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MACWORLD

The Macintosh® Magazine April 1990 $3.95 Canada $4.95

GRAY-SCALE SPECIAL

23 Monitors: Page 132 Imaging Software: Page 124

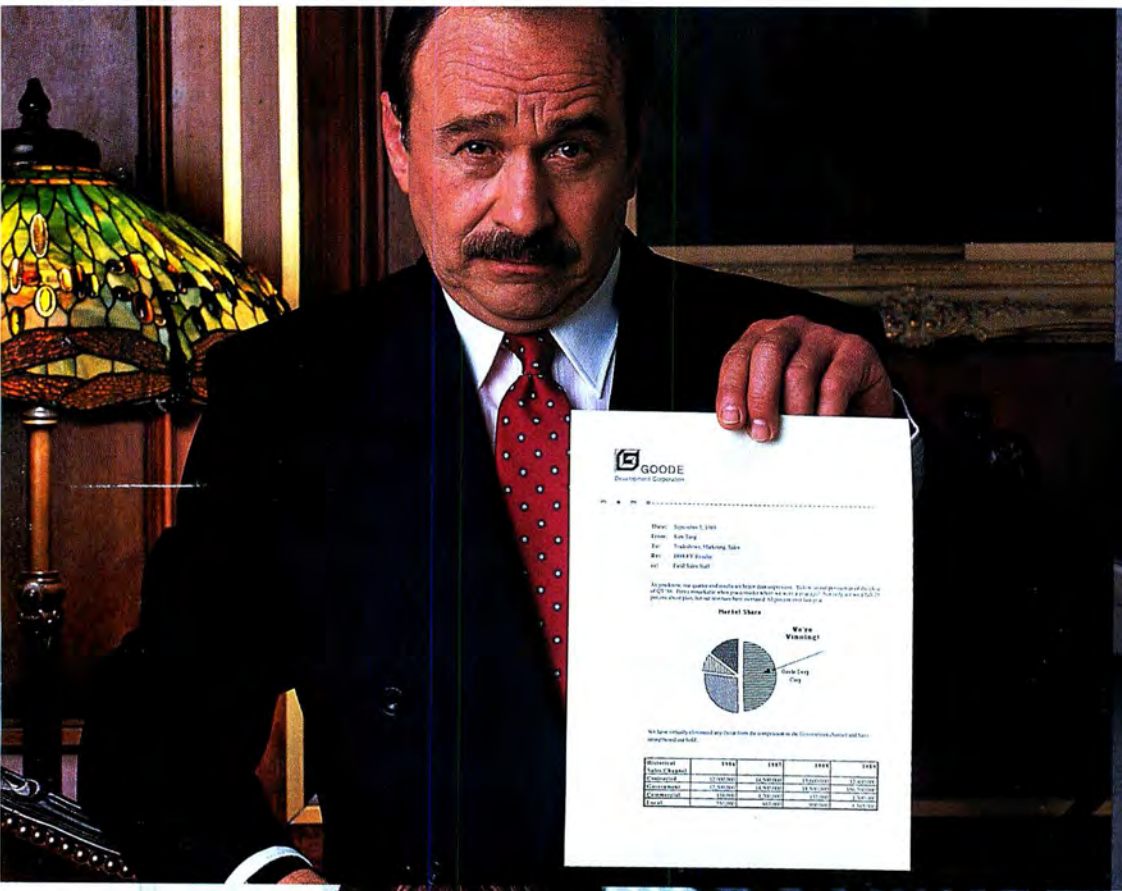
MORE FOR YOUR MEMORY
All About RAM

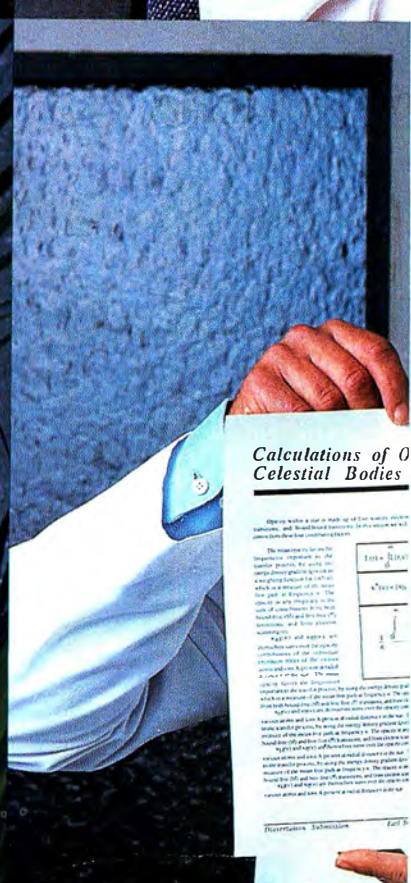
MULTIMEDIA
Is It Real?

APPLE'S FONT STRATEGY
Battle Royal

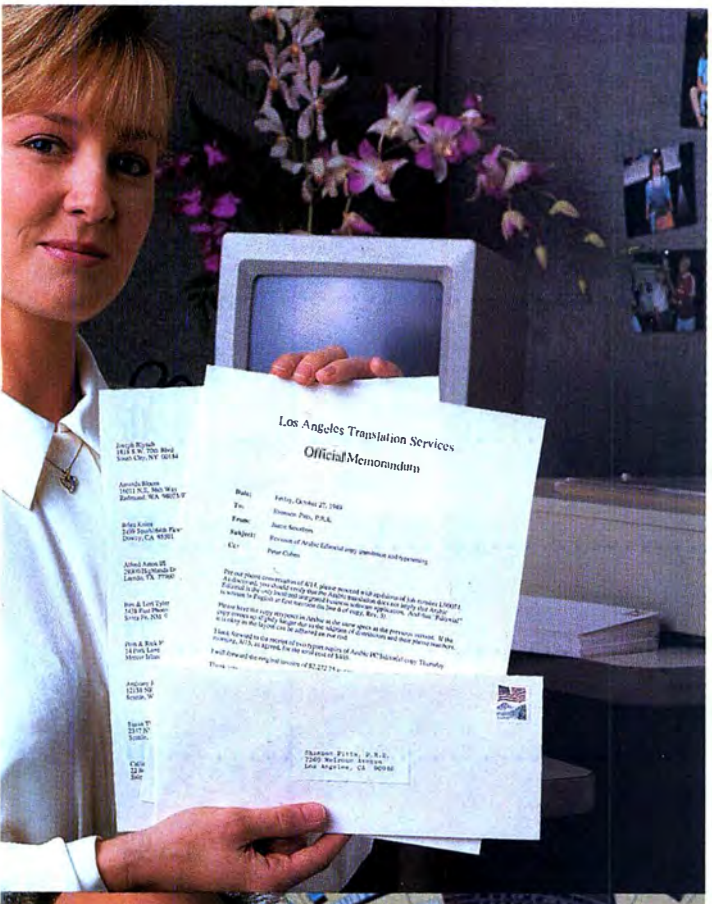
GEEK CHIC

There's a Word fo





r people like you.



Whether you're a marketing maven on your way up, a scientist knee-deep in formulas, or a temp trying to cope with an unfamiliar corporate mindset, when it comes to putting thoughts to paper, Microsoft is the Word for you.

And our users aren't the only ones who think so. Recently, the editors of *Mac User* gave Microsoft® Word version 4.0 the highest rating of any Macintosh® word processing program. Period.

A move we weren't altogether surprised by. You see, besides being perversely committed to research and development, we use a highly sophisticated approach to improving our product. We listen.

All of which has led to innovations like Word 4.0's powerful Table feature, enabling users to create side-by-side paragraphs, lists and even forms, without the hassle of dealing with tabs.

And since there *are* other word processing programs, Word 4.0 provides connectivity to Microsoft Word version 5.0 for the PC, PC WordPerfect,® DCA and other file formats. So now you can share your work with those less fortunate than yourself.

What's more, Word 4.0 is uniquely capable of delivering even more performance when it's used with other applications. For example, even highly educated executives can import Microsoft Excel tables and charts and automatically update them. Making it easy to ensure document accuracy. Plus, Microsoft Mail can be sent from within Word 4.0, significantly boosting workgroup productivity.

For something a tad more informative than this ad, call (800) 541-1261, Dept. J92, to receive a brochure or ask for the location of your nearest dealer for a demo. You'll find that no matter what type of word processing you're performing, you could be doing it better.

Just take our Word for it.

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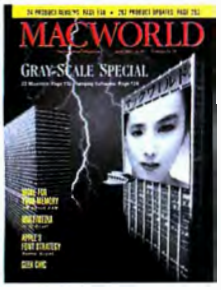

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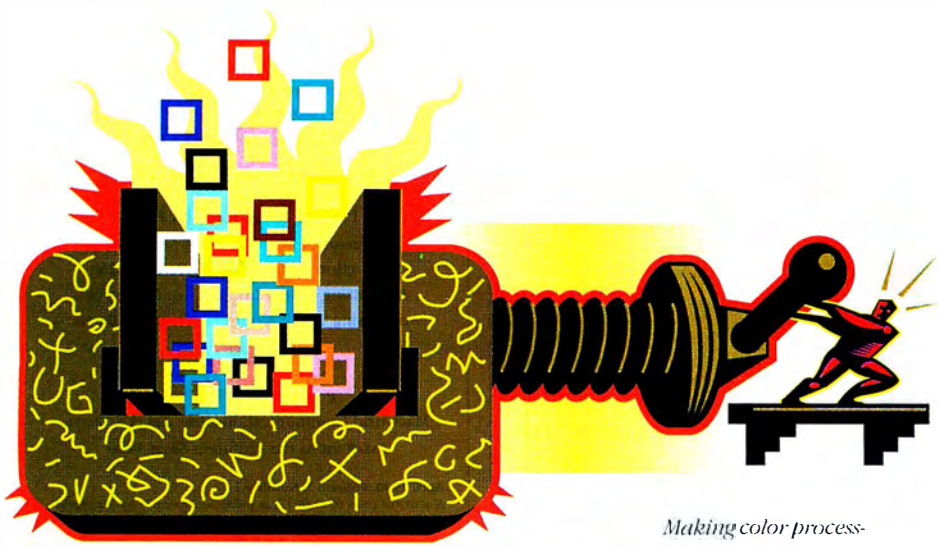

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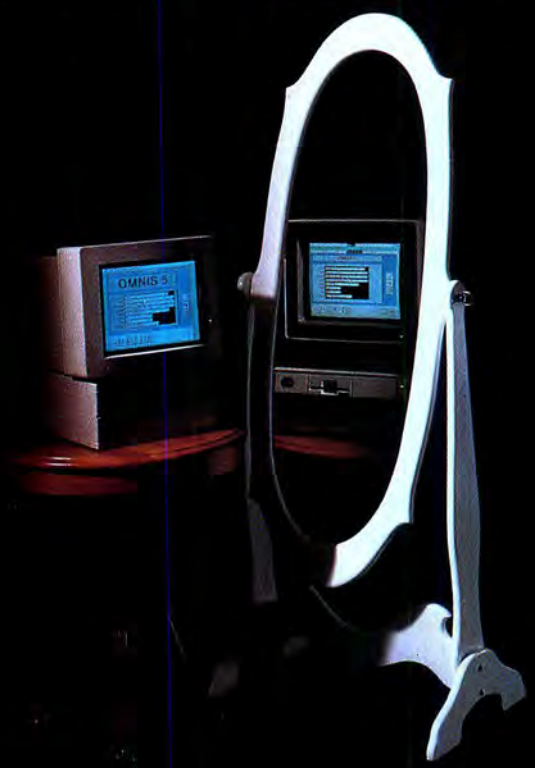

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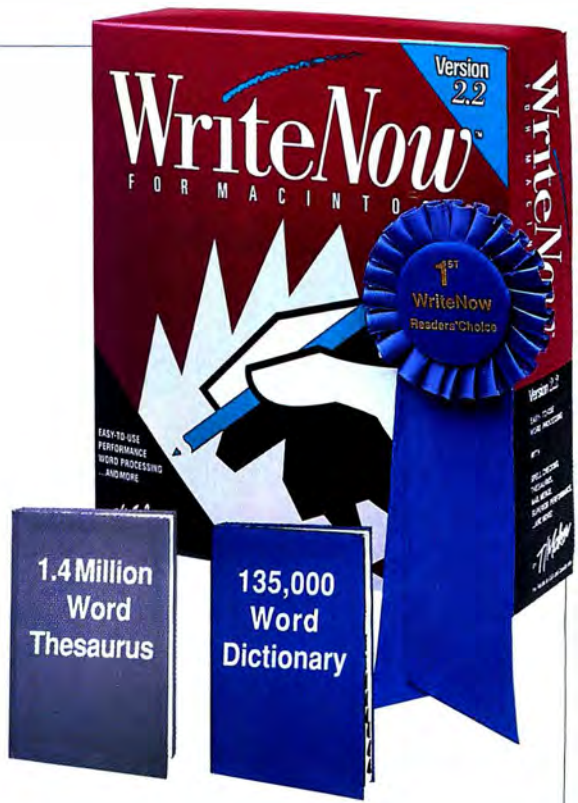

Reviews

"WriteNow is the definitive Macintosh word processor. It's ***easy to use, powerful, and comfortable****... Highly recommended.*
—JOHN DVORAK, INDUSTRY COLUMNIST

[WriteNow] might be The ***Best Program*** *I'd Ever Used. On any computer—it's* ***the fastest*** *Macintosh word processor I've ever seen.*
—JIM SEYMOUR, MACUSER MAGAZINE

Even if WriteNow is your first Mac application, you'll be up and running in no time. We rate ease of learning ***excellent****."*
—INFOWORLD MAGAZINE

Awards

1989 Editors' Choice Award,
'Best New Word Processor'—MACUSER

1989 Readers' Choice Award,
'Best Word Processor'—MACAZINE

#1 Rated *Word Processor in Macintosh 'PC Week Poll of Corporate Satisfaction.'*
—PC WEEK MAGAZINE

Comparison of Leading Word Processors

	WriteNow 2.2	MacWrite II	Word	Works
Actual disk space needed:	(2) 800K	Hard disk	Hard disk	Hard disk
Thesaurus:	**1.4 million**	220,000	220,000	No
Spell Checker:	**135,000**	100,000	130,000	60,000
Mail Merge:	**Yes**	Yes	Yes	Yes
Format Accelerators:	**Yes**	No	Yes	No
Multiple Header/Footers:	**Yes**	No	Yes	No
Extensive Undo:	**Yes**	No	No	No
Retail Price:	**$195**	$249.95	$395	$295

For more information...

Registered users will receive WriteNow 2.2 upgrade information in the mail. Nonregistered users should call or write for details.

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See us at Macworld Expo, Booth #1217

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PART IV SOLUTIONS

Industry Challenged To Take Role In Education

As we have seen, the inadequacy of the U.S. labor force is reaching crisis proportions. The average literacy level of today's young adults is below the average level needed by the job market. In the next ten years, the job market will demand an ever higher level of proficiency in reading and math. Many young adults with only a high school diploma or worse, will effectively be shut out from the job market as demand for unskilled, manual labor jobs decreases. This ever growing segment of the population will become a drag on the economy due to increased unemployment.

Corporations can ill afford not to try and remedy this situation, for if they do not, they will not have a satisfactory pool of job applicants from which to choose the workers to fill the positions which will develop in the next several years. The jobs will have to be filled by unqualified, undereducated workers. This will create lower productivity and thus a lower standard of living across the board. This, of course, has worldwide implications as well, adversely affecting U.S.

Sponsor curriculum development

As corporations assess key skills required over the next several decades, they should cooperate with high schools and junior high schools to develop programs that breed interest and proficiency in these areas. Corporations can even sponsor extracurricular activities such as science, computer or speech clubs that would reproduce real-life situations. Exposure, experience and excitement about the field can grow together.

Reward those who graduate

Corporations can offer guaranteed part-time employment to students who agree to remain in school and pursue courses preparing them for careers in their chosen field. Students perceive an incentive to stay in school and to experience a variety of disciplines.

Support employee involvement in school activities

Corporations should encourage executives to spend time with students in the classroom. The man-hours forfeited would be repaid many times over. For students, school becomes a more interesting environment with clear attachments to the outside world. At the same time, the company builds a close relationship with young people with roots

"THE BEST COMPUTER FOR PUBLISHING EVER MADE."

The words are those of Jonathan Seybold, perhaps the most respected voice in desktop publishing. His newsletter, The Seybold Report, reaches some 200,000 publishers–of whom we estimate 199,990 have never even tried a NeXT™ Computer.

Certainly, then, Mr. Seybold's words weren't calculated to gain favor among his readers. We suspect a far simpler motive: honesty.

The NeXTmachine has caused many to believe that it was designed exclusively for publishing. Not a bad theory, considering the evidence.

To begin with, the NeXT Computer is the first pure PostScript• machine. You can work on-screen with the hundreds of fonts in Adobe's type library. You can output to any PostScript device, be it laser printer, slide maker or the highest quality professional typesetter. And what you see on the display is precisely what will print.

As the rest of the industry explores ways to accomplish this feat, in a year at best, only the NeXT Computer can do it today.

In addition, the quality of the image itself is raised dramatically.

The NeXT MegaPixel Display provides a huge workspace, with sharpness and detail you haven't seen on a computer before. The NeXT Laser Printer, at 400 dots per inch, offers over 75% greater resolution than the current 300 dpi standard.

Ours is also the only system to offer optical storage as a standard feature. A single optical disk (256 megabytes) lets you store and transport multiple versions of long documents, rich in graphics–along with expansive libraries of fonts and art.

The NeXT Computer streamlines the entire publishing process. FrameMaker• software combines writing, graphics and layout tools in one publishing package. Which brings an end to the tradition of forever bouncing between programs, "importing" and "exporting" as you go.

And, thanks to true multitasking, you can instantly access other applications.

The NeXT Digital Library,™ for example, is always at hand. It includes entire books, such as Webster's Ninth New Collegiate Dictionary• and Collegiate• Thesaurus. Or archives of your past work, in which you can pinpoint text or graphics in seconds, to copy into new documents.

NeXT Mail makes publishing a truly collaborative process. Unlike ordinary e-mail, it lets you send and receive messages that include text, graphics, voice, even entire documents. Never has there been a more effective way to locate information, receive comments and get approvals.

And, as Publish! magazine recently reported, the NeXT Computer "offers a staggering price advantage" when compared to personal computers configured for desktop publishing.

To receive our publishing brochure, call 800-848-NeXT. While you're on the line, ask for the location of your nearest Businessland Center. There, you can get some hands-on experience with the world's most sophisticated desktop publishing system.

And get a quote on a system all your own.

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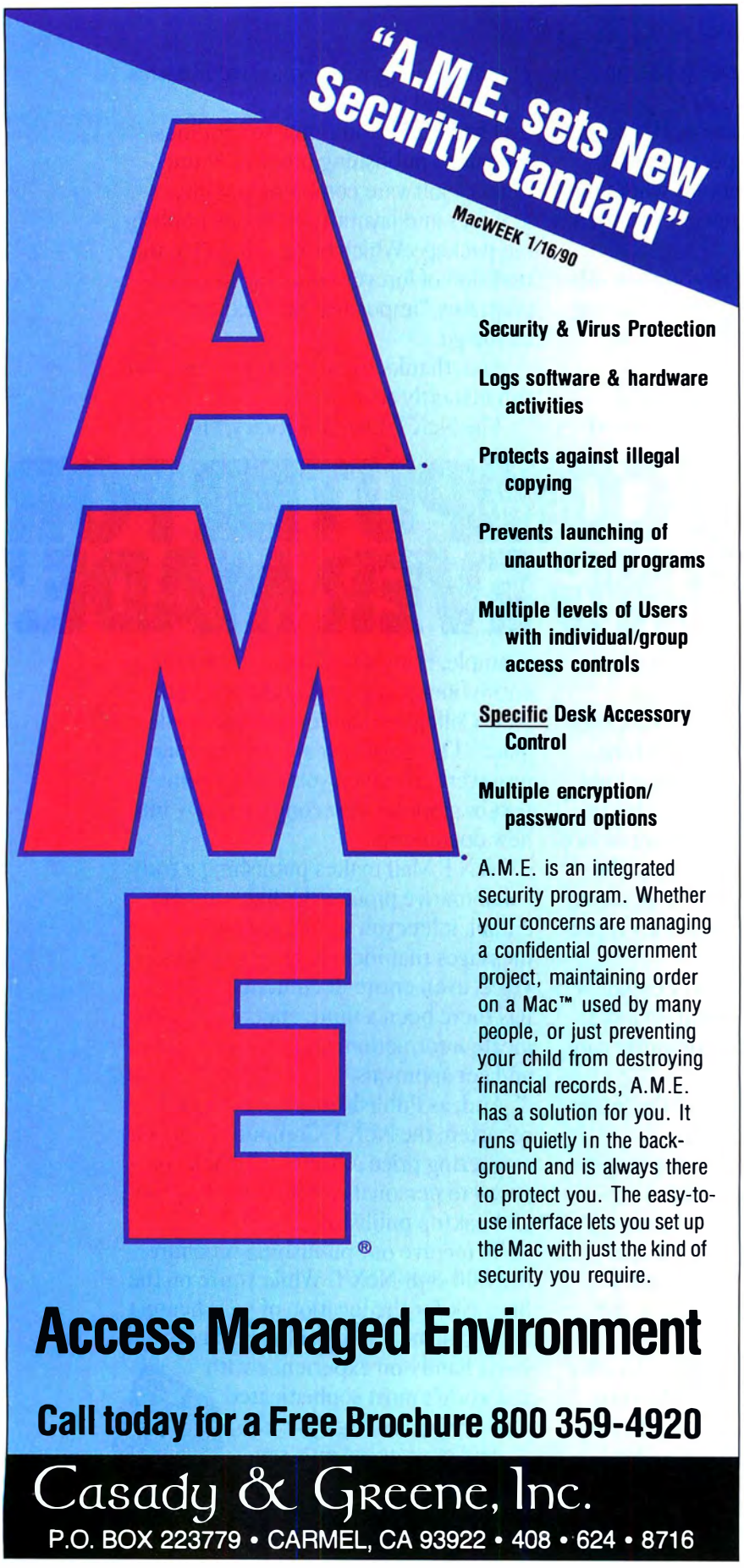

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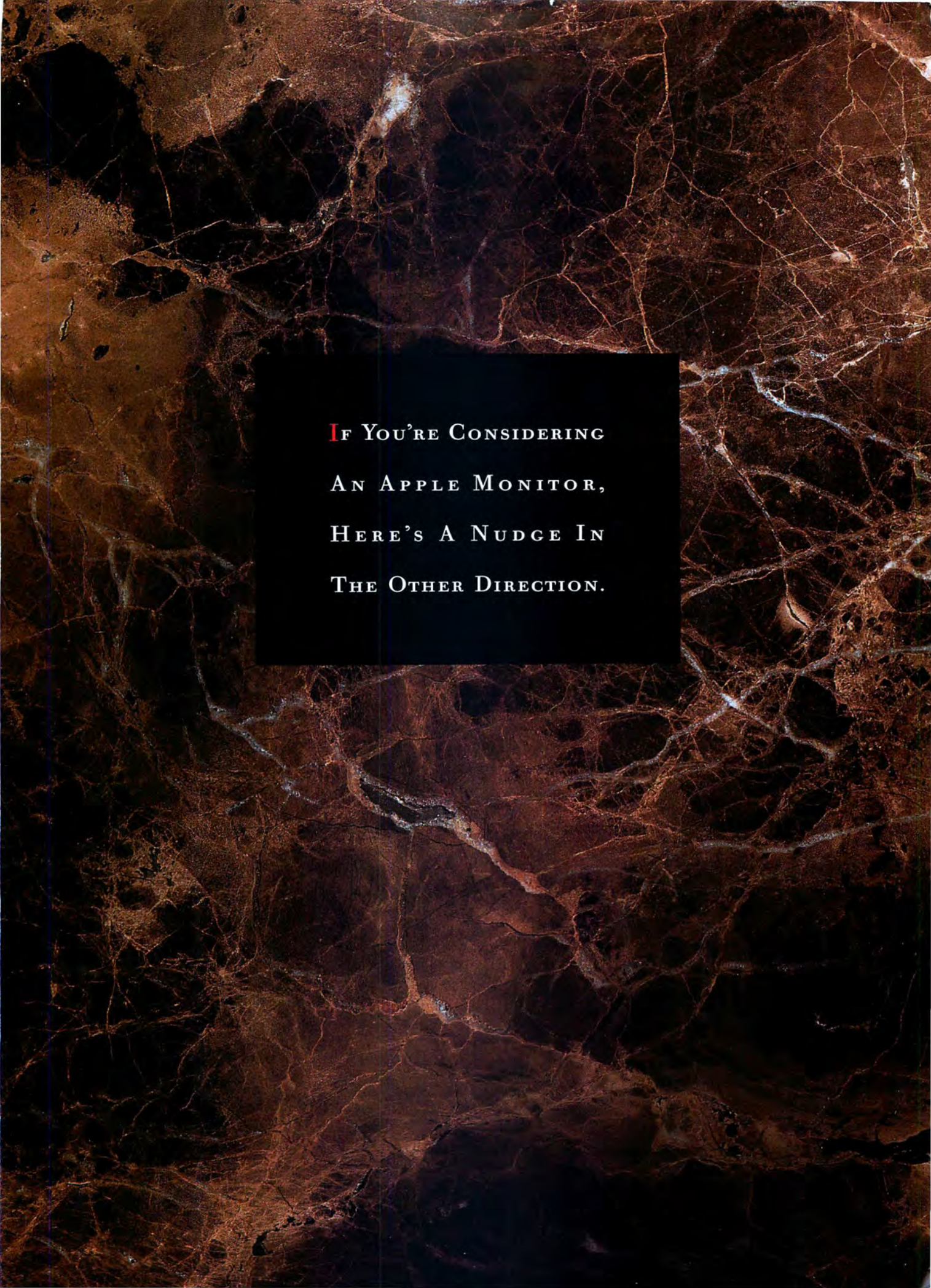
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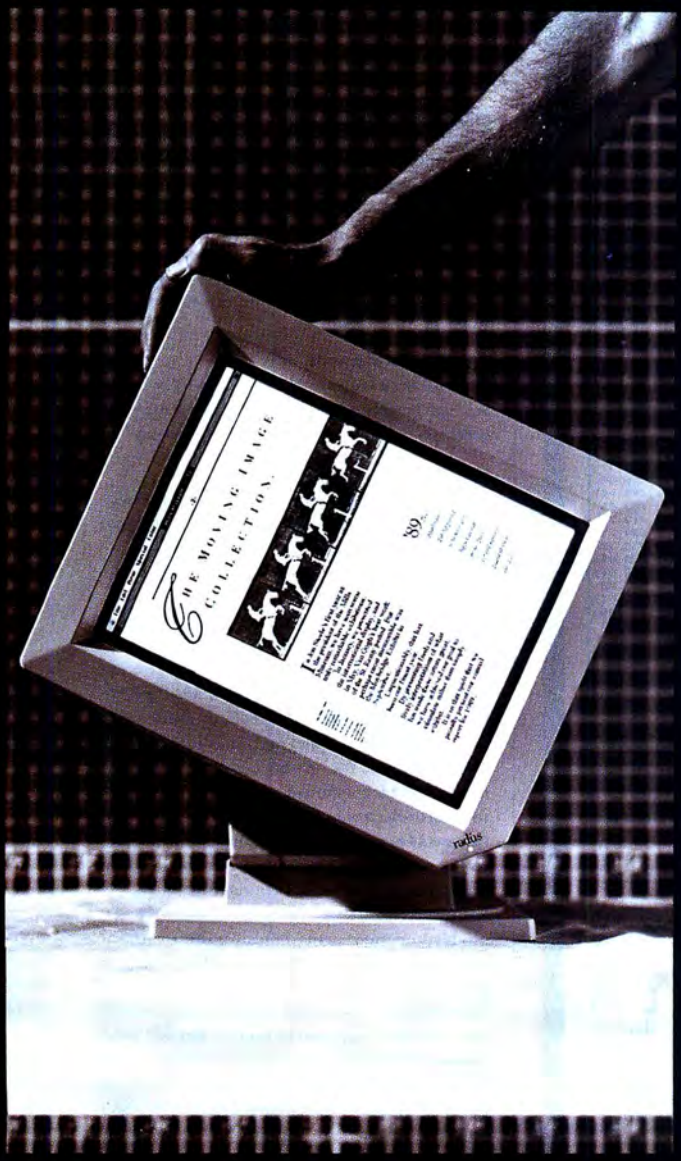

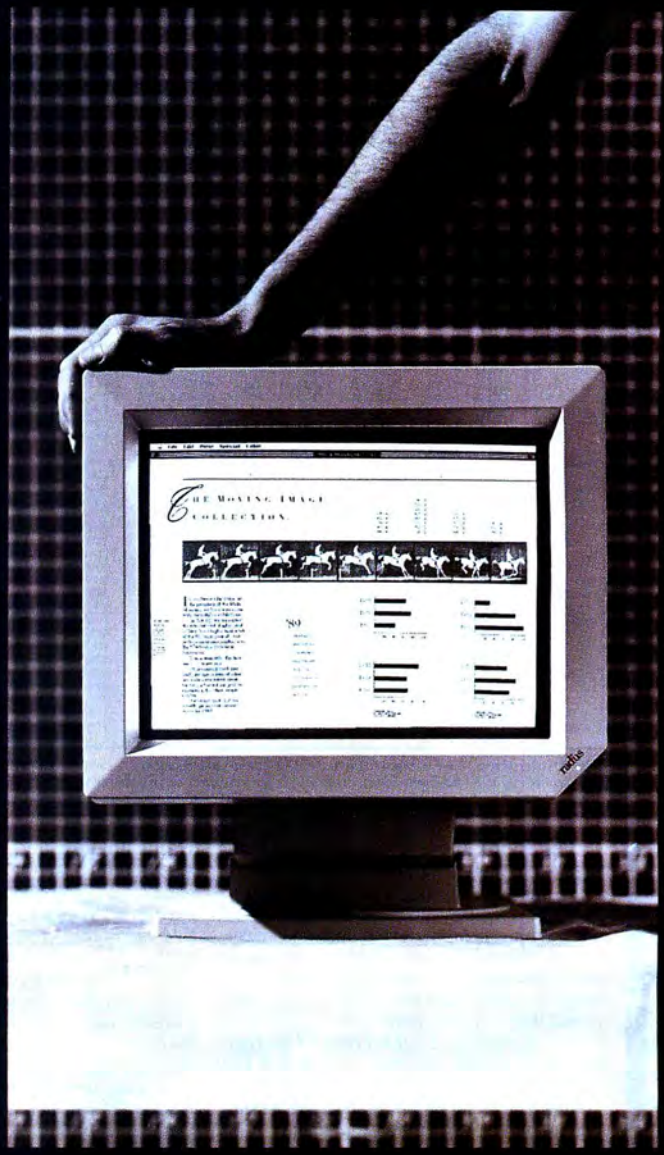

levels of gray are furnished, with upgrades to 16 levels for near-photographic quality images. Ideal for graphic design and desktop publishing. ● Pivot is compatible with virtually every Macintosh application and may be used with either the SE/30 or Macintosh II family.

● To find your nearby Radius reseller, phone 1-800-227-2795.* Then, before you buy a display for your Macintosh, check out another amazing way to look at things from Radius.

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Puts	09/16/85	100	$2.25	$209.25	$22,709.25	09/26/85	$2.50	$209.25	$24,790.75	$2,081.50
Calls	11/05/85	100	$4.88	$245.00	$48,995.00	12/18/85	$19.63	$687.50	$195,562.50	$146,567.50
Calls	01/27/86	100	$3.25	$209.25	$32,709.25	03/04/86	$10.88	$425.00	$108,325.00	$75,615.75
Calls	03/12/86	100	$4.75	$241.25	$47,741.25	04/29/86	$9.63	$387.50	$95,862.50	$48,121.25
Calls	05/21/86	100	$4.50	$233.75	$45,233.75	06/09/86	$9.75	$391.25	$97,108.75	$51,875.00
Calls	08/06/86	100	$4.13	$222.50	$41,472.50	09/05/86	$12.75	$481.25	$127,018.75	$85,546.25
Calls	09/17/86	100	$4.50	$233.75	$45,233.75	11/13/86	$6.88	$305.00	$68,445.00	$23,211.25
Calls	11/25/86	100	$4.13	$222.50	$41,472.50	12/19/86	$4.88	$245.00	$48,505.00	$7,032.50
Puts	01/02/87	100	$2.38	$209.25	$23,959.25	01/05/87	$1.00	$209.25	$9,790.75	($14,168.50)
Calls	01/08/87	100	$6.75	$301.25	$67,801.25	03/03/87	$29.63	$987.50	$295,262.50	$227,461.25
Calls	03/05/87	100	$3.50	$209.25	$35,209.25	03/12/87	$2.94	$209.25	$29,165.75	($6,043.50)
Calls	03/20/87	100	$4.75	$241.25	$47,741.25	04/07/87	$8.25	$346.25	$82,153.75	$34,412.50
Calls	05/06/87	100	$3.75	$211.25	$37,711.25	05/08/87	$2.25	$209.25	$22,290.75	($15,420.50)
Puts	05/19/87	100	$4.88	$245.00	$48,995.00	05/21/87	$7.50	$323.75	$74,676.25	$25,681.25
Calls	06/17/87	100	$4.25	$226.25	$42,726.25	07/16/87	$8.25	$346.25	$82,153.75	$39,427.50
Calls	07/31/87	100	$3.13	$209.25	$31,459.25	08/06/87	$5.00	$248.75	$49,751.25	$18,292.00
Calls	08/10/87	100	$5.88	$275.00	$59,025.00	08/26/87	$13.69	$509.45	$136,390.55	$77,365.55
Puts	09/09/87	100	$4.38	$230.00	$43,980.00	09/10/87	$3.63	$209.25	$36,040.75	($7,939.25)
Puts	10/08/87	100	$7.75	$303.13	$77,803.13	10/20/87	$97.00	$2,757.50	$967,242.50	$889,439.37
Puts	11/10/87	100	$5.00	$248.75	$50,248.75	11/11/87	$5.69	$269.38	$56,605.63	$6,356.88
Calls	11/13/87	100	$3.50	$203.75	$35,203.75	11/24/87	$2.38	$209.25	$23,540.75	($11,663.00)
Calls	12/15/87	100	$3.13	$209.25	$31,459.25	12/24/87	$8.50	$353.75	$84,646.25	$53,187.00
Calls	02/11/88	100	$2.25	$209.25	$22,709.25	03/17/89	$7.63	$327.50	$75,922.50	$53,213.25
Puts	03/25/88	100	$3.38	$209.25	$33,959.25	04/05/88	$5.63	$267.50	$55,982.50	$22,023.25
Calls	05/16/88	100	$4.63	$237.50	$46,487.50	05/16/88	$5.25	$256.25	$52,243.75	$5,756.25
Calls	05/28/88	100	$4.25	$226.25	$42,726.25	06/27/88	$15.00	$548.75	$149,451.25	$106,725.00
Calls	08/01/88	100	$4.00	$218.75	$40,218.75	08/05/88	$2.63	$209.25	$26,040.75	($14,178.00)
Puts	08/10/88	100	$4.00	$218.75	$40,218.75	08/24/88	$7.38	$320.00	$73,430.00	$33,211.25
Puts	10/05/88	100	$3.25	$209.25	$32,709.25	10/10/88	$2.00	$209.25	$19,790.75	($12,918.50)
Calls	10/18/88	100	$5.50	$263.75	$55,263.75	10/22/88	$9.50	$383.75	$94,616.25	$39,352.50
Calls	01/09/89	100	$7.13	$312.50	$71,562.50	02/09/89	$18.00	$638.75	$179,361.25	$107,798.75
Calls	02/17/89	100	$6.25	$286.25	$62,786.25	02/22/89	$5.25	$256.25	$52,243.75	($10,542.50)
Puts	02/23/89	100	$3.75	$211.25	$37,711.25	03/02/89	$4.88	$245.00	$48,505.00	$10,793.75
Calls	03/06/89	100	$5.63	$267.50	$56,517.50	03/19/89	$8.38	$350.00	$83,400.00	$26,882.50
Calls	03/29/89	100	$6.38	$290.00	$64,040.00	05/02/89	$10.75	$421.25	$107,078.75	$43,038.75
Puts	05/10/89	100	$2.63	$209.25	$26,459.25	05/12/89	$1.75	$209.25	$17,290.75	($9,168.50)
Calls	07/06/89	100	$5.75	$271.25	$57,771.25	08/14/89	$25.00	$673.25	$249,326.75	$191,555.50
Calls	08/24/89	100	$3.63	$209.25	$36,459.25	08/25/89	$8.13	$342.50	$80,907.50	$44,448.25
Calls	09/28/89	100	$4.13	$222.50	$41,472.50	10/09/89	$11.25	$436.25	$112,063.75	$70,591.25
										$2,520,603.80

76.09% Accurate: Above is a chart of actual OEX trades from December 28, 1984 to October 9, 1989, based on the signals generated by the ***Right Time-Index Program***™*. By following the signals generated by the program, the rules in the manual and starting with just a small amount of capital ($50,000) your profits would have been over $2,500,000.00.*

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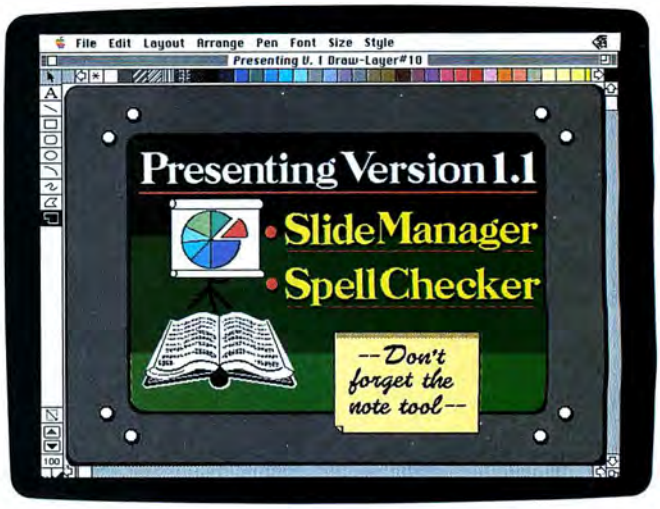

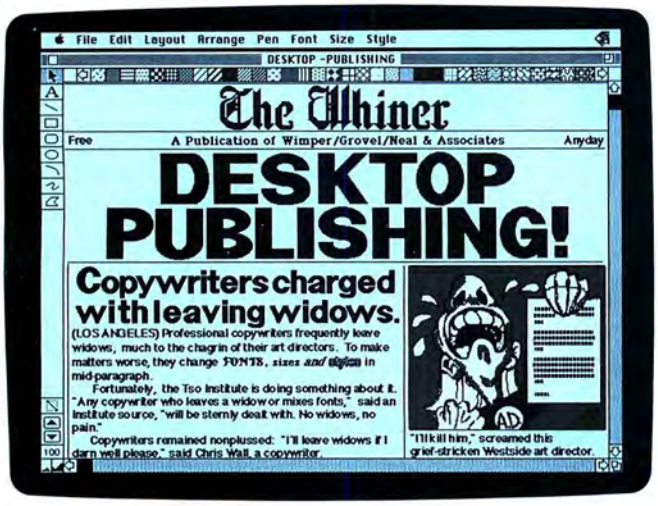

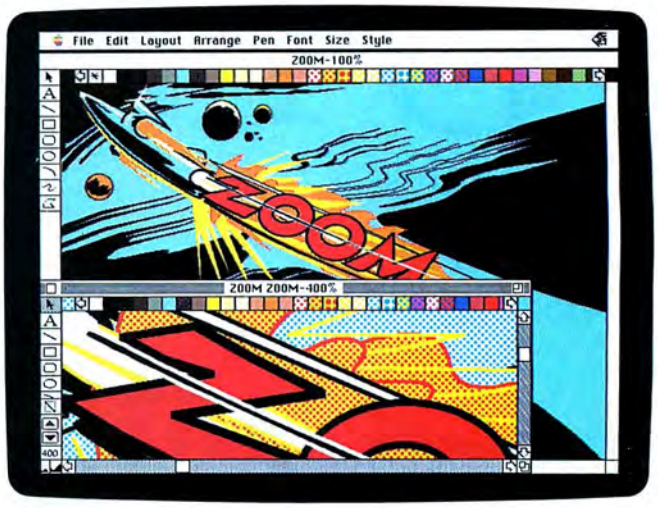

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MACBULLETIN

Adobe Wins Font Copyright

Adobe has won the copyright for a font based on its being an executable program that runs under PostScript, marking the first time the U.S. Copyright Office has acknowledged that a digital font can be a program. According to Adobe president John Warnock, U.S. law does not recognize font design as intellectual property, which prevents font designers from copyrighting fonts. But computer programs are protected. Warnock was uncertain how the changes would affect pricing and licensing arrangements for fonts.

Aldus Likely to Acquire Silicon Beach

At press time, Aldus representatives were in San Diego poring over Silicon Beach's books after the two companies signed a letter of intent for Aldus to acquire Silicon Beach. Representatives of both companies refused to comment on the future of Silicon Beach's products, which include SuperPaint, Super 3D, Digital Darkroom, Dark Castle, and SuperCard, but Aldus has long been rumored to be interested in a low-end page-layout program, and Silicon Beach was about to ship its $299 Personal Press.

Bon Mot about Word 4.0 Bug

Microsoft has just released Word version 4.0a to address problems with Word's management of imported PICT files; a bug occasionally corrupts PICT objects copied from Word back into their creating applications. The problem affects SuperPaint files (SuperPaint is bundled with Word); expressions created with Prescience Corporation's mathematical typography package, Expressionist; and possibly other applications. Version 4.0a also fixes a bug in Word's Calculate command. The upgrade is free to registered owners who require it. Contact Microsoft support at 206/454-2030.

SoftPC Adds Soft Peripherals

Insignia Solutions is upgrading SoftPC to emulate an IBM AT–class machine entirely in memory. SoftPC's EGA/AT Option Pack, which lists for $199, also emulates an EGA video board, an 80287 math coprocessor, and a LIM board for expanded memory. The new version requires a Mac II–family machine or an SE/30. For more information, contact Insignia Solutions at 408/522-7600.

TypeStyler Goes Type 1

Brøderbund has announced TypeStyler version 1.01, which applies TypeStyler effects to Adobe Type 1 fonts. Brøderbund is testing Type 1 fonts from other vendors as well. Version 1.0 could use only Type 3 fonts. The new version uses tools licensed from Pipeline Associates to convert Adobe Type 1 fonts to a format that TypeStyler can convert to SmoothFonts. The upgrade will be free to registered users who contact Brøderbund at 415/492-3200.

1stAid Abandons Virus Defenses

Anti-Virus Kit will no longer be upgraded to combat new computer viruses. 1stAid Software has written to all registered owners to explain its decision, calling the new virus WDEF a "second generation" virus designed to escape detection, and saying that without virus control in hardware, WDEF will spawn an "endless cycle of response/counter-response," like the battles over copy protection, as virus writers try to evade virus-detection programs.

Radius Shows 21-Inch Gray-Scale Monitor

Radius recently unveiled its TPD/21, a 21-inch monitor that can display two full pages of a document side by side. Compatible with both the Macintosh family and the IBM PC/AT and its equivalents, the TPD/21 provides either monochrome or 8-bit gray-scale display, depending on the controller board used with it. For the Macintosh, the monitor's resolution is 1152 by 882 pixels, or 74 pixels per inch. Its refresh rate is 71Hz. The TPD/21 is compatible with other Radius products, including the PrecisionColor Calibrator (works in gray-scale only), the Radius GS/C Interface, the TPD Interface, and Radius accelerators. The monitor is available now at a suggested list price of $1795, which includes RadiusWare software. Radius also reduced the list price of its Macintosh TPD Interface by $100, to $595. For more information, call Radius at 408/434-1010.

Adding Color Vision

Digital Vision has begun shipping a color version of its ComputerEyes video digitizer for the Mac II series. Called the ComputerEyes Professional Series, the digitizer can capture either 8-bit or 24-bit images generated by any standard NTSC video source, including S-video frames from Hi-8 or Super VHS machines. The ComputerEyes Professional Series is a single NuBus board with a list price of $449.95, including software. For more information, call Digital Vision at 617/329-5400.

MicroNet Offers DAT Tape, Erasable Optical Drive

Two high-capacity storage subsystems for the Mac, a *(continues)*

1.3GB DAT drive and a 600MB erasable optical drive, have recently begun shipping from MicroNet Technology. The DAT drive comes in a 5¼-inch form factor and includes a SCSI controller. Called the Micro/DAT, it has an average access time of 20 seconds and retails for $4295. The erasable optical drive, based on a Sony device, stores 300MB on each side of a single optical disk. Also equipped with a SCSI port, the Micro/Optical has an average access time of 95ms and a data-transfer rate of 7.4 megabits per second. The Micro/Optical drive retails for $5295. For more information, call MicroNet at 714/837-6033.

Claris Takes Wingz

Claris has acquired access to core technology underlying the Wingz graphical spreadsheet that could fill in gaps in the Claris product line. Wingz has several capabilities that Claris could develop as separate applications or incorporate into its other applications, including 3-D graphing, the high-level programming language HyperScript, the spreadsheet engine, and SQL hook for communicating with host minicomputer and mainframe databases. Claris officials declined to comment on their plans.

MitemView to Support 3270 Emulation

MitemView, a set of tools for building HyperCard front ends that enable Macs to communicate with minicomputers and mainframes, has two new "personality" modules. One supports Tri-Data's Netway gateways, which use a networked Mac to emulate a 3270 cluster controller; and the other supports the Avatar MacMainframe, a board that makes individual Macs appear as 3270 terminals to the mainframe. The MitemView 3270 modules list for $495 each and require MitemView at $995. Mitem has also announced a Tandem 6530 module at $495. For more information, contact Mitem at 408/559-8801.

MultiClip 2.0 in Development

At press time, Olduvai's Clipboard-and-Scrapbook-enhancement utility, MultiClip 2.0, had just gone into beta testing. The new version adds support for naming and printing individual ClipFrames; pasting ClipFrames from a pop-up menu without opening MultiClip; and 32-bit color. Olduvai says the new MultiClip is faster, offers improved window management under MultiFinder, and sports a simplified interface. List price remains $99. For more information, call Olduvai at 305/665-4665.

A Shell for Plugging Holes

Abbott Systems is developing a utility that runs special functions inside any application. For example, a list-sorter that sorts a column of names in a spreadsheet or a page-layout document, and a case-changer that corrects capitalization in a downloaded text file. An INIT launches the functions, which are similar to XCMDs. Abbott Systems will ship the still-unnamed product with a collection of functions and provide tools for third-party developers to write more. Company president Ken Abbott said pricing would be in the utility product range: "between $50 and $150." For more information, call 914/747-3116.

Faxgate Turns Macs Into Fax Servers

Solutions' Faxgate integrates E-mail with sending and receiving faxes over most Mac-compatible fax modems. Faxgate adds fax-serving capability to an E-mail server, intercepting outgoing E-mail messages, converting them to Group 3 fax format, and sending them out via fax modem. Incoming faxes are sent as E-mail messages to the recipient. Solutions is shipping a Microsoft Mail 2.0–compatible version and expects to add QuickMail compatibility in April. Faxgate lists for $395 and requires Solutions' BackFax software at $245. Faxgate includes five copies of MailMaker, an E-mail document-exchange utility like Solutions' SuperGlue. For more information, contact Solutions at 802/865-9220.

Liberty Ships Small 200MB Hard Disk

Liberty Systems is shipping a 200MB external hard disk that weighs 3 pounds and measures only 2 by 5 by 7 inches. Called the Liberty 200R, the $1699 hard disk uses an 18ms Rodime mechanism and is internally terminated. An optional $50 international power supply, which fits inside the case, works with power lines that provide from 90 to 300 volts and functions as a surge protector with U.S. voltages. For more information, call Liberty at 408/983-1127.

Varityper Builds PostScript Offerings

Varityper is shipping its modular Series 4000 PostScript imagesetter controllers, which can output to a 600-dpi plain-paper device orto 72-pica or 108-pica film devices at resolutions up to 3048 dpi. Varityper is also releasing Adobe PostScript fonts for its imagesetters and is converting its own type library to Type 1 format. For more information, contact Varityper at 201/887-8000.

RasterOps Announces TV Board, Introductory Offer

RasterOps recently announced the ColorBoard 364, which combines the capability of its 24-bit ColorBoard 264 graphics adapter with additional video features. The ColorBoard 364 accepts 24-bit color video input from any NTSC source and displays it in real time. The board can function as a frame grabber, sending digitized PICT files to disk at a rate of 30 frames per second. RasterOps is working on connections to HyperCard and SuperCard, and will provide add-on external hardware that will act as a TV tuner and cable TV connector. The introductory price of the ColorBoard 364 will be $1500 until April 1, at which time the price will rise to $1995.

The company also introduced the ColorBoard 208, an 8-bit version of its 24-bit ColorBoard 264, that can be upgraded to 24-bit color by adding one megabyte of video RAM. The ColorBoard 208, available now, lists for $495. The upgrade will list for about $400 from RasterOps, but users can also buy the VRAM from third parties. For more information, contact RasterOps at 408/562-4200. M

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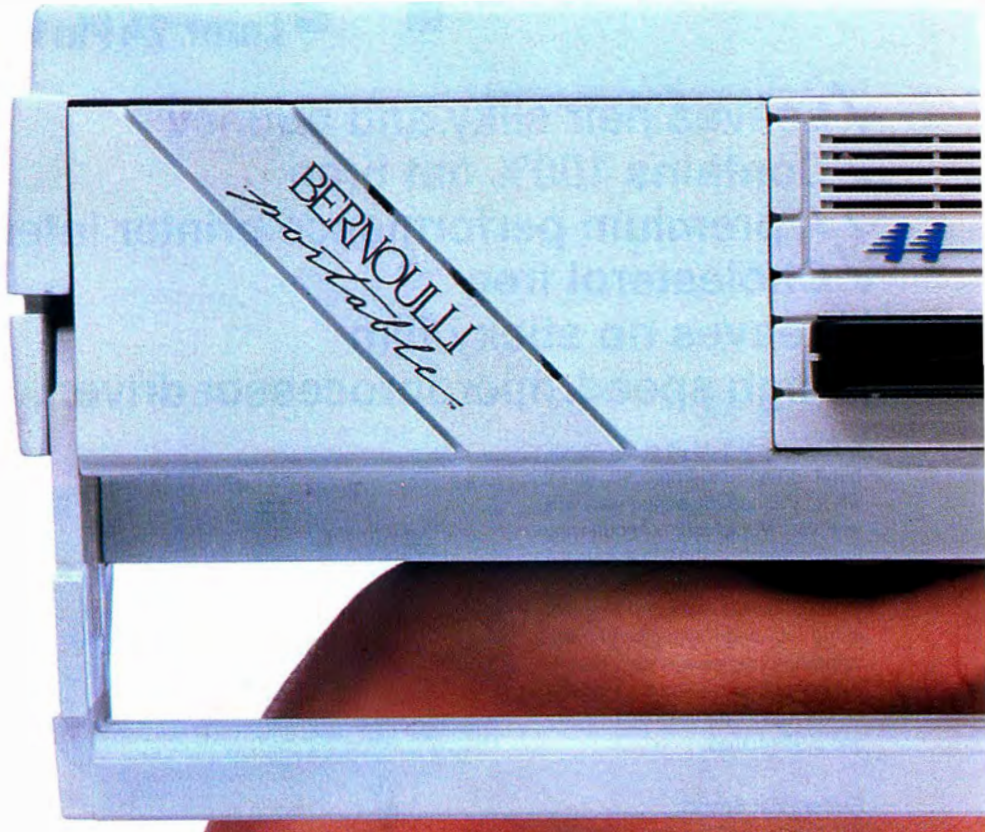

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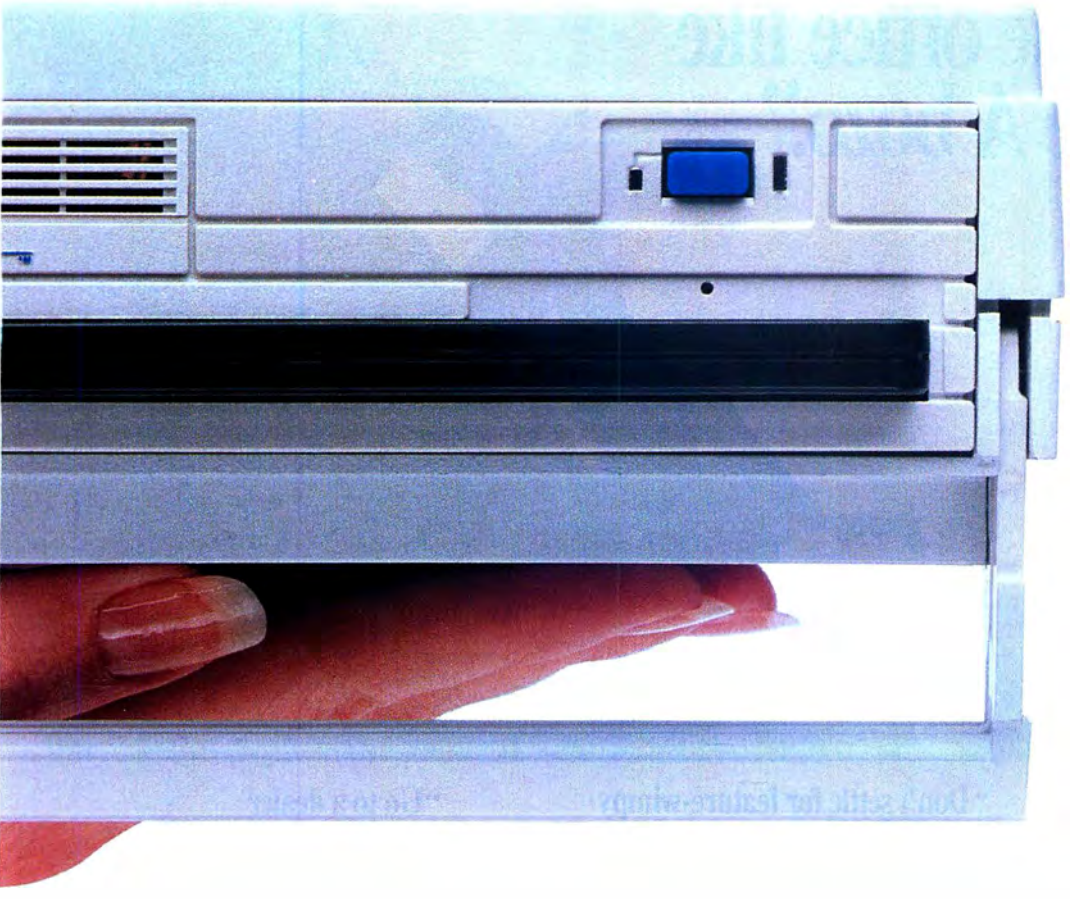
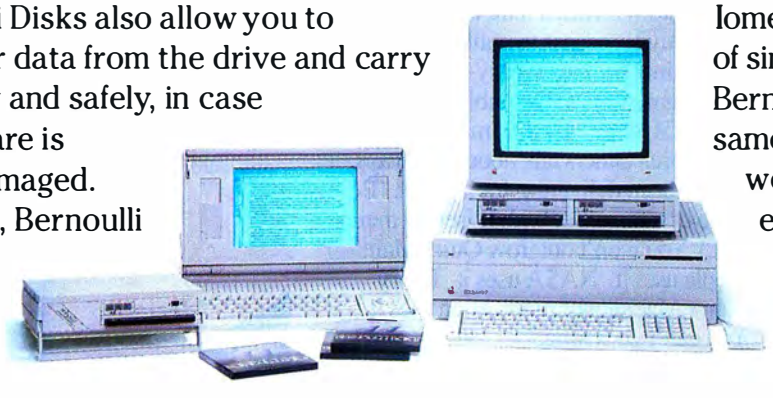


Bernoulli Disks also allow you to remove your data from the drive and carry it separately and safely, in case your hardware is stolen or damaged. Beyond that, Bernoulli provides unlimited storage and backup capacity, with 22msec effective access time, and Reed-Solomon data protection that's 15 times more effective than that used on a typical hard disk.



As the leader in removable mass storage, Iomega also has a complete line of single-and dual-drive 44MB Bernoulli products that offer the same benefits for Macintosh as well as IBM® users in desktop environments.*

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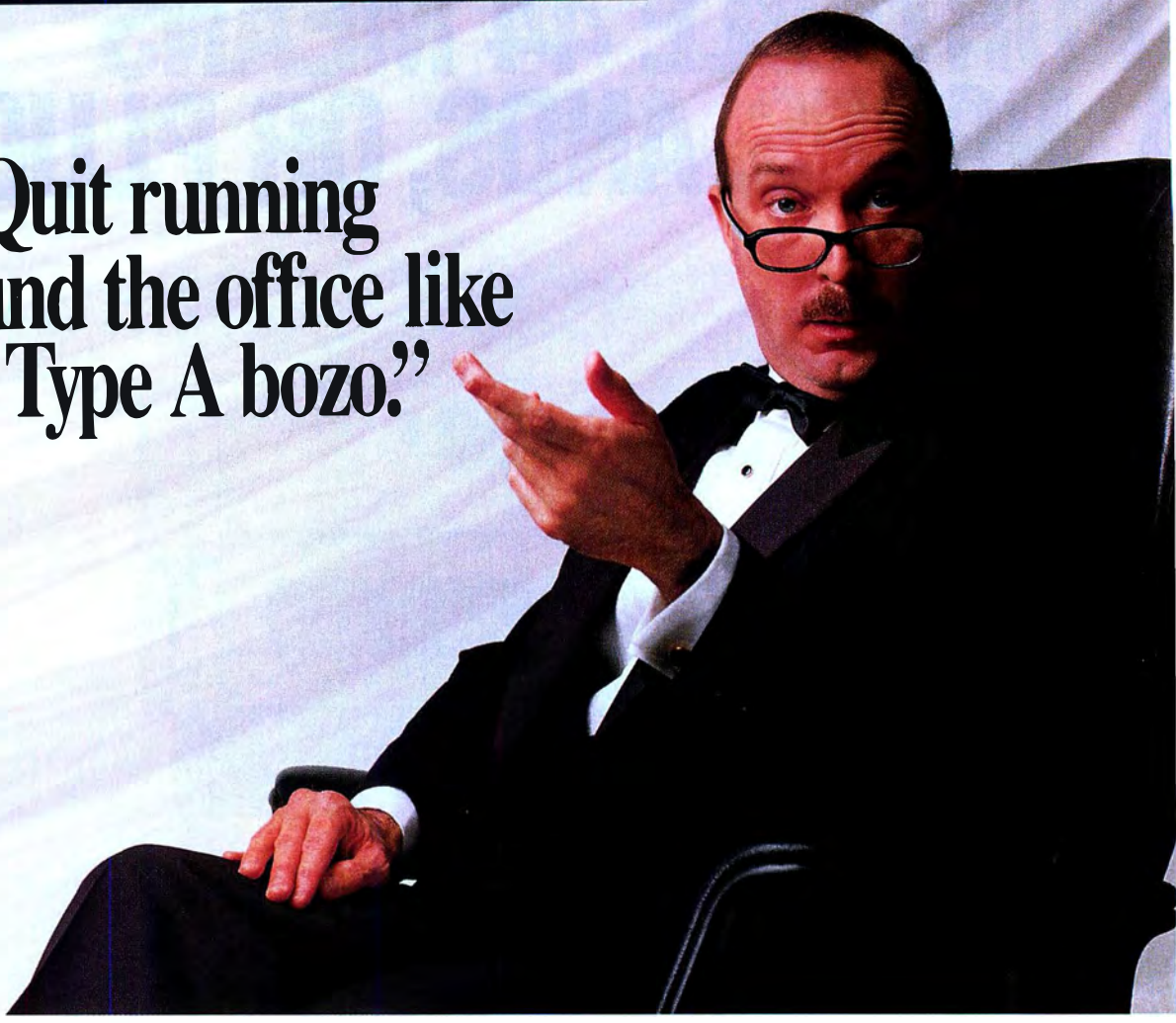

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Macworld Goes Global

How we made MacNost in the USSR

BY JERRY BORRELL

Somewhere on a side street of Moscow is an office where several people sit stooped over a couple of dim computer screens. The gray Russian winter still beats on the windows outside with a ferocity announcing its arctic origin. In the crowded room, thick with cigarette smoke, you can hear the clicking of a computer keyboard. And then, from the far side of the room, comes a little cling that proclaims a Macintosh has been turned on.

Yes, Macs in Moscow. The irony of it all. The computer for the rest of us is becoming the people's computer, although that expression is certainly passé in the Soviet Union of today. Now the Macintosh will be used to help produce *PC Mir (PC World)* in the Soviet Union.

Fifteen years ago I wandered Moscow's streets as a student, my footsteps dogged by a host of less-than-subtle observers. At times an older person would pull me aside and whisper that as long as the Soviet people had bread, shelter, and peace, things were all right. Twenty million countrymen had died in the Second World War and could I please tell everybody in America that what people in the Soviet Union wanted most was peace.

Argue what you will about the role the USSR has played—Evil Empire or tormented giant of Asia—the Mac can certainly help bring about change and the greater possibility of peace to the Soviet Union. Last fall the State Department approved the export of Motorola 68000 processors to the Eastern Bloc. So with the help of Apple Computer's Michael Spindler, Kent Edquist, and others, I have contrived to deliver the editors at *PC Mir* from PC tyranny through the use of Macintoshes to produce their bimonthly publication. Moreover, I've instigated an upcoming article in *PC Mir* that tells readers how to get started with desktop publishing in Cyrillic. Last winter I discussed desktop publication of *PC Mir* with my Soviet colleague Michael Volodarsky, director of Information Computer Enterprises [ICE] of the USSR subsidiary of IDG, our parent company. I was concerned—torn by my old experiences with the deadening Soviet system and by heartrending television pictures of thousands of people standing at the Brandenburg Gate of Berlin, singing, dancing. Celebrating the finish of four decades of totalitarian society. In the end, it was no contest and I plunged headlong into helping acquire Macs for the USSR.

PageMaker is being localized for Cyrillic, and Apple is expected to deliver a Cyrillic Mac for the USSR as early as May. A *Macworld*-sponsored seminar scheduled for April will help U.S. developers enter the Soviet market. The first major exposition of U.S. computers in Moscow is scheduled for

(continues)

TAN WEE KHIANG

DUDLEY REED

James L. Forquer, managing director of Apple Computer Singapore, shows associate features editor Cheryl England Spencer the monitor-testing site at Apple's factory (top). Macworld UK editor Peter Worlock and senior associate reviews editor Carol Person savor London's famous weather.

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TIMOTHY PORTER

Shigechika Takeuchi, president of Apple Computer Japan (right), and executive editor David Ushijima met in Tokyo.

July by cosponsors IDG and ICE.

There in the shadow of the Exposition of Achievements of the Soviet Economy will be Macintosh hardware and software as well as other personal computers. You could say that we are delivering technology to the Soviets that will help them repair their ravaged economy, and you may wonder whether that is something we should do. But as an observer with more than an academic knowledge of the Soviet people, I would argue that putting Macs into the hands of Soviet technocrats will accomplish what samizdat (publishing by hand—usually clandestine copies of banned books or political tracts) has only aspired to.

Growing Global Influence

It may be hard to believe that in the greater scheme of things, in matters of the world, the Mac and *Macworld* have some role to play. But over the last year we have both grown incredibly. The Macintosh, with its ease of localization and expanding success abroad, has become much more an international computer. As for *Macworld,* sister publications are springing up around the world. Foreign *Macworld*s have been created by our parent company in Sweden, Australia, the United Kingdom, Denmark, Taiwan, and Germany. And versions are planned for Norway, Finland, Japan, France, and other countries. They do not merely license our name, but actually involve sharing editorial and staff between publications.

Three years ago I began to envision an international sharing of editorial staff, building bridges between our offices in San Francisco and the 35 countries where IDG has subsidiaries. Most magazines offer travel perks to journalists (one of the small benefits they're given to make up for the relatively little money they derive from their profession) but I hope to offer the *Macworld* staff something more—actual working knowledge of what is happening with the Mac in foreign countries, knowledge of publishing abroad, exposure to different cultures. In turn we're welcoming the editors of foreign *Macworld*s into our offices, and initiating them into the ways of Silicon Valley.

This is not merely an attempt to win the loyalty (and longevity) of young editors, for the Macintosh has expanded greatly worldwide. In 1989 nearly 35 percent of Apple's revenues were derived outside of the United States. Strong markets and communities of product developers are appearing in other countries. People abroad are doing things with the Mac that are of interest to our readers, and we have a long tradition of writing about them.

An Editorial Exchange Program

Senior editor Adrian Mello was chosen for the first exchange. Adrian traveled to Australia for three weeks in 1988 and went there again last fall. At that time, Adrian and I initiated remote network access to our AppleShare network server via Farallon's Timbuktu Remote, a setup that worked only sporadically in the first year. It was my goal to allow foreign editors to log on to our in-house network and access our stories, staff-created graphics, and E-mail.

The network capacity has grown—and *Macworld* UK was the first to log

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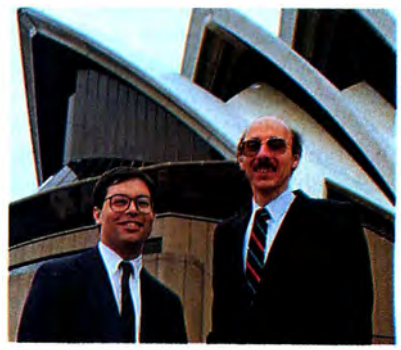

GRAHAM GILLIES

Australian Macworld **editor Osmund Lind Iversen (right) shows the sights of Sydney to senior features editor Adrian Mello.**

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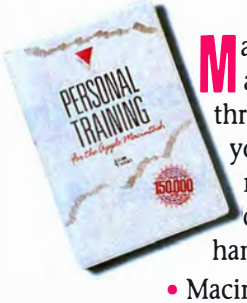

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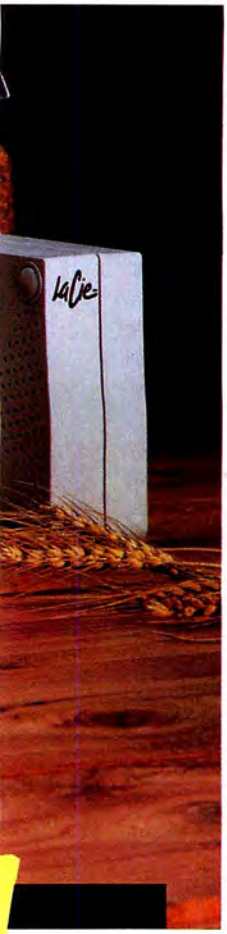
the Crop"

MacWorld, May 1989.



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LUIS DELGADO

Editor-in-chief Jerry Borrell meets with Claris president Bill Campbell at the company's Sunnyvale, California, headquarters.

on with 9600-baud links and retrieve compressed graphics and text files. *Macworld* UK is actually a latecomer, the fifth Mac magazine to be launched in Great Britain and the largest Mac publication in that country, with over 33,000 readers. Our British sister publication is also the most active user of our network. Reviews editor Carol Person, assigned to work with British editor Peter Worlock, spent two weeks in January in the London offices. In April we will host a meeting of *Macworld* editors from around the world with the goal of sharing our electronic publishing technology on a wider basis. We await the time when the technology of image compression from companies such as Creative Circuits Corporation will allow us to send full-color images across the world just as we send half-megabyte graphics files at present.

Beyond the practical issues of communicating with international *Macworld*s, covering Apple Computer as it grows beyond $5 billion in annual revenues has become a global task. Features editor Cheryl England Spencer's upcoming story on Apple's manufacturing required her to travel to Singapore to see one of the most automated plants in the world. Executive editor David Ushijima has been in Japan three times during the past year to follow the progress of Apple Computer in the Japanese market. Departments editor Deborah Branscum—fluent in Swedish—traveled to Sweden in March for an extended period of work with *Macworld* Sweden. After France, Sweden represents the largest market for Macs in Europe.

The editors of our sister publications in foreign countries give us eyes and ears in Mac communities far beyond the reach of what we might be expected to know. The result? An extraordinary insight into uses of the Macintosh and how it will fare in international competition. And we've kept pace in the United States. We still maintain the largest editorial and design staff dedicated to covering the Mac. With over 375,000 subscribers, *Macworld* has grown to more than the circulation of the next two largest dedicated Mac publications combined. By the end of the year some issues will have more than 400,000 subscribers, making *Macworld* the fifth-largest computer magazine in the world. And as many as an additional 100,000 Mac users read our editorial material in foreign *Macworld*s. That's more people than read magazines such as *Science, Connoisseur,* and *Premiere.*

Back in the USSR

All of this makes me wonder what we might be able to accomplish in a nation like the USSR with 270 million people. At the time of Leonid Brezhnev's tenure there was a joke in Moscow that went like this: "Is it possible to wrap an elephant in a newspaper?" "Yes, if Comrade Brezhnev appeared at the Presidium yesterday"—an allusion to the fact that newspapers were required to print the full text of the stifling bureaucratese that constituted political speeches in the USSR.

For centuries Russia shared a great literary tradition with European cultures: Tolstoy, Dostoyevski, Gogol, Turgenev, Chekhov, Goncharov, Sholokov, Blok, Mandelstam, Babel, Pasternak, Solzhenitsyn. Writers who have vanished from (or never appeared in) government-sanctioned bookstores. Entire bodies of literature disappeared with the Communist consolidation of power in the 1920s. (After that the press and publishing became the organ of official opinion.)

Today, in the quiet bustle of a small office in Moscow, one can imagine the whistle of a LaserWriter fan and a slight grinding sound as the rollers push another page out. In excitement, people cluster around the machine to look at the Cyrillic text. For them, and for this nation, the Macintosh is truly a revolution. M

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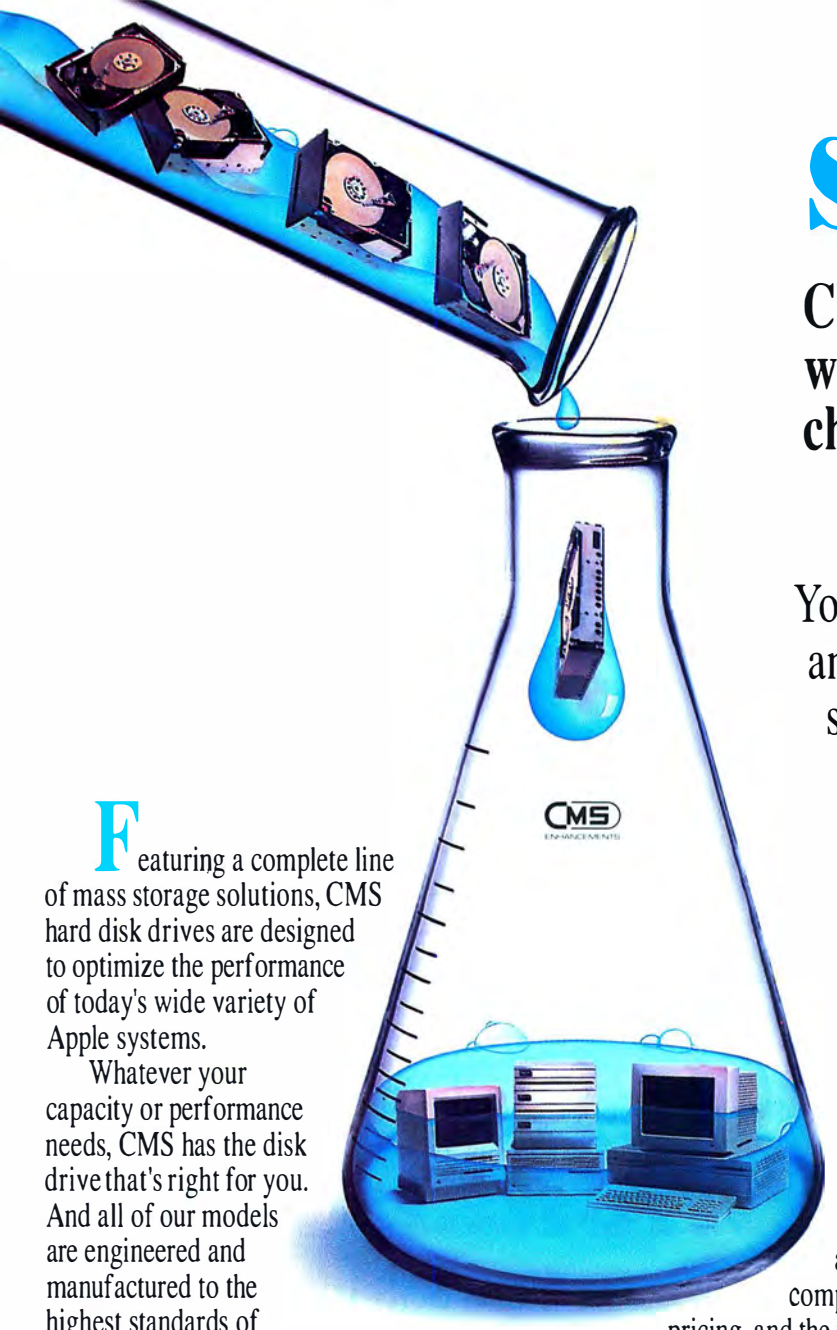

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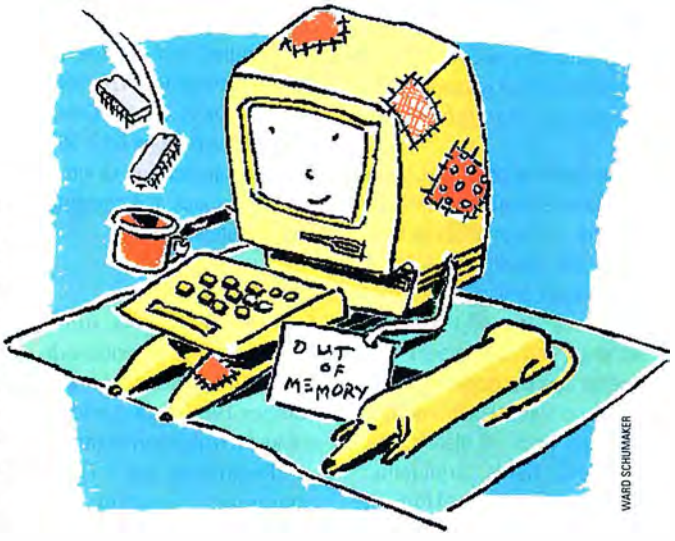
LETTERS

A forum for Macworld readers



Can You Spare a Couple of Megs?

What a bunch of whiners! You will always need to upgrade computer hardware to take advantage of new and exciting technology [*Letters*, December 1989]. I'm surprised that these guys bought a Mac to begin with, when they were probably happy with their Speak & Spell (which, by the way, never needed an upgrade).

Hey, guys, wake up and smell the coffee. System 7 will run on everything from a Plus on up—as long as you have 2 megabytes (are you listening? 2MB) of RAM. With the cost of RAM steadily declining, what's the big deal? Is this too much to spend for IAC, outline fonts, new print architecture, database access, and so on? Five bucks says some of you are still watching black-and-white TVs and bitching about the C-note you dropped ten years ago for that HP calculator.

G. Overton
Des Moines, Iowa

Upgrade Optional, Not Required

From all the griping about System 7 in the December *Letters* column, I'd swear that RAM upgrades cost thousands of dollars and that Apple is going to recall all copies of System 6 as soon as System 7 ships.

System 7 is not going to make your SE obsolete. Turn to page 96 of the December issue and you'll see an ad for RAM at $119 a megabyte. My Calculator DA tells me that comes to $238 plus shipping to make your Mac ready for System 7. No, you won't get virtual memory, but you don't have it now, either, so you won't be any worse off than you were before.

I find it hard to understand why users who won't balk at spending hundreds of dollars on the latest word processor, page-layout, or illustration program suddenly march themselves off to the poorhouse when confronted with the purchase of RAM.

Take heart, genuinely penniless Mac users who can't budget a RAM upgrade. Jean-Louis Gassée is not going to slide down your chimney one night and smilingly make off with your System Folder. You can keep running System 6 and your current applications till the cows come home—or till you win the lottery.

J. Peter Alfke
Tucson, Arizona

Package Pollution

You should add one more parameter to your evaluation of software, namely, the level of excessive hard-plastic (not shrink-wrap) packaging. Maybe you could even use a trash can symbol for amount of waste (for example, a one-can versus a four-can product).

I have come to be appalled by the number of hard-plastic presentation shells I toss when I get a new piece of software.

This stuff is very difficult to dispose of in the environment; it can actually trap and kill many forms of wildlife, especially in marine ecosystems. Coastal birds and some mammals ingest this stuff and either have their throats cut by it or starve to death. Cardboard

(continues)

Corrections

RGB Technology charges $720 per year for on-site service of its printers in the continental United States ("Hot Wax & Cold Ink," February 1990) and $2000 for customers in Alaska and Hawaii.

*Hey I Can Print, by R&B Software, 800/627-9778 (*New Products, *January 1990), is a series of printing tools for HyperCard and SuperCard.*

The table "Number Processors" ("Math without Tears," January 1990) should have noted that MatLab 1.1 runs on the Mac, PC, VMS, and UNIX.

The following information should have appeared in the table "Forms Features" ("Forming Opinions," February 1990): Panorama 1.5 has been released; it can generate forms of up to 9 pages; it imports PICT and EPS graphics; and it offers data-entry constraint options.

*Quality Discount Computers offers a 90-day (not a 30-day) warranty on its Mac/Apple II daisy-wheel printer (*Conspicuous Consumer, *February 1990).*

The phone number for Mac Doctor Electronics, maker of Brainstorm memory expansion and SCSI interfaces and system upgrades ("Is Your Mac Obsolete?" February 1990), is 415/964-2131.

and paper can serve the same structural function for packaging; for example, HyperGlot uses cardboard and paper packaging for its language HyperCard stacks.

This is one industry that should be sensitive to that kind of thing.

Elliot Einzig Porter
Berkeley, California

Harmful Emissions

As an owner of a Mac SE, I have long wondered about the existence of harmful emissions beamed at me as I work. How bad are these thought to be by the medical community? And are there any reasonably priced products that effectively deal with these emissions?

Thus far, the seemingly most effective shield that I know about is the rather expensive ($179) Eyeguard-XP (Natural Energy Works, P.O. Box 1395-C, El Cerrito, CA 94530, 415/527-6267). It's a thick leaded shield that the company claims will filter out emissions from X rays, microwaves, ultraviolet rays, positive ions, VLF, and ELF. Is this my only effective recourse?

Raymond H. Rosenstock
Keene, New Hampshire

While there is proof that VDTs produce emissions that are harmful, space prohibits us from going into detail here. (Please read our upcoming June issue, which will focus on this topic.) Although monitor screens and shields can cut down on emissions and glare, we know of none that can block *all* electric and magnetic fields. Ergonomic Computer Products (415/673-5757) has information on many of them. Safe Computing Company (617/444-7778, 800/222-3003) makes a shielded liquid crystal display monitor that it claims emits no electric or magnetic fields. The company also makes a hand-held meter to measure magnetic radiation from computers. Other resources for information on VDT-related radiation studies include the bimonthly newsletter *VDT News* (212/517-2802) and the Center for Office Technology (212/560-1298), an association of industry trade groups and computer manufacturers.—Ed.

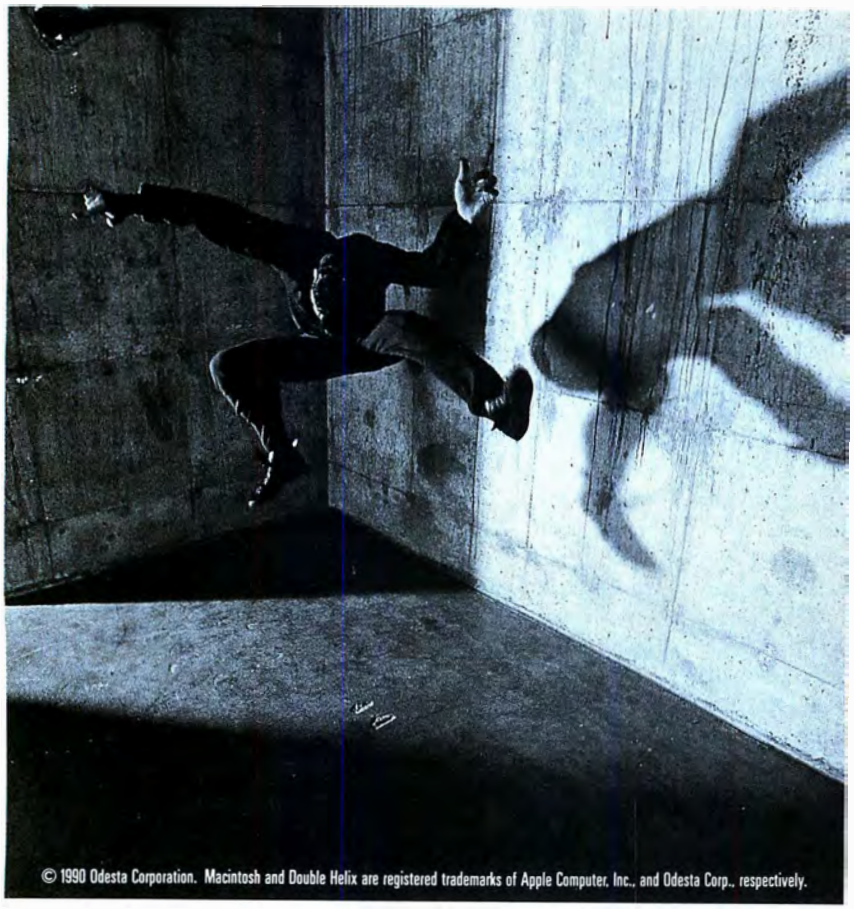
Mac Font Formats

I want to clarify two items mentioned in your editorial [*Commentary*, December 1989] that could be subject to misinterpretation.

Regarding Agfa Compugraphic's position concerning font formats, we intend to support the major font formats in the marketplace: Hewlett-Packard's PCL, Adobe's PostScript, and Apple's Royal. However, we have made no such commitment to manufacture a QuickDraw imagesetter. This can be a confusing issue as it relates to the difference between font formats and page-description languages.

I also want to clarify my comments regarding HP and IBM. We are working with HP to address the significant office-publishing market with our Intellifont font-scaling technology and HP's PCL printer line. We have also worked closely with HP to bring to market a PCL-based imagesetter and font utility, Type Director. The point is, IBM—not

(continues)



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Hewlett-Packard—could be the potential loser as a result of the Microsoft-Apple alliance, because Apple can now compete on a more equal footing with IBM PCs.

Ken Draeger
Agfa Compugraphic
Wilmington, Massachusetts

90 Days Is Enough

Regarding "Apple Plays Robber Baron" [*Conspicuous Consumer,* December 1989]: A 1-year warranty is something we Mac consumers don't need but are going to have to pay for. Lemon hardware will crap out within 3 months, and hardware that holds up for 3 months is going to last at least 9 more. I know there are exceptions. But thanks to all the uproar, Apple will have a legitimate excuse for charging a dollar for a dime's worth of additional service. I vote for Apple to continue good quality control, 90-day warranties, *and* the lower prices.

Your article says Apple can make money off defective merchandise by getting a 12-month warranty from another manufacturer, passing that manufacturer's merchandise on to the consumer with only a 3-month warranty. If Apple does indeed do this, consumers will eventually go directly to those manufacturers, cutting Apple out altogether. Apple, however, has not gotten where it has by adhering to shortsighted marketing practices. Right, Apple?

Joe A. Dale
Waco, Texas

Quality, Not Quantity

Your December *Conspicuous Consumer* column continues the recent trend of Apple bashing in your publication. From experience, I've learned that the length of a product's warranty has remarkably little correlation to the product's quality. Reliability is what I want and what I've gotten from Apple products and, with a few exceptions, what I've not gotten from third-party products.

Have there been problems? Certainly. As your column pointed out, the original Mac and Mac Plus power supplies had problems. Hard disks have been a more recent problem. A few weeks ago, I had an 80MB hard disk fail. The "inadequate" 90-day warranty on the Mac IIcx had expired, but of course I had to get the disk repaired. How much did the repair cost? Nothing. How long did it take? Including "shipping" time, about 45 minutes. Not bad for off-warranty service.

Kenneth Good
Ann Arbor, Michigan

1MB Is Not Enough

Having recently upgraded from a Mac Plus to a IIci, I've encountered numerous conversion problems, including software incompatibility, problems with peripheral interfacing, unkept delivery commitments, and—most irritating—the discovery that the IIci requires 2MB of RAM to run color properly. My dealer had just returned from an Apple-sponsored seminar for educating dealers on the IIci, where the Apple representative assured everyone that the machine would work perfectly with 1MB. I called Apple to com-

(continues)

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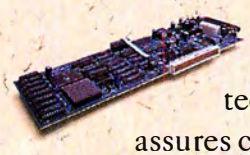

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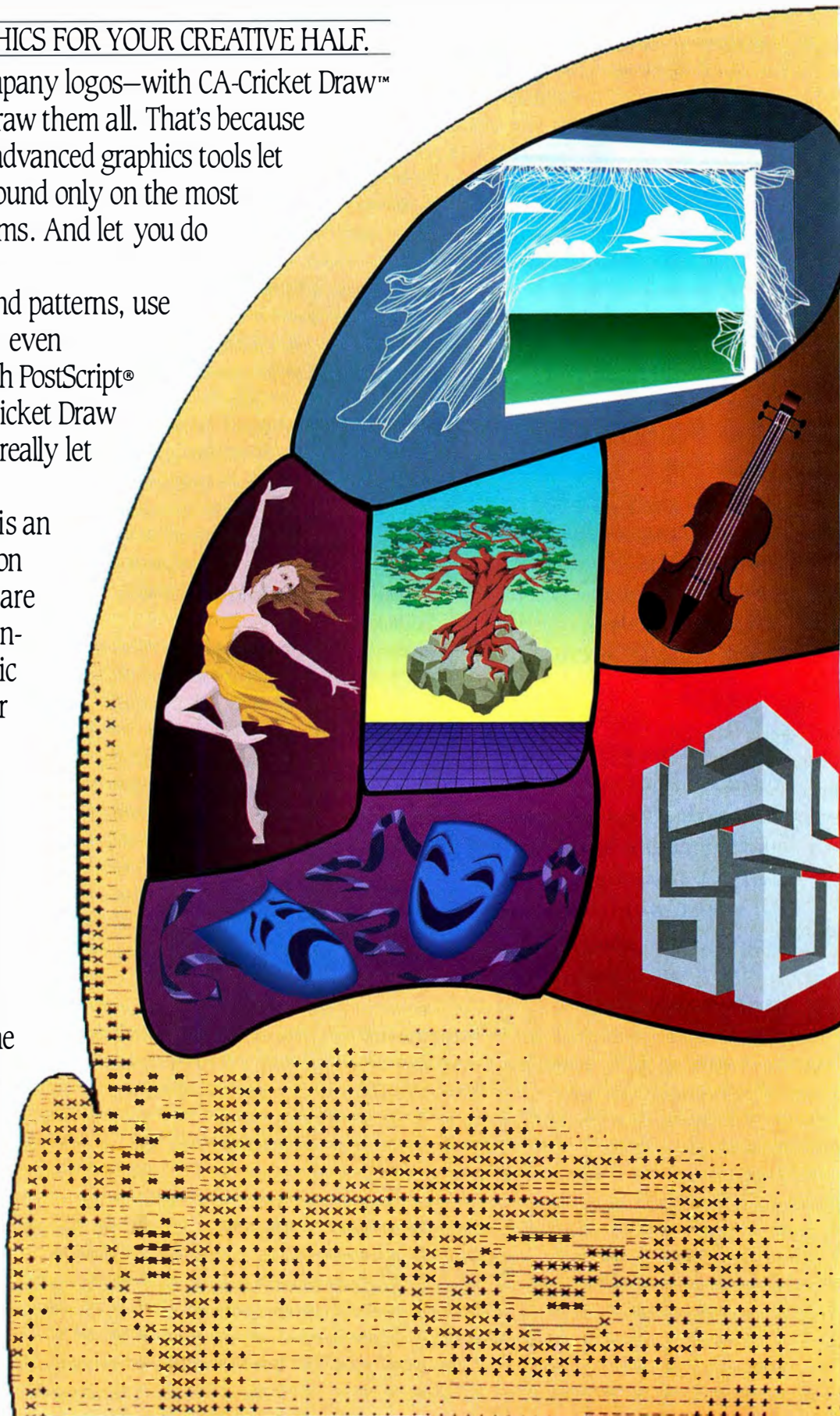

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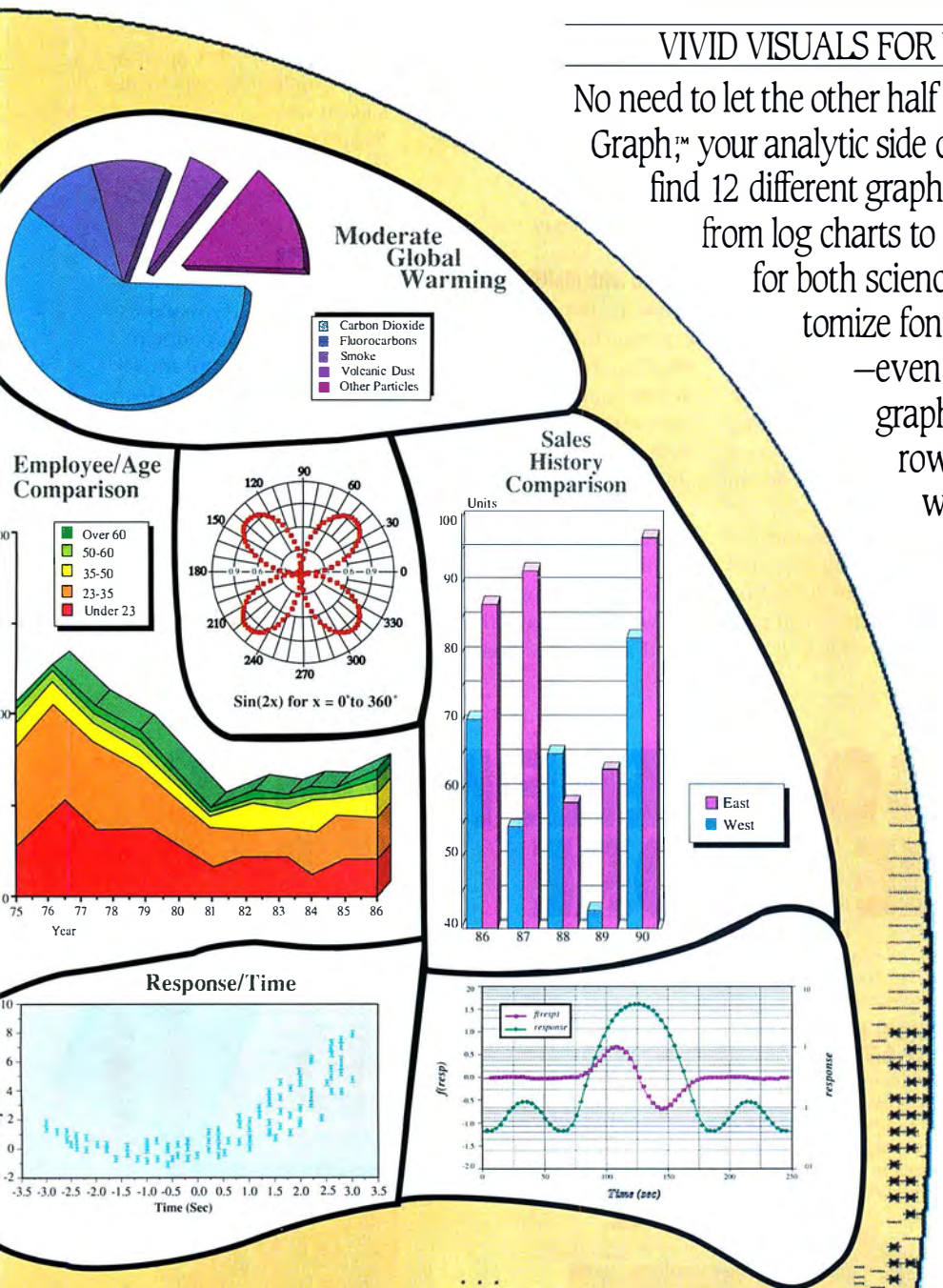

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plain, but received, predictably, little sympathy, no support, and no admission of guilt.

I asked my dealer to order me three additional 1MB SIMM chips from Apple. Of course, they're back-ordered. I've been waiting six weeks and the best delivery estimate Apple can give my dealer is "maybe this month."

Michael Darling
Ossining, New York

Erasing Some Black Marks

After reading your December review of the Ricoh PC Laser 6000-PS printer (our best-selling laser), we were puzzled by your statement that replacing the toner can be a messy job. Not one customer has ever complained about having to clean up a mess. We've used several alongside our Apple LaserWriters on a network and found them no messier than the Apples.

You follow the same process to release the toner into the work tray as you do with the Apple and other Canon engine–based lasers. The only difference is that you have to hold the cartridge in place, and then discard it when finished, as opposed to leaving it in the machine.

He next complains that you have to get down on your knees to read the display panel. Why would you have to do this, when, if the printer is sitting on your desk, you're already at an acceptable eye level with the display? He also says that the legend for the control panel is located away from the panel itself, and you can't see one while looking at the other. Not true. The control panel legend is visible right on the control panel as it should be.

We feel sorry for those readers who, based on perhaps well-meaning reviewer comments, spent hundreds more for less performance.

Steve Folkestad
Mac Friends
Portland, Oregon

In Sync with MultiFinder

In your December review of Synchronicity, our personal strategy tool, the reviewer claimed that you cannot use the MultiFinder icon while the program is running. This is not true—Synchronicity is (and always has been) fully compatible with MultiFinder. I think what the author was trying to point out was that, due to the full-bleed art on the screen, we opted to keep the MultiFinder icon invisible while the program is being used. But the button is still in position, and it can be clicked to switch between applications, including Synchronicity, at will.

Paul O'Brien
Visionary Software
Portland, Oregon

Acius Online

The CompuServe Information Service (CIS) address listed in Tony Oppenheim's article "Insights on 4th Dimension 2.0" (January 1990) was recently changed. To access the Acius forum on CompuServe, just type Go Acius from the main menu.

The Acius forum now provides multiple sections dealing with various 4th Dimension topics—such as *(continues)*

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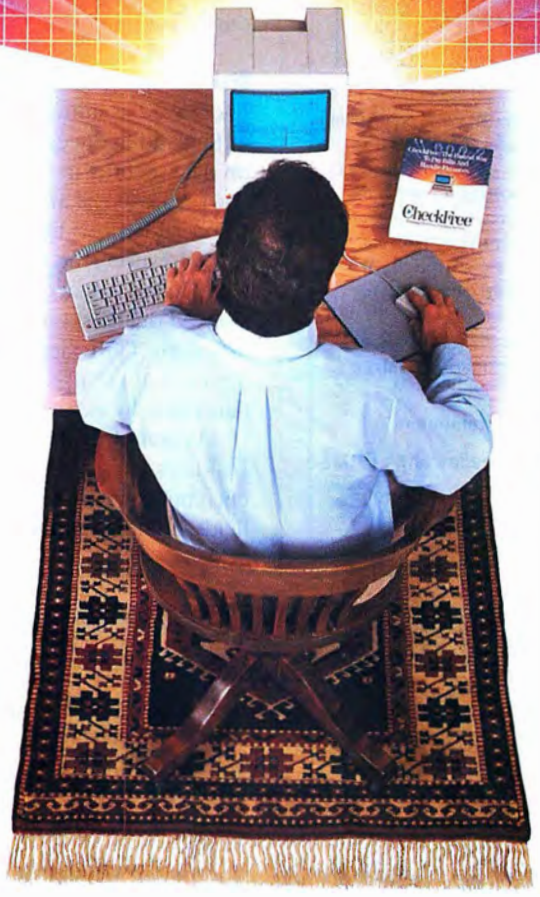

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PC Magazine, Best of 1989 Awards
January 16, 1990 issue

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PC Magazine

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Robert Cullen, Home Office Computing

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technical and customer support—as well as an exclusive developer area. The upload areas feature many examples and external procedures for enhancing 4th Dimension databases.

Ron Dell'Aquila
Acius
Cupertino, California

DiskLock Encrypts

I enjoyed reading Cheryl England Spencer's article on data security in the January 1990 issue of *Macworld* ["Special Report: Data Safety"]. However, the chart on page 145 was inaccurate. It showed that DiskLock, published by Fifth Generation Systems, does not provide data encryption.

As stated in the article, DiskLock uses a proprietary encryption system to encrypt fields, folders, and applications. Additionally, it encrypts subfolders within a folder, overwrites the original file (so that file-recovery programs cannot get data you thought was securely locked), and optionally re-encrypts all decrypted files at shutdown time.

David Shayer
Fifth Generation Systems
San Carlos, California

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Dan Gookin, **ComputorEdge Magazine**, March 10, 1989.

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Laurie Wigham, **Publish!**, August 1989.

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Robert Art Morgan, **ComputorEdge Magazine**, June 30, 1989.

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Carlos Martinez, **MacUser,** July 1989.

"SuperPaint offers quantity, quality, and depth in each of its options."
DataPro's Microcomputer Lab staff, **DataPro Research Letter**, April 1989.

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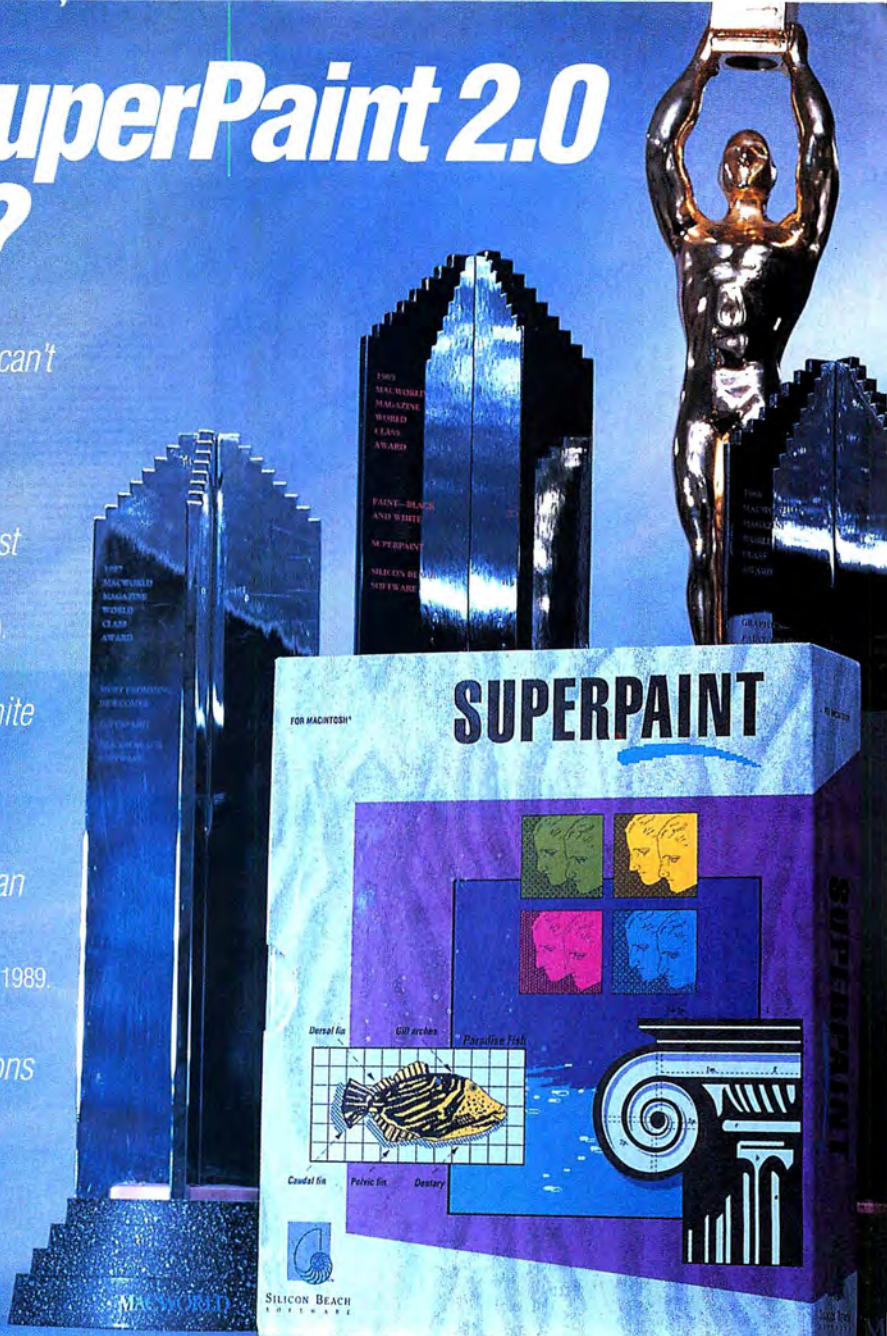
Tom Thompson, **BYTE**, June 1989



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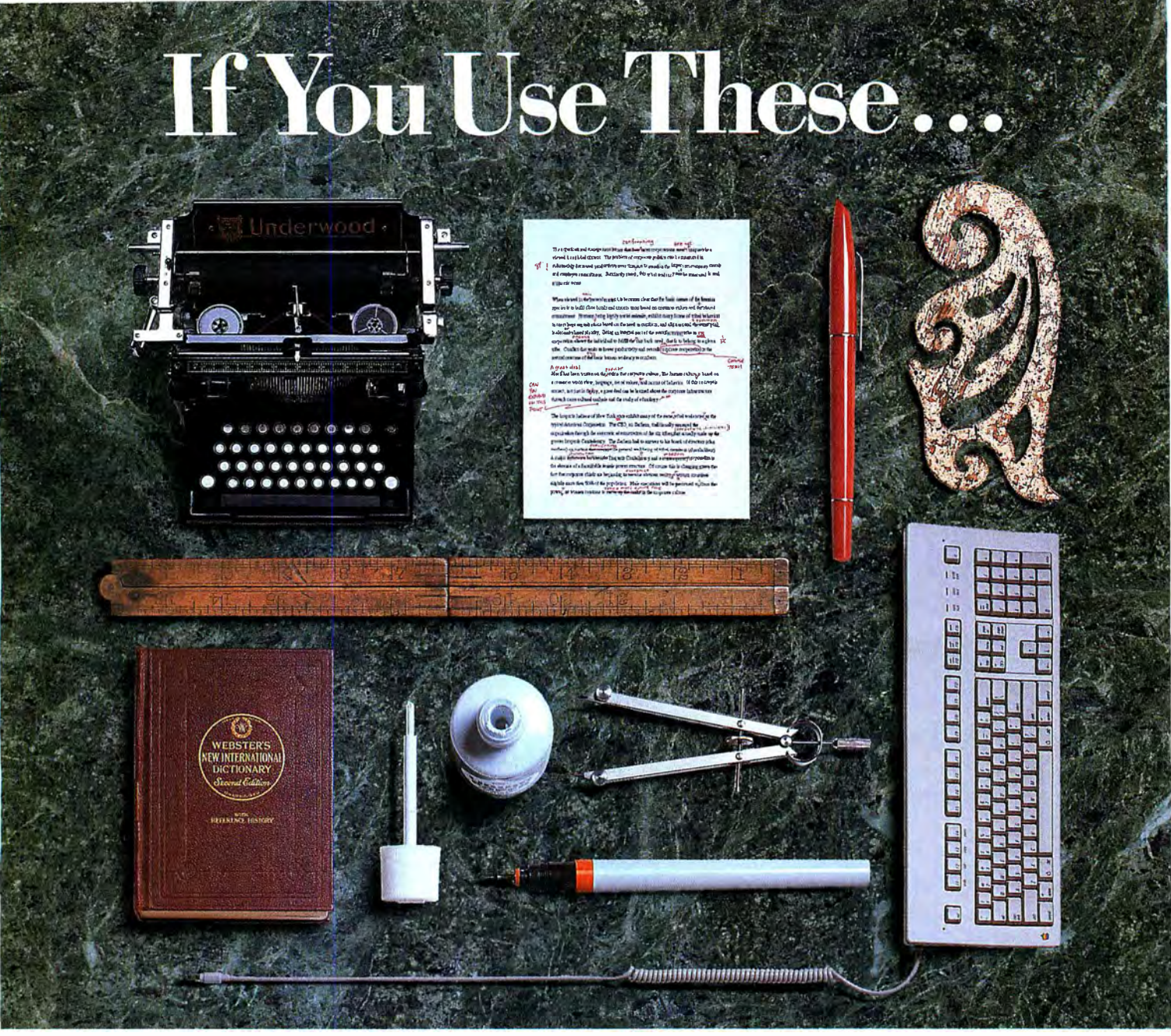

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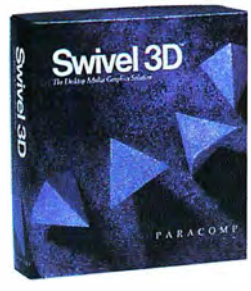

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ART BEAT

by Deborah Branscum

This column examines the tools and the talent behind Macworld's graphics and discusses the techniques that make them possible

Artists: *Macworld* designer Arne Hurty created the dramatic cover image, referring to gray-scale software, based on a concept by art director Joanne Hoffman.

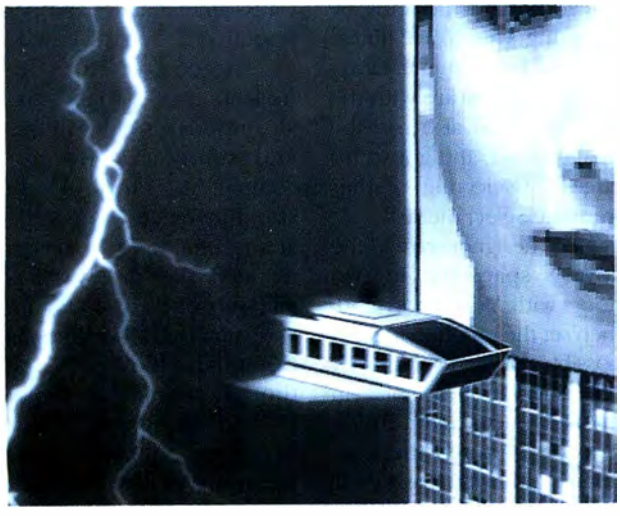
Tools: The hardware included a Macintosh IIcx, a Radius Color Display System with a Radius QuickColor Graphics Accelerator, 8MB of RAM, a 100MB external SuperMac DataFrame hard disk, a Siemens ST800 gray-scale scanner, and a Barneyscan slide scanner. The software used was Adobe Photoshop, Aldus FreeHand, and Capture from Mainstay.

How It Was Done: Hurty used four transparencies from a photo service, an illustration in FreeHand, and typeset Japanese text to create a cover image that conjures up the illusion of a *Blade Runner*–like future.

To get started, Hurty used the Barneyscan scanner to scan in two 35mm slides of buildings as TIFF files that were placed into a Photoshop file. Too small as they were, Hurty duplicated both buildings to double their width. Next he selected the background of the Photoshop file, then copied and pasted the lightning (which had been scanned in earlier) inside the background.

Art director Hoffman wanted to establish a low-resolution look for the face used on the cover. Hurty opened the scanned image in Photoshop and *sampled down* the image to reduce its total number of pixels. Then he resampled it to a larger size using the *near-*

(continues)



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est neighbor interpolation command under the Edit and Preferences menus in Photoshop. That interpolation creates groups of four or more pixels that are the same color, resulting in a low-resolution look from what is actually a high-resolution image.

Because Photoshop skews an image but doesn't offer true perspective, Hurty was forced to compress the face vertically in tiny increments. "The hardest part of creating the cover was producing the effect of perspective," says Hurty. He compressed the face from right to left, from least distortion to most distortion, using the Stretch command under the Effects and Image menus. Then he pasted the face onto the building on the right. Hurty followed the same process for the Japanese text, which was set at a service bureau and then scanned in with the Siemens device. (The kanji reads *Macworld* phonetically.)

For both the face and text Hurty selected the Fringe command from the Select menu to create a 1-pixel-wide black outline around the elements. He also added drop shadows. A graduated fill was also used with the text, and texture was placed behind the kanji by selecting the Noise Filter from the Image menu. Hurty blurred the texture with the Blur command, also from the Image menu, and got softer edges by selecting Feather from the Select menu.

The designer created the cover's spaceship in two hours with Aldus FreeHand, then set the program to best-possible screen resolution by selecting Better Display in the Document Setup dialog box. He captured the illustration and saved it as a PICT file using a utility called Capture. Then the bitmapped image was placed in the Photoshop file and resized. Hurty selected the spaceship and added a Motion Blur filter for a motion effect.

Several other details demanded attention. In doubling the high rise on the right, Hurty also duplicated a shadow; he eliminated it by copying and pasting a pristine panel from the building. And the background lightning was extended so it would bleed off the top of the cover. Hurty used Photoshop's brush tool in Lighten Only mode.

Blotches in the background were a special challenge. Initially Hurty tried to smooth out the blotches by using the eyedropper tool. That didn't work, so Hurty selected the background using the magic wand and lasso tools from the tools palette. Then he created a radial fill using the blend tool, with the foreground color set at 65 percent gray and the background set at 100 percent black. He worked from the center to create a starburst-like effect. Then Hurty applied the Noise Filter to the entire background. "The Noise Filter breaks up the gradation evenly and helps avoid banding," said the designer. "Then I applied the Gaussian Blur filter to further smooth out the background."

The completed image took about 33 hours to create (including stuffing the file and sending it out for comps). More than 8MB in size, the image was printed at a resolution of 142 pixels per inch. The cover was digitally separated using Photoshop and output on an Afga Compugraphic 9600S. Although simple black-and-white printing could have been used, four-color separations were chosen because they create richer blacks.

Beyond Reality.

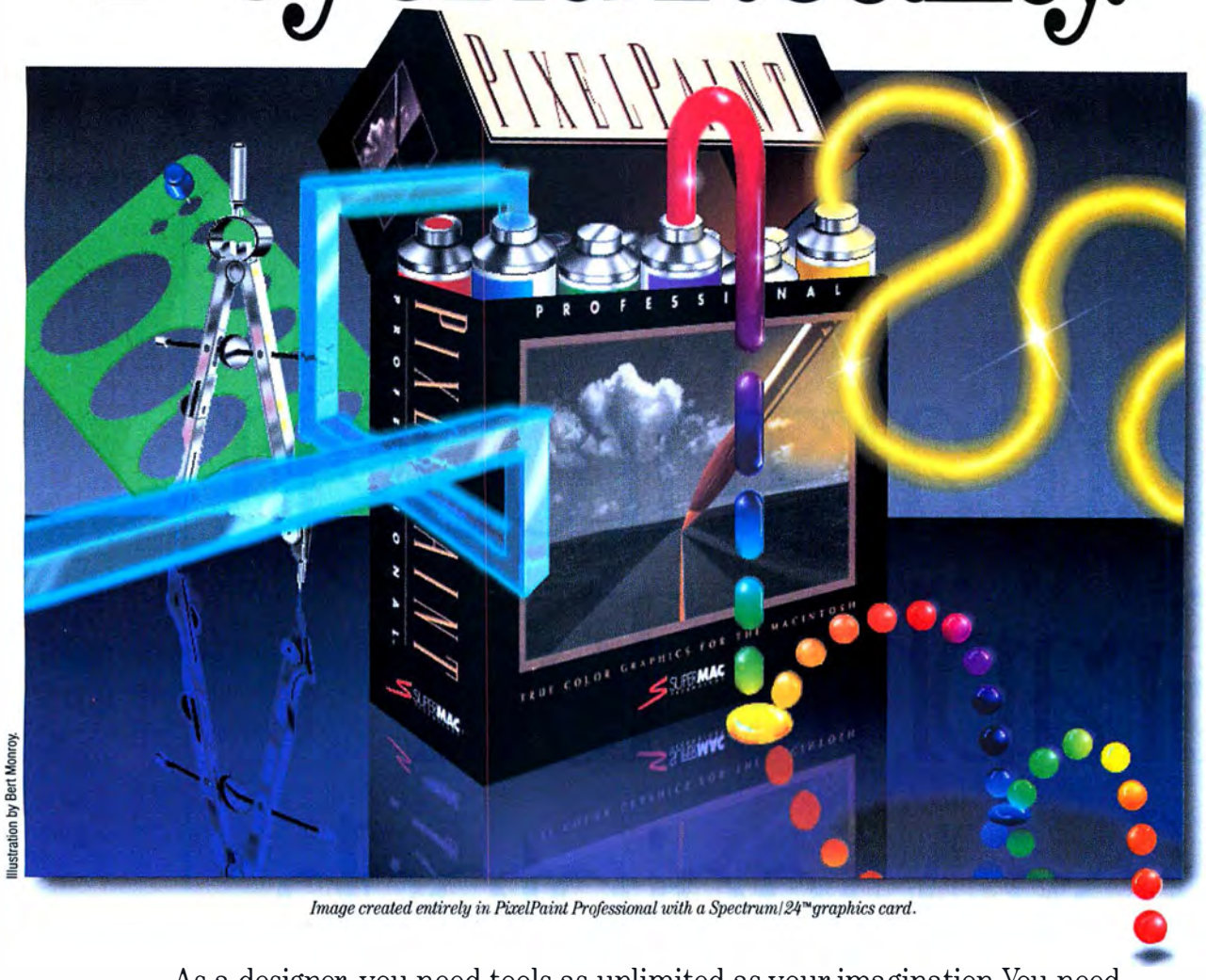

Illustration by Bert Monroy.

Image created entirely in PixelPaint Professional with a Spectrum/24™ graphics card.

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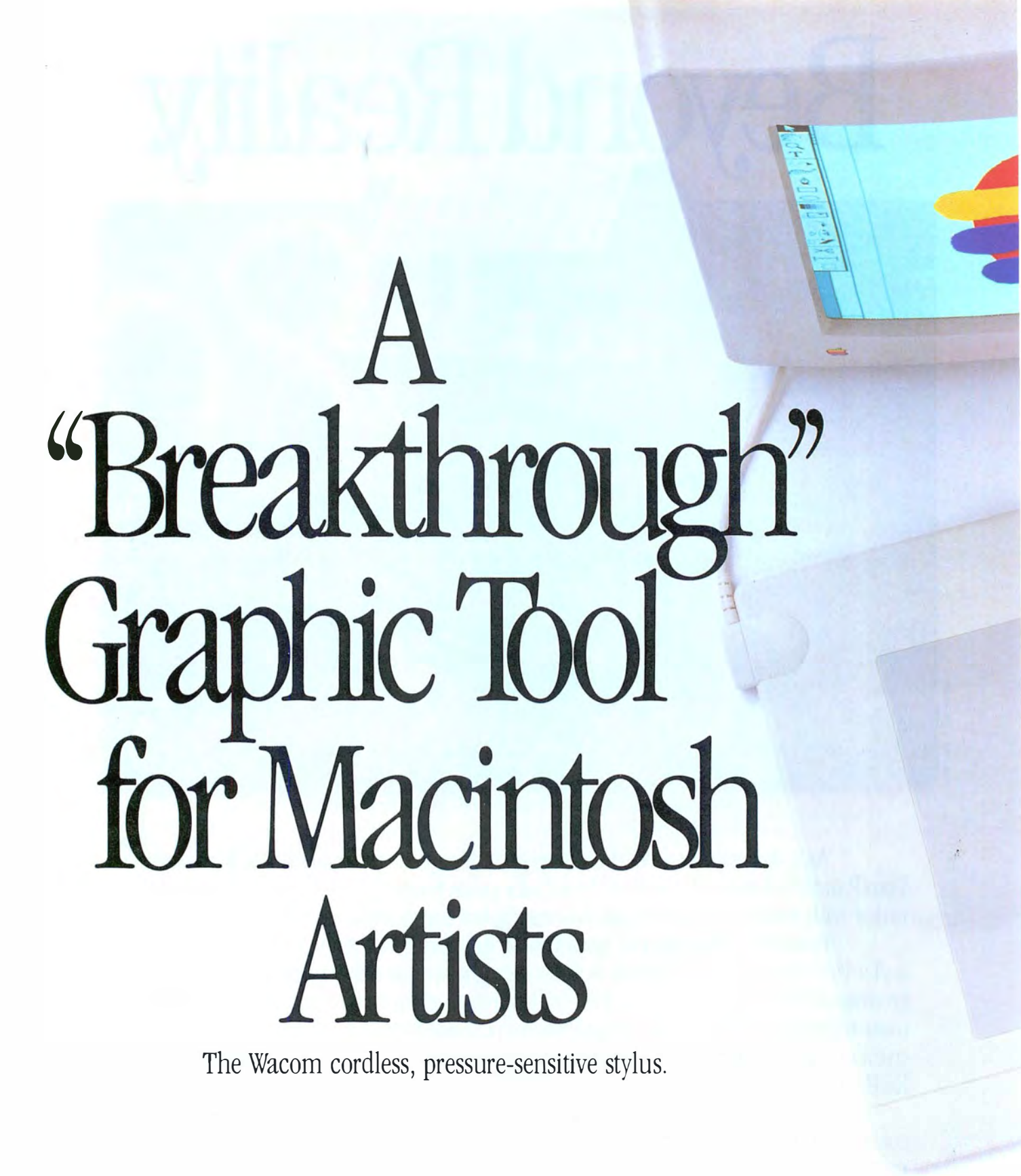

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PC MAGAZINE
EDITORS' CHOICE
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Andrich MINERVA ITALIC

Antikva MARGARET
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Aquarius 2
Aquarius 6
Aquarius 10
Aquarius OUTLINE

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Arrow

AUGUSTEA
AUGUSTEA INLINE

Avant Garde GOTHIC LIGHT
Avant Garde GOTHIC LIGHT OBL
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Casino GREY

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Out on a Sim

EXPLORING THE NATURE OF SIMULATION VERSUS REALITY

BY STEVEN LEVY

I like to think that it was something more than idleness that recently led me to lock myself in a bedroom for 14 consecutive hours, interacting with a software program called SimCity. A worried human being pounded on the door—"Are you all right in there? Are you all right?"—but I must admit that human beings of the corporeal persuasion were the farthest thing from my mind.

Instead, I was concerned about, well, pseudo-human beings. Little *faux* creatures that my screen didn't even display, but only implied. I could see evidence of their existence, though, in Lower Gomorrah, the city I controlled. These virtual people, called Sims, moved into houses and often upgraded them to nicer homes. Sometimes, when the neighborhood got too crowded, they let the places go to seed. They drove around in little cars that got stuck in little traffic jams, at which time tiny helicopters making not-so-tiny chopping noises hovered overhead, announcing gridlock. The Sims even attended football games in the stadium they had demanded for this burgeoning burg—the games lasted about five seconds (Note to NFL: hire Sim referees), and then the Sims would jump into their cars and zip over to another traffic jam. It was up to me, the city planner who had omnipotent control over zoning, budgeting, tax rates, and municipal construction in Lower Gomorrah, to keep the Sims happy. Otherwise they'd move out, and my personal metropolis would no longer thrive.

Anyway, that's the scenario of SimCity, a computer game you've probably heard about: it has sold lots of copies, and last December it won the highest honor on earth, inclusion in the *Macworld* Game Hall of Fame. But what brings me to address it at this late date is a mental obsession I've been grappling with lately, one that is proving as compelling a passion as the one I indulged in my SimCity binge.

LESLIE FLORES

Some call him an artist, but SimCity creator Will Wright demurs.

Accepting No Substitutes

The obsession deals with the nature of computer simulation itself. Everything boils down to this: When I was running Lower Gomorrah, something that looked like a city and felt like a city, was I really manipulating anything that bore formal resemblance to a city? I hear that supposedly legitimate city planners are tinkering with SimCity; it's being used in college courses as an educational modeling tool. Is this a valid practice, or are these folks tricked by an illusion? How relevant is the imitation to the real thing?

Obviously, an imitation of a thing is not the same as the thing itself. It's a metaphor, something that emphasizes a particular similarity of one aspect of the original to the object in question. When you compare a colleague to a pig, probably you're referring to that person's undisguised eagerness to sate various hungers, or perhaps an unfortunate lack of cleanliness. Chances are you're not implying that the person walks on all fours.

But it is the nature of computer simulation to generate a fuzziness at the edge of metaphor. If we can extract some nugget of validity from using SimCity—if it has any value at all to people thinking about cities and zoning—how can we know how *much* it applies? And how do we know when the metaphor does not apply at all?

We need to understand this problem in order to make sense of a new breed of simulation, one that attempts to give us a political understanding of an aspect of the world. Hidden Agenda, another terrific Mac Game

(continues)

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Hall of Famer released last year, puts the user in the Presidential Palace of Chimerica, a virtual country in Central America. As the new Presidente, the user is forced to balance the demands of representatives of competing factions. There are threats from the left and from the right, and all too often the user will fail to keep the dogs of war at bay. The horrified user may be the victim of a coup, or assassinated. Or the user may be shocked to find him- or herself a survivor, but one in charge of a soulless, overcompromised nation. In any case, the intent is to give the user the impression that Central American reality is similar to the reality of Hidden Agenda. If not, the learning experience is misleading, perhaps even intentionally. Simulations of this nature, after all, hold potential for insidious propagandizing.

It's not an idle pursuit to wonder about the relationship of simulation to reality. Simulations of this sort (one hopes more sophisticated) are run on government computers to help determine national policy on big issues like national defense and budgeting. So we have an interest in finding out the relevancy of such simulations, and their potential for transmitting bias on behalf of the designer.

Yeah, but Is It Art?

To shed some light on this, I visited Jim Gasperini in his New York City apartment; he's the guy who, along with Trans Fiction Systems, designed Hidden Agenda. He assured me that he had not stacked the deck to support a particular political bent. As evidence he claims that the game has been attacked from people on both ends of the political spectrum: leftists complain that the game is too pragmatist, righties think Gasperini is a pinko. But he acknowledged that there is no way he could create a simulation free of any of his biases. After some discussion he admitted that his view of the political situation was indeed reflected in Hidden Agenda: he believes Central America is a complex conundrum where compromise is inevitable, and so it is in the game.

Of course, in order to endow the simulation with authenticity, Gasperini had to learn a lot about the subject. Ultimately, he had to winnow out some of the complexities: out went various ethnic tensions, and any aspects of Chimerica's relations to its neighbors. Meanwhile, he kept concepts like land reform, death squads, and relations to the superpowers. "You strive to maintain verisimilitude, but you don't want to sacrifice comprehensibility," Gasperini explains.

Now hard at work writing Perestroika, a simulation of an Eastern European country, Gasperini made an interesting claim. Creating simulations—choosing which aspects are essential to include—is an art form, he said. Novels are a form of simulation, using paper. Movies are simulations that use images. Computer simulations are simply a more interactive form of narrative. Well, I asked him, what about SimCity, a simulation that has no pretense to narrative, but which allows you some control over a silicon organism called a city? Is its creator, Will Wright, also an artist? "Will doesn't think of himself as an artist," said Gasperini. "I'm trying to convince him he is."

The Wright Stuff

I figured out that I should ask Will Wright for myself, so I ventured to the programmer's study, in his Berkeley, California, home. Like Gasperini, Wright does not claim that the prodigious research that went into his particular simulation—he read 50 books on city planning—means that one can extrapolate too much from SimCity. "I wouldn't want to predict a *real* city with it," he says. Yet he notes with some pride that city planners have embraced the game as a tool for understanding cities, and that Maxis Software has published a teacher's guide to the program.

In doing simulations like SimCity, Wright sees himself as a popularizer of otherwise arcane subjects. "SimCity has been more educational for me than for the users," he says. "I guess I'm more of a synthesizer [than an artist]."

We talked for a while about the nature of simulation and agreed that after a certain point something like SimCity has a life of its own. It *is* a city—just not a real one. And that is at the heart of my interest in the nature

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of simulations. Not what they profess to address—those implicit claims to educational value or eye-opening exposure to some hitherto foreign point of view—but the separate realities they generate. Simulations are real things, in and of themselves.

And though simulations are not identical to the things they simulate, they can produce behavior that is not merely similar to things in the real world, but identical. For instance, Craig Reynolds, a graphics programmer at the Symbolics Company, has created a simulation using boids, little birdlike constructs. After much observation of flying birds in formation, he surmised certain rules for flocking, then programmed his boids to follow those rules. And without being specifically programmed to do so, the boids flew in convincing formation! Scientists studying the phenomenon now say that Reynolds's simulation does not merely imitate the behavior of real birds—in a genuine sense, *they are actually flocking.*

Since "real" behavior can come from simulation, then simulations are indeed objects worthy of examination; lessons can be drawn from them. Whether those lessons apply to other objects—"real" ones, if you will—can only be determined by experimentation. Best of all, simulations can generate insights that might one day be verified as valuable knowledge.

Lives of a Cellular Automaton

For support of this (not particularly original) thesis I invoke a class of simulations known as cellular automata (CA). These are simple mathematical constructs with deceptive significance. Most commonly, they begin with a checkerboard-like grid laid upon the "world." Each square is called a cell, and each cell is assigned a given state. Often these are limited to two possible states, on or off. The simulation begins by going to the next generation: depending on the state of its various neighbors, a cell may or may not change its state in this new configuration. (This is determined by a set of rules drawn up beforehand.)

The best known CA simulation is one devised by mathematician John Conway, called Life. Although the rules are insanely simple, the behavior of the cells once the generations turn is tremendously, spellbindingly complex. Some scientists, notably Stephen Wolfram (known to some Mac users as the maestro of Mathematica), argue that this characteristic of CAs points to a profound physical understanding of the nature of the complexity in the Universe itself. More daringly, a brilliant scientist named Ed Fredkin, who once headed MIT's prestigious Project Mac artificial intelligence lab, has postulated in all seriousness that our universe, the biggest of all possible imaginable enchiladas, is itself a giant cellular automaton—a simulation.

(Incidentally, there is a wonderful set of computer programs published by Autodesk called Rudy Rucker's Cellular Automata. Tragically, Autodesk offers these marvels only in the MS-DOS format, and the program is useless to Mac owners.)

Simulations can produce behavior identical to that of the real world

Are we getting far afield here? No—this leads to the ultimate justification for my SimCity binge. SimCity, it seems, shares many features of a deeply interesting cellular automaton. The various zones of the city adjust their behavior partially as a consequence of the state of their neighbors. Just as CAs can give us clues to the nature of behavior, so can SimCity reveal to us some of the hidden agendas, so to speak, of cities. When I asked Will Wright whether SimCity had uncovered any such aspects, he said, yes, there was one thing in particular that routinely occurred in the simulation, even though it had never been programmed into it. This was the deterioration of some inner-city areas when they became congested or surrounded by an inhospitable industrial area. Slummification. Just as in real cities, there was a principle that was triggered when conditions reached a certain point.

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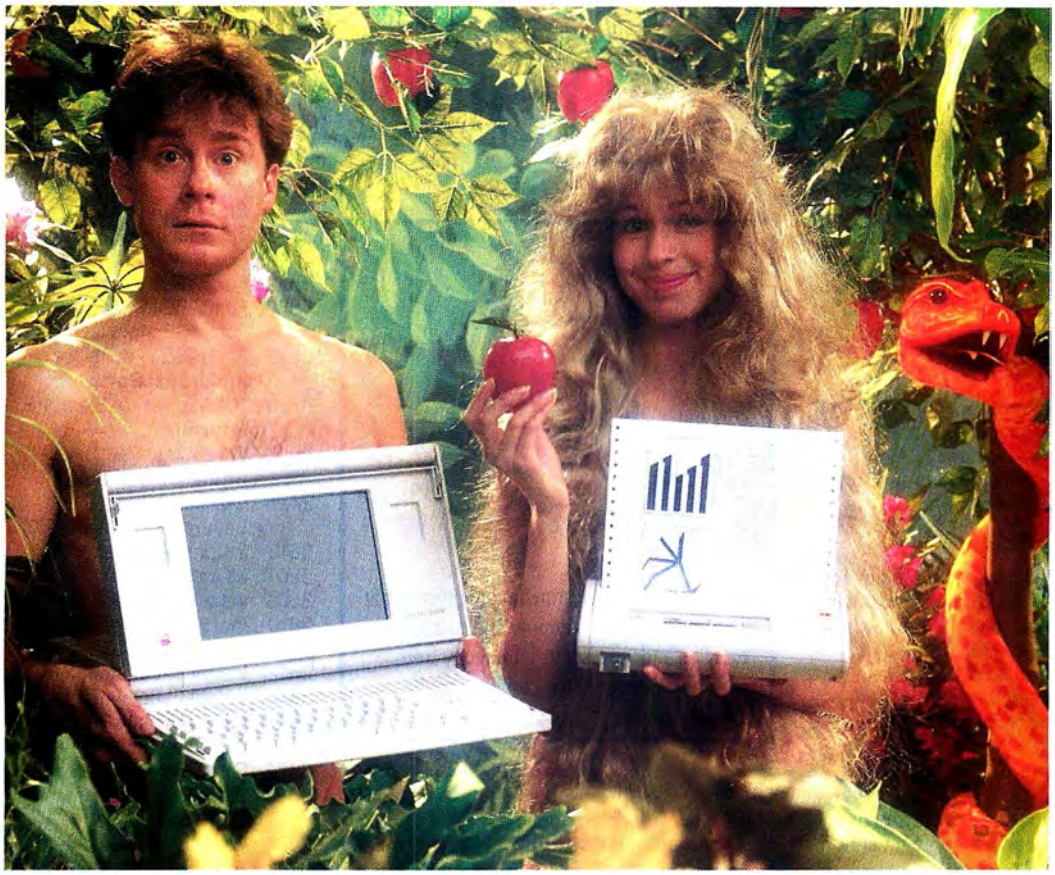

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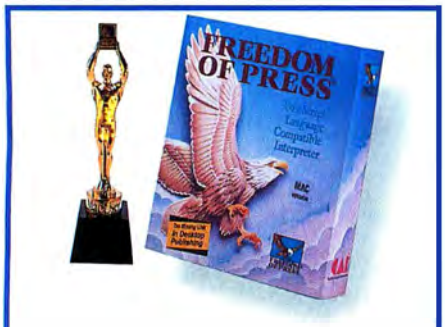

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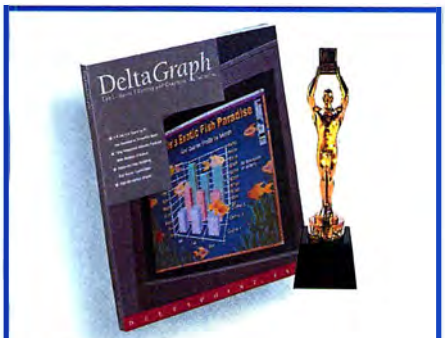

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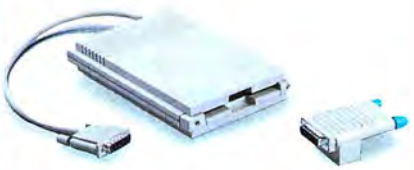

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5760 FlexForm Bus. Templates II *special* 45.
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5970 9 Futura Medium . . . . . 89.
5976 11 Letter Gothic *(12 Pitch)* . . . . . 89.
5974 15 ITC Garamond . . . . . 89.
5975 16 ITC Souvenir . . . . . 89.
5969 18 Bitstream Charter . . . . . 89.
5973 19 ITC Galliard . . . . . 89.
5971 20 Headlines 1 . . . . . 89.
5972 21 Headlines 2 . . . . . 89.
5968 23 Baskerville . . . . . 89.
5977 27 News Gothic . . . . . 89.
Bright Star Technology
3962 HyperAnimator 1.5 . . . . . 98.
6093 Interface 1.0 . . . . . 249.

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Products that are

Aladdin Systems ... 30 day MBG
Shortcut 1.0.1–Honorable mention–1990 MacUser Editors' Choice Award for *Best General Utility.* "An INT/cdev finder replacement written by Raymond Lau, winner of the Derek Van Alstyne Rising Star Award" ..... $46.

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1427 Print Shop 1.3.1 ..... 35.
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4834 Distinctive Pack *(Vol. 8, 19-22)* ..... 159.
4833 Classic Pack *(Vol. 3-6, & 13)* ..... 159.
1575 Fluent Fonts 2.0 ..... 27.

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1123 MacPaint II 2.0 ..... 95.
4815 Smart Form Designer 1.01V ..... 295.
1117 MacDraw II 1.1 ..... 295.
5911 MacDraw II & MacWrite II Bundle ..... 369.
4814 Claris CAD 1.0 ..... 595.

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1668 Cricket Graph 1.3 ..... 125.
1670 Cricket Presents 2.0 ..... 285.

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6517 Freedom of Press 2.1A ..... 259.

★DeltaPoint ... 60 day MBG
6095 DeltaGraph 1.0 ..... 99.

★Deneba Software ... 30 day MBG
6365 UltraPaint 1.5 ..... 125.
1769 Canvas 2.1 ..... 189.

★DreamMaker ... 30 day MBG
4088 MacGallery *(MacPaint format)* ..... 27.
4840 Cliptures: Business 1 ..... 69.
4841 Cliptures: Business 2 ..... 69.

Dubl-Click Software
World-Class LaserType Vol. 1-9 *each* 42.
3972 World-Class Fonts! Originals ..... 42.
3973 World-Class Fonts! Stylish ..... 42.
3974 World-Class Fonts! Giants ..... 42.
5131 World-Class Fonts! Triples ..... 42.
3964 WetPaint Classic Clip-Art *(1 & 2)* ..... 42.
3965 WetPaint For Publishing *(3 & 4)* ..... 42.
3966 WetPaint Animal Kingdom *(5 & 6)* ..... 42.
3967 WetPaint Special Occasions *(7 & 8)* ..... 42.
3968 WetPaint Printer's Helper *(9 & 10)* ..... 42.
3969 WetPaint Industrial Revol. *(11 & 12)* ..... 42.
3970 WetPaint Old Earth Almanac *(13 & 14)* 42.
3971 WetPaint Island Life *(15 & 16)* ..... 42.
4940 WetPaint All the People *(17 & 18)* ..... 42.

★Electronic Arts ... 30 day MBG
5289 Studio/1 1.0 ..... $96.
4315 Studio/8 1.0 ..... 296.

★Emerald City ... 30 day MBG
6098 TypeAlign for ATM 1.0 ..... 60.
5168 SmartArt I 1.0 ..... 84.
5602 Smart Art II 1.0 ..... 84.
5603 Smart Art III 1.0 ..... 84.

★Enabling Technologies ... 30 day MBG
1871 Pro3D 1.2 ..... 279.
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★Farallon Computing ... 30 day MBG
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2199 MacRecorder 2.0 ..... 159.

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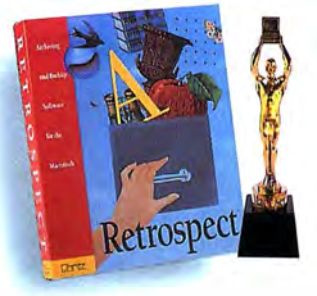
2384 Comic Strip Factory 1.6 ..... 38.

★Generic Software ... 60 day MBG
4319 Generic CADD Level 1 1.1 ..... 84.

★Good Software ... 30 day MBG
5428 NuPaint 1.0.4 ..... *special* 69.

★Graphsoft ... 30 day MBG
6502 Blueprint 1.0 ..... 339.
4993 MiniCad+ 2.0V4 ..... 519.



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Retrospect 1.1–1990 MacUser Editors' Choice Award for *Best Backup Software.* "Retrospect can quickly store data on almost every backup medium. It also makes backup chores as painless as possible" ..... $149.

★Great Wave ... 30 day MBG
2272 Crystal Paint 1.0 ..... *special* 25.

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2417 MacDraft 1.2B ..... 173.
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2621 Ready,Set,Go! 4.5 ..... 275.
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4709 LetraStudio 1.5 ..... 275.
6300 Font Studio ..... 469.
6302 Design Studio ..... 619.
6301 Color Studio ..... 1589.

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Over 100 language fonts ..... call
2630 Greek ..... 59.
2636 Kanji 6.0 ..... 59.
2625 Chinese Cantonese ..... 79.
2645 Chinese Mandarin ..... 79.
5759 LaserArabic & Farsi ..... 59.
2641 LaserHebrew ..... 79.
2640 LaserGreek ..... 79.
2642 LaserKorean ..... 89.

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4952 VideoWorks II HyperCard Driver 1.2 $64.
4954 VideoWorks II Accel. 1.1 ... *special* 99.
6159 MacroMind Accelerator ..... 125.
5087 MacroMind Director 1.01 ..... 445.

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5514 MacAtlas *(EPSF version)* ..... 105.
5513 MacAtlas *(Professional version)* ... 105.
5515 MacAtlas Presentation Pack ..... 105.

★Microsoft ... 30 day MBG
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Paracomp
4597 Swivel 3D 1.1 ..... 299.
5028 ModelShop 1.0 ..... 375.

★Preferred Publishers ... 30 day MBG
5751 Exposure 1.1 ..... 52.

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4621 QuarkStyle 1.0 ..... call
3230 Quark XPress 2.12 ..... call

★Silicon Beach ... 60 day MBG
3504 Silicon Press 1.1 ..... 52.
3506 SuperPaint 2.0 ..... 125.
3980 Digital Darkroom 1.1 ..... 249.
3507 Super3D 2.0 ..... 315.

★Softstream Int'l., Inc. ... 60 day MBG
4996 UltraSpec 1.0 ..... 95.

★Solutions Int'l. ... 60 day MBG
3446 The Curator 1.05 ..... 72.

★Springboard ... 30 day MBG
3530 Certificate Maker 2.0 ..... 22.
3532 Certificate Library ..... 18.
4497 Top Honors 1.01 ..... 59.
4500 Springboard Publisher II ..... 109.

★Strategic Mapping ... 30 day MBG
6511 Estatix ..... 219.
6518 MapMaker 4.0 ..... 289.

★SuperMac Software ... 60 day MBG
3380 PixelPaint 2.0 ..... 225.
5625 PixelPaint Professional 1.0 ..... 389.

★Timeworks ... 30 day MBG
5908 Publish-it! 1.1.1 ..... 225.

★T/Maker ... 30 day MBG
3632 ClickArt Business Images ..... 32.
3633 ClickArt Christian Images ..... 39.
3635 EPS Illustrations ..... 82.
5167 EPS Business Art ..... 82.

Microsoft ... 30 day MBG
Excel 2.2–Honorable mention–1990 MacUser Editors' Choice Award for *Best Spreadsheet.* "Enhanced interface, which adds interapplication communication with *Mail 2.0*"–*Honorable mention (Best Communication Product)* .... $249.

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3942 Images with Impact: Graphics 1 . . $51.
4583 Images with Impact: Business 1 . . . 65.
★Wayzata Tech. ... 60 day MBG
6370 Quick Art *(CD-ROM)* . . . . . 175.
★Wildflower ... 30 day MBG
6512 SnapJot 2.0 . . . . . 32.
★Zedcor ... 60 day MBG
3986 DeskPaint & DeskDraw 2.01 . . . . . 64.

PROGRAMMING & HYPERMEDIA

★Antic Software ... 30 day MBG
6100 HOT-SPOT . . . . . 42.
Apple Computer
1118 HyperCard 1.2.2 . . . . . 42.
Bantam Publishing
1403 Complete HyperCard Handbook . . 22.
★Beacon Technology ... 30 day MBG
6426 Gems of The Word 1.0 . . . . . 25.
4967 HyperBible *(King James)* 1.0 . . . . 145.
4968 HyperBible *(New International)* 1.0 175.
Borland International
1511 Turbo Pascal 1.1 . . . . . 68.
1512 Turbo Pascal Tutor 1.0. . . . . 46.
Broderbund Software
5237 Whole Earth Catalog *(CD-ROM)* . . . 89.
★Digitalk ... 60 day MBG
5166 SmallTalk/V Mac 1.1 . . . . . 125.

SoftView
MacInTax 1989 1040–1990 MacUser Editors' Choice Award for *Best Personal Finance Package.* "The most popular tax package for the Macintosh. SoftView offers an electronic filing service for fax and disk submissions" . . . $65.

★DreamMaker ... 30 day MBG
4115 MacGallery *(HyperCard format)* . . . 27.
★Emerald City ... 30 day MBG
5728 LaserTalk 1.0. . . . . 149.
Hyperpress Publishing
4233 Icon Factory 1.0 . . . . . 29.
5089 Script Library 1.0 . . . . . 29.
6501 StepAhead 1.0 . . . . . 57.
ICOM Simulations
5681 HyperTMON 1.0. . . . . 59.
4085 TMON 2.8.2 . . . . . 87.

SuperMac Software ... 60 day MBG
PixelPaint Pro. 1.0–Honorable mention–1990 MacUser Editors' Choice Award for *Best Graphics Program.* "Limitless colors, sophisticated effects, & an interface for creating, editing, & color-separating full-color images" . . . $389.

Individual Software
4719 101 Scripts & Buttons HyperCard 1.0. 36.
★Manx Software ... 60 day MBG
4075 Aztec C + SDB 3.6B. . . . . 95.
★MicroMaps ... 30 day MBG
5512 HyperAtlas . . . . . 59.
5518 QuickMap . . . . . 59.
★Microsoft ... 30 day MBG
4471 QuickBasic 1.0. . . . . 65.
★Millenium Software ... 30 day MBG
6105 HyperX 3.0. . . . . 65.
★Now Software ... 30 day MBG
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1478 Prototyper 3.0. . . . . 185.
Olduvai
5446 PLUS 1.11. . . . . 109.
★Silicon Beach ... 60 day MBG
5100 SuperCard 1.0 . . . . . 125.
★Softstream Int'l., Inc. ... 60 day MBG
6513 Authenticate & Mutate. . . . . 79.
5440 HyperHIT 1.0 . . . . . 125.
★Somak Software ... 30 day MBG
5897 ScriptEdit 1.1 . . . . . 49.
★Springboard ... 30 day MBG
4495 Family Matters 1.0 . . . . . 28.
★Symantec ... 30 day MBG
4644 Just Enough Pascal 1.0 . . . . . 52.
3421 THINK Pascal 2.03 . . . . . 103.
3420 THINK C 4.0. . . . . 168.
★Symmetry ... 30 day MBG
3318 HyperDA 1.2 . . . . . 45.
★Timeworks ... 30 day MBG
5905 The Hyperworks Organizer 1.0. . . . 57.
★TML Systems ... 30 day MBG
3548 TML Source Code Library II 1.1 . . . 39.
3549 TML Pascal II 3.0 *(w/MPW 3.0)* . . . 109.
Trendware
5203 Stack Cleaner. . . . . 29.
5202 HyperTools #1 1.02. . . . . 52.
5199 HyperTools #2 1.04. . . . . 52.
5609 XCAL 1.0 . . . . . $77.
True BASIC, Inc.
3587 True BASIC 2.02 . . . . . 55.
3583 Scientific Graphics . . . . . 39.
3588 3D Graphics. . . . . 39.
Additional Toolkits available. . . . . . call
★Zedcor ... 60 day MBG
3985 ZBASIC 5.0. . . . . 89.

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★Abbott Systems ... 30 day MBG
5236 CanOpener 1.1 . . . . . 64.
★Affinity Microsystems ... 60 day MBG
1014 Affinifile 1.1. . . . . 45.
1016 Tempo II 1.02 . . . . . 75.
★Aladdin Systems ... 30 day MBG
6169 Shortcut 1.0.1. . . . . 46.
★American Power ... 30 day MBG
6102 PowerChute . . . . . 65.
★Berkeley Systems ... 30 day MBG
5737 After Dark 1.1. . . . . 22.
1541 Stepping Out II 2.01 . . . . . 49.
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1510 Sidekick 2.0 . . . . . 68.
★Bravo ... 30 day MBG
5404 SPAMM 1.1 . . . . . 48.
★Casady & Greene ... 60 day MBG
2269 QuickDEX 1.4A . . . . . 31.
★CE Software ... 60 day MBG
4689 MockPackage Plus Utilities 4.4 . . . . 32.
1727 CalendarMaker 3.0. . . . . 32.
6278 DiskTop 4.0. . . . . 64.
1729 QuicKeys 1.2 . . . . . 64.
★Central Point ... 30 day MBG
5040 Copy II Mac 7.2 . . . . . 23.
5041 PC Tools Deluxe Mac 1.1 . . . . . 45.
★Connectix ... 30 day MBG
6123 Virtual 2.0 (for SE/30, IIcx, IIx, & IIci) 115.
6122 Virtual 2.0 (for Mac II, incl. PMMU) . 188.

Farallon Computing ... 30 day MBG
Timbuktu Remote 1.0.1–Honorable mention–1990 MacUser Editors' Choice Award for *Best Connectivity/Networking Hardware.* "Allows you to control another Mac and pass files to and from it through a modem connection". $125.

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1824 Calculator Construction Set 2.01 . . . 45.
★Electronic Arts ... 30 day MBG
1843 Disk Tools Plus 1.01 *(Batteries Incl.)* . 31.
★Fifth Generation ... 60 day MBG
4287 PYRO! 3.3 *(screen saver)* . . . . . 14.
3954 PowerStation 2.5. . . . . 34.
3955 Suitcase II 1.2.3 . . . . . 44.
5178 FastBack II 2.0 . . . . . 107.
5725 DiskLock 1.0. . . . . 107.
★HJC Software ... 30 day MBG
4803 Virex *(lastest version)* . . . . . 52.
5885 Virex *(10 Pack)* . . . . . 329.
ICOM Simulations
4084 On Cue 1.3. . . . . 35.
★Insight Development ... 30 day MBG
6173 MacEnvelope 4.1 . . . . . .79.
6171 MacPrint 1.2. . . . . 95.
★JAM Software ... 30 day MBG
6089 Smart Alarms Single User . . . . . 49.
6088 Smart Alarms 1-4 Users . . . . . 99.
6087 Smart Alarms 5-8 Users . . . . . 149.
6086 Smart Alarms 9-15 Users. . . . . 199.
6085 Smart Alarms 16-25 Users . . . . . 299.
★Kent Marsh Ltd. ... 30 day MBG
5457 QuickLock 1.0 . . . . . 56.
2591 The NightWatch 1.03 . . . . . 86.
6134 MacSafe II. . . . . 107.
★Kiwi Software ... 60 day MBG
6267 Kiwi Envelopes! 3.0 . . . . . 35.
★Loop Software ... 30 day MBG
5442 PictureBook 3.2 . . . . . 39.
★Microlytics ... 60 day MBG
2732 GOfer 2.0 . . . . . 45.
★Microseeds Pub. ... 60 day MBG
4848 INITPicker 1.0. . . . . 25.
4210 Screen Gems 1.0 . . . . . 39.
2913 Redux 1.6. . . . . 49.
Olduvai
4503 MultiClip 1.01 . . . . . 50.
★ON Technology ... 1 year MBG
6385 On Location 1.0 . . . . . 75.
★Software Innovations ... 30 day MBG
5869 HandOff 1.1 . . . . . 32.
★Solutions Int'l. ... 60 day MBG
3448 SmartScrap & The Clipper 2.1 . . . . 45.
3449 SuperGlue II 2.0 . . . . . $61.
★SuperMac Software ... 60 day MBG
3383 SuperSpool 5.0 . . . . . 58.
3382 SuperLaserSpool 2.0 . . . . . 87.
3378 SuperLaserSpool 5-Pack 2.0 . . . . 289.
3377 DiskFit 1.5 . . . . . 58.
3379 Network DiskFit 1.5. . . . . 225.
3381 Sentinel 2.0 . . . . . 87.
★Symantec ... 30 day MBG
5176 Symantec Anti-virus for Mac 1.1 . . . 68.
5724 Symantec Utilities II for Mac . . . . . 99.
★Williams & Macias ... 30 day MBG
3779 DiskFinder . . . . . 25.
3783 myDiskLabeler w/Color 2.9.1I. . . . . 28.
3784 myDiskLabeler w/LaserWriter 2.9.1LI. 33.
3780 ImageWriter II Label Pack *(Qty. 216)* 15.
3781 LaserWriter Label Pack *(Qty. 216)* . . 18.
4976 Sticky Business 1.0.7 . . . . . 89.
★XTree ... 30 day MBG
5177 XTreeMac 1.02 . . . . . 52.

Acius ... 30 day MBG
4th Dimension 2.0–1990 MacUser Editors' Choice Award for *Best Database*. "Increased power, speed and performance, makes 4th Dimension the most powerful database on the Mac" . . . . . $469.

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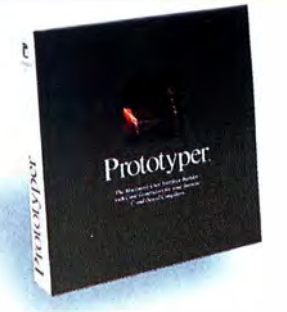
Access Software
4655 World Class Leader Board Golf. . . . 26.
Accolade
1184 Hardball *(CP)* . . . . . 27.
4484 Mean 18 *(CP)* . . . . . 27.
4485 4th and Inches *(CP)* . . . . . 27.
Activision
4475 Quarterstaff *(CP)*. . . . . 29.
4486 Manhole. . . . . 29.
5127 Manhole *(CD-ROM)* . . . . . 35.
5517 Cosmic Osmo. . . . . 41.
★Ars Nova ... 30 day MBG
1215 Practica Musica 2.2 . . . . . 69.
★Bogas Productions ... 60 day MBG
1461 Studio Session 1.2 SE. . . . . 45.
4255 Super Studio Session 2.0 . . . . . 65.
6135 Super Studio Bundle *(w/5 below)* . . 99.
1459 Heavy Metal Rock. . . . . 13.
1460 String Quartet . . . . . 13.
1458 Country Disk. . . . . 13.
4832 Sound Effects . . . . . 13.
5719 Brass Disk. . . . . 13.
Bright Star Technology
3961 Talking Tiles 1.0 . . . . . 27.
1402 Alphabet Blocks 1.0 . . . . . 30.
Broderbund Software
4314 Type! 1.0. . . . . $18.
5886 Star Wars *(CP)* . . . . . 24.
4099 Shufflepuck Cafe *(CP)*. . . . . 24.
1421 Ancient Art of War *(CP)* . . . . . 27.
4540 Ancient Art of War at Sea *(CP)*. . . . 27.
6516 The Playroom *(CP)* . . . . . 27.
4229 Where/World Carmen Sandiego? *(CP)* 27.
5755 Where/Europe Carmen Sandiego?*(CP)* 29.
5233 Where/USA Carmen Sandiego? *(CP)* 29.
6384 PlayMaker Football *(CP)* . . . . . 29.
1423 Jam Session 1.1 *(CP)* . . . . . 29.
4966 SimCity 1.1 *(CP)* . . . . . 29.
5871 SimCity Supreme *(CP)* . . . . . 48.
6515 SimCity Terrain Editor *(CP)* . . . . . 16.
1422 Geometry 1.2 *(CP)* . . . . . 58.
4067 Calculus 1.2 *(CP)* . . . . . 58.
1426 Physics 1.2 *(CP)* . . . . . 58.
★Bull City Software ... 30 day MBG
5841 Moriarty's Revenge *(CP)*. . . . . 32.
Bullseye
1545 Fokker Triplane 2.02 *(CP)* . . . . . 24.
1544 Ferrari Grand Prix *(CP)* . . . . . 32.
4074 P51 Mustang Flight Simulator *(CP)* . 32.
Carina Software
5726 Voyager 1.2 . . . . . 89.
★Casady & Greene ... 60 day MBG
2268 Crystal Quest 2.2T . . . . . 25.
4119 Crystal Quest w/Critter Editor 2.2T . 40.
Coda Music Systems
4367 MacDrums 1.01 *(CP)* . . . . . 31.
4483 Perceive 1.0 . . . . . 49.
5854 MusicProse 1.0. . . . . 169.
5604 Finale 2.0 . . . . . 569.
Davidson & Associates
1734 Math Blaster! 1.0 *(CP)*. . . . . 26.
6128 Math Blaster Mystery *(CP)*. . . . . 26.
4978 Speed Reader II 1.0 *(CP)* . . . . . 26.
★Electronic Arts ... 30 day MBG
1848 Patton vs Rommel. . . . . 15.
1850 Reach for the Stars . . . . . 26.
6297 Halls of Montezuma . . . . . 26.
5554 Bard's Tale . . . . . 32.
4064 Chuck Yeager Flight Simulator . . . . 32.
4588 Life & Death *(CP)* . . . . . 32.
4945 The Hunt for Red October. . . . . 32.
4981 Starfleet 1 . . . . . 36.
1846 Deluxe Music Construction Set 2.5 . 84.



SmethersBarnes ... 30 day MBG
Prototyper 2.1–*Honorable mention*–1990 MacUser Editors' Choice Award for *Best Programming Tool*. "Clearly shows direction CASE interface tools should be taking." 3.0 now supports custom controls & more flexible code generation $185.

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★First Byte ... 30 day MBG

5294 Puzzle Storybook 1.0 *(ages 3-8)* . . . 27.
5293 Dinosaur Discovery Kit 1.0 *(ages 3-8)*. 27.
3941 SmoothTalker 2.1 . . . . . 32.
3936 KidTalk 2.0 *(ages 5-15)* . . . . . 32.
3935 Speller Bee 2.0 *(ages 5-12)* . . . . . 32.

★Great Wave ... 30 day MBG

2277 TimeMasters 1.0 *(ages 4 +)* . . . . . 22.
2276 KidsTime 1.2 *(ages 3-8)* . . . . . 26.
5642 KidsMath 1.1 *(ages 3-8)* . . . . . 26.
4334 NumberMaze 1.1 *(ages 5-12)* . . . . . 26.
2270 American Discovery 2.3 *(ages 9 +)* 26.
2273 ConcertWare+ 4.0 . . . . . 38.
2271 ConcertWare+ MIDI 5.0 . . . . . 99.

Infocom

5814 Journey . . . . . 29.
5816 Shogun . . . . . 35.

Inline Design

5870 Bomber *(includes headphones)* . . . 26.

★Learning Company ... 30 day MBG

2670 Reader Rabbit 2.1 *(CP) (ages 4-7)*. . 31.
5453 Talking Math Rabbit 1.0 *(ages 4-7)* . 31.

MicroProse

4697 Pirates! *(CP)* . . . . . 35.

★Microsoft ... 30 day MBG

2868 Flight Simulator *(CP)* . . . . . 33.

Miles Computing

5253 The Puzzle Gallery . . . . . 26.
2765 Fool's Errand . . . . . 32.
2767 Harrier Strike Mission II *(CP)* . . . . . 32.

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4083 Balance of Power 1990 *(CP)* . . . . . 29.
3987 Colony *(CP)* . . . . . 29.
4596 Deja Vu II *(CP)* . . . . . 29.
2743 Crossword Magic *(CP)* . . . . . 29.
2749 Shadowgate *(CP)* . . . . . 29.
5252 Gauntlet *(CP)* . . . . . 29.
2751 Uninvited *(CP)* . . . . . 29.

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6094 MacTag 2.04. . . . . 42.

★Penton Overseas ... 30 day MBG

5864 VocabuLearn/ce French *(level 1)* . . . $29.
5887 VocabuLearn/ce French *(level 2)* . . . . 29.
5865 VocabuLearn/ce Italian *(level 1)* . . . . . 29.
5889 VocabuLearn/ce Italian *(level 2)* . . . . . 29.
5867 VocabuLearn/ce Spanish *(level 1)* . . . 29.
5891 VocabuLearn/ce Spanish *(level 2)* . . . 29.
5868 VocabuLearn/ce German *(level 1)* . . . 29.
5888 VocabuLearn/ce German *(level 2)* . . . 29.
5866 VocabuLearn/ce Japanese *(level 1)* . . 35.
5890 VocabuLearn/ce Japanese *(level 2)* . . 35.

★Personal Training Sys. ... 60 day MBG

Personal Training for Excel

5573 XL1 Beginning Spreadsheets . . . . . 36.
5574 XL2 Intermediate Spreadsheets . . . 36.
5575 XL3 Advanced Spreadsheets . . . . . 36.
5576 XL4 Creating Business Graphics. . . 36.
6021 XL5 Building Databases . . . . . 36.
6020 XL6 Beginning Macros . . . . . 36.
6367 XL7 Advanced Macros . . . . . 36.

Personal Training for Macintosh

5263 B1 The Basics *(for 2 floppy drives)*. . 36.
5264 B2 The Basics *(for Plus or SE w/HD)* 36.
5265 B3 The Basics *(for Mac II w/HD)* . . . 36.
5266 B4 Beyond the Basics. . . . . 36.

Personal Training for Word

4947 W1 Beginning Level . . . . . 36.
4854 W2 Intermediate Level . . . . . 36.
5098 W3 Advanced Level . . . . . 36.
5418 W4 Additional Features. . . . . 36.

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5272 LP4 Creating Artwork . . . . . 36.

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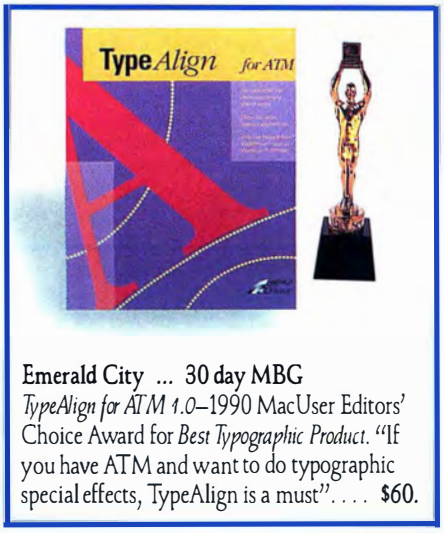

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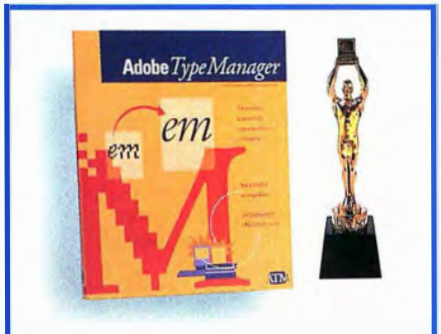

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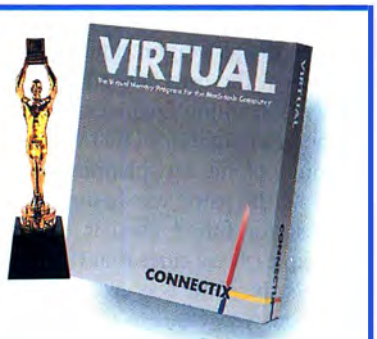

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2793 3½" HD Disks 1.44 Meg *(10)* . . . . . 27.
★3M ... 60 day MBG
3943 DC2000 Tape Cartridge . . . . . 20.

ACCESSORIES

Apple Computer
1113 Black ImageWriter Ribbon . . . . . 10.
1114 LaserWriter Plus Toner Cartridge . . 109.
1115 LaserWriter II Toner Cartridge . . . . 115.
★Avery ... 60 day MBG
4864 Disk Labels 3½" *(Qty. 250)* . . . . . 13.
5392 Disk Labels—Laser 3½" *(Qty. 630)*. 29.
5403 Address Labels 1⅞" x 4" *(Qty. 1000)* . . . 9.

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Then I recalled something that the publisher of SimCity, Jeff Braun of Maxis Software, had told me. Apparently there was one very smart user who devised a scheme that would enable him to grow a very big city from a very small one in an incredibly short period of time. (This did not involve the notorious "secret" feature of embezzling.) It involved creating blocks of several areas zoned in a particular pattern of commercial, residential, and industrial blocks. Something about that exact pattern was amazingly conducive to growth.

City planning is a piece of cake compared to what Wright is trying to model next—Earth

What I want to know is whether the pattern is simply an anomaly of SimCity, or perhaps a certain combination that would be beneficial to growth if used in a real city. We know it works in the world Will Wright created inside a computer—but will it work outside? Only experimentation would yield the answer.

Meanwhile real city planners, while keeping in mind that SimCity is an extremely simplified model of reality, are finding the program useful. "It does simulate the flavor of a city in some ways," says Bruce Joffe, the manager of geographic information systems at the firm James M. Montgomery Consulting Engineers. (Joffe, formerly a neighbor of Will Wright's, lent some of his city-planning expertise while the game was being designed.) "Just for fun, I used it to model a couple of real cities that I've designed recently. One was a community in Papua, New Guinea. That worked out really well. The other was a city of 25,000 that I designed in Venezuela. That one diverged from the actual city because I got too much into the simulation, trying to respond to the demands of the Sims. But it proved a valuable lesson for a city planner—to focus on the process of urban development rather than attempt to create a package."

"Was there anything in the simulated version of the Venezuelan town that you felt could have been used in the real place?" I asked the planner. "No," he said. He reiterated that SimCity, for all its virtues, does not include sufficient complexity to really model a city.

Everybody Wants to Rule the World

City planning, though, is a piece of cake compared to what Will Wright is trying to model next. His encore project is called Gaia, and it is no less than a simulation of Earth itself. With this program, the user will be able to watch the planet and life on it evolve, from the continental drifting period, to the emergence and development of life, to the perilous environmental changes that come from the industrial age. The user will be charged with preventing a desktop Greenhouse Effect from causing environmental disaster.

Wright cheerfully admits that his model can only incorporate a tiny fraction of the complexities involved in simulating the behavior of Earth and its inhabitants. Yet the very idea of having the whole world in one's hands is so thrilling that people are lining up to suspend their disbelief. Among the groups contacting Wright for advance information on Gaia, the simulation, is the Global Business Network, some members of which are associated with the largest corporations on the planet. They think that the game will help people understand the real world.

Personally, I'm more eager to explore the little world that Will Wright will create, the one that bears some resemblance to Planet E, but behaves like nothing so much as itself. And if I wipe out a few billion years of evolution with a Greenhouse Effect, well, then, I'll just go up to the File menu and select New. Were it only so easy with the real thing. ■

Steven Levy is a Macworld *columnist and the author of* The Unicorn's Secret: Murder in the Age of Aquarius *(NAL, 1989).*

Macintosh Training That Works

"I have been using FileMaker for about a year now and decided to get the MacAcademy tape to see how the program was presented, the content, and to see if other tapes would be useful. After looking at the tape I promptly ordered three more! Needless to say I was pleased, as the tapes are professionally done and most useful. You and your company do a fine job." Mr. James H. Patterson, M.D.

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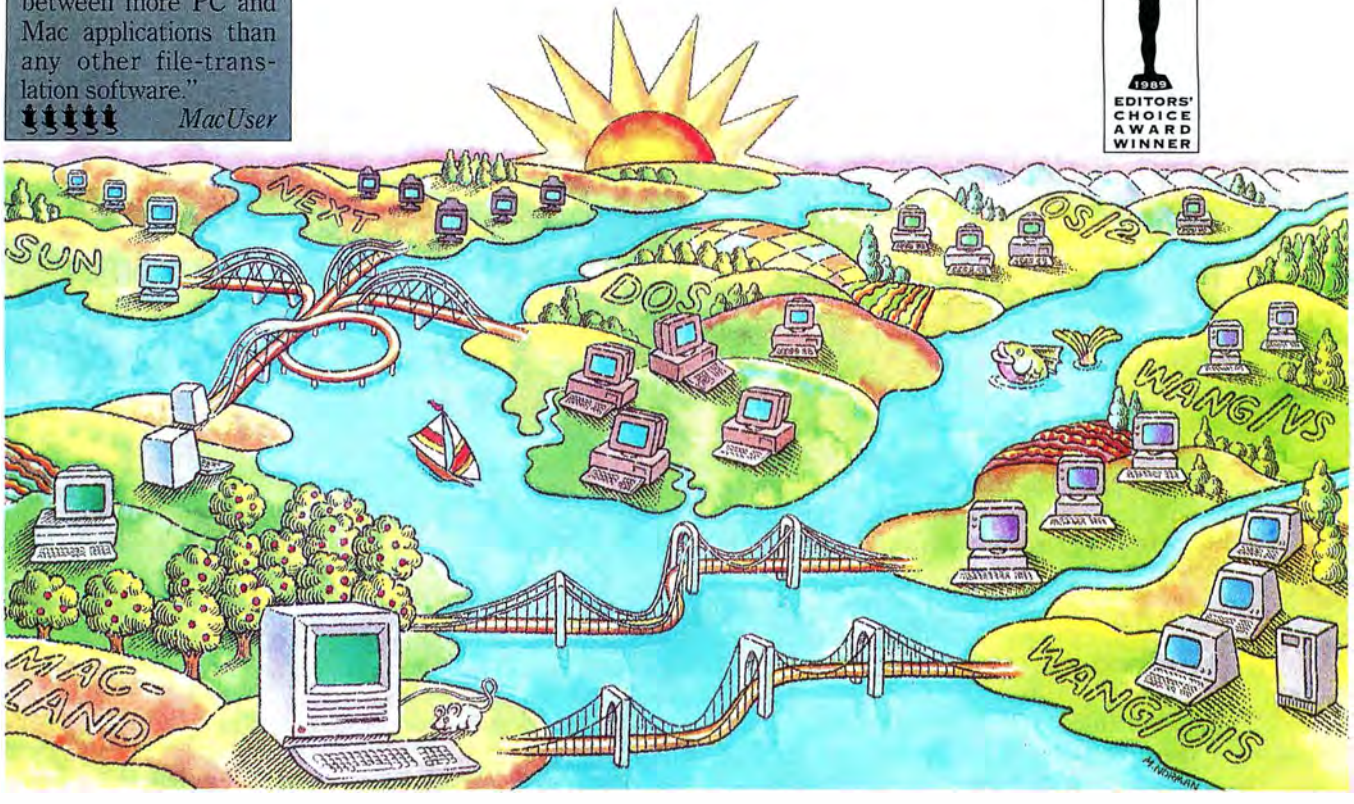

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They're No Angels

A PRISON USER GROUP GIVES AS GOOD AS IT GETS

BY DEBORAH BRANSCUM

A couple of years ago a man named Charlie needed information. He was taking college courses that gave him access to a Macintosh, but not much more. He had outdated programs, no manuals, and no teachers to talk to directly. So he checked *Macworld*'s 1988 user group directory and wrote to several MUGs asking for help. The Worcester (Massachusetts) Mac User Group was the only organization to respond, but it did more than simply write back. In February of 1989, volunteers began meeting monthly with Charlie and his friends, kicking off the Bad Apples, a special interest group for inmates of the Massachusetts Corrections Institution, Lancaster Pre-Release Facility.

"We went there thinking we would be teaching them everything from soup to nuts," says Ted Verdone, who is a regular at Bad Apple SIG meetings. "We found out the group was fairly knowledgeable. Since then a couple of them have bought their own Macintosh machines and they're doing quite well. Now, instead of my going over there and helping them, I go over there and ask them questions."

Like Charlie (who asked that we use his first name), several prisoners at Lancaster became interested in the Macintosh because of courses they were taking. They received assignments from college teachers via modem and sent their work back the same way. The students wanted information about the Mac but had no easy way to get it. "We decided that since these guys couldn't get to our meetings, we'd get a volunteer to go once a month," says David Peller, WMUG executive director. "They always have questions for us, lots and lots of questions. We got them a set of manuals, donated a copy of *The Macintosh Bible*, and let them copy a set of public domain software. They've been doing great."

The Bad Apples have all the problems of a typical user group. Maintaining membership is one, as people leave the program for parole. "We have had as many as ten people in the group; now it's down to four," says Verdone. Charlie says the group is trying to rebuild by appealing to the college students at the prison.

Another familiar problem is technical support. Charlie, who practices what he calls "bedtop" publishing in his 6-by-9-foot room, writes a column for *RAMblings*, the WMUG newsletter. In the September issue he described problems with a printer: "I must rewire everything from scratch every time I go to press. With switches being located in awkward, out-of-the-way places, I leave them on and use the cord as the on/off mechanism. The result was that I fried the circuit board. The next morning I spent a solid half hour of consecutive dialing to reach the technical service 800 number in New Jersey and got nothing but a busy signal. I made several attempts on three or four occasions during the day and finally made a call to the store where it was purchased. The clerk said he couldn't tell what was wrong over the phone, so 'bring it in.' Yeah, sure. I'll just hop into the warden's cruiser,

turn on the blue lights, and zip into Worcester with my printer tied on the luggage rack."

"It's interesting to see how hungry for information these guys are," says Peller. "They wait all month for us to get there and can't thank us enough for coming. And since they've been up there, they're starting to make money with the Mac." Despite the headaches of being a Mac fan in prison, Charlie has become a whiz at Microsoft Word 4.0, HyperCard, and Excel and can contribute expertise to WMUG in several areas. "The Worcester Macintosh Users group has been sending people over every month," says Charlie. "We, in turn, have been able to teach them what we've learned." One former member, now on parole, developed real-estate–management software while in prison. He is now preparing to buy a Macintosh and use the software in his business. Charlie hopes to develop a specialty in custom spreadsheets for small businesses, work he is beginning now and can carry with him when he leaves Lancaster.

(continues)

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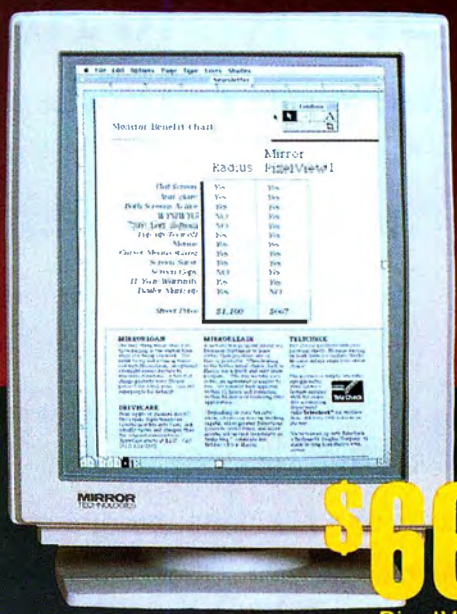

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SERVICE HEROES

Reader Bob Eldred of Pleasanton, California, writes to praise "an innovative piece of software which is supported by a first-rate customer service department." Eldred bought Practica Musica from Jeffrey Evans, owner of Ars Nova Software, in order to learn more about music notation. But Eldred ran into problems getting his MIDI keyboard to work properly with one module of the program, which was running on a Macintosh IIcx.

"I was able to reach Jeff on his toll-free number. Over the course of many weeks, Jeff persevered in trying to find a fix," writes Eldred. Evans acquired additional equipment to try to duplicate the problem and test several software upgrades, sent free of charge. "After much joint troubleshooting, I discovered the solution by changing an obscure setting on my keyboard. The problem never was in the software or the equipment, but in my limited knowledge of MIDI." Despite this discovery, Evans was "most gracious in assuring me that all the effort and expense was well worth it. It's the first time I have ever had such a pleasurable experience from what is normally a nightmare."

Gregory Gunter of the Virgin Islands writes of good service after buying Omnis from a local dealer. Several weeks after the purchase, Gunter read about the Omnis Express portion of the program, which was not included with his package. He faxed Blyth Software to inquire about the missing portion. Julie Andres from Blyth called and said the program Gunter had bought was several years old. She sent him the complete upgrade, plus the Express section, at no cost. "In addition, I was offered the chance to purchase the new Omnis 5 at a substantially reduced price. Sure enough, the complete package arrived about a week later in the mail."

Charlie agrees that the Worcester group has helped him in many ways, but clearly WMUG has also benefited. "It backfired on us," says Verdone with good humor. "We thought we'd be giving, giving, giving, and now the students have excelled their teachers. They're helping me now."

The Bad Apples is a success story that illustrates a user group at its best. Charlie needed help with his Macintosh. He got it. And now he's helping others.

(Call 508/476-7014 for information about joining the Worcester Macintosh User Group. For information on user groups in the United States, call Apple toll-free at 800/538-9696, ext. 500.)

NAUGC Rides Again

The annual National Apple User Group Conference is slated for Arlington Heights, Illinois, April 20–22. This year the conference is being cosponsored by 11 Chicago-area Apple II and Macintosh user groups. Microsoft CEO Bill Gates will help kick off the conference as the keynote speaker. Call 708/518-2642 or 708/665-6319 for details, or try AppleLink at UG0083.

Portland Outing

The Portland (Oregon) Macintosh User Group sponsors a MacCamp twice a year at the Silver Falls State Park Conference Center. The spring classes concentrate on business-productivity software such as Word, Excel, and FileMaker. People bring Macs, set up an AppleShare network of 40 to 50 people, and work up a sweat playing Maze Wars on Saturday night.

MacCamp is open only to PMUG members. The next MacCamp is scheduled for late April. Call PMUG at 503/228-1779 for more information.

Smoke Gets Digitized

A fire department user group formed last fall "brings two neighboring fire departments together for a common cause besides mutual aid for an emergency response," reports Kevin Farrell of The Singerly Fire Company.

The Aetna Hose, Hook and Lad-

(continues)

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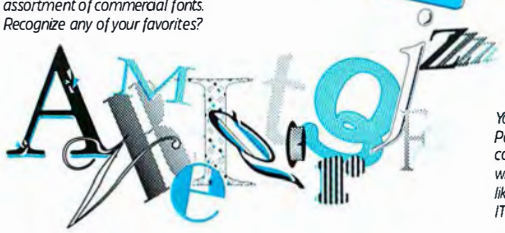

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der Company (known as the Newark [Delaware] Fire Department) and the William M. Singerly Steam Fire Engine, Hose, Hook and Ladder Company, No. 1, of Cecil County (known as the Singerly Fire Company) of Elkton, Maryland, formed the group to share computer information and techniques, according to Farrell. The all-volunteer departments want to make the most of recently purchased Mac hardware. Once established, this user group may expand to include other local aid departments. Contact Farrell at 301/398-3355 or his brother John in Newark at 302/454-3307 for more information.

Consultants Gather

April is a busy month. The Macintosh Consultants Network is holding its Fourth International Macintosh Consultants Conference at the Rancho Bernardo Inn in San Diego, April 27–29, 1990. Jim Sheldon-Dean, MCN executive director, says one day will be devoted to specific consulting issues; the remaining time will be devoted to communications, connectivity, and project-management topics. MCN can be reached for details at 206/453-2729 or on Connect (MCN). M

Send nominees for sainthood to Service Heroes, *Macworld*, 501 Second St., San Francisco, CA 94107 or via AppleLink (Macworld1) or Connect (Branscum). Conversely, drop *Conspicuous Consumer* a line if a company is ignoring you. I will help solve your problem, if I can. If your user group is sponsoring an event, please get in touch.

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All screen images were scanned, imported, displayed and photographed on CalComp DrawingCard displays.

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The Color Squeeze

IMAGE PROCESSING DEMANDS A LOT OF RESOURCES, BUT HELP MAY BE ON THE WAY

BY BRUCE F. WEBSTER

The Macintosh is suffering from graphical overload. The advance of image technology has overwhelmed the memory, storage, and processor resources of all but the most powerful (and expensive) Macintosh systems. Put simply, color is running out of space. Try this quick demonstration. Turn on a classic Mac (Mac Plus, SE, or SE/030) and create a screen shot by pressing Shift-⌘-3. The resulting PICT file is 21K in size. You can fit nearly 40 of these on a regular 800K floppy disk.

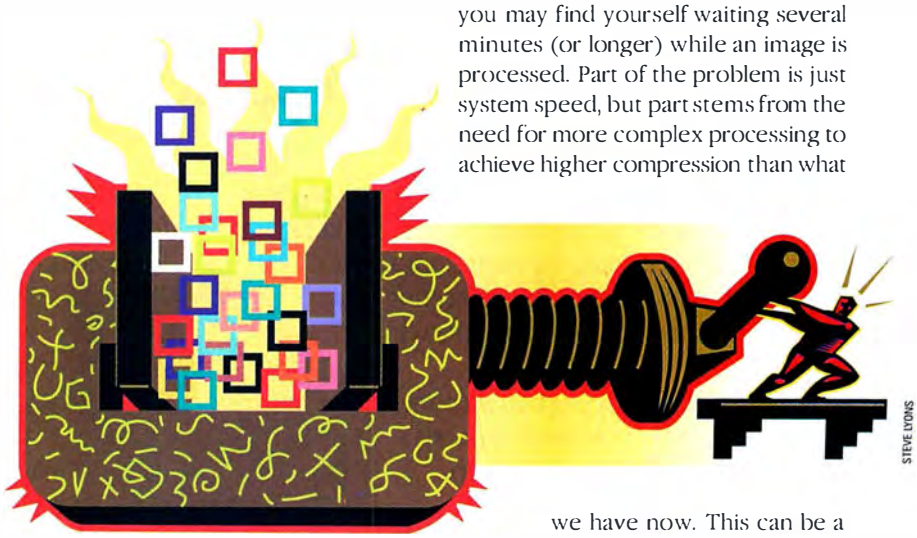
Now try using a Macintosh IIcx with a Spectrum/8 color display board and a large (1024-by-768-pixel) screen. Launch PixelPaint, open a new document, stretch the window to the full screen size, and fill it with some paint color. Save it and look at the file size—over 700K. You can fit just one of these on a regular 800K floppy.

Finally, hook up a Sharp or Howtek 300-dpi color scanner to the Mac IIcx. Try to scan in a full 8½-by-11-inch image at 300 dots per inch and 8 bits per pixel. Chances are you can't do it; you'd need over 8 megabytes of memory just to hold the image. The ratio of this image's size to that of a classic Mac screen shot: 385 to 1.

This color explosion has occurred in less than three years' time. Since the introduction of the Macintosh II in 1987, hardware and software resources have not been able to keep up. And new developments in color imaging—color separation, 3-D solid modeling, animation—continue to push the limits of what's possible.

Shrink to Fit

Major problems result from the tremendous inflation of image size. You can overcome these limitations in capacity and/or bandwidth to a certain degree by spending lots of money on peripherals, but the return on your investment diminishes quickly. In short, color is expensive.



STEVE LYONS

But that may not always be the case. What if there's a different approach? Instead of spending money on memory, storage devices, and accelerators, what if there were a way to make the large color images smaller?

Several compression utilities are now on the market, and some are available as shareware and public domain software. Typically these programs achieve only 40 percent to 60 percent compression on a given file. That's a start, but reducing an 8MB image to 4MB doesn't solve all your problems. For instance, since these utilities are not integrated within imaging software, you may run out of memory or disk space before you even have a chance to compress the image.

Another issue is that of compression and decompression speed. Since you're dealing with very large images, you may find yourself waiting several minutes (or longer) while an image is processed. Part of the problem is just system speed, but part stems from the need for more complex processing to achieve higher compression than what we have now. This can be a serious limitation if you need to compress a file on the fly, such as while scanning in an image.

Also, you're often faced with a trade-off between image quality and storage. Some algorithms result in high

(continues)

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Electronics for Imaging uses an image shot by photographer Morton Beebe to demonstrate its compression technology. This original image, 2.1MB in size, was digitized using a slide scanner.

This image shows the result of 22 to 1 compression, which brought the file size down to 0.10MB. Some small artifacts are visible along the top cable of the bridge.

MORTON BEEBE

This image shows the result of 39 to 1 compression which reduced the file size to 0.05MB. Notice the artifacts along the cables and top of the towers.

compression, but with a significant loss of information. When the image is decompressed, gaps, patterns, and other artifacts appear in the image. Repeated compression and decompression can make image quality worse.

Finally, there is the issue of coordination: if I compress an image and give it to you, will you have the right utility to decompress it? More important, if the scanner-control software compresses the image you are scanning in, can the image-manipulation software that you want to use correctly decompress that image? To achieve this kind of integration, there needs to be a standard of some sort.

Slouching toward a Standard

An international committee is trying to do just that. The Joint Photographic Experts Group (JPEG) has created a compression-and-decompression algo-

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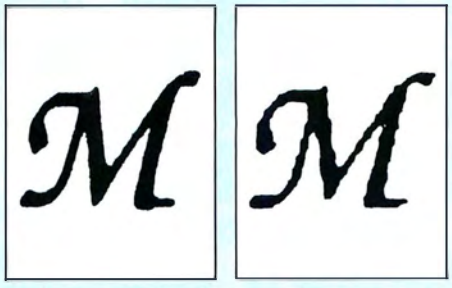

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rithm designed to work with large color images. JPEG's goal is to achieve high compression ratios with minimal degradation by throwing away "unimportant" information in the image.

As defined by JPEG, the algorithm uses three steps to compress an image. First, it divides the image up into 8-by-8-pixel squares and applies a discrete cosine transform (DCT) to each square. Because the DCT is a member of the Fourier transform family, the result is 64 frequency values. Second, these frequencies are put through a quantization algorithm to eliminate unimportant frequencies (based on studies of people's color-perception thresholds). Third, the remaining values are run through a Huffman coding scheme, which uses a predefined table to encode each remaining value as a variable-length string of bits, with the most frequently occurring values using the fewest bits.

Decompression reverses the process. First, the Huffman bit strings are decoded. Next, the quantization algorithm recreates a set of 64 frequencies. Finally, an inverse cosine transform (ICT) is applied, resulting in an 8-by-8-pixel square.

The JPEG algorithm is designed to let users adjust the compression ratio, trading off image quality for greater compression. Thus, you might increase compression if picture quality or integrity were not as important as, say, simple recognition of the general image. Conversely, you could bring down the compression to maintain high image integrity.

JPEG's intent is to establish this algorithm as a standard, not just for computers, but for any application requiring storage, manipulation, or transmission of large color images, such as high-definition TV (HDTV). At least two companies—Electronics for Imaging (EFI) and Creative Circuits Corporation (C^3)—want to aid JPEG in that effort and earn themselves some money in the process.

Software versus Silicon

EFI (415/742-3400) of San Bruno, California, has developed and released an implementation of the JPEG algorithm in a software library called Ecomp. EFI claims that Ecomp provides a compression ratio of 20 to 1 or better for color images, with only a minor loss of quality on initial compression, and with no additional loss on repeated compression-decompression cycles. That kind of compression lets you fit several large-screen, 32-bit color images (more than 3MB each) onto a single 800K floppy disk.

EFI's results look impressive. There is no visible degradation in the sample image of the Golden Gate Bridge after an 11-to-1 compression, and little degradation after a 22-to-1 compression. Even a 39-to-1 compression-decompression cycle left the image relatively intact, with visual artifacts confined mostly to the portion of the image containing the bridge's support cables.

Unfortunately, speed is not Ecomp's strongest feature, due to the heavy math involved in the process. Compression and decompression pro-

(continues)

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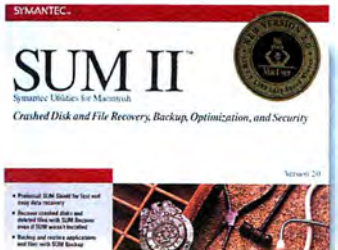

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ceed at the same rate, processing about 10 kilobytes of decompressed image per second on a Mac II system. That may be bearable if you are working with smaller images (a 3MB image takes about 5 minutes). But that rate works out to about 18 minutes to compress or decompress a 10MB image, a speed I suspect most users would find intolerable and that would limit the use of Ecomp in real-time applications, such as scanning.

C³ (408/944-6300) of San Jose, California, is trying to eliminate that speed barrier. According to C³ representatives, the company has not only implemented the JPEG algorithm in software, but also in a custom silicon-chip design that is still in the prototyping stages. Company officials claim that the chip can decompress a 10MB image in 1/3 second, some 3000 times faster than the software implementation. According to C³, this rate is achieved by using some 300 levels of pipelining; in other words, the chip steps through 300 operations simultaneously. Furthermore, the chip is designed for parallel processing, allowing a hardware manufacturer to achieve faster compression and decompression rates by using several chips. C³ says that four of these chips should be able to do real-time (30-frames-per-second) decompression of full-color HDTV images.

If these claims are true, the chip (or something like it) could have significant implications for both computer and general consumer markets. For example, an image processing unit based on this chip could become a standard option or feature for computer systems, much as floating-point units are now, and as digital signal processors are becoming. Such a chip could also find its way into video (and audio) consumer devices, promoting the current shift from analog to digital and removing some of the information barriers between consumer and computer electronics.

Will Users Benefit?

EFI and C³ are targeting developers with their products by licensing their technology. The cost is a flat, one-time fee. EFI charges a company $1000 for internal use and $10,000 for use in products; C³ charges $500 and $15,000, respectively. In both cases the higher figure allows a firm to use the JPEG algorithm in commercial products, with no per-copy royalties of any kind. The goal is to establish the JPEG algorithm as a software standard before implementing it in hardware.

That goal, however, is not being served by the pricing fees described. The simple truth is that we won't benefit from this or any other compression routine unless it's widely adopted. If EFI and C³ really want to set a standard, they should write simple compression and decompression utilities for all their target platforms and release them in the public domain, then cut their licensing fees to a half or a third of what they are asking now. The first move would establish a demand for applications that support the compressed image format; the second would allow more small developers to jump on the bandwagon (and would probably result in higher revenues, to boot).

Even with increases in processor speed, though, the JPEG algorithm is just too slow for effective, convenient use. The best solution is hardware; that same algorithm in silicon—an image processing unit like the C³ chip—needs to be a standard part of every Macintosh system that deals with large color images.

What we need now is strong leadership from Apple, which developed and released 32-bit QuickDraw without providing hardware and software solutions to the resulting bottleneck. Third-party companies are seeking their own answers to the problems of graphic storage, manipulation, and transmission. But those solutions may be incompatible. Apple could serve its customers and itself by making the JPEG algorithm a standard part of system software and, eventually, of system hardware. Until then, high-quality color will remain a burden for most of us. And that load will ultimately weigh down Apple in the fiercely competitive years that lie ahead.

Contributing editor Bruce F. Webster is project manager at San Diego–based LaserGo. He can be reached via BIX (bwebster) and via MCI Mail (Bruce Webster).

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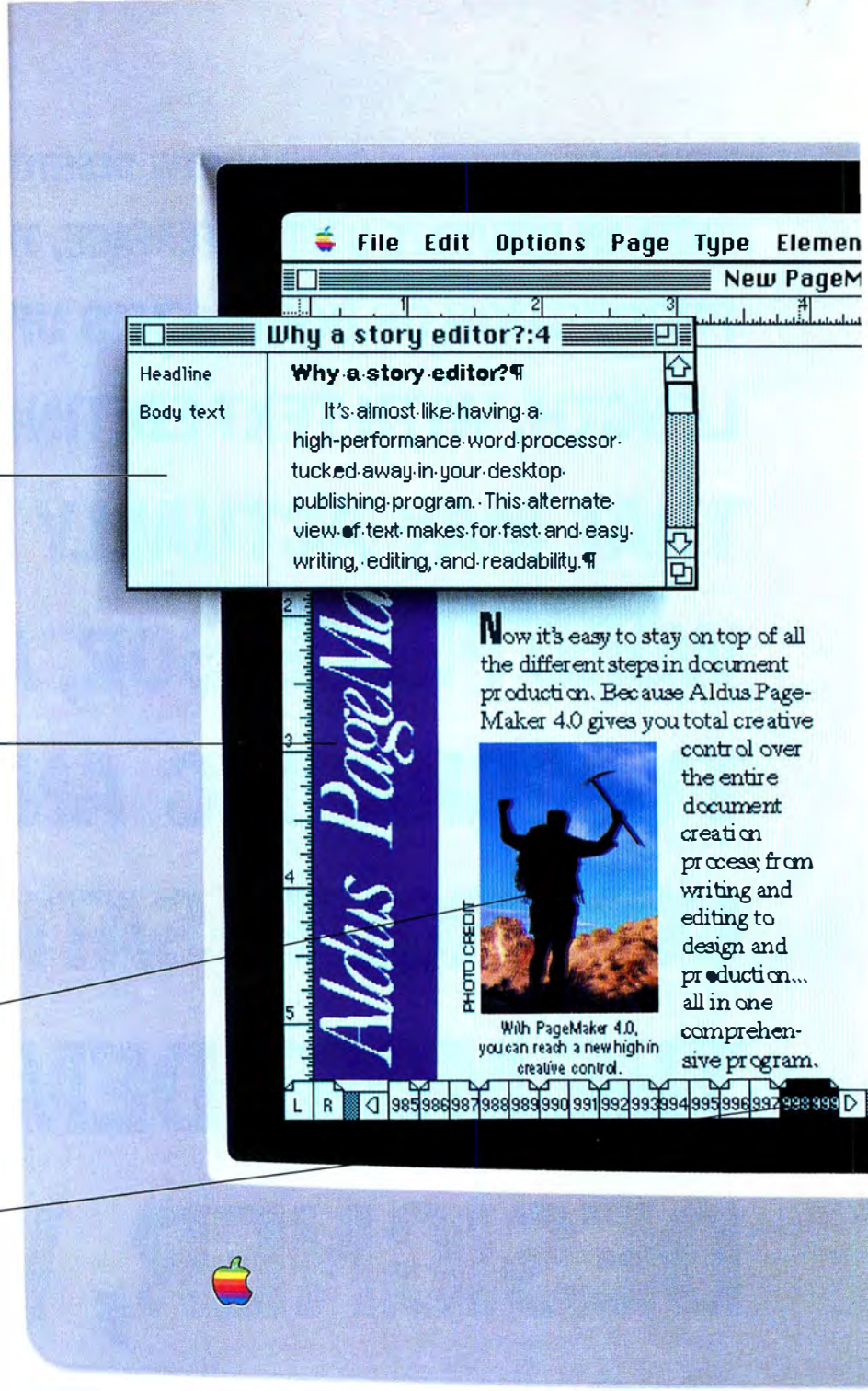

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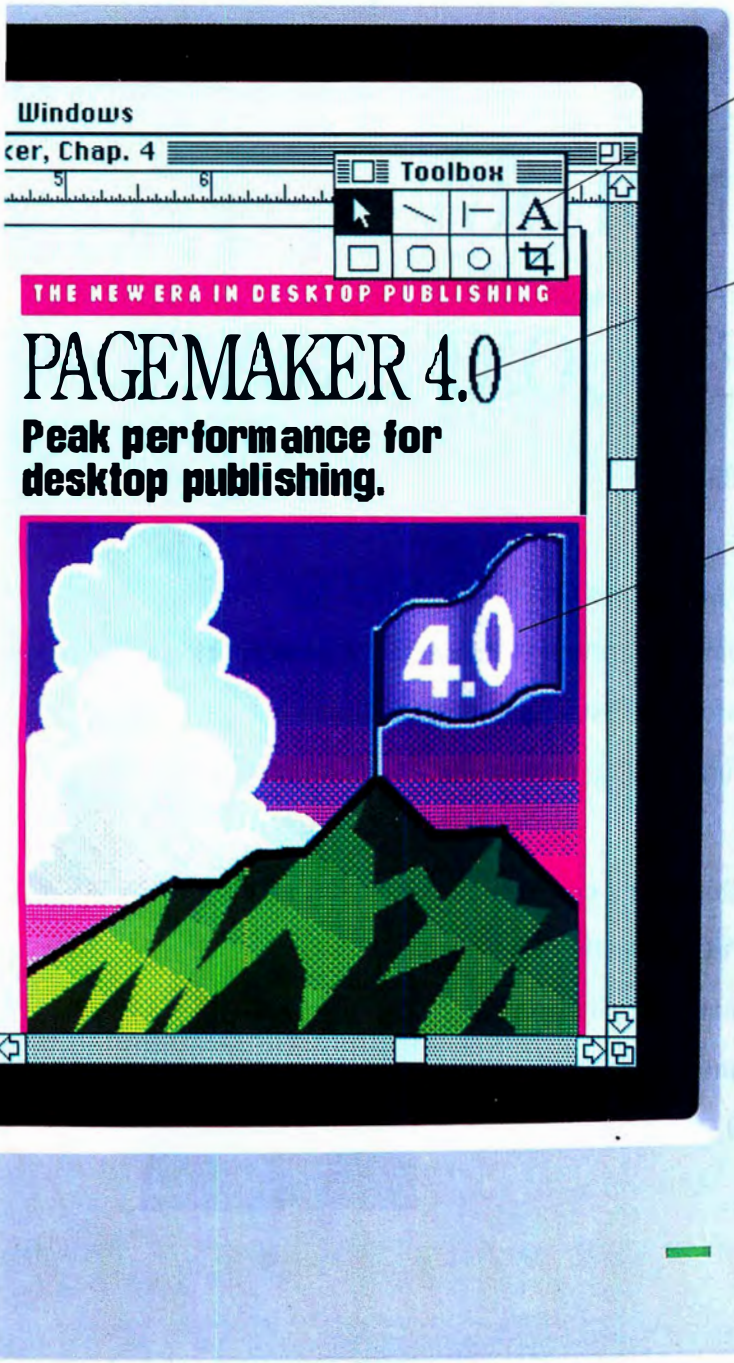

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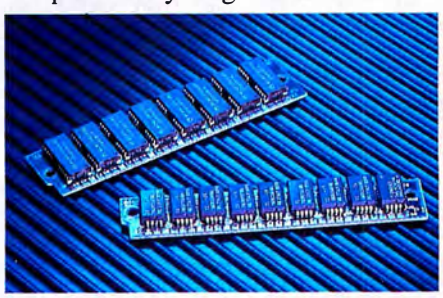

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1M x 8	(80 ns) Memory Masters	$ 99.00*	$ 90.00
1M x 9	(80 ns) Microproccessors	$110.00*	$ 99.00

SIMMs (continued)		Their Price	Our Price
4M x 8	High Profile .950 inches	NA	$ 700.00
4M x 9	High Profile .950 inches	NA	$ 750.00
4M x 8	Low Profile .800 inches	NA	$1000.00
4M x 9	Low Profile .800 inches	NA	$1100.00

*Published prices in Computer Shopper 2/90

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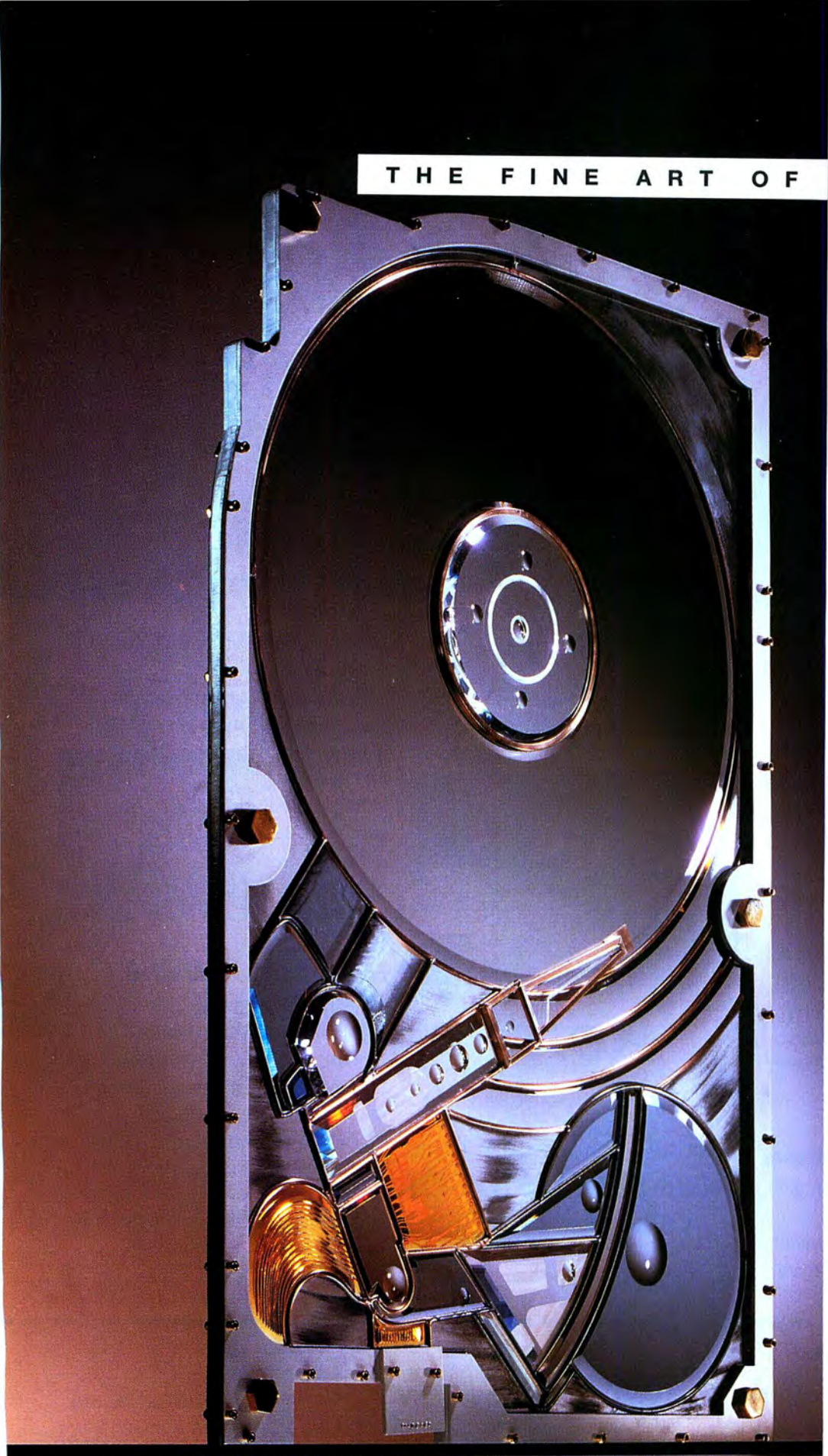

Beveled Glass Window by
Thomas Tisch & Andreas Lehmann
Oakland, California

Even to the experienced observer, a disc drive is a technological marvel. With discs spinning at 60 revolutions per second, the mechanics involved are astounding. It takes a company with a unique level of skill and experience to produce drives in volume that perform reliably year after year. A company like Seagate.

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MACWORLD NEWS

by Dan Littman and
Tom Moran

Moonraker: Not for Your Eyes Only

Workstation Technologies' Moonraker Video Digitizer is the first real-time, color video digitizer for the Mac II series. It can capture an analog video signal in a variety of broadcast formats and convert it into digital information for manipulation by the computer.

The Moonraker, which consists of one full-size NuBus board, accepts input from any PAL or NTSC video source. In NTSC mode, it offers a resolution of 645 by 484 pixels; when the board's software is set for PAL, its resolution is 768 by 512. The digitizer can create 8-bit color or gray-scale digitized images, 16-bit color images, or 32-bit color images. Its speed varies from 2½ frames per second in 32-bit mode, to 30 frames per second in 8-bit mode for NTSC, and 25 frames per second for PAL in 8-bit mode.

Two RGB inputs, one composite-video input, and one Super VHS input are incorporated in the board. You can attach both a video camera and a videodisc player and do fades and dissolves with the two inputs.

The board also supports scaling and masking of the digitized image. A sophisticated color-mapping technique allows the user to change all pixels of one color to another color, among other functions.

The Moonraker will not be available directly from Workstation Technologies, but will be resold by third-party vendors. For more information on products incorporating the Moonraker digitizer, call the company in Irvine, California, at 714/250-8969.

—Tom Moran

DAVID B. MOORE

With video camera attached, the Moonraker Video Digitizer captures our photographer on screen in real-time, full-motion video.

HyperCard to Translate Medical Babble

Lexical Technology didn't set out to construct the world's largest known HyperCard application, but the company's MetaCard, a comprehensive cross-reference of thousands of phrases from the leading biomedical indexes, has achieved that distinction: it packs more than 106,000 cards into 109 stacks that consume 136MB of disk space. MetaCard is the browser interface to the Metathesaurus, the first milestone of the National Library of Medicine's (NLM) ten-year Unified Medical Language System (UMLS) project. The UMLS project is a federal initiative to facilitate retrieval and integration of information from machine-readable sources including journal articles, clinical records, databases such as organ-donor registries, and medical knowledge-bases.

One of MetaCard's primary functions will be to allow physicians to compose natural language queries to the Medline online database. Up to now, Medline searching has suffered from a lack of standard terminology among the indexing systems. For instance, to a physician *atherosclerotic heart disease* and *coronary artery disease* mean virtually the same thing,

(continues)

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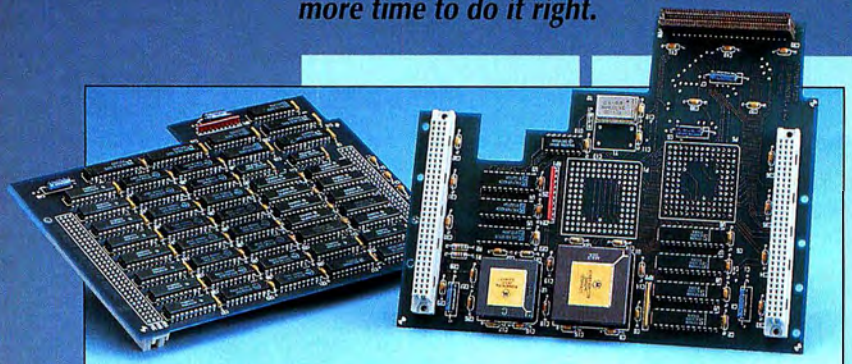

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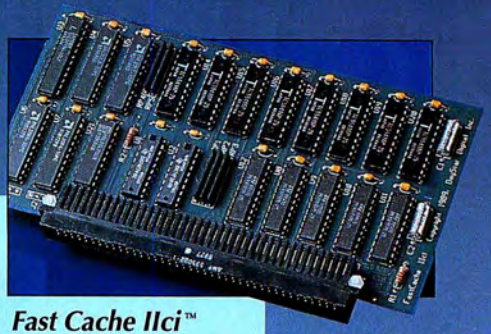

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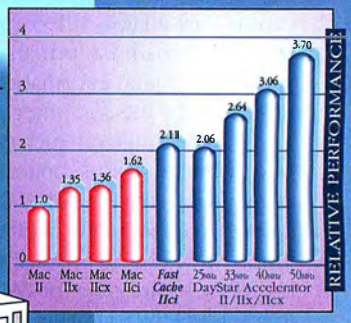
Fast Cache IIci increases Mac IIci processing speed up to 40%



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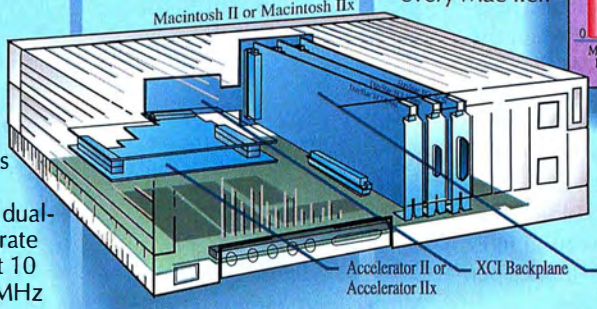

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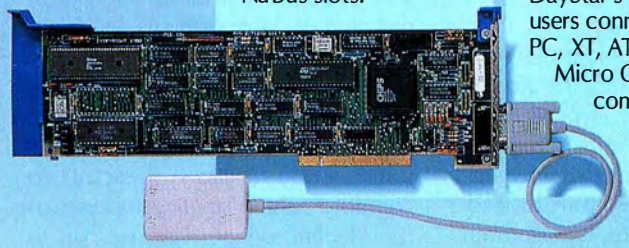

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David Sheretz (left) and Mark Tuttle of Lexical Technology.

but to a computer searching a database by word-matching, there is no overlap. MetaCard creates thousands of conceptual links between such linguistically disparate terms.

MetaCard owes its capabilities to two unique features: a powerful lexical-matching algorithm that automates the cross-referencing process, and a lightning-fast search routine that bypasses HyperCard's cumbersome Find command.

MetaCard will eventually be pressed on CD ROM and updated periodically as medical terminology evolves. It will revolutionize the use of multilayered information systems of telecommunications, databases, and decision-support systems. Physicians will use it for consulting with online expert systems such as AMANet's DXplain, and at hospitals and insurance companies it will access patient records to automate billing. The MetaCard technology can be generalized to any field that uses a vast lexicon of technical terms, such as law, engineering, or insurance underwriting.

For more information contact Lexical Technology in Alameda, California, at 415/865-8500.

—Beverley Kane, M.D.

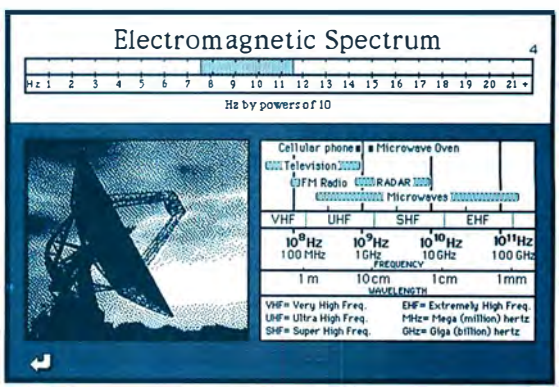
The Parallax Mac

The 1990 Time Table of Science and Innovation from Xiphias is a CD ROM for the Mac that provides simultaneous glimpses along three time lines: past, present, and future. You view the past through a variety of multimedia tools that show the dawn of human innovation and let you see what theorists think was hot in recent prehistory.

The disk is organized to provide hypertext linking of related topics by keywords, and each word in a report is hot-linked to the disk's search engine. Choosing the word *China,* for example, produces a list of all stories on the disk about Chinese technology and scientific discovery.

In addition to displaying text, however, the 1990 Time Table of Science and Innovation provides a number of features that further enhance the learning and the fun. Video sequences, composed of digitized video frames that are displayed at a rate of two per second, provide moving pictures of important events. One sequence, for example, shows animations of the space shuttle and of a moon landing. Still graphics, including shots of artwork from major museums and private contributors, also enhance the reports.

An Atlas button brings up maps that show where particular important events occurred. A Zoom button shows the distance from the earth of



A screen from the 1990 Time Table of Science and Innovation shows the electromagnetic spectrum.

an aerospace event or space discovery by having you visually lift off from the earth and rise to view the planet from the appropriate altitude.

A Frequency button shows the electromagnetic frequency at which types of energy occur; a Geochronology Timeline button shows the evolution of life on earth; a First Person button displays a text field with a witness's first-person account of a particular event; and a Bibliography button gives citations of sources for each of the more than 6000 stories in the Time Table. Also, you can navigate by selecting specific titles or keywords, by selecting a range of calendar years to search for innovations, or by activating Time Cycles which tie technological innovation to economic cycles.

The 1990 Time Table of Science and Innovation was scheduled to ship in January. Its suggested retail price is $185, although registered owners of the 1989 version may upgrade for no charge. For more information, call Xiphias in Los Angeles, California, at 213/841-2790.

—Mark Brownstein

The Evolution of Animate Objects

MacroMind's two new products, Director 2.0 and Three-D, boost Macintosh animation another step up the ladder.

Director's Score environment—in which you line up actors, sounds, and other animation parts—will add a channel for scripts written in its new object-oriented language, Lingo, so that Director 2.0 animations can react to input from people or other sources. When people respond to prompts or click on buttons, Lingo scripts will be able to interpret the input and change an animation to match. Lingo can also create windows, menus, and other Mac interface objects. It provides a wide range of functions, constants, operators, and properties, but as in HyperCard, basic scripting will be accessible to anyone.

MacroMind Three-D is not a 3-D modeling package. It is designed for importing 3-D objects from other packages (including Swivel 3D, Super 3D, MiniCAD, Design Dimensions, and DXF and IGES files) and preparing the objects for use in Director. Three-D can render images or export them to

(continues)

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A Director 2.0 animation with buttons and open Score window.

renderers such as Pixar and Silicon Graphics machines. MacroMind describes Three-D as a key parameter system, as opposed to the key framing system used by many 3-D packages, because you can edit all parameters—for example, color changes and *x*-, *y*-, and *z*-movement—individually, rather than having to set up and take snapshots of a series of frames.

Three-D will also be able to send rendered animations frame-by-frame to video recorders such as the Diaquest, ARTI, and Lyon-Lamb devices; and using drivers written as Lingo XObjects (similar to HyperCard XCMDs), Director and Three-D will be able to call other devices as well.

Pricing had not been established for either product at press time. For more information, contact MacroMind in San Francisco at 415/442-0200.

—Dan Littman

Making a Higher Resolution

LaserMax Systems, maker of high-resolution laser printers and controllers, has announced a technology that allows the company's printers to achieve 1000-by-1000-dpi resolution. Called TurboRes, the technique can also increase the vertical resolution of other laser printers based on Canon's popular CX or SX engines.

Previously this was thought impossible because both the rate at which the imaging laser draws lines across the page and the speed at which the paper goes through the laser printer are set. However, LaserMax has applied for a patent on a method to selectively increase the height of the dots drawn by the laser on the imaging drum. Because this means that the printer can draw very smooth curves, the effective vertical resolution of the output is increased to 1000 dpi, according to the company. Before it developed TurboRes, LaserMax had already been producing printers and controllers with 1000-dpi horizontal resolution by doubling the RAM of the printer and increasing the speed with which the laser turns on and off as it marks individual dots. This method results in narrower dots and more of them in the same space.

The resolution that TurboRes adds to various LaserMax printer controllers depends in part on the amount of RAM the controllers include. With a $100 software upgrade to TurboRes, LaserMax's MX6/4, MX6/6, and LaserMax 1000 controllers all increase their resolutions; the 4MB MX6/4 to 600 by 600 dpi, the 6MB MX6/6 to 800 by 800, and the 6MB LaserMax 1000 to the full 1000-by-1000-dpi resolution.

The LaserMax 1000 laser printer controller provides up to 1000-by-1000-dpi output.

The upgrade—which will be free to those who bought the products after November 10, 1989—applies to printers that currently have MX6/4, MX6/6, or LaserMax 1000 controllers. All those controllers shipped after December 15, 1989, will include the new TurboRes capability. The upgrade was slated to be available in January.

The LaserMax 1000 printer has a suggested retail price of $7995, which includes the controller and software. The printer's controller requires one NuBus slot. For more information, call LaserMax Systems in Eden Prairie, Minnesota, at 612/944-9085.**—T.M.**

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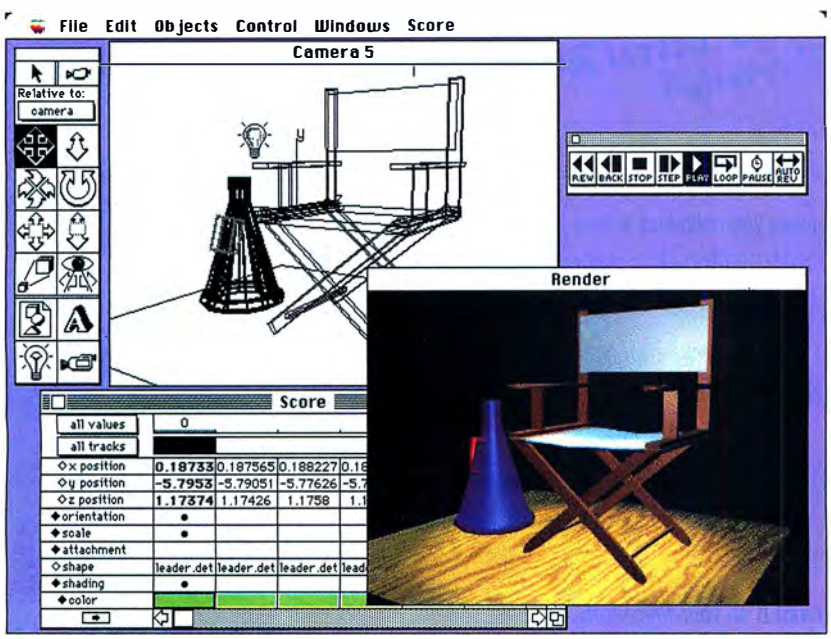

In MacroMind Three-D you can assign values to all of an object's attributes, including position and path, and then render the image.

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Reality Built for Two

In 1970 computer-science professor Myron Krueger sat before a video monitor at the University of Wisconsin watching two hands moving. One hand was his own and the other belonged to his colleague, who was observing the same live video at a screen a mile away. Cameras trained on each man's hand fed video into a single computer, which then composited the input into the one image appearing on both screens. Krueger noticed that when their on-screen hands nearly touched, his colleague pulled away—maintaining masculine propriety even in this artificial reality. Krueger chased his shy colleague's hand all around the screen: "We were already a mile apart," he says, "but he still couldn't get away fast enough."

Krueger has experimented with artificial reality since the 1960s. Since 1974, he has pursued his ideas in an ever-evolving piece called Videoplace, an installation at the Connecticut Museum of Natural History in Storrs, Connecticut. Videoplace visitors in separate rooms can fingerpaint together, perform free-fall gymnastics, tickle each other, and have all sorts of fun. The computer combines and alters input from separate cameras trained on each person, who responds in turn to the computer's output, playing games in the worlds Krueger's software creates.

It sounds like science fiction, but Apple's Human Interface Group is interested. Joy Mountford, the group's manager, has loaned Krueger a Mac to integrate into Videoplace's custom hardware and software setup. Krueger plans to apply his "gestural interface" to Mac applications, and to use the Mac's graphics power to improve Videoplace. He thinks someday we'll set aside our mice and put both hands right into the Mac's screen to select with a gesture or draw with our fingers. Krueger envisions human interfaces that we use unawares. In Videoplace, there is nothing to hold or manipulate. You can stand, walk around, and use your whole body, not just your brain and your fingers. As Mountford says, "[Krueger is] pushing intuitive computing beyond the mere graphical interface and into the realm of human gesture, drama, and personality." Imagine thinking, writing, drawing, or designing as fully human, mind-body activities, instead of somatic enslavement to mind and machine.

One person turning cartwheels and another toying with string find their realities combined in Videoplace.

Krueger's seminal theoretical work, *Artificial Reality* (Addison-Wesley, 1983), will be reissued this summer. For more information, contact Krueger at Artificial Reality, P.O. Box 786, Vernon, Connecticut 06066.

—Ann Garrison

Holy 128K, Batman!

If you think you need a fully loaded, top-of-the-line Mac in order for your business venture to succeed, you might want to think again. At least one company, University Games, of Menlo Park, California, managed to make a success story with nary a Mac II or color monitor in sight. Cris Lehman and Bob Moog of University Games ventured into the board-game market mixing their own brand of strategy and whimsy on no more than an IBM portable, an ImageWriter, and a Mac 128K.

Business has been brisk since the company's inception in 1983, with annual revenues now above the $5 million mark. Although the computers used have grown too, they still reflect the company's humble beginnings.

A part of The Batman Game board, designed by University Games on a low-end Mac.

The original 128K is still crunching away, although it's been upgraded to a 512KE with a 20MB hard disk. The company also added a Mac Plus with a 45MB drive and a LaserWriter. The Macs share the LaserWriter with a few IBM PCs via TOPS.

University Games has used the Macs primarily to design instructions and game cards for about twenty games the company has created. The Macs helped in producing the company catalog and in making sketches of game boards during brainstorming sessions. Last year, with the help of MacDraw II, the company designed the entire prototype for the board used in The Batman Game, which has sold more than 350,000 copies.

Batman is the first game for which the company created the final playing board on the Mac. David Andrews, who designed much of the board, said the only drawback was in sizing the pages. He found it difficult to scale the pages so they would correspond with the exact size needed for the board. Hence, there was a lot of cutting and pasting during development.

University Games—the originator of the Murder Mystery Party games—has just come out with a game called Pop Opinion, and has about eight to ten other projects in the works. With the help of Aldus FreeHand, Page-

(continues)

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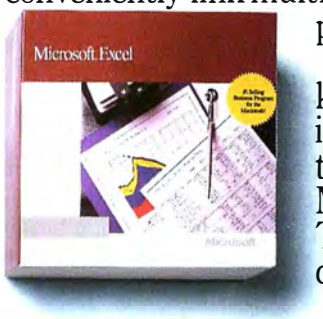

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	Forecast	$6,453	$8,800	$10,050	$9,460	$12,000	$18,900
	Variance	$1,947	$3,500	$3,850	($760)	$1,000	$2,400
	%	130%	140%	138%	92%	108%	113%
Cost of Goods Sold	Actual	$1,848	$3,198	$3,475	$2,262	$2,860	$7,663
	Forecast	$1,549	$2,288	$2,312	$1,608	$2,640	$3,969
	Variance	$299	$910	$1,164	$654	$220	($3,969)
	%	119%	140%	150%	141%	108%	0%
	Gross Profit	**$6,552**	**$9,102**	**$10,425**	**$6,438**	**$10,140**	**$21,300**

WxC 1000

		JUL	AUG	SEP	OCT	NOV	DEC
Revenue *(In Thousands)*	Actual	$2,184	$3,198	$3,892	$2,610	$4,030	$5,325
	Forecast	$1,613	$2,200	$2,513	$2,365	$3,000	$4,725
	Variance	$571	$998	$1,380	$245	$1,030	$600
	%	135%	145%	155%	110%	134%	118%

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MEMO:

TO: *Shannon Pitts*

FR: *Peter Cohen*

DT: *November 13th, 1989*

RE: *Presentation to the Board*

In preparation for the annual meeting, I've created a 20-minute slide presentation on our successful entry into the small printer market.

The presentation will explain to the shareholders that, on a basis of sound marketing strategy, reinforced with our knowledge of the printer business at other levels, we have been able to grow from a 2 percent share of market, to 9 percent in 18 short months.

To the right is an excerpt of the presentation which illustrates our growth. Anticipated concerns will probably center around quality of service and the ability to meet market demand over the next year.

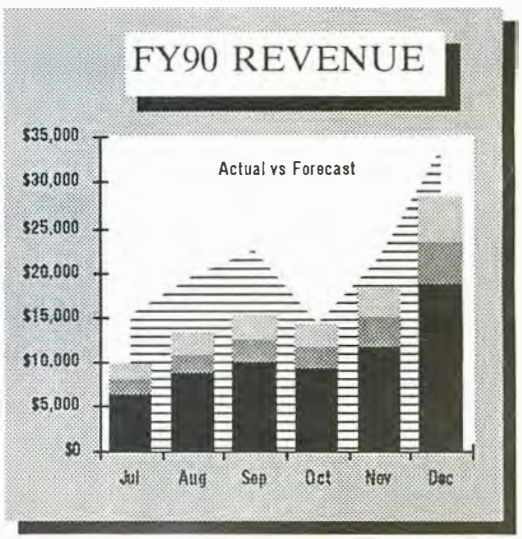
We should be able to squelch any fears by explaining that our small printers have a very low (4%) field repair call requirement at present.

And our assembly resources here in the U.S. and Asia are operating at 87% capacity.

WxC 2000

	JUL	AUG	SEP
Revenue *(In Thousands)*			
Actual	$8,400	$12,300	$13,900
Forecast	$6,453	$8,800	$10,050
Variance	$1,947	$3,500	$3,850
%	130%	140%	138%

With a very respectable 9 percent share after only 18 months, we feel we can reach 15 percent by the end of the next fiscal year (see six month projection).



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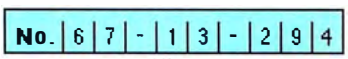

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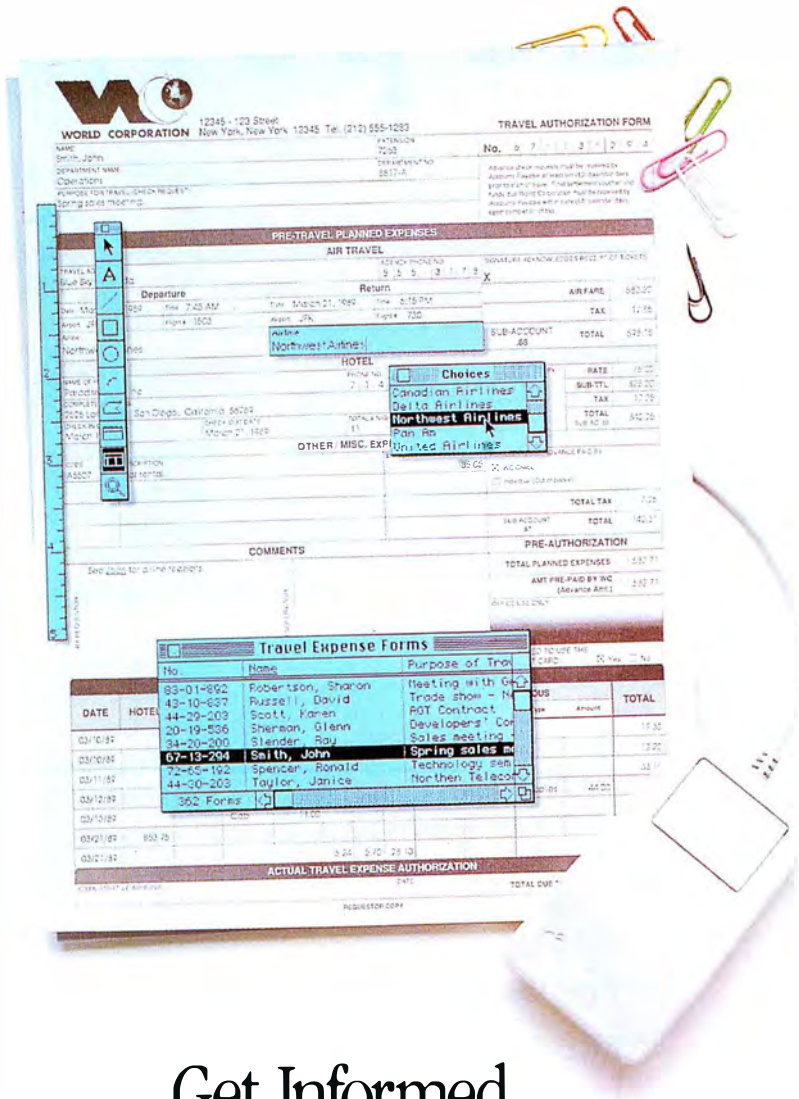

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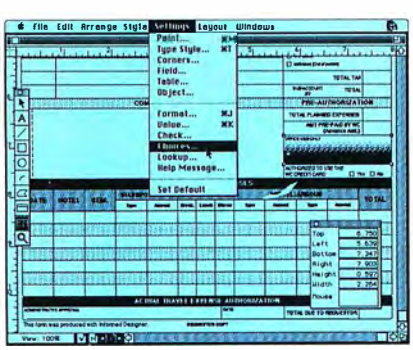
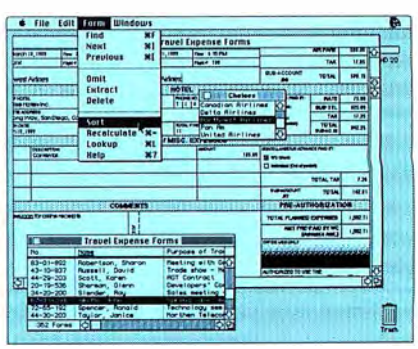


Informed Designer



Informed Manager

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Circle 297 on reader service card

Maker, and Adobe Illustrator—the software programs they primarily use—they will be working their Plus and 512KE without rest for quite a while.

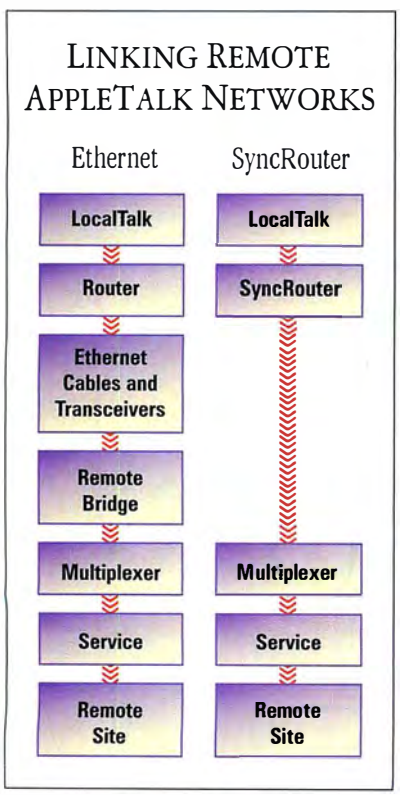
Do they see the need for a higher-end machine soon? CEO Cris Lehman says they don't have a pressing need for color yet, but as the company grows, so will the size Mac he buys. The next purchase, he says, will probably be an SE.

University Games can be reached at 415/322-3953.

—Mary Margaret Lewis

High-Speed Communication to Remote Macs

Engage Communication has begun shipping SyncRouter, a synchronous AppleTalk network router that connects to remote networks via high-speed communications services. SyncRouter includes Chooser-level software that lets you select printers, file servers, and other devices in the remote location. Previous routers were designed for use with Ethernet, which meant that LocalTalk networks required one gateway to Ethernet and another gateway from Ethernet to the communications services.



SyncRouter eliminates the Ethernet step in communicating between remote AppleTalk networks.

SyncRouter comes with three I/O interfaces, an RS-232C port, an RS-449 port, and a V.35 connector. Any one of the interfaces can be used to connect to the supported communications paths, which include T1, Digital Data Service, fiber-optic lines, and satellite links.

The router will also be compatible with ISDN (Integrated Services Digital Network) in the near future, according to Engage Communication. SyncRouter currently supports bidirectional data-transfer rates ranging from 54 kilobits per second to 1.544MB per second, depending on the carrier.

Because SyncRouter supports AppleTalk Phase 2, it can access a practically unlimited number of nodes at the remote location. It automatically maps the devices in the various zones and displays them at the Chooser level.

SyncRouter is available now from Engage Communication for $1895. For more information, call the company in Foster City, California, at 415/358-0264.**—T.M.**

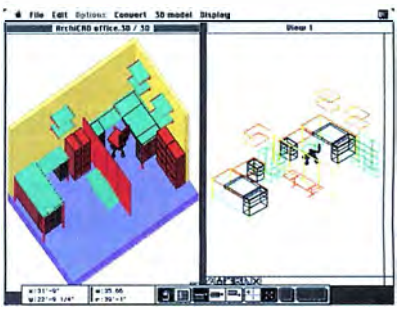
Object-Oriented CAD Communicates

Architects can now use two Macintosh CAD programs together to design everything from floor plans to ceiling fixtures, thanks to a link between the programs that is more intelligent than the IGES and DXF standards.

ArchiCAD, a 2-D and 3-D architectural modeling application from Graphisoft USA, can now be launched by Application User Commands (AUC), the object-oriented programming language underlying the generic drafting and design program MicroStation from Intergraph. Architects can use ArchiCAD's architectural drawing tools to design a floor plan, then use MicroStation's industrial design tools for details like plumbing, wiring, and even ceiling fixtures.

ArchiCAD can access MicroStation's preprogrammed object-oriented routines to manipulate graphics. Keith Bentley, president of Bentley Systems, which developed MicroStation for Intergraph, says, "When you use IGES, it's time-consuming and information always gets lost in the [translation] process. ArchiCAD and MicroStation are communicating directly, resulting in more complete information being transferred between applications."

To send the dimensions for a wall, for example, from one CAD program to another traditionally, you would first send the dimensions to a DXF or IGES translator, and then transfer them to the second program. These translators are geometric rather than object oriented, so by the time the wall reaches the second program, it is no longer a wall, with its sheathing, finish, and other qualities, but only a set of lines and unrelated characteristics. Those relationships have to be reestablished, which wastes time and leaves room for errors.



The same office, modeled and shaded in ArchiCAD (left) and as a mechanical design in MicroStation.

ArchiCAD and MicroStation can run together under MultiFinder with 5MB of memory, but 8MB is recommended. MicroStation lists for $3300, and ArchiCAD for $3950. For more information, contact Intergraph in Huntsville, Alabama, at 205/730-2000 and Graphisoft in South San Francisco, California, at 415/266-8720.

—Karen Sperling

The Tour Guide Inside

Agents—tiny digital people inside your computer who pop up here and there to take orders or make suggestions—have lived in visionaries' dreams for years. Now programmers are catching up with the dreamers.

(continues)

INTRODUCING NEW DISKLOCK

Unbreakable password protection for the Macintosh

It's sad but true. All it takes is a few minutes with your back turned, and an intruder could walk away with your most confidential data. *And you'd never even know it!*

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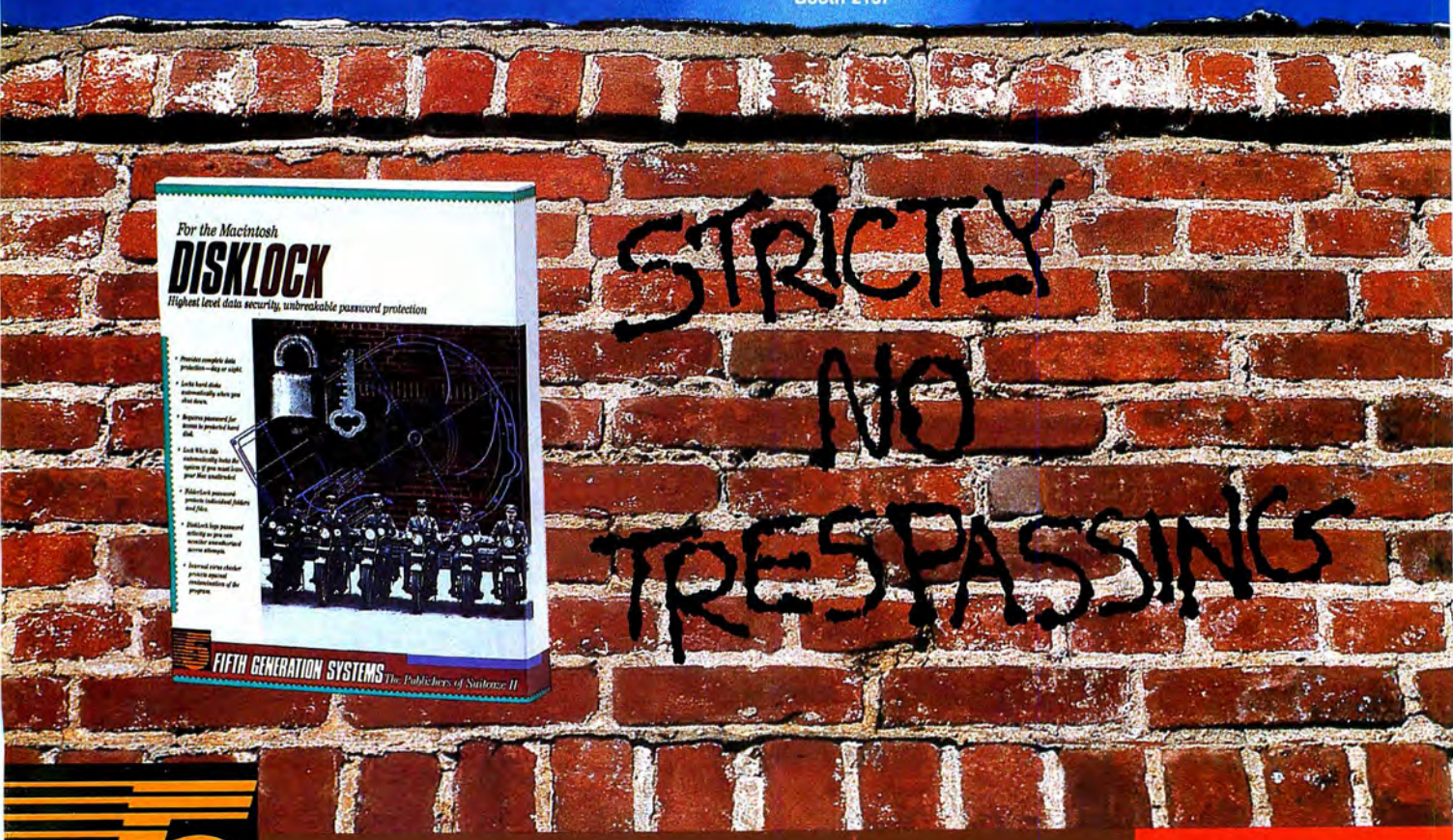

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Circle 250 on reader service card

Synchronizing a talking agent's facial movements to a woman's voice as MacRecorder captures her speech.

Bright Star Technology has published several HyperCard-based products for teaching languages and for building primitive talking agents, or *actors,* by generating speech from written language and coordinating speech with animated faces. Its most recent product, interFACE, is a compiled application, free of HyperCard's limitations. Bright Star's technology matches a universal phonetic language with facial expressions, though interFACE still must use Apple's robotic-sounding and phonetically nonstandard MacinTalk for its voice.

interFACE has many capabilities the earlier HyperAnimator lacked: actors can have 120 facial expressions, can be any size, and can appear in color, even in HyperCard stacks; a coarticulation capability lets actors change facial expression when pronouncing a phoneme altered by surrounding phonemes; multiple actors can appear at one time and quickly trade off speaking. With Bright Star's list of essential phonemes and a digitizing camera, you could even build a complete actor of your own face.

The RAVEL language has been expanded from 7 to 37 commands. The additional 30 commands enable you to assign agents to specific windows or applications; call the RAVE driver from any environment that supports outside calls (including C and Pascal, making it possible to code agents right into compiled applications); and make agents adapt to different Mac configurations.

Computers are only machines, but it may not be long before they'll have us fooled. Bright Star's products are moving on two parallel tracks: improving computing's human interface by making it sound more human; and making speech synthesis good enough that people will use it. In fact, Bright Star may release the underlying language- and machine-independent engine, in hopes of establishing a speech-synthesis standard that would be equivalent to PostScript's position in the printer market.

interFACE will list for $499.95. For more information, contact Bright Star Technology in Bellevue, Washington, at 206/451-3697. **—D.L.**

For a Faster SE with a Second Monitor

Lapis Technologies has introduced a multifunction add-in board for the SE that accelerates the system and supports a second display. Like Lapis's first products—the DisplayServer SE and DisplayServer II—the DisplayServer SE/XL supports an external Mac monitor or a non-Mac monitor such as a TTL, VGA, EGA, or multisynching display. The DisplayServer SE/XL adds a 16MHz 68000 microprocessor that accelerates the system, and both the acceleration and display functions reside on a single, standard SE board. The board does not provide color display.

Although speed increases will vary depending on the application, the 16MHz clock rate of the board's processor is twice that of the standard SE system board. The DisplayServer SE/XL also includes a socket for an optional 16MHz 68881 math coprocessor, which is sold by third parties.

The main advantage of supporting a non-Mac monitor is that monitors from the IBM PC world tend to be much less expensive than their Mac counterparts. Also, companies that have been replacing their PCs with Macs, or their monochrome displays with color devices, can now recycle the old monitors as inexpensive second displays for the Mac. The company recommends dealer installation of the device, but says that the process is about as difficult as adding SIMMs.

The list price for the DisplayServer SE/XL was not finalized at press time,

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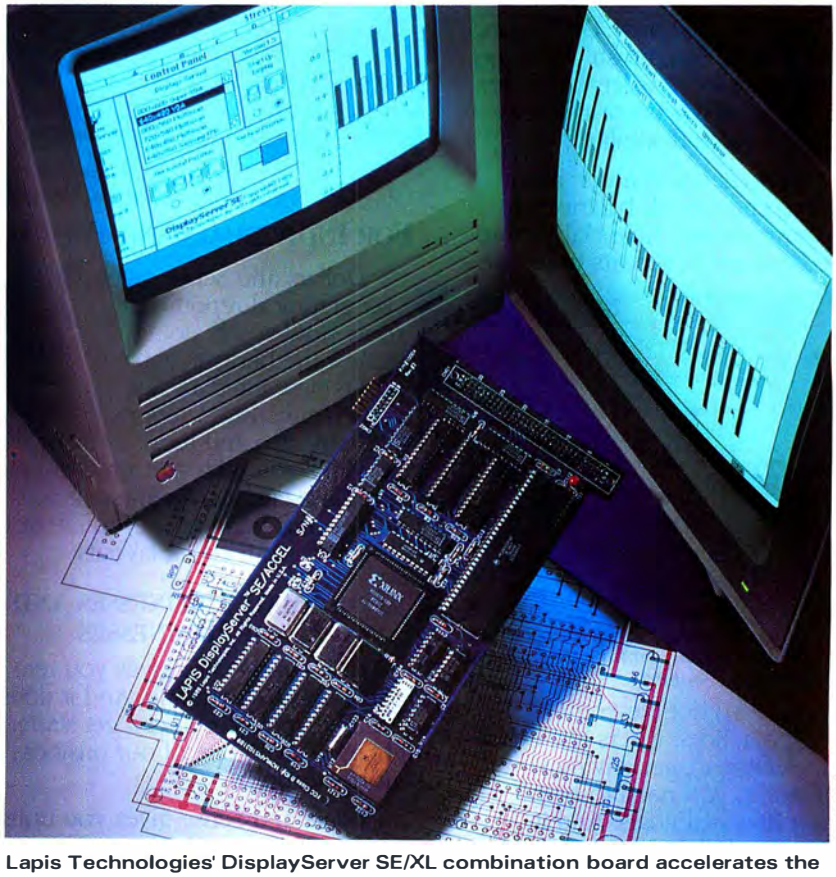

LUIS DELGADO

Lapis Technologies' DisplayServer SE/XL combination board accelerates the SE and supports an external non-Mac or Mac monitor.

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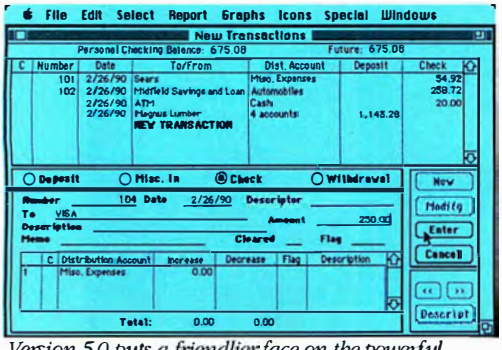

Version 5.0 puts a friendlier face on the powerful business-capable financial planning program that became the industry standard.

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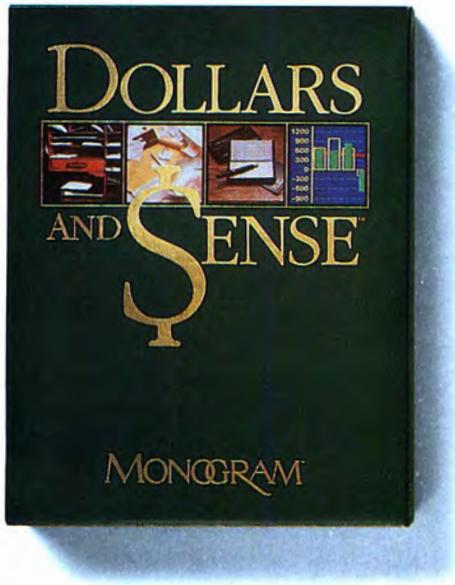

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Tracks assets, liabilities, equity	Yes	No	Yes
Full financial statements	Yes	No	Yes
Reports in graphic formats	Yes	No	Yes
Multiple checkbooks	Yes	No	No
Flexible custom reporting	Yes	No	No
Sub account levels	8	0	3
Easy to correct mistakes	Yes	No	No
Password security	Yes	No	No
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accounts. You can have multiple transaction accounts (like checks and credit cards) within a single file. And subaccounts so that you can more precisely track income, expenses, assets and liabilities. And you won't waste time and effort, because unlike other financial programs, Dollars and Sense can export your account data to full-fledged business accounting programs.

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Circle 87 on reader service card

but the company predicted it would be between $650 and $750. The board was scheduled to ship by the end of February. For more information, contact Lapis Technologies in Alameda, California, at 415/748-1600.—**T.M.**

John Hancock Goes Mac

Looking for the ultimate virus protector? Can't run a paperless office because too many documents need signing? Take a look at RSA Data Security's digital fingerprinting product.

RSAsign and RSAcheck are based on cryptographic technology developed at MIT in the late 1970s. Under this system, you have two keys—a public key, with which other users encrypt messages for you, and a private key you use to decrypt messages that have been encrypted with your public key.

Rather than encrypt data, RSAsign and RSAcheck verify the authenticity and integrity of documents by attaching an encrypted digital "signature" or "fingerprint." RSAsign distills the contents of a file into a 16-byte digital fingerprint, which it then encrypts and inserts in that document as a resource. When the receiving party decrypts the signature, if even a single bit in the file has been altered—by tampering, by a virus, or even due to a disk-write error—the two fingerprints won't match. Because only the tiny signatures are encrypted, signing and verifying files takes just a few milliseconds, and files can be processed in batches.

RSAsign and RSAcheck are most useful where data integrity or authorship is as important as secrecy. For example, when faced with managing the many versions of software they are developing, the programmers at RSA use RSAsign to lock down a version and its documentation. RSA's technology can also be incorporated into other products—for example, Lotus uses the IBM PC version in its Lotus Notes, a groupware editing product.

A single copy of RSAsign and RSAcheck lists for $195; site licenses and server versions are much less expensive. For more information, contact RSA Data Security in Redwood City, California, at 415/595-8782.
—***Macworld* Staff**

Physics On Screen

Mechanical physics is essentially the study of forces that put matter in motion, change its course, or stop it from moving. Physics students learn about motion by description, first anecdotal and then mathematical, but even using such common teaching tools as wave tanks, time-lapse films of bouncing ping-pong balls, and 50-foot slinkies, the concepts are difficult to grasp.

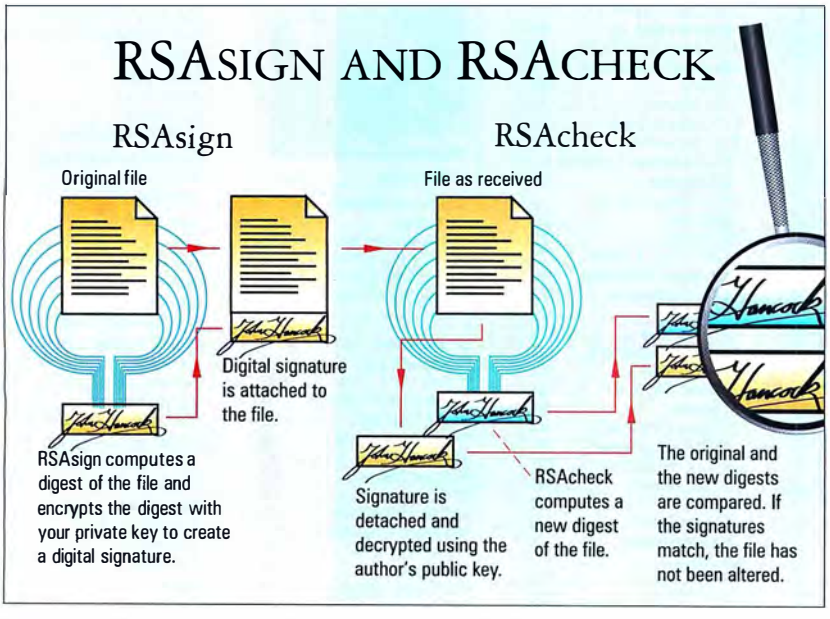
Interactive Physics teaches mechanics by giving you control of a world. You build an environment using rectangles, circles, and polygons, then tie them together with anchor points, springs, ropes, and shock absorbers, and set it all in motion. You control the density, mass, and initial velocity of each object; the tension of springs and shock absorbers; and even gravity and air resistance. A few lines moving about in a two-dimensional plane appear realistic because they are governed by the same math that describes motion in the real world—in fact, the sample file of a car and passenger crashing into a wall will undoubtedly make you cringe.

TOM WOLFF

Professor John Ertel teaches mechanical physics to future navy officers.

John Ertel teaches physics to two dozen second-year students at the U.S. Naval Academy, in Annapolis, Maryland, aided by Interactive Physics on a 37-inch Mitsubishi monitor. He says, "There are things you can do with Interactive Physics that you can't do in a lab—for example, slow down time as an action progresses." He doesn't know yet if test scores will improve, but students "can set up a problem and get a mental picture of it [which makes it] a whole lot easier to . . . understand the mathematics." Ertel adds that because Interactive Physics is mechanically oriented it is unsuited for teaching about sound, heat, and electromagnetism.

Interactive Physics lists for $449. It runs on a Macintosh Plus or SE, but its performance is greatly enhanced by the math coprocessor in the SE/30 and II-family machines. For further information, contact Knowledge Revolution in San Francisco, California, at 415/377-1940.—**D.L.**



To authenticate documents, RSAsign and RSAcheck reverse the standard method of using a public key to encrypt data and a private key to decrypt it.

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The Mac Zone

Get the inside story on hard drives - page 3

1stAid Software, Inc.

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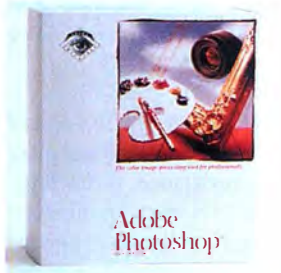

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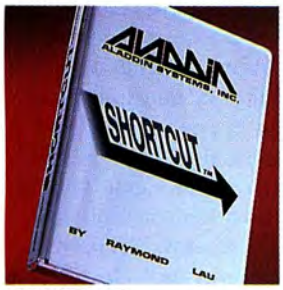

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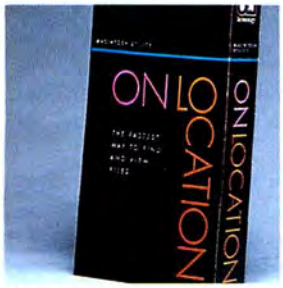

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61 Helvetica 3 ..... 180.
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105 Utopia Expert Coll. ..... 123.
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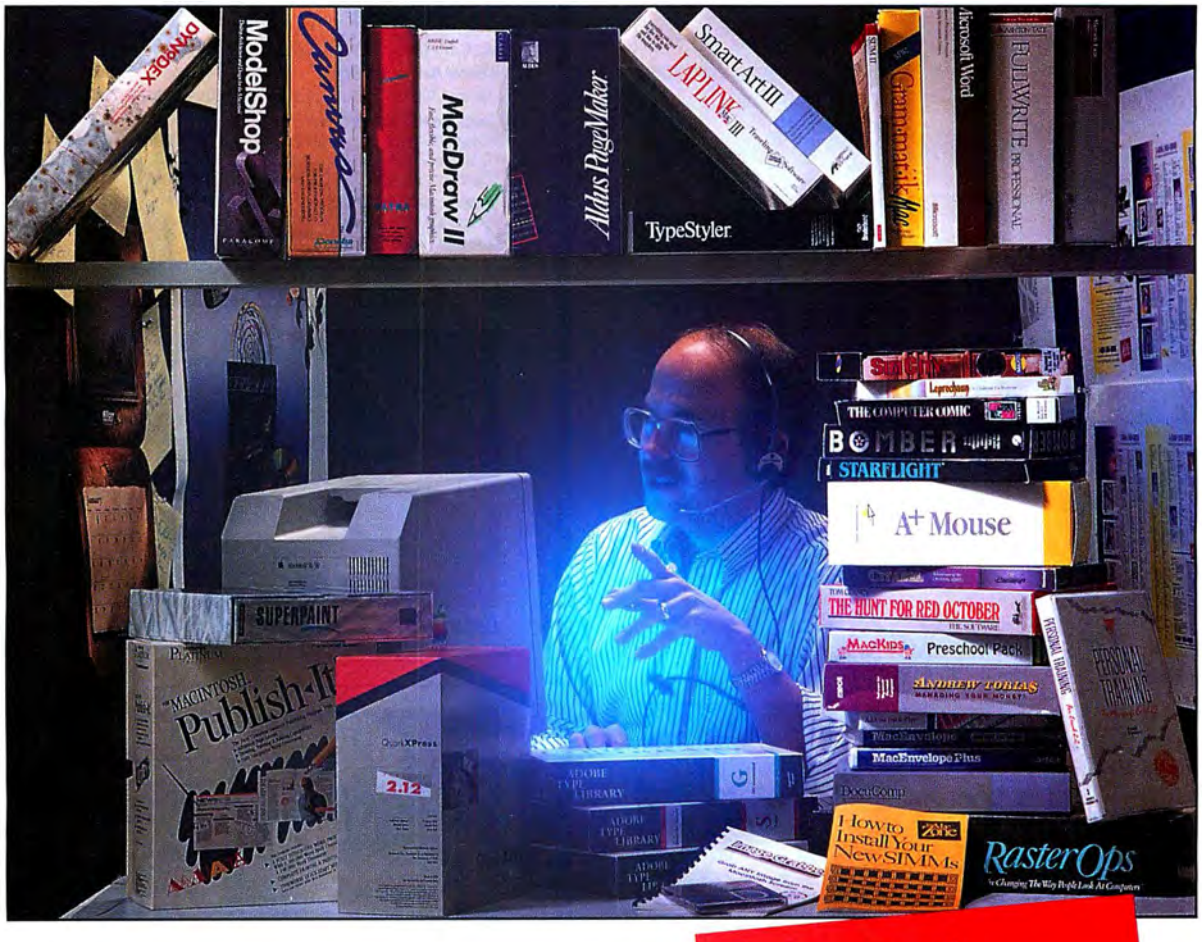

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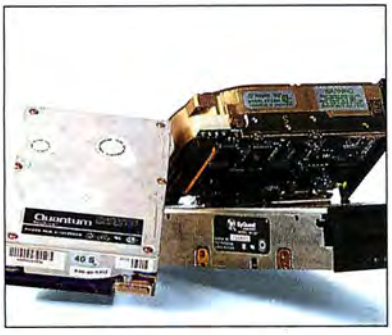

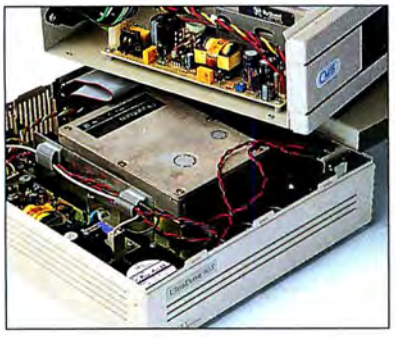

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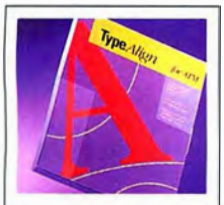

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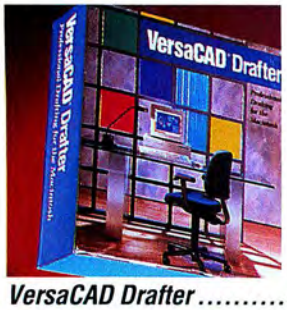

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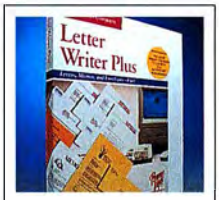

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TML Source Code Library ... 39.

TOPS
DOS Administrator ..... 215.
Mac Administrator ..... 215.
InBox 3.0/ + Macintosh ..... 628.
TOPS (DOS Version) ..... 99.
TOPS Network Bundle (Mac Version) ..... 188.
TOPS NetPrint 2.0 ..... 117.

Director ..... $439.

MacroMind

Create full color & sound animated presentations, storyboards, educational courseware, point of sale displays, or music videos.

Totem Graphics
Color Clip Art by Subject
Birds ..... 98.
Domestic Animals ..... 98.
Fish ..... 98.
Flowers ..... 98.
Food ..... 98.
Holidays ..... 98.
Insects ..... 98.
Nautical ..... 98.
Sports ..... 98.
Tools & Hardware ..... 98.
Wild Animals ..... 98.
Women ..... 98.
Color Clip Art by Volume
1 - 12 ..... each 74.

Traveling Software
Lap-Link Mac 2.0 ..... 81.
Lap-Link Mac Release III Connectivity Pack ..... 128.
Lap-Link Mac Release III Network Pack ..... 189.

Trendware
XCAL ..... 77.

True BASIC, Inc.
True BASIC 2.02 ..... 56.

True BASIC Graphics Toolkits
3-D Graphics ..... 43.
Business Graphics ..... 45.
Scientific Graphics ..... 43.
Developer's ..... 43.
Mathematician's ..... 43.
Sorting & Searching ..... 43.
Advanced String ..... 43.
Communications Support ... 43.
FORTRAN Convertor ..... 43.

True BASIC Toolkits .. $43.

True BASIC, Inc.

Extend the capabilities of the True BASIC language system with powerful libraries of optimized subroutines developed by experts!

U.S. Micro Labs
FontSizer II ..... 69.

VersaCad
VersaCad Drafter ..... 419.

Visionary Software
Synchronicity ..... 36.

Williams & Macias
myDiskLabeler
...for ImageWriter ..... 28.
...for LaserWriter) ..... 33.
Labels, 216 (ImageWriter) .. 15.
Labels, 216 (LaserWriter) .... 18.
Sticky Business ..... 89.

WordPerfect Corp.
WordPerfect 1.0.3 ..... 189.

Working Software
QuickLetter ..... 73.

Xerox (Oatacopy)
AccuText ..... 545.

Zedcor Inc
DeskPaint/DeskDraw ..... 64.
ZBasic 5.0 ..... 89.

HARDWARE

Scanners

Abaton Scanners
300/GS (8 Bit) ..... 1,495.
300/S (4 Bit) ..... 1,198.

Logitech
Scan Man ..... 320.

Mirror Technologies
Flatbed Scanner 200dpi ..... 498.
Flatbed Scanner 300dpi ..... 625.

RasterOps
TrueCapture 324 ..... 1,995.
...w/ColorBoard 264 ..... 2,395.
w/Comp. Video Option ... 2,398.

Sharp Color Scanners
JX 300 ..... 3995.
JX 450 ..... 5995.

Thunderware
Lightning Scan ..... 368.
ThunderScan 5.0 ..... 179.

Modems

Everex
EMAC Md2400 MNP 5 ..... 198.

Hayes
Smartmodem 2400 ..... 385.
Smartmodem 9600 ..... 899.

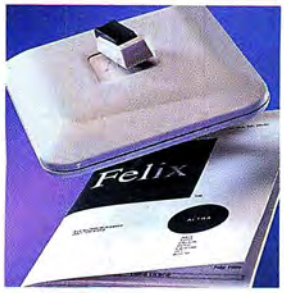
MacTech - SmartLink Modem
2400m (MNP 5) ..... 245.
2400s ..... 139.

Prometheus
9600m Plus V.32 ..... 768.

Shiva Corporation
NetModem V2400 ..... 439.

Supra Corp.
Supra Modem 2400 ..... 119.

One call source for Mac solutions 1-800-248-0800



ALTRA

A completely new design in pointing devices. Designed to be used with the fingers, using the same motion as writing with a pen. The optical measurement system combined with the on-board micro processor enables Felix to provide unmatched ease of use and pointing control.

Felix ..... $125.

SYNEX

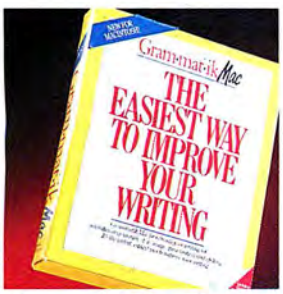
MacEnvelope: Print graphics, messages, mailing addresses, return addresses & Postal Bar Code on any envelope or label on any printer. MacEnvelope Plus: 100,000 names per file, eliminates duplicate addresses, tracks names with comments & flags, multi level sorts.

MacEnvelope & Plus ..... see listings

Paracomp

Best selling fastest color drawing/modeling program. Ideal for newsletter publishers graphic artists, animators, illustrators, product designers, communcation specialists. Endless uses: images, overheads, charts, slides, logos, storyboarding, animation. Free Image Library, req. 1mb.

Swivel 3D™ ..... $294.



Reference Software

This full featured grammar & style checker can help anyone improve their writing. Finds thousands of common errors by parsing a sentence, comparing each word against a complete collection of writing rules, and lets users fix them immediately. Answers most grammar & style questions.

Grammatik Mac IV ..... $56.

Farallon

To capture, manipulate, bend, twist, echo, or just generally play with sound & sound resources, MacRecorder does it all..... $162.

Electronic Arts

Studio/1 is a unique combination of black & white graphics combined with powerful and EASY on screen animation..... $96.

Mac Recorder & Studio/1 Bundle ... $210.

SmartLink 2400S .... $139.

SmartLink2400M ... $245.

MacTech

2400 baud modem, Bitcom communications software, and Mac to modem cable in one complete package.

Telebit

T-1000 (9600 BPS) ..... 699.
T-2000 (19,000 BPS) ..... 1,254.
T-2500 V.32 (19,000) ..... 1,254.

U.S. Robotics

2400 Baud ..... 325.
9600 HST Baud ..... 685.

Monitors & Cards

Micron Color Cards

for SE/30, II, IIx, IIcx, & IIci
Xceed (8 Bit - 13") ..... 385.
Xceed (8 Bit - 19") ..... 598.

NEC Color Monitors

NEC MacSync 14" ..... 498.
NEC Multisync XI 20" ..... 2,695.

RasterOps

ClearVue/SE 19" Monitor w/ 16MHz Board ..... 1,595.
Trinitron 19" Monitor ..... 3,398.

ColorBoards

108+ (II, IIx, IIcx, IIci) ..... 899.
108+ (SE/30) ..... 1,045.
224 (32 Bit - 19") ..... 3,151.
264 (II series - 13") ..... 755.
264 (SE/30 - 13") ..... 1,038.

Sony - Color Multiscan

14" 1304 HG Color ..... 795.
16" HG Color ..... 2,498.
19" HG Color ..... 3,198.

Accelerators & Upgrades

Dove

MacSnap Upgrades
524 (512k to 1 Mb) ..... 192.
524e (512kE to 1 Mb) ..... 185.
524s (524e w/SCSI) ..... 235.
548 (512k to 2 Mb) ..... 432.
548e (512kE to 2 Mb) ..... 415.
548s (548e w/SCSI) ..... 475.
SCSI Port Adapter ..... 109.

Marathon 020 SE Accelerators
MSE1 (Board Only) ..... 419.
MSE2 (...w/1 Mb) ..... 695.
MSE3 (...w/68881) ..... 579.
MSE4 (...w/68881 & 1Mb) ... 875.

Marathon 030 Accelerators
Mac II series or SE/30 .. ea. 965.
Marathon Racer ..... 148.

Macintosh Memory Upgrades

available in 70ns - 120ns
256k SIMMs .....
1 Mb SIMMs .....
4 Mb SIMMs ..... Call for prices

Motorola

Math Co-Processors
68882 - 16MHz ..... 289.
68882 - 25MHz ..... 399.
68882 - 33MHz ..... 695.
68882 - 40MHz ..... 748.

National Semiconductor

Maccelerate A/Ux ..... 469.

Orchid Technology

Mac Sprint II ..... 249.

Total Systems

Gemini 020/030 Accelerators
68020 SE - 16MHz ..... 697.
68020 SE - 25MHz ..... 1,118.
68030 SE - 16MHz ..... 976.
68030 SE - 20MHz ..... 1,118.
68030 SE - 25MHz ..... 1,285.
GemKit (allows user to put Gemini 020/030 Accelerators in Mac+, 512kE, 512k, & 128k. Includes internal fan, SCSI port, and space for extra RAM memory) .... 149.

Hard Disks & Backups

Everex - EMAC Drives

60/60dtl Deluxe ..... 1,495.
60t (Tape Backup) ..... 658.
Impact Tape (150 Mb) ..... 985.
Impact 40 Plus ..... 735.
Impact 80 ..... 1,095.

PLI (Peripheral Land, Inc.)

Infinity 40 Turbo ..... 998.
Infinity 40/40 Turbo ..... 1,798.
Infinity Optical 600 Mb ... 3,998.
TurboFloppy 1.4 ..... 345.

Networking Hardware

Adaptec

Nodem E/Thinknet ..... 383.
Nodem T/Twisted Pair ..... 454.

Cayman Systems

Gator Box ..... 2,159.
Gator Mail Gateway ..... 698.
Gator Mail to Unix ..... 698.
Gator Share Software ..... 1,398.
Gator Card (Mac SE, II, IIx, IIcx, IIci, or SE/30) ..... ea. 460.

David Systems

Twisted Pair Ethernet
Easy to install. Please call for information and current prices.

Icon-It! ..... $46.

Tactic Software

With a simple click on one of Icon-It!'s custom designed icons, you can select menu items. DA's, fonts, and even macros.

Dove

FastNet Equipment
Fastnet AE ..... 1,249.
FastNet SE or SE/30 ..... 365.
FastNet III ..... 365.
II Intelligent Controller ..... 545.
FI-1 Ethernet LAN/68020 Accelerator SE ..... 895.
SCSI CheaperNet ..... 748.
SCSI Thickwire Ethernet ... 849.

Farallon - PhoneNet

DB-9 ..... 29.
DIN-8 ..... 32.
DIN-8 (10 Pack) ..... 198.
Star Connector ..... 19.
Star Connector (10 Pack) .. 198.
Star Controller ..... 825.
Star Controller EN ..... CALL
Repeater ..... 315.

Hayes

InterBridge ..... 648.

Kinetics

EtherPort ..... 469.
EtherPort Lattis Net ..... 498.
Fast Path ..... 1,945.

MacTech

ZoneNet - DB-9 or DIN-8 ..... 17.

Nuvotech

NuvoLink SC ..... 345.
Turbo Bridge ..... 318.
Turbo Net - DB-9 ..... 22.
Turbo Net - DIN-8 ..... 21.
Turbo Net ST - DB-9 ..... 30.
Turbo Net ST - DIN-8 ..... 30.

Shiva Corporation

EtherGate ..... 1,831.
NetBridge ..... 339.
NetSerial ..... 279.
TeleBridge ..... 348.

TOPS

Flash Card (TOPS Dos) ..... 158.
TOPS FlashBox ..... 109.
TOPS Repeater ..... 119.

Miscellaneous

Aapps Corporation

Micro TV ..... 269.

Abaton

InterFax 12/48 ..... 259.
InterFax 24/96 ..... 418.
Quickstep Page Printer ... 3,295.

American Power Conversion

UPS 110SE ..... 268.

MacSprint ..... $249.

Orchid

Increases microprocessor throughput by an average of 22% to a max of 30% by eliminating wait states. Installs in 5 minutes.

Dayna Communications

Dayna Talk Connector ..... 99.

DaynaFile - Single Drive
Df0100 (360k) ..... 498.
Df0200 (1.2Mb) ..... 605.
Df0300 (720k) ..... 605.
Df0400 (1.44Mb) ..... 685.

DaynaFile - Dual Drive
Df0102 (360k/1.2Mb) ..... 729.
Df0103 (360k/720k) ..... 729.
Df0104 (360k/1.44Mb) ..... 725.
Df0204 (1.2Mb/1.44Mb) ... 898.

Kurta - Is/ADB Tablets

Cordless 4 Button Cursor .... 64.
8.5" x 11" (w/Stylus) ..... 254.
12" x 12" (w/Stylus) ..... 384.
12" x 17" (w/Stylus) ..... 624.

NEC CO ROM Drive

Battery Pack ..... 68.
Intersect Cdr-35 ..... 495.

Orange Micro

Grappler C/Mac/GS ..... 78.
Grappler LQ, LS ..... ea. 102.
Grappler Mac LX ..... 129.
Mac 286 NuBus Card ..... 1,099.
Mac 86 NuBus Card ..... 498.

Orchid Technology

Orchid Fax Modem ..... 446.

PCPC (8mm Tape Backup)

Jetstream ..... 4,725.

Qume

Crystal Print Publisher .... 2,950.

Summagraphics Bit Pad Plus

12" x 12" Tablet - ADB ..... 315.

ENTERTAINMENT

Access Software

World Class Leader Board ... 25.

Accolade

4th & Inches ..... 27.
FastBreak ..... 27.
Grand Prix Circuit ..... 27.
Hardball ..... 26.
Mean 18 ..... 26.

Activision

Cosmic Osmo ..... 41.
Manhole ..... 29.
Manhole CD Version ..... 35.

Addison Wesley

The Hobbit ..... 26.
Fellowship of The Ring ..... 26.
The Shadows of Mordor ..... 26.
The Crack of Doom ..... 26.

Brøderbund

Ancient Art of War ..... 26.
Ancient Art of War at Sea .... 26.
PlayMaker Football ..... 32.
Shufflepuck Cafe ..... 23.
SimCity 1.1 ..... 29.
SimCity Color ..... 48.
Star Wars ..... 24.
Where In Europe Is Carmen Sandiego? ..... 29.
Where In The U.S.A. Is Carmen Sandiego? ..... 29.
Where In The World Is Carmen Sandiego? ..... 29.

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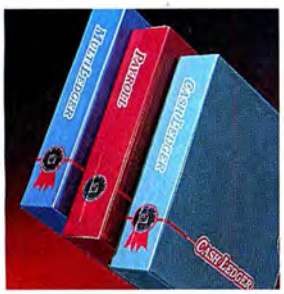
The Mac Zone

Ask about product money back guarantees



Check Mark Software

MultiLedger: combines G/L, A/R, A/P & Inventory into a single integrated program, w/invoices, statements & financial reports. Cash Ledger: entry level G/L program. Payroll: handles 1 to 1,000 employees, can be integrated with Cash Ledger, MultiLedger or used as a stand alone program.

.....see listings

Software Innovations

Lets you open any document from the Finder, even if you don't have the application that created it. Assign documents to any compatible application by their creator or filename extension. Supports the Desktop Manager. Rated in 200 best Mac Products and awarded 4 1/2 mice by MacUser.

HandOff.....CALL

Postcraft International

Fantasy role playing climbs to new heights of challenge & excitement while exploring the most graphically realistic, 3-dimensional maze in the depths of the CITADEL. Sound & animation plus 60 animated monsters will keep any player on the edge of their seat.

Citadel.....$32.

Fuji Disks

Receive a FREE Fujicolor Quicksnap camera with every 3 boxes ordered. Tested & certified 100% error free, complete with Fuji's ltd lifetime warranty. 10 pack DS or HD disks available in standard beige or rainbow pack (5 different colors, screen cleaning cloth included & sturdy disk storage case).

DS or HD Disks.....see listings

MBG
30-60 day money back guarantees on many items. Ask!

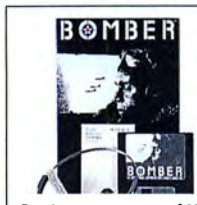
Bullseye Software
Ferrari Grand Prix ..... 32.
P-51 Mustang Flight Sim. .... 31.

Casady & Greene
Crystal Quest 2.2 ..... 25.
...w/Critter Editor ..... 40.

Centron
Casino Master B & W ..... 44.
Casino Master Color ..... 49.

Data East
Super HangOn ..... 26.

Discovery Software
Arkanoid ..... 26.



Bomber .....$25.

Inline Design

Explosive WWII action. Digitized sound, animation, and a crew that talks back. Requires 1 Mb Mac, hard disk & HyperCard.

Electronic Arts
Bard's Tale ..... 31.
Chessmaster 2100 ..... 32.
Chuck Yeager's A.F.T. ..... 31.
Might & Magic II ..... 38.
Panzer Battles ..... 28.
Patton Vs Rommel ..... 14.
Starflight ..... 39.

Infocom
Arthur: Quest for Excalibur .. 25.
Quarterstaff ..... 28.

Inline Design
Bomber (w/Headphones) .... 25.

Lucasfilm
Pipe Dream ..... 28.

Mediagenic
Shanghai ..... 19.

Micro League Sports
Micro League Baseball II ..... 35.

MicroProse
Pirates! ..... 35.

Microsoft
Flight Simulator 1.02 ..... 32.

Miles Computing
Fool's Errand ..... 31.
Harrier Strike Mission II ..... 31.
Puzzle Gallery ..... 26.

Mindscape
Aussie Joker Poker ..... 19.
Balance of Power 1990 ..... 29.
Colony ..... 29.
Crossword Magic ..... 29.
Deja Vu ..... 29.
Deja Vu II ..... 29.
Gauntlet ..... 29.
Shadowgate ..... 29.
Trust & Betrayal ..... 29.
Uninvited ..... 29.

Origin Systems
Autoduel ..... 23.
Moebius ..... 23.
Ogre ..... 16.
Space Rogue ..... 30.

Postcraft International
Citadel ..... 32.

Premier Technology
NetTrek ..... 34.
Strategic Conquest 2.0 ..... 34.

Shodan
Leprechaun ..... 29.

Silicon Beach Software
Apache Strike 1.1 ..... 24.
Beyond Dark Castle ..... 24.
Dark Castle ..... 22.

Sir Tech
Wizardry ..... 35.

Software Toolworks
Cribbage King/Gin King .....38.
Hunt for Red October ..... 31.
Life & Death ..... 31.

Sphere
Falcon 2.2 ..... 30.
Gato 1.4 ..... 26.
Pt-109 ..... 26.
Solitaire Royale ..... 19.
Tetris (Black & White) ..... 19.
Tetris (Color Version) ..... 22.
Welltris ..... CALL

Spinnaker
Sargon IV ..... 26.

Strategic Simulations, Inc.
AD&D: Pool of Radiance ..... 32.

Strategic Studies Group
American Civil War ..... 30.
Halls of Montezuma ..... 30.

Three Sixty
Sands of Fire ..... 34.
Warlock ..... 28.

Toyogo, Inc.
Nemesis Go Master ..... 47.
Nemesis Joseki Tutor ..... 28.

XOR Corporation
Lunar Rescue ..... 33.
Mac Racquetball ..... 36.
MacCourses ..... 19.
MacGolf ..... 32.
MacGolf Classic ..... 52.
NFL Challenge ..... 54.
Pro Challenge ..... 28.
Road Racer ..... 38.
TaskMaker ..... 27.

Micro League Baseball II .. ..$35.

Micro League Sports

Hall of Famers and All-Stars alike take the field on your own baseball diamond, and you're the manager!

EDUCATION

Bible Research Systems
The Word
(KJV, NIV, NKJV, RSV) ..... 164.
The Word Add-On ..... 65.
The Word Verse Search ..... 78.

Bright Star Technology
Alphabet Blocks ..... 29.
Talking Tiles ..... 25.

Brøderbund
Calculus ..... 58.
Geometry ..... 58.
Physics ..... 58.
Type! ..... 18.

Carina
Voyager 1.2 ..... 88.

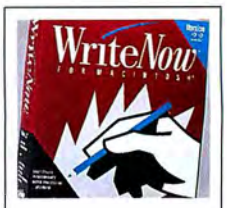
Davidson & Associates
Math Blaster ..... 26.

First Byte
Dinosaur Discovery Kit ..... 26.

Great Wave Software
KidsMath ..... 26.
KidsTime ..... 25.
Number Maze ..... 26.

Learning Company
Math Rabbit ..... 31.
Reader Rabbit 2.2 ..... 31.

Nordic
Alphabetizer ..... 27.
BodyWorks ..... 27.
ClockWorks ..... 27.
CoinWorks ..... 27.
EarthWorks ..... 27.
FlashWorks ..... 27.
Lemonade Stand ..... 27.
MacKids Preschool Pack ..... 36.
Naval Battle ..... 27.
Preschool Disk 1 ..... 27.
Preschool Disk 2 ..... 27.
Turbo Math Facts ..... 27.
Word Quest ..... 31.
Word Search ..... 27.



WriteNow 2.2 ..... CALL

T/Maker

1,400,000 word thesaurus, 135,000 word spell checker, direct MS Word compatibility. Still the easiest & fastest word processor.

Penton Overseas
VocabuLearn/ce
French Level 1 ..... 29.
French Level 2 ..... 29.
German Level 1 ..... 29.
German Level 2 ..... 29.
Italian Level 1 ..... 29.
Italian Level 2 ..... 29.
Japanese Level 1 ..... 35.
Japanese Level 2 ..... 35.
Spanish Level 1 ..... 29.
Spanish Level 2 ..... 29.

Personal Training Systems
Learn88 Training Series
A1 Beginning Illustrator ..... 36.
A2 Int. Illustrator ..... 36.
A3 Creating Special FX ..... 36.
A4 Prec. Drawing Tech. ..... 36.
MacTeach Training Series - The Basics
B1 Plus & SE w/out HD ..... 36.
B2 Plus & SE w/HD ..... 36.
B3 020 & 030 w/HD ..... 36.
B4 Beyond the Basics ..... 36.
Learn Freehand Training Series
FH1 Beginning Freehand ..... 36.
FH2 Int. Freehand ..... 36.
FH3 Creating Special FX ..... 36.
FH4 Prec. Drawing Tech. ..... 36.
Learn FileMaker Training Series
FM1 Beginning FileMaker .... 36.
FM2 Int. FileMaker ..... 36.
FM3 Advanced FileMaker .... 36.
FM4 Tips & Techniques ..... 36.
HyperEasy Training Series
H1 Using HyperCard ..... 36.
H2 Creating Cards/Stacks ... 36.
H3 Basic Scripting ..... 36.
H4 Advanced Scripting ..... 36.
LearnPersuasion Training Series
LP1 Beg. Persuasion ..... 36.
LP2 Int. Persuasion ..... 36.
LP3 Creating Templates ..... 36.
LP4 Creating Artwork ..... 36.
MasterWorks Training Series
M1 Database & Form Let. ...36.
M2 Advanced Database ..... 36.
M3 Spreadsheets ..... 36.
M4 Word Processing ..... 36.
PageTutor Training Series
P1 Beginning PageMaker .... 36.
P2 Int. PageMaker ..... 36.
P3 Tips & Techniques ..... 36.
P4 Advanced Features ..... 36.
LearnWord Training Series
W1 Beginning Level ..... 36.
W2 Intermediate Level ..... 36.
W3 Advanced Level ..... 36.
W4 Additional Features ..... 36.
Excellerate Training Series
XL1 Beg. Spreadsheets ..... 36.
XL2 Int. Spreadsheets ..... 36.
XL3 Adv. Spreadsheets ..... 36.
XL4 Creating Bus. Graphs ... 36.
XL5 Building Databases ..... 36.
XL6 Beginning Macros ..... 36.
XL7 Advanced Macros ..... 36.
XL8 Macros for Excel 2.2 .... 36.
XL9 What's New for 2.2 ..... 36.

Simon & Schuster
Typing Tutor IV ..... 29.

Software Toolworks
M Beacon Teaches Typing .. 32.

Spinnaker
Typing Made Easy ..... 25.

True BASIC, Inc.
Algebra ..... 33.
Arithmetic ..... 33.

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Datadesk

The Mac-101 keyboard is for all Mac users who use their keyboard for more than just typing. The 101 key layout, positive response keys and free MasterStrokes keyboard macro software take you beyond the limits like never before. French, Spanish & German versions also available.

Datadesk Mac 101 Keyboard ..... $135.

Aalrix

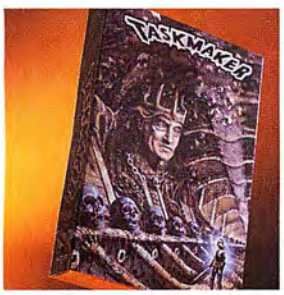
Prints on nearly any checkform, even prints on personal checks with ImageWriter or LaserWriter. CheckWriter II reminds you of your bills due each morning. (You'll never pay a late fee again!) Also print envelopes or mailing labels from the built-in address database. 1990 Eddy Nominee.

CheckWriter II ..... $32.

Orchid

The 9600 bps Fax and Data Modem for the Macintosh. Sends and receives faxes at 9600 bps for fastest transmission, and connects at 9600 bps with OrchidFAX and AppleFax modems. Package comes complete with BackFAX software and letter quality fonts for better looking faxes.

OrchidFAX Modem ..... $446.



XOR Corporation

The world has plunged into depression and devastation... the once mighty Kingdom is no longer. You must restore order and prosperity to the Kingdom, but you have no experience. To gain help, find the TaskMaker, and with his guidance and your courage, the Kingdom might be saved!

TaskMaker ..... $27.

Cricket Software

Cricket's answer to the need for sophisticated precision object oriented graphic tools for the Macintosh computer. Effectively capitalizes on the capability of PostScript printers. Includes enhanced text handling features, color, precise control, and advanced PostScript special effects.

Cricket Draw ..... $167.

Calculus ..... 33.
Discrete Mathematics ..... 33.
Pre-Calculus/Trig. ..... 33.
Probability Theory ..... 33.
TrueSTAT ..... 33.
Combo Packs w/Workbook
Algebra Combo Pack ..... 39.
Calculus Combo Pack ..... 39.
Pre-Calculus Combo Pack ... 39.

MUSIC

Ars Nova
Practica Musica ..... 69.

Bogas Productions
Studio Session ..... 44.
Super Studio Session ..... 65.
Brass, Country, Heavy Metal, Sound Effects, String Quartet ..... each 13.

Brøderbund
Jam Session ..... 28.

Coda
Finale 2.0 ..... 558.
Mac Drums ..... 31.
MusicProse ..... 169.
Perceive ..... 49.

Electronic Arts
Dix Music Const. Set ..... 82.
Deluxe Recorder ..... 98.

Farallon
MacRecorder 2.0 ..... 162.

Great Wave Software
ConcertWare Plus MIDI ..... 108.

Mark of The Unicorn
Professional Composer ..... 389.
Professional Performer ..... 395.

Passport Designs
Click Tracks ..... 309.
MasterTracks Jr. ..... 89.
MasterTracks Pro 4.0 ..... 355.
MIDI Interface ..... 79.
MIDI Transport ..... 309.
Note Writer II ..... 320.

Primera Software
Different Drummer ..... 58.

Resonate
Listen 2.1 ..... 61.

ACCESSORIES

Abaton
Pro Point ADB (SE & II) ..... 79.

Acco
Disk Page (2 Pages) ..... 6.

Addison Wesley
Inside Macintosh, Vol. 1 ..... 21.
Inside Macintosh, Vol. 2 ..... 21.
Inside Macintosh, Vol. 3 ..... 18.
Inside Macintosh, Vol. 4 ..... 21.
Inside Macintosh, Vol. 5 ..... 23.
Inside Macintosh, X-Ref ..... 9.
Macintosh Programming Secrets ..... 19.

Advanced Gravis
MouseStick ..... 64.
MouseStick (ADB) ..... 79.

Altra
Felix ..... 125.

Apple
HyperCard 1.2 ..... 39.
MacTerminal ..... 99.
Toner Cartridges
LaserWriter II Series ..... 99.
LaserWriter Plus Series ..... 96.

Avery Labels
Address Labels
2.5" x 15/16" (3000) White .. 12.
3.5" x 15/16" (1000) White .... 5.
3.5" x 15/16" (3750) White .. 13.
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File Folder Labels
3.5" x 7/16" (1000) Asst ..... 7.
Laser Printer Labels
1" x 2-5/8" (3000) White ..... 16.
1.5" x 4" (1400) White ..... 18.
1/2" x 1.75" (2000) ..... 7.
Laser Transparencies (50) ... 22.
Round 1.5" (300) White ..... 7.

Bantam Books
Illustrator 88 Handbook ..... 19.
Mastering Wingz ..... 21.
HyperCard Handbook ..... 22.

Datadesk
Hyper Dialer ..... 24.
Mac 101 Keyboard ..... 135.

Datashield
MacDirector ..... 79.

Ergotron
MacTilt ..... 68.
Mouse Cleaner 360 ..... 9.

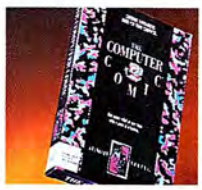
Fuji Disks
Double Sided (800k)
10 Pack ..... 13.
Rainbow 10 Pack ..... 13.
Bulk (Units of 50) ..... each .70
High Density (1.44 Mb)
10 Pack ..... 22.
Rainbow 10 Pack ..... 25.
Bulk (Units of 50) ..... each 2.10

Fujitsu
800k Disk Drive ..... 159.

Golden Ribbons
Multi Colored ..... 7.
Black ..... 3.

Goldstein & Blair
Macintosh Bible ..... 19.
w/Book Disk Combo ..... 26.

Kalmar Designs
Teakwood Disk File Cabinet
135 Disks ..... 29.
45 Disks ..... 14.
90 Disks ..... 21.



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Tilt Swivel ..... 21.
Turbo Mouse ..... 108.
Universal Printer Stand ..... 15.

Keytronics Keyboard
Mac Pro Kb-105 ADB ..... 125.

Kraft
QuickStick (512k & Plus) .... 39.
QuickStick ADB ..... 49.

Lynx
Turbo Trackball ADB ..... 58.

Mac Packs
Gray, Navy, or Wine
ImageWriter Bag ..... 45.
Mac Plus/SE Bag ..... 55.
Mac SE Bag Xt (Extended Keyboard) ..... 69.

Mac Zone
7 Outlet Noise & Surge Protector ..... 24.
Mouse Pads ..... each 6.
SCSI Tester ..... 39.
Mac Tool Kit Mac w/Grounding Strap ..... 15.

Maxell Backup Tapes
150 Mb Tapes ..... 24.
60 Mb Backup Tape ..... 19.

Microlytics
Personal Organizer w/Mac Advantage ..... 92.

Microsoft Press
Excel In Business for 1.5 ..... 20.

Mobius
Fanny Mac ..... 59.

MSC Technologies
A+ Mouse (512k & Plus) ..... 58.
A+ Mouse ADB ..... 75.

Portfolio Systems
DynoDex Address Book ..... 88.

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10 Pack ..... 22.
Bulk (Units of 50) ..... each 1.80

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Pro Print 8.5 x 11 20# White Laser Bond 500/Ream ..... 7.
Pro Print 9.5 X 11 20# Kleenedge Bond 1000/Box 18.
Pro Print 9.5 X 11 20# Kleenedge Bond 500/Pac .. 10.

Targus Bags
Black, Gray, Navy, or Wine
Deluxe for Extended Kybd ... 68.
ImageWriter (Black only) ..... 45.
Mac/SE Bag (Black only) ..... 54.
IIcx/IIci Bag ..... 78.

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MULTIMEDIA

IS IT REAL?

Juggling media types for maximum impact—multimedia's promises and problems

Buzzwords intrigue but rarely inform. The term *multimedia,* for instance, is bandied about as though we all agree on its definition and implications. The truth is, consumers, developers, and computer pundits have stretched its meaning until there is little left beyond hyperbole and generalizations.

To find out what lies behind the hype, we interviewed pioneering multimedia developers. We looked at the available production tools and publishing options. Finally, we drew up a definition of multimedia as it applies to the Macintosh.

In the course of our research, we listened to pie-in-the-sky visionaries, sympathized with frustrated developers, and talked to everyone from computer retailers to high-school teachers. We catalogued the tools available to multimedia producers (see "Multimedia Production Tools"). Finally, after juggling the pieces of the puzzle, it became clear that asking whether or not multimedia computing lies in our future is a bit like our grandparents' wondering whether or not movies should have sound. It's not a question of if, but when.

by Suzanne Stefanac and Liza Weiman

MICHAEL LEEWELLYN

CYNTHIA MOORE

Using his solar-powered multimedia lab, ecologist Mike Hamilton catalogs the wildlife of the James San Jacinto Mountains Reserve.

Multimedia Defined

- Multimedia incorporates several media types—text, graphics, audio, animation, video—in a single computer document; sound and/or motion are integral to a true multimedia project.
- What distinguishes multimedia from film or video is interactivity. Watching a detective movie is one thing, solving the mystery is another. Computer-based multimedia allows the user to determine the pace and path through ever-branching options.
- Multimedia developers must be much more than programmers, video producers, and audio wizards. They must also be interface designers able to knit several media into easy-to-navigate documents.

Where Is the Knowledge Navigator?

Apple touts the Macintosh as a multimedia machine, primed for easy integration of multiple media. As a teaser, John Sculley often shows a video about the Knowledge Navigator—a simulated notebook-size computer that talks and listens, fetches clips from video databases, and even schedules appointments for its lucky owner. But as much as we'd like to believe that voice-activated electronic butlers are in our near future, it just isn't true.

The problem, as usual, lies not in the vision, but in the technology. Before full-motion video can be delivered over networks and real-time animation is available in 32 bits, we'll need CPUs and graphics processing capabilities many times faster than those currently available. Storing these memory-hungry multimedia files is another problem in search of a solution. And although Articulate Systems' Voice Navigator looks promising, voice-recognition technology for personal computers is still in its infancy—a fact even Apple tacitly admits.

In a recent Desktop Media campaign aimed at the business community, Apple featured a multimedia presentation of a cartoon car with propellers—the HeloCar—that included page layout, 3-D graphics, 35mm slides, and overhead transparencies. Screens with HyperCard-like buttons let you choose between an animation of the car flying, schematic drawings of the interior of the engine, or dynamic cost breakdowns. What this slick presentation lacked was 32-bit color animation, full-motion video, and voice annotation.

Other Platforms

While Apple is promoting the Macintosh as a platform for multimedia, other computer companies are pitching their own development schemes. Next, for instance, is attracting some first-rate developers (see "Multimedia on the Next"), and IBM's InfoWindows with TouchScreen Display and Sony's View System have been popular in the

MULTIMEDIA PRODUCTION TOOLS

Products on this line are arranged according to the amount of time and money you must invest if you want to include sound, animation, or video in your multimedia documents. – Suzanne Stefanac

Basic Authoring
HyperCard 1.2.5, Apple Computer, $120

Basic Animation
MacMovies, Lapis Technologies, $99
Studio/1, Electronic Arts, $99
VideoWorks II, MacroMind, $295
VideoWorks II HyperCard Driver, MacroMind, $99.95

Basic Audio Input and Editing
The Voyager CD AudioStack,
The Voyager Company, $99.95
MacRecorder, Farallon Computing, $249

Talking Agents
HyperAnimator, Bright Star Technology, $199.95
interFACE, Bright Star Technology, $499.95

corporate community for years. Intel's continued promise of affordable DVI (digital video interactive) standards might make the compression and playback of full-motion (30-frames-per-second) video a reality on the IBM PC—someday.

The problem with Intel's compression scheme is that although you might be able to play back compressed video on a personal computer, it takes a large, expensive computer to compress the data in the first place. Personal-computer owners can inexpensively play multimedia releases that were very expensive to produce. Just as with records or CDs, consumers can play them, but not make them.

Apple, in contrast, has stated publicly that its vision requires that the Macintosh be able to both make and play multimedia on the desktop. Apple believes that users should have the option to be both consumers and producers.

In keeping with this vision, HyperCard was Apple's early entry into the multimedia sweepstakes. Because it enables users to write their own simple interactive applications and because it can be used to access and control other media—CD ROM and videodisc players, for instance—HyperCard struck a chord. As HyperCard creator Bill Atkinson notes, "We were surprised at the way people jumped right in and started using HyperTalk. This was probably due to a pent-up demand for user programmability."

The Multimedia Pyramid

Of course, even if Apple's vision becomes a reality, most people will

Users should have the option to be both consumers and producers

probably encounter multimedia presentations in boardrooms and salesrooms, schools and training centers, museums and shopping-mall kiosks. Some people will learn to add a few sounds or short animations to presentations. Very few, however, will be in a position to invest the time and money necessary for creating truly professional multimedia projects. Multimedia production, particularly if video is involved, will still be in the hands of the few who have access to advanced technology. (For an overview of the costs involved in optical publishing, see "Be Your Own Producer.")

On the other hand, homemade videos are quite popular, and the fact that the quality isn't professional doesn't seem to matter to most people. Multimedia presentations are similar.For a small investment in time and money, you can incorporate text, graphics, and sound into your documents. For a little more money, you can add color, animation, and CD-quality sound. For still more money and time you can use digitized video still-frame pictures. For a lot more money you can include full-motion video. And at the highest end of the spectrum, you can incorporate real-time video complete with computer-generated text and graphic overlays.

The following profiles illustrate some of the ways in which people have found multimedia to be a cost-effective solution to problems in their workplaces. (For a listing of multimedia production tools arranged loosely according to the time and money investments involved, see "Multimedia Tools," the table running along the bottom of these pages.)

In-House Expertise

In a fast-changing world, keeping employees and customers up to date on technical information is a challenge many companies face. Multimedia-based training, because it can incorporate voice, music, animation, and interactive course work, has proven popular in many corporations.

Codex Corporation, a subsidiary of Motorola, is a data-communications and networking-services company that needed to find a way to effectively train its sales representatives, applications engineers, systems engineers, customer-service representatives, and customers in the basics of digital telecommunications technology.

Working with interactive multimedia developers Madeline Butler and Paul Raila, Codex produced Basics of Digital Voice Technology, an 8MB interactive HyperCard stack that replaces an eight-hour lecture-type course with a three- to four-hour interactive one.

Incorporating VideoWorks II animation, sounds digitized with MacRecorder, and animated characters produced with HyperAnimator, this interactive training course simulates a year in the life of a communications manager in a medium-size company.

"We chose to make it a simulation

*Not shipping at press time.

with specific challenges," says lead designer Madeline Butler, "so that people would have an inherent motivation to finish the course without feeling pressure related directly to their own jobs."

Basics of Digital Voice Technology is currently running in over 30 sales and service centers nationwide, and Codex is developing an interactive stack-based course on ISDN (Integrated Services Digital Network). Having developed expertise while working on Basics of Digital Voice Technology, Codex is creating the ISDN project entirely in-house, using outside contractors only for the design of some of the graphics. This time the developers are adding a ComputerEyes digitizer for capturing the images of real people, and they've added MacroMind Director to their toolbox for creating animations.

Getting the Big Picture

Ecologist Mike Hamilton, resident director of a University of California ecological reserve for teaching and research, wanted to create an interactive ecological database both as a teaching aid and as a model for cataloging the natural world. In order to do so, he built a solar-powered multimedia lab.

Using a Mac II with an Apple 8-bit video board, a 40MB hard disk, a 20MB hard disk for backup, a Digital Vision ComputerEyes Pro Color video digitizer, a Pioneer 4200 videodisc player, and a 19-inch Sony multisync monitor, Hamilton has created the Macroscope Ecology Laserdisc, a videodisc with over 25,000 still images, full-motion video sequences, and a 30MB HyperCard stack that contains detailed ecological information. His goal is to create a scientifically accurate and comprehensive database appropriate to the needs and levels of interest of groups from kindergartners to Forest Service professionals.

"The important thing is that this doesn't have to be a big-budget enterprise"

Using still-frame video cameras from Canon—the Xap Shot and RC701—and an 8mm Sony HandyCam camcorder, Hamilton and his crew of researchers take video images in the field of all relevant biological phenomena, including close-ups, full-motion sequences of animal behavior, and a highly structured 150-frame view of an area that becomes a *videomap,* a series of overlapping images that record everything a person can see while standing in a particular spot. Information about the location, format, date, time, and photographer of each image, as well as species information and ecological classification, is added back at camp on HyperCard cards using a Macintosh Plus. Parabolic microphones and cassette tape recorders are used to capture animal sounds, and MacRecorder is used to digitize the sounds and add them to the stack back at the office.

Hamilton makes three to four videodiscs per year for a total of about $3000. Working with Laser Edit, a post-production video service bureau in Los Angeles, he transfers his video in animation mode, one frame at a time, onto professional 1-inch-format videotape. This is then recorded on an Opticle Disc Corporation Mark II WORM drive to make a one-shot check disc that is LaserVision 2-compatible (playable on standard industrial players). This plastic disc cannot be replicated, but at $300 per check disc it is an economical way to prototype the version of the Macroscope that Hamilton will eventually produce in large quantities (see "Be Your Own Producer").

"The important thing," Hamilton says, "is that this doesn't have to be a big-budget enterprise. You can make multimedia happen on a Mac Plus with less than $1000, once you own the basic equipment. This stuff is like Hollywood, it will absorb as much money and time as you're willing to put into it—your budget may go way beyond $1000 if you don't plan carefully."

Selling in the Twenty-First Century

The people at Live Marketing have been creating presentations for large corporations for the past 17 years. They've used slides, multiple slide projectors, video walls, lasers, and even puppets and holography to sell,

MULTIMEDIA PRODUCTION TOOLS (continued)

Video In and Out
NuVista (1MB, 2MB, 4MB RAM), Truevision, $2995, $4495, $6495
ColorSpace II, Mass Microsystems, $1995
ColorSpace FX, Mass Microsystems, $2995
Genlock Converter, Julian Systems, $999
*Moonraker, Workstation Technologies, TBA

Video In
ColorSnap-32, Computer Friends, $1595
FrameGrabber 324NC, RasterOps, $1995
Neotech Image Grabber 1.8, Advent Computer Products, $1499
Personal Vision, Orange Micro, $2899
PixelGrabber, Perceptics, Corporation, $1720
ProViz Video Scanner, Pixelogic, $1100 black and white, $1700 color
ProViz Video Color Converter, Pixelogic, $595
Quick Capture, Data Translation, $1245
Color Capture, Data Translation, $2995

RGB and Composite Convertors
NTSC Converter for Macintosh II, Julian Systems, $699
NTSC Converter, Orange Micro, $799
VIDI/O Box (NTSC and PAL versions), Truevision, $995, $1995
D5-SCX Video Scan Converter, Dimension 5, $1695

Video Out (RGB and NTSC)
ColorBoard 224, 232, 264, RasterOps Corporation, $3995, $2995, $995
SFX, RasterOps Corporation, $1495

persuade, and communicate with people in the chaotic and competitive trade-show environment.

Now Bill Stimwich, vice president of marketing, has added Mac-based multimedia presentations to the company's portfolio. Using MacroMind Director as the basic design tool, he adds images created with Swivel 3D, Aldus Persuasion, MacDraw, and Canvas 2.0. He scans in 35mm slides with a Barneyscan color slide scanner and uses a flatbed Howtek scanner for color photographs. For certain digital-audio effects Stimwich uses MacRecorder, but the bulk of the sound track usually runs on a tape deck hidden within the booth, synchronized to the presentation running on a 37-inch monitor and a Mac II.

Stimwich's productions also include a live actor working in sync with the multimedia presentation, which runs repeatedly from five to six minutes throughout a trade show. Calling his work twenty-first-century slide shows, he uses animated effects including montages of photos, color animations, and visual magic to draw attention to his presentation subject.

For presentations projected onto screens, he feels that 8-bit color achieves the nearly photographic realism he requires. "There's nothing limiting about the Mac environment today. Right now, I can do everything I can ever imagine wanting to do, with readily available tools."

Access to Video Archives

What happens to that video clip after you've seen it on the evening news? Until very recently, at ABC News it went into storage; to see it again, you had to pay thousands of dollars for each minute of video footage. Then in late 1988 David Bohrman and his team at ABC News Interactive began publishing videodiscs for the education market.

Bohrman had been executive producer for ABC's coverage of the 1988 presidential election, so it made sense that ABC News Interactive's first release would be The '88 Vote, Campaign for the White House. Subsequently, in tandem with distributor Optical Data Corporation, ABC News Interactive released the videodiscs AIDS, The Great Quake of '89, and Martin Luther King Jr. (including the entire "I Have a Dream" speech). In the works are Mission: The Moon, an overview of the Mercury, Gemini, and Apollo space flights; and The Powers That Be, a three-part project that will look at the Supreme Court, Congress,

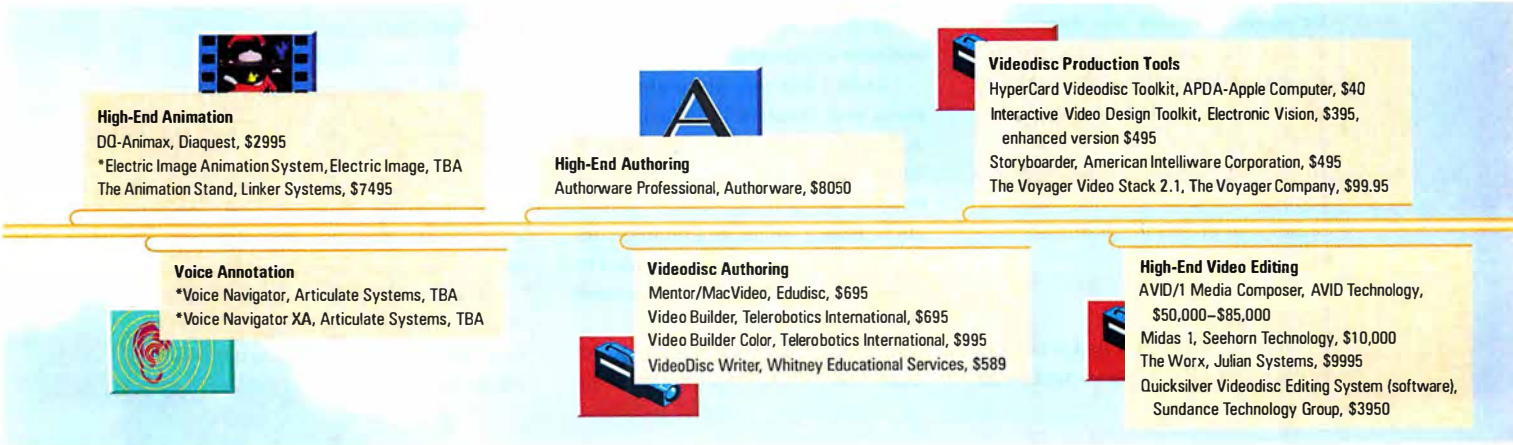
MULTIMEDIA ON THE NEXT

The Next machine incorporates several hardware and software features that are generating interest among multimedia developers. With its 25MHz 68030 processing unit, 8MB of RAM (expandable to 16MB), direct memory access (12 I/O processors), and digital signal processor (DSP), the Next is designed to capitalize on multimedia's need for enhanced speed, memory, data-storage, and sound capabilities.

The Next comes bundled with Mail, an electronic-mail application that lets you send voice messages over built-in Ethernet circuitry. FrameMaker, a desktop publishing program from Frame Technology Corporation, lets you add voice annotation to documents.

Developers like Metaresearch have created software and external peripherals that let users input and manipulate CD-quality sounds and video images, taking advantage of the Next's DSP chip. Digital Ears consists of a sound utility plus hardware; it opens, plays, records, and saves sound onto SCSI disks or optical discs using a simple graphical interface. Digital Eye grabs still-video frames or sequences from laser disc players, still and full-motion video cameras, and other standard NTSC video sources. Files created with either product can then be included in documents and in other applications.

MediaStation, an application from Imagine, enables users to capture, store, and process images, animations, and sounds in an environment that allows several media to be accessed and retrieved at once. Storing data on optical discs allows visual archives, digital audio libraries, electronic storyboards, and desktop presentations to take advantage of high resolution visual and sound files.



*Not shipping at press time.

and the presidency.

Using HyperCard as a navigational front end, the ABC Interactive videodiscs enable teachers to create customized lesson plans that draw upon the recorded video information. In a supportive move, Apple approved the use of its educational marketing funds for the purchase of videodisc players and monitors in schools.

Development, Distribution, and Tools

The Voyager Company is striving to create a consumer market for interactive multimedia. Its products range from educational to entertainment,

BE YOUR OWN PRODUCER

CD ROMs hold over 600MB per disc and are perfect for the distribution of multimedia applications that incorporate animations, graphics, audio, and text. For those who want to use full-motion video in their multimedia presentations, videodiscs are the preferred medium.

CD ROM pressing plants accept data on tape or hard disk. Mastering prices range from $1500 to $3000; replication and packaging prices depend on the total number of discs pressed. To produce from 1 to 500 discs, the price per disc starts at $2.35. As the volume goes up, the price per disc goes down. A one-time-only disc for last-minute testing and fine-tuning, costs from $500 to $1000.

Videodiscs haven't had the impact on the consumer market that their cousins, VCRs, have, but they do offer high-resolution pictures and CD-quality sound. In addition, you can access the information on a videodisc in a random manner, and the disc doesn't wear out. Authoring systems such as HyperCard and SuperCard control the access to specific frames or sequences.

Consumer versus Industrial

There are two kinds of videodisc players on the market. Consumer-level players are generally priced from $400 to $2000 and are designed primarily for viewing movies and listening to audio CDs. Industrial-level players, starting at $1000, have access times three to four times faster than consumer-level players. They also have an RS-232C port for interfacing with a computer, and an internal microprocessor that allows programmed control of the videodisc.

CLV versus CAV

Videodiscs can be recorded in two different ways. The CLV (constant linear velocity) format provides up to 60 minutes per side of straight play on a 12-inch videodisc but has limited interactive capabilities. You don't have random access to the material (except on the most expensive industrial-level players), and you can't freeze frames or view material in slow motion, although you can still scan through the material sequentially and access it by chapter.

In contrast, CAV (constant angular velocity) format provides only half the storage capacity—30 minutes of full-motion video per side of a 12-inch disc—but it does offer interactivity. Depending on the player you're using, you can randomly access any of the 54,000 frames per side, view material in fast or slow motion, step through frames backwards or forwards one frame at a time, or freeze single frames. Because of this interactive capability, most computer-based multimedia applications use the CAV format.

Both CLV and CAV offer dual audio channels of 30 minutes per side, allowing you to record two audio tracks for the same video sequence. You can have narration in two languages or at two levels of difficulty, for instance, without having to rerecord identical video tracks.

Interactive Programming

There are three levels of interactivity available to videodisc producers.

Level I lets you place automatic stops and chapters in your material during mastering. User interaction is limited to playing and searching for material using these markers, and input is usually limited to a remote-control device. Level I disks are meant to be played on standard consumer-level players.

Level II contains programming, located in one or more segments of the second audio channel, that controls the videodisc. The data is preloaded into the videodisc player's memory. Normally Level II programming requires the use of an industrial player.

Level III videodiscs are completely controlled by an external computer. All the data necessary to do this is loaded into the computer from another source, not encoded on the videodisc itself. Since a computer is controlling the play, more-sophisticated levels of programming control video playback and user interaction. Level III allows more flexibility in programming, since the controlling information is not pressed onto the videodisc.

Production Costs

While the main cost of any videodisc production is in scripting, shooting, and editing, the following is a list of the major postproduction costs.

Premastering You must deliver your material to a videodisc production facility on professional-quality videotape. This necessitates the use of a postproduction facility where, at the very least, you transfer your videotape to a 1-inch or ¾-inch master at a cost ranging from $150 to $400 per hour.

Producing a check disc A one-time-only copy of your material for use in development of the final version, or for limited distribution, costs from $300 to $750 dollars, depending on your choice of a glass or plastic disc and of the manufacturing plant.

Mastering the disc Transferring your data to a glass master costs from $1800 to $7000 depending on turnaround time (faster costs more) and interactivity level (Level II costs more).

Replicating the disc Stamping out multiple copies of a mastered disc costs from $9 to $21 per side, depending on the total number of copies.

Multimedia

is not just a buzzword

or a

set of products

from videodisc based to CD-audio based. Categorizing itself as analogous to a book publisher, Voyager adds supplementary material to videos and other work brought in from around the world, generates its own video productions, and distributes its own and others' works.

Voyager also sells videodisc and CD ROM drivers that can be converted to SuperCard, and the company supports videodisc models that the Apple-supplied drivers don't. Voyager sells The Box as well, an external device that provides computer control over some models of consumer videodisc players, enabling consumers to play interactive multimedia on the same player they bought to play movies.

Voyager's in-house staff of artists, writers, video producers, graphic artists, and HyperCard scripters collaborate with recognized authorities in specialized fields such as music or art history to produce the informative, visually appealing, and comprehensive products for which the company is known.

But making the products is one task, distributing them is another. Not yet comfortably positioned in computer software stores, video rental outlets, bookstores, or record stores, Voyager sells some of its titles in videodisc stores and most of them through direct sales. Voyager would like to see a new kind of store emerge, where you could buy multimedia hardware and software in one convenient place.

Another pioneer in the multimedia market is Warner New Media, which is producing innovative CD-audio and CD ROM products, including a three-CD set on Mozart's *The Magic Flute*.

Is It Realistic Yet?

Multimedia is not just a buzzword or a set of products. It isn't even really an emerging market niche. Rather, it is the convergence of many new, and some not so new, technologies that promise to work together in new and meaningful ways. Multimedia promises to enrich our computing environment and bring multisensory, nonlinear approaches to our work and play. It is expensive, demanding, and potentially rewarding. The appropriate question may not be "Is multimedia real?" but rather, "Is it realistic?"

Until optical read-write technology is easily affordable and technically reliable and real-time schemes for compression and decompression of video become feasible, the storage and transportation of multimedia documents will continue to present problems. One frame of digitized full-motion video, after all, currently takes up 700K of space. Because full-motion video requires 30 frames per second, digitized video on the desktop remains unrealistic.

The amount of disk space and RAM a sound file takes up depends upon the sampling rate that it was recorded at. The sampling rate reflects the number of digital "snapshots" taken of a sound in one second. The higher the sampling rate used, the more room the recording will take up, and the higher the quality of the recording.

Eight-bit sound, adequate for speech and some sound effects, requires up to 22K of RAM per second to play. CD-quality sound, in which 16 bits are assigned to each sample, is ideal for music and high-quality effects, but needs up to 85K of RAM per second. Until recently, these storage requirements have made it difficult to add more than brief sound bites to presentations. New software compression schemes now make it possible to compress sound files for storage, but they do degrade the quality of the recording on playback. The Audiomedia board from Digidesign uses a DSP chip and specialized driver software that allow real-time playback of CD-quality sound from a hard disk, making the Mac competitive with the Next machine in audio processing, and making it feasible for desktop developers to include long sound sequences in multimedia documents.

RUSS WIDSTRAND

Publisher Jane Wheeler of The Voyager Company recognizes that distribution is a crucial link in the development of a multimedia market.

But even if you've digitized still frames of your videos and only used snippets of sound to save disk space, a five-minute multimedia presentation incorporating 3-D animation and 8-bit color could easily take up several megabytes. Traveling with your presentation means lugging an expensive and fragile hard disk around or investing in a removable system.

Worse still, if you want to show your presentation to more than a few people, you're going to have to spend the money to transfer it to videotape and rent either an expensive video-projection unit or a 37-inch monitor. Either way, you have to decide whether the increased interactivity, animation, and sound really make the added cost and setup time worth it.

Multimedia, however, *is* the wave of the computing future. The speed, storage, and price constraints that currently limit multimedia productions will largely evaporate as the technology evolves. While the task of producing full-fledged multimedia productions will continue to fall to dedicated developers, more and more individuals within the education, training, and business fields will undoubtedly invest the time and money to create lower-end multimedia presentations that will assist them in communicating with and persuading their target audiences. ■

See *Where to Buy* for contact information.

Gray-Scale

JOHN HERSEY

Contrasts

New gray-scale programs broaden the range of offerings, but sharp contrasts make for black-and-white decisions

BY JOE MATAZZONI

So you want to start using gray-scale scans for desktop publishing. You want to place black-and-white images directly in electronic page layouts and then print negatives on an imagesetter or laser printer. You want to speed up turnarounds while cutting stat-house and stripping bills. You want creative control: the power to paste birds into the sky, turn up the contrast till afternoon looks like sunset, paint out that telephone pole sprouting from the company president's head.

Provided the work you do is appropriate (see "What Exactly Is This Stuff Good For, Anyway?"), you can do all these things, and more. But to do them well, to do them economically, and to have any fun in the process, you'll need to get the right image-manipulation software.

For years now buying a gray-scale program has been, as we say in the computer game, a binary decision: Digital Darkroom, from Silicon Beach, or Letraset's ImageStudio. Recently two new programs have entered the picture, bringing with them powerful capabilities. One of the newcomers, Enhance, from MicroFrontier, will appeal to people who do technical image analysis as well as to publishers and artists. The other, Blue Solutions' PhotoPress, bills itself as a tool for no-nonsense production. This article compares all four of these programs to see which does what best.

For some people at either the high or the low end of Mac halftoning, the right software won't be a gray-scale program, or a commercial gray-scale program, at all, and we'll look at some other options worth considering. But first let's compare the old standbys to the digital debutants to see how gracefully the gray-scale graybeards have aged.

Digital Darkroom

Digital Darkroom is a reasonably flexible, well-designed program. It offers some powerful features that until recently were uniquely its own. The interface is convenient and the manual is the best of those under review.

For the most part Digital Darkroom includes the same basic halftoning, retouching, and brightness and contrast controls as its forebear and longtime competitor, ImageStudio (see "Dots Nice!"). Some notable departures, however, do Digital Darkroom credit. Among the program's most powerful features are its Image and Paste controls, which enable you to re-

strict the gray values that will be affected by painting, filtering, and even pasting operations.

The Image Controls work with the paint brushes and some of the filters, such as Sharpen and Blur. Suppose, for example, you have a picture with a relatively light sky and a foreground made up of darker shades. The Image Controls enable you to restrict touch-up tools so that you can paint clouds in the sky without affecting the mountains that form the horizon.

The Paste Controls work on a similar principle but include features useful in cut-and-paste work (see "Paste If"). In the example just cited, the Paste Controls could enable you to specify that pastes replace only the sky shades. You could then forget about painting clouds and simply drop in a dramatic sunset behind your mountains.

In the retouching department, Digital Darkroom's Stamp, which permits you to pick up a small section of an image and paint with it, is particularly useful. Photographs rarely contain smooth tones, and without this or a similar tool, touched up areas can look unnaturally flat. The only problem with Stamp is that the sampling area is severely limited; if you're not careful when using it to paint an area larger than the sample, the repeating stamp produces a grid pattern.

Digital Darkroom was the first Mac program to offer an autoselect feature—which searches for the edges of zones with similar gray values, so you can select objects in a picture without manually lassoing them. And it's still the only gray-scale program with an autotrace feature, which outlines objects and exports the outlines as Adobe Illustrator files.

Unfortunately, despite its many strengths, Digital Darkroom is a program in need of a major upgrade. It competes with ImageStudio, particularly since it has a $100 price edge, but doesn't have what it takes to keep up with today's graphics programs (see "Gray-Scale Features").

Digital Darkroom's biggest limitation is that it's just not designed for the large files that 8-bit scans often yield. It's OK for working with 4-bit files or images destined for a laser printer. But for files larger than 750K or so—about the size of a 5-by-7-inch, 120-dots-per-inch, 8-bit scan—program speed slows to a crawl. You find yourself waiting around for tools to come back, while the screen laboriously refreshes. And the program has a tendency to crash.

Even if you're not going to use large files, you still have to have a lot of RAM to use Digital Darkroom. I tested these programs on a machine with 5 megabytes, and I wouldn't recommend that anyone do much real work in any gray-scale program without at least 4MB (8MB would be better). Still, the fact is that it's possible to work in ImageStudio with only 2MB.

Digital Darkroom holds everything in RAM, and it stores copies of the image in buffers in order to provide three levels of Undo. These buffers give the program its nice, interactive feeling, but they also eat up memory, the lack of which causes various program features not to function. To use all of Digital Darkroom's features re-

Paste If

Digital Darkroom's Paste Controls enable you to protect parts of the source or target images during pastes. In this example, the white portions of the Target bar indicate that pastes will not affect light areas in the target image. The line cutting across the graduated bar moves to reflect sampled values in the on-screen image, helping you to pinpoint values for masking. The Darken, Lighten, Blend, and Dissolve options provide control over the relative brightness of source and target images and also enable you to produce double exposures.

WHAT EXACTLY IS THIS STUFF GOOD FOR, ANYWAY?

If you have a quality, glossy publication and want to use Mac gray-scale scans to cut down your stat-house bills, forget it. In the first place, I've never seen a side-by-side quality comparison between Mac and conventional halftones where the former looked better. And secondly, black-and-white halftones aren't that expensive; any money you might save on stripping and stat fees will probably be offset by the value of the time you've put into doing everything yourself.

If your work fits some or all of the following descriptions, however, digital halftoning can pay off.

- Your quality demands are moderate. Gray-scale scanning is a good application for newspapers, for example, where paper quality and halftone resolution are low. The *New York Times* uses scanned photographs "almost every day" in editorial illustrations, according to Rich Meislin, head of the graphics department.
- You want control over creative effects, such as cutting images from backgrounds or making double exposures. A typical application would be ad design. If you do ads for newspapers or other medium-quality purposes, you can do everything in-house, cut costs by saving on stripping and services like airbrushing or mask cutting, and probably shave your deadlines.
- You have a need for accurate, impressive mock-ups.
- You regularly work with damaged, amateur, or other poor-quality photographs. Gray-scale editors are superb at retouching blemishes and tears, and can do a lot to fix poorly exposed or printed pictures (see "Touch-up Tester").
- You don't require large sizes at high resolutions. Even with a beefy system, this isn't practical.
- A scanner can be a cost-cutting production tool even if you don't need creative effects—especially if the publication uses many photographs, quality is moderate, and you have more time than money.

For more insights on when scanning is and isn't appropriate, see "A Halftone Handbook," *Macworld,* October 1988.

quires RAM equaling *four times* the size of the file, in addition to the size of the program (about 450K). So with 2MB free, you'd fall short if you tried to rotate a 500K file (rotation being a memory-intensive operation).

ImageStudio

ImageStudio was the first Mac gray-scale program. It was ahead of its time, unique—but that was then. Now Letraset, which has evidently been concentrating its energies on ColorStudio, hasn't upgraded the original in almost two years, and at this point there are only a few reasons for considering ImageStudio.

The program's gray-scale touch-up tools are very good (see "Batmoon"). Numerous controls that work with the fingertip (smudge), water drop (blur), charcoal (lighten, darken), and paintbrush tools enable you to change their responses in useful ways (see "State Your Preference"). ImageStudio is the only gray-scale program that lets you create new brush shapes and save them. To make things even more flexible, you can create your own tools: take a custom brush shape, give it the characteristics of a given tool (the rubber stamp, for example, which can

Batmoon

ImageStudio's touch-up tools are so fast and flexible that artists such as Pepe Moreno (who won first place for illustration in *Macworld*'s art contest last year) have used it as a black-and-white paint package, later colorizing their images in other software.

From *Digital Justice*, © DC Comics 1990

GRAY-SCALE FEATURES

	ImageStudio 1.5	Digital Darkroom 1.1	Enhance 1.0	PhotoPress 1.0	Image 1.22
Price	$495	$395	$375	$295	free
Minimum requirement	Mac Plus	Mac Plus	Mac II, 2 MB	SE/30 with 8-bit card, 2M	SE/30 with 8-bit card, 2MB
Limited by RAM or disk	disk	RAM	RAM	RAM	RAM
Shades displayed	102	128	256	256	256
Opens multiple files	○	○	●	●	●
Autoscroll	○	●	●	○	○
Text tool	○	○	●	●	●
Colorization features	○	○	●	●	●
Save: PICT/ EPS/TIFF	●/●/●	●/●/●	●/●/●	●/○/●	●/○/●
MacPaint/Compressed	●/●	●/●	○/○	○/○	○/○
Set print angle/frequency	●/●	●/●	●/●	○/●	○/●
Save angle/frequency	EPS only	○	○	○	○
Revert to Saved	RIFF only	PICT only	●	●	●
Number of zoom levels	9	6	11	8 [1]	8 [1]
GRAY-SCALE EDITING					
Bright, contrast sliders	●	●	●	●	●
Interactive gray-map graph	●	●	●	◗ [2]	◗ [2]
Alter selection only	●	○	●	●	●
Histogram/line profile	○/○	◗ [3]/○	●/●	○/●	●/●
SELECTING AND TRACING					
Autoselect/set sensitivity	○/○	●/◗ [4]	●/●	◗ [5]/●	◗ [5]/●
Edit selections	◗ [6]	●	●	●	●
Adobe Illustrator Autotrace	○	●	○	○	○
Masking buffer	○	○	●	◗ [7]	◗
Circle/square/polygon	○/●/●	●/●/●	●/●/●	●/●/●	●/●/●
CUT AND PASTE					
Blend images/control fade	◗/◗ [8]	●/●	●/●	●/○	●/○
Paste-if controls	○ [9]	●	●	○	○
Pastes scaled to fit selection	●	●	●	○	○
PAINT AND RETOUCHING					
Brush and airbrush	●	●	●	●	●
Create new brush shape	●	○	○	○	○
Control brush fade	●	○	●	○	○
Lighten and darken tools	●	●	●	○	○
Smudge/blur/sharpen tools	●/●/○	●/●/●	●/●/○	○/○/○	○/○/○
Set tool-response levels	●	◗	●	○	○
Fill graduate	●	○	●	○	○
Arbitrary orientation	●	○	○	○	○
Set Paint Bucket tolerance	◗	○	●	○	○
Graphic primitives	○	◗	●	◗	◗
Texture paint	○	●	○	○	○
Define custom fill	●	○	○	○	○
Paint only on selected grays	◗	●	●	○	○
EFFECTS					
Number of filters (approx.)	9	26	75	25	16
Manually/numerically rotate	◗/◗ [8]	●/●	●/●	○/◗ [10]	○/◗ [10]
Apply to irregular selections	◗	●	●	◗	◗
Scale selection	◗ [8]	●	●	◗ [10]	◗ [10]
Stretch/distort/skew	○/○/○	●/●/●	●/●/●	●/○/○	●/○/○
Rotate image	●	◗ [11]	◗ [11]	◗ [11]	◗ [11]

A ◗ indicates that a program includes the feature in question, but that it isn't well implemented or is limited in some way.

[1] No zoom out.

[2] Linear corrections only.

[3] No numeric data.

[4] Repeating command widens selection.

[5] Contiguous areas only; no adding to selection.

[6] Can't add to or subtract from rectangle.

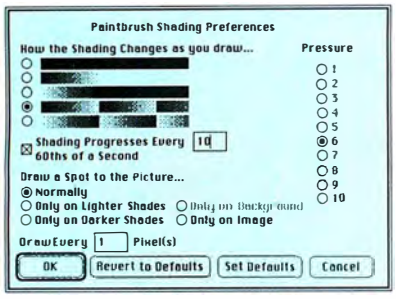
[7] Save/Restore Selection marquee provides many functions of masking. Feature not operational with version 1 of PhotoPress.

[8] Through Effects module; rectangular selections only.

[9] Will ignore shade set as Background.

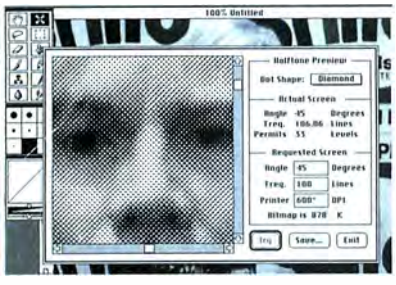
[10] Rectangular selections only.

[11] Window doesn't rotate with image.



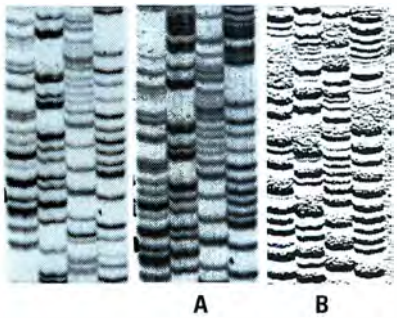
State Your Preference

ImageStudio offers a Shading Preferences dialog for all its paint tools. Pressure controls the cycling interval of the fade-out brush options on the left, as well as the response of the smudge tool and charcoal. Shading Progresses Every —— 60th of a Second controls a tool's *flow* (how fast a spot builds up). Draw a Spot to the Picture provides you with four options for crude gray masking. And Draw Every —— Pixels causes the brush to work intermittently, which is nice for making patterns.



Dots Nice!

ImageStudio's Halftone Preview calculates available angles, frequencies, and gray levels at a given printer resolution. At left, note the standard tools, including the gray-map graph (bottom). Editing the diagonal line changes the relationship of input values to output values.



Bio Bar Code

Biologists such as *Macworld* contributing editor Charles Seiter use gray-scale software to help analyze X rays of DNA. For a clear reading, the film should look almost like a set of bar codes. Here, Enhance's Histogram Equalization (A) and Heavy Shadowing (B) filters make individual bands on the film stand out.

paint transparently), select the other preferences you want (such as shading and pressure), and save your choices as a new tool.

For some users, ImageStudio's strongest selling point is its virtual memory, which enables it to function within the confines of modest systems. Some people dispute that Letraset's scheme is true virtual memory (virtually virtual?), but in any case it allows you to substitute hard disk space for RAM when opening large files. Thus, if you're working on files of up to 1MB, ImageStudio is the only program that will enable you to get by with just 2MB of RAM, though you won't get full image undo. The system works well. When running under virtual, it's possible to make gray-scale and other overall changes on an entire image. Only a slice of the image as large as available RAM is visible for pixel editing, but there's a convenient mechanism for changing slices.

The real question is how long virtual memory will continue to be a unique advantage for ImageStudio. Apple has announced that System 7.0—which was due, last I heard, in late spring—will include virtual-memory features. This theoretically means that all programs—or at least all that have followed Apple's programming guidelines—will be able to work on large files. We'll see.

In an attempt to pump some new life into this product, Letraset has produced an Effects Module that comes free with ImageStudio now but costs $99 for those who bought the program before August 1989. This module fills some obvious holes, such as the inability to scale or rotate selections, but the effects in the beta version I looked at aren't as flexible as similar features built into other programs. Scale and rotate, for example, work only with rectangular selections. Effects does include a clever halftone-preview utility that should be standard in all gray-scale programs' printing dialogs (see "Dots Nice!").

Enhance

Well, I can't hold back any longer. Enhance is, simply, the only true second-generation gray-scale program. It does many things the others can't, and what the others can do, Enhance can—for the most part—do better. It's a program with great parts, but its real strength is that all the parts work together to accomplish things no other Mac (or DOS, for that matter) gray-scale program is capable of doing.

I'm told Enhance started out in life as a technical image-analysis and -enhancement program, and if you're doing that kind of work don't even consider any of these other packages. In fact, according to contributing editor and molecular biologist Charles Seiter, whose day job involves enhancing autoradiograms, Enhance beats out Mac and IBM PC image-analysis programs that cost many times its price (see "Bio Bar Code"). But this technical bent shouldn't put off artists and publishers.

Both technical users and artists will appreciate Enhance's powerful image-masking features, for example. To work with just one part or even one tonal range of an image, you duplicate the image, select the part or values you want to work on, and fill the selection with black. This duplicate can now be a mask. Bring up Image Masking, and all painting, filtering, and gray-scale operations will affect only the black regions in the active mask (see "Paint It Black").

Enhance is the only program with masking buffers, but what makes its masking abilities especially useful are the program's unequaled tools for isolating and selecting just about whatever parts of an image you might want to mask. Enhance has two types of autoselect lassos (one shrinks to fit, the other expands like a typical magic wand); and you can precisely set the tolerance of both by telling them how many gray values above and below the touch point to include in the selection. You can also set an absolute threshold for selection—everything above or below value 100, say. Enhance's half-dozen brightness and contrast tools enable you to isolate a given gray value with relative ease. The Threshold tool, for example, has sliders that let you isolate a particular value or range in an image. Clicking on a button brings up a palette from which you can select any value—including black or even a color—to substitute for the selected range.

The rest of the brightness and con-

trast tools enable you to adjust an image's gray values much more precisely than do the gray-scale features in Digital Darkroom and ImageStudio (though Enhance also duplicates their controls). Particularly nice is the gamma filter, which lightens or darkens an image without chopping off the lows or highs. Moving the slider up or down gives you the same effect you would achieve if you could go into ImageStudio's or Digital Darkroom's gray-map graphs and keep drawing successively deeper smooth curves.

Just as the selection and gray-scale tools work hand-in-hand with the masking features, Enhance's gray-scale editors in turn are augmented by its histogram. Unlike Digital Darkroom's histogram, which provides a plot but no data, Enhance's histogram not only plots the distribution of values in an image but also displays numeric data about such things as the high, low, and mean values. A readout like this may seem superfluous—until you've used one. A histogram can be very useful when you're trying to identify and correct image problems. The histogram updates after filtering to show exactly how an operation changed the image (see "I Don't Know if It's Art, but I Know How Dark It Is").

Enhance's ruler is another of its simple but synergistic features. The ruler calculates the locations of points, the lengths of lines, and the angle between any two lines. Not too impressive. But add the program's ability to compare ruler information from one window with ruler information in another, and to use ruler information to control operations such as scale, rotate, and translate (move), and you start to see the possibilities.

Suppose you want to compare two aerial photographs of your town to see how it has changed in the last ten years, but the photographs were taken from different locations or different altitudes. No problem. Just load both images into memory in split-screen mode and then stretch ruler lines from First to Main streets in both windows. Now you can tell the program to scale the photographs so that the lines are the same size and to rotate the images till they have the same orientation. You could set points on the statue of George Washington in the park, use the Translate command to align the photographs, and superimpose the new town over the old.

If you know the size of something in town, you can calibrate the images to that known quantity in any unit from microns to miles, and measure, say, the town's changing width over the years. You can calibrate the ruler so that it reads distances relative to any point you set, and you can even change the coordinate system so that it displays x and y coordinates according to four different orientations (top left to lower right, lower left to upper right, and so on).

Technical users who like Enhance's ability to compare and measure image elements will be even more impressed by its filtering features. Enhance comes with a selection of about 70 to 80 filters (depending on how you count them). But if those aren't enough, the program has a unique dialog box that enables you to easily modify any of the filters or create new ones (see "Convolution Made Simple").

The prime advantage of developing a second-generation program is that you get to steal the best from everyone and then improve on it. That about characterizes Enhance's interface, which is filled with those nice touches that make a program a pleasure to use. Enhance has an excellent selection of tools, general operation is fast and clean, and the program is less expensive than either ImageStudio or Digital Darkroom.

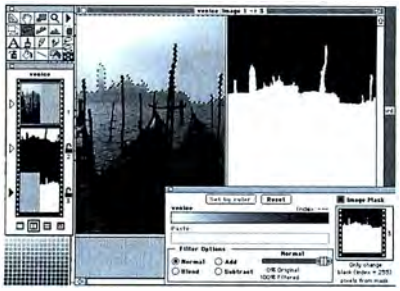
PhotoPress

I agree wholeheartedly with Blue Solutions' gray-scale strategy. The idea was to produce an easy-to-use program at a reasonable price for the vast majority of potential gray-scale publishers who will never create photo

WIDE WORLD PHOTOS

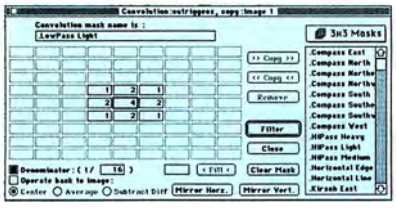
Worlds within Worlds

San Francisco illustrator Keith Baumann created this collage to help evaluate the programs under review. Because Enhance's skewing features produced curved edges, Baumann distorted the side and bottom panels using Digital Darkroom. He finished the rest of the job in Enhance, using features like autoselect (to remove Andy from his original background), smudge (to smooth the figure into its new surroundings), and various sharpening and brightness and contrast filters (to correct for blurriness resulting from scaling and skewing and to match the different images' values to each other). Since the inside of the picture frame was originally white, Baumann was able to crop the skewed, miniature image automatically using the Paste If controls (pasting only to white).



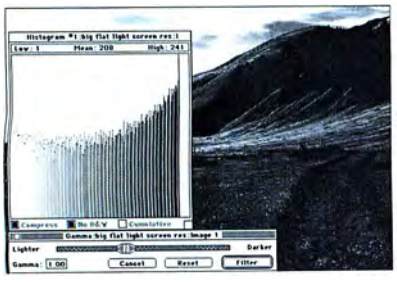
Paint It Black

In Enhance, anything you can make black can be a mask. Here, the icon views at left show that masks have been created to isolate the foreground and sky. The dialog box (bottom) indicates that buffer 3 is the active mask channel, meaning that changes can now be made only to the sky. The controls on the left of the dialog box duplicate Digital Darkroom's gray-sensitive Paste Controls (see "Paste It").



Convolution Made Simple

Enhance's Convolution mask lets you easily change filter parameters or make entirely new filters. The Copy button loads the parameters for any of the program's filters into the mask grid and associated control boxes. You then simply make any changes you want and copy the renamed filter back to the menu.



I Don't Know if It's Art, but I Know How Dark It Is

Enhance's histogram can help to identify problems in a picture. In this example, the image is obviously dark (note the high mean value), but the darkest value is level 241, which means the scan contains no true black (level 256). The Gamma filter at bottom can be used to correct both flaws.

collages with double exposures and otherworldly filter effects. Offer a simple, moderately priced program with only the most useful features and nothing to confuse and scanner owners will beat a path to your door.

Unfortunately, the path to Blue Solutions' door is liable to remain relatively untrodden. Strategy has to be backed up by good tactical decisions, and this program embodies too many poor choices for me to recommend it, despite its price advantage.

PhotoPress does have a few things going for it. Like Enhance but unlike Digital Darkroom and ImageStudio, PhotoPress displays a full 256 gray values on screen. Most of the time this doesn't matter, but seeing exactly what's going on instead of getting a display that shows every other shade can be a big plus for detailed touch-up work. PhotoPress's most sophisticated feature is an option that saves selection marquees for later use. When I wrote this, the command to restore the marquee wasn't working, but the company promised that a fix would be out before this article.

Another nice PhotoPress feature is its Dynamic Masking, which works a bit like Enhance's Threshold filter, providing visual feedback so you can isolate a value or range of values precisely. When used with the magic wand, Dynamic Masking gives the same effect as an adjustable autoselect tool. Well, almost the same effect; Dynamic Masking with the magic wand is great at selecting one region, but you can't autoselect noncontiguous regions—a fairly common thing to want to do. PhotoPress has colorization features, and comes with some predefined palettes that turn a black-and-white photograph into a sepia or a duotone print (Enhance offers this as well).

So what can't PhotoPress do? For one thing, it doesn't offer very good control over gray values. It comes with a gray-map graph and sliders that look like the ones in ImageStudio and Digital Darkroom, but you can't draw curves on the graph, you can only slide the straight line around. PhotoPress comes with an automatic contrast-correction filter, but it's a canned, hit-and-miss proposition.

In the touch-up department, PhotoPress lacks some of the other programs' most useful tools. Missing are smudge, lighten and darken (charcoal), as well as blur, which is key since it makes manual antialiasing possible. The paintbrush paints with any shape you want as long as it's a circle (albeit a circle of any size).

When it comes to printing options, PhotoPress offers only two halftone screen angles: 45 and 90 degrees. Big deal, you say, who prints at nonstandard angles? Answer: people who want optimal results from a laser printer. PostScript printers require nonstandard angles to be able to print at many frequencies. By limiting you to two halftone angles, PhotoPress drastically reduces the frequencies available on 300-dpi printers. So forget about trying different frequencies to get just the right trade-off of gray values and resolution.

PhotoPress is the only gray-scale program that thinks about image size solely in pixels. For example, it has a ruler feature, which is a nice thought, but why couldn't the program divide by 72 to give you measurements in inches? The Mac is a computer—it's supposed to compute things.

As part of this 72-dpi myopia, PhotoPress completely ignores all files' source resolution and sizing, indifferently treating all scans as if they were 72-dpi. If you open a 300-dpi, 5-by-7-inch scan in PhotoPress, it comes up on screen at more than four times its original size; an information box offers that the file is a 72-dpi image (aren't they all!) of dimensions x pixels by y pixels. That wouldn't be too bad, except that PhotoPress *can't zoom out,* which means the only place you can see your entire image is in the shrink-to-fit window, where many program functions don't work. If you happen not to know a scan's original dimensions and resolution, or if you want to scale the scan to a particular size, you have to dig out the old percentage wheel and calculator—or go to another program.

Overall, PhotoPress just feels half-baked and I can't quite picture the user it would serve well.

The Big Picture

Which one should you get? The answer isn't as clear as it might seem. If

Touch-up Tester

Macworld artist and designer Arne Hurty (see cover) helped evaluate the packages under review for their touch-up capabilities. After working with all the programs, he chose Enhance to complete the project shown here, for the following reasons: (1) The interface was more convenient. "Controls are easy to understand, and accomplishing things generally takes fewer steps." Strangely enough, Enhance is the only program in which drawing tools appear at the size they draw, even in enlarged views—a simple but significant plus. (2) Hurty found the ability to see all 256 gray levels on screen "critical," since touch-ups require so much work at the individual pixel level. (3) "It's faster, and it didn't bomb."

your needs are simple, don't waste your money on any of these programs. In "Gray-Scale Features" you will notice a public-domain program called Image. The code for this software actually forms the core of PhotoPress, and the only significant advantage I can see to the latter is that it comes with an illustrated manual and phone support. Image shares many of PhotoPress's limitations, but it will enable you to open and view gray-scale files, touch-up specks and scratches, and change brightness and contrast. Since PageMaker, QuarkXPress, ReadySetGo, and DesignStudio all offer brightness and contrast control for gray-scale images, Image will probably be most useful for modest retouching. Image was designed for medical image analysis and includes a number of useful features for that purpose. You can get it virtually free from many user groups or by logging on to CompuServe (Macpro DL14) or one of the other major services.

Silicon Beach Software has been working on a new version of Digital Darkroom, but at press time the company couldn't comment about release dates. When and if version 2.0 comes out, it will, I'm sure, be worth checking into. Another program with gray-scale features that was forthcoming at press time is Deneba's UltraPaint. This appears to be one of those do-everything packages, but if you're in the market for a paint package anyway and your gray-scale editing needs are simple, it might also be worth a look.

If you're serious about using digital halftones for production, the choice still isn't cut-and-dried. When it comes to gray-scale software, Enhance is a hard-to-beat combination of the best program at the best price. But it may be that making the best gray-scale program today is a bit like coming up with a better turntable just when everyone is switching to CDs.

Some of the new color programs that should be on the market by the time this article comes out will have even more power than Enhance. At $1995, ColorStudio is a bit expensive for black-and-white work. But Adobe has announced that its Photoshop will sell for $895, and the beta version I looked at has some features that retouchers of color or black-and-white images will definitely covet.

To name a few: the ability to feather the edges of masks, which provides the essential ability to alter images without being obvious—subtly dodging a sky here or burning in a faded edge there. Photoshop also has automatic antialiasing, as well as Clone and Stamp features that work along the same lines as Digital Darkroom's Stamp but are much more flexible. For the production minded, Photoshop provides the ability to save gamma curves for later use. The graphics staff at the *New York Times* uses this feature with every Mac image they print, applying a curve they've developed that adjusts for the limited tonal range of newsprint. The list goes on.

So, turntable or CD? *Macworld* hasn't officially reviewed Photoshop and we don't usually compare beta software to shipping products. But Photoshop has been used widely enough by people I know both inside and outside *Macworld* for me to say confidently that ad designers, illustrators who use photographs, or anyone else who wants complete creative control over scans should at least look into Photoshop before they buy. If you plan to do color work anyway, there's no reason to have Enhance *and* an expensive color image processing program. On the other hand, Photoshop is more than twice the price of Enhance and may have other disadvantages that aren't clear at this point. If your operation is strictly black and white and you can get by without Photoshop's features, Enhance is an excellent tool.

Gray-scale editing is an appealing proposition for certain types of work. It's been my observation over the last few years, however, that although scanner sales seemed to be booming and many people had gray-scale editors, few artists or publishers were actually using the software to its potential. In part the reasons had to do with people not having the right hardware to work effectively—no gray-scale display or not enough RAM. In part it was people's resistance to learning the things about digital halftoning that they need to know to get good results. And in part it was that few Linotronic bureaus had the expertise required to produce consistent output.

But the blame also rests with the available software, which hasn't been quite powerful enough to make the effort-to-results equation pay off. Now that a new generation of more advanced image editors is emerging to complement today's more powerful hardware and the maturing service-bureau business, it will be interesting to see whether digital halftoning and photography take off, or whether this will turn out to be a technology whose time never was. M

See *Where to Buy* for contact information.

Erase coils

Shown from left to right are the Sigma Designs monochrome and gray-scale SilverView, the MegaGraphic MegaScreen 2001/3001 monochrome monitor, and the Radius monochrome Full Page Display.

PHOTOGRAPHS BY STAN MUSILEK. SCREEN IMAGE BY AYAKO PARKS

by Robert C. Eckhardt

MONOCHROME MONITOR MANIA

An obsessive evaluation uncovers the best monochrome monitors

Each time Macworld Expo rolls around, searching for the ideal monochrome monitor goes to the top of my to-do list. But even though nearly every kind of black-and-white and gray-scale monitor is there under one or two roofs, I end up hardly more enlightened than I was before. The exhibitors rarely set several different monitors side-by-side for easy comparison, and it's almost impossible to view even a handful under uniform conditions. Some beam down at you from above, some stare you straight in the eye, and others look up from belt-buckle level. Some are hidden in the shadows while others face the harsh light of Expo reality. Few monitors at the shows display documents relevant to my kind of work, and heaven only knows if an Expo monitor's controls are set properly.

So, after years of comparing monochrome monitors at numerous Expos without success, I jumped at the chance to compare a group of them in one room, under uniform conditions, displaying the same sample documents. For this article, Macworld Labs tested 12 gray-scale and 11 black-and-white monitors. At the same time, I ran each monitor through its paces with a variety of applications, documents, and subjective tests. (Although some monitors may be used with boards from other manufacturers, all monitors for this article were tested as systems—that is, with board and monitor both coming from the same manufacturer.)

Dozens of monitors and hours of squinty-eyed testing later, I have finally identified my favorite monochrome monitors. But I've also discovered how personal and subjective the choice of a monitor can be. Therefore I can't presume that my top choices will be

RasterOps ClearVue monochrome display

yours. But I can tell you what I've learned about selecting monitors and offer a few opinions along the way.

Shades of Gray

Gray-scale monitors can display as many as 256 shades of gray, whereas a black-and-white monitor has just two: black and white. If you work with images such as scanned photographs, a gray-scale monitor is a necessity. Since many gray-scale boards, such as SuperMac's Spectrum/8, produce 256 colors on a color monitor, gray-scale could also be considered the first step toward color. (Similarly, many black-and-white monitors can be converted into gray-scale monitors simply by changing the board.)

Virtually all gray-scale monitors (including the Apple High Resolution Monochrome Monitor) display 256 gray shades. Apple sells two 16-gray-level monitors (the Portrait Display and the Two-Page Monochrome Monitor), because, Apple says, these monitors match the input of the Apple 16-gray-level scanner and the output of the LaserWriter family. Apple loyalists should check out these 16-shade offerings, but most everyone else will be happier with the 256 degrees of freedom provided by the competition.

Pixel Density

A pixel (short for picture element) is the smallest dot that a monitor can display; pixel density is the number of pixels per linear inch. (In Macintosh monitors, the pixel density is—or should be—the same horizontally and vertically.) Most monitors have a fixed pixel density; some, however, such as Sigma Designs' L-View and PageView and E-Machines' QuickView Z21, can switch between several different pixel densities, in much the same way my old Selectric typewriter could alternate between 10 and 12 pitch.

Macintosh Plus and SE screens have a pixel density of 72 dots per inch. So do RasterOps' ClearVue/II, Sigma Designs' SilverView, PCPC's ShadowGraph along with many others. This pixel density is the standard by which all monitors are measured because most applications and all screen fonts are built around it. At 72 dpi, what is displayed on the screen most closely approximates the dimensions of the printed page.

Among the monitors we looked at, only Sigma Designs' L-View and E-Machines' QuickView Z21 can switch to pixel densities of less than 72 dpi. These lower densities (60 dpi and 36 or 40 dpi, respectively) create easy-on-the-eyes, larger-than-life images not unlike the large-type edition of *Reader's Digest*. On the other hand, many monitors display pixel densities higher than 72 dpi. MegaGraphics' MegaScreen 2008 has a pixel density of 75 dpi, for example, while Radius's Two Page Display System is 82 dpi, and E-Machines' The Big Picture is 85 dpi. At these densities, on-screen text, though slightly smaller, is sharper and thus easier to read. Beyond such moderate increases in pixel density, however, everyday type sizes become too small for comfort. An example is the tiny type of Sigma Designs' L-View which, in its 120-dpi mode, is just too much of a good thing (except for the CAD specialists for whom it was designed).

Issues of legibility aside, the choice of desirable pixel density revolves around the opposing forces of WYSIWYG-ness and maximum displayed page area. At 85 dpi, page dimensions on screen are appreciably smaller than the printed page. But compared to 72 dpi (or less), you can see more rows and cells in a spreadsheet, or a greater page area in a page-makeup program. If matching the screen image to the printed output is important to you, stick to 72 dpi. If you work on two-page spreads or large spreadsheets regularly, a pixel density in the 80- to 85-dpi range may allow you to see everything you need to see without scrolling.

Special SE Considerations

If you are purchasing an external monitor for an SE, you need to consider more than the pixel density, pixel dimensions, and the number of grays a monitor has. Most external moni-

PIXEL DIMENSIONS EXPLAINED

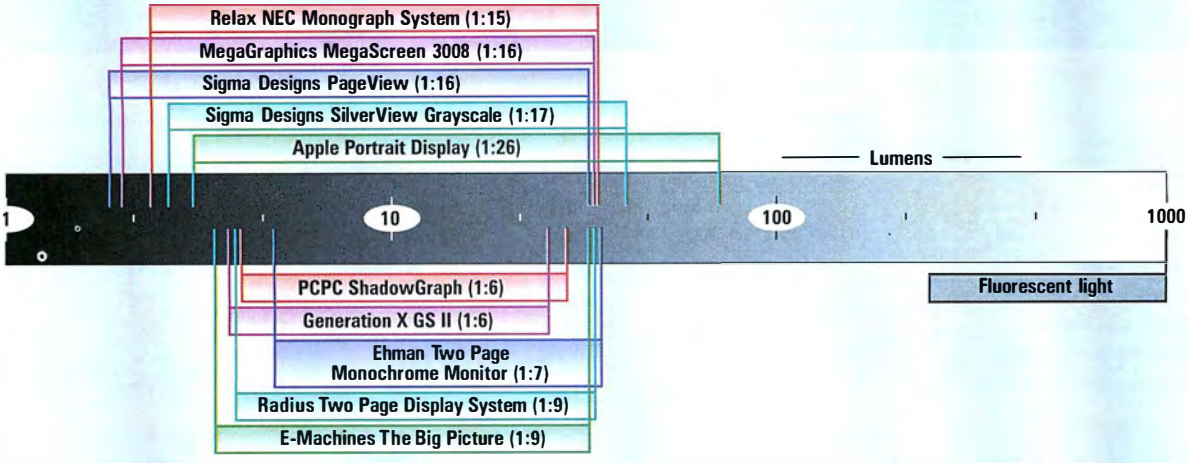
The diagonal measure of the video tube and the linear dimensions of the active area (the part of the screen that actually displays information) give a rough idea of the real estate you'll be dealing with. But it's the pixel dimensions of the active area that give a true reading of the maximum page area a monitor can display. In fact, four standard pixel dimensions are all you need to know to size up a monitor:

Pixel Dimensions	Display
640 x 860	one full page (vertical)
1024 x 770	two facing pages less about one inch top and bottom and two inches right and left
1150 x 880	two facing pages less about one inch right and left
1280 x 960	two full facing pages

A few monochrome monitors can't display even one full page. The Apple High Resolution Monochrome Monitor, at 640 by 480, and Relax's NEC Monograph System, at 768 by 767, are two examples. Choose one of these monitors only if other characteristics, such as the relatively compact size of the Apple display, heavily outweigh displayed page area in your calculations.

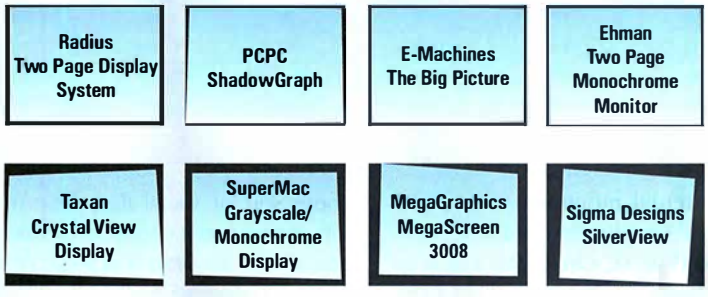
COMPARING CONTRAST

Measured in Lumens



Since contrast is the relative difference between dark and light areas, monitors with the best contrast (top) are the ones that allow the greatest range between dark and light areas. The monitors with the worst contrast have much narrower ranges (bottom). All other monitors displayed average contrast. The numbers in parentheses denote the ratio of light to dark.

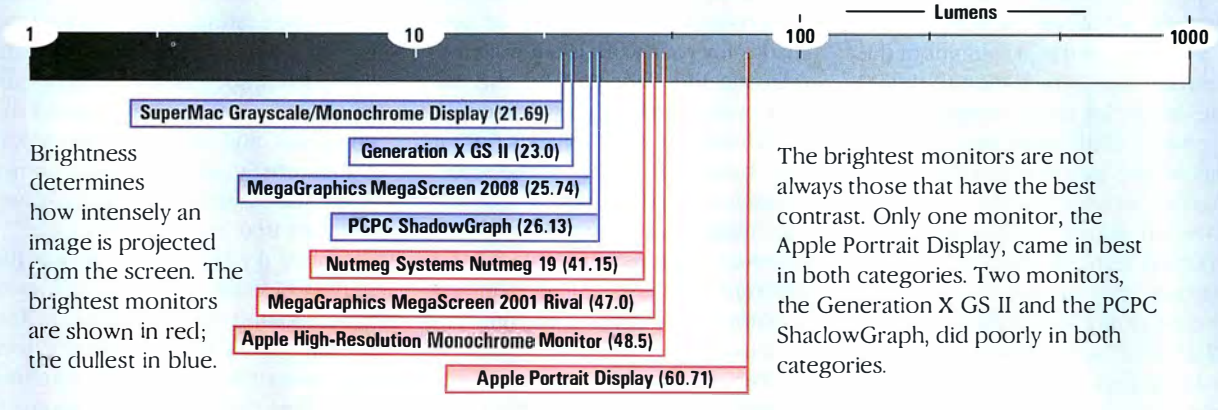
DISTORTION DISPLAYED



All of the monitors we tested showed some distortion, especially in the corners. This diagram represents the best (top) and worst (bottom) monitors. The drawings are exaggerated, but they have been rendered proportionally to what we measured on the real screen.

BRIGHTNESS

Measured in Lumens



Brightness determines how intensely an image is projected from the screen. The brightest monitors are shown in red; the dullest in blue.

The brightest monitors are not always those that have the best contrast. Only one monitor, the Apple Portrait Display, came in best in both categories. Two monitors, the Generation X GS II and the PCPC ShadowGraph, did poorly in both categories.

BLACK-AND-WHITE MONITORS

	Ehman	E-Machines	E-Machines	MegaGraphics	Nutmeg Systems	Nutmeg Systems	Radius
Product	Two Page Monochrome	The Big Picture	QuickView Z21	MegaScreen 2001/ 3001 Rival	Nutmeg 19	Nutmeg/Xerox Full Page Display	Radius Full Page Display
Price for Macintosh II series model	$899	$1795	$2495	$1698	$1699	$999	$1490
Price for Macintosh SE/30 model	$899	not avail.	$2495	$1698	$1699	$999	$1490
Price for Macintosh SE model	$899	$1695	$2395	$1698	$1699	$1299	$1490
Price for Macintosh Plus model	not avail.	$1695 [1]	not avail.	$1748	$1699	$1299	$1490
Orientation	landscape	landscape	landscape	landscape	landscape	portrait	portrait
Diagonal size (in inches)	19	17	21	19	19	15	15
Active area (w x h, in inches)	13.9 x 10.7	11.8 x 9.3	16 x 12	13.7 x 10.7	14.2 x 10.7	8 x 10	8.3 x 11.2
Pixel dimensions available (w x h)	1024 x 769	1024 x 808	576 x 432; 640 x 480; 1152 x 864; 1280 x 960	1024 x 826	1024 x 768	606 x 760	640 x 864
Pixel density available (in dpi)	73	85	36, 40, 72, 80	75	72	72	77
Vertical refresh rate available (in Hz)	78	60	70, 76	75	78	76	69
Antiglare treatment	no	no	yes	optional	no	yes	no
Virtual screen	Stepping Out II [2]	no	hardware	no	Stepping Out II	Stepping Out II	hardware
Tilt and/or swivel stand	yes	no	yes	yes	yes	yes	yes
Warranty period	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Extended warranty available	yes	yes	yes	yes	no	no	no
Special features for 512K, Plus, SE series							
Can use both screens	yes	yes	yes	yes	yes	yes	yes
Can adjust cursor crossover point	no	yes	yes	yes	yes	yes	yes
Position in relation to Mac	right	left	left	right or left	right or left	right or left	right or left
Can display same image on both screens	no	yes	no	yes	no	no	no

[1] *Macintosh 512K model also available.* [2] *For Macintosh II and SE/30 only.*

tors for the SE, such as the RasterOps ClearVue/SE and Taxan's Crystal View SE, can be used in tandem with the SE's screen; a few, such as Sigma Designs' L-View, turn off the SE screen. Since the SE screen is a worthwhile work area and a convenient place to park tear-off menus, tool palettes, and the like, you should avoid monitors that put it out of commission.

Flexibility in the placement of the external monitor in relation to the SE varies according to the monitor's utility software. With some, the crossover window (the area in which the cursor can move between monitors) is always on the left side of the SE screen and/or is fixed vertically; with others, the crossover area can be set either on the right or the left of the SE screen and adjusted up or down to conform to the actual position of the big monitor.

Finally, for those who want to use the larger screen for demonstrations, some external monitors, such as E-Machines' The Big Picture and RasterOps' ClearVue/SE, can display a blown-up duplicate of the image that's on the SE screen.

The Search for Perfection

Narrowing your choices by determining the optimum pixel density, pixel dimensions, and number of gray shades for your work is equivalent to selecting the right tool for the job. Now comes the hard part—determining which brand of tool feels right in your hand. The quality of the screen image is an essential part of that feeling. Image quality is an elusive beast, however, composed as it is of many different elements: focus, contrast, brightness, flicker, phosphor tint, freedom from flaws, and so on.

Perfection might be possible in monitors, but only the Pentagon would be willing or able to pay the price. Every monitor I looked at had some sort of visual flaw. The upper left corner was a common problem; it was almost always out of focus or bent out of shape to some degree (see "Distortion Displayed"). Some monitors displayed other flaws as well, such as squashed or fuzzy menu bars, kinks in straight lines, bowed or pinched borders, or black specks in the phosphor (the coating on the inside of the screen that creates the visual image). Some flaws, such as a fuzzy menu bar, are due to compromises made by the engineers, and are thus more or less characteristic of that model; other flaws, such as specks in the phosphor, may vary from monitor to monitor.

Since no Mac vendor makes the perfect monitor, you shouldn't waste time looking for one. Rather, you should search for the monitor with the fewest flaws, and make sure that what flaws there are won't eventually drive you crazy. I find a few black specks in the phosphor easy to over-

Radius	RasterOps	Sigma Designs	Sigma Designs	Taxan
Radius Two Page Display	ClearVue/II and SE	SilverView	PageView	Taxan Crystal View Display
$1990	$1995	$1999	$1399	$1699
$1990	not avail.	$1999	$1399	$1699
$1990	$1995	$1999	$1299	$1699
not avail.	not avail.	not avail.	not avail.	not avail.
landscape	landscape	landscape	portrait	landscape
19	19	21	15	19
14 x 10.7	13.9 x 10.4	16 x 12	8 x 10.7	14.2 x 10.7
1152 x 882	1024 x 768	1152 x 870	576 x 768; 640 x 870; 704 x 940	1024 x 768
82	72	72	72, 80, 88	72
71	72	73	80–97	78
no	no	no	optional	yes
no	no	no	no	no
yes	yes	yes	yes	yes
1 year	1 year	1 year	1 year	1 year
no	yes	no	no	yes
yes	yes	yes	yes	yes
yes	yes	no	no	no
right or left	right or left	right or left	right or left	right or left
yes	yes	no	no	no

look, while bends in what should be straight lines are maddening. Not one of the monitors I reviewed, however, had visual flaws so irritating that I ruled it out for that reason alone.

Large-screen monitors are rarely without other visual flaws, including problems with focus; edges and corners in particular are prone to fuzziness. In general, focus was uniformly excellent on the Apple displays (except for the Two-Page Monochrome Monitor) and on all the models for the Mac II by Radius, SuperMac, and RasterOps. Among the others, I found minor, and usually spotty, focus problems along the sides and the bottom, but because these areas usually contain page margins and scroll bars rather than vital information, a few fuzzy spots are acceptable. Watch out, however, for bands of fuzziness wider than 1/4 inch or so, and for fuzziness along the top of the screen. Although some people might consider it merely a cosmetic distraction, out-of-focus menu bars—such as those found in Taxan's Crystal View and the Apple Two-Page Monochrome Monitor—can be a major visual irritant.

The Quality of the Environment

The color of your office, the position of windows, the level of ambient light, whether or not other monitors will be attached to your Mac, and other aspects of your work environment need to be factored into your final decision as well. For example, consider antiglare treatment, which is included on some monitors and not on others. If you habitually wear white shirts and work in a brightly lit room, even the best antiglare treatment may not help much. On the other hand, if you usually wear dark colors and have some control over the lighting and physical arrangement of your work area, you may not need any antiglare treatment.

In favorable conditions such as low light, antiglare treatment can enhance contrast. Under unfavorable conditions (lots of light, lots of glare), antiglare treatment can reduce contrast. Under all conditions, antiglare treatment reduces brightness and often makes the screen image appear slightly unfocused. (Turning up the brightness to compensate can put the image even more out of focus.) If your work environment permits, I recommend that you eschew antiglare treatment, or at least avoid heavy-duty treatment such as that found on the Apple Two-Page Monochrome Monitor.

SuperMac Grayscale/Monochrome Display

No one argues with the need for good contrast (whiter whites and blacker blacks) and brightness (to avoid that washed-out look), and Macworld Labs' test results show which monitors come out on top in this regard (see "Comparing Contrast" and "Brightness"). But remember that the right brightness and contrast for one situation may be far more or far less than is needed in another. In general, if your workplace has low light levels, you won't need to crank the brightness and contrast up very high. If you use your monitor for, say, public demonstrations in brightly lit areas, you'll need all the brightness and contrast you can get.

One other point about brightness: monitors tend to decrease in brightness as time passes and the phosphor loses its youthful glow. If you buy a monitor whose brightness control can be turned up higher than you currently need, you'll be able to compensate for the monitor's inevitable senescence. If the monitor needs to be set

GRAY-SCALE MONITORS

Product	Apple Computer Portrait Display	Apple Computer High-Resolution Monochrome Monitor	Apple Computer Two-Page Monochrome Monitor	E-Machines QuickView Z21 IQ	Generation X GS II and GS 30	MegaGraphics MegaScreen 2008/3008	PCPC ShadowGraph
Price for Macintosh II series model	$1698 [1]	$1047 [2]	$2748 [3]	$3495	$1999	$2948	$2895
Price for Macintosh SE/30 model	not avail.	not avail.	not avail.	not avail.	$1999	$3198	$3495
Price for Macintosh SE model	not avail.	not avail.	not avail.	not avail.	not avail.	not avail.	not avail.
Price for Macintosh Plus model	not avail.	not avail.	not avail.	not avail.	not avail.	not avail.	not avail
Orientation	portrait	landscape	landscape	landscape	landscape	landscape	landscape
Diagonal size (in inches)	15	12	21	21	19	19	19
Active area (w x h, in inches)	7.8 x 11	8.4 x 6.3	15 x 11.3	16 x 12	14.2 X 10.7	13.6 x 10.7	14.2 x 10.7
Pixel dimensions available (w x h)	640 x 870	640 x 480	1152 x 870	1280 x 960 (at 80 dpi)	1024 X 768	1024 x 826	1024 x 768
Pixel density available (in dpi)	80	76	77	72, 80	72	75	72
Vertical refresh rate available (in Hz)	75	66.7	75	70, 76	75	69	60
Number of gray levels available	2, 4, 16	2, 4, 16, 256	2, 4, 16	2, 4, 16, 256	2, 4, 16, 256	2, 4, 16, 256	2, 4, 16, 256
Antiglare treatment	yes	yes	yes	yes	yes	optional	yes
Virtual screen	no	no	no	hardware	no	no	Stepping Out
Tilt and/or swivel stand	optional	optional	yes	yes	yes	yes	yes
Warranty period	3 months	3 months	3 months	1 year	1 year	1 year	1 year
Extended warranty available	no	no	no	yes	no	yes	no
Special features for 512K, Plus, SE series	n/a	n/a	n/a	n/a			
Can use both screens					yes	yes	yes
Can adjust cursor crossover point					no	yes	yes
Position in relation to Mac					right or left	right or left	right or left
Can display same image on both screens					no	yes	no

[1] $1099 for Macintosh IIci (board not required). [2] $399 for Macintosh IIci (board not required). [3] $2149 for Macintosh IIci (board not required).

at full brightness from the very beginning, however, there's no way you will be able to adjust it to be bright enough a year or two down the road.

Monochromatic Colors

Most phosphors for the Macintosh come in one of three different shades: blue (like Apple's monitors and the Nutmeg 19), paper white (SuperMac's Grayscale/Monochrome Display), and amber yellow (E-Machines' The Big Picture and Relax Technology's NEC Monograph system) (see "Phosphor Color"). Many Macintosh owners prefer the blue of the Mac Plus and SE screens because it is what they've grown accustomed to.

First-time monitor buyers, however, should know that people tend to find amber yellow phosphor more comfortable in incandescent light, and blue monitors more comfortable in fluorescent light. Also, if you are buying a second monitor, it's usually a good idea to stick with more or less the same color as your original monitor. Blue and amber yellow monitors look jarringly different when sitting side-by-side.

Persistence and Surge

A phosphor's persistence is the length of time it takes the phosphor to turn off; the longer the persistence, the more likely you are to see momentary ghosts of disappearing or moving objects. All monitors ghost to some extent, but under average lighting conditions, you shouldn't be aware of it. Apple monitors have the shortest persistence; if you work with animation or live-action video, these are good choices. In our tests the longest persistence was displayed by Sigma Designs' L-View and by E-Machines' The Big Picture. The latter displayed strong, sickly yellow ghosts whenever part of the screen switched from white to black. I would avoid The Big Picture for this reason alone. All the other monitors had acceptable persistences in between these two extremes.

All monitors also experience surge: a change in the linear dimensions of the active area, like a balloon suddenly inflating or deflating. Generally speaking, only people who perform graphics tasks involving frequent switching between largely black and largely white screens are likely to experience surge at its worst; if this describes what you do, you want to avoid monitors with high surge scores. (These include E-Machines' Z-21 and The Big Picture, MegaGraphics' 2001/3001, the Nutmeg 19, and the Radius Full Page Display.) On the other hand, I tested the Radius Full Page Display for several weeks in text-intensive work, and even though it has the worst surge-test scores, I hardly noticed the problem.

What You See Is What You Get

What you see on a monitor's screen is in some ways comparable to a motion picture; a sequence of dozens of images per second gives the impression

Radius	Relax Technology	Sigma Designs	Sigma Designs	SuperMac Technology
Radius Two Page Display	NEC Monograph System	SilverView	Monochrome L-View	Grayscale/ Monochrome Display
$3390	$1995	$2999	$2495	$3294
not avail.	not avail.	not avail.	$2495	not avail.
not avail.	not avail.	not avail.	$2395	not avail.
not avail.	not avail.	not avail.	not avail.	not avail.
landscape	square	landscape	landscape	landscape
19	16	21	19	19
14 x 10.7	10.2 x 10	16 x 12	14 x 10.1	13.9 x 10.3
1152 x 882	768 x 767	1152 x 870	1200 x 1664; 600 x 832	1024 x 768
82	72	72	60, 120	72
71	90	73	60	75
2, 16, 256	2, 4, 16, 256	2, 4, 16, 256	4	2, 4, 16, 256
no	yes	no	optional	yes
no	no	no	no	hardware
yes	yes	yes	yes	yes
1 year	1 year	1 year	1 year	1 year
no	no	no	no	no
n/a	n/a	n/a		n/a
			no	
			no	
			right or left	
			no	

The Radius monochrome and gray-scale Two Page Display

of a rock-solid display. The rate at which those images are flashed on the screen is called the vertical refresh rate; a rate of 74Hz, for example, means that 74 images per second are painted on the screen. If the refresh rate is too low, below 60Hz, the screen will seem to flicker, like an old-time movie. Above 65Hz, most people will see a steady screen without any flicker. What you see at rates between 60Hz and 65Hz depends on the acuity of your vision.

Screen flicker is, at best, a strain on the eyes and, at worst, a form of information-age torture. Nowadays, most monitors have refresh rates above 70Hz. But low-refresh-rate monitors do still exist, and you should reject them if you detect flicker. E-Machines' The Big Picture, PCPC's ShadowGraph, and Sigma Designs' L-View all have refresh rates of 60Hz, for example, and I detected enough flicker in all three to rule them out.

If you work primarily with words, be sure to compare text quality of different monitors. It's a little-known fact that individual pixels vary in size and shape from one brand of monitor to the next. Because body-text type is often composed of one- and two-pixel-wide strokes, this variation can have a significant effect on the appearance of type on screen.

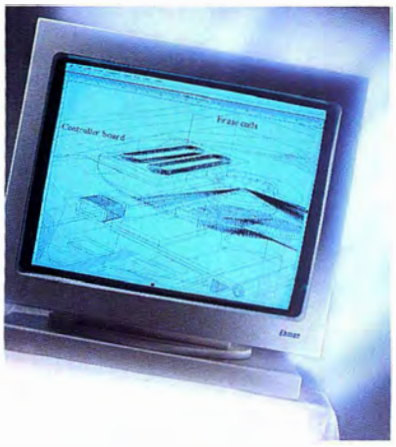
A comparison of Apple's Portrait Display and the Radius Full Page Display illustrates what I mean. New York font, a good all-around font for on-screen text work, looks spindly and anemic on the Apple monitor, and full and robust on the Radius. This difference was enough for me to strike the Apple monitor from my list.

Little (and Not So Little) Extras

Monitors differ significantly in the amount and quality of utility software they provide. Many monitors, such as those from Apple, are sold without software of any kind. Others, such as those from Radius and some models from E-Machines, include screen savers and utilities for tear-off menus, larger menu bars, automatic dialog-box centering, and more. Since utility software is not essential to the operation of the monitor and can even conflict with your existing INITs, it should figure little, if at all, in your buying decision. If the monitor you like best lacks utility software, you can easily buy a screen saver, tear-off menu utility, or whatever from a software company.

One especially useful capability for an external monitor is a virtual screen. With a virtual screen, the Macintosh is tricked into thinking that the active area is larger than it really is. When the cursor reaches the edge of the screen, the view automatically shifts to reveal the hidden part of the virtual screen. Several monitors, such as PCPC's ShadowGraph, Ehman's Two Page Monochrome Monitor, and the Nutmeg 19, come bundled with Berkeley Systems' virtual screen program, Stepping Out II.

Virtual screens are built into the hardware of other monitors. Hardware-based virtual screens do not use System RAM as software-based ones do and they usually allow smoother panning. Radius's Full Page Display (real resolution 640 by 864 pixels) offers a virtual resolution of 1024 by 864. SuperMac's Grayscale/Monochrome Display offers three virtual resolutions (at the expense of the number of gray levels), the largest being 4096 by 1536 pixels. And E-Machines' already large The Big Picture Z21 supports dozens



Ehman Two Page Monochrome Display

of different virtual resolutions, with sizes up to 10,240 by 960 pixels.

The Right Tool for the Job

We didn't use Price Waterhouse to tabulate the results, but the staff at Macworld Labs and I did choose our favorites, and I'll end the suspense and open the envelopes. Our picks are predicated on common tasks such as editing text and graphics as well as on our testing results.

For a full-page monitor, we preferred Radius's Full Page Display because of its superior text quality and sharp focus. We settled on two choices for a big-screen black-and-white monitor. MegaGraphics' MegaScreen 2001/3001 has a near-WYSIWYG pixel density of 75 dpi and performed consistently well, in our opinion. Radius's Two Page Display is the other big-screen favorite; it's the same size as the MegaScreen, but it displays a larger page area at a non-WYSIWYG 82 dpi. For a big-screen gray-scale monitor we also chose two. Again, one is the Radius Two Page Display, this time with a gray-scale board. The other is Sigma Designs' SilverView, a true WYSIWYG monitor (at 72 dpi), whose phosphor, unlike that of our other picks, is on the yellow side. Runners-up in the two big-screen categories include the RasterOps ClearVue and SuperMac's Grayscale/Monochrome Display.

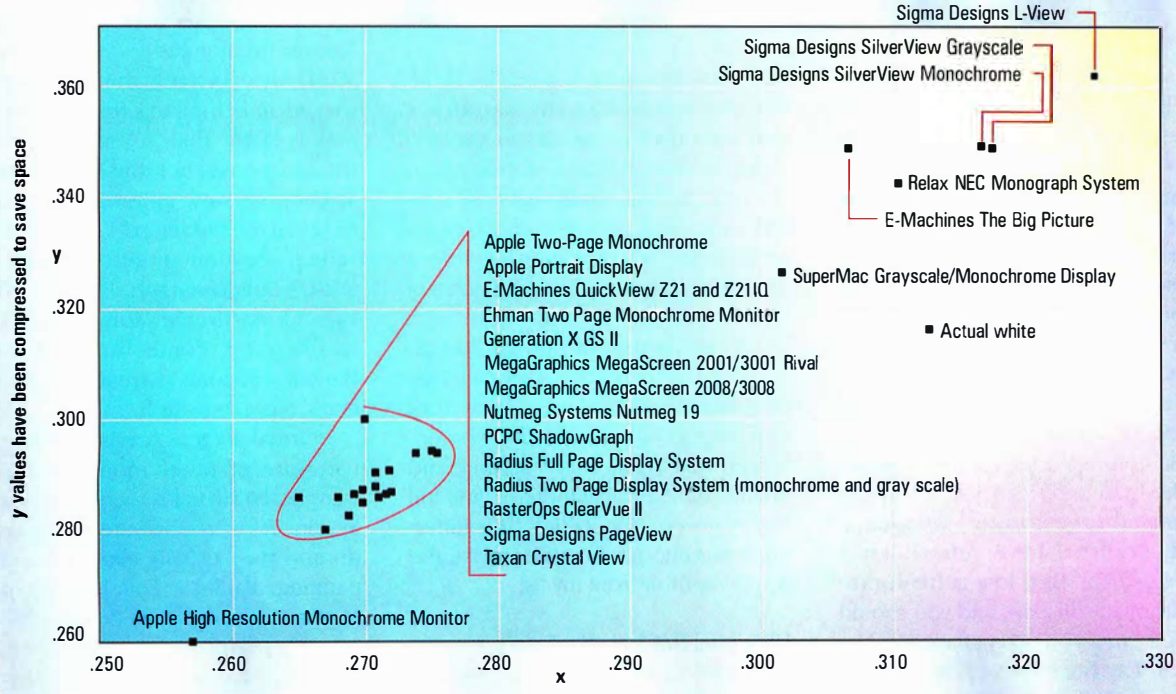
Finally, you may have noticed that I've said little about the price of monochrome monitors. Because you will have to live with your monitor day after day, possibly for many years, the choice has more to do with how well you work together than it does with money. If you buy a monitor primarily because it's inexpensive, one morning you may find yourself sitting opposite a monitor you can't stand to look at anymore. My advice is to save your eyesight and your sanity and hitch up with the right monitor the first time, even if it costs a bit more. M

See Where to Buy for contact information.

Robert C. Eckhardt *is a* Macworld *contributing editor, and author of* The Fully Powered Mac *(Brady Books, 1988) and* The FullWrite Professional Handbook *(Brady Books, 1989).*

PHOSPHOR COLOR

Measured as *x* and *y* coordinates on a detail of a standard CIE chromaticity diagram



Even though these are monochrome monitors, each has a distinctive tint. Blue is the color people are accustomed to seeing on a Mac's screen and is best in fluorescent light. Yellow is easier on the eyes in incandescent light. We used a Minolta TV Color Analyzer to test phosphor color.

GEEK CHIC

Preview Issue

When is a geek chic?

THE JOLT DIET

INTEGRATED FASHION CIRCUITS

BINARY LOGIC LINGO

UNMASKING THE TECHNO ELITE

MACWORLD PREVIEWS NEW SISTER PUBLICATION

Do you find the line between real life and science fiction blurring? Are you growing impatient with the transition from analog to digital? Do you wish you knew what "the rest of us" were doing, thinking, buying?

Finally, there's a weekly magazine dedicated to documenting the manners and tastes of those who boot up and log on daily. *Macworld* is proud to announce the launching of our new sister publication . . .

GEEK CHIC™

Just as the phonograph once shaped the aesthetic of an entire era, the personal computer promises to spawn a life-style all its own. "The geeks of today are the trendsetters of tomorrow," claim the founders of Harvard's Society of Nerds and Geeks (SONG). We couldn't have said it better ourselves.

The technology has cunningly woven itself into our social fabric. T-shirts, shoulder bags, and bumper stickers broadcast allegiance to user groups and software products. Casual conversations are peppered with a brand of technospeak that was once the hallmark of the electronic nerd or ham radio operator. Macintoshes appear as props in the trendiest sitcoms and advertisements. Geekdom unexpectedly finds itself stylish.

As a fascination with the accoutrements of computing eclipses the allure of the technology itself, we find a new aesthetic shaping our expectations. No longer satistifed with adding a new peripheral or a project-management application to our computing environment, we stroll the aisles of computer emporiums and thumb through mail-order catalogs looking for power, excitement, and peer approval. *GeekChic*™ is the atlas to aid us in navigating these uncharted electronic waters.

GeekChic™ will feature book and demo reviews, blow-by-blow accounts of all the major Mac-related court cases, and how-to articles covering topics such as applying faux finishes to your Mac and sewing custom dustcovers for hard-to-fit peripherals. We'll offer in-depth tip sheets for programs such as ResEdit, MacsBug, or MultiFinder. After each Mac trade show, we'll rank the promotional bags and badges and tell you which were most popular on the show floor. We'll critique the symposia and rate the nearby cafés and restaurants.

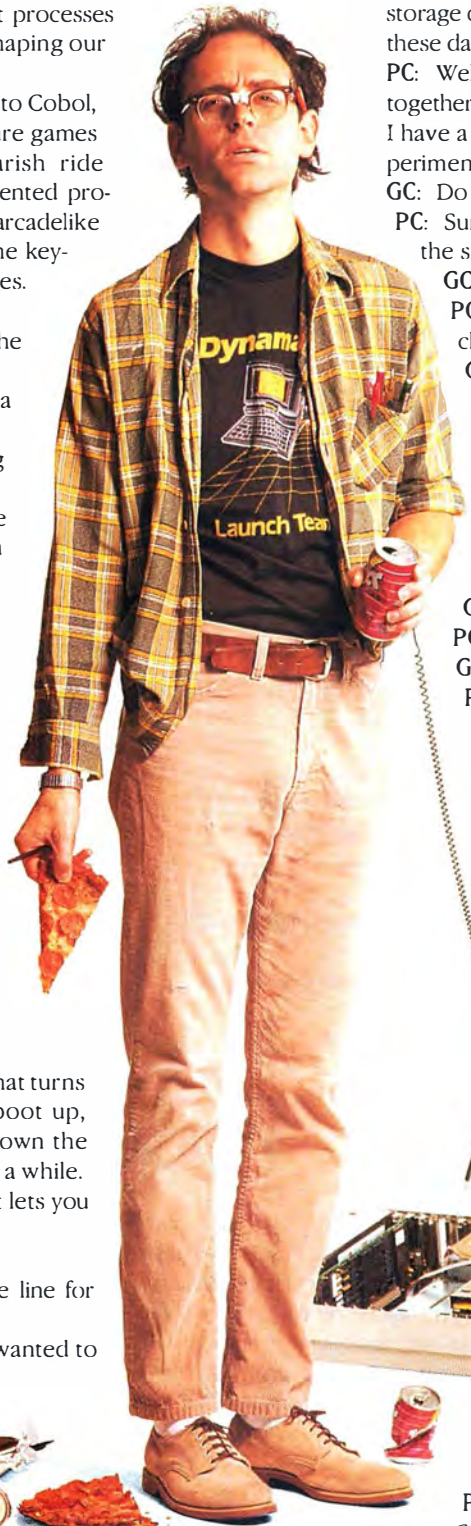
And each week you can look forward to our regular columns and departments. *Geek of the Week* offers profiles of movers and hackers within the Mac community. *GeekChicSpeak* will offer an illuminating collection of odd words, phrases, and acronyms. *Celebrity Makeovers* will turn famous users' Mac configurations into cutting-edge workstations. And finally, inspired by an article in *Cosmopolitan* magazine that dubbed the Boston Computer Society "one of the best places to meet men in Boston," we introduce our *Meet a Geek* personals column. Lonely readers will no longer need to look for companionship while dawdling over remaindered printed circuit boards from France.

If you've read this far, you're just the nineties sort of person we're looking for. Go on, admit it. You're *GeekChic*™. Whether you subscribe to our glossy hard-copy edition or to our electronic online version, we know you'll be glad you're keeping up with the geeks. And remember, if you subscribe to *GeekChic*™ before April 1, you could win big prizes.

GEEK OF THE WEEK

Geekness is a frame of mind. Some are born to it; others gravitate toward it. Each week we'll interview individuals who embody the geek ethos. We'll probe their bioROMs and offer insights into the thought processes of the users and shakers who are shaping our electronic environment.

Our first *Geek of the Week* is Plato Cobol, author of the ever-popular adventure games Windoids from Hell, a nightmarish ride through the brain of an object-oriented programmer, and Marching Ants, an arcadelike game with an add-on that allows the keyboard to carry small electrical charges.



GC: Hi Plato, thanks for taking the time to meet with us.

PC: Right, so let's hit it. I've got a killer deadline to meet.

GC: What project are you working on right now?

PC: Bomber Billiards. It's a game that combines flight simulation with 3-D billiards. We're going into beta right now. So far everyone who's seen it thinks it's the hottest thing since Tetris.

GC: Why do you think sports-simulation games are so popular with geeks?

PC: You don't have to wear special clothes, and most of us were never that good at the real thing anyway.

GC: You're a prolific programmer. What's your daily schedule like?

PC: Go to bed at dawn. Wake up at noon. Eat breakfast. Then work until dawn again.

GC: Breakfast is your only meal?

PC: Well, I wrote a little program that turns my coffee maker on whenever I boot up, and there's a Jolt Cola dispenser down the hall. I modem out for pizza once in a while.

GC: You know of a pizza place that lets you order via modem?

PC: Sure, it's called Big Bytes.

GC: Do you have a separate phone line for your modem?

PC: Of course. What if my mother wanted to link me?

GC: Your mother is a Mac user?

PC: She's a sysop for a BBS that lets subscribers play bingo online.

GC: You have quite a setup here. I see quite a few storage devices piled up here. What are you using these days?

PC: Well, I have three hard disks daisy-chained together—an old 40MB and two 100MB ones. Plus I have a tape drive for backup, and I've been experimenting with an erasable optical.

GC: Do you still run out of space?

PC: Sure. All my INITS and cdevs barely fit on the small drive.

GC: Do you beta test many programs?

PC: Yeah, what's it to you? I take nondisclosure pretty seriously.

GC: Sorry, didn't mean to pry. What's the first thing you do after installing a new application?

PC: Memorize the keyboard shortcuts.

GC: Have you ever borrowed or lent any pirated software?

PC: I thought we agreed that you wouldn't ask those kinds of questions.

GC: Sorry. What's your favorite program?

PC: MacsBug.

GC: What's your most prized possession?

PC: Well, that would have to be either my unmodified 128K or my HomeBrew Computer Club T-shirt.

GC: Do you back up regularly?

PC: Nah, backing up is for wimps.

GC: I see the complete set of *Inside Macintosh* on your shelves. Have you read them all?

PC: Read them? Hell, I've memorized every volume. Go on, ask me anything.

GC: No, no. I believe you. So how did you get started with the Mac?

PC: I wrote a fan letter to Steve Wozniak back in the old days. He invited me to drop by. It's been strict interface guidelines ever since.

GC: Ever been tempted to abandon the Mac for Jobs's black box?

PC: Naw, programming it is too easy.

GC: Well, Plato, I see we're nearly out of time. Thanks a lot for being our first *Geek of the Week* and good luck with Bomber Billiards.

PC: Yeah, right, so when do I get my *GeekChic*™ T-shirt?

PHOTOGRAPHS BY DAN ESCOBAR

GEEK CHIC Speak

The vernacular of geekdom can be disconcerting for the uninitiated. Readers of GeekChic™*, however, will no longer need to worry about confusing terms such as Boolean and bezier, grep and fetch, widow and orphan. In our* GeekChicSpeak *column, noted technolinguist William Satire will analyze the etymology of the terms that make up the lingua franca of the cybernetics set. After reading* GeekChicSpeak *for a few issues, you'll never again be caught speechless at a trade show or user-group meeting. To gauge your current grasp of the Mac's idiomatic argot, we've put together a quiz. Have fun and don't cheat.*

1. INIT
- a. member of Eskimo tribe
- b. small program launched at start-up
- c. shiny black insect that bites

2. RAM
- a. John Sculley's astrological sign
- b. random access memory
- c. member of Los Angeles football team

3. ISDN
- a. I Still Don't Know
- b. Integrated Services Digital Network
- c. InterStellar Dime Nickelodeon

4. hot link
- a. Cajun ground pork dish
- b. programming tie between applications
- c. secret KGB wiretapping device

5. terabyte
- a. popular name for pet snapping turtles
- b. one trillion bytes
- c. an alien in the 23rd "Star Trek" episode

6. SCSI port
- a. Fleet Week site
- b. small computer systems interface
- c. cheap after-dinner drink

7. MIDI
- a. below-the-knee fashion for women
- b. musical instrument digital interface
- c. Walter's surname

8. OOP
- a. surname of comic Neanderthal
- b. object-oriented programming
- c. what you say after locking yourself out

9. pixel
- a. small fairylike creature
- b. screen display unit
- c. hairstyle popular in the 1950s

10. alpha channel
- a. swimmer's ultimate challenge
- b. 8 extra bits in new QuickDraw
- c. noted Parisian perfume

11. QuickDraw
- a. Huckleberry Hound's cohort
- b. Apple's screen-imaging system
- c. left-brain enhancement technique

12. terminator
- a. Schwarzenegger's job description
- b. end of a SCSI connection
- c. author of dictionary

SCORING: Real geeks are so sure of themselves they wouldn't deign to check here; but give yourself an extra ten minutes with your favorite computer game for each *b* answer. If you answered more than two of the questions with an *a* or *c*, you definitely need to commit each week's *GeekChicSpeak* column to memory. Get smart. Subscribe to *GeekChic*™ now.

And remember, everyone who subscribes to *GeekChic*™ before April 1 will receive, absolutely free, Acronyms Dancing on the Head of a Pin, an animated HyperCard stack that indexes over 10,000 computer-related acronyms.

MEET A GEEK

After distributing pilot issues of *GeekChic*™ at a few of the finer Silicon Valley delicatessens, we discovered that one of the most popular sections was *Meet a Geek*. Readers submit listings to our personals column describing the contents of their System Folder, their backup routine, and their favorite clip art package; each hopeful was assigned one of our electronic-mailbox numbers. Dozens of readers too bashful or too busy to meet significant others through traditional mating services have found *Meet a Geek* the ideal forum for their romantic exchanges.

We are pleased to announce that one such couple, Bitsy Apda and Chip Simm, are now engaged to be married. "I didn't realize that love was just a 9600-baud modem away," says Bitsy, a programmer for a major database developer. She fell for Chip when she read the message he'd uploaded to her box number: "Hey, gigababe, why buy a generic OEM hard drive when, for a mere $300 extra, you can enjoy the prestige, security, and free coffee mug that comes with the same drive in a brand name box!" Chip, a WORM-drive developer, was intrigued when he heard that all of Bitsy's dreams adhered to Mac interface guidelines; and when she wrote that she wrapped her IIcx in a silver lamé cover, he just had to see it.

Talk about magneto-optical! Chip and Bitsy are definitely stuck on each other.

For their first date, Bitsy packed a romantic lunch for two in her Portable Mac case, and Chip arrived carrying a 24-bit printout of digitized roses. Both were wearing anti-radiation glasses and Screenscreen (a zinc oxide–like substance that guards against harsh monitor rays), and between them they were carrying several dozen floppies. The duo were so taken with each other that they began designing desktop-published wedding invitations on the spot.

Currently in the process of combining their extensive collections of Apple logo pins and badges, Bitsy and Chip look forward to uploading joint holiday greetings for many fiscal years to come.

WIN BIG PRIZES!!!

GeekChic™ isn't publishing yet, but prizes and bonuses await as soon as it does. In addition to the animated HyperCard stack, Acronyms Dancing on the Head of a Pin, readers will receive an official *GeekChic*™ T-shirt and their names will be entered in our *GeekChic*™ Sweepstakes. Three lucky winners will receive the ergonomically designed Keyboardion from Vapo-Matix. Besides easing repetitive-stress syndrome, the Keyboardion comes programmed to play several popular polkas. G

Writers interested in submitting articles to GeekChic™ *should send manuscripts with SASE to* GeekChic *editor Suzanne Stefanac.*

If you've read this far, you're our kind of reader. As with so many other products coveted by true geeks, ***GeekChic*** isn't shipping yet and, quite frankly, may never ship. Stay tuned for possible beta publication next April Fool's Day.

Sweepstakes Prize

Readers Will Wear This Shirt

Neither the magazine nor the T-shirt are available yet, but you can wear our ***GeekChic*** button. Just cut along the clotted line, back with double-sided tape, and wear with pride.

R
Royal
Adobe

by Erfert Fenton

FONTS BATTLE ROYAL

The impending release of Apple's Royal font format raises important questions for publishers and everyone else who uses Mac type. Does this challenge to the PostScript standard spell the beginning of chaos, or the end of a monopoly? A special report on the future of fonts.

Just when Mac publishers were getting the hang of PostScript fonts, Apple went and announced its own font format, dubbed Royal. Many Mac owners are confused by the prospect of dealing with two font formats. How do they differ? Will current PostScript fonts work with new Apple hardware and software? Will the new Apple fonts work with existing hardware and software? What if you already own a substantial library of PostScript typefaces—can you mix the two formats? If you're new to desktop publishing, should you put off buying typefaces and a printer until Apple's new format arrives?

In an attempt to answer these and other questions, I spoke recently with a number of type-industry experts, including the product manager of Apple's Imaging Systems Group, Jim Gable, and Kevin Wandryk, typographic business manager at Adobe Systems. Their analyses and comments help shed some light on what 1990 and beyond will hold for Mac publishers.

Font History: An Outline

For those who haven't kept up with last year's dramatic font developments, here's a synopsis. Despite a long-running lawsuit over interface design, when it comes to font technology Apple and Microsoft have decided to bury the hatchet. In this case, they've buried it in Adobe's back.

The first blow came in the spring of 1988, when Apple announced it would use its own screen-display software rather than licensing Adobe's Display PostScript, a technology that would have made PostScript the standard for both screen display and output. Then Apple announced plans to develop its own outline fonts instead of sticking with Adobe's PostScript font format. In the summer of 1989, Apple sold its considerable holding of Adobe stock. The coup de grace came at a press conference last September: Apple and Microsoft announced an alliance that teams Apple's new font

RON CHAN

technology with a PostScript-clone interpreter acquired by Microsoft. Apple's font technology will be incorporated in Microsoft's OS/2 Presentation Manager for screen display on IBM PCs and compatibles, and Microsoft's PostScript-clone interpreter will be included in future Apple laser printers. Because Microsoft and Apple now share a common font format, Mac and PC owners will be able to use the same font library and printers, resulting in greater compatibility between the two kinds of machines.

Keep in mind that Apple is not abandoning PostScript itself as a printing technology, but rather breaking free of Adobe's implementation of PostScript. The interpreter Microsoft purchased uses Adobe's PostScript language but was independently developed by Bauer Enterprises. Apple has diverged from PostScript as a font format, however; Royal employs Apple's own method of describing character outlines.

To understand these developments it's useful to take a look at the history of the Apple-Adobe relationship. When the Macintosh was introduced, desktop publishing didn't exist. Then came the LaserWriter, which, in the opinion of many, saved the Mac's bacon, transforming the Macintosh from a novelty into a tool for producing professional-quality type and graphics. The LaserWriter contains Adobe's proprietary PostScript interpreter—software that receives PostScript instructions from an application and translates them into instructions that tell a printer where to lay the dots that make up a printed page. The LaserWriter also contains a set of built-in PostScript fonts created by Adobe and optimized for printing at 300 dots per inch. To use the PostScript fonts and interpreter, Apple—and later other printer manufacturers—had to pay royalties to Adobe.

Not all printer companies wanted to pay Adobe royalties, however, so some struck out on their own and developed their own PostScript interpreters, which eventually appeared in the so-called PostScript-clone printers and imagesetters. The clone manufacturers had access to Adobe's PostScript specifications, which were published in Adobe's *PostScript Language Reference Manual*. But the book didn't tell developers everything; clone interpreters were in development for years. When the PostScript-clone developers finally got their printers to work, they wouldn't print Adobe fonts. Why not? Because Adobe's fonts are encrypted, which means that only printers with a true Adobe PostScript

Garamonds Galore

The faces on the left are printed at the relatively low resolution of 300 dpi, while the ones on the right are printed at 1270 dpi. The hints included in Type 1 faces improve their appearance somewhat on 300-dpi devices such as the LaserWriter, but this advantage disappears at higher resolutions.

Type 1 PostScript, 300 dpi

ADOBE GARAMOND

Garamonds Garamonds Garamonds

GARAMOND 3 (ADOBE)

Garamonds Garamonds Garamonds

STEMPEL GARAMOND (ADOBE)

Garamonds Garamonds Garamonds

Type 1 PostScript, 1270 dpi

ADOBE GARAMOND

Garamonds Garamonds Garamonds

GARAMOND 3 (ADOBE)

Garamonds Garamonds Garamonds

STEMPEL GARAMOND (ADOBE)

Garamonds Garamonds Garamonds

Type 3 PostScript, 300 dpi

GARAMOND ANTIQUA (AGFA COMPUGRAPHIC)

Garamonds Garamonds Garamonds

ITC GARAMOND BOOK (BITSTREAM)

Garamonds Garamonds Garamonds

SIMONCINI GARAMOND (THE FONT COMPANY)

Garamonds Garamonds Garamonds

Type 3 PostScript, 1270 dpi

GARAMOND ANTIQUA (AGFA COMPUGRAPHIC)

Garamonds Garamonds Garamonds

ITC GARAMOND BOOK (BITSTREAM)

Garamonds Garamonds Garamonds

SIMONCINI GARAMOND (THE FONT COMPANY)

Garamonds Garamonds Garamonds

interpreter can read them. Most printer companies got around this difficulty by using unencrypted fonts from font giant Bitstream.

Give Me a Hint

Printer manufacturers weren't the only ones who chose alternatives to paying for Adobe's technology. In addition to licensing its PostScript interpreter to printer manufacturers, Adobe also licenses its font-creation technology to type manufacturers, such as Agfa Compugraphic, Autologic, Linotype, Monotype, Morisawa, and Varityper.

Adobe and Adobe-licensee fonts are known to digital typographers as *Type 1* fonts. These fonts, in addition to being encrypted, include proprietary scaling algorithms known as *hints*. Adobe's hints optimize the appearance of printed characters, making minute adjustments to produce even stem weights, consistent character heights, and other characteristics that make type look good at low resolutions. Adobe's hints work in conjunction with a *rasterizer*, software that converts an outline into a printed bitmap.

Many type designers create *Type 3* fonts, which are PostScript fonts without Adobe's hinting or encryption. ("Whatever happened to Type 2?" you might ask. On Adobe's evolutionary tree Type 2 was a branch that died off when a proposed technology didn't pan out.) Some companies use their own font-creation software; others use Fontographer, a font-creation program from Altsys Corporation. Like Type 1 fonts, Type 3 fonts can be downloaded to a PostScript laser printer or imagesetter. While many Type 3 fonts don't look as crisp and clear as Adobe's hinted fonts when printed at low resolutions, the discrepancy disappears at high resolutions, where the grid of dots that makes up characters is composed of much smaller dots. (Note: Version 3.0 of Fontographer lets type designers add hints, but for the most part, the current crop of Type 3 fonts are unhinted.) "Garamonds Galore" compares Type 1 and Type 3 fonts printed at two different resolutions.

Some type designers—along with purveyors of Type 3 fonts, of course—contend that Adobe's hinting technology degrades the quality of traditional type designs because it regularizes letterforms, for example, making stem weights even when in some cases there *should* be subtle differences in weight. Adobe's Kevin Wandryk admits that some of Adobe's earliest typefaces may have erred on the side of character regularization but insists that current designs adhere as much as possible—within a digital format—to the original type designs. "There's nothing in our font technology that mandates overregularization," he says.

Some companies, such as Bitstream, use their own hinting strategies. Bitstream's *Type A* outline fonts, which are used with printers that employ Adobe's interpreter, don't include hints. Bitstream's *Type B* fonts, which are used with clone interpreters that employ Bitstream's Fontware scaling technology, include Bitstream's own hints; the company's *Type C* fonts, designed for PostScript-clone printers that use neither Adobe's nor Bitstream's scaling technology, contain no hints. Other companies argue that hints are unnecessary, since serious users will print final copy on high-resolution imagesetters and use 300-dpi printers mainly for proofing.

ROBERT HOLMGREN

When our fonts go into our new version of PostScript, they'll do anything PostScript fonts can do.

JIM GABLE
MANAGER, APPLE'S IMAGING SYSTEMS GROUP

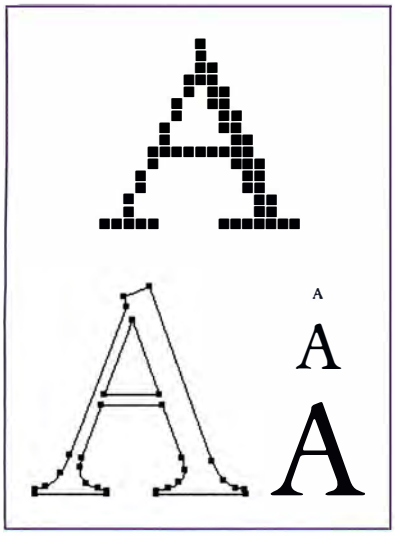
1 for All?

We'll see if any of Adobe's critics change their tune about the quality of Type 1 fonts when given the chance to create Type 1 fonts of their own. Last September, in a surprise response to the Apple-Microsoft announcements, Adobe declared that it would publish the specifications for Type 1 fonts, making these hitherto well-guarded secrets an option for any type designer—and theoretically making it possible for PostScript-clone printers to use Adobe's fonts. Keep in mind, however, that publishing the specifications is not the same as giving away source code; developers will still have to do some work. Likewise, Adobe is not giving away the code for its rasterizer program. Adobe's chairman, John Warnock, compared the publication of the Type 1 specs to giving auto manufacturers the parts list for a Ferrari and leaving it up to them to figure out how to build the car.

Therefore, even after the Type 1 specs are published, Adobe will continue to license its Type 1 font-creation tools to interested type houses. So Adobe hasn't provided a completely open format, but it has opened the door a crack. Publishing the Type 1 specs now may turn out to be too little too late; a major selling point to developers considering Royal is that Apple's font format, unlike Adobe's, is completely open. Apple will provide the specifications for Royal fonts in the System 7.0 developers' notes. (For a preview of System 7.0, see *Macworld*, August 1989.)

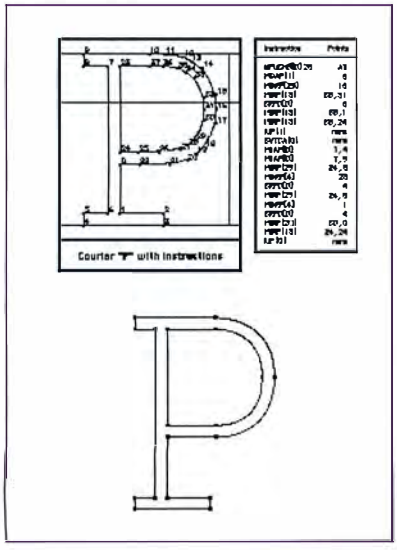
Royal Revealed

So, what is the Royal format? Basically, Royal fonts are outline fonts, as are the PostScript fonts you print on a LaserWriter today. Each character is made up of a series of lines, curves, and control points that describe its shape. As with current PostScript fonts,



Bitmaps versus Outlines

A bitmapped font is made up of a pattern of dots, while an outline font is made up of a series of bezier curves. Both Royal and PostScript fonts are outline fonts. Since an outline is a mathematical description of a character's shape, rather than a static pattern of dots, an outline can be scaled to virtually any size and maintain its shape. Outline fonts actually end up as bitmaps when they're printed, but the individual dots (typically 300 to 2540 per inch) are too small to be seen.



Inside Outlines

Each character in Apple's Royal format (top) has a series of attached instructions that optimize its appearance at various resolutions. Note that the quadratic curves that make up the Royal character require more control points than the cubic curves that make up a PostScript character (bottom). (I've dissected a Type 3 font here, since Adobe's character outlines are encrypted.)

a single outline definition can be scaled to any size for printing (see "Bitmaps versus Outlines"). System 7.0 will use Royal outlines to generate screen fonts on the fly, doing away with the need to install screen fonts in various sizes.

To appreciate the implications of this, let's briefly review how fonts work today. In the simplest scenario, when you're printing on a dot matrix printer such as the ImageWriter, you use only bitmapped fonts. You use Apple's Font/DA Mover, which places fonts in the System file where they'll be available to all applications, to install as many sizes of bitmapped screen fonts as you wish to print.

Let's say, for example, that you want to print a document in 12-point Bitstream Charter on an ImageWriter, which is a QuickDraw printer. If you wish, you can install only the 12-point screen font and simply print it out dot-for-dot as it appears on the Mac's screen, which has a resolution of 72 dpi. For better quality, however, you can also install a screen font that's twice the size you want to print—24-point in this example. The ImageWriter scales down the larger size to print at a resolution of 144 dpi, producing better-looking characters than those printed at 72 dpi.

But let's say you want to print 14-point text. If you install a 14-point font for the screen display—and a 28-point screen font for printing at the higher resolution—all is well. But as it turns out, Bitstream doesn't supply a 28-point screen font in its MacFontware packages. Now, let's suppose you want to print 16-point text on the ImageWriter. Alas, Bitstream doesn't supply a 16-point screen font (nor do most font vendors, since 16-point isn't considered a common size). If you select the 16-point size option in a word processor or other application, the Mac's QuickDraw algorithms will do their best to scale the characters to 16-point, but the quality won't be very good. Therein lies a fundamental problem of bitmapped printing under the current scheme of things: if a font vendor doesn't supply a handcrafted version of a bitmapped font, you're out of luck.

Similar sizing dilemmas apply to other QuickDraw-based printers. To print high-quality text on Apple's ImageWriter LQ, you have to install a screen font that's three times the size you want to print. For the LaserWriter IISC, you have to install a font that's four times the size of the printed font. Again, you're faced with the chore of installing the correct sizes of screen fonts, each of which eats up precious disk space.

According to Apple's Jim Gable, System 7.0 will do away with the muss and fuss of installing screen fonts with the Font/DA mover. You'll be able to simply drag a font icon into the System Folder, and System 7.0 will automatically create readable screen fonts at any size. (Gable claims this method has the added bonus of eliminating those pesky font ID number conflicts that have plagued power publishers in the past.) And you'll be able to print good-looking text on QuickDraw-based printers without having to worry about which sizes to install.

In addition to simplifying screen display and QuickDraw-based printing, Royal font outlines will also be used to print high-quality text on Apple's PostScript-clone printer (or PostScript-compatible printer, as they prefer to call it), just like PostScript fonts are used with today's Adobe PostScript printers. The character outlines will be scaled and printed at any size your application supports, be it 7.5-point or 75-point text.

Although Royal and PostScript fonts are both outline fonts, there are some differences between the two formats. For example, Royal fonts are made up of *quadratic curves,* while PostScript font outlines are composed of *cubic curves,* which require fewer control points to define a character's shape. According to Gable, the mathematics used to scale and transform (rotate, stretch, and so on) quadratic curves is simpler, and hence faster, than the math used for cubic curves. On the other hand, since quadratic curves use more control points, Royal outline files will be larger than their PostScript counterparts (not much larger, asserts Gable). For a side-by-side look at the points and curves that make up a Royal character and a PostScript character, see "Inside Outlines."

Another difference between PostScript and Royal fonts is in where you find a font's intelligence—the instruc-

tions that tell a printer which dots to fill in at various sizes and resolutions. Apple has chosen to build Royal's intelligence into the font itself; each character has a set of hinting instructions attached to it. "All the hard work happens in the font instructions," says Gable, "rather than at scan-conversion time [when instructions are sent to a printer]. Once the instructions are done, the pixels are filled in very quickly." Developers can choose how sophisticated they want to make their hints; high-level hints will most likely increase processing time. How the overall display and printing speed of Royal fonts compares to that of PostScript fonts remains to be seen.

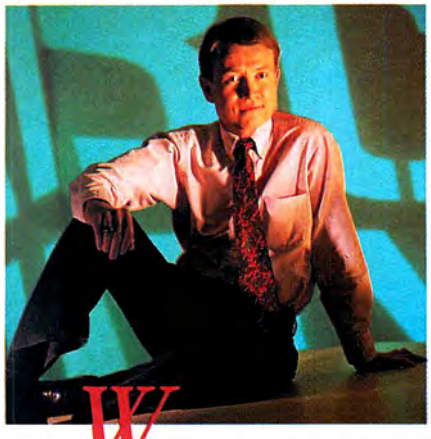
Adobe's approach, on the other hand, is to put most of the scaling intelligence in the rasterizer. According to Kevin Wandryk, "We think that font designers' concerns are twofold: they're interested in the shape of a character and in how it's spaced relative to other characters. Learning a programming language to make characters shouldn't be the font designer's concern. Besides, when you put the intelligence in the rasterizer, the technology behind rasterizing can get better and better and the font data doesn't have to change."

But Why a New Format?

Font format philosophizing is interesting, but it doesn't explain why Apple chose to forsake Adobe, especially for such a strange bedfellow as Microsoft. "The Microsoft agreement is really a technology exchange: our fonts for their PostScript," says Gable. "The benefit is that with a version of PostScript that has our fonts, not only will Apple be able to make better PostScript printers in the future, but we expect that third parties who license from Microsoft will also be able to make better PostScript printers for the Mac." In other words, Apple had a font format and Microsoft had a PostScript clone, and the result was a marriage of convenience.

But Adobe's PostScript is a good printing solution, not to mention a well-entrenched standard. If it ain't broke, why fix it? Despite talk on Apple's part of improving quality and speed, most people agree that the real reason comes down to money—it's a matter of Royal versus royalties. In combination with the Microsoft clone, the new font format is a way to get around the fees Adobe charges for its technology.

"I don't think anybody likes monopolies," says Louise Domenitz, Bitstream's director of corporate communications. "I think it's good that there's a second option in terms of an imaging model that incorporates attention to typographical needs. At first glance, it may seem like now there's something else to deal with—but I think what Apple is trying to do is raise the bottom line. Royal is a sophisticated format that allows for the preservation of typographic quality."



ROBERT HOLMGREN

We think that because of the expertise we've gained over the last five or six years, Adobe will be able to compete based on the quality of our implementation of both PostScript and PostScript fonts.

KEVIN WANDRYK
TYPOGRAPHIC BUSINESS MANAGER, ADOBE

Agfa Compugraphic's marketing director Dan Richards is more straightforward in his assessment of Apple's decision. "I think Apple's saying to the world in general—and especially to Adobe—'We're not going to pay these high royalties to get a device. Not only are we not going to pay on the printer end, but we're not going to pay on the font end. And this is our answer because Adobe won't open up its technology.'"

Richards predicts that the price of both type and printers will fall as a result of increased competition. "Royal fonts will be considerably less expensive than current PostScript fonts because you won't have any royalties attached to them. And Adobe's font prices will probably drop as a result." As for printers, "It will be like the IBM PC all over again—someone comes out with a standard and everyone keeps doing it one better, and pretty soon it's the clones that are making all the money, not the originator. Adobe's PostScript will continue to be a standard, but I think in three to five years the clones will have more of the market than Adobe."

Not everyone is happy with Apple's introduction of a new format, however. Paul Beyer, the owner of a design and production company and a member of the board of the New York Professional PostScript Users Group, feels that introducing a new standard will slow down the improvement of the previous standard. "As a graphic designer and a user of high-level imaging technology, I have absolutely no interest in Royal," says Beyer. "Apple has dollar signs in its eyes; what this format allows Apple to do is bring a whole lower end to the PostScript market. They haven't penetrated a large part of the office market because their output devices have generally been too expensive. The technology exchange with Microsoft opens up a larger market by introducing a new PostScript standard—or PostScript deviation, I should say."

Beyer feels that because developers will have to learn a new format, fewer resources will be devoted to improving Adobe's PostScript. "Many of the commercial projects I take on really push the technology. We were getting to the point where we were starting to approach the capabilities

SETH RESNICK

From our point of view, you can get significantly improved typography using the Royal technology, rather than Adobe's technology.

ROB FRIEDMAN
PRESIDENT, BITSTREAM

of the high-end prepress systems. The Apple-Microsoft pact throws a monkey wrench in there. I have a system that works now; I don't want to take five steps backward and wait for Royal to catch up."

Adobe's Intermediate Solution

While Royal and System 7.0 have their proponents, the fact is neither is available now (at this writing, System 7.0 was reportedly scheduled for release in the late spring). Nor are the promised legions of Royal-format fonts here yet. And Jim Gable wouldn't comment on when we would be likely to see printers that include Microsoft's interpreter, either from Apple or from other companies.

In the meantime, Adobe hasn't been idle. Adobe Type Manager (ATM) has given us all a peek at what life will be like for all font users when System 7.0 arrives. (I'll describe the basics of ATM here; for a more detailed description, see the review in the February issue of *Macworld*.) Remember the earlier discussion of installing scads of screen font sizes for readable screen display and presentable printing? Well, Adobe's handy utility does away with all that. ATM takes scaling information from Type 1 PostScript fonts and applies it to characters displayed on the screen, producing sharp, legible type at virtually any size on the screen, as well as on QuickDraw printers (see "The Shape of Characters to Come").

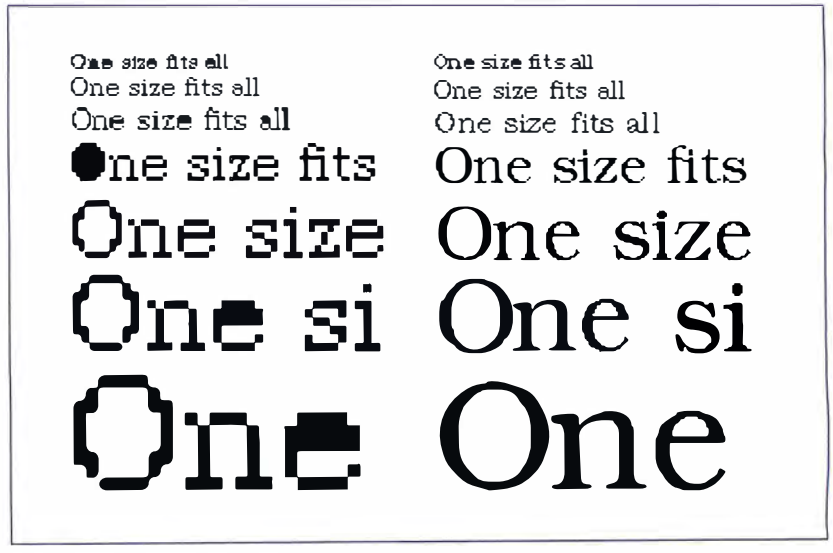
To use ATM, you install it as a cdev (Control Panel device) and drag the outline fonts you want to use into the System Folder. You need to install only a single screen font for each typeface, and ATM automatically scales screen fonts to whatever size you specify. The results are impressive, both on screen and on paper. The $99 utility includes four font families: Times, Helvetica, Courier, and Symbol. A $198 add-on package offers seven additional families. You aren't limited to this selection, however; ATM works with any Type 1 PostScript font.

System 7.0's font scaling has the additional advantages of not being limited to Type 1 fonts and of being built into the Mac's system software. On the other hand, System 7.0 will require 2 megabytes of memory to run. Adobe Type Manager not only requires just 1MB to run, but it's up and running *now*, two decided points in its favor. (At least one company isn't waiting around for Adobe to publish its Type 1 specs in order to offer ATM-compatible fonts. The Font Company claims to have created Type 1 fonts without the benefit of Adobe's specs; according to a Font Company representative, these new fonts work with Adobe Type Manager.)

Apple or Adobe—or Both?

Despite the Apple-Microsoft pact, Adobe's PostScript isn't about to dry up and blow away. PostScript is built into printing devices from dozens of companies and is the format for hundreds of typeface families from numerous manufacturers. So it looks as if we'll be stuck with two standards.

Many Mac owners are dismayed by the prospect of two font standards, but compared to the current labyrinth of font formats, a mere double standard may not be so bad. Right now, we've got bitmapped fonts, outline fonts, PostScript printer fonts, QuickDraw printers with bitmapped fonts, and QuickDraw printers (from GCC) with outline fonts. There are fonts that work only in LetraStudio and fonts that work only on specific printers. Apple's



The Shape of Characters to Come

Adobe Type Manager (right) vastly improves the appearance of displayed text, as well as text printed on QuickDraw-based printers. System 7.0 will also scale displayed characters automatically, saving you the trouble of installing numerous sizes of screen fonts.

Jim Gable admits, "Frankly, [fonts] are kind of a mess. Professional users are used to it, but new users can't figure this stuff out. I think it's going to be better to have two formats than to have six or seven."

Since PostScript is here to stay, how will users cope with the existence of two formats? Once the dust settles, you'll be able to choose which format suits you—or possibly even opt for both formats.

Gable assured me that "one objective of System 7 is to be backward-compatible. The way System 7 is built, all the old font structures and printing structures are still there, and we have new ones next to them. We can guarantee that PostScript fonts will work the way they do today."

Gable also claimed Royal fonts will work with existing printers—including PostScript printers—although he was unable to explain exactly how. "Apple's engineers are looking at different options. Basically, we'll do a translation in the Macintosh and send out whatever kind of font a given printer can understand. The techniques for conversion will vary, but in general we're doing it in our printer drivers." In addition to Apple's efforts, Adobe is working on a utility that converts Royal fonts to PostScript for printing.

According to Gable, "If you go out and buy a font in the new format from, say, Linotype, we want you to feel comfortable that it will print to any printer—a PostScript printer, a ColorQuick printer from Tektronix, a film recorder from Mirus . . . one font does it all. We're doing things in our printer drivers where we need to, and in the System itself where we need to, in order to make fonts work on everything from the least expensive to the most expensive machines."

Although PostScript fonts will work as they do now, whether ATM—which apparently plays a little loose with Apple's developer guidelines—will work under System 7.0 remains to be seen. "ATM is kind of a ringer," says Gable, "and we don't really know too much about how it works. Our solution for ATM is that we're going to seed Adobe [with the new System] like we seed everybody else, and then they can revise ATM to work under System 7." In other words, it will work if Adobe can make it work.

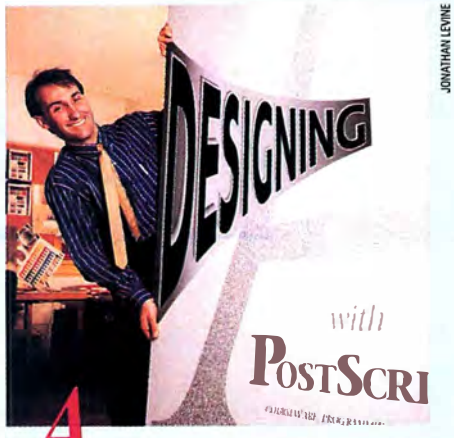
Other compatibility questions arise. For example, will PostScript fonts print on the new Apple-Microsoft clone printers? Don't bet on it. Also in the realm of speculation is whether Royal fonts will work with other PostScript-clone printers and typesetters, programs such as PageMaker that use their own printer drivers, and PostScript graphics programs such as Aldus FreeHand and Adobe Illustrator. According to Gable, Royal theoretically poses no problem for any of these. We'll have to wait until later this year to see how well theory translates to reality.

How Royal fonts will compare to PostScript fonts with respect to such attributes as the file size, display speed, and printing speed remains to be seen, since only prototypes of Royal fonts exist at this writing. Quality will also have to be judged later. And quality may well vary from one type vendor to another; Apple is providing third parties with what developers generally acknowledge to be excellent font-making tools, but it is up to type manufacturers to use the tools to their potential. As Adobe's Wandryk points out, "The companies who are fastest in getting fonts to market may do so at the expense of quality."

Although Gable refused to comment on future Apple printers, he claimed that "when Apple's fonts go into our new version of PostScript, they'll do anything PostScript fonts can do."

A bold claim indeed, and at this point I have to agree with Adobe cofounder John Warnock that Apple and Microsoft "had better put up or shut up." Apple's new hardware and software is still under development, while PostScript is alive and well. If you are considering investing in fonts, PostScript is still the way to go—unless you've got plenty of time to wait. The number of PostScript fonts continues to mushroom and ATM provides a great step forward in convenience. (Look in *Where to Buy* under "Fonts" for a list of PostScript type vendors.)

With any luck, the font wars won't cause too many civilian casualties. Despite their differences, it's in neither Apple's nor Adobe's best interest to make things hard on the user. And despite the current confusion, Mac users may actually profit from the font feud. In the best-case scenario, the number of available faces will go up and competition will drive font and printer prices down. As they say, stay tuned for further details. M



As a designer, what I want is better output, better color, and a better technology base for PostScript. That's not going to happen if developers focus their energies on what's already been done. Anybody who's got a significant investment in PostScript technology stands a large chance of being hurt by what Apple and Microsoft are doing.

PAUL BEYER
PRESIDENT, NEW YORK PROFESSIONAL POSTSCRIPT USERS GROUP

Erfert Fenton *is a* Macworld *contributing editor and the author of* The Macintosh Font Book *(Peachpit Press, 1989).*

More For Your Memory

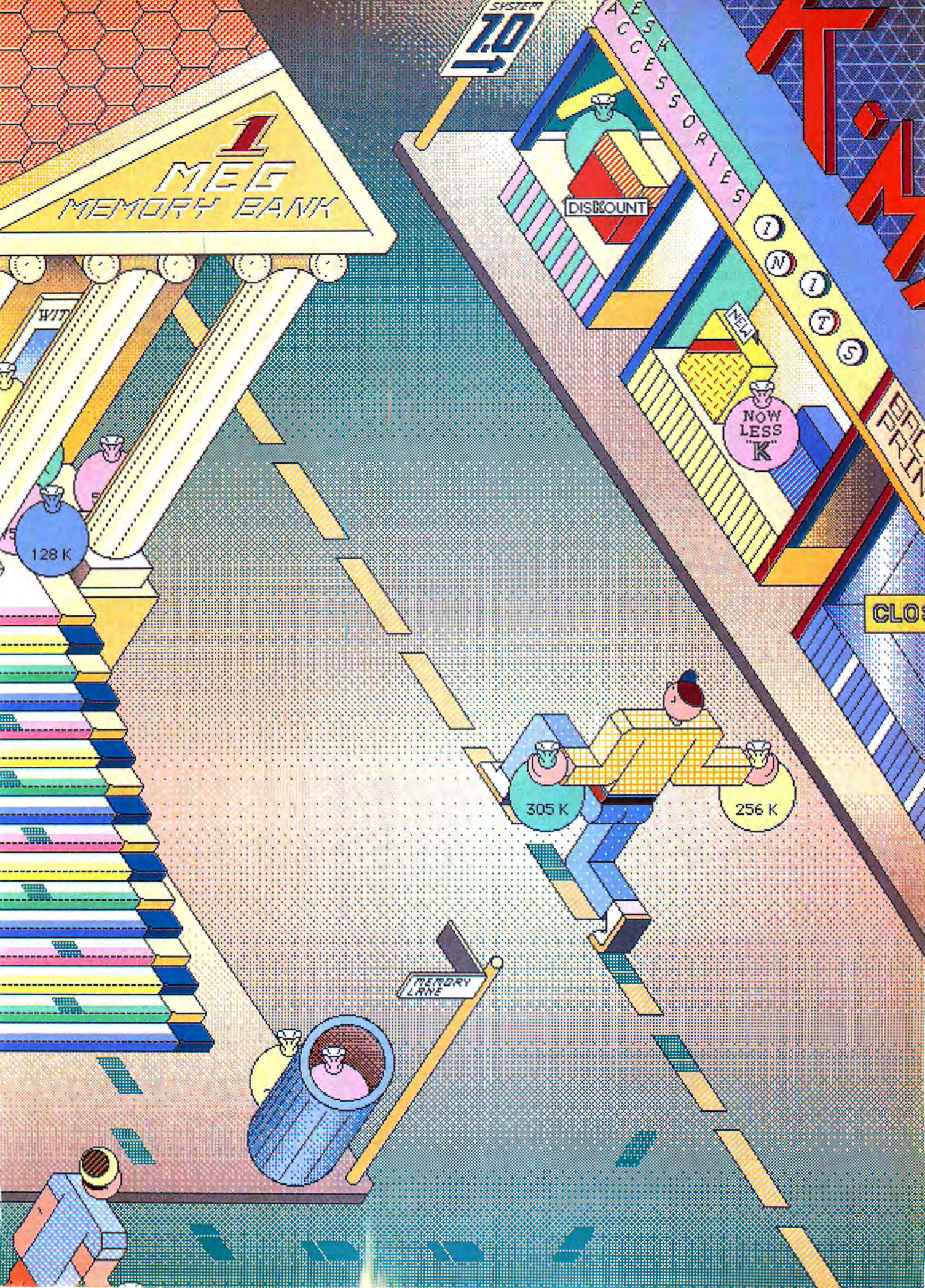
Tips and strategies for getting the most from the Mac's memory

Memory is like money: you can't have too much and you never seem to have enough. Where money is concerned, that means living within your means—scrimping instead of splurging, window shopping instead of store hopping, and choosing discounts over Dior.

Ditto with memory. You may long to run the latest designer programs, but if your Mac has only a megabyte or two of memory, they may not fit your memory budget. Time was when 1MB was a fortune you couldn't spend in a lifetime. Today, it's lunch money.

Blame it on software inflation. Today's applications are larger and more complex than yesterday's. They do more, but they need more room to do it. The Mac's system software is growing, too, as it keeps pace with increasingly complex hardware. When System 7.0 arrives this year, you'll need 2MB to run it.

by Jim Heid


1 MEG MEMORY BANK
SYSTEM 1.0
DESK ACCESSORIES
DISKOUNT
NEW
NOW LESS "K"
128 K
305 K
256 K
MEMORY LANE

As applications that take full advantage of System 7.0's features appear, 4MB may become cramped. The more you have, the more you want.

Although memory-chip prices are falling, thousands of Macs are still running with only 1MB in their bank account. And not just Pluses and SEs, either. The pricey Macintosh Portable includes a mere megabyte and it has champagne tastes, requiring exotic static RAM chips that cost $649 per megabyte.

How do you keep a 1MB Mac alive in a multimegabyte world? By fine-tuning your system and your software to get the most out of the memory you have. The techniques I'll describe here work on Macs of all sizes, so you owners of multimegabyte machines can benefit, too. For an introduction to basic memory terms and concepts, see "Getting Started with Memory," in this issue.

System Software: Supporting the Bureaucracy

Just as part of your income goes to supporting the government, part of a Mac's memory goes to accommodating the fundamental software required to run the Mac. If you are running MultiFinder on a 1MB Mac, you're in the 40 percent tax bracket: of your 1MB, only about 600K remains free for your own use.

But as any clever taxpayer knows, you can control how much you pay. Here are several loopholes that can lower your system software tax.

- Don't use MultiFinder. Use the Finder's Set Startup command to specify that the Mac start up with the Finder instead. You'll gain an extra 160K of memory—enough to allow a 1MB Mac to run memory lovers like HyperCard, Ashton-Tate's Full Impact, Letraset's ImageStudio, and Farallon's SoundEdit. And if you equip your Apple menu with a selection of desk accessories, you'll minimize application switching and still be able to do a few things at once.
- Disable background printing. PrintMonitor, a small application in the System Folder, lets you use MultiFinder to print to a LaserWriter in the background, but PrintMonitor requires 72K. If you can't do without MultiFinder, you can at least reclaim 72K when printing by using the Chooser to disable background printing. This also prevents the "There is insufficient memory to print at this time" message, which PrintMonitor displays when there isn't room for it to run.
- Open desk accessories in an application layer. When you open a desk accessory while using MultiFinder, the Mac loads a system file called DA Handler, which uses about 18K and provides a layer in which desk accessories run. If you're low on memory, press the Option key while choosing the desk accessory's name from the Apple menu. This bypasses DA Handler and opens the desk accessory within the current application's layer. Another plus: the accessory opens faster since the Mac doesn't have to load DA Handler.
- Don't use a disk cache. The Control Panel's RAM cache option boosts performance but uses memory. After turning off the RAM cache, restart the Mac to put the change into effect.
- Use the appropriate system software version. By running the system version Apple recommends for your Mac, you won't waste memory on system routines the Mac doesn't need (see "What's Your Version Number?"). This is especially important for elderly Macs such as the 512K and 512K Enhanced. For example, if you start a 512KE with a System 6.0 disk, you'll have a scant 170K free. Start the same Mac with a System 3.2 disk—the version Apple recommends for that machine—and you'll have 274K free.
- Consider using an older version of the System. Recent versions use more memory than older ones. You can save some memory by using an older version—provided it's compatible with your Mac. For example, System 6.0.2 leaves about 647K free on a 1MB SE, but System 4.1 (released in April 1987) leaves 724K free. But be forewarned: you may not be able to run recent applications that require the latest System. Check your programs' manuals to see which version they require, and use this technique as a last resort only. Finally, be sure to use all the system files that accompanied the older version. For example, don't replace a newer version of the System file with an older version without replacing the Finder file, too.

INITS: Luxuries That'll Cost You

Everyone likes to splurge on a luxury item now and then. But luxuries do erode the bank balance, meaning that there's less left over for necessities. INITs—pieces of software that load when the Mac starts up—are the luxury items of the Mac world. They enhance the Mac's operation by providing such features as electronic mail and customized keyboard shortcuts

THE PRICE OF LUXURY

INIT Name	Developer	Purpose	Memory Used
TOPS 2.1	Sun Microsystems	Network file server	110K
Timbuktu 3.0	Farallon Computing	Network remote control	107K
QuickMail 2.0	CE Software	Network electronic mail	82K
Microsoft Mail 2.0	Microsoft	Network electronic mail	80K
MacroMaker 1.0.1	Apple Computer	Mouse and keyboard automation	50K
MasterJuggler 1.5	ALSoft	System resource management	48K
QuicKeys 1.2	CE Software	Mouse and keyboard automation	33K
Tempo II 1.02	Affinity Microsystems	Mouse and keyboard automation	25K
Shortcut 1.0	Aladdin Systems	File locater	20K
SuperLaserSpool 2.0	SuperMac Technology	Print spooler	16K
AppleShare 2.0.1	Apple Computer	Network file server access	15K
Suitcase II 1.2	Fifth Generation Systems	System resource management	12K
Pyro 3.0	Fifth Generation Systems	Screen blanker	3K
SuperClock 3.3	Steve Christensen	Menu bar clock and stopwatch	2K
Capture 2.0	Mainstay	Screen image capture	2K
Easy Access 1.0	Apple Computer	Keyboard control of pointer	1K

(see "Start with Utilities," *Macworld,* October 1989, and "Getting Started with Utilities," February 1990). But every INIT you use reduces the memory available for applications.

Here are some ways you can balance an appetite for luxuries against the need to pay the bills.

- Think twice about running memory-hungry INITs on a 1MB system. Examples of such INITs include system resource managers such as Suitcase II and MasterJuggler, electronic mail software such as QuickMail and Microsoft Mail, and network software like TOPS and Timbuktu. If you can't live without one or more of these products, you'll almost certainly need to forgo MultiFinder to avoid going broke. Even then, you'll need to limit yourself to applications that use memory sparingly. "The Price of Luxury" lists the memory requirements of numerous INITs.
- Disable one or more INITs when you need extra memory. One way is to open the System Folder and drag the INITs out onto the desktop (not to the Trash). To tell the INITs apart from the other System Folder files, use the Finder's By Kind command; each INIT is labeled as a Startup document. Restart the Mac after dragging the INITs out of the System Folder.

For an easier way to disable INITs, use an INIT-management utility such as CE Software's Aask (part of the MockPackage Plus Utilities collection), Microseeds Publishing's INITPicker, or Natural Intelligence's Inix (see *Reviews, Macworld,* October 1989). Aask displays the approximate amount of memory required by each INIT, making it easy to determine which ones are worth disabling.

WHAT'S YOUR VERSION NUMBER?

Macintosh Model	Recommended Versions	Acceptable
128K	System 2.0/Finder 4.1	
512K	System 3.2/Finder 5.3	
512KE	System 3.2/Finder 5.3	System 4.0/Finder 5.4
	System 3.3/Finder 5.4	System 4.1/Finder 5.5
	System 3.4/Finder 6.1 (for use with AppleShare)	
Plus	System 6.0.2/Finder 6.1	System 3.2/Finder 5.3
	System 6.0.3/Finder 6.1	System 3.3/Finder 5.4
	System 6.0.4/Finder 6.1	System 4.0/Finder 5.4
		System 4.1/Finder 5.5
		System 4.2/Finder 6.0
SE	System 6.0.2/Finder 6.1	System 4.0/Finder 5.4
	System 6.0.3/Finder 6.1	System 4.1/Finder 5.5
	System 6.0.4/Finder 6.1	System 4.2/Finder 6.0
SE/30	System 6.0.3/Finder 6.1	
	System 6.0.4/Finder 6.1	
II	System 6.0.2/Finder 6.1	System 4.1/Finder 5.5
	System 6.0.3/Finder 6.1	System 4.2/Finder 6.0
	System 6.0.4/Finder 6.1	
IIx	System 6.0.3/Finder 6.1	
	System 6.0.4/Finder 6.1	
IIcx	System 6.0.3/Finder 6.1	
	System 6.0.4/Finder 6.1	
IIci	System 6.0.4/Finder 6.1	
Portable	System 6.0.4/Finder 6.1	

Applications: When Smaller Is Better

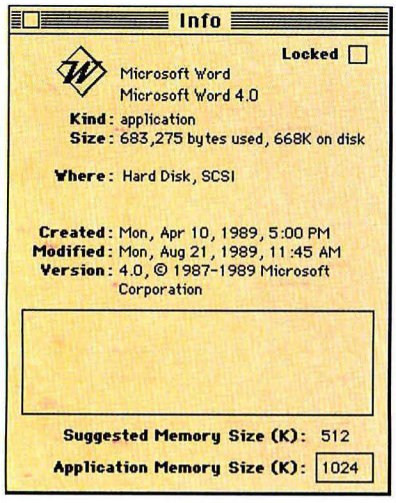
It helps to cut the tax bill and go light on luxuries, but a smart money manager also shops carefully for the basics. Bargain hunting, discount shopping, even price dickering—these are the best ways to stretch your money.

Similar techniques apply to stretching memory. The memory equivalent of bargain hunting involves choosing applications that use memory sparingly. Of the programs in a given category, some need more memory than others. For example, Microsoft Word runs comfortably in 512K. But Ashton-Tate's portly FullWrite Professional, with its kitchen-sink mix of features, barely fits within 1MB and all but demands 2MB.

Until customers demand otherwise, the software industry will keep on giving priority to adding features instead of reducing memory requirements. When was the last time you saw a new version of a program debut not with new features but with reduced memory requirements?

But some programs do use memory sparingly.

- For word processing, T/Maker's WriteNow is the unchallenged champion of memory conservation. It's the only currently shipping word processor I know of that runs on every Mac ever made—even the primordial 128K (if you want to use the program's spelling checker, you'll need 200K). And WriteNow compares favorably with its more corpulent competitors (see "Write, Write, Write," *Macworld,* October 1989).
- For spreadsheet analysis, check out Bravo Technologies' MacCalc. It runs on all Macs from the 512K (enhanced or not) on up and needs just 256K. It's fast, well designed, and packed with features. And its $139 price can't be beat.



Memory Suggestions

When you choose the Get Info command for an application, the bottom of the Finder's Get Info window displays two memory values. Suggested Memory Size represents the minimum amount of memory the developer recommends (although not necessarily the minimum amount of memory in which the program will run). Application Memory Size reflects the ideal amount of memory. By lowering the latter value, you can reduce a program's memory requirements.

▪ For database management, a good choice is Software Discoveries' Record Holder Plus, which requires just 300K. Claris's FileMaker II provides more-complete form-design, scripting, and networking features and runs in as little as 350K. Microsoft File is a capable filer that runs in as little as 200K. It offers excellent color support and works well with Microsoft Word's print merge features.

▪ For personal-finance management, consider Intuit's Quicken. It packs check writing, checkbook balancing, budgeting, and tax record keeping into a compact application that uses only 375K and runs on unenhanced 512K Macs.

▪ For graphics, well, good luck. Graphics programs are inherently memory hungry. For example, Silicon Beach Software's SuperPaint 2.0 needs 700K, and Claris's MacDraw II and MacPaint 2.0 need 537K and 352K, respectively. And for MacDraw and MacPaint those figures are bare minimums that limit your document size and the number of documents you can open simultaneously. One noteworthy alternative is the DeskPaint and DeskDraw combination from Zedcor—two desk accessories that pack impressive painting and drawing features into the Apple menu.

How can you tell how much memory a program needs? It isn't easy. Software firms rarely list minimum memory requirements on their boxes. They tell you if a program runs on a 1MB machine, but they don't say how much of that 1MB the software actually uses. Determining that requires some detective work on your part.

Sizing Up Software

If a computer dealer will let you experiment, you can use two techniques to determine a program's memory requirements. The easiest technique involves selecting the application's icon and then choosing the Finder's Get Info command. Two values appear at the bottom of the Get Info window: the program's suggested memory size, the minimum amount its developer recommends, and its application memory size, the ideal amount its developer recommends (see "Memory Suggestions").

The suggested memory size is usually less than the application memory size. Sometimes, however, the two values are the same, as is the case with SuperPaint 2.0, MacWrite II, and FileMaker II, to name a few. In any case, the suggested memory size is the value to watch, since it reflects a realistic minimum. The suggested memory size is the minimum amount of memory the developer recommends for acceptable performance and reliability. Don't confuse this with the *minimum memory size*—a more dubious figure indicating a theoretical minimum that may yield poor performance or prove unreliable.

SLEUTHING THE SIZE RESOURCE

How little memory can you safely allocate to an application? To find out, use ResEdit to examine the application's SIZE resource as follows.

1. Start the Mac using the Finder, not MultiFinder. ResEdit is more reliable when you don't use MultiFinder.

2. In ResEdit's directory window, double-click on the name of the application whose SIZE resource you want to examine. (For safety's sake, work with a backup copy of the application, not the original.) A window appears listing the resources in that application.

3. Locate the SIZE entry and double-click on it. Another window appears containing an entry labeled SIZE ID = -1. SIZE ID = 0 may also appear. This second entry is a SIZE resource added by the Finder and indicates that someone has adjusted the application's memory size using the Get Info command. The SIZE ID = 0 resource overrides the SIZE ID = -1 resource.

4. Open the SIZE ID = -1 resource by double-clicking on it. A new window appears displaying the contents of the resource. Don't change any entries; you're here to observe only.

5. Scroll to the bottom of the window and locate the two entries labeled Size and Min size (see "Inside SIZE"). The Size value corresponds to MultiFinder's suggested memory size. The Min size value represents the smallest amount of memory in which the application can reliably run. This value is in bytes; to convert it into kilobytes—the format required by the Get Info window—divide it by 1024. For example, the value 393216 represents 384K. Write down this minimum number.

6. Quit ResEdit. If you're asked to save changes, answer No.

7. Use the Finder's Get Info command to change the application memory size to match the minimum value you wrote down in step 5. Close the Get Info box to save your changes. At this point, you may want to start the Mac under MultiFinder and test the application's performance by opening it and performing the tasks you usually perform.

Both the *application memory size* and the *suggested memory size* come from a *resource* stored within the application file. This resource, aptly named SIZE, contains information that the Mac uses to determine how the program runs under MultiFinder.

When you start a program, MultiFinder consults the program's SIZE resource to determine how much memory the program would like to have and how much it will settle for if that ideal amount isn't available. If less than the ideal amount is available, MultiFinder determines if at least the minimum amount is available. If it is, a dialog box appears asking if you want to run the program within that amount. If even the minimum amount isn't available, MultiFinder informs you that the program couldn't be opened and suggests quitting another application to free up memory.

"Sleuthing the SIZE Resource" describes how to examine an application's SIZE resource by using Apple's ResEdit utility. ResEdit is available through APDA (the Apple Programmer's and Developer's Association) and also through user groups and online services such as CompuServe.

Dickering with Applications

You can't change an application's suggested memory size (actually, you can with ResEdit, but the application may rebel). However, you can change the application memory size by simply typing a new value in the Get Info window. By lowering the application memory size, you talk the program into accepting less memory. It's price dickering, software style, and it increases your chances of being able to run your favorite programs simultaneously under MultiFinder.

But how much of a change should you make? That depends.

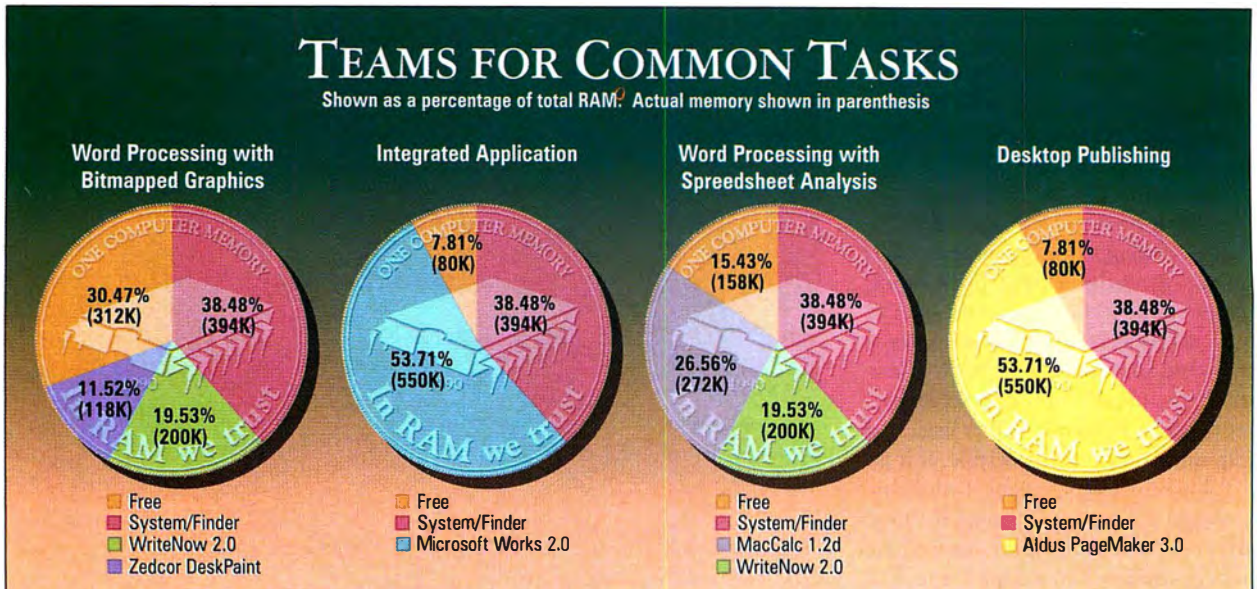
- If the application memory size is greater than the suggested memory size, you can safely reduce the application memory size to match the suggested memory size.
- If both memory-size values are identical, you can try reducing the application memory size, but the program may not run reliably. Because the potential for problems exists, the Finder asks for verification when you supply an application memory size that's below that suggested memory.

What are the effects of reduced memory sizes? The program will probably run slower, and it will access the disk more frequently as it loads and discards portions of program code in order to fit within its cramped confines. If the program keeps open documents entirely in memory (Microsoft Works and drawing and painting programs do), you'll be restricted to smaller documents, and you won't be able to have as many documents open simultaneously.

Incidentally, if you can spare the memory, you can boost a program's

APPLICATION MEMORY SIZES

Application	Suggested Memory Size	Application Memory Size	Minimum Memory Size	Disk Space
Aldus FreeHand 2.0	750K	1200K	700K	700K
Aldus Persuasion 1.0	800K	800K	800K	753K
Aldus PageMaker 3.0	700K	700K	700K	890K
Business Filevision 1.5	288K	288K	148K	286K
Business Sense 1.0	512K	512K	384K	256K
CA-Cricket Draw 1.1.1	768K	768K	668K	313K
CA-Cricket Paint 1.0	1000K	1000K	750K	318K
CA-Cricket Presents 1.0	1024K	1024K	1024K	528K
DiskFit 1.5	512K	512K	448K	181K
FileMaker II 1.1v2	512K	512K	350K	393K
FoxBase+/Mac 1.0	1024K	1024K	1024K	568K
Full Impact 1.0	1024K	1024K	1024K	522K
FullWriteProfessional 1.0	1124K	1124K	1024K	773K
Graphist Paint II	1611K	1611K	1514K	156K
LaserTalk 1.1	500K	500K	375K	177K
MacCalc 1.2d	272K	304K	256K	182K
MacDraw II 1.1	900K	900K	537K	467K
MacPaint 2.0	512K	512K	352K	147K
MacProject II 1.0	384K	384K	256K	209K
MacWrite II 1.1v1	800K	800K	590K	451K
Mathematica 1.2	3072K	3072K	512K	679K
Microsoft Excel 2.2	1024K	1024K	512K	728K
Microsoft File 2.0	384K	384K	200K	201K
Microsoft FowerPoint 2.0	800K	800K	380K	401K
Microsoft Word 4.0	512K	1024K	384K	668K
Microsoft Works 2.0	768K	768K	224K	587K
Modem Artist 2.0	1200K	1200K	1200K	249K
More II 2.0	1024K	1024K	700K	733K
Nisus 2.02	700K	900K	700K	555K
Panorama 1.0	976K	976K	512K	320K
PixelPaint 2.0	2560K	1800K	1800K	762K
Plus 1.1	1953K	1953K	1953K	548K
QuarkXPress 2.0	992K	992K	992K	762K
Quicken 1.5	375K	375K	375K	201K
ReadySetGo 4.5	1024K	1024K	800K	506K
ReadySetShow 1.0	800K	800K	800K	458K
Record Holder Plus 3.1	300K	300K	300K	187K
Reflex Plus 1.0	350K	350K	350K	251K
SoundEdit 2.0	1024K	1024K	256K	262K
Springboard Publisher II	900K	900K	600K	625K
SuperCard 1.0	735K	1600K	735K	345K
SuperPaint 2.0	700K	700K	700K	505K
WordPerfect 1.0.2	600K	600K	400K	317K
WriteNow 2.0	400K	400K	200K	102K



Here are four ways you can combine programs under MultiFinder to perform common tasks. The numbers in parentheses following each program indicate how much memory you should give that program using the Finder's Get Info command. (Technically, PageMaker's minimum memory requirement is 700K, but the program appears to run reliably in 550K. You might also consider Timeworks' Publish It for desktop publishing; it even runs on a 512KE Mac.) For tasks requiring database management, such as producing personalized form letters, consider an integrated package such as Microsoft Works, or Software Discoveries' Record Holder Plus, which can run in as little as 300K. Note that you may need to fine-tune some memory values depending on your system configuration. For example, if you want to use MultiFinder's background printing option, be sure that at least 80K remains free. The 394K value for the System and Finder assume the use of the System 6.0.2 minimal installer script for a 1MB Mac SE.

performance by giving it more memory. For programs that keep open documents in memory, this lets you create larger documents and have more of them open simultaneously.

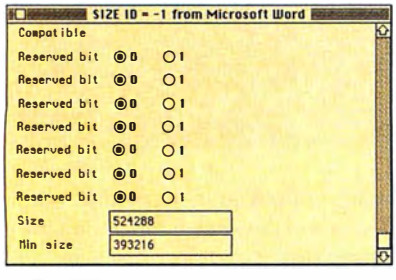
Putting Theory into Practice

It's easy to talk about experimenting with memory size, but many people lack the time or inclination to do so. For this group, "Application Memory Sizes" lists the memory-size values of popular programs, and "Teams for Common Tasks" lists some program combinations, memory size, and disk space requirements for popular tasks.

I've concentrated on memory limitations here, but disk space may also be a factor. If you don't have a hard disk, you need to do some careful organizing to be able to store programs, system files, and documents. Your job will be relatively easy if your Mac has 1.4MB SuperDrive floppies and downright daunting if it has the original 400K drives. The Mac's system software includes an installation program that creates a stripped-down System Folder designed for floppy-only systems. In the System Update 6.0 package, these minimal installers are on the Macintosh Utilities Disk 1.

Finally, a word to owners of unenhanced 512K Macs: upgrade. The shadow of obsolescence is fast approaching; soon you may have no new programs to choose from. Upgrading to a 512KE opens the doors to many popular applications. A Plus upgrade is better still, although you can buy a 512KE upgrade and add a non-Apple SCSI port and memory upgrade to get a cheaper equivalent of a Plus (see "Is Your Mac Obsolete?" in the February 1990 issue). The same do-it-yourself price advantages apply to upgrading a 128K Mac.

Is it right for software firms to continue releasing ever-larger programs with more and more features? Yes, if that's what customers want. But companies should be up front about listing memory requirements. The minimum amount of memory required for a program should appear on its box, allowing you to determine whether a program will be able to coexist under MultiFinder with the other programs you run. After all, you can't put a system together unless you know whether its pieces are going to fit. M



Inside SIZE

In the SIZE resource, the Size value corresponds to MultiFinder's suggested memory size. This value is in bytes; divide the Min size value by 1024 to convert it to kilobytes.

***Jim Heid** is a* Macworld *contributing editor and columnist. He recently coauthored* Inside the Apple Macintosh *(Brady, 1989) with Peter Norton.* *He would like to thank Dennis Cohen for technical assistance with this article.*

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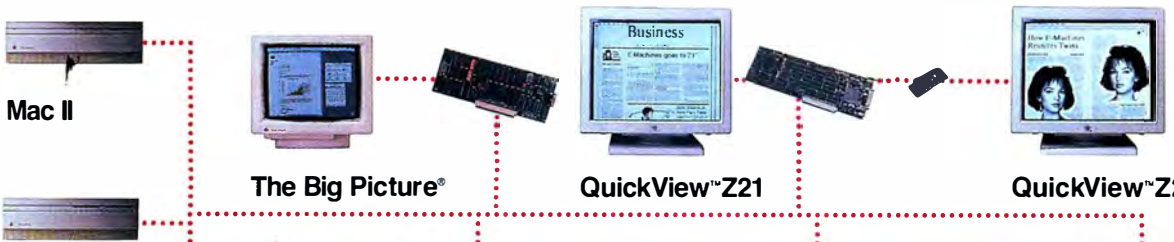

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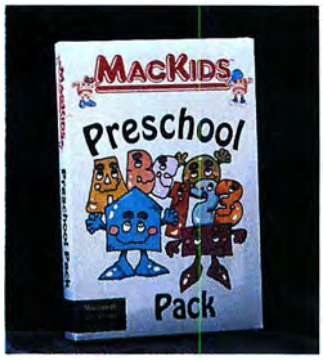

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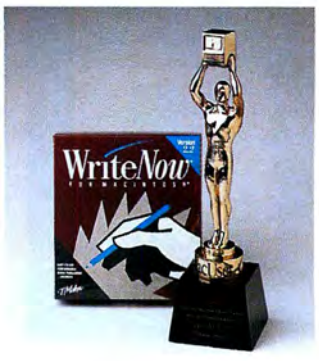

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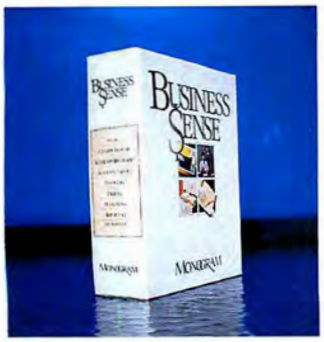

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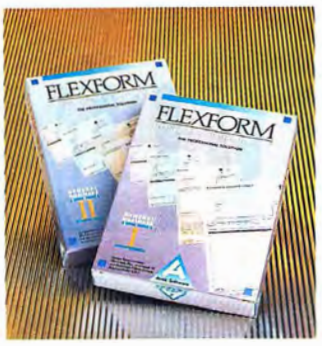

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Circle 44 on reader service card

REVIEWS

PostScript Laser Printer

QMS-PS 820 TURBO

Pros: Fast; versatile paper-handling; accepts memory expansions and SCSI hard disk. **Cons:** 8-ppm engine creates a bottleneck with typographically simple documents. **Company:** QMS. **Requires:** Mac Plus. **List price:** $6995. Additional paper trays $75 each.

MARK JOHANN

QMS-PS 820 turbo

The QMS-PS 820 turbo costs $4 less than Apple's top-of-the-line LaserWriter IINTX, plus it does more and does it faster. The PS 820 turbo combines excellent performance with versatile paper-handling features. The result is one hot PostScript laser printer—and a strong challenger to the NTX.

The PS 820 turbo uses Canon's LBP-TX print engine, which is similar to the popular LBP-SX engines used in Apple's LaserWriter II models and in the QMS-PS 810. Both engines produce 300-dots-per-inch output, both have a maximum print speed of 8 pages per minute (ppm), and both are easy to set up: simply remove the packing material and slide a mess-free disposable toner cartridge (good for about 4000 pages) into place.

But instead of just one 200-sheet paper tray, the TX has two. You can put letterhead in one tray and second sheets in the other. Or, one tray can hold letter-size paper and the other legal-size stock, or envelopes. Or you can put the same paper in both trays and set up the printer to switch trays when the first one empties. A front-panel status display shows which tray is active. (The PS 820 turbo comes with two letter-size trays.)

The PS 820 turbo provides three connection ports: LocalTalk, RS-232C serial, and Centronics parallel. Apple's PostScript printers don't have the Centronics port, which is generally used to connect to IBM PCs. The rear-panel thumb switch makes choosing the active port a breeze; Apple uses small, unlabeled DIP switches.

It's Smart, Too

The driving force behind the PS 820 turbo's TX engine is a high-performance Adobe Discovery controller containing a 68020 processor running at 20MHz. The LaserWriter IINTX and Dataproducts' slick LZR-1260 both contain a 68020, but they run at a slower 16MHz (see "Paging All Printers," *Macworld,* October 1989). The PS 820 turbo's faster processor enables it to outpace its competitors when printing complex illustrations or documents containing numerous fonts and type sizes (see "Testing the Turbo").

When printing typographically simple documents, however, such as double-spaced manuscripts formatted in Courier, the PS 820 turbo falls victim to its engine's 8-ppm maximum printing speed. With simple documents, the PS 820 turbo finished behind even the NEC SilentWriter LC890, which uses a laggardly 10MHz 68000 controller but has a 10-ppm engine.

The PS 820 turbo's 2MB of memory is expandable to 8MB—enough to hold hundreds of downloadable fonts. (QMS charges $595 for a 1MB expansion kit, $995 for 2MB, and $1495 for 4MB.) Like other upper-class PostScript printers, the PS 820 turbo has a SCSI port that accepts a hard disk for storing fonts and boosting performance. As for built-in fonts, the printer includes 39—the standard 35 typefaces built into LaserWriters and most other PostScript printers, plus the Helvetica Condensed family.

Like other PostScript printers, the PS 820 turbo offers emulation modes that let the printer act like something it isn't. Both the LaserWriter IINTX and

Dataproducts' LZR-1260 can emulate a Diablo 630 daisy wheel printer or a Hewlett-Packard LaserJet Plus. The PS 820 turbo can imitate a LaserJet Plus, but it trades the Diablo 630 emulation mode for a more useful one: Hewlett-Packard Graphics Language (HPGL), a set of printing rules popular in the world of pen plotters and computer-aided design (CAD).

Little Things that Count

Price and performance are reason enough to buy the PS 820 turbo. Happily, there's more—an excellent support package of documentation and utilities for the Mac and the IBM PC. The documentation contains a useful tutorial on typographic basics as well as detailed information on the Turbo's version of PostScript.

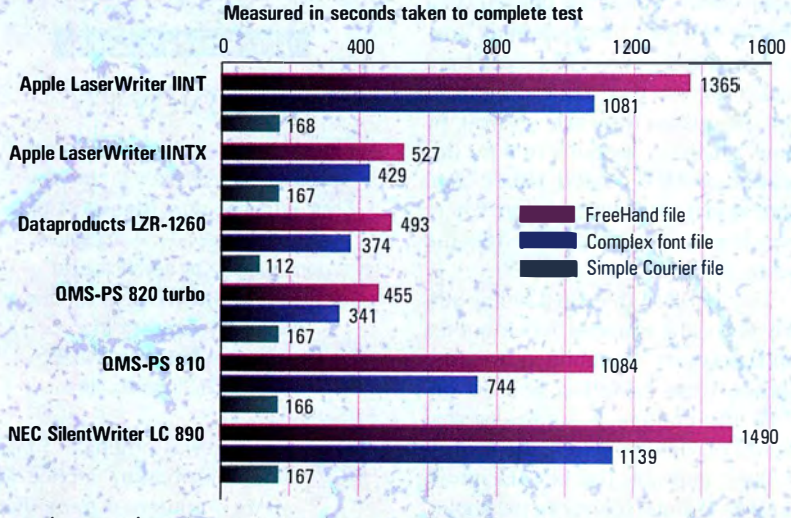
The utilities include a program that lets you align the printer to center images on each page, and a desk accessory that lets you switch between the first and second paper trays or specify that the printer automatically switch to the second when the first is empty. Also included are Adobe Printer Description and PostScript Printer Description files. Applications such as Aldus's PageMaker and FreeHand and Adobe's Illustrator 88 use these files to learn about a printer's specific features. For example, when a PageMaker user chooses the PS 820 turbo in the Print dialog box, additional buttons appear for choosing between the upper and lower paper trays.

Is the PS 820 turbo the best high-performance PostScript printer for under $10,000? It depends. If you print hundreds of pages a day, you might be better served by Dataproducts' industrial-strength LZR-1260. It's a tad slower than the PS 820 turbo and costs $1000 more, but its heavy-duty, 12-ppm Toshiba print engine is rated for 25,000 pages per month. The PS 820 turbo's Canon TX engine is rated for only 5000 pages per month.

But the PS 820 turbo definitely beats the LaserWriter IINTX—it is faster, easier to use, and has better paper-handling and emulation features. If you are thinking of buying a LaserWriter IINTX, get a PS 820 turbo instead. And if you don't need two paper trays, consider the QMS-PS 810 turbo for $5995. It contains the same fast controller as the PS 820 turbo, but uses the single-tray Canon CX engine.—**Jim Heid**

See **Where to Buy** *or circle 823 on reader service card.*

Testing the Turbo



With complex documents, the QMS-PS 820 turbo is faster than the LaserWriter IINTX and Dataproducts LZR-1260. With simple documents, however, the turbo's 8-pages-per-minute engine is a performance bottleneck. Tests were performed on a 2MB Mac II with MultiFinder and background printing disabled, using version 5.2 of the LaserWriter driver.

Online Information Service

AMERICA ONLINE

Pros: Outstanding interface; simple to navigate; upbeat, helpful atmosphere; well-implemented services. **Cons:** Addictive; some forums not fully developed. **Company:** Quantum Information Services. **Requires:** Mac Plus, modem. **List price:** $5.95 per month (includes one-hour connect time; additional time billed at $5 to $10 per hour).

America Online is a happy place. And, more than any other online service it is indeed a place; there are "rooms" to explore—each with its own atmosphere—and people to meet. An evolution of AppleLink Personal Edition, America Online is run by Quantum Computer Services (not the hard drive company).

Smiling Interface

The America Online software itself guides you through the registration process. When your modem reaches the service, a cheery (digitized) voice bids you "Welcome." (This same voice later tells you, "You have mail" and, after downloading a file, says "File done.") Once you begin to use the service, you'll notice that you're in a true Macintosh environment. The commands are in menus, you can save anything on the screen in its own text file, each department is in its own window, and files are neatly organized in folders. In fact, America Online is truer to the letter and spirit of the Macintosh interface than any other online service.

Within the first ten minutes, you'll notice something else unusual: you're not interacting with some remote computer; you're actually encountering people. In the interactive areas of America Online, you see a transcript of all the remarks being written by the members currently online. Anything you type appears on the screen of anyone else in the room and vice versa, like a computerized conference call (see "Talk Is Cheap").

Real-time conferencing has been available for years—although much more expensively—on CompuServe.

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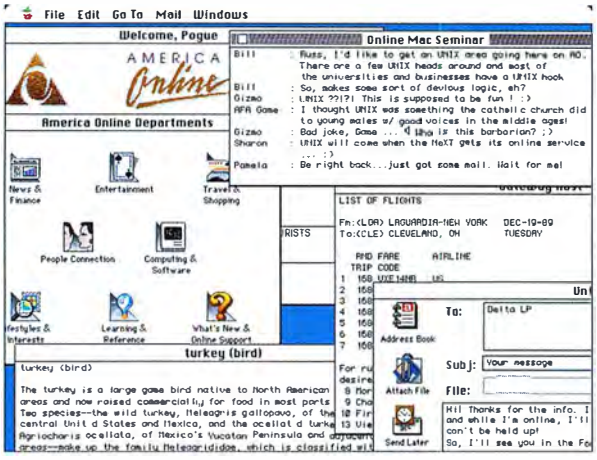
Talk Is Cheap

America Online lets you work in many places at once. Here are (clockwise from top left) the opening screen; a real-time seminar; a flight reservation being made; E-mail in progress; an online encyclopedia entry; and the Departments screen, for accessing services.



But America Online takes the principle much further; real-time interaction is the foundation of its instructional, social, and Macintosh-support aspects. For example, if you get lost and need help, you don't have to leave an electronic message in some technician's mailbox. You simply enter one of the interactive rooms and find a guide—a live person, whose screen name and geographical location you know, who joins the conversation, greets you by name when you sign on, and helps you immediately with your questions.

There's no end to the fun you can have in real time. You begin to recognize people from previous visits; friendships actually develop; and, in this faceless medium, you begin to learn things about the way people communicate that aren't always apparent in real life. Many of America Online's real-time events are more structured than those on other services (for example, there are game shows, well-run computer seminars, and even online homework help for students), but simply participating in a conversation among, say, 20 people all over the country is an affecting learning process in itself.

At Your Service

There's more to America Online than its conferencing, of course. As on other online services, you can research and make plane reservations (but America Online lets you do so at no extra cost). The clean, folder-based interface for the bulletin board areas is a breath of fresh air compared with the mystifying systems used by other online services. A 32,000-entry encyclopedia produces search results in four seconds. And a top-notch E-mail system makes messaging easy; you can compose the mail offline, send files, forward copies of incoming mail to other people, send carbon copies, and so on.

There's a fairly respectable Macintosh software library for downloading (at this writing, about 6000 files). It's only a fraction of the size of the more established libraries, like the one on CompuServe, but it grows daily. There's also an online shopping service run by CompuStore Online. The store's discounted prices are guaranteed to be lower than street prices (and because it's a form of mail order, you usually don't have to pay sales tax).

There is a heavy philosophical emphasis on learning and on social interaction. For example, real-time instructional classes are offered on a number of topics (programming, music theory, and so on). When you have a question, you type a question mark, and the instructor calls on you by name. There's a special forum for discussion of AIDS-related issues. And there's even a romance section, where an online matchmaker supervises the personal ads.

Finally, all of the usual online-service perks are available: stock quotes (updated every 15 minutes), weather reports, news bulletins, and so on. While the content is similar to that offered on other services, the form—scrolling, copyable text in a Macintosh window—is infinitely more palatable.

If at any point in your explorations you need help, you can enter a special help forum; you're not billed for the time you spend in this area. That's consistent with the rest of the service's helpful, upbeat atmosphere.

Online on the Line

Because it's a fledgling operation, there are still a few problems with America Online. For example, there's not yet very *much* of anything—the system could be improved with more services, more forums, and a larger membership. You can't do banking with the service, and you can't order groceries. You might even complain that the service occasionally carries the Macintosh interface too far; for example, to read a joke in the humor section, you have to plow through six nested folders. And sometimes in the evening, glitches in the phone-switching system cut you off in midsentence.

But as long as you understand America Online's emphasis on tele*communications,* you won't be disappointed. The heart of America Online is "live" interaction between people—instructors, system administrators, and other Macintosh and Apple II users. And America Online's exemplary interface is so friendly that it's easy to forgive the fact that its services and membership are still expanding. It's not the right service for business users, doctoral thesis researchers, or grouches. But it's great for anyone else who gets a kick out of the Macintosh. America Online, you might say, is the service for the rest of us.—**David Pogue**

See* Where to Buy *or circle 702 on reader service card.

Online Information Service

PRODIGY 1.0

Pros: Attractive pricing; wide variety of useful services; easy to navigate. **Cons:** Extremely slow; horrendous IBM-style interface; no way to capture information; no downloadable software. **Company:** Prodigy Services Company. **Requires:** Mac Plus, modem. **List price:** $49.95; service $9.95 per month.

Prodigy was originally an online information service for IBM computers. A joint effort by IBM and Sears, it offered an innovative navigational scheme, colorful graphics, and some dramatic steps into the future of home computing. With only a modem and the Prodigy soft-

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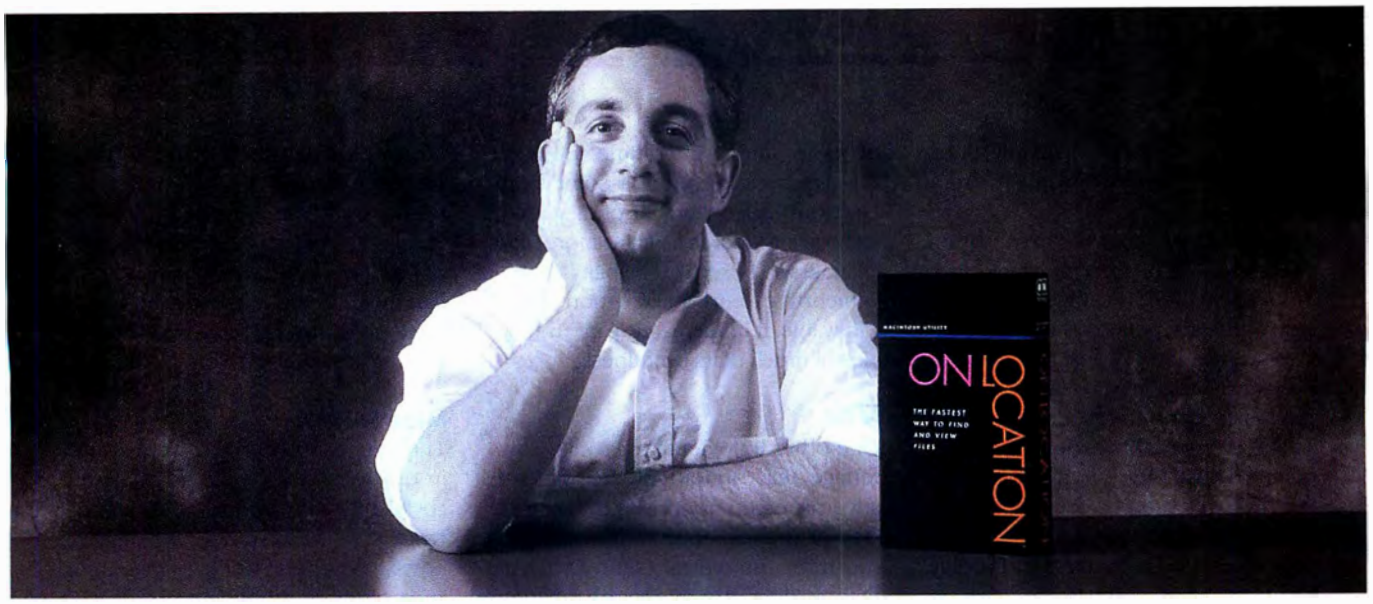

Mitch Kapor, chairman, ON Technology.

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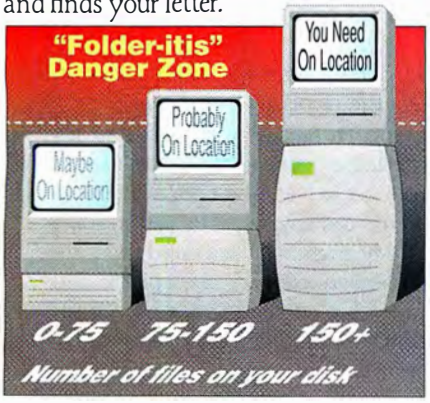

And you don't have to open your word processor to read the file. Double-click on the file name, and you'll instantly see the text, including the original fonts and styles for word-processing documents. You can also copy text to the clipboard. Or launch the file directly into its application program.

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- see actual fonts and styles for leading word processors, including MacWrite II,® Microsoft® Word, WriteNow,™ and WordPerfect®
- directly open files and application programs
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Circle 370 on reader service card

ware, you could do your banking, book airline reservations, and even order groceries.

The service has now been adapted—in a manner of speaking—for the Macintosh. Prodigy's introductory offers are generous and its pricing scheme is favorable to frequent users. Instead of paying a steep hourly rate (as for CompuServe), you're billed a flat $9.95 per month, no matter how much you use the system.

Where's the Mac?

Unfortunately, the makers of Prodigy haven't gone nearly far enough in adapting Prodigy to the Macintosh, either technically or philosophically. There are no windows, no menus, no Macintosh fonts. Instead, your screen is painted, top to bottom, with gawky-looking IBM lettering (see "Prodigy's Face"). There is some attractive use of color for Mac II users, but the scheme otherwise offers nothing but penalties. That is, because Prodigy sends an entire screenful of graphics information at a time (and not textual information, like most online services), you have to wait until the service has transmitted the entire screenful before a new screen can appear. Even on a Mac IIci with the color turned off, the wait for each new screen is intolerable—between 6 and 15 seconds per screen at 2400 baud. More than anything else, Prodigy is slow.

The all-graphics scheme is also much more sensitive to transmission errors than text-based systems are. The slightest bit of phone-line static is likely to require the time-consuming retransmission of the entire picture or, at worst, will cause you to be unceremoniously logged off the system, leaving you no choice but to log on again and hope the phone lines are kinder.

Prodigy doesn't support MultiFinder or desk accessories, either. That's a serious problem if you encounter something on the service that you want to retain; there's simply no way to capture text from Prodigy onto your disk. You can capture a bitmapped image using the ⌘-Shift-3 function key, which gives you a MacPaint file you can open later, or you can send a particular screen's text to your printer. But the former solution is inconvenient, and the latter results in a waste of paper and printer time. Because Prodigy uses a crude 24-point typeface, only a few lines fit on a screen, so no printout ever contains more than a paragraph or so. This inability to conveniently capture information is unforgivable. It immediately robs the service of much of its usefulness.

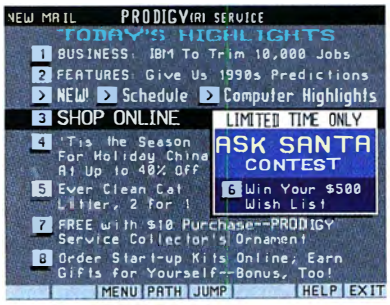
Ad Out

One other little detail of Prodigy's interface may annoy you: teasers for advertisements appear on the bottom fifth of the screen at all times. They run from the typical ("Enter the Air France sweepstakes") to the unappetizing ("Imodium A-D can stop diarrhea with just one dose!"). Should these teasers prove enticing, you can choose to see the entire ad.

As if the teasers weren't offensive enough, Prodigy's computers monitor the time you spend looking at the ads whenever the teasers pull you in. And all of the data regarding your reaction to the ads, as well as your demographic characteristics, is then passed on to the advertisers. The whole system is a little disconcerting.

Jumping for Joy

If you can overlook all of these drawbacks, the service itself is very good. You never feel bewildered, as you often do using CompuServe. Each Prodigy service has been assigned a keyword. Type one of these *jump words* and press Enter, and you move directly to that service. **MHT Bank** is Manufacturers Hanover electronic banking, **Siskel** takes you to Gene Siskel's latest movie review, **Browns** shows you the latest Cleveland Browns football scores, and so on. To make navigation even easier, the jump word **Index** always takes you to an alphabetical list of Prodigy's hundreds of services. You can move immediately to any service by double-clicking on its name, so exploring is easy and inviting.



Prodigy's Face

Prodigy's opening screen is typical of its interface: large, crude typefaces; no menus; and a number of buttons that you double-click. This opening screen doesn't show the usual advertising stripe at the bottom—but you get the idea, since most of the options are commercial in nature.

At Your Service

The services themselves vary widely in quality and usefulness. The extra-cost banking is practical—the bank will write and mail checks for you. The news, weather, stock quotes, and sports scores are all up-to-date and easy to find. There are complete reprints of *Consumer Reports* articles and tests. Eaasy SABRE, the airline flights-and-reservations system (run by American Airlines) is a bit confusing, but on Prodigy it is free (the equivalent program on CompuServe carries a steep hourly fee).

Prodigy also has bulletin boards about Macintosh hardware and software, but the problem is that only a few lines of gigantic text appear on a screen. You have to click the Next button to see the rest of the message. When compounded by the system's devastating slowness, you can see how clumsy the process is. The same problem plagues the electronic-mail system. And not only is there no real-time conferencing on Prodigy, but every message you post on a bulletin board is screened for content by Prodigy's "editors"; therefore, no message appears online until the day after you send it. For example, you're not permitted to post any message that smacks of "commercial, classified, or personal" advertising. I volunteered to help a bulletin-board member with a Mac problem and sent him my phone number. But the exchange of phone numbers or addresses is prohibited, so my message was returned to me with the explanation that it "failed to meet the [Prodigy] guidelines."

Incidentally, if you decide to try ordering groceries online, don't order produce. In fact, don't order anything you'd normally want to select yourself. My grapefruit was moldy, the cucumber looked more like a pickle, and the lettuce seemed to have been sat upon (not Prodigy's fault, of course).

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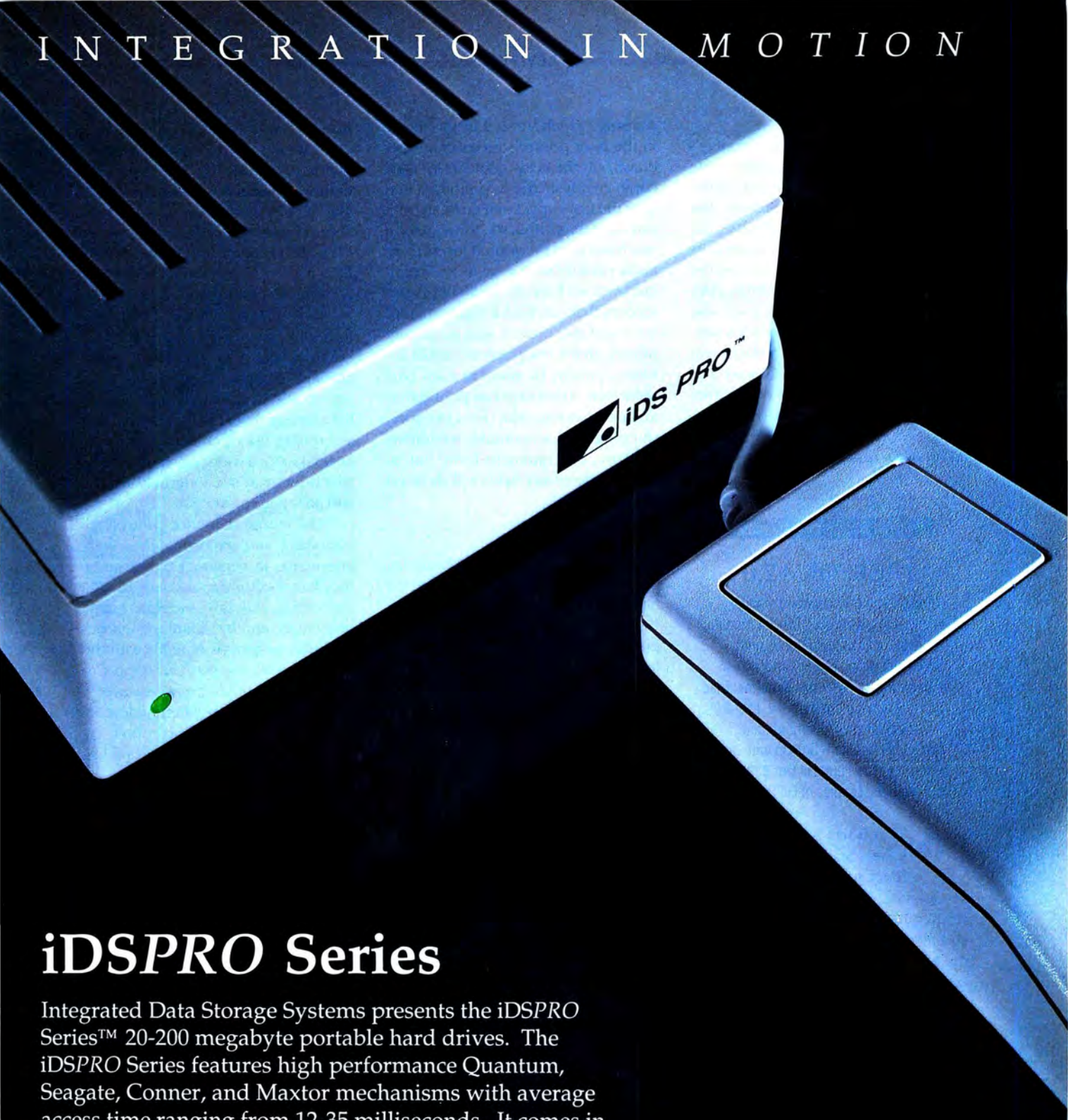
INTEGRATION IN *MOTION*



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Prodigal Someday

The prodigious failings of Prodigy's interface are doubly disappointing because the quantity and variety of the services themselves are impressive. But Prodigy's idea that it can win over the Macintosh world simply by porting its problem-plagued interface is a misconception. Without fonts, menus, DAs, windows, MultiFinder, or a good way to capture text to disk, Prodigy's software can hardly be called a Macintosh application. And until its speed and interface problems are overcome, Prodigy can hardly be called a Macintosh service.—**David Pogue**

See Where to Buy *for contact information.*

Electronic Forms Management

TRUEFORM 2.0

Pros: Easy-to-understand manual; fast operation; enhanced Fill-Out module.
Cons: Lacks drawing tools; print-alignment dialog box not interactive.
Company: Adobe Systems. **Requires:** Mac Plus; additional memory, hard disk, and scanner highly recommended.
List price: TrueForm Set-Up with one copy of TrueForm Fill-Out $395; four additional copies of Fill-Out $295.

TrueForm's original publisher, Spectrum Digital Systems, was acquired by Adobe in October 1988; and version 2.0's cleaner interface, relative lack of bugs, and first-class manual definitely show the Adobe stamp.

Formalities

Any forms-design package must consider how its users will divide up creating forms and filling them out, and whether to emphasize data management or graphic design. A program like TrueForm, designed primarily for turning scanned copies of old paper forms into electronic forms, also runs up against TIFF files' slow print times, laser printers that can print only 8-by-10½-inch documents in a world full of 8 7/16-by-10 7/8-inch paper forms, and multipart forms with different data on each layer.

There are no easy answers to these problems, but TrueForm has a way around some of them. Its *forms-caching* (which stores a form's image in the laser printer's memory and redraws only the fields' contents for each copy) greatly increases printing speed after the first copy. TrueForm can print just the data without the form image if you hand-feed preprinted forms to an impact printer such as an ImageWriter, but until we have 25- or 50-bin paper feeders that can feed a wide range of sizes and thicknesses into an impact printer, that's not a very workable solution. Finally, by printing each part separately, TrueForm can print differing information—say, for customer, shipping, and accounting—on different parts of a multipart form, but labels for the empty fields will show on all parts.

A Formal Application

TrueForm is actually two applications: one for setting up forms, and one for filling them out. To use TrueForm Set-Up you import either a scanned form or a PICT file—TrueForm has no drawing tools at all. When you click on a line or box in the imported form, TrueForm locates the edges of the object and places a data entry field over it. You can format fields for text, numbers, dates, and check boxes; and you can assign them spreadsheetlike formulas to perform operations such as calculating totals on an invoice, adding 30 days to a date, or evaluating a text string to pick out Texas addresses and then add sales tax. When you have finished setting up a form, you can open it in Fill-Out, tab through the fields, enter data, and print completed forms or save them in Stacks (no relation to HyperCard).

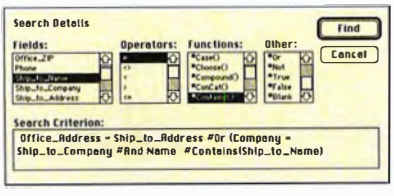
Reformed

Version 2.0 has some new features and a lot of improvements. The old manual's tutorial has disappeared for some reason, but the new manual explains TrueForm more clearly, in particular how to use the functions (including eight new ones) to build constraints and perform calculations. Overall operation is faster and smoother. On a Mac II, TrueForm Set-Up 1.0 took about 5 minutes to import a scanned TIFF file; version 2.0 running on a Mac Plus imported the same file in only 1½ minutes. Impressive.

If you're scanning a multipage form directly into TrueForm, the new version lets you rescan a single crooked page without starting over. Set-Up also now includes a command for aligning fields; fields that present a scrolling list of choices (similar to FileMaker's); a wider tab-order dialog, which lets you see long field names; and password protection.

The merge-sequence controls for importing and exporting data were impressive in version 1.0, but in 2.0 they have become almost surreal. You can create and save multiple merge sequences, and by delimiting individual fields or groups of fields with different characters, you can import to or export from different parts of a form, and to or from different destinations and sources. You can now append exported text to an existing file. You can also apply constraint-checking to data as it is imported, and skip the headers in an imported file.

You can set up numbers with incredibly detailed formatting so that, for example, TrueForm displays parentheses around negative numbers, places a dollar sign before an amount, and rounds the pennies to two decimal places. Date and number formats are also user definable, as in Excel. Finally, for 4th Dimension users, a special 4D module that comes with TrueForm will add a new menu to your 4D applications to export data from 4D into TrueForm for printing.



Search Menu
TrueForm Fill-Out's Select dialog box provides the power to root out forms buried deep in a Stack.

Deformed

Set-Up still can't zoom in on small areas like check boxes, nor can it juggle rectangular fields placed over irregularly shaped areas (such as individual facets of teeth in TrueForm's sample dentist's chart). Zooming in on a scan, which is stored at 300 dots per inch but displayed at the Mac monitor's 72 dpi, is always a problem, but Adobe Illustrator manages it elegantly. Even

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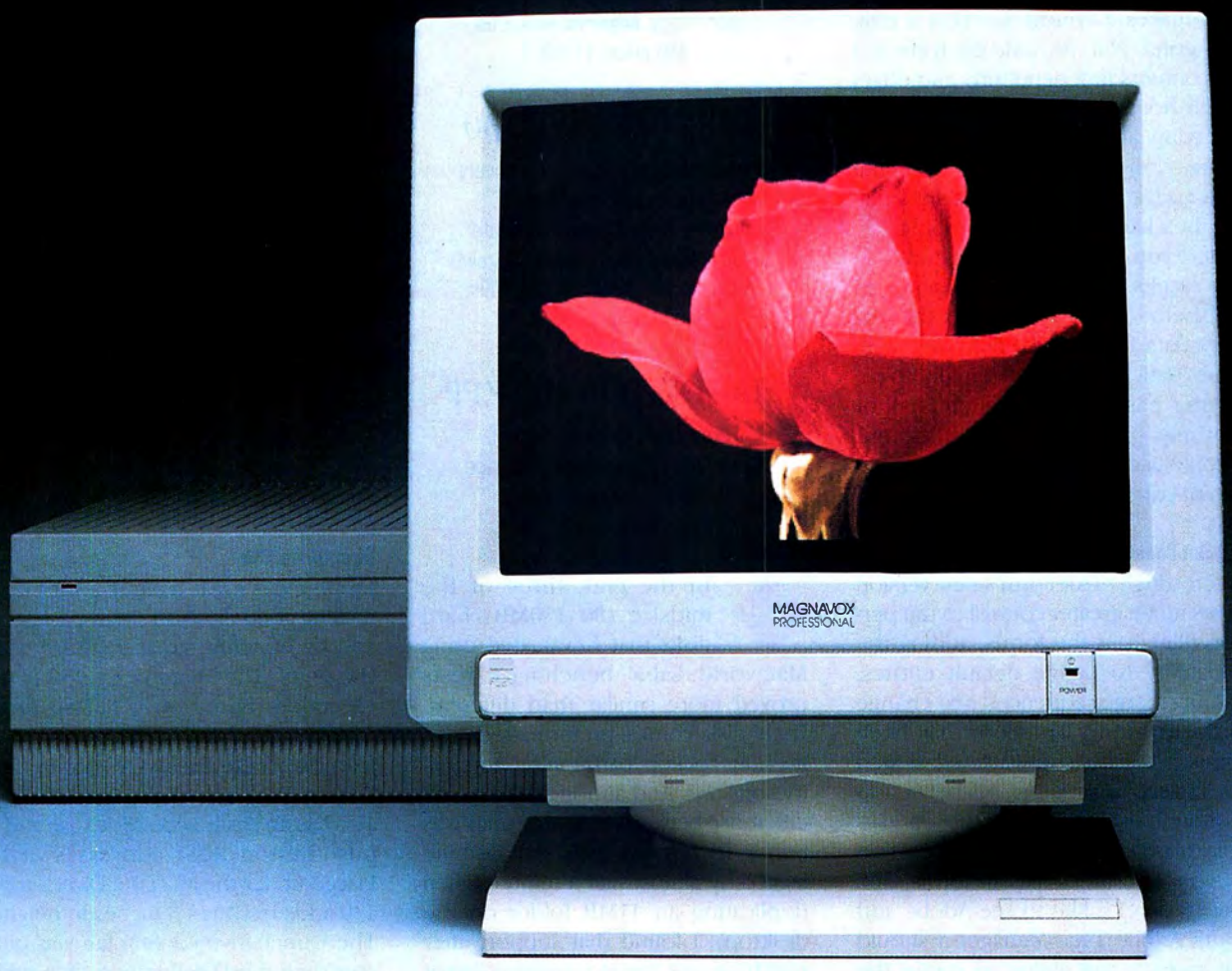

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more useful than zooming would be different field shapes (circles would be especially useful) or the autotrace capability found in Adobe Streamline. TrueForm still lacks even rudimentary drawing tools—the one I miss most is an eraser or white box for covering up junk (scanner detritus, for example). The modal printing-alignment dialog box makes a critical function a tedious grind: you can scale the form and its contents independently and offset them horizontally and vertically, but effecting a change on the form requires closing the dialog box each time you nudge the image. I'd prefer a dialog box like Microsoft Word's Styles, where you can apply a change and see the results immediately. It would also be useful if the same hooks that export data from 4D could drop TrueForm data back into 4D. Finally, TrueForm's password protection is all or nothing—you can't give different people access to or control over different parts of a form.

Fill-Out Changes

Interestingly, TrueForm's new version gives much greater control to the person filling out the forms, adding the capability to define default entries, modify merge sequences, and change text formatting. TrueForm has been enhanced with sophisticated search and select capabilities, a label set-up option in the Print dialog box, and—for those overnight print jobs—an option to collate multipage forms. One nice touch I'd like to see Adobe add (with Adobe Type Manager it should be easy) is the ability to rotate the horizontal QuickForm fields (TrueForm's version of comments scrawled on a paper form) so they would be more visible.

The Future of Forms

So far, no forms program can entirely replace paper and pencil. On the other hand, the appeal of not having to do double work—first on a paper form, then at a keyboard entering the data into an accounting program—will continue to push electronic forms until the reality catches up with the concept. In the meantime, TrueForm is a practical and even attractive interim solution. **—Dan Littman**

See **Where to Buy** *or circle 848 on reader service card.*

Midsize Hard Disks

DATAFRAME XP100

Pros: Excellent backup, utility, and print spooler software included. **Cons:** Upright configuration takes up desk space. **Company:** SuperMac Technology. **Requires:** Mac Plus. **List price:** $1599.

DIRECTDRIVE 130

Pros: Includes SUM II disk-recovery and utility software, two AC power outlets. **Cons:** Inadequate technical support. **Company:** Jasmine Technologies. **Requires:** Mac Plus; SCSI port. **List price:** $1349.

MACINSTOR 100-ZFP

Pros: Good utility software. **Cons:** Noisy fan. **Company:** Storage Dimensions. **Requires:** Mac Plus. **List price:** $1899.

In the end, three of the midsize (80–150MB) hard disks that I evaluated using Macworld Labs' benchmark tests proved more similar than different. Each disk comes preformatted, and includes backup, partitioning, and utility software. And although the speed difference between the three units was minor in normal use (the Jasmine lagged by almost half a minute when duplicating an 11MB folder on the desktop), I found that support after purchase was the determining factor in deciding which drive to buy.

DataFrame XP100

The internally terminated DataFrame XP100 stands upright and uses a drive mechanism manufactured by Quantum. Noise from the cooling fan, although noticeable in a quiet room, was not intrusive. The XP100 comes with an excellent set of utilities. The DiskFit backup program backs up to floppies or another hard disk volume. Two print spoolers are included: SuperSpool, for direct connection to ImageWriters; and SuperLaserSpool, for connecting to AppleTalk ImageWriters and LaserWriters. All three of these utilities are special versions that work only with DataFrames. Also included is the Manager utility, consisting of an application and a cdev. The Manager application lets you test the drive, change the SCSI ID, or partition the disk. The Manager cdev allows you to mount hard disk partitions, which can then be password-protected and encrypted. The XP100 feels quick in operation, as did the other two tested units.

MARK JOHANN

Three midsize hard disks

DirectDrive 130

Jasmine has made a name for itself by making good drives in smart packages, and by bundling great software with the units. The DirectDrive 130 is no exception. Based on a Fujitsu drive mechanism, the unit has several nice features. There are two AC power outlets on the back of the hard disk; it also has an easily accessible fuse and a push-button SCSI address switch. Placed under the Mac, the DirectDrive 130 adds less than 3 inches in height. The DirectDrive cooling fan was quieter than the DataFrame's. One oddity was that the drive periodically makes a clattering—unlike normal drive access noise—for about two seconds. This wasn't especially annoying and didn't appear to cause any problems. The DirectDrive 130 rated a little slower than the other two units on the SCSI Evaluator and large-folder duplication benchmarks, but held its own when opening Excel and PageMaker files.

Jasmine includes DriveWare, an application and cdev combination, which is comparable to SuperMac's Manager in terms of functions and ease-of-use. DriveWare includes online help for the inexperienced. Jasmine

(continues)

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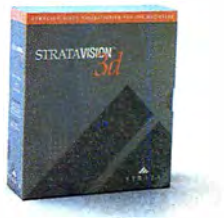

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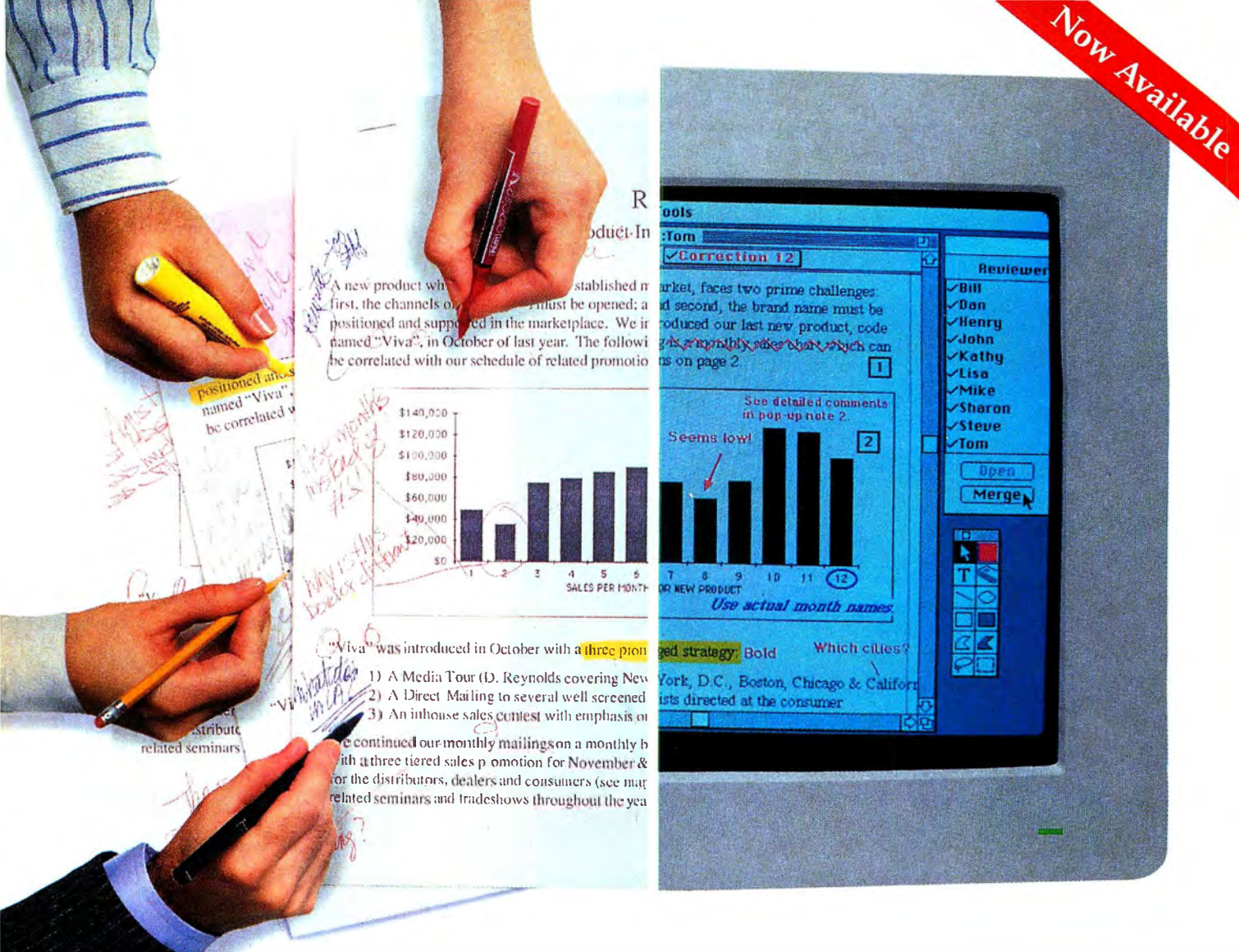
Circle 504 on reader service card



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ships the hard disk with a folder called DemoWare, which is a good assortment of about 6MB of public domain, shareware, and demonstration versions of commercial programs. The DirectDrive 130 also comes with Symantec's SUM II disk-utility package, which includes backup, encryption, and optimization programs, as well as one of the best crashed-disk-recovery programs available.

MacinStor 100-ZFP

The MacinStor 100-ZFP is built around the same Quantum 100MB mechanism as the DataFrame XP100, so it wasn't surprising that the two units produced virtually identical test results. The MacinStor has external SCSI termination, so you'll have to use the supplied terminator if you put the hard disk at the end of the SCSI chain. You change the SCSI ID with a rotary switch on the back of the unit. The cooling fan was annoyingly loud in a quiet room.

MacinStor's Installer program, which includes an application and a cdev, shares many of the same features as the installers that come with the other two hard disks. Storage Dimensions bundles Central Point Software's PC Tools Deluxe Mac Version with the 100-ZFP. This software includes a Locate DA, recovery applications for crashed floppies and hard disks, a file defragmenter, a backup program, and several other well-thought-out and useful utilities. Although PC Tools Deluxe has many of the same functions as the SUM II package, the Symantec utilities come with a superior manual and are better integrated to work together.

Support Systems

It doesn't matter how good the hardware is if you can't get help from the hard disk's manufacturer when something goes wrong. I placed two anonymous calls to each manufacturer's technical support line over a period of a week. I asked questions about both the hardware and the bundled software. I graded the response according to accuracy, promptness, and courtesy. (None of the manufacturers offer a toll-free number for technical support.)

SuperMac's support staff fared best of the three companies. I was put through to a support technician after a wait of no more than a few minutes. Both people I spoke with there were knowledgeable about the product, were pleasant, and easily fielded my questions. I rated SuperMac's support as very good.

Storage Dimensions put me on hold for a few minutes, then an operator offered to have a technician call me back. I received a callback within two hours, but I managed to stump the technician with a fairly complex question. To his credit, he promised to find out the answer and call me back, which he did within a half hour. I rated Storage Dimensions' support as good.

Jasmine's support was abysmal. After being put on hold for more than 20 minutes without a response, I called back and asked to speak to a technician immediately. I was told that they were all busy and that if I left my number, someone would call me back later that day. I never received a call. In four separate calls I never spoke to a technician. Jasmine's support rated unacceptable.

Which Hard Disk Should You Buy?

None of these hard disks will disappoint you in terms of performance. But with the market as competitive as it is these days, you have to look at the whole picture to make the best choice. The hardware, the bundled software, the product support, and the price are all important.

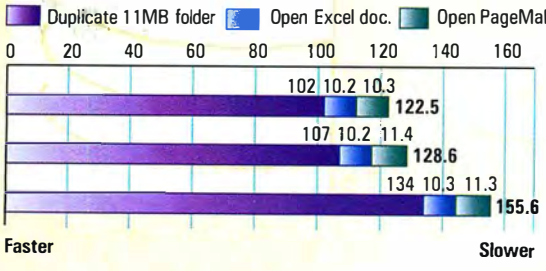
The Storage Dimensions MacinStor 100-ZFP is a fine unit, but it costs $300 more than the SuperMac DataFrame XP100, which is based on the same Quantum mechanism. And while PC Tools is a good package, I found the SuperMac utilities easier to use. The Jasmine DirectDrive 130 gives you an extra 30MB of storage for $250 less than the SuperMac, and has excellent bundled software, but also has unacceptable product support. Although I feel the DirectDrive 130 is the overall best value, because of Jasmine's support problems, I have to rate the SuperMac DataFrame XP100 as the winner.—**Tom Negrino**

See Where to Buy or circle 724 (DataFrame XP100), 727 (DirectDrive 130), 785 (MacinStor 100-ZPF II) on reader service card.

HARD DISK PERFORMANCE

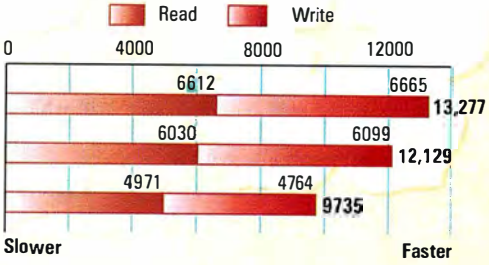
Real-World Tests

Measured in seconds taken to complete test



SCSI Evaluator

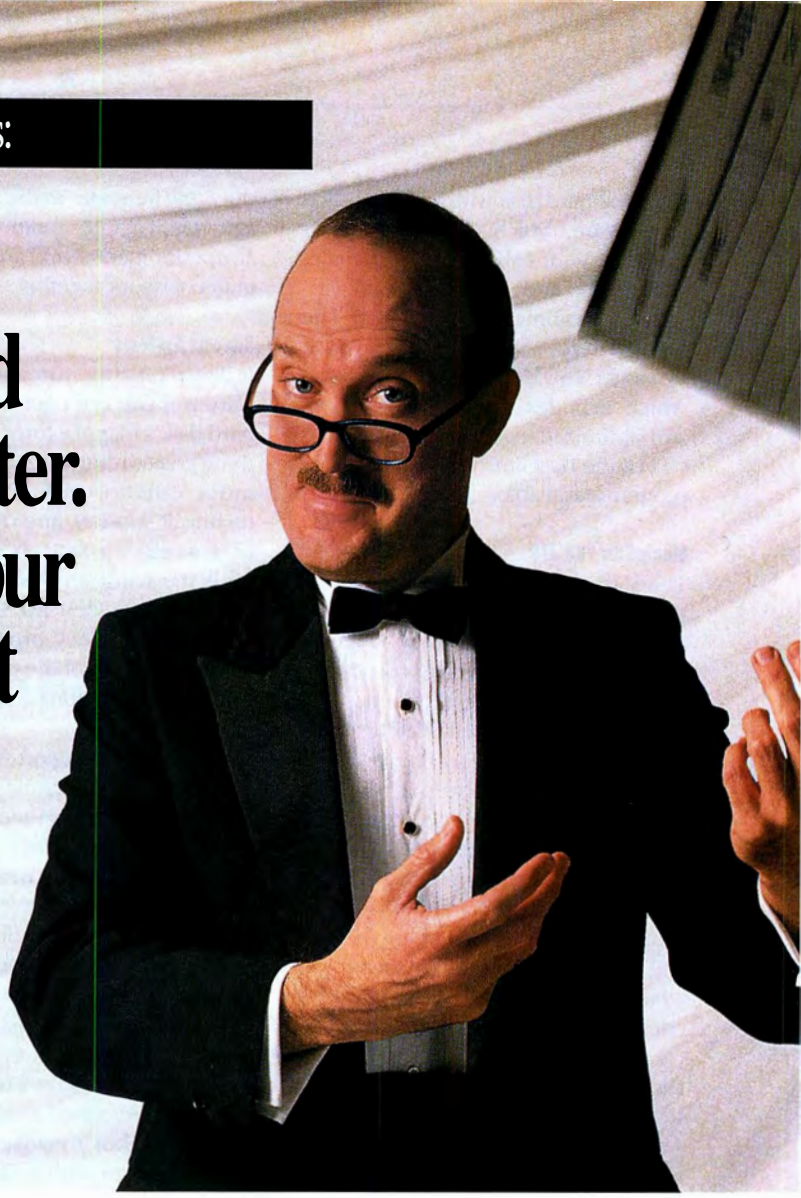
Measured in kilobits per second



In my tests, the DataFrame and MacinStor, both based on the Quantum 100 mechanism, performed nearly identically. The Jasmine, although equivalent in opening Excel and PageMaker documents, was slower in the SCSI Read/Write test, and lagged behind by almost half a minute when duplicating a large folder on the desktop.

Dr. Productivity Says:

"You trashed your typewriter. Now trash your office in/out board."



"Never wonder where the heck George went again."

"The busier your organization, the more time you waste running around looking for people. 'Where's George? Should we start the meeting? Should we wait? When will he be back? How can I get him the moment he gets back?' Blah blah blah. Time down the toilet. Fortunately, there is a cure."

"You can let everyone wonder where the heck you went. Or let people know where you are in a flash."

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"Now your receptionist can stop paging everyone to death."

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Point of Sale and Inventory Management

POS-IM 2.0

Pros: A sophisticated, powerful, comprehensive program; excellent use of the Mac interface; imports and exports text files; links directly to Layered's Insight Expert Accounting series.
Cons: Some training might be needed if unfamiliar with automated point-of-sale/inventory systems; documentation lacks index; no specs for program capacity.
Company: Ensign Systems. **Requires:** Mac Plus; 20MB hard disk. **List price:** $1795; multiuser version $2495.

POS-IM (or Point of Sale–Inventory Management) is for businesses with large, complex inventories that require an integrated sales and inventory system. The program competes less with other Macintosh inventory applications than with similar minicomputer programs.

POS-IM makes excellent use of the Mac interface, allowing you to click from summary information to invoices to inventory items. An added advantage of the program is its linkup with Layered's Insight Expert Accounting series. POS-IM feeds its information directly into Insight's Accounts Receivable module, which in turn feeds the data into Insight's General Ledger. If you don't use the Insight system, you'll have to key the data directly into your general ledger program.

POS-IM contains three separate modules: Sales-Point, the point-of-sale program; Inventory-Analyzer, the inventory program; and Accounts-Receivable. POS-IM includes an excellent 46-page tutorial, a setup guide for the program, and a reference manual. Although the documentation is well written and you get 60 days of free telephone support, you will likely need help in training your employees with the system. I suggest picking a supplier carefully, especially if you are not presently using an automated point-of-sale/inventory system. Learning the program itself is not especially difficult, due in large part to its excellent interface. But learning any point-of-sale/inventory system is by no means a piece of cake, and you might have to depend on your supplier for help.

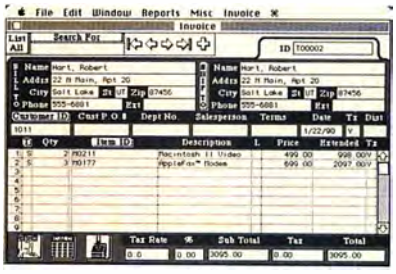
Taking Inventory

Setting up the POS-IM system is the starting point, and the program does all it can to help by importing text files with ease and setting up inventory item cards if your import text is in the correct format (formats are defined in the reference manual). All inventory items carry item codes, and the program gives you ample flexibility in assigning your own numbers or using those preassigned by manufacturers. The program integrates with TPS and MSI hand-held light pens, the Metrologic countertop scanner, and the Indiana and APG cash drawers. You can scan merchandise into and out of inventory using preprinted UPC bar codes, or you can create your own alpha character "39" codes.

The program also accounts for serial-number items and prompts you whenever they enter and leave your inventory. A separate database record is available for each serial number item.

You can have up to seven different selling prices, and you can price via formulas using functions within the program. For example, you can price an item at suggested retail price, retail price less 20 percent, retail price less 20 percent less 10 percent, or cost of the item plus 50 percent. The program also offers IF-THEN expressions, date functions, and relational operators (equal to, less than, less than or equal, and so on).

To add items to inventory without scanning, you can type in the vendor ID number and the order item ID number or you can select the vendor and items from pop-up screens (arranged either by ID number or in alphabetical order). To add new items to the inventory list, you type in an ID number, a description, and a price on an order form; and the program calculates the amount based on the item price and quantity ordered. The next time you use the inventory list, the item appears automatically.



The Sales Invoice Form

POS-IM's sales invoice form resembles a paper form and is easy to complete. Sale items may be entered by scanner or bar-code reader, by selecting from a pop-up sales-item list, or by typing the item ID number in the appropriate column. When the invoice is complete, the salesperson clicks on the Calc icon (bottom left) to calculate the totals and the Sale icon to move to the payment form. The third icon is for scanned or bar-code data.

You can also order items from a vendor card. By clicking on the Items icon at the bottom of the vendor card you can see a list of items supplied by the vendor.

Item records contain complete information, including a description, the preferred vendor (which you can change at any time), last cost, average cost, suggested retail, your retail, stock on hand, stock on order, maximum stock, and reorder point. You can also create automatic reorders from the Item screen when stock has been reduced to a certain point.

The item ledger card also has four icons that let you move immediately to the serial number screen, the components screen (for subassemblies), the vendor list, or an order form.

The standard inventory valuation is by average unit cost of all items on hand, with other valuation forms (LIFO, for example) requiring some extra effort. Inventory-Analyzer also allows you to set up various sales-commission codes, with each item carrying its own designated code.

When you create inventory orders, you have the option of posting each order individually, posting in batches, or posting in the background. Since POS-IM takes about 40 seconds to print and post each order, you might prefer to choose either batch or background posting.

Making a Sale

Because point-of-sale activity is less complex than inventory control, most salespeople can easily be trained in these procedures.

Once a customer file is located (or created), the salesperson merely writes the invoice on an invoice voucher screen that resembles a paper invoice form (see "The Sales Invoice Form"). *(continues)*

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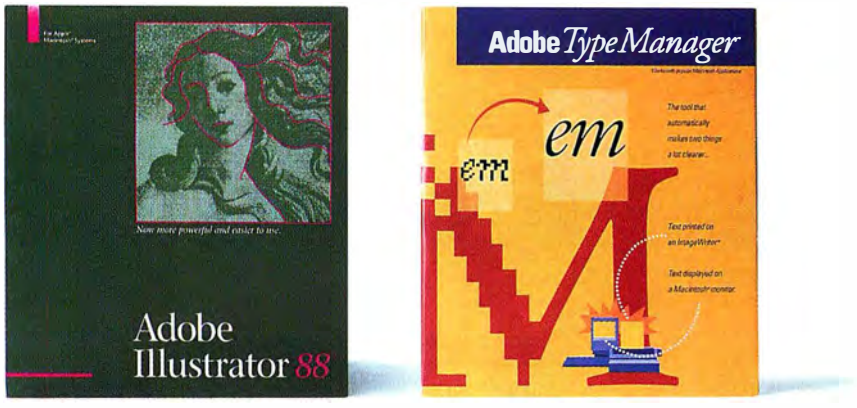

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For cash transactions no customer ID is required, and the salesperson enters the cash payment directly on the form.

Upon completion and posting of a sale, all inventory and customer records are immediately updated. POS-IM can also process returns, transfers, labor charges, back orders, gift certificates, and other options in a similar manner. Invoices can also be placed on hold and completed later.

After an invoice is written, credit sales post to the Accounts Receivable ledger. The A/R ledger—which charges interest on past-due accounts, prints statements, and provides reports on receivables—is the easiest module to use. If you link to the Insight Expert A/R module, you can track receivables in that program.

Reports

You can print merchandise labels and a complete range of reports; on-hand, on-order, and reorder reports for inventory; sales and commission reports; and the usual aged-receivables report. In addition, you can create custom reports by merely copying fields onto the report much as you would move a DA with Font/DA Mover. Custom grids can be used for creating reports that contain items requiring two descriptions (for example, size and color or style and size). Reports can also be saved to a disk file and imported as text to a spreadsheet application where you can rearrange the data or create specialized charts for enhanced formatting.

POS-IM includes a useful Utility file that can be used for setting passwords, checking and repairing databases, or copying databases and rebuilding their indexes.

My main complaint, which is a relatively minor one, is that the program should include information on memory requirements. Businesses with large inventories and several other programs might have to look at expanding hard disk capacity to accommodate the program. Ensign Systems says that data is limited only by disk size and that data can even be spread over additional peripheral hard disks (or hard disk partitions). My only other criticism is the lack of indexes in the documentation.

On the Whole

If you are managing a heavy or complex inventory manually because you can't afford a minicomputer, or if you're using a personal computer and think you'll soon have to move to heavier hardware, or if you're using a minicomputer and would like to reduce your costs significantly, take a good look at POS-IM. The program is sophisticated and powerful, and its excellent Mac interface makes point-of-sale and inventory control about as easy as these difficult jobs can be. Ensign Systems hasn't left much out of this excellent program.—**Alan L. Slay**

See **Where to Buy** *or circle 818 on reader service card.*

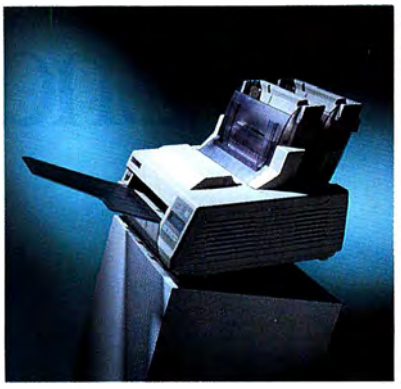
PostScript Printer

FUJITSU RX7100PS

Pros: HP LaserJet II emulation; small footprint; second paper bin available. **Cons:** Cannot feed envelopes; solid blacks lack density. **Company:** Fujitsu America. **Requires:** Mac Plus. **List price:** 2MB $3995; 4MB RX7100PS+ $4795.

The first thing I noticed about the Fujitsu RX7100PS is that it sure doesn't look like a laser printer. It has the small footprint, light weight, low profile, and upright sheet-feeder design typical of impact dot matrix printers.

The RX7100PS is a true PostScript page printer, with the same AppleTalk interface, 300-dots-per-inch resolution, built-in fonts, and xerographic imaging system found on the Apple LaserWriter. The Fujitsu printer also includes some nice touches, like an easy-to-read alphanumeric status display and setup menu, an optional software-controlled second paper bin, and built-in emulation of Hewlett-Packard LaserJet series printers (an important plus if the printer might be needed in an MS-DOS environment). But it's not really a laser printer. Fujitsu has replaced the semiconductor laser and rotating mirror used in laser printers with an array of light emitting diodes (LEDs). By simplifying the optics and reducing the size of the xerographic print engine, Fujitsu has squeezed the functionality of a LaserWriter into a package smaller in every dimension, a



MARK JOHANN

Fujitsu RX7100PS

pound lighter, and somewhat cheaper than a LaserWriter IINT.

There are some trade-offs, however. While the print engine in a LaserWriter II is rated at 8 pages per minute (ppm), the RX7100PS's engine is only rated at 5 ppm. Whether that is significant depends on how the printer is used. Unless you are printing multiple copies of the same page, most PostScript printers are limited not by the engine speed, but by the speed of the PostScript interpreter. The RX7100PS's PostScript interpreter runs slightly faster than the LaserWriter's, so the time required to print a single page is about the same. Only when printing multiple copies of the same document, or long documents that consist entirely of text without a lot of formatting, is the slower engine in the Fujitsu printer noticeably different.

Much of what I print eventually gets mailed; I need to print an envelope for every three to six single sheets. The RX7100PS, with its optional software-controlled second paper bin, seemed like a natural for my environment. I could load up one bin with paper and another with envelopes, and print letters and envelopes on the fly. The first problem I encountered was that the Macintosh LaserWriter driver doesn't have a provision for controlling dual bins. You can select the bins from the front panel, or even instruct the printer to automatically switch bins when one becomes empty, but you cannot switch bins from the Macintosh. A bigger problem is that, according to the manual, the Fujitsu printer cannot accept envelopes. I ignored the warnings and attempted all kinds of

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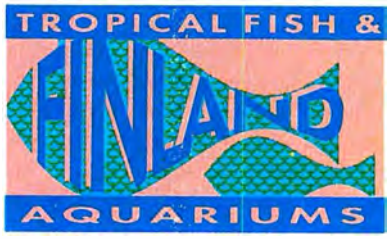

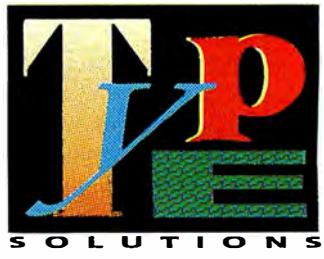

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tricks for getting the RX7100PS to accept an envelope, all to no avail. I can't even print envelopes using the manual feed. So if your printing needs include a lot of envelopes, this could be a real drawback. Otherwise the paper handling is good. The upright paper bins are easy to check and load, and while they did seem to feed double sheets a bit more often than other printers, the only time I succeeded in causing a paper jam was when I tried to feed an envelope.

The Fujitsu engine uses a single cartridge to replace the toner and electrostatic imaging surface ($185 replacement cost for approximately 6000 pages). It's a little easier to change a Fujitsu cartridge than it is to change the cartridge on Canon engines (the engine used in the LaserWriter II and many other printers) because of the wide-open design of the RX7100PS. The design also makes clearing the rare paper jams a breeze. Unfortunately, the engine produces blacks that aren't as sharp and dense as those from printers based on the Canon engine. The quality is generally acceptable for text, but documents with large solid black areas aren't as clear and even as they might be, and changing the setting of the front-panel density control doesn't help.

The documentation and support materials are excellent, though the printer design is self-explanatory. As with all PostScript printers I've seen to date, the RX7100PS does not come with PostScript screen fonts on disk, which increases the difficulty of proper printer installation by at least an order of magnitude.

Recommend But . . .

I want to be able to recommend this printer. The RX7100PS is the friendliest PostScript page printer I have seen to date. It is small, quiet, reliable, and easy to understand. It could be a favorite of mine, in spite of its tendency to print less-than-perfect solids. Unfortunately, my need for a printer that will conveniently print envelopes outweighs my need for friendliness. Before choosing the RX7100PS, consider carefully how important dense solids and the ability to print envelopes are to you. **—Ron Risley**

See **Where to Buy** *for contact information.*

Music-Notation Program

MUSICPROSE 1.0

Pros: Easy to use; many semiautomatic features; easy transposition of chords and placement of markings; fast.
Cons: No tool for setting length of rests; no Undo command; can't extract parts.
Company: Coda Music Software.
Requires: Mac Plus; second disk drive. Hard disk recommended. **List price:** $249.

Music-publishing programs for the Mac have been an endless source of aggravation for many musicians. None of the high-end programs widely available really present a viable solution for the working musician who simply needs to print up a lead sheet or horn chart. What has long been missing from the market is a midrange program that transcribes music as it is being played, imports files from a MIDI sequencer program, and offers a suitable array of page-layout tools to produce output that's ready to be published. Coda Software's new MusicProse, based on the company's high-end program Finale, offers the right set of features at a moderate price.

Enter without Knocking

Prospective users of a desktop music-publishing system tend to want one thing more than any other: the ability to automatically transcribe music from a keyboard played in real time. MusicProse's HyperScribe mode allows just that. You play music on a MIDI-equipped instrument, provide your own tempo reference by tapping a footswitch, and HyperScribe accurately transcribes every note. If you prefer you can play to a steady metronome click, but providing your own tempo reference allows you to play *rubato* phrases and still obtain an accurate transcription.

MARK JOHANN

In addition to real-time transcription, MusicProse offers two other input methods under the Entry menu. In Simple Entry mode, you select a note value (quarter note, eighth note, and so on) from a floating palette or the numerical keypad and simply click on the score to enter notes. Speedy Entry is similar, with the added ability to use the Mac keyboard's arrow keys to move about on the score and select pitches (pitches can also be entered from a MIDI instrument). This is very similar to the step-recording function found on most sequencer programs, and it works quite well. The only strange aspect to MusicProse's Simple and Speedy entry modes is that there are no tools for adding rests of various durations; you must first add a note of the desired value and then use the eraser tool (or the Enter key in Speedy mode) to change the note into a rest. While this works just fine, it would be more intuitive to enter rests in the same way as notes, by choosing them from a palette.

Beyond the Entry

MusicProse gives you eight main tools, each of which has a pull-down menu of its own. The Staff, Measure, and Page menus have commands that affect the position, size, and other attributes of staff systems, measures, and text blocks. Commands like Fit Music and Lay Out Measures let you perform some incredibly useful semiautomatic operations that, for instance, stretch out overly dense measures and help avoid horizontal overlap between lyrics. Staff Transposition is a saving grace for composers because it can transpose a staff for B-flat clarinet, for instance, and play the notes as they should sound, not as they look on the screen (see "Transposing Chords").

The Measure menu is where you'll find commands for copying and pasting chunks of music and setting rehearsal marks, measure numbers, and alternate notation symbols such as slash note heads for notating percussion. Any range of measures can be

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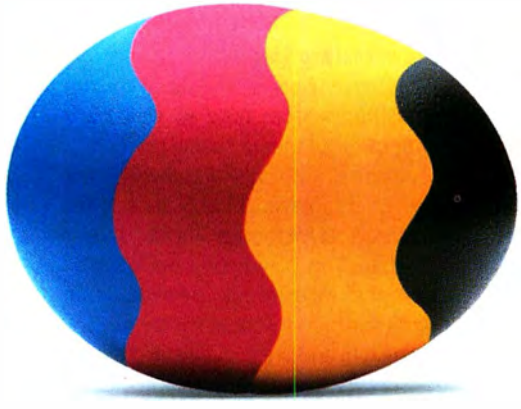

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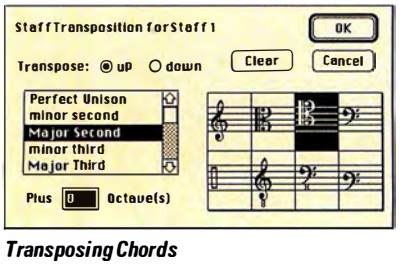
transposed, and can have its own key signature, clef, meter, and style of bar lines. Measure mode forgivably departs from normal Macintosh conventions in that you don't need to use any keys or commands to copy and paste a region of measures: you just select the range to be copied and drag it to the desired destination.

Express Yourself

You choose markings such as slurs, crescendos, pedal, and dynamic symbols, and text expressions like *Allegro* from four floating palettes accessed from the Expression menu. Simply click on the palette to choose a symbol, and then double-click on the score where you want the symbol to appear. All of these symbols can be freely positioned; slurs, crescendos and decrescendos, and octave markings can be stretched and resized with handles similar to those found in most drawing programs.

With MusicProse you can also edit and analyze any chord, and the program provides the appropriate chord symbol automatically. You can edit chords either using MIDI input or via an onscreen music keyboard. Chord symbols, including guitar fingerboard symbols, are entered using the Chord menu. In addition, there is a user-definable library of chord symbols and suffixes.

Dealing with on-screen lyrics is a breeze, thanks to the Click Assignment function under the Lyric menu. After lyrics are entered, each syllable can be assigned to a specific note entry by clicking on the score. This ensures that each syllable aligns properly underneath the note it's intended for, and that it stays that way throughout any repositioning of staves and measures.



Transposing Chords

This dialog box lets users set a transposition for notes displayed in any staff, without changing the pitches associated with that staff. This means you can set transpositions for instruments that are not in the key of C, without changing the pitches that will sound on playback.

Import and Export Duties

MusicProse can import and export any file that supports the standard MIDI File format, although all ornaments and expression markings will have to be added by hand. It's also possible to compile a PostScript listing, or to export an encapsulated PostScript file to programs like Aldus FreeHand or PageMaker so you can incorporate your score into other documents.

MusicProse fully supports laser printer output, although the outline versions of Coda's Petrucci and Seville fonts cost an extra $89 to registered MusicProse owners. Screen fonts are included with the program.

Upscale, but Midrange

MusicProse's note-entry and page-layout features rival in elegance those of other applications costing considerably more, but the program does have a few limitations. For instance, a score can have no more than 8 staves; other programs offer 16 or more. Furthermore, you cannot automatically extract and print separate parts; you must save separate files and delete all but one instrument from each. And there is no mode for fine-tuning placement of notes; other programs have a mode in which every symbol on a page can be repositioned precisely. And since exported EPS files cannot be ungrouped, you will have to settle for the default placement of most notes. Finally, MusicProse has one unforgivable shortcoming: there is no Undo command.

Despite the missing Undo command, the lack of a draw program–style object-placement mode, and the eight-staff limitation, MusicProse is a solid program with a reasonably streamlined interface and a healthy set of well-thought-out defaults. MusicProse is probably the best choice for anyone who needs no more than eight staves per score, and is a sensible solution for sequencer users who simply want to print lead sheets, horn charts, and the like. It is flexible, fast, and not at all confusing; compared to its competition, that's saying a lot.

—Charles Clouser

See Where to Buy *or circle 801 on reader service card.*

Digitizing Tablets

KURTA STUDIO FOR ALDUS PRODUCTS

Pros: Full optimization for efficient use of Aldus software; lifetime warranty; tool icons laid out adjacent to drawing area. **Cons:** Proportionally small drawing area; clunky stylus. **Company:** Kurta Corporation. **Requires:** Mac SE. **List price:** $1295.

PERSONAL WRITER PW10 SL

Pros: Easy macro recording; sleek, lightweight design; proportionally large drawing area. **Cons:** Small command buttons. **Company:** Personal Writer. **Requires:** Mac 512KE. **List price:** $799.

WACOM SD-420L

Pros: Cordless, slim, pressure-sensitive stylus. **Cons:** Heavy; scant support for pressure feature. **Company:** Wacom. **Requires:** Mac Plus. **List price:** $795.

Digitizing tablets are designed to be an artist's keyboard, the ultimate input device for transporting a designer's creative cargo to the screen. The three tablets I evaluated—from Personal Writer, Kurta, and Wacom—approached this ideal from different angles. Nevertheless, I can recommend all three in good conscience, though each would go to a different artist with different needs.

The distinction between these tablets lies more in task orientation than in performance quality. All are high-resolution, highly responsive input devices. And once you've installed the driver software and set the DIP switches, there are few surprises. Choosing the right tablet is more a matter of feature preference than of avoiding any drawbacks.

All three companies include driver software with their tablets and let you choose from several pointing-device options: corded pen, cordless pen, or button cursor. Personal Writer and Wacom offer tablets in a variety of sizes in addition to the ones I reviewed.

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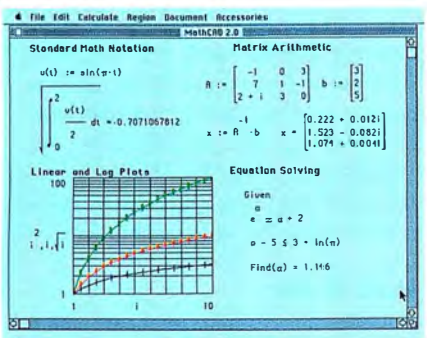

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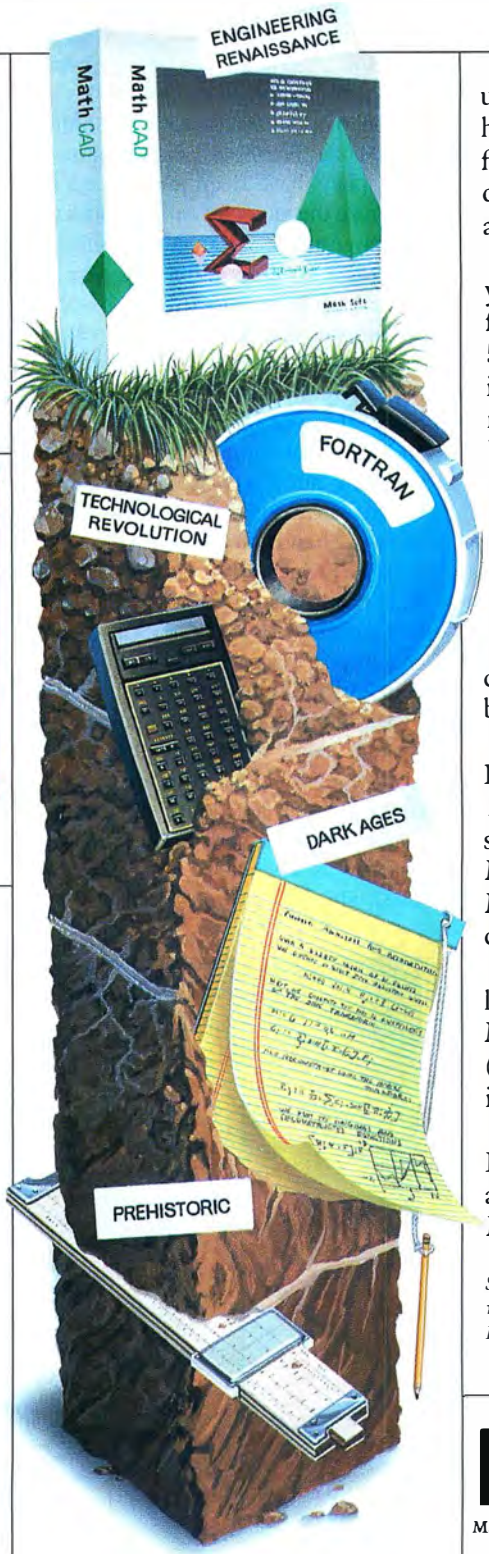

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Personal Writer also offers a tablet with optical-character-recognition (OCR) software that, according to Personal Writer, translates handwriting into typewritten data. One of Wacom's tablets offers a static-hold option that keeps a piece of paper or an overlay in place. The Kurta Studio for Aldus Products is preprogrammed, and it's customizable enough to do everything but mail in the registration card for you.

Personal Writer PW10 SL

The lightweight, space-efficient Personal Writer PW10 SL is the general-purpose tablet of the group. A handy tilt bar lets you adjust the tablet to lie flat or at a comfortable drawing angle of 6 degrees. The corded stylus is slim and highly responsive and has ink cartridges for drawing on paper. The tablet has a cork surface to hold the paper or an overlay in place.

A 2½-inch strip along the left side contains the PW10 SL's "cockpit"; it even has a tiny keyboard for entering minimal text (such as a file name) without leaving the tablet. The controls—a comprehensive array of macro buttons and sets, menu-command buttons (Quit, Save, Cut, and Paste), and so forth—are sensibly arranged but are too small. Even after practice, I could perform few operations without looking down at the tablet to check my position.

The PW10 SL lets you define up to 400 macros (10 sets of 40 each). The control area features 40 macro buttons; below these are 10 more buttons, which let you choose which set of macros is currently operating. Fortunately, you can name both individual macros and macro sets as you define them. Still, I'm skeptical about the usefulness of this vast empty arsenal—achieving full macro functionality could take a great many hours, even though the recording procedure is simple to learn.

The control strip also contains a mouse area for keeping your place in the active area of a drawing tablet. In addition, the mouse area allows you to select objects rapidly in drawing programs or to access that one menu item for which you neglected to record a macro.

The PW10 SL also has a scaling feature, another handy way to work with unwieldy sketches or renderings. The tablet allows you to adjust the live drawing area to proportionally match the size of your drawing.

Kurta Studio for Aldus Products

The Kurta Studio for Aldus Products allows for basic digitizing-tablet functions, plenty of programmable macros, and scaling and mouse-area features comparable to the PW10 SL's. It has been optimized to work with Aldus PageMaker, FreeHand, and Persuasion (and plans have been announced to optimize the tablet for other products, so stay tuned). To an Aldus faithful, using the Kurta Studio is like getting picked up in a limo to go to work. Under the standard tablet's plastic protective sheet rests a glossy heavy paper overlay with commands for all three Aldus programs; font options; and universal commands such as Revert, Save, and Undo. Around the drawing area are icons for the familiar Aldus tools— a handy arrangement.

The Kurta Studio comes equipped with preprogrammed commands for the Aldus trio and CE Software's QuicKeys, a macro program, which encourages additional customization and programming of the 23 function keys that lie along the top of the tablet. Kurta even includes a permanent-ink pen and labels for identifying custom macros on the overlay. The function key row is a standard Kurta design, also built into its low-end models.

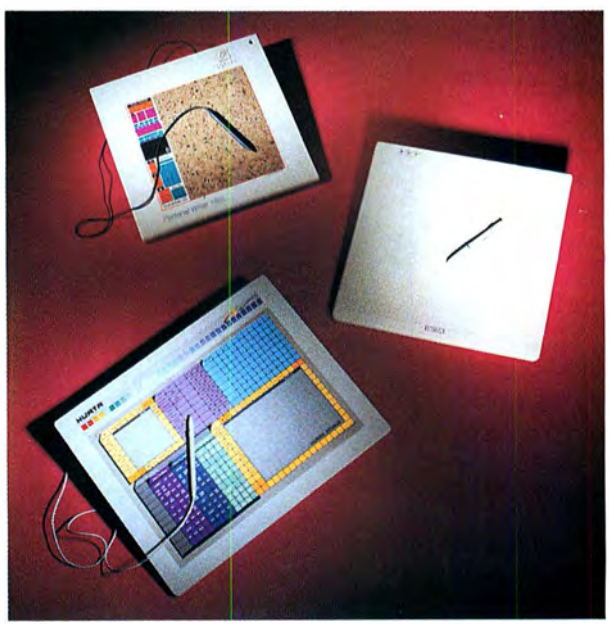
The Kurta Studio's drawing area is somewhat miserly. While the PW10 SL controls are too small, certain of the Kurta Studio's are too big—at the expense of live drawing area. This also means lots of travel time for hand and stylus. The drawing area corresponds to Mac SE screen size; rather than accommodating larger monitors.

At 12 by 17 inches the Kurta Studio is the largest of Kurta's tablets. The Aldus-optimized overlay is described in the manual as a template. You can disable the overlay and still keep the function-key macros operable. The discussion of macro-recording options and the use of the term *template* was somewhat confusing. The tablet also requires the installation of two sets of software (three if you count QuicKeys.) And in fact, the entire process of macro recording is unduly complex, especially in comparison with the PW10 SL's. You have to become familiar with the QuicKeys manual, and you must record macros on the template itself rather than with an on-screen naming option as provided by the PW10 SL. The Kurta styluses are also rather clunky in comparison with the other contenders.

Wacom SD-420L

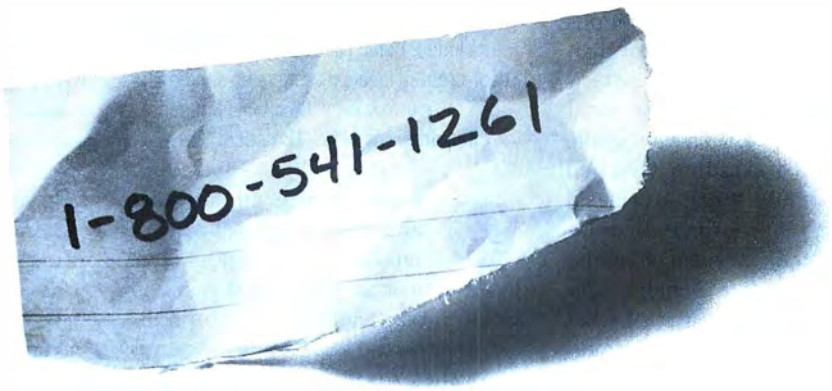
The Wacom SD-420L is more useful for drawing and sketching than for drafting or technical applications. What makes the SD-420L a magic slate is its

(continues)



MARK JOHANN

Three digitizing tablets: the Personal Writer PW10 SL (top), the Kurta Studio for Aldus Products (bottom), and the Wacom SD-420L (right).



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cordless, pressure-sensitive stylus. Simply put, the slim, superbly streamlined stylus responds to pressure so that as you move the stylus across the tablet you lay down thicker lines with heavier pressure and thinner lines with lighter pressure. The stylus responds just like a paintbrush or a stick of charcoal. At first I thought I'd just lost my objectivity, but I watched the most jaded, technically savvy artists shake their heads and grin as they sketched using the SD-420L . When I reviewed the tablet, only Wacom's demo drawing program took advantage of the pressure feature, but Deneba Software's UltraPaint is the first of what Wacom hopes will be many commercial applications incorporating the technology.

The design of the Wacom tablet, especially in contrast to those of the Personal Writer and Kurta tablets, is zenlike and unpretentious. There are, however, a few peas under the mattress. The SD-420L is heavy—nearly 10 pounds—outweighing the other two tablets by a long shot. (In contrast, Wacom's latest SD-510 6-by-9-inch tablet weights in at a sprightly 1.9 pounds). And I found the packaging and advertising somewhat misleading. Wacom's literature always refers to the SD-420L as a "cordless digitizing tablet." In fact, it requires two cords, one to the Mac and one to an electrical outlet; only the stylus is cordless, and I wish they'd just say that.

Each of the tablets I looked at has the potential to be a primary tool for an artist or designer. I was impressed by the hand-to-screen accuracy of all, having worked with tablets in the past that had flutters or that sent wild signals with the slightest slip of the pointing device. As I worked with the tablets and watched other artists become accustomed to them, it was encouraging to see moderately priced, desktop-sized tablets holding their own against the sketch-and-scan and mouse-drawing methods many designers have cultivated. It seems possible that a wide variety of visual artists might soon enjoy an easier path from concept to on-screen realization.

—Annie Jenkel

See **Where to Buy** *or circle 781 (Kurta Studio), 814 (Personal Writer), 863 (Wacom) on reader service card.*

Arcade-Style Game

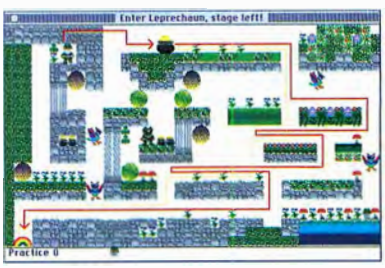
LEPRECHAUN 2.6

Pros: Addictive; easy to learn, yet difficult to master; supports 256 colors; game editor included. **Cons:** No solutions supplied; user-created levels may have no solutions; can't use arrow keys. **Company:** Shodan. **Requires:** Mac Plus. **List price:** $59.

Leprechaun is an addictive arcade-style game. It is spectacular in 256 colors, but looks almost as good—and plays as well—in black and white. The premise, to move the leprechaun king until he pushes a pot of gold onto a rainbow, is deceptively simple. There's more strategy involved than you think at first. Like all good arcade games, it's easy to learn, but difficult to master.

Do You Want to Play a Game?

Pushing the pot of gold onto the rainbow involves constantly avoiding such enemies as birds, trolls, troglodytes, and snails. Each moves in a specific fashion. Birds wander back and forth in straight lines; troglodytes wander aimlessly; snails move at random too, but slower than troglodytes; trolls are smart enough to follow you around. Contact with any of them kills the leprechaun king immediately. Most levels are studded with thorns, which also kill the king. Not everything is deadly; there are also shamrocks, which you can collect and throw at enemies. Each shamrock stuns an enemy for a few seconds, and throwing several of them at a time freezes an enemy for longer. Finally, there are rocks and balloons, which can be pushed off ledges onto enemies.



The Cliff of Despair

Pushing the pot of gold the wrong way (in this case, to the right) can make it impossible to complete the level. The leprechaun's path is shown in red. To win this level the player must push the pot along the path indicated in gold. (Note: The red and gold path lines have been drawn in and do not appear in the program.)

The game is made up of scenarios, which are collections of levels; successfully completing one level allows you to move to the next. To get started with Leprechaun, the first scenario you should master is called Basic Techniques—a series of simple incremental learning levels that teach you skills that help you improve your score.

After mastering Basic Techniques, you can move on to the actual game. It has more than 100 levels, and after months of play, there are still many I haven't completed (see "The Cliff of Despair"). In some levels it's easy to push the pot of gold into a position that makes it impossible to move the pot onto the rainbow. Then you have to use the game's Abandon feature, which kills the king and starts the level over. You get four kings per game, but you earn an extra one for every 16 small pots of gold that you collect.

In case you manage to master all of the supplied levels, the game includes an editor that lets you create new levels and scenarios that are as complex or as simple as you like. Unfortunately, there is no way of checking if the level you create is indeed solvable. Leprechaun comes with a scenario entitled Kiddy Land. It's chock-full of adorable sounds—the kids in our neighborhood loved the squeal of the birds and the squishy sound the falling rocks make when they kill an enemy.

I have only a couple of gripes about Leprechaun. First, no solutions are provided for the supplied scenarios. If you can't figure out how to solve a level, you're stuck. Hints would help. Although the king can be controlled with the mouse or user-configurable keys, the arrow keys, which I prefer for games like this, cannot be used.

But these are minor quibbles. Leprechaun is a winner in my book—an enjoyable, intriguing, and thoughtfully designed game. It's also extremely addictive. Gamers young and old will find themselves slinking back to the Mac at all hours, muttering, "I'll just play one more game. Really. Just one."

—Bob LeVitus

See **Where to Buy** *or circle 782 on reader service card.*

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Circle 302 on reader service card

Custom On-Screen Calculator Tool Kit

CALCULATOR CONSTRUCTION SET 2.06

Pros: Many useful calculation, conversion, and display functions; calculator functions and appearance easy to design; straightforward programming language; excellent compatibility with HP-41C calculators. **Cons:** Lacks standard Undo and Cut, Copy, and Paste features for calculator design functions; lacks built-in conversion and display functions for weight and volume. **Company:** Dubl-Click Software. **Requires:** 128K Mac. System 6.03 recommended. **List price:** $89.95.

When Dubl-Click Software subtitled its upgrade to Calculator Construction Set (CCS) "the 2.0 Power Version," they weren't fooling around. CCS 2.0 is a rich system for creating custom software calculators. Few people will fully exploit its mathematical potential, but no matter: CCS remains accessible enough for anyone who needs even a little boost in calculating power.

Calculator du Jour

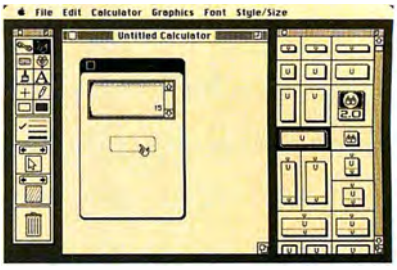
CCS starts with the unarguable premise that no one calculator is right for everyone and takes this axiom to its ultimate conclusion. The program's first line of attack is simply to supply completed calculators that you can immediately put to use. Included in the 61-member potpourri are near-perfect emulations of several popular Hewlett-Packard programmable calculators; a calculator that adds, subtracts, and multiplies time (minutes and hours); one for balancing a checkbook; several converting calculators (from barrels of oil to quarts, degrees Kelvin to degrees Fahrenheit, and so on); and three different flavors of programmer's calculators. Among a grab bag of special-purpose machines, there's one that does typesetter's conversions, one that figures the rise and run of rafters, and a periodic table of the elements (click on an element, and you're given its atomic number and atomic mass). If you can put two or three of the prefab models to regular use, they alone will justify CCS's purchase price. Nevertheless, it's the ability to build your own calculators that makes CCS so unique and so fascinating. You can start from an existing calculator, work from one of 15 supplied templates, or design your own new calculator from scratch. I used the first approach to expand one of the prefab programmer's calculators into one tailored to the needs of the PostScript programmer, featuring an octal notation display and conversions between the coordinate systems of PostScript and the ordinary measurements.

Build Your Own

No matter which approach you take, however, the mechanics of calculator design with Calculator Construction Set are simple and straightforward. A screen palette holds a miscellany of parts for your calculator: keys, buttons, and various display elements. All you do is drag the parts you want to add from the palette to their destination on the calculator (see "Calculated to Please"). Once a part is in place, you must then wire it to perform a particular function.

You can, for instance, hook up a key as a number or letter for input; as any of a myriad of built-in functions, from simple arithmetic operations to complex statistical calculations; or as a trigger for your own program (more later about programming with CCS). In fact, you can write external functions in C, Pascal, or assembler and call them from calculator keys. In the finished calculator, you activate each screen key by clicking on it, and if you design the appropriate connection, you can activate screen keys by pressing keys on the Mac's keyboard. You can label each key how-ever you like, and you can place text and PICT graphics anywhere on the calculator.

Display parts include a variety of imitation LEDs (for showing single numbers), a scrolling facsimile of a paper-tape printout (that records all entries and calculations), and a monthly calendar. As with the keys, you can wire many of the LED readouts to suit your needs. For example, you can have separate LEDs showing the same value in different numeric systems, such as decimal, hexadecimal, octal, and binary notation. Just as easily, you can configure an LED to read out in hours and minutes, feet and inches, or yen. You can also wire LEDs to display the current value of any of CCS's 255 memory registers (temporary numeric parking places). Being able to see the numbers you've stored means you don't have to guess which memory register to recall during a complicated calculation.



Calculated to Please

Calculator Construction Set 2.0 provides two tool palettes, one for adding keys and display elements to your nascent calculator, the other for manipulating it, as shown on either side of the screen. The center of the screen is devoted to the work space in which you actually assemble the calculator.

Don't Make a Mistake

With all the flexibility of its design tools, it's surprising that the program lacks standard Macintosh editing functions. You can drag a selected calculator part around on the screen or dump it in a special trash can—but you can't cut, copy, or paste. Worse yet, there's no Undo command.

The CCS programming language has been overhauled to make it closely compatible with that of the HP-41C series calculators. That was a wise decision, since the 41C family is widely used by engineers and its language is a model of terse power. Though CCS still doesn't duplicate the HP language precisely, you'll be able to easily modify any existing 41C program to run on a CCS calculator. Besides, most of the remaining disparities represent improvements, additional CCS features not available in the 41C. For example, CCS boasts financial functions in abundance that are missing from the 41C. What's more, individual scripts (programs) can be as large as 32K in CCS, a size you can approach only with add-on memory modules in the 41C. Given the wealth of programming functions, and the fact that CCS lets you call one

(continues)

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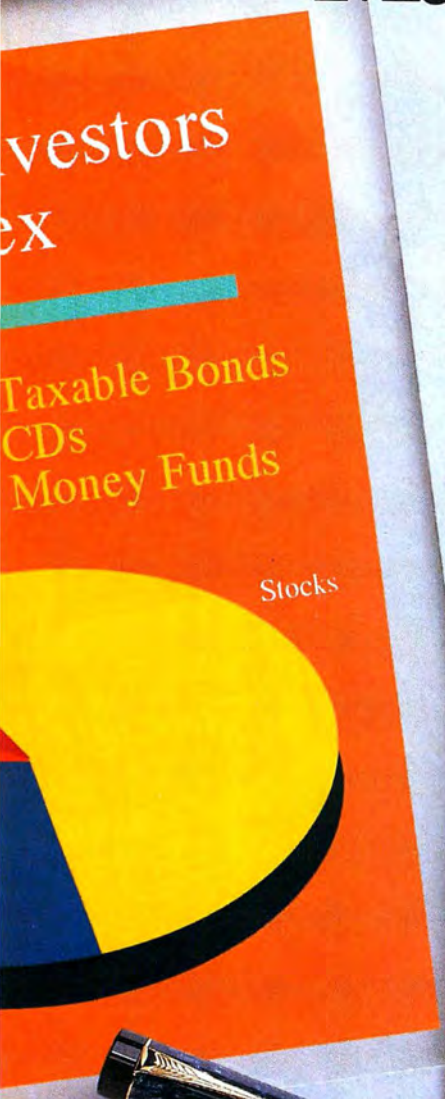

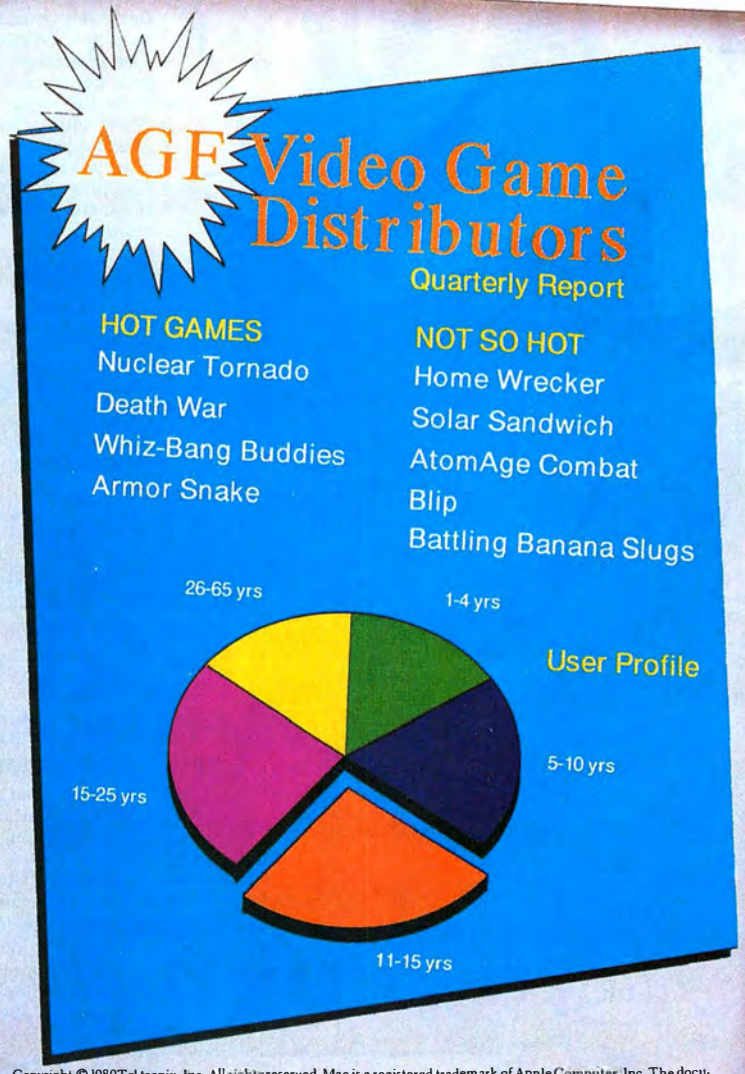

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Circle 143 on reader service card

script from another, you can create extremely sophisticated and truly gargantuan programs. For further fun, you can wire a script to a particular key ahead of time, or design a calculator that can be programmed on the fly.

Once you've finished assembling a calculator, you just Save As to create either a DA or stand-alone application. CCS stores the editable version of the calculator in a third file type of its own.

You can't carry CCS in your pocket, and it doesn't have quite the convenience of a hardware calculator. In every other respect, however, this package is superior: it has better displays, a wider range of calculating functions, more memory, bigger programs—and the clincher, it can make your dream calculator a reality. If applied math is a necessity or a passion for you, Calculator Construction Set belongs in your software collection.

—Steve Cummings

See **Where to Buy** *or circle 710 on reader service card.*

Removable Hard Disk System

TRAVELLER 40MAC

Pros: Hard disk removes easily for transport or security. **Cons:** Separate power supply; additional cable required for SCSI daisy-chaining; no formatting or utility software supplied; expensive additional hard disk systems. **Company:** AströSystems. **Requires:** Mac Plus. **List price:** $1225; additional TravelPak 40MB disk $1045; additional TravelPort base unit $155; power supply $115.

Removable hard disk systems offer three advantages over fixed hard disks. The first is transportability; you can remove the disk portion and put it in your briefcase, then insert it into a similar base unit at your destination. The second advantage is security; you take out the disk and lock it up for safekeeping. The last advantage is expandability; you can buy more disks for additional storage capacity.

Aströ Systems' Traveller 40Mac comes in three parts: a 40-megabyte hard disk in a plastic shell about the size of a James Michener paperback; a base unit; and a power supply. The TravelPak disk portion slides into the TravelPort base unit, which receives power and data signals through a connector at the rear of the unit. The power supply is a box the size of your hand, with a line cord and a smaller cord leading to the base unit. The base unit has a power switch and one DB-25 SCSI connector on the back. Almost all other external Macintosh hard disks provide two SCSI connectors, so that you can easily daisy-chain additional SCSI devices. But in order to hook up more SCSI devices to the Traveller 40Mac, you must purchase an optional adapter cable from Aströ. Another annoyance is that when the Traveller is attached to an SE/30, the Mac's internal drive doesn't boot unless the Traveller is switched on. The drive also comes preformatted, loaded with Apple's system software, and preset to SCSI ID 1; there is no way for the user to change the SCSI ID, another unusual "feature."

Although the unit I tested had a 40MB 3½-inch Quantum drive mechanism, there are also 80MB and 100MB versions of the Traveller Mac. The Traveller's speed and performance were good, and the drive ran relatively quietly. The unit doesn't have a cooling fan, but running the Traveller 40Mac for several hours only made the case slightly warm to the touch.

Amazingly, Aströ Systems doesn't include disk-formatting software with the product. The technical support staff at the company told me that software is unnecessary because the hard disk comes preformatted, and that the company doesn't like to give the software out because it is "too easy" for Macintosh owners to destroy all their data with just a few clicks of the mouse. I then asked what I should do if the hard disk becomes corrupted, requiring reformatting. I was told that a dealer could perform the service for me, or that Aströ would send the software upon request. No other software, such as disk utility or backup software, comes with the product. The documentation is poor, with only one page of the thin manual devoted to installation procedures for the Macintosh (although the company states that a new manual is in the works).

MARK JOHANN

Aströ Systems' Traveller 40Mac

Home from the Office

The Traveller, however, isn't the only solution to the problem of moving data between two locations. Its primary competition is the removable 40MB hard disk cartridge system made by Syquest and marketed by a number of companies. And when compared to the Syquest drives, the Traveller 40Mac falls short in almost every category. The Syquest cartridges are smaller and lighter, yet hold the same amount of data. A Syquest drive with one cartridge sells for as little as $799, with additional 40MB cartridges costing only $99. An extra 40MB TravelPak costs $1045. And should you want to carry a single TravelPak between home and office, a second TravelPort and power supply costs $270. The total cost for a two-location solution is $1495 for the Traveller, and $1598 for two Syquest units. But you get an extra 40MB of storage when you buy the second Syquest drive, so it's clearly a better value. And you have the added bonus of being able to exchange Syquest cartridges with colleagues who also have these popular drives. The TravelPak has an edge in reliability, however; since it contains a sealed hard disk, it's less likely to fail than a Syquest cartridge, which is more susceptible to contamination.

Although the Traveller 40Mac ran well, because of its high cost, hardware annoyances, the missing formatting software, poor documentation, and mediocre support I can't recommend it to people who need to carry their data with them. Buying one of the many available Syquest cartridge drives is a better solution. Or you could even buy one of the smaller 40MB hard disks and put up with the inconvenience of dealing with the power cord and SCSI cables.**—Tom Negrino**

See **Where to Buy** *or circle 847 on reader service card.*

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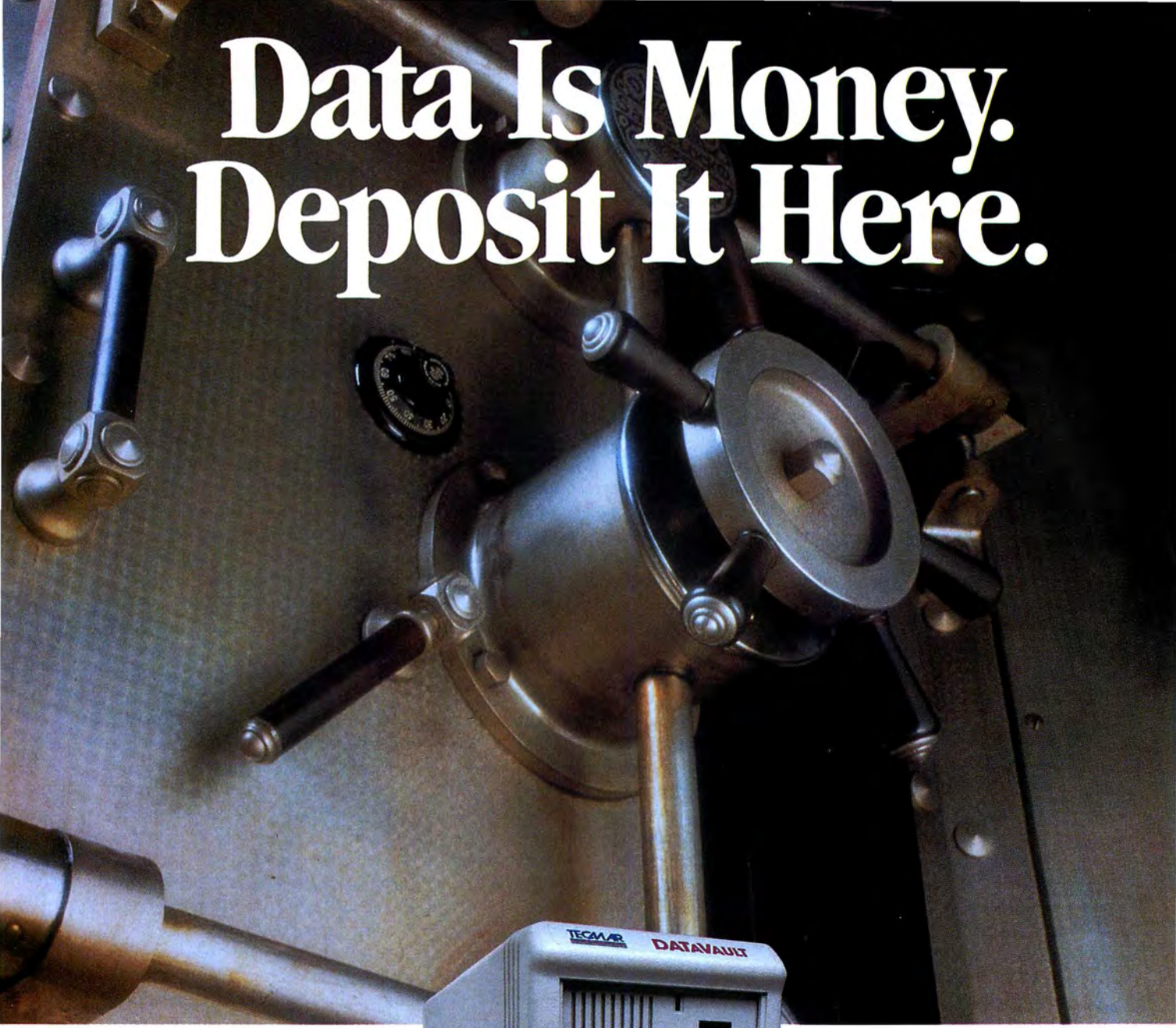

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Circle 321 on reader service card

Plotting and Analysis Program

KALEIDAGRAPH 2.0

Pros: Fast plotting; provides full control of plot symbols, sizes, fonts; page view allows precise placement of plots; can save page layouts as PICT files; includes version that uses floating-point processor for 68020/030 Macs. **Cons:** No option to tile or stack windows. **Company:** Synergy Software. **Requires:** Mac Plus. **List price:** $249.

When KaleidaGraph first came out over a year ago, its performance and many of its features were better than the best-selling graphing program at that time, Cricket Graph. Now Synergy Software (formerly Peripherals, Computers & Supplies) has made a good thing better with the release of version 2.0.

Improving on a Good Thing

KaleidaGraph includes line, scatter, and double-*y* plots, as well as probability, *x*-*y* probability, stacked histogram, box, and percentile plots. In addition to the polar, pie, and column plots found in version 1.1, KaleidaGraph now has horizontal bar and stacked bar plots. The line, scatter, double-*y*, and *x*-*y* probability plots can be assigned up to nine *x* variables.

When you start working with KaleidaGraph, you'll probably be struck by the similarity of its interface to Cricket Graph; when you double-click on an axis, for example, it displays a window with options for changing the tick interval, the format of the numbers, and so on. KaleidaGraph's data display is the now-common spreadsheet window.

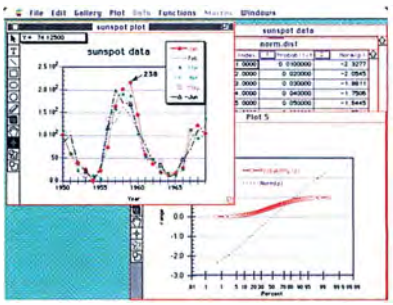
Soon, however, you'll realize how different the two programs are. For instance, KaleidaGraph plots data faster than Cricket Graph (4 seconds for 500 points and 10 seconds for 2000 points with KaleidaGraph, versus 11 seconds and 10 *minutes,* respectively, with Cricket Graph). KaleidaGraph also offers new options for zooming and panning a plot as well as for selecting only certain data for plotting.

KaleidaGraph has a window that looks just like a regular programmable calculator. You can use this window to perform many types of calculations, from simple math to exponential and logarithmic operations and vector manipulation. This calculator also enables you to create or modify macros. Macros can be saved in individual files—statistical analysis macros in one file and quality-control analysis macros in another file, for example.

Data with a Foreign Accent

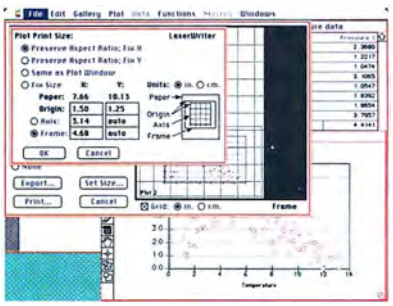
KaleidaGraph has some excellent but complicated options for importing data from text files. The complications arise from KaleidaGraph's flexibility. For instance, you can tell KaleidaGraph to read one header line as the data set title, skip a few lines in the header to get to the line containing the variable names, and then read only certain columns of data into the data set you're creating. You can experiment with the import options until you get the data you want without any frustration.

KaleidaGraph also offers good formatting options for both text and numeric data. The time format includes m/d/yy, d-m-yy, h:mm:ss, and mm:ss.ss. KaleidaGraph also automatically converts fractions like 34⅝ to 34.625 for plotting.



Getting It All on Screen

Two datasets have been plotted in different windows. Spreadsheet views of both sets of data are in the upper-right corner. The sunspot plot is a regular scatter plot of six variables, while the other plot (unlabeled) is a probability plot of two variables from another data set.



Laying Out the Plots

This dialog box represents all the options for rescaling a plot on the page view prior to printing. One plot has already been sized and placed on the page (look to the lower right of the dialog box).

Give Me More Plots

Version 2.0 has removed the restriction of working with only one plot window at a time. Initially, only one plot appears, but you can display other plots by selecting names from a hierarchical menu. There's also a menu item to show all plots.

KaleidaGraph stores separate layout styles for each plot type; you can use different fonts and data symbols and put the legend in a different location for each type of plot.

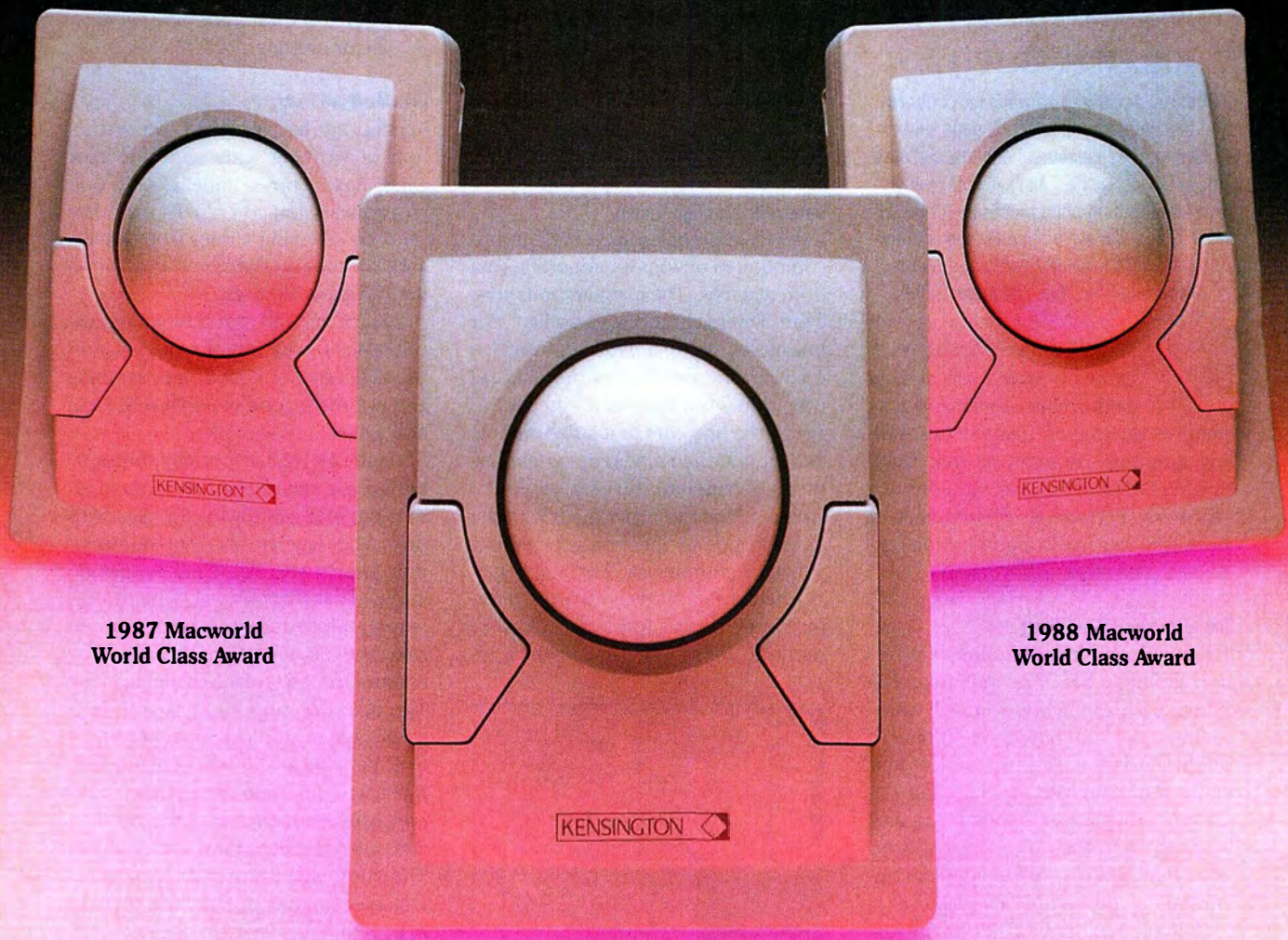
KaleidaGraph especially shines by letting you manipulate the data in either the plot window or the data window. The data window's masking option allows you to select a specific range of data for plotting. When working in a plot window, you can use either the data-selection tool or the zoom-selection tool for changing plots. The data-selection tool lets you draw a polygon around part of a plot to define that data as the points of interest; KaleidaGraph then generates a new plot using only that data and recalculates any fitted lines for that data alone. The zoom-selection tool lets you select a rectangular region for a smaller-scale plot; KaleidaGraph doesn't recalculate fitted lines for zoom selections.

KaleidaGraph also provides a tool for identifying plotted points. After selecting the Identify icon from the tool palette, you can use the cursor to determine the *x* and *y* values of any plotted point. If you hold down the Option key after selecting a point, the program prints a label with the value of that point in a free area of the graph and draws an arrow from that label to the point (see "Getting It All on Screen").

Final Output

KaleidaGraph provides a page view for specifying sizes, locations, and aspect ratios of each plot. You can resize plots, maintaining either the length of one axis or the ratio of the two axes. Once you are satisfied with the layout, you can either print the page or save it as a PICT file, which is useful if you

(continues)



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want to merge a plot layout into another document. You can also save individual plots as PICT or MacPaint files.

KaleidaGraph has taken steps to produce high-quality output on LaserWriters, especially when reproducing fine lines and small symbols. It has produced some of the best-looking graphs I've seen. KaleidaGraph has also added PostScript information to the comment section of the PICT files so that you can use the plots in other applications—like PageMaker and PowerPoint—that can read the PICT comments.

KaleidaGraph is easy to use even when importing data from other files. Its plotting speed makes it easy to fine-tune the appearance of a plot without frustration. I especially like the page layout and PICT-file options for printing and using plots with other programs. At only $50 more than Cricket Graph, KaleidaGraph is a much better buy, both in terms of features and performance. The price advantage might not last long, however, as another plotting program, Igor, looks very competitive and costs less ($195).

—Dave Kosiur

See **Where to Buy** *or circle 780 on reader service card.*

Network Sign-out Board

IN/OUT 1.0

Pros: Easy to use; user-defined shortcuts for posting new notes quickly; doesn't require file server. **Cons:** Workgroups limited to 48 users. **Company:** CE Software. **Requires:** Mac Plus; AppleTalk network; System 6.0.3. **List price:** 5-user pack $199.95; 10-user pack $299.95; 50-user pack $999.95.

Do people pass in and out of your office as if it's Grand Central Station? Are you still trying to figure out where people are and what equipment is available? If so, you should be using In/Out, the first network sign-out board.

In/Out keeps track of people's schedules by letting networked users share a common database of appointments. You can also do such things as check on whether an overhead projector is available, or inform coworkers where you're likely to be for the next few hours, but it only works when people use it consistently.

Setting Up In/Out

In/Out is designed to run in the background or on a Macintosh running AppleShare. You must be running System 6.0.3 or a later System version for In/Out to operate properly. Also, if you install In/Out on an AppleShare server, the server needs a minimum of 2 megabytes of RAM to work as a mail server or printer server or to handle more than 100 In/Out users.

In/Out allows you to define users, resources, and workgroups. You also have the flexibility of specifying a user's full name or using just first or last names. Workgroups can contain up to 48 names; if a workgroup gets larger, you'll need to divide it into two or more smaller groups.

In/Out is available in 5-, 10-, and 50-user packs; each pack has a serial number. When you're installing the In/Out server, the IOS Install program checks these serial numbers to prevent illegal duplication.

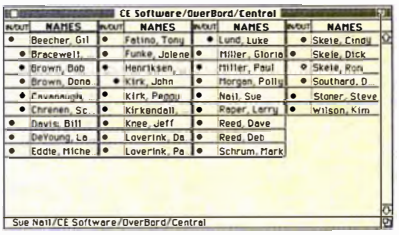
In/Out allows administrators to add or delete users and resources, create new workgroups, or change the In/Out server configuration.

Coming or Going?

Using In/Out is fairly easy. Like many other network programs, the first time you use it you have to select the network zone and the In/Out server that you want to log on to. The zone server is selected automatically after the initial setup. I encountered some long delays (one to two minutes) logging on with a Mac Plus to an In/Out server across a LocalTalk router; CE Software indicated that this is an abnormally long wait, but I have been unable to isolate the problem.

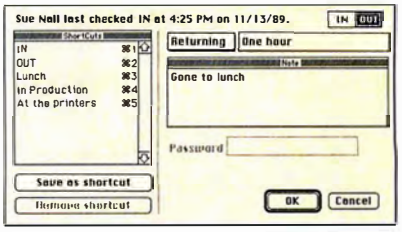
You can have In/Out automatically notify the server that you're "in" when you turn on the Mac and that you're "out" when you turn off the Mac. Other scheduling has to be done manually.

One nice touch is In/Out's screen saver. You can post a message that you are leaving, and it appears on your Mac as part of In/Out's screen saver; the message simply moves around a darkened screen.



Keeping Track

In/Out's names-only view shows each user's name and whether he or she is in or out.



Out the Door in a Flash

The Shortcut dialog window includes a list of user-defined shortcuts for notes that can be generated with a ⌘-key combination. The notes "IN," "OUT," and "Lunch" are standard notes defined by In/Out; "In Production" and "Atthe printers" are defined by the users for their own standard messages.

The main purpose of In/Out is to inform coworkers of your presence or absence and to check who or what is available in the office. The tracking window, accessed using the In/Out desk accessory, displays full information or just names (see "Keeping Track"). For each user, the Full Information display includes name, return time, a note line, and the date and time that In/Out was last used. The Names Only display presents the names and status (In or Out) of all users in a multiple-column display. The program only displays one workgroup at a time.

In/Out's handy Shortcut dialog box lets you create your own often-used notes and assign them to ⌘-key combinations (see "Out the Door in a Flash"). Thereafter, you select the appropriate keyboard shortcuts and the note's entered.

I'm Dutta Here

In/Out is a deceptively simple, but useful, network application that allows you to keep track of people and resources within a workgroup with a minimum of fuss.**—Dave Kosiur**

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MACazine / *March 1989*

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Computers in Accounting / *January 1989*

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MacUser / *April 1989*

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The Macintosh Buyer's Guide / *Spring 1989*

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Drawing and Visualization Package

STRATAVISION 3D 1.0.2

Pros: Clear user interface; excellent documentation. **Cons:** No surfacing tools; requires lots of memory when manipulating large drawings. **Company:** Strata. **Requires:** Mac II; 2MB RAM; 20MB hard disk; System 6.0.3; 32-bit QuickDraw. 5MB on hard disk recommended. **List price:** $495.

After upgrading from my old 24-bit color board, I found the new ability to choose millions of colors from the monitor control panel device to be exciting, especially after I got a software package that makes use of 32-bit QuickDraw. It wasn't too long ago that complex photo-realistic imaging was available only to those who could afford a $150,000 workstation. StrataVision 3D now brings complex imaging to the Macintosh at an affordable price.

Picture Perfect

StrataVision 3D begins with a pleasantly simple, yet powerful, user interface. Those familiar with Super 3D or MacDraw will notice many similar drawing tools such as polylines, circles, boxes, and text. You can create 3-D images using these tools, but StrataVision 3D includes tools for creating 3-D primitives such as spheres, cylinders, cones, and cubes, thus relieving you of the task of revolving and extruding a 2-D image.

Although there's a grid for accurate placement of objects, grid spacing units are in pixels and are not as accurate as I expected. StrataVision 3D lets you import images from just about any drawing package. You can import and render PICT and EPS files, but if the images you want to import have the slightest complexity, you'll probably have to import them in sections.

StrataVision 3D allows for both DXF and IGES translation. I imported AutoCAD Release 10 DXF files into StrataVision 3D and all the complex surfaces came through without a problem. StrataVision 3D recognizes the surfaces created in AutoCAD and can render them, but StrataVision 3D should incorporate its own complex surfacing tools. Unfortunately, when I imported an IGES file from Schlumberger's MacBravo, many of the surfaces were not in the proper place and had to be deleted or moved. IGES-translation problems are due to the lack of proper standardization rules and cannot be blamed on any one software package. A novice CAD user will find StrataVision 3D simple and easy to use. On the other hand, the program gives a trained expert the power to manipulate such intricate parameters as transparency, reflectivity, index of refraction, and so forth.

A 3-D model can have an infinite number of either spot lighting or diffuse lighting sources, each of which can be any color available in Apple's color wheel. You adjust light sources by dragging them around a sphere. Before you can render objects, surface attributes need to be assigned. When assigning attributes to the different objects, my favorite part is the texture mapping. Not only can you color an object and give it a shiny or transparent look, but StrataVision 3D makes surfaces come to life with a set of unique predefined attributes for plastic, wood, and metal.

After manipulating the position and the surface attributes of an object, you use the camera tool to render. Multiple images can be batch-processed and rendered back to back. StrataVision 3D runs well under MultiFinder. I ray-traced a complex object in 32-bit mode while writing this article using the Mac with negligible slowdown. The slowdown becomes more apparent with complex images.

MARKS COMMUNICATIONS INC.

Ray-traced images
StrataVision 3D allows you to create many different surfaces. Reflective, transparent, and special marble surfaces interact with each other in these ray-traced images.

Track Performance

Although StrataVision 3D is relatively inexpensive, you have to make a substantial hardware investment to make use of all its wonderful features and be able to view the result. After finding out that 32-bit QuickDraw doesn't work on RasterOps' 24-bit ColorBoard 104, I broke down and paid $2800 for the upgrade. For $1000 you can get a board to use with a 13-inch monitor; a 19-inch monitor with a 32-bit color board costs between $7000 and $9000.

Though StrataVision 3D runs on a 2MB Mac, you won't be able to use MultiFinder or render and manipulate files quickly and painlessly. The more memory you have, and the faster your hard disk, the better. Even when I put the program on my slower optical disk, the optical disk was accessed through the System Folder on my hard disk. Be sure you have plenty of space on your hard disk for the cache file, since it can grow to be too big before the job is complete. Even on my 8MB Mac IIx, the cache file for a small image was 4MB while ray-tracing. You can view a file as it is being imaged, but there is a speed penalty for doing so.

Overall Image

StrataVision 3D accomplishes many feats that less than a year ago were available only through Visual Information's Dimensions package. Although complex surface tools have been left out, you can import AutoCAD Release 10 images. Both complex surfaces and animation are being considered for future StrataVision 3D upgrades. Strata also has three attribute modules that contain decorative stone such as marble and granite; a military camouflage module; and a wood-grain module. If you have all the equipment to take advantage of it, this exceptional package is definitely worth the price.

—Victor Elgohary

See **Where to Buy** *or circle 844 on reader service card.*

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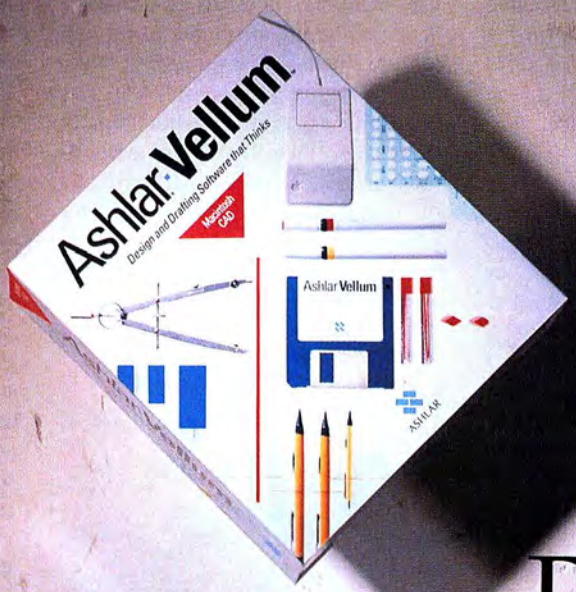
CAD



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WINDOW SHOPPING

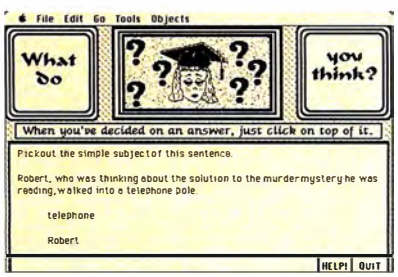
by Lawrence Stevens

This month I look at two tutorials: one for grammar, the other for darkroom work. I also review a utility for recovering deleted files and another for opening documents whose applications are not available.

Nuts & HyperBolts 2.0

Nuts & HyperBolts ($189.95 from Sterling Swift Software) is a HyperCard-based grammar workbook. It provides lessons on parts of speech and parts of sentences, and lessons and practice sessions on agreement, sentence fragments, comma placement, and pronoun reference. The lessons are divided into small portions and displayed on a card. The grammar examples are humorous and interesting, and the explanatory text is clear, often witty, and sprinkled with encouraging phrases (see "Making the Right Choice").

The four practice stacks contain 20 cards each, with five practice sentences or fragments per card. You choose the card you want to work on by clicking on its title—for example, Frankenstein, The Marx Brothers, Quarterback. On each card, you must decide if the sentences or sentence fragments are grammatically correct. If incorrect, you specify—through



Making the Right Choice

While most Nuts & HyperBolts lesson cards expound a grammatical rule, a few offer multiple-choice questions. You select the answer by clicking on it. The selection you make determines the next card, which explains why you were right or wrong.

mouse clicks, not keystrokes—how to rectify the problem.

If you err on a practice question, Nuts & HyperBolts first displays a card that explains why your answer was wrong. Then the program takes you to the lesson section that covers that topic. You can choose to review the lesson or go back to practice.

Educational software has two potential advantages over its paper counterpart: it can branch into different topics based on a student's response, and it can be more attractive and fun to use. Nuts & HyperBolts excels wonderfully in the first category but falls somewhat short in the second. While the cartoon drawings are fun, there is no sound, and the only movement on each card is the blinking of the screen when a question is answered correctly. Unfortunately, since the scripts are inaccessible, HyperCard-savvy instructors won't be able to add their own frills.

The program is made tamperproof by having all HyperCard menu and keyboard functions (as well as the Apple menu) disabled. Users are dependent on on-screen buttons for navigation. These buttons work fine unless you inadvertently move to a wrong section. It would be nice to be able to use HyperCard's Previous command rather than using Nuts & HyperBolts' predetermined route.

I think the lack of control over movement within a stack and the inability to use DAs or to customize cards outweigh the advantage of protecting the stack from tinkering students.

The problems notwithstanding, this is a fine example of computer-aided instruction. It's hard to conceive of a student completing the program without becoming adept in the subject matter.

MacPhotography Workshop 1.02

MacPhotography Workshop (bundled with MacIntheDark from Joseph Ciaglia Photography for $79.50 plus $3.50 shipping) is an ambitious, seven-disk, 4.5MB, non-HyperCard photography tutorial and darkroom assistant.

MacPhotography Workshop is a complete beginner's course in black-and-white camera and darkroom work. The camera section includes topics on lenses, film, light meters, and image control. The darkroom section includes everything you need to know to develop film. Each section begins with a text module that describes the processes in detail, delineates the equipment you need, offers some brand-name recommendations, and includes safety caveats.

The text sections are followed by interactive animated sequences. In some cases, the interactive sequences are relatively helpful. For example, you can click on various combinations of exposure times and paper grades to see how an on-screen image of a print is affected by them. It's less helpful

(continues)

when, for example, you use a mouse pointer in the shape of a hand to place a negative in an enlarger or convey photographic paper from chemical tray to chemical tray. It's true that practice might reinforce the skills learned in the text. But on-screen mouse movements are only slightly helpful in preparing for the real thing.

MacIntheDark helps you time the sundry processes required to develop film. With MacIntheDark, you create a script that contains all the steps of the process including the time intervals. The program then vocalizes the beginning and end of each step and announces when to agitate the chemicals. Concurrently, the appropriate process description, which you had typed into the script, is displayed on the screen.

This is a beautiful and ingenious program—but given the large number of video tapes and books on photography, I wonder whether a computer is really the best medium for learning about the subject. And unless you have a gray-scale monitor, the Mac does an atrocious job of displaying photographic prints.

These problems are, of course, related to the Mac, not to the software. If you prefer computer-based learning, MacIntheDark is a good choice.

HandOff 1.1.1

One advantage the Mac System and Finder combination has over other computer systems is that you can access an application by selecting a document created by that application. Unfortunately, if the creator application is absent, this feature won't work. HandOff ($49.95 from Software Innovations) solves this problem by replacing the Mac's application-is-busy-or-missing dialog box with a dialog box that lets you select the application in which you want the document opened. If the substitute application and document are compatible, they will open. If not, the application opens without a document.

Whenever you open a document with a substitute application, you can specify that HandOff open all subsequent documents that have the same creator with the same substitute application.

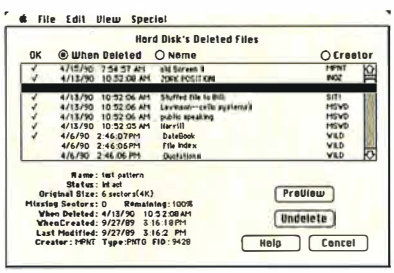
A final feature lets you invent a file-name extension (a period followed by characters) to designate that a particular document should open a particular application. If, for example, Mac users in your company are working with a number of different paint programs, you could all agree to follow each filename with .PAINT. Each user then indicates in a HandOff window that whenever a document whose filename ends with .PAINT is selected, the paint application is opened even if the document was created by another application.

The only disadvantage of HandOff is that its features don't work if the creator application is available. So if your word processor is Microsoft Word, but you also have MacWrite on your hard disk, any document created by MacWrite will open MacWrite no matter what filename extension you give it.

If your company hasn't standardized on one application in each category and there are a number of file transfers either by disk or network, HandOff can save you a good deal of trouble.

Complete Undelete 1.0

Complete Undelete ($49.95 from 1stAid Software) represents the coming-of-age of file-recovery utilities. It's not that this one is able to recover trashed material any better than its predecessors—the process is an iffy one at best, with its success depending on how much you used the disk after the file was deleted. But the fact that it's a Control Panel device (cdev) instead of an application, along with its superior disk-management and protective features, combine to make this utility more convenient and foolproof than any other file-recovery utility I have seen.



Deleted File Log

By selecting any of these deleted files in Complete Undelete, you view (at the bottom left) complete information about the nature and current status of the file. The PreView button lets you see whatever is left of the file's text.

Complete Undelete creates a Deleted File Log (automatically if you so specify) on every disk that you use. To undelete a file, you access Complete Undelete from the Control Panel and select the volume with the file. The cdev then displays a list of deleted files along with information about each file (see "Deleted File Log").

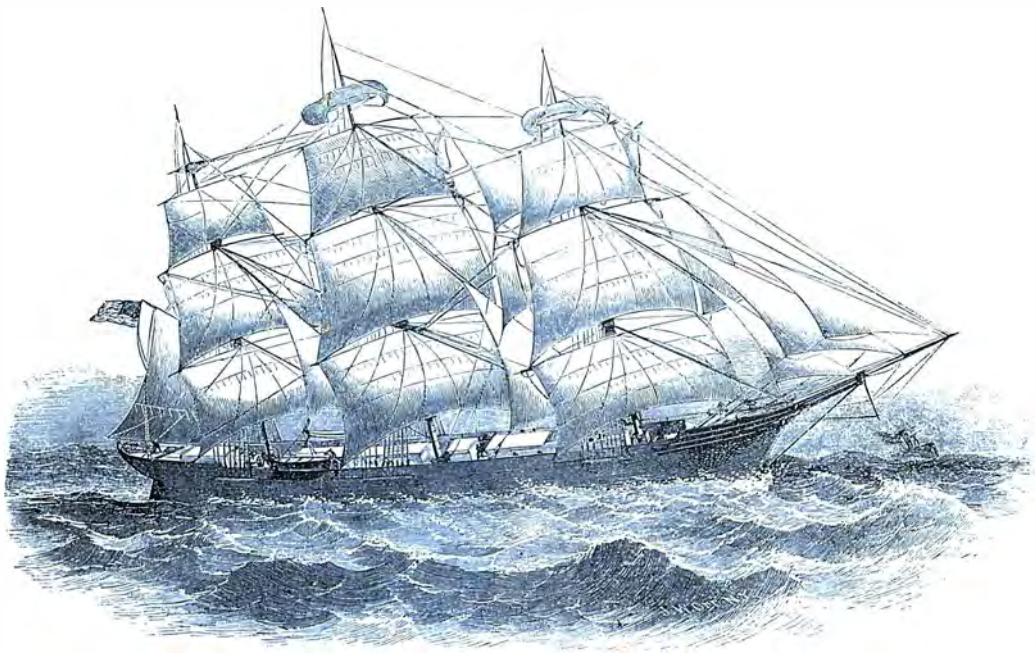
If you select an undamaged file from the log and select Undelete, the file will be back on the desktop. If the file you've selected is damaged, you can have Complete Undelete try to restore the file in one or both of two methods. Zero-out causes the missing sectors to be replaced with blank spaces. The nature of the missing data determines whether or not the file can be opened. The second method, Extract Text, creates a document that contains what remains of the file's text information. The file can then be opened in any application that reads ASCII.

One of the biggest advantages of Complete Undelete is that it is a cdev; you can use it without leaving an application. It enables you to restore files that you deleted using an application's File menu or even, in some cases, to restore previous versions of a document that you lost because you saved a new version.

Complete Undelete will not recover damaged applications because they might corrupt other files, even the System file. The program also displays a warning box advising you not to restore damaged files to the same volume on which you are recovering trash, because of the danger of further corrupting a file.

Unfortunately, Complete Undelete can only recover files that were deleted after Complete Undelete was installed. Too often people buy disaster insurance after they suffered a loss. Complete Undelete is insurance that you pay for only once. If there is any chance that its functions might be needed—and for most of us there is—it is well worth the 50 bucks. MW

See Where to Buy or circle 808 (Nuts & HyperBolts), 787 (MacPhotography Workshop), 772 (HandOff), 720 (Complete Undelete) on reader service card.



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Hard Drive Makers

All the hard drive brands sold today have a couple of things in common.

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Second, they buy a "box" to put the drive into. Now, here's the problem.

A Short Economics Lesson

Each step of the way, these hard drive "makers" add a mark-up. Profit. Now, we'd be the last to say a company is not entitled to a profit. But here's how you get shafted.

When these companies buy a hard drive. They add a little profit. When they buy boxes. They add a little profit. When they buy cables. They add a little profit. The dealer add his profit. Pretty soon...well you get the picture. Right?

A Better Way

Here's the trade secret that will allow you to get the drive you want and save money too!

Universal MacProducts, Inc. is the worldwide leader in one thing. Kits. We make more Macintosh hard drive kits than anyone else. There's a StorMate™ kit for internal installations or for external use.

With our kits, you can take virtually any SCSI hard drive and in minutes be Macintosh compatible.

You save money because you cut out the middle-man. You buy the drive and box. The savings are past on to you. Install it yourself or let your dealer do it.

It's The Box

Since all hard drives, regardless of how you buy them, come from the same source. The only variable is the "box." Here's what comes standard with our StorMate kits. Cables, bracket or enclosure cabinet, StorWare™ software and manuals. And somehting we call **Total Satisfaction**.

1. **Guaranteed Satisfaction**. When you purchase any StorMate kit, you have 30 days to change your mind. If for any reason you're dissatisfied with your purchase, just bring it back.

2. **Box-to-Macintosh Warranty**. For a full two years, your StorMate kit is covered by the best warranty in the business. Should any part become defective, we will repair or replace absolutely without charge to you.

3. **Optional Lifetime Warranty**. As a registered owner, you can purchase extended warranty coverage on your purchase. In fact, for as long as you own the StorMate product we will repair or replace any defective part at no cost to you!

The Next Step

See your local Apple reseller. Tell him what drive you want and that you want the StorMate kit. Have him give you a price. Then compare to all the hoopla from those other companies. You'll be convinced.

Need Help?

For $7.00, we'll send you our **BYOM** *(Build Your Own Macintosh)* disk. This disk "walks" you through the hard drive buying business. Step-by-step. It even prints a quote that you can take to your local dealer. And, of course we guarantee that it's more than worth the seven bucks. If you don't agree, we'll give you double your money back!

StorMate. From now on, you won't have to take it anymore.

Universal MacProducts, Inc.
23402 South Pointe
Laguna Hills, CA 92653-1512
Telephone (714) 581-3442

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Don't Be A One-Mac Band.

The largest group of Mac® users in the world shares its problems and solutions online every day in CompuServe's Mac Forums. And you can join them.

Find out which Mac software lives up to its claims, which hard drive is best for your applications, how to use the new and exciting HyperCard.™ Get support from Mac software authors and hardware vendors.

Struggling with a complicated desktop publishing program? Ask someone who's been through it all. Can't make your word processing software work with PixelPaint? Visit a CompuServe Mac Forum and get the answers. There's no better way to get more out of your Mac.

To join CompuServe, see your computer dealer. To order direct or for more information, call 800 848-8199. If you're already a member, type GO MACINTOSH at any ! prompt.

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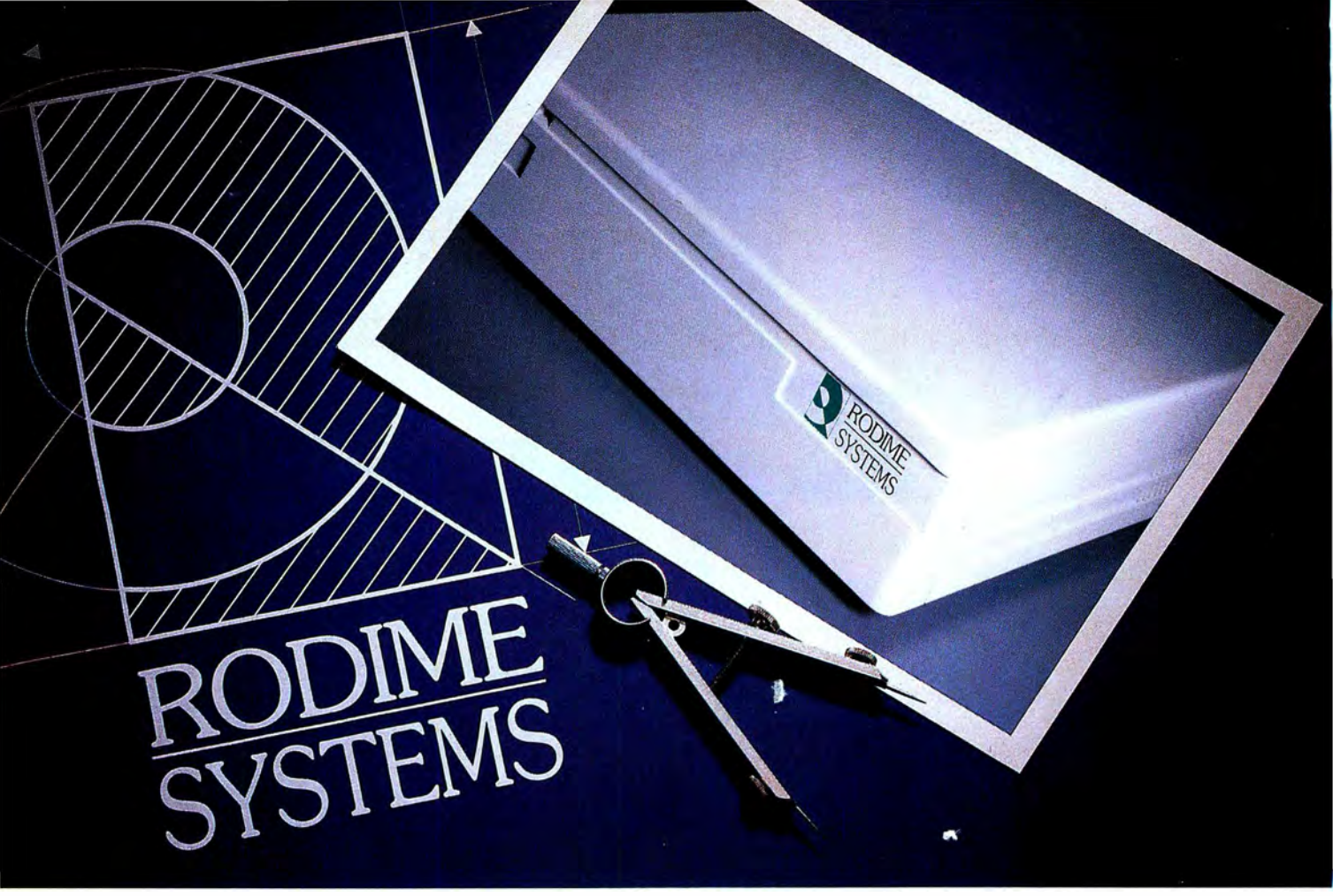

Rodime Introduces the Standard for Hard Disk Technology.

COBRA™ DRIVES SET THE STANDARD. Cobra™ high performance internal and external hard drives are the finest drives available for your Mac. With capacities of 45MB, 70MB, 100MB, and 210MB, Cobra is the answer to all your storage needs. External Cobra drives come in a new, sleek low profile cabinet that fits neatly beneath your Mac Plus, Mac SE or Mac SE/30. Internal Cobra drives come with three mounting brackets. One for installation in the Mac II, MacIIx, Mac SE or Mac SE/30, one for mounting in the Mac IIcx and one for a Mac SE which allows you to keep both floppy ports active.

FAST 18ms ACCESS TIME. Nothing is faster! With an average access time of 18ms Cobra is the fastest drive available on the market for the Macintosh line of computers. Cobra drives also come with up to 48K Caching Buffer which allows even faster access to your data by storing frequently used data in "instant access" RAM.

CONVENIENT SINGLE POWER SOURCE. With the external Cobra, the flip of one switch on the drive activates your CPU, printer and other peripherals, eliminating cumbersome cables.

LED'S THAT PUT YOU IN CONTROL. Now you can be aware of the status of the drive at all times, with power-on, fault status indicator and drive activity lights.

ONE YEAR WARRANTY. Rodime Systems offers the level of reliability, innovation and support only an original equipment manufacturer can provide.

FREE BACK-UP AND UTILITY SOFTWARE. Cobra drives come with a FREE copy of FASTBACK™ back-up software as well as Rodime's Utility Software which allows partitioning (including A/UX), media verification, formatting and driver installation.

RODIME'S COMMITMENT TO QUALITY. At Rodime Systems, the craftsmanship built into every drive is our commitment to produce the finest, most reliable drives available. When you buy a Rodime Systems product, you are buying years of manufacturing experience, state of the art engineering and peace of mind that comes from knowing that more Mac users have chosen Rodime drives than any other.

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SYSTEMS

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NEW PRODUCTS

Edited by Mary Margaret Lewis

This section covers Macintosh products formally announced but not yet evaluated by Macworld. All prices are suggested retail. Please call vendors for information on availability.

HARDWARE

2400XF Modem

Menu-driven fax modem that can send to any Group II facsimile machine. Can be programmed to send one or several pages from a document containing text or graphics at predetermined times to multiple fax numbers. Measures 5½ x 4¼ x 1½ inches. Micro Electronic Technologies, 508/435-9057.

Chinon DS-2000 and DS-3000 Macintosh Scanners

Desktop scanner with SCSI power adapter and cable, utility software, scanner cable, and AC adapter. 200 dpi version $695. 300 dpi version $895. Chinon, 213/533-0274.

Colormate PS

Colormate PS

Color PostScript printer with 8MB of RAM and a Motorola 68020-based Adobe PostScript interpreter that provides 35 resident fonts. $9995. NEC, 415/961-4400.

ColorSnap-32

Color capture board that captures 24-bit images from the Canon Xap Shot and other Canon still video cameras, as well as from other NTSC composite video sources such as video cameras, video recorders, and monitors. $1595. Computer Friends, 503/626-2291.

DataVault

DataVault

A 4mm, 1.3GB tape drive that supports the digital data storage (DDS) format. Has ten times the search speed of an 8mm tape, and stores data at 11MB per minute. $4995. Tecmar, 216/349-0600.

Ether2

NuBus board for the Macintosh II family that supports both thick- and thin-wire Ethernet and comes with management software. $395. Compatible Systems, 303/444-9532.

GridMaster

GridMaster

Digitizer tablet designed as a flexible mat that may be rolled up like a poster. Can be used with all graphics applications. Has a resolution of 1000 lines per inch. Includes side-switch pen stylus or four-button mouse. Weighs 4 ounces. With four-button mouse $469, with stylus $449. Numonics, 215/362-2766.

Kodak Diconix M150

Kodak Diconix M150

Portable ink-jet printer designed to fit in a briefcase or the Macintosh Portable carrying case with the Mac Portable. Produces letter-quality output on plain paper. Is Adobe-type-font compatible and battery operated. $699. Kodak, 800/255-3434.

LaserBank 600 R

Rewritable optical-disk system for the Macintosh that uses 600MB laser disks for data storage and retrieval. System includes backup and archival backup utility that enables you to back up entire contents of disk or specific files only. $6995. Micro Design International, 407/677-8333.

LFR Plus

LFR Plus

Desktop film recorder that provides color sweeps to images that have finely shaded backgrounds and sharp detail. Produces more than 30 slides per hour. $13,750. Lasergraphics, 714/727-2651.

MacPoint

MacPoint

Alternative input device for the Macintosh Portable that performs function of keyboard and numeric keypad. Can be used with a stylus or a finger. Snaps into the keypad of the Mac Portable. $299. Interlink Electronics, 805/684-2100.

(continues)

Nanao FlexScan Model 9400

Monitor that supports 24-bit color. Capable of resolutions up to 1024 by 768 on a Macintosh II when used with graphics boards such as Radius's Direct-Color/24 or RasterOps' ColorBoard 108. $3799. Nanao USA, 213/325-5202.

Nanao FlexScan Model 9400

QuickCAD

Graphics display system for Mac II family that consists of single-slot, plug-in NuBus board and proprietary software. Uses VLSI technology and is capable of computing six million instructions per second. $1495. Radius, 408/434-1010.

The Remote Mouse

The Remote Mouse

Hand-held remote-control input device installed on the ADB port of the Mac. Bundled software utility provides mouse control and labeled keypad enables you to point, click, drag, and select. $395. Forte Communications, 408/733-5100.

RGB VideoLink 600AX

Scan converter for transforming computer graphics to video for the Mac II. $11,995. VGA and Mac II cables $135. RGB Spectrum, 415/848-0180.

RGB VideoLink 600AX

Silentwriter2 290

An 8-ppm, 300-dpi PostScript laser printer. Includes 2MB of RAM and is expandable to 4MB. Contains built-in controller comprising 16.7 MHz M68000 CPU, Adobe PostScript interpreter, and 35 resident scalable typefaces. $4495. Adobe, 415/961-4400.

Smartmodem 2400M

Internal modem for the Mac II family that incorporates CCITT V.42 bis, V.42, and X.32 standards. Provides point-to-point error-control throughput to 9600 bps, and connections to packet-switched networks. $699. Hayes, 404/449-8791.

Super Digitizer 510C Tablet

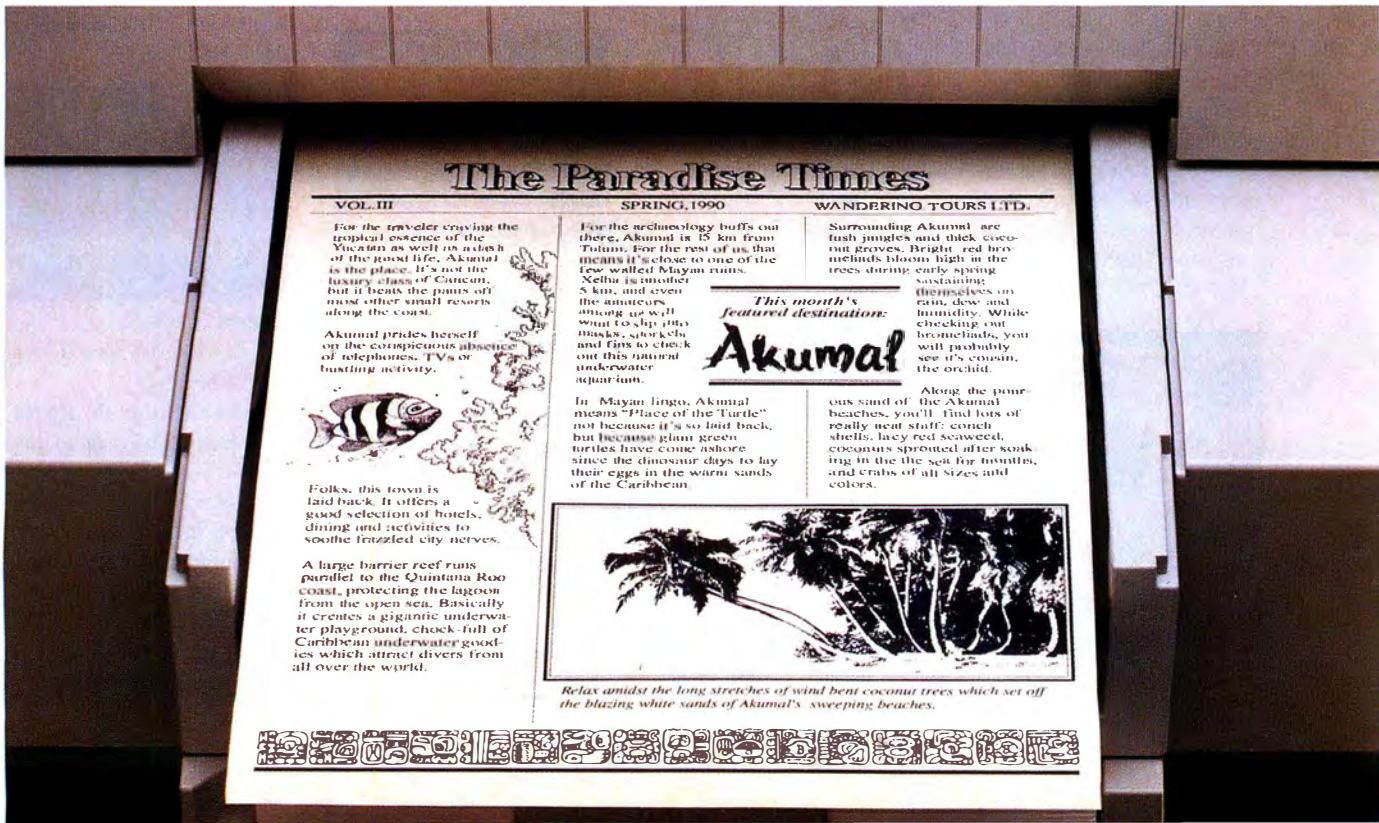
Super Digitizer 510C Tablet

Pressure-sensitive, cordless digitizing tablet that can be used with pressure-sensitive stylus pen. Has 6-by-9-inch reading and drawing surface and weighs 1.9 pounds. $495 including stylus. Wacom, 201/265-4226.

ViewFrame RGB

Color LCD-projection panel that allows you to project computer-generated presentations in color with a

With the HP DeskWriter, you can



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transmissive overhead projector. Allows simultaneous viewing of local monitor and projected image. $3995. nView Corporation, 804/873-1354.

SOFTWARE

Auto-Architect

Software to be used with Auto-CAD for architects, architectural engineers, facility managers, space planners, and construction professionals. Provides tools for design, input, and editing in plan, elevation, and 3-D. 5MB min. memory. $1995. D.C.A. Engineering Software, 603/428-3199.

Bird Brain

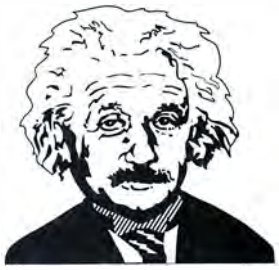
Expandable database designed to help bird-watchers keep track of their sightings. Contains reference database of common and scientific names and taxonomic order of North American birds. Also contains page references for each bird in major field guides. 1MB min. memory. $125. Ideaform, 515/472-7256.

Blackjack Tutor

Program for creating, testing, and teaching blackjack gambling strategies. Show Stats feature helps you determine success of various blackjack strategies. Uses running card counts and makes suggestions for bets. 512KE min. memory. $24.95 plus $2.50 s/h. Post Meridian Software, 612/733-7697.

Clipables

Collection of PostScript clip art, 17 disks containing more than 600 illustrations in such categories as sports, humor, holidays, animals, and maps. Compatible with any program that accepts



Clipables

EPS graphics. 1MB min. memory. $149.95. C.A.R., 314/721-6305.

Cost Management System

Project-management software with features for cost estimating, job costing, cost variance reporting, and general ledger file export. Has more than 20 management reports. 1MB min. memory. $495. Softouch Software, 503/241-1841.

Docket Time

Software for law offices that enables you to calculate legal deadlines, create docket slips, and print docket calendars for each lawyer working in a firm. Program automatically accounts for weekends, legal holidays, and service by mail. 1MB min. memory. $249. Professional Software Designs, 602/841-4220.

Flash

Mac-to-Mac information-exchange software that operates in the background on Macintosh network. Groups data being sent or received into folders. Compatible with MultiFinder. 1MB min. memory. $199.95. Beagle Bros., 619/452-5500.

FlexiGraphs

Software that uses graphs as interactive devices for the input and manipulation of numerical data. Derives numeric values from line, bar, or pie charts drawn

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have it all. (But keep it to yourself.)

The HP DeskWriter printer puts laser-quality printing right at your fingertips.

With a small size and a $1,195* price tag, the DeskWriter printer easily fits on your desk and in your budget. And its advanced 300 dpi inkjet technology lets you print sparkling text and detailed graphics.

The DeskWriter is also designed for easy use with your Macintosh, and even includes scalable and outline fonts. Combine that with the DeskWriter's whisper-quiet operation, and keeping it to yourself will be that much easier. So call **1-800-752-0900, Ext. 1004** for your authorized HP dealer.

There is a better way.

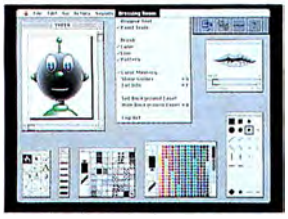
Circle 343 on reader service card

HEWLETT PACKARD

freehand by user. 1MB min. memory. $179. Tree Star, 805/682-4096.

How To Use Microsoft Word, Macintosh Version 4

Self-paced audiotape and software course that teaches user to create, edit, merge, and print documents created in Microsoft Word. Also explains changes in Word's menus, spelling checker, and indexing structure. 1MB min. memory. $99. FlipTrack Learning Systems, 312/790-1117.



interFACE

interFACE

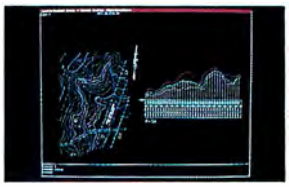
Software that lets the user create *talking agents* within the Macintosh interface. Extends the concept of HyperAnimator with improved digitized-sound-synchronizing utility, compressed sound capabilities that are compatible with Farallon's MacRecorder, and speed improvements. Has import-export facilities and imports color into HyperCard. 2MB min. memory. $499.95. Bright Star Technology, 206/451-3697.

LetterWorks

Disk-and-book package containing 400 sample business letters. Documents are in ASCII text format and are compatible with most major Mac word processors. Letters are annotated with suggestions for appropriate use. 1MB min. memory. $79.95 plus $4.95 s/h. Round Lake Publishing, 203/438-5255.

Mac CGM Converter

Software converts ANSI or ISO graphic files created on an IBM PC or compatible, PS/2, workstation, mainframe, or minicomputer to Mac PICT or PICT2 format. 512K min. memory. $150. Pixelix, P.O. Box 158, Cohuna, VC, 3568 Australia.



MacCivil

MacCivil

Civil-engineering and site-design program that operates inside AutoCAD. Provides range of coordinate-geometry, topographic, and civil-engineering design applications that address all aspects of site development. 5MB min. memory. $1995. D.C.A. Engineering Software, 603/428-3199.

Mail Rater

HyperCard reference program that includes database containing 600 United States Postal Service zone charts; rate regulations for first class, priority, third class, fourth class, and express mail; and information on special services such as return receipt and insurance. 1MB min. memory. $49.95. Tight Line Software, 714/367-0007.

MindLink

Problem-solving software helps you link ideas and brainstorm within a problem-solving environment. 1MB min. memory. $499. MindLink, 802/457-2025.

Moby Hyphenator

Software listing over 150,000 English words with

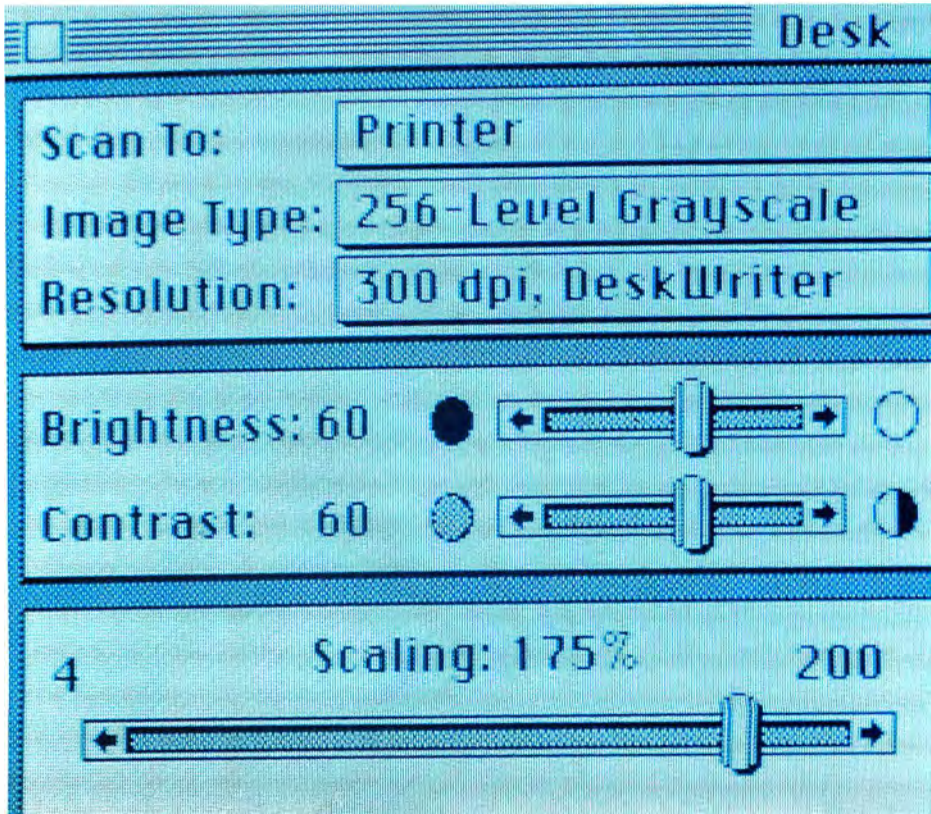
With the HP ScanJet Plus, you've

The HP ScanJet Plus scanner provides 8-bit photographic-quality scanning.

That means 256 shades of gray for the hottest-looking output from your Mac. And it's so easy, too. At the click of a mouse, you can get negative or mirror images, as well as scaling in 1% increments from 4-200%. All for $2,190,* about what you would expect to pay for a 4-bit scanner.

So if you want the richest, most detailed images from your Mac, you've got it made with Hewlett-Packard. Call **1-800-752-0900, Ext. 1005** for your authorized HP dealer.

There is a better way.



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hyphenation and syllabification. 1MB min. memory. $129. Illumind Unabridged, 408/373-1491.

Pipe Dream

Spatial strategy game in which you build the longest possible continuous pipeline (from various shapes of pipe), while racing against a moving stream of chemical fluid called flooz. 1MB min. memory. $39.95. LucasFilm Games, 415/662-1966.

The Playroom

The Playroom

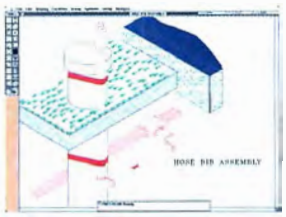
Program built around the theme of child's playroom filled with games, toys, and surprises. Includes seven games that introduce children to essential skills, including early math, reading readiness, telling time, beginning typing, art, creativity, and logical thinking skills. 1MB min. memory. $119.95. Brøderbund Software, 415/492-3299.

PosterWorks

Poster-production software that prints color images up to 100 square feet on any PostScript device. Program creates halftones, color prints, or color separations. 1MB min. memory. $167. S.H. Pierce & Company, 617/395-8350.

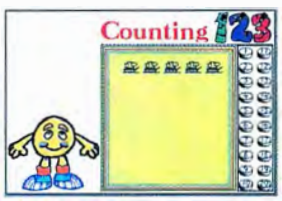
Precision

CADD package in 2 ½-D that combines CAD and drawing features. Includes global symbols, built-in IGES and DXF translators. Variable text feature lets you define



Precision

a symbol according to its context. Supports PICT file format. 2MB min. memory. $295. Innovative Systems, 413/737-3993.



Preschool Pack

Preschool Pack

Software teaches children the alphabet and numbers using color, animation, and graphics. Lessons include AlphaWorks; Bar Math; Concentration; Connect the Dots; Counting 1,2,3; and ShapeWorks. 1MB min. memory. $69.65. Nordic Software, 402/466-6502.

PS View

PostScript compatible programming and imaging environment that enables you to view PostScript graphics files on screen before printing. 1MB min. memory. $499. ImageSoft, 516/767-2233.

QuickLock

Security software that password-protects desktop access, provides F-key access, and includes a time-out locking mechanism. Remains active when the machine is restarted and acts as a screen saver. 1MB min. memory. $99.95. Kent Marsh Ltd., 713/623-8618, 800/325-3587.

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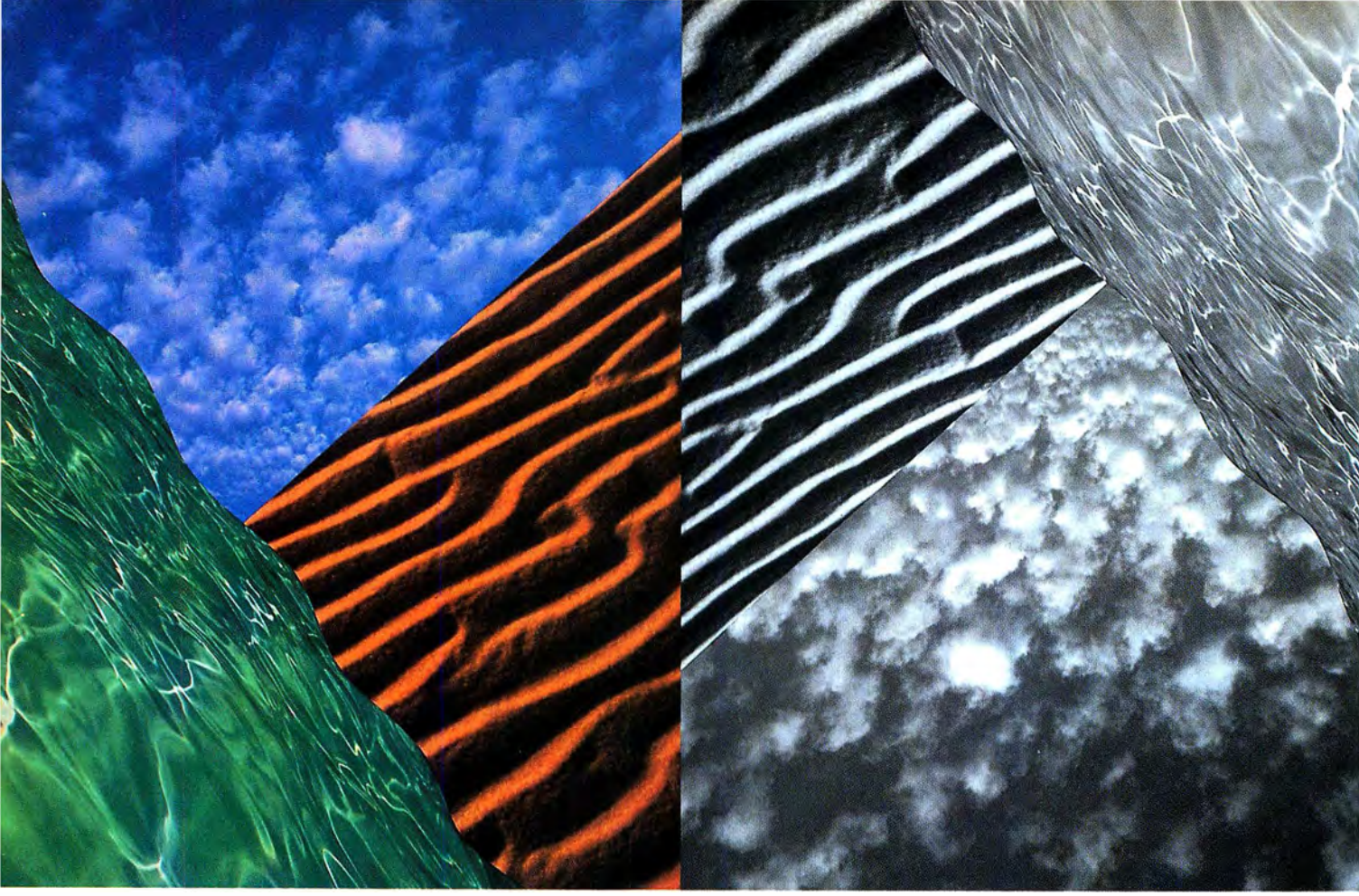
got it made in the shades.

*Suggested U.S. list price. © 1990 Hewlett-Packard Company PE12004



The First Color/Gray-Scale Scanner For Under $2700!

Microtek presents the MSF-300Z. The one scanner that can do it all: color, gray-scale, drawings and text. All for a price that until now, could barely buy you gray-scale capabilities.

Hard to believe, but it's true. You can scan vivid color images into your computer for desktop publishing, presentation graphics or pre-press work. A full 16.8 million colors at a time.

If you don't have a color application yet, this unique scanner captures gray-scale as well as black and white. So you can start working today.

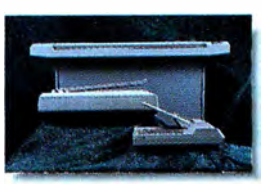
Images can be scanned in 256 gray-scale mode and then retouched, scaled or rotated. And printed on a laser printer or phototypesetter with outstanding results.

Charts and drawings are quickly scanned in single bit-per-pixel mode then imported into your favorite publishing or word processing program. You can even bring words into your computer without retyping by adding OCR software.

The Microtek Color/Gray scanner also comes with sophisticated color, gray-scale and black and white image editing software. Making it an even more outstanding value.

24 BIT COLOR
8 BIT 256 GRAY LEVELS

If you need a scanner for your IBM PC, PS/2, or Macintosh, you need Microtek's MSF-300Z Color/Gray scanner. Call (800) 654-4160 or in California (213) 321-2121 today to find your nearest Microtek dealer. After all, at this price, you can hardly afford not to.



The MSF-300Z Color/Gray scanner is just one member of a whole family of innovative scanners available from Microtek.

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Best Performer!

FoxBASE+/Mac: The Most Celebrated Mac DBMS Now Includes a Powerful Report Writer!

New Version 2.00!

New FoxBASE+/Mac Version 2.00 is here—and stealing the show! In its first year, FoxBASE+/Mac won more awards—both in the U.S. and Europe—than any other DBMS ever created for the Macintosh! And Version 2.00 is faster and more powerful than ever—packed with innovative new features and language enhancements!

New FoxReport!

FoxReport lets you create virtually any columnar or free-form report—without *any* programming! FoxReport includes:

- **Page Layout:** Designate many layout settings for your report: number of columns, left margin setting, column width, space between columns, measurement size for each page, and more!
- **Report Layout Window:** Define the different areas within your report, using FoxReport's new "band" system. Start with the default bands: Page Header, Body, and Page Footer, then bring in other bands like Title, Summary, Column Headers and Footers, etc.
- **Object Menu:** Control the Type Font, Sizes and Styles of text objects. Fill and Pen options let you change the color and shading of almost every object!
- **Page Preview:** "What-You-See-Is-What-You-Get" design ensures that the report on your screen is *exactly* as it will appear in print!
- **Label Generator:** Create labels of almost any size and configuration. You can even include pictures *anywhere* on the label space!

New Features!

- **Enhanced XCMD/XFCN Support:** Load up to 16 external XCMD's and XFCN's, then access them directly from within FoxBASE+/Mac 2.00 programs!
- **Language Enhancements:** Other features include: support for custom hierarchical menus, new commands to help handle resources, new system functions to improve filename and screen management, and much more!

Perfect Connectivity!

FoxBASE+/Mac 2.00's Multi-User version allows complete data and application sharing between networked Macs and PCs! (when used with FoxBASE+/LAN). It also runs on the most popular network systems: AppleShare, Novell and 3Com! . . . ***And It's Faster Than Ever!***

Order or Upgrade Now!

FoxBASE+/Mac Version 2.00 is the *new* Leader of the Mac! And at only $495 ($695 for Multi-User), it's a phenomenal bargain! If you're already a FoxBASE+/Mac registered user, you can upgrade to Version 2.00 for just $75!

To order your copy (or ask for a ***FREE*** demo disk), call (419) 874-0162. Or visit your local quality software dealer.

After all, when it comes to the Macintosh, *Nothing Runs Like a Fox!*

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Fox Software

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Perrysburg, OH 43551
(419) 874-0162, Ext. 650
Fax: (419) 874-8678
Telex: 6503040827 Fox

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Research Assistant

Software designed to teach students how to use a library effectively. Program divides the research process into a series of steps from initial stages of research to recording citations. 1MB min. memory. $150. Upper Broadway Bodega, 203/647-8104.

Sands of Fire

World War II tank simulation that is designed to re-create the atmosphere of a small tank unit engaged in warfare in the North African desert. User can fight battles as either a British or American commander in any of six different theaters. 1MB min. memory. $49.94. Electronic Arts, 415/571-7171, ext. 379.

SecureInit

Program that lets you set a password to start a hard disk; enables you to lock application and System files, enables you to refresh System files. Also lets you hide System Folder, lock disk after use, verify all or selected applications, close all windows at start-up; lets you protect hard disks from being launched by invalid user name. Has automatic file purge, erases empty folders, ejects System disks, and protects configuration with a password. 512K min. memory. $99.95; educational and site license discount available. Direct Software, 415/347-1590.

Space Rogue

Space-flight simulation game that takes place in a universe of three-dimensional outposts, mining stations, planets, asteroids, stars, and starships. Players get to execute loops, rolls, and spins, and experience the tug of gravity while moving past stars. 512KE min. memory. $49.95. Origin, 603/644-3360.

StrataVision Surface Attribute Libraries

StrataVision Surface Attribute Libraries

A series of three surface-attribute libraries that is designed for use with StrataVision three-dimensional rendering package. Predefined images are photo-realistic and come in decorative stone, military camouflage, and wood grain. Surface images are 32-bit color. 2MB min. memory. $139 per library. Strata, 801/628-5218.

TaskMaker

TaskMaker

The goal in this graphic adventure game is to complete ten tasks assigned by TaskMaker to restore order and prosperity to a devastated kingdom. In the process user fights monsters, searches out trap doors and dark pits, discovers jewels, and explores secret passages. 1MB min. memory. $49.95. Xor, 612/831-0444.

Ticklers

Game composed of 30 original limericks, each of which has been formed into a puzzle. Player's challenge is to put together informa-

tion gathered from clues in order to solve the puzzle and discover the limerick. Graphical menu. 512K min. memory. $34.95. MBI Software, 213/479-6790.

ACCESSORIES

12-Volt DC Power Adapter

Power adapter for the Mac Portable that charges internal battery from any 12-volt DC power source, such as an automobile or boat. $69.95. Lind Electronic Design, 612/927-6303.

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External Battery Charger

Battery charger for the Mac Portable that will also charge any 12-volt DC power source or the spare battery of an automobile. $99.95. Lind Electronic Design, 612/927-6303.

Macnifier

Macnifier

Magnifying screen with glare protection. Has adjustable magnification of up to 130 percent, making a 10-point font appear to be 14 points, for instance. $129.95. Premtech, 404/662-1533, 800/445-5737.

BOOKS & VIDEOS

The Complete Directory of Public Domain and Shareware Software for the Apple Macintosh

Directory with more than 10,000 different titles for Macintosh public domain software and shareware. Titles described in directory are available from Budgetbytes for $5.99 per disk. $2. Budgetbytes, 913/266-2200, 800/356-3551.

Macintosh Hypermedia

Reference guide that is dedicated to Hypermedia on the Macintosh. Includes history and underlying concepts of hypermedia, its uses and applications, and its social implications, including issues that involve privacy, copyright, private versus public publishing, and intellectual property. $17.97. Scott Foresman Macintosh Computer Books, 708/729-3000.

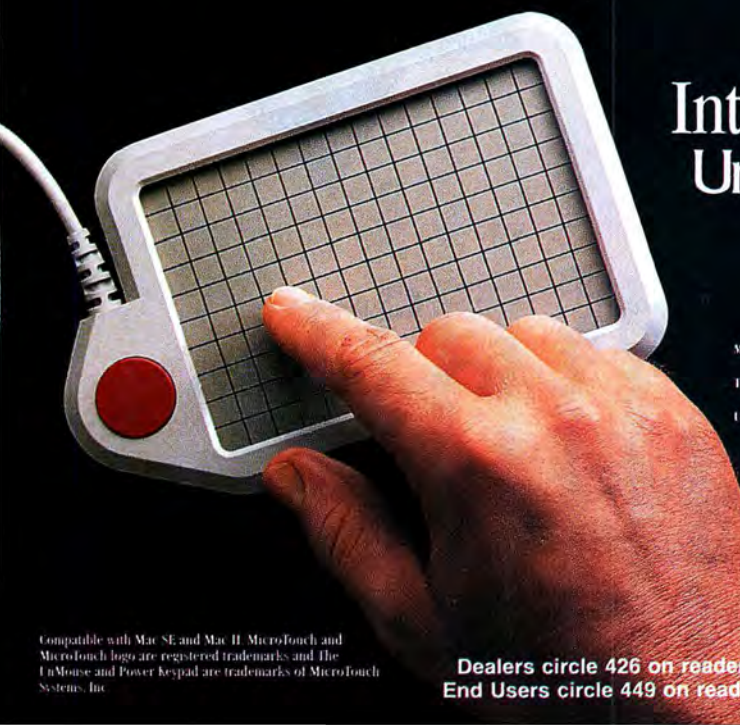
The Ventura Publisher Solutions Book: Recipes for Advanced Results

Step-by-step guide for intermediate and advanced Ventura Publisher users takes a cookbook approach by providing solutions and tips in recipe format. Covers Ventura Publisher 2.0 and Professional Extension. $24.95. International Typeface Collection, 212/371-0699. M

To have your product considered for inclusion in New Products, *send an announcement with product name, description, minimum memory, peripherals required, pricing, company name, phone number (and two copies of software) to New Products Editor,* Macworld, *501 Second St., San Francisco, CA 94107. We reserve the right to edit submissions.*

To The Point.

Introducing the UnMouse™



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Quick Tips

Best ImageWriter quality, keyboard-connector life, quitting the Finder, and more

BY LON POOLE

How do you feel when you insert a floppy disk containing a week's work and the Mac responds with "This is not a Macintosh disk: Do you want to initialize it?" A little tight in the pit of your stomach? Disks do wear out and drives drift out of alignment, as I explained last December. Russell K. Hobbie of Saint Paul, Minnesota, can sometimes get a marginal disk to work by reinserting it several times or by trying a different drive. He's also successfully fixed flaky floppies using Apple's Disk First Aid utility software. Disk First Aid will show its normally hidden activity if you press ⌘-S after selecting a disk to check or repair, reports F. Stephen Costa of Loudonville, New York.

To guard against premature floppy failure, keep disks and disk drives away from magnetic fields. That includes a telephone with a traditional bell ringer and the power supply (located on the left side) of the Mac Plus, the 512K, and the 128K.

Coprocessor Confusion

Q Since the load of virtual-memory on the Mac II is handled by the 68881 coprocessor, wouldn't this make it faster than Macs having a 68030 central processing unit (CPU)? Could the 68882 replace the 68881 in a Mac II? Can the 68882 perform virtual-memory tasks?

Michael J. Sanders
Address unknown

A The Motorola 68881 coprocessor handles complex math functions on the Mac II. The Motorola 68882 is a newer, faster math coprocessor and is used in the Mac IIx, IIcx, and IIci. You can replace the 68881 in a Mac II with a 68882. Expect 25 to 40 percent improvement in tasks that involve lots of number processing, such as math calculations, statistics, and calculations of new views of complex graphics. An application designed to take advantage of the 68882's features can boost its numeric processing speed by as much as 100 percent. But otherwise, installing a 68882 has no direct benefit aside from speeding up floating-point numeric calculations.

A Mac II's 68020 CPU can use virtual memory only if you replace the standard memory-management coprocessor with a 68851 paged memory management unit (PMMU) coprocessor. You'll also need virtual-memory software, either Virtual 2.0 from Connectix (415/324-0727), or System 7.0—due out sometime this year—or A/UX from Apple. The Mac IIx, IIcx, and IIci don't need a 68851, since its functions are built into their 68030 CPUs.

The 68882 and 68851 chips are available from several sources, including Total Systems Integration (800/874-2288, 503/345-7395) and Tercom (206/527-1257, 800/544-9543 from 7 a.m. to 7 p.m., 800/669-7555 from 10 a.m. to 6 p.m.). Orvac Electronics (714/871-1020) has the 68851. Be sure to get 16MHz chips for a Mac II.

If you install a 68851 PMMU in your Mac II and the screen goes blank, the

chip socket on the main logic board is probably missing some pins. Take it to an Apple dealer for a free replacement logic board.

Warning: Chips have delicate pins and can sustain latent damage from static discharge during handling. Have a technician make the swap unless you know what you're doing.

Faster Faster, Best Best

Q I realize I can get a faster Faster quality on an ImageWriter II by pressing the Shift, Option, and Caps Lock keys while clicking OK in the Print dialog. The ImageWriter II then prints bidirectionally (as the print head moves left and right) instead of unidirectionally (only as the print head moves right). Bidirectional printing is faster but slightly lower quality than unidirectional printing.

In Best quality, the ImageWriter II normally prints bidirectionally. How can I make it print unidirectionally for absolutely the best Best quality?

F. Stephen Costa
Loudonville, New York

(continues)

A You can't make an ImageWriter print unidirectionally in Best quality. And the print quality would not be any better if you could. Ideally, the ImageWriter II would always print bidirectionally because that's faster than unidirectional printing. However, some ImageWriter IIs don't line up dots properly when printing bidirectionally in Faster quality. The ImageWriter driver software works around this glitch by printing unidirectionally in Faster Quality.

Multiple Graphs and Data

Q Is there an application that can save three sets of data and produce three charts in one file? I use a Macintosh SE.

Karen Melzer
Rexdale, Ontario, Canada

A Any spreadsheet can keep multiple sets of data in one file as long as the total amount of data doesn't exceed the maximum spreadsheet size. Wingz from Informix (913/492-3800) and Full Impact from Ashton-Tate (213/329-8000) both let you create multiple charts in one spreadsheet document.

When you use a single spreadsheet for more than one set of data, put each set in a separate work area. Arrange the work areas along an imaginary diagonal line running from the upper-left corner of the spreadsheet to the lower-right corner (see "Diagonal Construction"). That way if you need to insert or delete rows and columns in one set of data later, the action won't affect the other sets. If you lay out your sets of data side by side, changes to one set may adversely affect other sets.

Auto-Scroll Substitute

TIP: Panorama doesn't scroll automatically if you try to drag or resize an object past the boundary of a forms window in graphics mode. You can lessen the likelihood of bumping into the window boundaries by working in a reduced view. To reduce the view, select the magnifying glass tool, press the space bar, and click. All the tools work in reduced views. It's also possible to resize or place an object beyond the window boundaries by using the Dimension command (on the Edit menu).

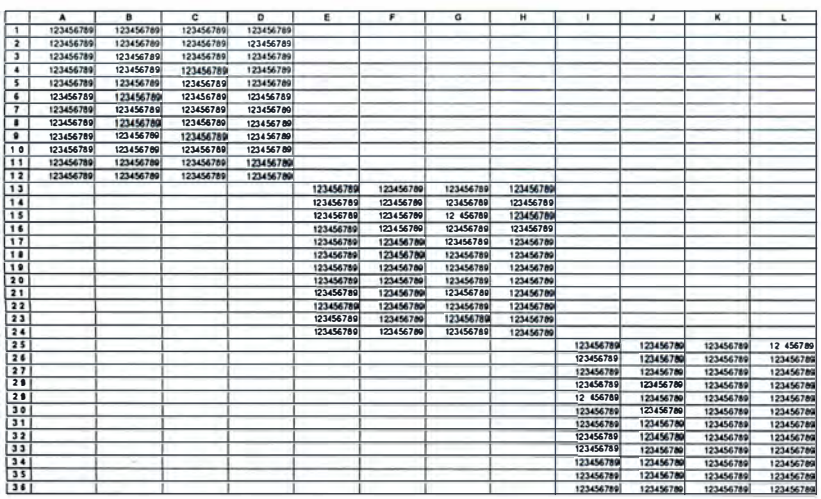
To return the view to actual size, select the magnifying glass tool and click once while pressing the ⌘ key.

Paul Chance
Huntington Beach, California

Quick Move

TIP: Before leaving one page to work on another in PageMaker, choose Fit in Window from the Page menu (shortcuts: ⌘-W or, when working in actual size, Option-⌘-click). When you return to that page, you can quickly and precisely go to any part of it. To do that, press Option-⌘ for actual size, or Shift-Option-⌘ for 200 percent enlargement, while clicking on the area you want to see. By comparison, scrolling at actual size or at a magnified view is much slower and less precise.

Rick Archer
Fairfield, Iowa



Diagonal Construction

By organizing different parts of a spreadsheet along an imaginary diagonal, you prevent changes in one part from inadvertently affecting other parts.

Surface and Contour Plots

TIP: Wingz has two problems related to surface and contour graphs.

First, Wingz uses a seemingly random set of colors that makes contour graphs and surface graphs not only ugly but more confusing than if they had no color. You typically want the colorbands to vary smoothly from one color at the vertical axis (*z* axis) minimum to a different color at the maximum. Those of us not yet fortunate enough to own a color laser printer generally want a smooth variation of gray shades from black to white. "Shaded Surface" shows the difference.

Second, you cannot conveniently set the number of color bands on a contour graph. The color bands correspond to vertical-axis divisions, but the vertical axis does not appear on a contour graph, so you cannot change its number of divisions. To work around this problem manually, you must first plot your data as a surface graph. There you select the vertical axis, choose Scale Info from the Axes submenu of the Graph menu, and set the Manual Scale option and the number of divisions. You can then replot the surface graph as a contour graph with the correct number of color bands by choosing Contour from the Gallery submenu of the Graph menu.

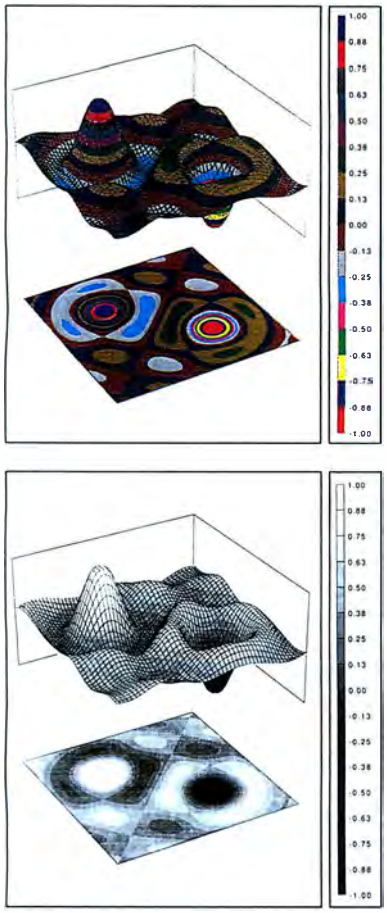
The Wingz script in "Smooth Variations" solves both problems. It sets the vertical axis for 16 shades of gray, which produces good results when printed on a 300-dpi LaserWriter using LaserWriter driver 6.0. (For more gray levels, change the script to set *variable number* to a number higher than 16.) To use the script, simply select the contour or surface graph to be converted and run the script.

Bill White
Livermore, California

ADB Mating Cycles

TIP: Mac SE and SE/30 owners who regularly transport their systems may soon face some expensive repair bills. Apparently the ADB connectors used

(continues)



Shaded Surface

Standard Wingz colors in surface and contour graphs don't provide useful shading information (top). Applying the script in "Smooth Variations" to those graphs achieves smooth, intuitive shading (bottom).

in the keyboard and the Mac may wear out after only 500 mating cycles. If you disassemble and transport the Mac to and from work every day as I do (two mating cycles per day), expect your keyboard and Mac ADB connectors to last less than one year. If you frequently transport your Macintosh, I recommend leaving the keyboard and mouse cables attached.

If the keyboard or mouse starts operating only intermittently, press the various connectors to try to determine which one is bad. Connectors are fairly easy to replace (some soldering is required). This route is far less costly than replacing the keyboard or main logic board (your dealer's likely recommendations). The connector is AMP part number 749264-1 or 7491811 (call 800/522-6752 for the name of an AMP distributor). Do not use other

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John Gillett
Macworld 5/89

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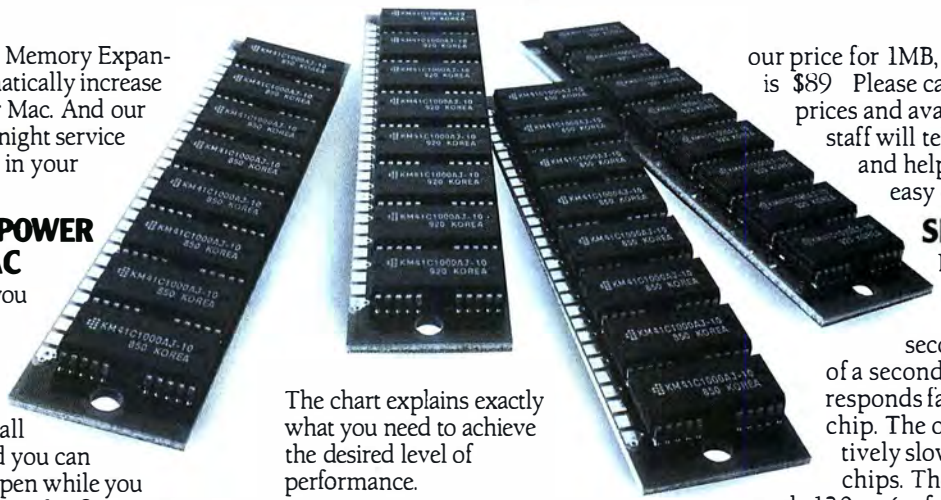

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4 MB	Replace all four 256K SIMMs with four 1M SIMMs.
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Dolphin, Integra	429	$70	479	$116	549	$170	615	$163	695	$300	879	$260
PLI, Infinity Turbo	–	–	569	$20	619	**$26	–	–	–	–	1098	$21
*Quantum Internal	–	–	–	–	499	$26	–	–	829	$40	–	–

Savings are calculated from MacWarehouse December 1989 published prices. *Quantum drives are for internal installation and require a 3.5 Internal Drive Kit for $39. **PLI is a 50meg turbo drive. ***40+ meg Removable Cartridge Drives come with 1 cartridge. Additional cartridges available.

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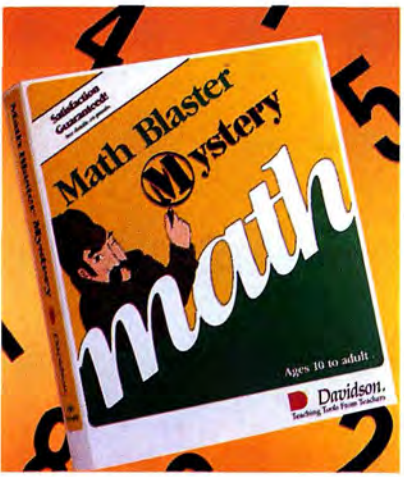

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Laser 3.5 Diskettes ..... 29.
Laser File Folders ..... 6.
Laser Transparencies ..... 22.
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HardTop ImageWriter Covers ..... 17.
Keyboard Flip ..... 6.
Dust Covers - Grey Nylon Ripstop
ImageWriter or LaserWriter ..... 12.
Mac Plus and keyboard ..... 11.
Mac SE & extd. or reg. keyboard ..... 11.
Mac II and extd. keyboard ..... 12.
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Utility Pac ..... 11.
Computer Friends, Inc.
MacInker (IW & IW II) ..... 41.
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Computer Tool Kit (52 pc.) ..... 49.
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MacTilt-SE ..... 68.
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Macinware IIcx Carrying Case ..... 85.
Macinware Mac II Carrying Case ..... 99.
Macinware Plus Carrying Case ..... 64.
Macinware SE Carrying Case ..... 75.
Monitorware Apple RGB Case ..... 79.
The Ultimate SE Carrying Case ..... 79.
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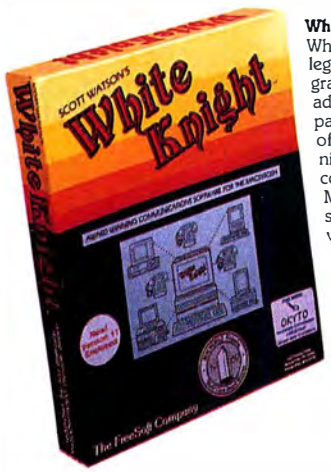
FastKeys 2.0 ..... 35.
Targus, Ltd.
Deluxe Plus/SE-XKB Case (black) ..... 69.
ImageWriter II Case (black) ..... 45.
Mac Plus/SE Case (black) ..... 55.
IIcx /IIci Case ..... Call.

Shop Keeper Software
Bill-It 2.0 ..... 99.
Softview
MacInTax Federal '89 - 1040 ..... 65.
State supplements ..... ea. 56.
MacInTax/Quicken 1.5 bundle ..... 95.
Taxview 1040 ..... 355.
Survivor
MacMoney 3.5 ..... 60.



White Knight 11.0 (FreeSoft)
White Knight is Scott Watson's successor to the legendary Red Ryder telecommunications program. It's more than just a new version - the added new features list alone is more than 20 pages long! The 270+ pg. manual has plenty of step by step tips to help beginners communicate like the pros in no time. White Knight comes bundled with Okyto, a revolutionary Mac-to-Mac file transfer program. A free subscription to the GEnie network is also provided. (communications) **$89.**

BLANK MEDIA

B.A.S.F. made in U.S.A
DS/DD (box of 10) ..... 14.
DS/High Density (1.44 Meg) ..... 24.
Peripheral Land, Inc.
Turbo 40 Cartridge ..... 115.
Sony
DS/DD (box of 10) ..... 14.
DS/HD (1.44 mb) ..... 25.

ACCOUNTING & PERSONAL FINANCES

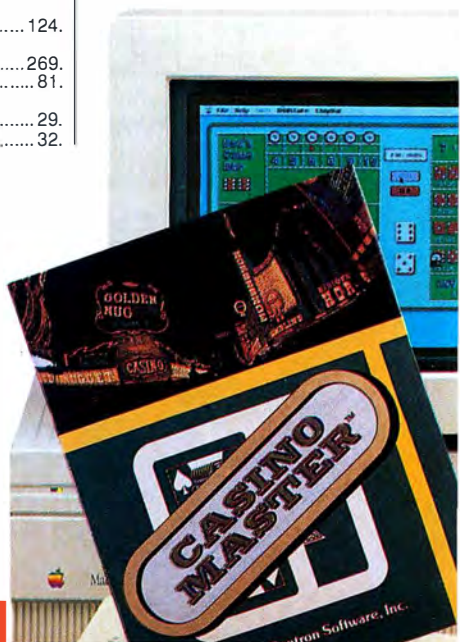
Aatrix
Checkwriter ..... 37.
Payroll 3.5 ..... 109.
Payroll PLUS ..... 149.
TimeMinder ..... 175.
Bedford (Computer Associates)
Simply Accounting ..... 225.
DAC
Dac-Easy Light ..... 42.
Intuit
Quicken 1.5 ..... 36.
Layered, Inc.
at Once! ..... 285.
MECA
Managing Your Money ..... 124.
Monogram
Business Sense ..... 269.
Dollars and Sense ..... 81.
Nolo Press
For The Record ..... 29.
WillMaker ..... 32.

BUSINESS & PRESENTATION

A Lasting Impression
ResumExpert (word vers.) ..... 39.
Cover Letters or Students ..... 39.
Manager Edition ..... 39.
Sales and Marketing Edition ..... 39.
Adobe Systems, Inc.
TrueForm SetUp ..... 225.
AEC Management Systems
FastTrack Schedule ..... 115.

Kensington
Anti-Glare Filter ..... 33.
Apple Security Kit ..... 34.
Mac II Stand w/Cable Kit ..... 64.
MasterPiece Mac II ..... 105.
PowerBacker 360 UPS Line ..... 269.
PowerBacker 800 UPS Line ..... 749.
PowerBacker 1200 UPS Line ..... 949.
System Saver ..... 63.
Mobius Products
Fanny Mac QT ..... 59.
SE Silencer ..... 39.

Macintosh SE/Plus w/Extended Keyboard Carrying Case (Targus)
Pamper your Mac with a Targus carrying case made of Zilicone treated nylon to give you waterproof durability and an impact absorbing high-density foam layer with a soft protective lining for complete protection. Cushioned shoulder pad and handles provide extra comfort and convenience. Plus there's room for everything from your Mac, a hard disk drive, and the extended keyboard to pockets for your mouse, floppies, cables, and pens. Full Targus Macintosh line available in black. Some styles available in blue, burgundy, and platinum. (accessories) **$69.**



Casino Master (Centron)
Let it Ride! You can bet on having hours of fun with Casino Master's five exciting casino games. Includes **Blackjack Ace**, **Crapsmaster**, **Roulette Master**, **Pokermaster** and **Baccarat Master**. Exact table simulation, mouse controlled betting, selectable bankroll, stored win/lose statistics and complete manual included. Mac II version available in full color! An odds-on favorite with professional gamblers. (entertainment) Individual games **$27.**each/ 5 game Casino Master Package **$49.** / Deluxe Mac II version **$55.**

SCRAMBLE!

Nightmare! It's midnight and your hard disk crashes. Or you read about a new piece of software you just can't do without.

Remember, the sun never sets on the folks at MacWarehouse. Ring...ring (only three rings?)... "How may I help you?"...."No problem Sir, we'll take care of it...We'll get it to you overnight — and the charge is just $3."

While you drift off to sleep the computers whirr. At our satellite warehouse — a former SAC airforce base — ROBOMAC prepares your order for immediate dispatch. The flight crews are standing by. One last hand of Old Maid. Don't want to miss that last order at 12:01! Then,... SCRAMBLE! They'll fly through the night to deliver your order (and thousands of others) not long after the morning paper. That's right. Order until 12:00 am for overnight delivery. It's called MIDNIGHT EXPRESS SERVICE and nobody else has it. Nobody gets it to you faster than MacWarehouse ... Nobody!

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It's here at last! It has all the power and convenience of your Mac in a 15.7 pound portable package.

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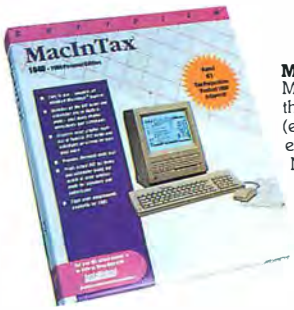

MacInTax Federal '89-1040 (Softview)
MacInTax Federal '89-1040 guides you through the process of preparing your Federal Taxes (eight state tax modules also available at $56 ea.). Just type in the requested numbers, and MacInTax does the rest. When finished, print the completed return on the LaserWriter or the ImageWriter. If you used MacInTax last year, it reads those files and brings forward relevant items, saving time and reducing errors. Its tax planner shows the effects of various tax strategies. (finance) **$65.**

Dreams (Innovative Data Design)
IDD, creator of MacDraft, offers a powerful precision drawing tool for professional scaled drawings, illustrations, presentations and general purpose graphics. Dreams offers zoom, rotation, layers, dimensioning, symbol libraries and a vast array of drawing tools, as well as many advanced illustration features. You can merge shapes together, cut edges of objects using other objects as templates...even glue lines and curves together to form unique shapes to be filled with colors or patterns. (graphics) **$325.**

SuperPaint 2.0 (Silicon Beach)
SuperPaint gives you the freedom of paint and the precision of draw in one easy-to-use program! Features powerful AutoTrace to automatically convert bitmapped paint graphics into high resolution draw objects, an adjustable airbrush, and a freehand tool to quickly sketch editable Bezier curves. You can mix fonts, styles and sizes within text blocks, and freely rotate, scale, or slant text and graphics without sacrificing high-resolution output. Oversized documents automatically "tile" over multiple pages, in either "Portrait" or "Landscape" orientation. (graphics) **$125.**

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MacWAREHOUSE™

1-800-255-6227

(1-800-ALL-MACS)

Inquiries:
FAX: 201-905-9279

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City _____ State _____ Zip _____

FROM MacWAREHOUSE™

FastLabel
End label hassles with FastLabel - the revolutionary way to print labels on the ImageWriter and LaserWriter. Pre-formatted templates to instantly create labels. One step text loading from any commercial database. Save hours of your valuable time! (business) **$49.**

Managing Your Money
A fully integrated software program addressing every aspect of personal and small business finance. Write and print checks, set up a personal budget, estimate your taxes and more. (finance) **$124.**

Ferrari Grand Prix
Gentlemen Start Your Engines! Squeeze into the cockpit of this thrilling Formula One racing simulator. Test your skill, concentration and nerve while chasing two cagey opponents around world famous Grand Prix courses. Handicap opponents and personalize racecourses for exciting competition. Spectacular sound and graphics. (entertainment) **$32.**

Dynodex-Instant Address Book
Fast on-line address database that prints elegant, double-sided address pages for Filofax, DayTimer, and most organizer systems. Includes binder, divider tabs, and 100 sheets of "no-fuss" laser paper. Powerful database functions include find, sort, select, import, export, merge, auto-dial, and much more. (business) **$89.**

Odesta
Double Helix III ..... 339.
GeoQuery ..... 199.
ProVUE
Panorama ..... 257.

DESK ACCESSORIES

Casady & Greene
QuickDEX ..... 31.
JAM Software
Smart Alarms & Appt. Diary ..... 49.
Smart Alarms (1 - 4 users) ..... 99.
Smart Alarms (5 - 8 users) ..... 149.
Smart Alarms (9 - 16 users) ..... 199.
Preferred Publishers
DAtabase 1.5 ..... 69.
Vantage 1.5 ..... 52.
Solutions
SmartScrap & The Clipper 2.0 ..... 45.

DESKTOP PUBLISHING

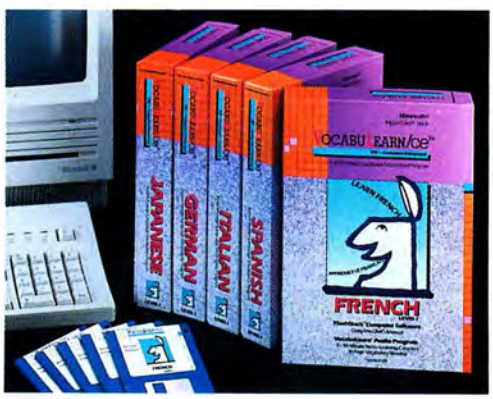
Aapps
MicroTV ..... 289.
Aldus
PageMaker 3.02 ..... 385.
PageMaker Color Extension ..... 135.
Broderbund
DTP Advisor ..... 47.
Data Translation
PhotoMac ..... 609.
Emerald City Software
Smart Art I, II, or III ..... ea. 85.
Icom Simulations
MacKern ..... 119.
Letraset
ColorStudio or FontStudio ..... Call.
ImageStudio ..... 275.
Ready,Set,Go! ..... 275.

CanOpener 1.1 (Abbott Systems)
Raider of the lost bytes! Don't waste time digging for buried text, graphics, sounds etc.... With CanOpener hot on its trail you can search anywhere and retrieve almost anything. Even locates text within pictures then gives you the whole picture! Once found, store information in CanOpener's personal library for safekeeping. (utility) **$65.**

Cutting Edge
800K External Floppy Drive ..... 149.
SyQuest Removable 45 Meg ..... 819.
Under the Mac 20 Meg ..... 359.
Under the Mac 30+ Meg ..... 439.
Under the Mac 45+ Meg ..... 499.
Under the Mac 60+ Meg ..... 599.
Under the Mac 80+ Meg ..... 659.
Dayna Communications
Dayna File Single 360K (5 1/4") ..... 525.
Dayna File Dual 360K & 1.44M ..... 729.
Dolphin Systems Tech
Integra 20 Meg ..... 429.
Integra 30 Meg ..... 479.
Integra 40 Meg ..... 549.
Integra 60 Meg ..... 615.
Integra 80 Meg ..... 695.
Flipper 44 Meg ..... 879.
Fujitsu
800K Disk Drive ..... 159.
Kennect Technology
Drive 2.4 ..... 329.
Rapport ..... 199.

EDUCATIONAL/ PERSONAL

Beacon Technology
GEMS of the Word ..... 25.
BrightStar
Alphabet Blocks ..... 30.
Talking Tiles ..... 27.
Bootware Software
ResumeWriter Pro ..... 58.
Davidson
Math Blaster Mystery ..... 26.
Speed Reader II ..... 26.
First Byte
The Dinosaur Discovery Kit ..... 27.
The Puzzle Storybook ..... 27.
The Rhyming Notebook ..... 27.
Help Software, Inc.
Desktop Help for Excel ..... 50.
Learning Company
Math Rabbit ..... 31.
Reader Rabbit ..... 31.
MicroTech
Elementary Signer ..... 49.
Finger Speller ..... 29.
Nordic Software (full line available)
MacKids Turbo Math Facts ..... 28.
MacKids Preschool Pack ..... 35.
MacKids Word Quest ..... 30.
Penton Overseas
VocabuLearn French, Spanish, German, Italian ..... ea. 30.
VocabuLearn Japanese ..... 36.
The Software Toolworks
Mavis Beacon Teaches Typing ..... 32.
Visionary Software
Synchronicity ..... 39.
Voice & Video Instruction Videos
HyperCard or Pagemaker 3.0 ..... ea. 35.
Word 4.0 Video Tape ..... 35.



VocabuLearn (Penton Overseas, Inc.)
A computer enhanced foreign language learning system for the Mac. A versatile, interactive HyperCard Stack, available in five languages and two levels. Each comes with two 90 minute audio cassettes, a handy size word list with over 1500 useful words and expressions, and HyperCard V.1.2. This is a great bilingual aid. Ideal learning tool for students, travelers, business people, and educators alike. Increase your comprehension using the building blocks of language! (education) French, Spanish, German, Italian **$30. ea.** Japanese **$36.**

Olduvai
Read-It! 2.1 (OCR) ..... 245.
Read-It! Personal 2.0 ..... 125.
Read-It! TS (ThunderScan) ..... 79.
Quark
QuarkStyle ..... 169.
Xpress ..... 449.
Spinnaker/Springboard
Plus 1.1 ..... 115.
Springboard Publisher II ..... 109.
TimeWorks
Publish-It! ..... 225.

DISK DRIVES/BOARDS

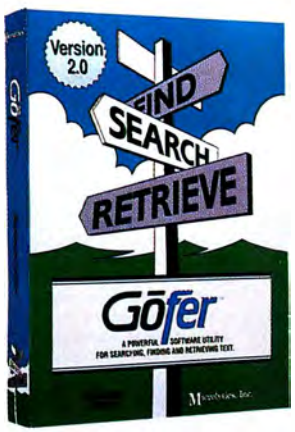
Aristotle Industries, Inc.
HardPac Mac 20 Meg ..... 469.
HardPac Mac 40 Meg ..... 749.
HardPac Mac 80 Meg ..... 1089.
HardPac Mac 105 Meg ..... 1229.
CMS
MacStack 20 Meg ..... 459.
MacStack 30 Meg ..... 499.
MacStack 45 Meg ..... 599.
MacStack 60 Meg ..... 649.
MacStack 80 Meg ..... 769.
MacStack 44 Meg Removable ..... 839.

Peripheral Land, Inc.
Infinity Turbo 40 Meg ..... 1098.
Turbo Floppy 1.4 ..... 359.
Quantum
Quantum 40 MB Raw Drive ..... 499.
Quantum 80 MB Raw Drive ..... 829.
RasterOps
RasterOps Colorboard 264 ..... 760.

The "ULTIMATE" SE Carrying Case (I/O Design, Inc.)
The "ULTIMATE" SE Carrying Case is designed with the same high quality standards as our other MacLuggage products. This case offers internal, padded compartments for ANY Macintosh keyboard, mouse, external hard disk and cables. It also features 2 additional exterior pockets for everything from disks to umbrellas. Combine these features with sturdy Dupont Cordura nylon and 1/2 inch high density foam padding and you'll see why this is the "Ultimate" carrying case for your Mac.(accessories) **$79.**

MORE FOR YOUR MONEY...

Aldus
Persuasion 2.0 ..... 339.
Antic Software
FlexForm Bus.Temp Vol 1 or 2 .... ea. 49.
Ashton-Tate
Full Impact ..... 249.
Claris
MacProject II ..... 369.
SmartForm Designer w/Assistant .... 295.
Cognition Technology
MacSMARTS PRO ..... 249.
Cricket (Computer Associates)
Cricket Graph 1.3 ..... 115.
Cricket Presents ..... 285.
HyperPress Publishing
Intelligent Developer ..... 219.
Informix
WingZ 1.1 ..... 249.
Microsoft
Excel 2.2 or PowerPoint 2.1 ..... ea.249.
The Microsoft Office ..... 599.
Works 2.0 ..... 185.
Portfolio Systems
Dynodex-Instant Address Book ..... 89.
Power Up
Address Book Plus ..... 53.
Address Book Plus w/Binder ..... 99.
Calendar Creator ..... 38.
FastForms! ..... 89.
Letter Writer Plus ..... 53.



GOfer (Microlytics)
The ultimate text finder. A powerful software utility that searches, finds and retrieves text. Searches through countless files on your hard disk drive or floppy disks to find the text you need. A phrase, a fact, a note, a date. If you need it, GOfer finds it in seconds. You can automatically import the section of text into the document you're currently working in. You save hours searching through files. GOfer operates as a Macintosh desk accessory. (utility) **$45.**

Preferred Publishers
Direct Mail ..... 54.
ProPlus
Wall Street Investor ..... 449.
Satori
Bulk Mailer 3.2.3 ..... 78.
Softstream International
Endeavour Planner ..... 95.
Symantec
More II 2.01 ..... 249.
Symmetry
KeyPlan ..... 249.
Synex
MacEnvelope 4.1 ..... 79.
MacEnvelope Plus ..... 149.
MacPhonebook ..... 40.
Vertical Solutions
FastLabel ..... 49.

CAD/CAE

Claris
ClarisCAD ..... 595.
Generic Software
Generic CADD Level 1 ..... 84.
Graphsoft
MiniCad+2.0 ..... 519.

TravelModem (Prometheus)
The TravelModem from Prometheus combines all the features of their Data/Fax modems in a small card designed to fit snugly in the modem slot of your Mac Portable. Send faxes, collect your electronic mail or dial into the office network from any remote location. TravelModem is the ideal traveling companion for the Mac user on the go! Includes a free copy of MAcKNOWLEDGE and a customized version of BackFAX. (modems) **$ 205.**

Innovative Data Design
MacDraft ..... 175.
I.S.I.
Precision ..... 155.
Strata
StrataVision 3D ..... 375.

COMMUNICATIONS & NETWORKING

CE Software
In/Out (1 to 5 Users) ..... 128.
QuickMail 2.0 (1-10 Users) ..... 249.
CompuServe
CompuServe Navigator 3.0 ..... 39.
CompuServe Subscription Kit ..... 24.
Connect Inc.
MacNet ..... 47.
DataVIZ
MacLink Plus w/Cable 4.1 ..... 125.
MacLink Plus/Translators 4.1 ..... 109.
Dove
FastNet SCSI ..... 749.
FastNet III ..... 375.
FastNet SE or SE/30 ..... ea. 375.
Dow Jones
News/Retrieval Membership ..... 24.
Farallon
Timbuktu 3.0 ..... 95.
Timbuktu Remote 1.0.1 ..... 125.
TrafficWatch ..... 125.
PhoneNET PLUS ..... 33.
PhoneNET Repeater ..... 319.
PhoneNET Star Controller ..... 839.
FreeSoft
White Knight 11.0 ..... 89.
Hayes
Smartcom II 3.1 ..... 85.
Infosphere
Liaison ..... 175.
InSignia Solutions
Soft PC (Mac II) ..... 245.
MetaComet
AccuWeather Forecaster ..... 58.
Microcom Software
Carbon Copy Mac ..... 119.
Prodigy
Mac Starter Kit ..... 27.
Prometheus
Acknowledge ..... 289.
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Shiva
NetBridge ..... 339.
NetSerial X232 ..... 279.
Software Ventures
Microphone II v.3.0 ..... 219.
TOPS
NetPrint ..... 119.
FlashBox ..... 122.
FlashCard ..... 155.
Repeater ..... 122.
Teleconnectors ..... 29.
TOPS 2.1A ..... 159.
TOPS 3.0 Network Bundle ..... 189.
TOPS DOS Network Bundle ..... 165.
Traveling Software
Lap Link ..... 81.
Lap-Link III Connectivity Pac ..... 114.
Lap-Link III Network Pac ..... 189.

DATABASE SOFTWARE

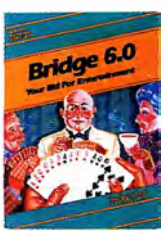
Acius
4th Dimension 2.0 ..... 469.
AEC Management Systems
AEC Information Manager ..... 409.
Blyth
Omnis 5 ..... 375.
Claris
FileMaker II ..... 219.
Fox Software
FoxBASE+/Mac ..... 295.
Microsoft
File 2.0 ..... 125.

Liaison
Liaison is the Eddy award winning software for connecting AppleTalk networks locally or remotely. Dial into AppleShare, MacServe or TOPS and access your E-mail anywhere, anytime. Offers exceptional flexibility, performance and network security. (networking) **$175.**

HandOff
HandOff lets you open any document from the finder, even if its application is missing. You can specify a compatible substitute based on the document's creator or file-name extension, even across networks. Jean-Louis Gassee calls it "a nice, unobtrusive and very much needed extension to my Macintosh". (utility) **$32.**

BASF 3.5" High Density Micro Diskettes
High 1.44 meg. capacity diskettes with no capacity for error. Every bit, every byte, on every track of each BASF 3.5" Micro Diskette is certified 100% error-free, manufacturer warranted for life. Made in the U.S.A. (blank media) **$24.** Double Density (Box of 10) also available. **$14.**

Bridge 6.0
Bridge 6.0 is a comprehensive contract or duplicate bridge - playing program which allows you and your computer partner to bid against two computer opponents and play out the hand. Ideal way for the novice to improve his or her game, and advanced player to get into a game without having to round up three additional players. (entertainment) **$24.**



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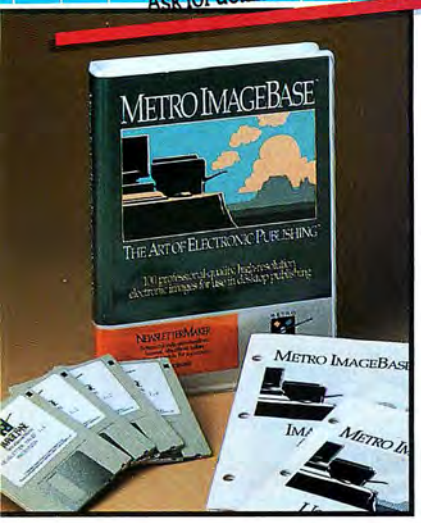

Metro ImageBase Electronic Art (Metro ImageBase)
High quality 300 dpi electronic art from one of the world's leading publishers of ready to use art. Enhance brochures, menus, reports, newsletters and presentations. One large image per file - 100 per package. Packages available: Newletter Maker, Business Graphics, Computers & Technology, ReportMaker, Borders & Boxes and 9 others. (graphics) **$76. ea.**

XOR/PCAI
Lunar Rescue or MacGolf 2.0 ..... 34.
MacGolf Classic ..... 53.
Road Racer ..... 39.
NFL Challenge ..... 54.

FONTS

Adobe
Adobe Type Manager ..... 56.
ATM Plus Pack ..... 109.
Fonts (full line avail.) ..... Call.
Forms and Schedules ..... 279.
Newsletters ..... 229.
Presentations ..... 279.
Textures, Fills, and Patterns ..... 129.
Altsys
Fontastic Plus 2.02 ..... 52.
Metamorphosis ..... Call.
The Art Importer 2.0 ..... 89.
Emerald City Software
TypeAlign ..... 60.
Letraset
LetraStudio ..... 275.
LetraFonts (various) ..... ea. 69.
Tactic Software
ArtFonts Vol.I, 2 or 3 ..... ea. 55.
Orange Micro
Alphabits ..... 69.

Casady & Greene
Vivid Impressions Vol. 1 ..... 67.
Claris
MacDraw II ..... 295.
MacPaint 2.0 ..... 95.
Cricket (Computer Associates)
Cricket Color Paint ..... 179.
Cricket Draw ..... 139.
Deneba
Canvas 2.1 ..... 189.
Ultra Paint ..... 125.
Digital Vision
Computer Eyes B&W ..... 209.
Computer Eyes Pro Color ..... 349.
Dream Maker
Cliptures, Business Images ..... 69.
MacGallery ..... 27.
Electronic Arts
Studio/1 ..... 96.
Studio/8 ..... 296.
Graphsoft
Blueprint ..... 349.
Innovative Data Design
Dreams ..... 325.
MacroMind
MacroMind Accelerator ..... 129.
MacroMind Director ..... 445.
VideoWorks II ..... 175.

UtilityPac
Give Your Mouse a House! Save valuable desktop space. Store your Mouse, Mouse Pad and Diskettes conveniently on the side of any monitor. Platinum color. (accessories) **$11.**

HardTops
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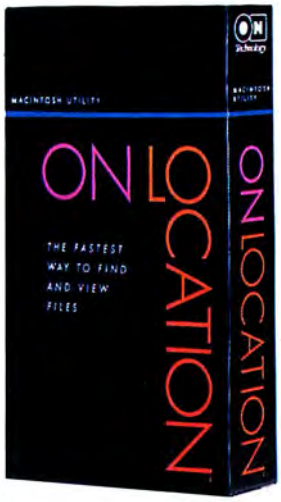
Address Book Plus
The most complete, ready-to-use solution for managing names, addresses, phone numbers, and other vital information. The program makes it easy to print top quality address book pages, phone lists, mailing labels, rotary-file cards, and envelopes. Also includes a separate Desk Accessory for searching and dialing. (business) **$53.** With leather binder **$99.**

ENTERTAINMENT

Access Software, Inc.
World Class Leader Board ..... 27.
Artworx
Bridge 6.0 ..... 24.
Daily Double Horse Racing ..... 19.
GrailQuest ..... 19.
Broderbund
Ancient Art of War At Sea ..... 27.
Shufflepuck Cafe ..... 24.
Where in the World is Carmen ..... 27.
Bull City Software
Moriarity's Revenge ..... 36.
Bullseye
Ferrari Grand Prix or P51 ..... ea 32.
Fokker Tri-plane ..... 24.
Centron Software, Inc.
BlackJack or CrapsMaster ..... ea 27.
CasinoMaster (5 pack) ..... 49.
Discovery Software
Arkanoid ..... 26.
Electronic Arts
Chuck Yeager Adv. Flight Trainer ..... 32.
Miles Computing
Fool's Errand ..... 32.
PuzzleGallery ..... 27.
Mindscape
Balance of Power, Deja Vu ..... ea. 29.
Hostage ..... 29.
The Colony or Gauntlet ..... 29.
Nemesis
Go Master ..... 49.
Joseki Tutor ..... 30.
Softstream
22nd Street Whist Tutor ..... 32.
MacRummy ..... 32.
Spectrum HoloByte
Falcon 2.0 ..... 31.
Tetris color version ..... 22.
Springboard
Hidden Agenda ..... 22.
Studio Zero
Orbital Mech ..... 29.
The Software Toolworks
ChessMaster 2100 ..... 32.
Cribbage & Gin King ..... 39.
Life & Death ..... 32.
The Hunt for Red October ..... 32.



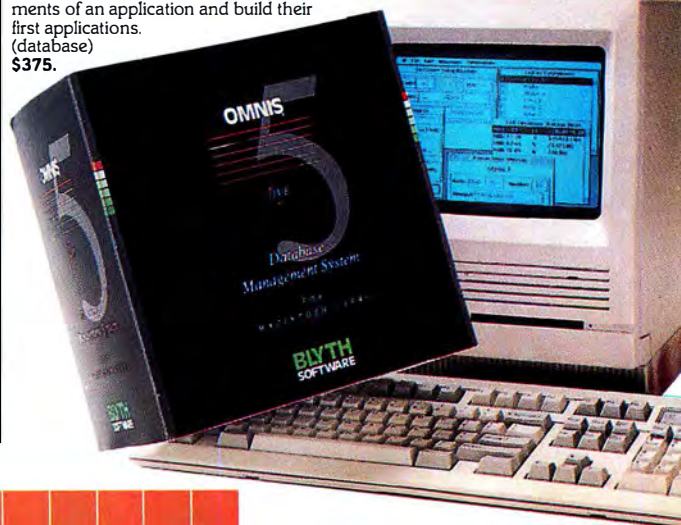
On Location (ON Technology)
There's no more need to be a super sleuth in order to find and view elusive files - with On Location it's elementary! Find a file by typing words it contains or any part of its name. Then instantly view the file with its original fonts and word-processing commands. Move copy, rename or delete files and more! (utility) **$75.**

GRAPHICS & DESIGN

3G Graphics
Images w/Impact
Graphics & Symbols 1 ..... 52.
Business 1 ..... 65.
Accents & Borders 1 ..... 65.
Adobe
Illustrator 88 1.9.3 ..... 279.
Photoshop ..... 539.
Streamline ..... 229.
Type Set 1 ..... 59.
Type Set 2 ..... 59.
Aldus
Freehand 2.0 ..... 339.
Aperture Technology
Aperture Visual Information Mgr. ..... 729.
Broderbund
Drawing Table ..... 75.
TypeStyler ..... 119.

Omnis 5 (Blyth)
Omnis 5 utilizes the graphical interface, enhanced memory, storage and color capabilities for both the Macintosh and IBM PS/2 hardware. It is designed to produce data files that can be shared between the Macintosh and IBM PC. Multi-user capabilities give simultaneous data access from both platforms. CL/1 and SQL connectivity allows Omnis 5 to access data from the VAX or IBM mainframe. HyperCard access is fully supported by Omnis 5. Included is Omnis 5 Express which allows the beginner to outline requirements of an application and build their first applications.
(database)
$375.

MacEnvelope 4.1 and MacEnvelope Plus (Synex)
Envelope and Label printing in one package! MacEnvelope 4.1 combines all of the features of envelope and label printing in one easy-to-use package. Import up to 1600 addresses per file. Unique Postal Bar Coding speeds delivery and saves money on postage (for bulk mailers). Over fifty preformatted ready-to use label and envelope styles. Create/save layouts, print graphics, messages, fonts and color. **$79.**
MacEnvelope Plus saves up to 100,000 addresses per file. Provides list management features such as comments, flags, multi-level sorting and print range. (business) **$149.**



Kraft Premium III Joystick
The button placement ensures fast action and comfortable use. Precision gimbals and dual-axis fine-tuners, give complete control over its operation. Connects to the ADB port of the Mac SE or MacII (input/output) **$49.**

Mac 101 Keyboards (DataDesk International)
Features 101 keys including a numeric keypad, a separate T-shaped cursor keypad, Cancel Key, Option and Command keys at both ends, definable function keys, plus scrolling, page control, and zooming keys. Manufacturer's two year warranty. (input/output) **$139.** International Versions also available.

MacTilt
See eye to eye with your Mac and watch productivity soar! Raise your Mac to eye level using MacTilt's 4 inch pedestal. Then tilt it up to 30 degrees and rotate it a full 360 degrees to make glare, eye, neck and back strain disappear like magic. (accessories) **$68.**

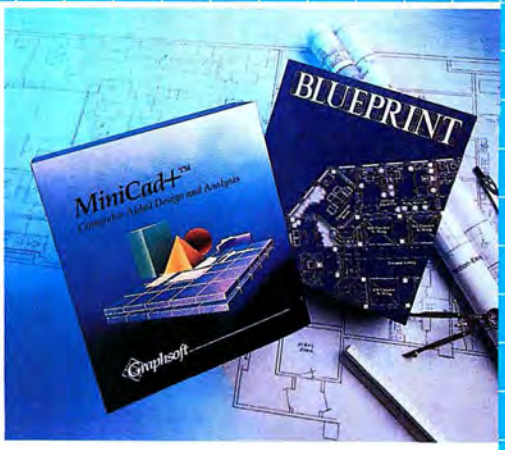
Endeavour Planner
Endeavour Planner puts you in charge of complicated projects. Its easy to use GANTT chart display lets you point, click and drag on any item. Each project can have its own calendar. You can adjust schedules midstream when conditions change, or lock in fixed deadlines. (business) **$95.**

LapLink Mac III
Share Mac Brain Power! - Transfer/translate files easily. **$81.**
LapLink Connectivity Pac-Includes cable/software for Mac-to-Mac/PC-to-Mac link-up. (2 Users) **$114.**
LapLink Network Pac-Link up to five Macs on an AppleTalk network. Both include hard disk password security, modem connections, split screen & more. (5 Users) **$189.** (communications)

Metro ImageBase (Full Line Available)
Art Deco or ReportMaker ..... ea. 76.
Newsletter Maker or Business ..... ea. 76.
Mindscape
ZING ..... 125.
Multi Ad Services
Multi-Ad Creator ..... 865.
ProArt: Bus., Sports or Holidays ...ea.95.
Paracomp
ModelShop ..... 379.
Swivel 3D 1.1 ..... 299.
Silicon Beach
Digital Darkroom ..... 249.
Super 3D 2.0 ..... 315.
SuperPaint 2.0 ..... 125.
Strata
StrataVISION 3d ..... 375.
Strategic Mapping, Inc. (Select Micro)
Map Maker 4.0 ..... 245.

MiniCad+ 2.0 (Graphsoft)
This year MiniCad+ is the people's choice, winning both the U.S. and Australian MacWorld World Class Awards for CAD. For the price of most 2D CAD packages, MiniCad+ provides 2D, 3D, a hotlinked spreadsheet and a programming language. The quality is unsurpassed. (cad/cae) **$519**

Blueprint
This new professional-level 2D CAD program has it all at an unbelievable price. Layers, fillets, DXF, constraint palette, high precision, auto-dimensioning, hatching, symbol library, encapsulated postscript plus more.(graphics) **$349.**



HYPERWARE

Bantam
Complete HyperCard Handbook ..... 22.
Beacon Technologies
HyperBible International Version ..... 175.
HyperBible King James Version ..... 145.
BrainPower
ArchiText ..... 199.
Bright Star Technology
HyperAnimator 1.5.1 ..... 98.
interFACE ..... 229.
DataDesk International
HyperDialer ..... 29.

SmartOne 2400 Modem (Best Data Products)
For beginners and experienced modem users. If you need a 2400 baud modem, the Smart One 2400 Modem provides an economical alternative. For less than the cost of some 1200 bps units, you get a Hayes compatible modem with and auto answer/originate, 300, 1200 and 2400 baud operation, pass-through phone jack, speaker with programmable volume, and a manufacturer's two-year warranty. All user options are stored in non-volatile memory. Includes software and cable. (modems) **$145.**

SuperMac
PixelPaint 2.0 ..... 225.
PixelPaint Professional ..... 389.
Tactic Software
Art Clips Vol. 1 ..... 51.
Art Clips Vol. 2 ..... 65.
Zedcor
Deskpaint 2.0 ..... 64.

HARDWARE & PERIPHERALS

Cutting Edge
Two Page 19" Monochrome Monitor 959.
DEST
Dest PC Scan Plus ..... **SPECIAL** 699.
General Computing Company
WriteMove Ink Jet Printer ..... 575.
Magnavox
Color Monitor 14" ..... 535.
Microtek
Microtek MSF-300GS Scanner ..... 1589.
Mobius
Multiscreen Video Card w/ Princeton 15" monitor ..... 529.
Qume
Crystal Print Publisher ..... 2900.
Seikosha America
Seikosha Printer (dot-matrix) ..... 235.
Sharp
The Wizard ..... 229.
ThunderWare
LightningScan ..... 369.
ThunderScan 5.0 ..... 187.

ICOM Simulations
HyperTMON ..... 59.
MicroMaps
HyperAtlas ..... 59.
Power Up
HyperTutor ..... 29.
Silicon Beach
SuperCard ..... 125.
Softstream International
HyperHit ..... 125.
Springboard
Family Matters ..... 28.
Symmetry
HyperDA 1.2 ..... 49.
TimeWorks
HyperWorks Organizer ..... 57.

INPUT/OUTPUT

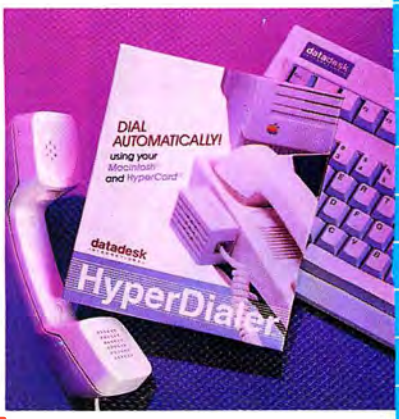
Altra
Felix ..... 127.
Asher Engineering
QuadLYNX Trackball ..... 59.
Cutting Edge
CE-105 ADB Keyboard ..... 125.
DataDesk Intl.
Mac 101 Keyboards ..... 139.
International versions ..... Call.
Kensington
New Turbo Mouse ..... 109.

Koala
MacVision 2.0 ..... 219.
Kraft
ADB Joystick Premium III (SE&II) ..... 49.
QuickStick ..... 39.
Trackball ..... 79.
Kurta
IS/ADB Tablet 8 1/2 x 11 ..... 255.
Micro Touch
The UnMouse ..... 189.
Mobius
Cordless Mouse ..... 99.
Mouse Systems
A+ Mouse (SE/II) ..... 79.
A+ Mouse (512/Plus) ..... 59.
Practical Solutions
The Cordless Mouse ..... 99.
Mouse Master ..... 57.
Summagraphics
Bit Pad Plus ..... 319.

LANGUAGES

Digitalk, Inc.
Smalltalk/V MAC ..... 125.
Microsoft.
QuickBasic ..... 65.
Shana Corporation
Inside Out ..... 369.
SmethersBarnes
Prototyper ..... 189.
Symantec
THINK'S C 4.0 ..... 165.
THINK'S Lightspeed Pascal ..... 105.
Zedcor
ZBasic 5.0 ..... 89.

HyperDialer (DataDesk International)
Now you can connect your Macintosh to your existing business or home telephone for automatic dialing with Apple's HyperCard. DataDesk's HyperDialer is designed specifically for HyperCard's touch-tone dialing capabilities and works with-line business phones without requiring a modem or dedicated phone line for automatic dialing. Automatically dials HyperCard, SideKick, Focal Point, C.A.T., SuperCard and QuickDex phone numbers. It connects to Mac's speaker port - not a precious serial port. (hyperware) **$29.**



GUARANTEE

Many of our products come with a thirty day money back guarantee, if you are not completely satisfied. Ask for details when you place your order.

UltraPaint (Deneba Software)
Michelangelo would turn Veronese green with envy! Combines B&W/color painting, gray scale image processing and object-oriented drawing. Supports 256 colors, a multi-color airbrush, editable mask & lasso, a water droplet tool and more. It's Open Architecture design makes adding features easy. (graphics) **$125.**

Canvas 2.1 Unleash your creativity! Version 2.1, faster and more versatile than before, offers an unlimited number of object layers and full 16.7 million color support (256 colors per palette). Also offers enhanced Bezier curves, 100,000 word spell checker, improved alignment manager, a four-color process separations utility, and more. Directly import MacDraw II and export EPS formatted files. (graphics) **$189.**

Supra
Supra Modem 2400 ..... 129.
US Robotics
Courier 9600 Modem ..... 689.

MacGolf Classic (XOR Corp.)
You won't be in the rough when you play MacGolf. This premium edition of MacGolf features vivid full-screen color graphics with unsurpassed screen image detail. Contains the original 2 MacGolf courses and 4 additional MacCourses, for a total of 108 holes to play. New features include 5 enlargement options for close-up viewing, 9 practice greens, a driving range, installability on hard disks and much more. Works with Plus, SE, II and IIcx. (enter.) **$53.**

HIP Software
Harmony Grid ..... 59.
Intelligent Music
OvalTune ..... 95.
Passport Designs
NoteWriter ..... 325.
Passport MIDI Interface ..... 89.
Primera Software
Different Drummer ..... 59.
Repertoire
Music Publisher ..... 359.
Resonate
Listen 2.0 ..... 62.
Tactic Software
Sound Clips Vol. 1 or 2 ..... ea. 49.

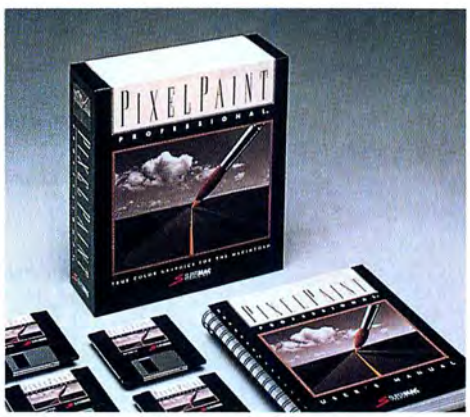
MEMORY UPGRADES/ ACCELERATORS

1 MEG SIMMS
Low Profile, 120ns High Quality Single In-Line Memory Modules for MacPlus, SE, II, IIx.
2 yr. Warranty. **New low price $89.**

Dove (full line available)
MaraThon 030 Accelerator ..... 969.
MaraThon 030X ..... 969.
MaraThon Racer ..... 149.
MacSnap 2S ..... 199.
MacSnap 4S ..... 395.
MacSnap 8S ..... 818.
MacSnap 524E ..... 185.
MacSnap 524S ..... 239.
MacSnap 548S ..... 499.

MODEMS/FAX

Abaton
InterFax12/48 ..... 265.
InterFax 24/96 ..... 425.
Best Data Products
SmartOne 2400/1200 ..... 145.
Hayes
Smartmodem 1200 ..... 295.
Smartmodem 2400 ..... 429.
Smartmodem 9600 (V series) ..... 759.
Prometheus
ProModem 2400 SE Int. ..... 209.
ProModem 2400M ..... 199.
Travel Modem ..... 205.



PixelPaint Professional 2.0 (SuperMac Technology)
PixelPaint Professional's photo-realistic paint capabilities let your imagination tinker with reality. Don't settle for manipulating images...*create* them with PixelPaint Professional! Offers an array of advanced paint tools for dazzling special effects. Choose from full transparency control, dynamic masking, image merging and a sophisticated airbrush tool. Use 8-to-32 bit color while selecting from a spectrum of custom palettes and color pickers including 4-color process, RGB, and PANTONE. (graphics) **$389.**

MUSIC AND SOUND

Altech
MIDI Interface ..... 59.
Bogas Productions
Super Studio Session 2.0 ..... 65.
Coda
Finale ..... 589.
MacDrums ..... 31.
Perceive ..... 49.
Electronic Arts
Deluxe Music Construction 2.5 ..... 85.
Deluxe Recorder ..... 99.
Esthetic Engineering
Music Mouse ..... 49.
Farallon Computing
MacRecorder (records sound) ..... 164.
Screen Recorder ..... 125.
First Byte
SmoothTalker ..... 33.
Great Wave
Concertware+MIDI 5.0 ..... 99.

SECURITY & VIRUS PROTECTION

ASD Software, Inc.
FileGuard ..... 125.
FileGuard Extend (office 5-pak) ..... 309.
TWINS ..... 109.
Fifth Generation
Disk Lock 107
Kent Marsh
MacSafe II ..... 107.
NightWatch ..... 86.
QuickLock ..... 56.
Mainstay
AntiToxin ..... 59.
Microcom
Virex 2.2 ..... 52.
Symantec Corporation
S. A. M. ..... 69.

SPELLING/DICTIONARY THESAURUS CHECKERS

Deneba Software
BigThesaurus ..... 59.
Spelling Coach Pro 3.1 ..... 125.
Electronic Arts
Thunder II ..... 49.
Lexpertise
MacProof 3.2.1 ..... 115.
Microlytics
Electronic Word Finder ..... 69.
Word Finder 2.0 ..... 34.
Sensible Software
BookEnds ..... 53.
Sensible Grammar ..... 51.

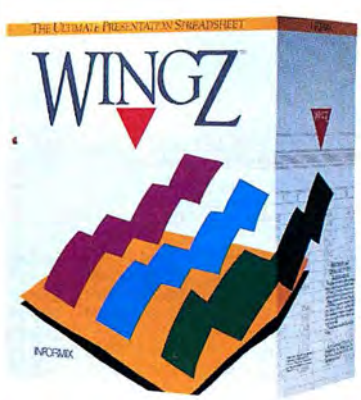
STATISTICAL ANALYSIS

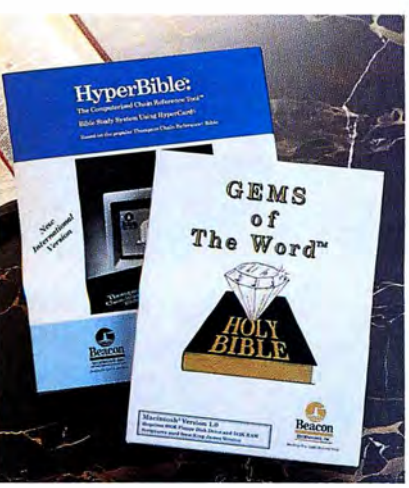
Abacus Concepts
StatView II ..... 285.
StatView SE+Graphics ..... 199.
BrainPower
StatView 512+ (requires 512k) ..... 149.
D2 Software
MacSpin 2.0 ..... 189.
Odesta
Data Desk 3.0 ..... 349.
Paracomp
Milo ..... 159.
Select Micro Systems, Inc.
Exstatix ..... 219.
Wolfram Research
Mathematica (SE) ..... 450.

UTILITIES

Abbott Systems
CanOpener 1.1 ..... 65.
Affinity
Tempo II ..... 75.
Aladdin Systems Inc.
Programmer's Assistants ..... 75.
Shortcut ..... 46.

WingZ 1.1 (Informix Software)
With WingZ, the largest, fastest and most versatile spreadsheet for any Macintosh- you can combine numbers, words and graphs on a single page. Ver. 1.1 of WingZ has completely new documentation including a 525-page HyperScript volume, new features, enhanced 3-D graphs, expanded capabilities in WingZ HyperScript development language and much more. (business) **$249.**





HyperBible (Beacon Technology)
Old and New Testament Bible quotations are easily accessed and brought to life with this amazing Bible study system. Use HyperBible's extensive historical data to trace the development of people and places described. 15MB hard disk space required. Includes HyperCard 1.2.2. (hyperware) New Int'l. Version **$175.** King James Version **$145.**

Gems of the Word
These Little Gems are Priceless! Put your day into perspective with up to 2,000 inspirational Bible verses. Covers over 150 topics. Gem of the Day program offers a new verse each day. 800k. (educational/personal) **$25.**

CompuServe

You can now contact MacWAREHOUSE or place orders with us in the **Electronic Mall** on CompuServe. The **MacWAREHOUSE GO code is GO MW**. As always, you'll get fast, dependable overnight service and you can leave messages for Kerry or any of our support staff.

TypeStyler (Broderbund)
Take an ordinary message - then bend it, shape it, anyway you want it! With TypeStyler you'll create dramatic graphics without expensive typesetting. Type it - then Style it using an array of unique paint features. Feel free to import and export PICT, Paint and EPS file formats, export Adobe Illustrator outlines and more. TypeStyler comes with 10 AGFA Compugraphic typefaces and works with thousands of fonts including Type I from Adobe. Next time say it with style... Say It With TypeStyler! (graphics) **$119.**

ALSoft
DiskExpress II ..... Call.
Font/DA Juggler ..... 42.
MultiDisk ..... 49.
Master Juggler ..... 64.
Berkeley System Design, Inc.
Stepping Out II ..... 50.
CE Software
DiskTop 4.0 ..... 64.
QuicKeys 1.2 ..... 64.
Caere
OmniPage ..... 549.
Central Point Software
Copy II Mac ..... 24.
Mac Tools ..... 45.
Custom Applications
Freedom of Press 2.1a ..... 265.
Dantz Development
Retrospect ..... 152.
Dayna Communications
DOS Mounter ..... 55.
Emerald City Software
Lasertalk 1.0 ..... 149.
Fifth Generation
FastBack II ..... 107.
PowerStation 2.5 ..... 34.
Pyro ..... 14.
Suitcase II ..... 44.
GO Technology
MacTree Plus ..... 46.
ICOM Simulations
On Cue ..... 35.
Insight Development
MacPrint ..... 95.
Magic Software
AutoSave II ..... 29.
BackMatic ..... 50.
POWERicons or POWERmenus ea. . 39.
Mainstay
Capture 2.0 ..... 49.

CONTEST RULES 1. Entries must be received on or before 4/30/90. 2. Winners selected in random drawings by attorneys for MicroWarehouse Inc. (MWH), whose decisions are final. 3. Mac Portable Computer prize subject to availability. MWH reserves the right to substitute wholesale cash value up to $6,000. 4. Winners responsible for taxes. 5. Odds of winning depend on number of entries. All prizes will be awarded. 6. MWH will announce the winners on or around 5/31/90. Winners notified by mail. Dates subject to change at the discretion of MWH. If unable to contact any winner, an alternate will be selected by random drawing. 7. Contest is open to US residents, except where prohibited by law. Employees of MWH and suppliers not eligible. 8. Prizes - one Mac Portable Computer w/40MB hard disk and 150 software and media prizes.

Microlytics
GOfer ..... 45.
Olduvai
ClipShare ..... 139.
MultiClip ..... 50.
ON Technology
On Location ..... 75.
PCPC
HFS Backup 3.0 ..... 54.
Peripheral Land, Inc.
TurboBack ..... 55.
TurboCache or Turbo Spool ..... ea. 69.
TurboOptimizer ..... 39.
Preferred Publishers
Exposure ..... 52.
Software Innovations
HandOff ..... 32.
SuperMac
DiskFit 1.5 or SuperSpool 5.0 ..... 58.
Sentinel 2.2 ..... 87.
SuperLaserSpool 2.0 (single user) .... 87.
Super LaserSpool (5-pack) ..... 289.
Symantec Corporation
SUM II ..... 99.
Tactic Software
FontShare 2.0 ..... 149.
Icon-It 2.0 ..... 39.
Williams & Macias
DiskFinder ..... 27.
myDiskLabeler ..... 33.
StickyBusiness 1.07 ..... 89.
XTree Company
XTree Mac ..... 52.

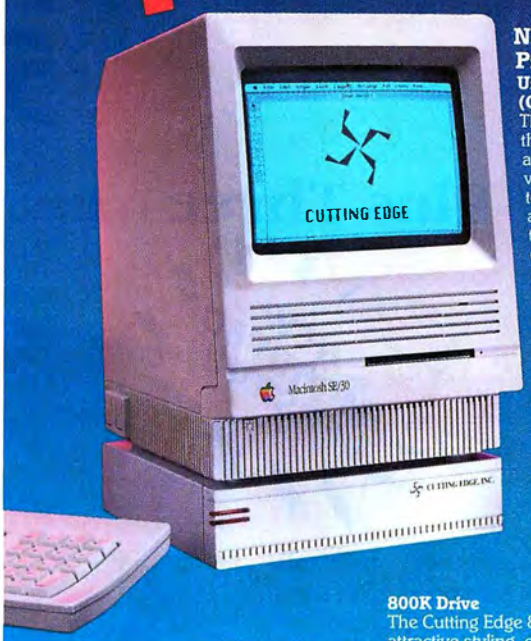
WORD PROCESSORS & OUTLINERS

Ashton-Tate
FullWrite Professional ..... 259.
Claris
MacWrite II ..... 169.
DeltaPoint, Inc.
MindWrite 2.1 ..... 95.

Read-It! OCR 2.1 (Olduvai)
Use any scanner to input pages of text as graphics. Then Read It! works interpreting those graphic images as ASCII characters. Handles forms filled in by typewriter, which can speed up many typical office operations. For every typeface, you'll have to teach it the alphabet, and afterwards, you'll want to run the output through a spelling checker. But think of the time you'll save when you don't have to type bulk text into your Mac. (desktop publishing) **$245.**

Microsoft
Word 4.0 ..... 249.
New Horizons Software
WordMaker ..... 65.
Niles & Associates
End Note ..... 75.
Symmetry
Acta Advantage w/DA ..... 65.
T/Maker
WriteNow 2.0 ..... 119.
WordPerfect Corp.
WordPerfect ..... 229.
Working Software
QuickLetter ..... 73.

STOP PRESS



NEW!
Price breakthrough!
Under the Mac Drives (Cutting Edge)
The Cutting Edge Under the Mac hard disk drives are quiet and reliable with access times down to 20 ms making it almost three times faster than most. Push button external SCSI address switch and removable SCSI terminators allow easy daisy chaining up to 7 SCSI devices. Sizes available 20 meg to 80 meg (see line listings)
20 meg only $359.
30+ meg only $439.
45+ meg only $499.
60+ meg only $599.
80+ meg only $659.

800K Drive
The Cutting Edge 800K Drive's attractive styling, quiet performance, and high-tech reliability make it our most popular floppy drive. Features an LED light to indicate disk access and a hinged door over the disk insertion slot to keep the mechanism clean. One year manufacturer's warranty. (disk drives) **$149.**

Two Page 19" Monochrome Monitor (Cutting Edge)
Every Mac SE and II user can now justify the expense of a big screen with the new Cutting Edge 19" Two Page Monochrome Display System. The Cutting Edge Monitor includes the interface card and matches just about all the features of other big screen display systems costing twice as much. It has a flicker-free refresh rate of 70 hz and a high resolution of 72 DPI. Like all Cutting Edge products it comes with a one year warranty and a 30 day money back guarantee. Please specify your Mac model. (hardware) **$959.**

I'm Donna, call me at

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Inquiries: 201-367-0440
FAX: 201-905-9279

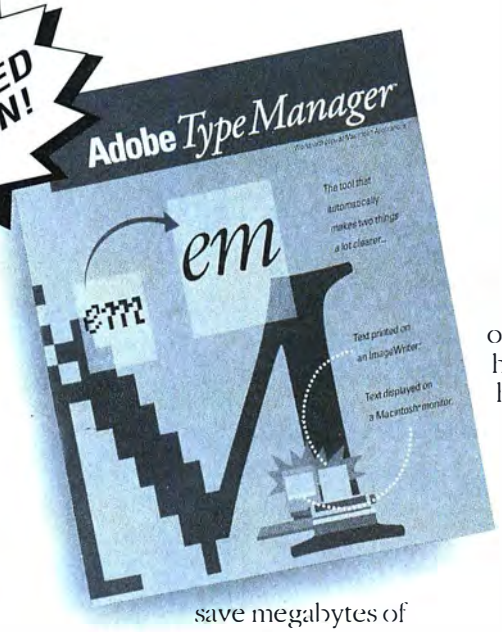
ORDER TOLL-FREE 24 HOURS A DAY.

Circle 78 on reader service card

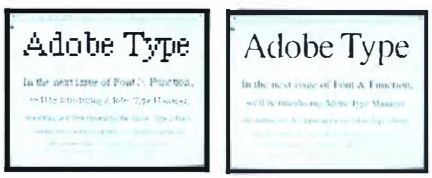
Introducing the New, Improved Adobe Type Manager $59.

Plus Three *New* Adobe Products*!

NEW IMPROVED VERSION!



Now you can get the **new edition** of Adobe Type Manager from MacWarehouse. You'll greatly improve the output of your ImageWriter or Hewlett-Packard DeskWriter and make your Macintosh display text smoother and more legible than before. But don't stand in line to pay $99 at your local software store. Pick up the phone now, and for just $59 (plus $3 s&h), we'll rush your copy by overnight delivery!



Believe it or not, Adobe Type Manager solves the problem of jagged edges on screen fonts, too. Now, what you see on your screen will more closely resemble what you get from any PostScript printer — no more 24-point headlines that look like brick piles on screen. It's almost like having Display PostScript on your Mac— for only $59.

Adobe Type Manager is compatible with virtually every major application, and it's easy to install on any Mac (running System 6 or later) from a Plus to a IIci. Just a few clicks with your mouse — install it and forget it. Because you'll only need one size of a screen font installed in your System, you can also save megabytes of space on your hard disk. You won't need any additional memory, either.

If you have a non-PostScript laser printer, like Apple's LaserWriter IISC, Adobe Type Manager will give you PostScript - quality type, without the PostScript expense. And Type Manager includes high quality outline versions of 13 popular fonts, so it's easy to produce the kind of text you thought only came from a PostScript laser printer.

Our friendly MacWarehouse staff of Mac fanatics is standing by to help with any questions you may have. Remember, nobody beats our fast, dependable, overnight service for Adobe Type Manager or any of the other fine Adobe products.

NEW!

- **Adobe Plus Pack** — Contains 22 additional typefaces — Adobe Typeface Packages 1-5 and Helvetica Narrow. (These are not included with Adobe Type Manager.) The MacWAREHOUSE low price is just **$109!**
- **Adobe Type Set 1** — Contains 7 typefaces. The MacWAREHOUSE low price is just **$59!**
- **Adobe Type Set 2** — Contains 7 typefaces. The MacWAREHOUSE low price is just **$59!**

ADOBE TYPE SET 1	ADOBE TYPE SET 2
Hobo	Peignot Demi
Bodoni	Present Script
Poster	Cooper Black
Freestyle Script	Franklin Gothic
VAG Rounded Bold	No. 2 Roman
Linotext	Copperplate Gothic 31AB
COTTONWOOD	LITHOS BOLD
TRAJAN	JUNIPER

*Designed for use with Adobe Type Manager — sold separately.

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connectors; some have a life rating of only 100 mating cycles.

I replaced the connectors in my Apple extended keyboard by simply removing the four screws on the bottom of the keyboard and then lifting off the top of the keyboard. The small printed circuit boards with the connectors mounted on them are then easily accessible.

Larry Junek
Schertz, Texas

Quit the Finder

TIP: Having trouble using MultiFinder on a 1MB Mac, or just want to buy yourself a couple hundred K when using MultiFinder? It's easy—quit the Finder. The Finder doesn't have a Quit command, but using ResEdit you can designate an F-key (function key) that acts like one. You use an F-key by pressing ⌘-Shift and a number. For example, ⌘-Shift-1 ejects a floppy disk.

Start by making a backup copy of the Finder (press Option while dragging the Finder icon from the System Folder to another folder or disk). Use ResEdit to open your copy of the Finder. Choose New from ResEdit's File menu. In the dialog box that appears, type in capital letters FKEY and click on OK. Again choose New from the File menu. In the window that opens, type A9F4. Next choose Get Info from ResEdit's File menu. In the dialog box that appears, change the number labeled ID to 0 or a number between 5 and 9. Quit ResEdit, answering Yes when it asks if you want to save changes to the Finder. Finally, open the System Folder, drag the Finder from it to the desktop, and drag your modified copy of the Finder to the System Folder. (Your modified Finder must be named Finder.)

To use the F-key, you must first activate MultiFinder using the Finder's Set Startup command (located on the Special menu) and restart the Mac. Then Open any application or desk accessory, switch to the Finder, and press ⌘-Shift together with the 1-digit number you assigned as the ID in ResEdit. Notice the disk and Trash icons disappear. Check the Apple menu—Finder is not open!

Peter Ford, George Weil, and Randy Zeitman
Address unknown

You'll also need to quit the application you opened before quitting the Finder. Otherwise the regained memory can only be used to open an application that needs no more memory than the Finder. Normally the Finder uses 160K. You can increase that amount by changing the Application Memory Size option (using the Finder's Get Info command) and then restarting.

With no Finder, you'll need an alternate method of opening applications. On Cue from ICOM Simulations (312/520-4440) adds a customizable application menu to either end of the menu bar. DiskTop from CE Software (515/224-1995) is a DA with all the functionality of the Finder (and more) but with a different interface.

The latest version of ResEdit, 1.2 at this writing, is available with documentation from APDA (408/562-3910, 800/282-2732 in the U.S., 800/637-0029 in Canada.)—L.P.

```
{Define the}
{variables needed}
{for the script}

{"chartnum" holds}
{the number that}
{refers to the}
{selected chart}
DEFINE chartnum

{"min" is the}
{default minimum}
{value assigned}
{to the chart}
DEFINE min

{"max" is the}
{default maximum}
{value assigned}
{to the chart}
DEFINE max

{"iterator" is}
{the loop counter}
DEFINE iterator

{"colorvalue" is}
{assigned to each}
{RGB component}
{to produce the}
{smoothly varying}
{grays}
DEFINE colorvalue

{"number" is the}
{number of Z axis}
{divisions and}
{corresponding}
{gray scales—in}
{this case 16}
DEFINE number

number = 16

{turn repaint off}
{so that the graph}
{is not redrawn}
{after each}
{command}
REPAINT OFF

{get the number}
{of the selected}
{chart}
chartnum=NUMBER()

{select that}
{charts Z axis}
SELECT CHART
  chartnum AXIS 3

{get the present}
{Z axis scaling}
min=SCALEMINIMUM()
max=SCALEMAXIMUM()

{set the Z axis}
{scaling and}
{number of major}
{divisions}
MANUAL SCALING
  FROM min TO max
  WITH
  number MAJOR AND
  1 MINOR DIVISIONS

{loop through each}
{Z axis division,}
{assigning the}
{next gray value}
{to that division}
FOR iterator =
  1 TO number

{calculate the}
{RGB values}
{needed for}
{this gray}
{level}
colorvalue =
iterator*255
/number

{select that}
{Z axis}
{division}
SELECT CHART
chartnum
SERIES
iterator

{assign the}
{proper RGB}
{values}
FILL FG RGB
(colorvalue,
colorvalue,
colorvalue)

{end loop}
END FOR

{now redraw the}
{graph}
REPAINT OBJECTS
```

Smooth Variations

This Wingz script smoothly shades a surface or contour graph. The script remaps the *z* axis to have 16 divisions, and makes each division a lighter shade of gray than the division below it.

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Jon Poole answers readers' questions and selects their tips for this monthly column. He has written many personal computer books, most recently the quick reference guide HyperTalk *(Microsoft Press, 1988), and has just finished a new book of Mac tips (to be published this summer by Microsoft Press),* Amazing Mac Facts.

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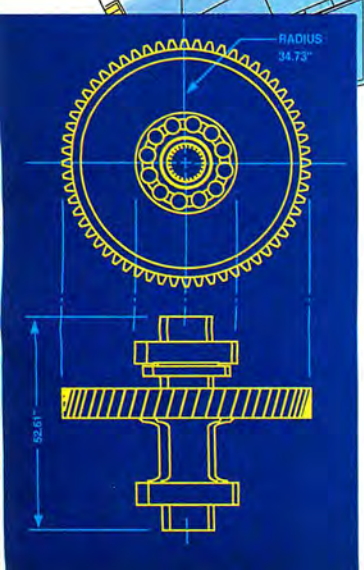

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Getting Started with Memory

How memory works, and how to make it work better for you

BY JIM HEID

In 1946 at a lecture at the Los Alamos National Laboratory, a mathematician named John von Neumann presented his vision of future computers: they would contain internal storage space for holding the results of calculations until the data could be permanently stored on punched cards. This temporary work space, which he called *internal memory,* would also allow a computer to hold sequences of instructions, eliminating the need to rewire the machine to perform a different type of calculation. Yes, in that computer Stone Age, to run a different program, you got out your wire cutters.

Since those early days memory has evolved from room-size circuits that could store a sentence to fingernail-size chips that can store a book. And someone reading this 20 years from now will probably chuckle at my quaint descriptions of today's memory. But it's likely that memory will still serve the same basic role: storing the programs we use and the data we create. This month, I'll look at this role as it applies to the Mac, and I'll describe ways to use memory to improve the Mac's performance.

Memory Minutiae

There are many types of memory, but most fall into either of two broad categories: *ROM* and *RAM.* You can't venture into the Mac world without encountering these two acronyms, so it helps to understand the concepts behind them.

ROM stands for *read-only memory:* the Mac can read the contents of a ROM chip, but it can't change them. A ROM chip's software is in there for good, frozen at the factory like the grooves on a phonograph album. The only real threat it faces is an electrical mishap such as a power surge or a spark of static electricity.

In the Mac, ROM chips store portions of the fundamental *system software* that enables the Mac to run. The Mac's ROM contains small software routines that applications call on to create pull-down menus, dialog boxes, and the other visual elements of the Mac's interface. (These routines are often collectively described as the *Toolbox.*) ROM also stores small diagnostic routines that swing into action when you switch the Mac on, testing its hardware for problems and then displaying the familiar where's-the-disk? icon.

If a ROM chip is like a phonograph album, a RAM chip is like a cassette tape or a disk—it's initially blank, and its contents can be changed over and over again. RAM stands for *random-access memory.* Because it can be written to as well as read from, it's sometimes called *read-write memory.*

RAM is versatile but vulnerable. Cassettes and disks store information using magnetic particles oriented in patterns that remain intact until another magnetic field comes along to change them. A RAM chip, on the other hand, uses millions of microscopic electronic switches that stay in place only as long as the chips have a steady, reliable supply of power. That's why programs have Save commands—and why it's a good idea to use them often.

Incidentally, RAM chips are often referred to as *DRAM* (pronounced *dee-RAM*) chips. *D* is for *dynamic* and reflects the chip's need for a periodic electronic nudging, or *refresh signal,* that allows it to retain its contents. The other major type of RAM chip, *static RAM,* doesn't require a refresh signal and therefore uses less power. That's one reason Apple used

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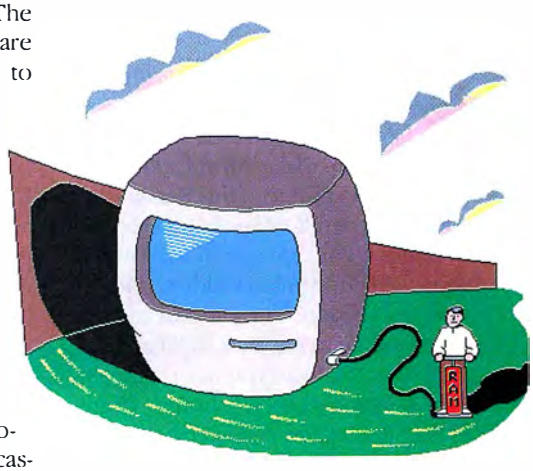

SCOTT BALDWIN

static RAM in the Mac Portable. But static RAM chips are more expensive than their dynamic counterparts; as a result, most deskbound computers use DRAM chips.

The RAM chips used in deskbound Macs are connected in groups of eight on small plug-in circuit boards called *Single Inline Memory Modules,* or *SIMMs.* (The Mac Portable uses its own specialized memory boards, and in the discontinued 128K and 512K Macs, RAM chips are connected directly to the computer's main circuit board.) In their least-expensive configuration, all currently manufactured Macs include 1 megabyte (MB) of RAM. One megabyte was a vast expanse in John von Neumann's computing world, but as we'll see shortly, today it's barely enough.

"Coming to Terms with Memory" defines the most common memory-related terms. For details on choosing and installing specific upgrades, see "Is Your Mac Obsolete?" (February 1990).

Coming to Terms with Memory

Access Time The time required, in nanoseconds (billionths of a second; abbreviated *ns*) to successfully read to or write from a RAM chip. Some Macs require faster RAM chips than others; the IIci needs 80ns RAM chips, while the Plus and SE can use slower chips. (Some static RAM chips provide access times as fast as 25ns.) You can use chips with a faster access time than your Mac needs, but they won't speed up processing; the computer's circuitry is designed for chips with a specific access time.

Bit Short for *binary digit,* the smallest unit of computer storage. A bit can represent one of two states: 1 (on) or 0 (off).

Byte The workhorse of information storage, equal to 8 bits. One byte can represent any of 256 values, since its 8 bits can be on or off in 256 different combinations. A byte can represent a single character; for example, storing the alphabet requires 26 bytes.

Density The capacity, in bits (not bytes), of an individual RAM or ROM chip. The most common densities are 256 kilobits and 1 megabit. By tying RAM chips together in groups of eight, a SIMM board can store 256 kilobytes or 1 megabyte. A 1MB Mac contains four 256K SIMMs; a 4MB Mac has four 1MB SIMMs.

Gigabyte 1024 megabytes; abbreviated as *GB.*

Kilobit 1024 bits; abbreviated as *Kbit.* The capacities of individual RAM chips are measured in Kbits.

Kilobyte 1024 bytes; abbreviated as *K.*

Megabit 1,048,576 bits; abbreviated as *Mbit.*

Megabyte 1024 kilobytes, or 1,048,576 bytes; abbreviated as *MB.*

Cramped RAM

The Mac's RAM and ROM chips work together—ROM supplies the carved-in-stone software that helps the Mac run, and RAM provides the storage space to hold, well, everything else. You might think the Mac's RAM holds only applications and their documents. Not so. RAM is like a shared closet—it's crammed with odds and ends that reduce the amount of space left over for your stuff. These odds and ends include the following.

- *RAM-based system software* Some of the Mac's system software isn't frozen in ROM but is instead loaded from disk during start-up. Apple omitted some of this RAM-based software from ROM in the interest of flexibility. (For example, if the Finder was in ROM, Apple couldn't release updated versions of it without requiring everyone to buy new ROM chips.)

Other RAM-based system routines bypass older ROM-based ones. Many ROM routines are designed to be replaced by newer ones, called *patches,* that load into RAM during start-up. A patch might fix a bug discovered in a ROM routine, or it might add new ROM-based features to an older Mac—for example, Apple's 32-bit QuickDraw software, which lets color Macs use the latest color video hardware (see *Macworld News*, August 1989). The IIci has 32-bit QuickDraw software in ROM, but other Mac IIs that don't have it need the patch. The price for this interface lift? About 80K of RAM.

- *Start-up documents (INITs)* These ubiquitous programs load during start-up and let you customize keyboard shortcuts, exchange electronic mail, and more (see "Start with Utilities," *Macworld,* October 1989, and "Getting Started with Utilities," February 1990). They're an effective way to customize and enhance the Mac, but they take their toll on free RAM.
- *MultiFinder* System software that lets you run multiple programs simultaneously. It requires 160K of RAM—enough to accommodate an array of INITs or to help feed a memory-hungry program.
- *The RAM cache* This Control Panel option can boost performance, but it uses RAM to do so.

The upshot of all this is that a 1MB Mac doesn't have 1MB of *free* memory; instead, it has only 600K to 700K—less if you use MultiFinder or memory-consuming INITs such as network or electronic-mail software. If yours is a 1MB Mac, you'll need to do some careful tweaking to get acceptable performance, and you should choose programs that use memory sparingly. For survival strategies for 1MB machines, see "More for Your Memory," in this issue.

Ramming Speed

By boosting the Mac's memory, you can take full advantage of MultiFinder's talents by running several programs at the same time and switching among them with a mouse click. You can also use extra memory to speed up the Mac's operation.

Extra memory can boost performance by reducing the need for the Mac to access both hard and floppy disks. When a program's code or data is stashed in memory instead of on disk, data transfers occur much faster than

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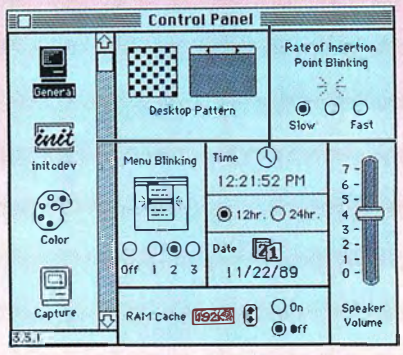
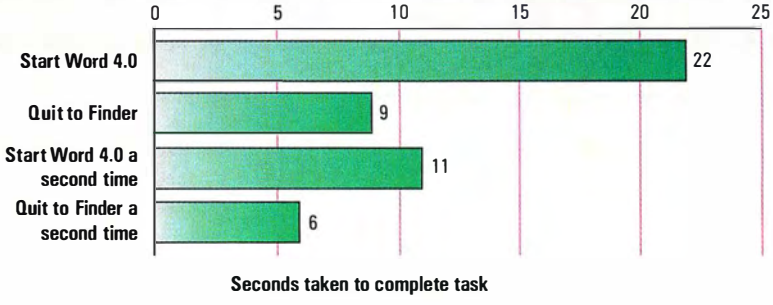


By activating the Control Panel's RAM cache option (top), you set aside memory (up to 25 percent of the total RAM) that the Mac uses to hold recently loaded program code and data. If that code or data is needed again, the cache supplies it, eliminating a relatively slow disk access. The chart (bottom) shows how a 256K cache improves performance on a 1MB Mac SE without a hard disk. It takes less time to start Word 4.0 and quit to the Finder a second time because part of each is stored in the cache. (After activating the RAM cache or changing its size, you must restart the Mac for the change to take effect.)



the leisurely pace of a spinning disk and its mechanical read-write heads.

There are three techniques you can use to improve performance by reducing disk accesses:

- *Give an application more memory under MultiFinder* The Finder's Get Info window lets you fine-tune how large a chunk of memory MultiFinder gives a program. If you increase this amount, more of the application's program code will be able to reside in memory at once. Otherwise, the Mac will have to swap portions of the program into and out of memory as you work. Large, complex programs such as Microsoft Word, Excel, and Aldus PageMaker are especially appreciative of more memory. Use this rule of thumb: if the Mac frequently accesses the disk when you choose commands or click on icons, chances are the program you're running can benefit from extra memory.
- *Activate the RAM cache* The RAM cache stores the most recently accessed portion of the disk in memory in case its program code or data is needed again. If it is, the Mac retrieves it from the cache instead of accessing the disk. The Control Panel lets you activate the RAM cache and specify its size. Generally, the larger the cache, the better the performance boost, until the cache equals about 25 percent of the Mac's RAM (see "Fast Cache").
- *Use a RAM disk* A RAM disk is a pseudo disk that you create in the Mac's memory using a RAM-disk utility (see "Electronic Disks"). Such a utility is often included with a memory upgrade. You can copy an application to a RAM disk and run it at lightning speed. If the RAM disk is large enough, you can stash the System Folder there too, and improve performance even more. Unless you have more than 2MB of RAM, however, chances are you won't be able to create a RAM disk large enough to hold the System Folder and a couple of applications. Incidentally, you should never store documents on a RAM disk; if the power goes off (or even fluctuates briefly) or if the Mac crashes, you'll learn the hard way just how pseudo a RAM disk is.

Cache Only

RAM caches and RAM disks sound similar; after all, both improve performance by replacing disk accesses with memory accesses. But beyond that the similarities end. A RAM cache is dynamic; its contents change as you use the Mac. A RAM disk contains only what you put in it. What's more, the effectiveness of each depends on how you use the Mac. If you generally run only one or two programs and you want maximum performance from them, try a RAM disk. If you routinely switch between two or more applications using MultiFinder or if you regularly repeat certain tasks, a RAM cache may be the better choice. But if your computing habits are haphazard rather than repetitive—if you never know which command or program you'll be using next—a RAM cache won't help much, since much of the program code it holds may not be needed again.

Some Macs can get the performance-boosting benefits of a RAM cache without donating some of the RAM that holds the programs. The IIci has a slot designed to accept an optional *cache memory* board, which holds a small amount of static RAM that can supply data several times faster than the machine's conventional dynamic RAM chips. Apple's cache memory board will provide 32K of cache memory; other manufacturers have boards in the works that will provide more. Apple claims its cache board will make the IIci about 20 percent faster.

Those of us who don't drive a IIci can still benefit from cache memory. Orchid Technology's MacSprint II is a 32K cache memory board for the Mac II that boosts performance by about 30 percent—not bad for a $299 add-on. You'll also find cache memory on some accelerator boards—those brain transplants that replace the Mac's central processor chip with a faster one (see "Getting Started with Expansion Slots," *Macworld,* April 1989). For example, the Radius Accelerator 16 and

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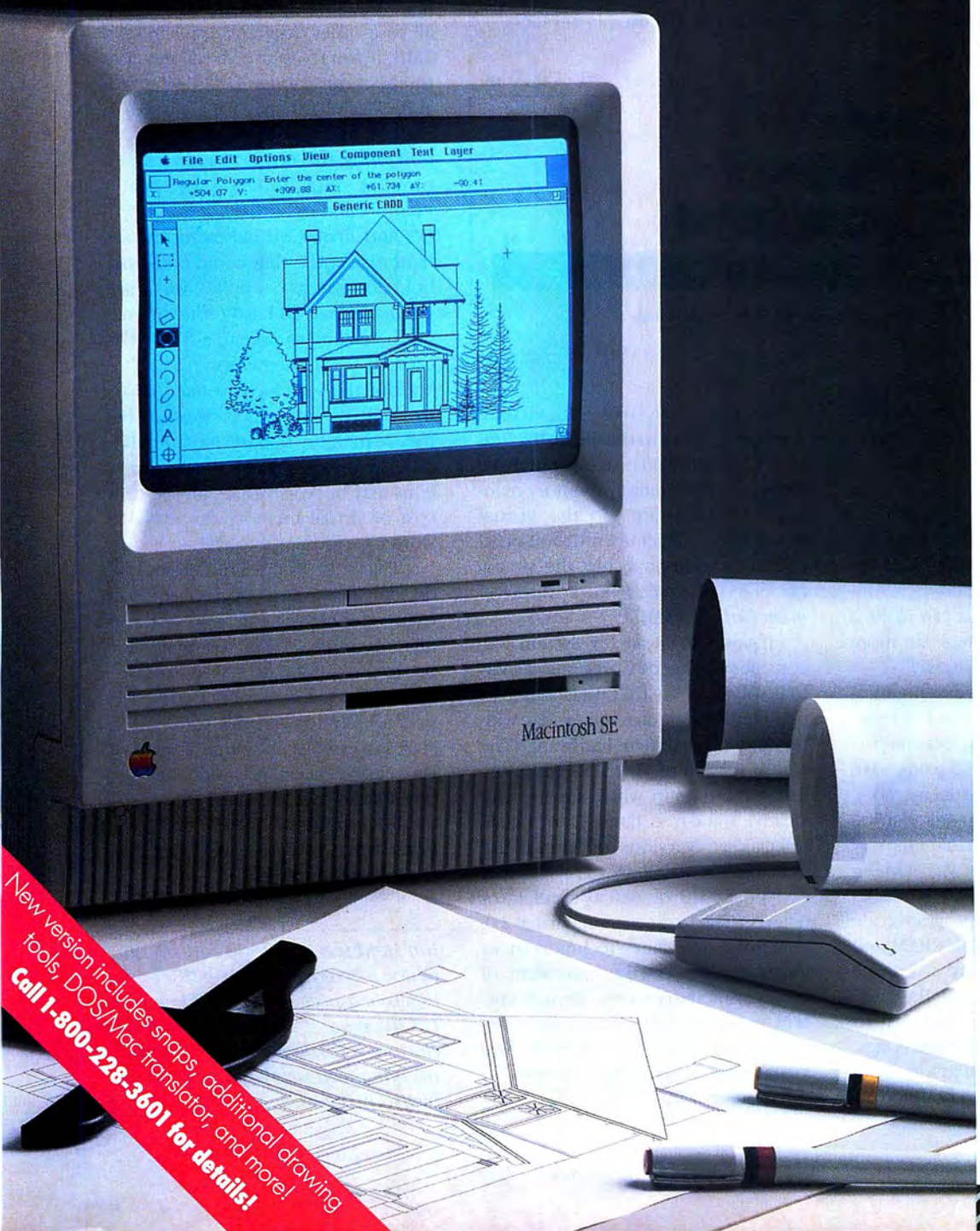

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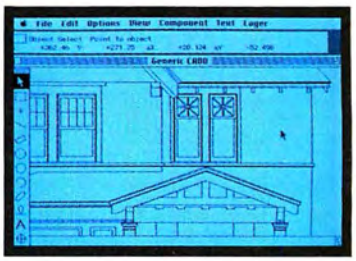

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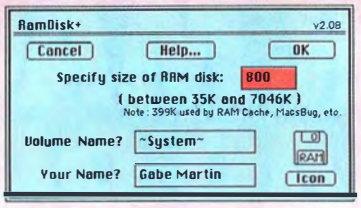
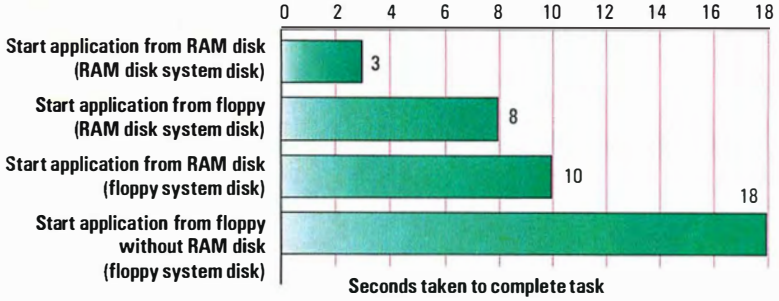


A RAM-disk utility such as Roger Bates's RamDisk+ (top) lets you set aside an area of memory as an electronic disk drive that works at lightning speed. (Another popular shareware RAM-disk utility is George Nelson's RAMStart.) RamDisk+ lists the minimum and maximum practical RAM disk size for the Mac it's running on (in this case, an 8MB Mac II) and also tells you how much memory is being used by the RAM cache and any programmer's debugging aids such as MacsBug. The chart (bottom) compares a RAM disk's effect on performance when it holds just an application (in this case, WriteNow 2.0), just the System Folder, and both the System Folder and an application against performance without a RAM disk.



Accelerator 25 boards for the SE both contain 32K of static cache memory.

Virtual Virtues

One of the most exciting recent developments in Macintosh memory has almost nothing to do with RAM. I'm referring to *virtual memory,* a software sleight of hand that can make a Mac act as though it had far more memory than it actually does.

Virtual memory is essentially a RAM disk in reverse: instead of treating part of RAM as a disk, it treats part of a hard disk as RAM. Set aside 8MB of hard-disk space for virtual memory, and you'll have the electronic equivalent of an 8MB Mac. Virtual-memory system software and the Mac's *memory management* hardware work behind the scenes to swap program code and data between the Mac's RAM and the hard disk. Because hard disk space costs less per megabyte than RAM, virtual memory is an economical way to banish those out-of-memory messages.

System 7.0, a major upgrade to the Mac's system software scheduled to debut this year, will add virtual-memory features to the SE/30, IIx, IIcx, and IIci. The 68030 processor in these Macs contains built-in memory-management hardware. To use virtual memory on a Macintosh II, you need to add an additional chip, the Motorola 68851 *Paged Memory Management Unit,* or *PMMU.*

If you can't wait for System 7.0, consider Connectix Corporation's Virtual software, an INIT that adds virtual-memory features to any Mac with memory-management hardware. (The Mac II version of Virtual includes the 68851 PMMU chip, which anyone with steady, static-free hands can install. Specialized versions of Virtual are available for Mac Pluses and SEs that contain 68020 or 68030 accelerator boards.) The latest version, Virtual 2.0, performs some fancy technical tricks that can give you the equivalent of 14MB of memory—even though current versions of the Macintosh's system software support only 8MB. And Virtual runs on 1MB Macs; System 7.0 will require 2MB.

But virtual memory isn't complete nourishment for a memory-starved Mac. For one thing, it's not as fast as real memory—remember, hard disks are mechanical beasts. A Mac with 8MB of real RAM will be faster than the same machine with 2MB of RAM and 6MB of virtual memory. (The exact difference in performance depends on the programs you run and on the speed of your hard disk.)

What's more, virtual memory works best when your Macintosh contains enough RAM to accommodate your largest programs. For example, if one of your programs needs 4MB, your Mac should have 4MB of RAM, even if all your other programs use less than 1MB. If you try to use virtual memory to shoehorn a huge program into a 1MB Macintosh, you'll be forced to endure frequent slowdowns due to *thrashing,* the nearly constant swapping of data between the Mac's memory and its hard disk.

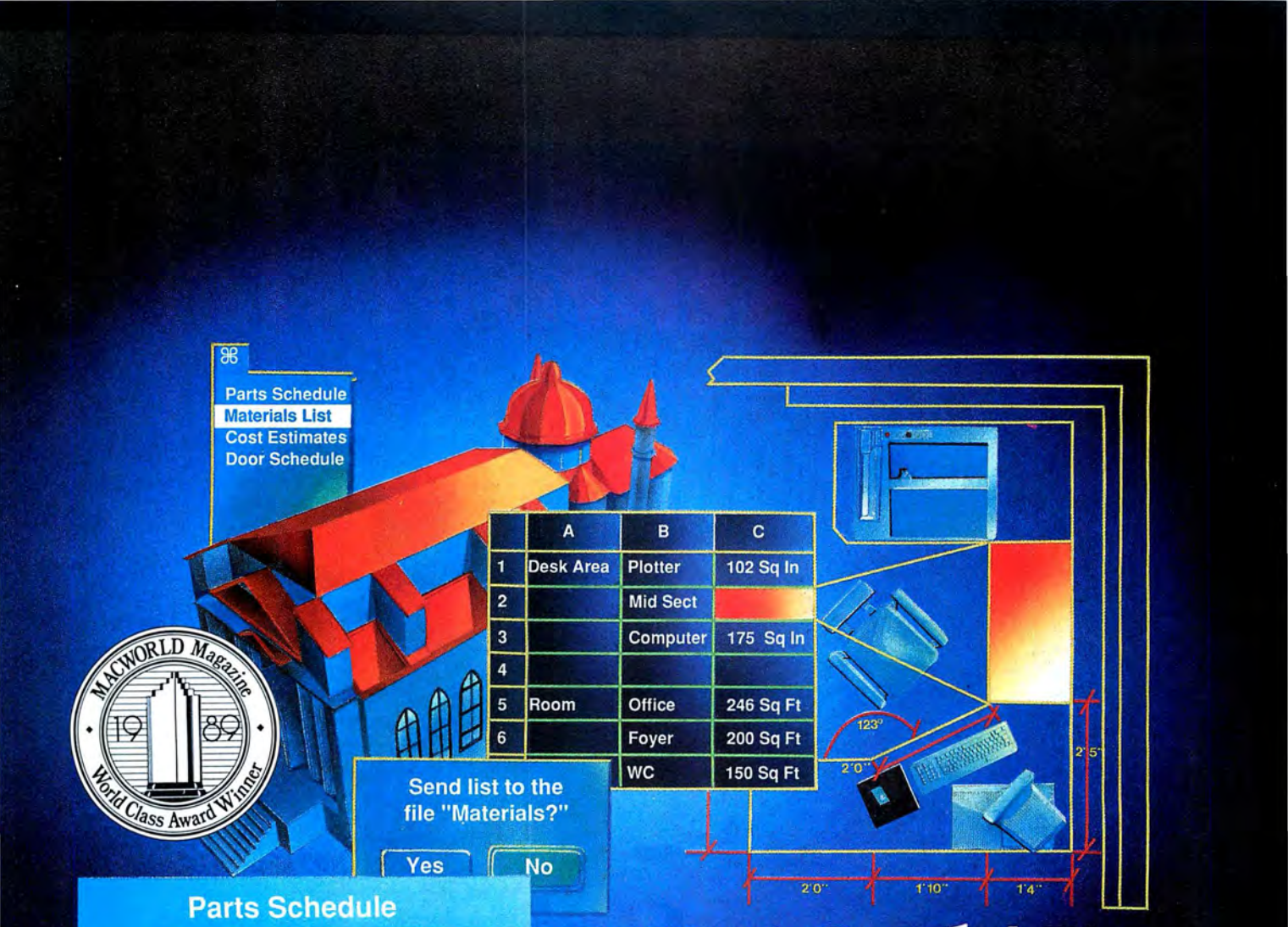
And finally, virtual memory uses hard disk space that could otherwise hold documents or application files. If you have a 20MB hard disk, you may not be willing to donate a third of its capacity to virtual memory.

But then again, you may. If you use only one or two programs—but they're memory-hungry ones—trading disk space for fewer memory problems may be worthwhile. And the low cost of virtual memory can make its slower performance tolerable.

That's the thing about memory—deciding how much you need and how to use it effectively is a game of tradeoffs. You must set aside enough memory to accommodate system software and INITs, yet retain enough to run your applications—while your budget stares over your shoulder. The game isn't easy, especially if you're just getting started with the Mac.

But look at it this way: at least you don't have to use wire cutters to change programs. ■

Jim Heid is a Macworld *contributing editor who each month focuses on a different aspect of Mac fundamentals. His latest book, coathored with Peter Norton, is* Inside the Apple Macintosh, *an advanced user's guide published by Brady Books.*



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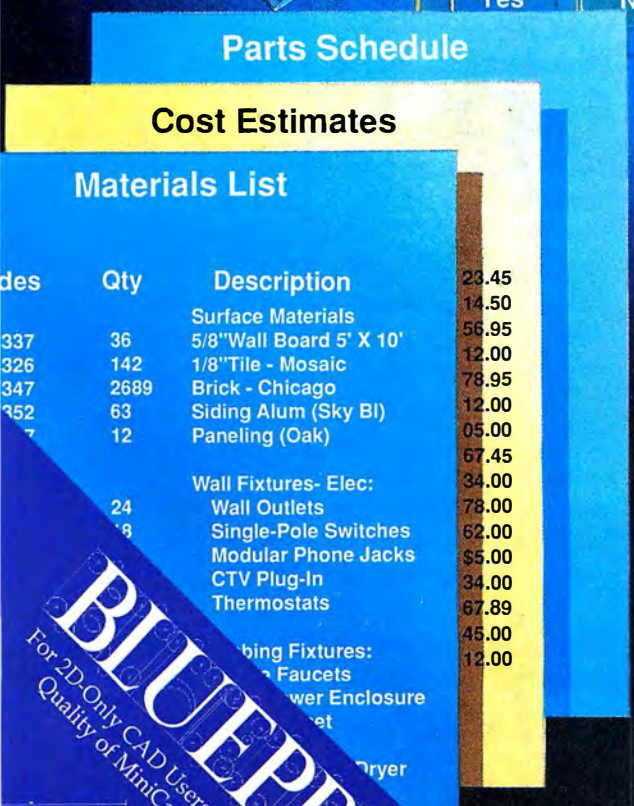

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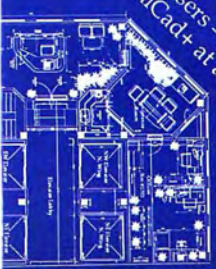

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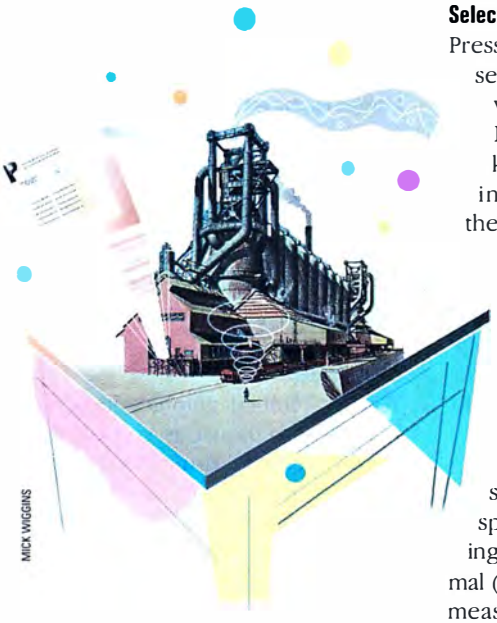
Insights on PageMaker 4.0

TIPS ON USING THE LATEST VERSION OF DESKTOP PUBLISHING'S FAVORED CHILD

BY OLAV MARTIN KVERN AND STEVE ROTH

The newly released PageMaker 4.0 goes a long way toward answering the criticisms leveled against the program by professional users, adding strong typographics and dozens of other features, while retaining the fluid interface that has always been the program's hallmark. Here's a load of tips for using the new features, and some new workarounds to compensate for the features that still aren't there.



Story Editor

Text editing has always been a problem in PageMaker---originally because of bugs, but lately more because PageMaker is a page-makeup program, not a word processor. PageMaker 4.0 addresses the problem with the Story Editor, which provides a new text view that's set up for more heavy-duty editing (see "Story Editor"). You can get to it a couple of ways:

- Triple-click on a text block
- Select a text block with the pointer tool or click an insertion point with the text tool, and press ⌘-E

Some things (search-and-replace, checking spelling) you can do only in story view, some (changing column width and position) only in layout view, and some (general text editing and formatting) in both.

Turning Pages

The quickest way to get to the next page isn't clicking on the icon for the next page. Instead, press ⌘-Tab. To go to the previous page, press ⌘-Shift-Tab. If you press these keys several times in a row, you jump several pages without stopping to display each one. So even if you're moving forward ten pages, you may find it easier to hit ⌘-Tab ten times (or five times with facing-page view).

To scroll through all the pages, hold down Shift and choose Go to Page, from the Page menu. PageMaker jumps to the first page of the document and starts displaying pages (or spreads) one after another. When it gets to the end it goes back to the first page and starts over. Click to stop at any time. You might first want to change the page view to something like Fit in Window for all your pages (hold down Option and choose a page view). These tricks also work in PageMaker 3.xx, though hardly anyone seems to know about them.

Selecting Tools with the Keyboard

Pressing ⌘-space bar in PageMaker 4.0 selects the pointer tool, no matter what tool you're currently using. If your keyboard has function keys, you can select tools by pressing certain Shift combinations; these also work in 3.xx (see "Toolbox Shortcuts"). If you have QuicKeys or another keyboard utility, you can even eschew the Shift key and just use the function keys.

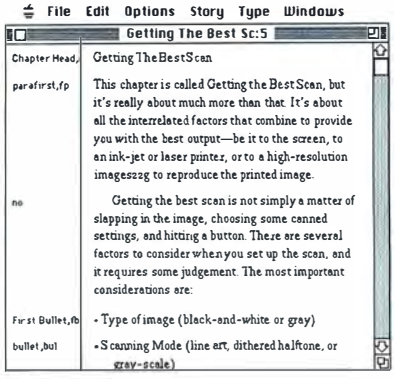
Percentage Scaling

Although PageMaker still won't size graphics to a percentage you specify, there is a way to do it using a calculator. Choose Inches decimal (or Millimeters) for the horizontal measurement in Preferences (under Edit). Set the zero point to the upper-left corner of the graphic. Measure the width of the graphic. Multiply the width of the graphic by the percentage reduction (or enlargement) you want (for example, if the graphic is 6 inches wide and you've specified an 80 percent reduction, you multiply 6 times .8). Drag out a ruler guide from the vertical ruler until the guide reaches the horizontal ruler at the measurement you found in the preceding step (in this example, 4.8 inches).

Make sure that Snap to Guides is on (⌘-U toggles it on and off); then

(continues)

Adapted from *Real World PageMaker: Industrial-Strength Techniques for the Macintosh,* by Steve Roth and Olav Martin Kvern (Bantam/ITC, 1990).



Story Editor

Triple-click on a text block, and PageMaker brings up the whole story in its new story view. When you finish editing and close the window, the changes are reflected in layout view.

hold down Shift, select the handle on the lower-right corner of the graphic, and resize the graphic until it snaps to the vertical ruler. This technique is fairly accurate, especially if you zoom into 400% size under the Page menu (⌘-4) before setting the ruler guide. In that view, the ruler increments are every .05 millimeters, or every .01 inch.

New Lines

A great new feature in PageMaker 4.0 is the new-line character; while holding down the Shift key press Enter (usually found on the numeric keypad). You use the new-line character when you want to break a line but do not want to start a new paragraph. For example, when working with complex tables, you might want to add a second line to a table item without adding a new paragraph with its attendant attributes—first-line indent, space before, space after, or paragraph rule. The new-line character is also handy if you want to break a line of justified type and keep it justified.

The tabs on the new line are the same as those on the previous line because they're all part of the same paragraph. To set different tab stops on the two lines, you need to make each line a separate paragraph.

Hang Dog

It may not look like it, but that doggie to the left is actually the first character in the paragraph. It's set up like a normal hanging indent, with a tab between the dog and the first word of the paragraph. You can position the graphic relative to the first line of text by dragging it up and down with the pointer tool.

Inline Graphics

You can embed graphics in text in PageMaker 4.0, just as you can in a word processor. You can even place graphics inline instead of pasting them in. When you click an insertion point, you get a new option in the Place Document dialog box: As inline graphic.

Inline graphics follow the text flow across columns and over page breaks. No more painful repositioning of graphics relative to text. You can size inline graphics, but you can't set a text wrap for them.

Autoleading

Ordinarily, when you place an inline graphic, it conforms to the leading set for the paragraph. If you want to make the paragraph the height of the graphic, the obvious solution is to choose Autoleading for the paragraph. The only problem is that you'll get some space above and below the graphic. The solution: open the Paragraph Specifications dialog box (⌘-M) and click the Spacing button.

In the Spacing Attributes dialog box, type **100** in the Autoleading text-edit field. Close the dialog boxes by pressing Return twice. The paragraph is now exactly the height of the graphic. You can create a style for graphics-only paragraphs with auto leading set to 100 percent.

Hanging Inline Graphics

You can even make inline graphics *hang* outward in a *companion column* to the left of the main text block (see "Hang Dog"). This trick is similar to creating a normal hanging indent for bulleted lists and the like, but you must use a large indent to leave room for the graphic. For instance:

Left indent: 1 inch
First-line indent: –1 inch
First tab stop: 1 inch

Now place or paste the graphic as an inline graphic, that is the first character in the paragraph. Press the Tab key to move the text over. Select the whole paragraph (including the graphic) and set the leading you want—don't use autoleading or this won't work.

Now comes the magic. Grab the inline graphic with the pointer tool and drag it up and down until you've got it where you want it. You're actually moving the graphic's baseline, positioning it in relation to the baseline of the first line of text.

Tabs Come Up to Snuff

Users of PageMaker 1.2 and 2.0 will remember how badly those versions handled tabs. Version 3.0 went a long way toward improving that, and version 4.0 has almost got it right. The new PageMaker includes a stand-alone table editor program, and much-improved tab handling.

When you choose Indents/tabs from the Type menu (⌘-I), the zero point of the ruler in the resulting dialog box aligns with the left edge of the currently selected text block, if the left edge is visible in the window (see "Adjustable Tabs"). This makes setting tabs a lot easier.

You can now select a tab (in the

(continues)

TOOLBOX SHORTCUTS

These shortcuts are especially useful when you're using a small-screen Mac and want to get the toolbox out of your way.

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F5	Rectangle tool
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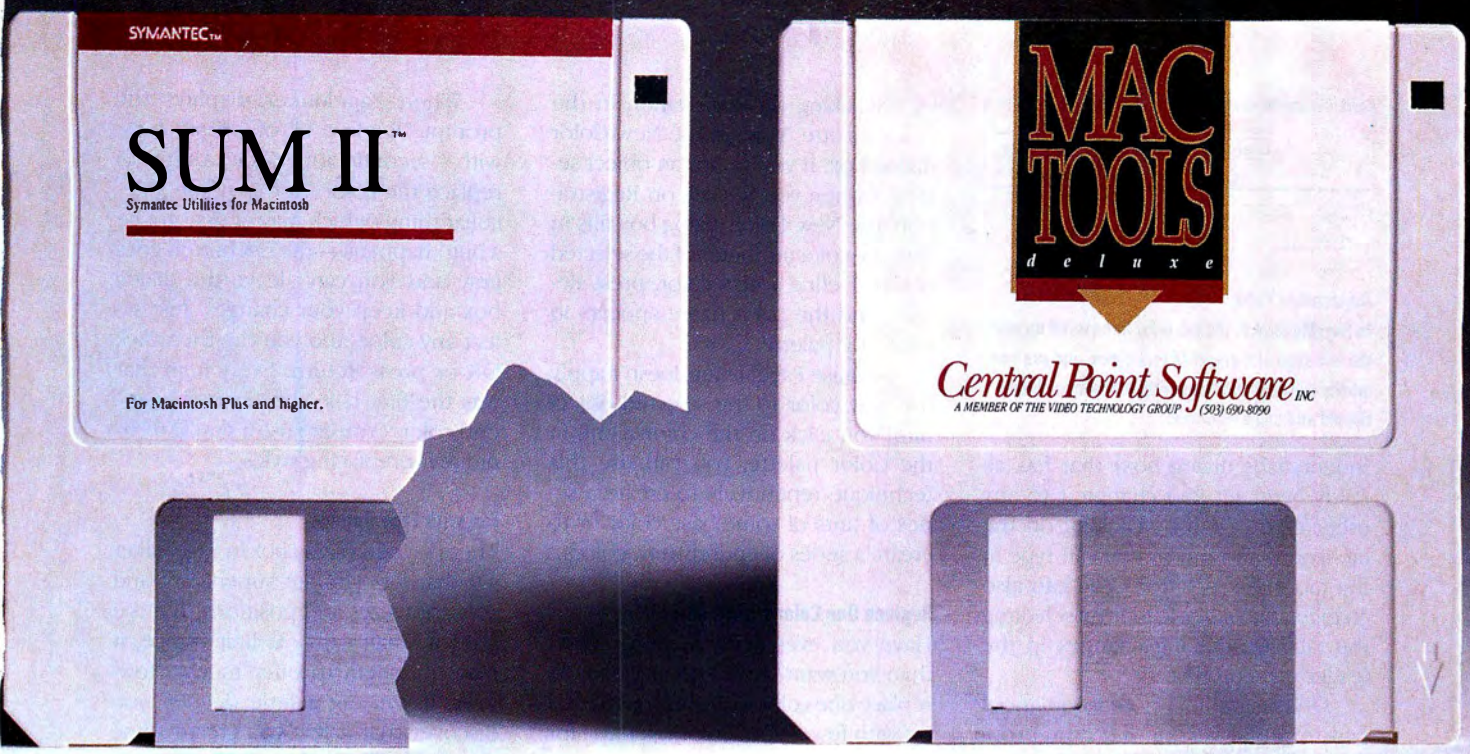

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×		×	Multiple Setup Files
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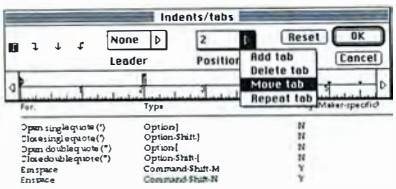

Adjustable Tabs

In PageMaker 4.0, the tab ruler lines itself up with the left edge of a selected text block, and you can modify existing tabs, rather than having to delete the old and add a new one.

Indents/tabs dialog box) that has already been set and change it to any other type of tab by clicking on the tab icon you want, or you can type in the tab's new position. You can also change a tab's dot leader by selecting the tab and making changes in the leader-text edit box.

One last tabular note for financial page-makers: version 4.0 now properly aligns columns of decimal-tabbed figures even when some figures are in parentheses and there are no decimal points. Footnotes must be next.

Define Colors Fast

Bypass the Define Colors dialog box by ⌘-clicking on Registration in the Color palette. You get the New Color dialog box. If you've got an object selected when you ⌘-click on Registration, the New Color dialog box fills in with the color attributes of the selected object. Define a new color, press Return, and the color name appears in the Color palette.

Because PageMaker doesn't apply the new color to the selected object until you click on the color name in the Color palette, you can use this technique repetitively to create a series of tints of some base color or to create a series of entirely new colors.

Replace One Color with Another

Have you ever defined more colors than you want? Here's the fast way to replace one color with another (to end up with fewer spot-color overlays, for example).

Choose Define Colors from the Options menu and double-click on the name of the color you want to change. Make its name the same as the color you plan to replace it with, and click OK.

When PageMaker displays the prompt "Replace all of <firstcolor> with <secondcolor>?" click on Yes to replace the color. At this point, a peculiar thing (which may or may not be a bug) happens—the OK button goes gray and you can't leave the dialog box and keep your changes. Just select any color, and you can then click OK or press Return. Every item that was the first color becomes the second color. (You can use a similar technique for replacing styles.)

Fun with Type Options

There's a new dialog box in PageMaker 4.0 that lets you set superscript and subscript sizes and positions, and the size of small caps. At first glance, it may not seem to offer much. However, if you dig a little deeper, you discover that it lets you create some nifty type effects. Here, for instance, is yet another way to create drop caps in PageMaker (see "Dropping Out"). You need to specify fixed leading—not autoleading—for this to work.

Select the first character in the

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(Jan. 1990 MacUser Magazine)

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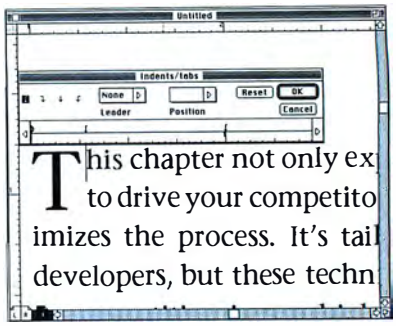
paragraph, and call up the Type Specifications dialog box (⌘-T). Choose the size you want for the drop cap (don't change the leading) and choose Subscript from the Position pop-up menu. Then click on Options and type **100** for Super/subscript size and 50 for Subscript position in the Type Option dialog box. You have to adjust the position for the typeface and size you're using, but 50 is a good place to start. Higher numbers move the letter down. Hit Return twice to close the two dialog boxes.

Next, place the insertion point immediately to the right of the dropped capital and press Tab. Bring up the Indents/tabs dialog box (⌘-I) and align the first tab with the point at which you want the body copy to start. Go to the end of the line and press Return; put a tab at the beginning of the second line. Continue for as many lines as necessary.

If you're working with justified type, you'll need to use the new-line character at the end of each line so they stay fully justified or use normal Returns and justify the lines using the new Force justify alignment option. For another example of fancy effects from Type options, see "Type within Type."



Dropping Out

You can create drop caps by treating the cap as an oversize subscript, and adjusting the subscript position. Then you set tabs (in this example, before *his* and *to*) for the position of the body text.

Searching and Replacing

PageMaker 4.0's Story Editor has great search-and-replace features, including the ability to replace text attributes. You can search for every instance of character formatting and replace it with different formatting. This is especially handy if, for example, all the product names in your company brochure should be in 9-point Stone Sans Bold Italic. You can use some attribute that's easy to apply from the keyboard (like outline or underline), then replace that formatting with 9-point Stone Sans Bold Italic.

Open the story you want to change with the Story Editor, then choose Change from the Edit menu. Do not enter any text in the Find What and Change To text-edit boxes. Click on the Attributes button, and enter the current formatting attributes of the text, then enter the new formatting attributes.

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Copacabaña

Type within Type

Here's another interesting type effect using the Type Options controls, with the addition of kerning (lots of kerning). You've probably seen this type effect often—particularly in corporate logos and advertising.

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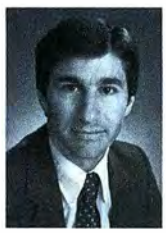

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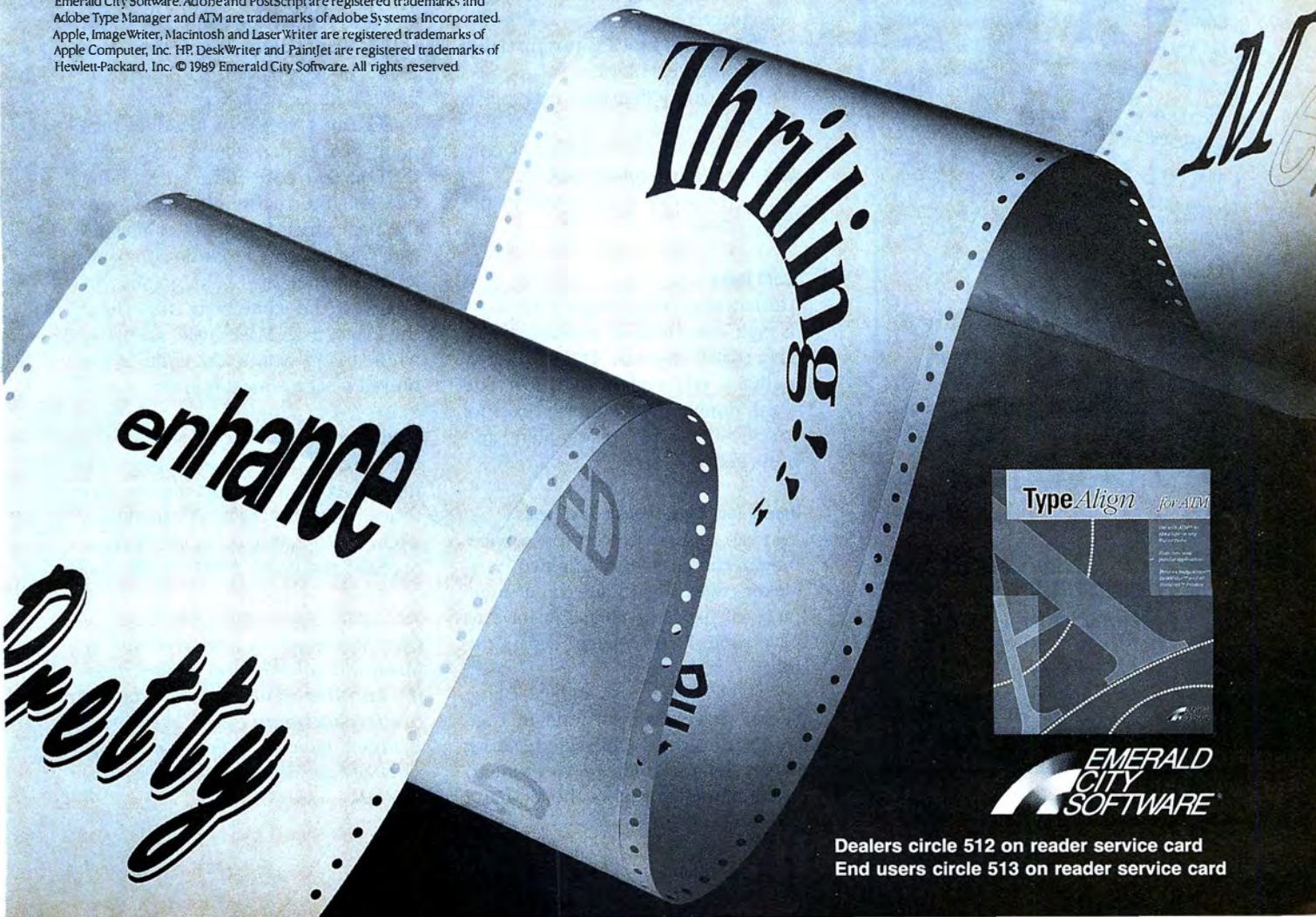

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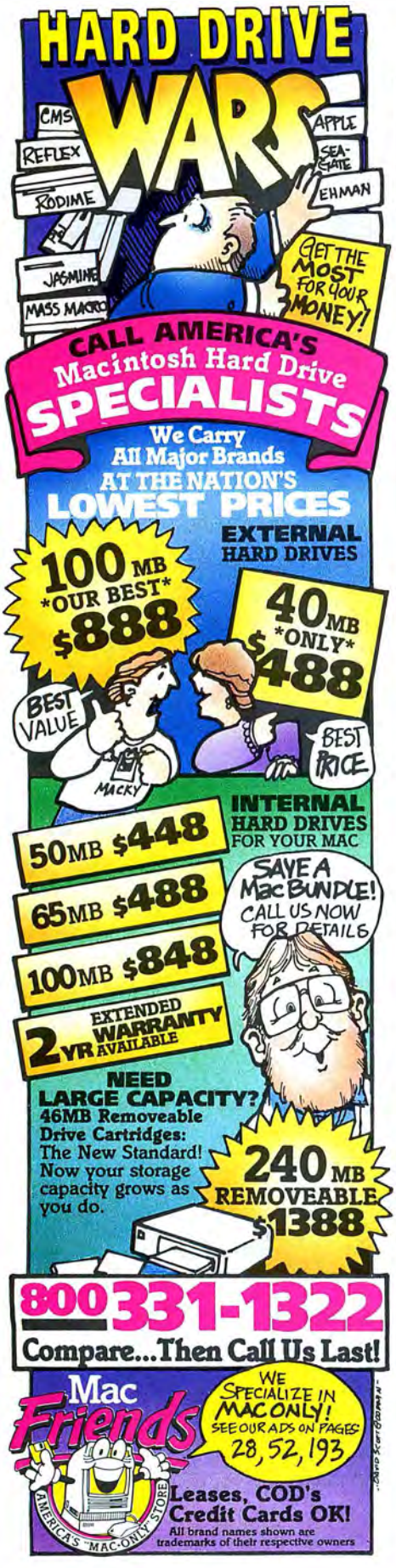

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Press Return to go back to the Change dialog box, then click on the Change all button. All text that was formatted with the first set of attributes will be reformatted with the second set of attributes. Depending on the formatting you specify, you may not be able to see your changes until you return to the layout view.

The Change Attributes dialog box still has some limitations: you can't search for (or change) based on attributes for leading, color, case, position, tracking, or Set width (type condensation or expansion). Still, it's a big improvement over the previous versions.

Rotated Text Blocks

PageMaker 4.0 lets you rotate anything you want as long as it's text, as long as it isn't threaded to other text, and as long as you're satisfied with 90-degree increments. If you've been trying to rotate a text block and the Text Rotation selection on the Element menu remains grayed out, you need to make sure that

- all the text in the story has been placed,
- the text block is not threaded to any other text block,
- no more than one text block is selected,
- the text block does not contain any inline graphics, and
- the story is not open in the Story Editor.

Quick Index

The indexing in PageMaker 4.0 is about as well conceived as anything we've seen (or envisioned). There's a lot to it, but if you want to add just one word, double-click with the text tool to select the word, press ⌘-Shift-; and press Return.

Double Your Pages, Double Your Funds

You can save 50 percent on service-bureau charges by printing two PageMaker pages side-by-side on a single piece of paper or film. You have to have room for two pages across the roll.

The trick is to use Manual Tiling. Set the page size you want in Page Setup. Choose double-sided, facing pages. Set the ruler's zero point to the upper-left corner of the left-hand page. This sets the upper-left corner of your tile.

In Print Options, select Letter, Wide (if you need a different size, you'll need to edit the APD file for your imagesetter). In the Print dialog box, select the left-hand page to print (page 2, or 4, or whatever) and press Return. The right-hand page just comes tagging along with it, within the size limits of the imagesetter.

You have to choose each left-hand page to print individually, and service bureaus won't want to babysit your job that much, so you might want to save each spread in PostScript format (Choose Options in the Print dialog box) then send all the PostScript files to the service bureau. PageMaker will not print automatic crop marks for the right-hand pages using this method, so you will probably want to place your own crop marks on the master pages.

Printing Outside the Page Area

You can print whatever you want outside the page area (within the limits of the actual physical paper size). If you want registration marks someplace other than where PageMaker puts them, or if you want to print a job name, date, or time, here's how.

Create a white box in a draw program, put the registration mark inside the box, then copy and paste both the box and the registration mark onto the page (with FreeHand or Illustrator, you'll have to Option-copy). As long as some part of the graphic (in this case, the white box) is touching the page, PageMaker will print the whole thing—within the limits of the output device's imaging area.

Sharing the Wealth

If you've found a tip or shortcut not mentioned here, spread the word to other *Macworld* readers by sending it to *Quick Tips, Macworld,* 501 Second St., San Francisco, CA 94107. M

Olav Martin Kvern and Steve Roth (a Macworld *contributing editor) spent the last nine months writing the definitive Macintosh PageMaker book. Between them, they've produced a stack of PageMaker pages several stories tall.*

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UPDATES

Here's our list of the current shipping versions of Mac software. Because these days, keeping track of the latest CPU is tough enough.

Canvas version 2.1 has enhanced bezier curves, editable dashed lines, a 100,000-word spelling checker, and an improved alignment manager. The new version imports MacDraw II native format files, exports EPS files, and features a four-color process-separation utility. Deneba Software, 7855 N.W. 12th St., #202, Miami, FL 33126; 305/594-6965. Contact dealer for upgrade policy; $299.95 new.

Freedom of Press version 2.2 is able to accept Adobe Systems' encrypted Type 1 fonts. CAI, 900 Technology Park Dr., Bldg. 8, Billerica, MA 01821; 508/667-8585. Upgrade $45 for registered owners; $495 new.

MacTerminal version 2.31 extends MacTerminal's capabilities to include support for the Mac IIci and Mac Portable. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014; 408/996-1010. Upgrade free for registered owners; $125 new.

Virex version 2.3 now enables users to set a password so that only authorized personnel can change settings. This version also combats WDEF virus. HJC Software, P.O. Box 51816, Durham, NC 27717; 919/490-1277. Contact dealer for upgrade policy; $99.95 new.

PRODUCT COMPARISON

Product	V.	Req.	Rev.	Price
1st Aid Kit ★	2.8	512KE/3.0		*
4th Dimension	2.0	1MB/6.02	3/90	*
Aatrix CheckWriter II ★	2.01	512K/4.1		$10
Aatrix TimeCard	2.0	512K/4.2		Free
Accountant Inc.	2.1	1MB/6.02		$9.50
AccuText ★	1.1	4MB/6.02		*
AdWriter	2.0	1MB/6.0		Free
Alchemy	1.1	1MB/6.0	1/89	$25
Aldus FreeHend	2.0	1MB/6.03	6/89	*
Aldus PageMaker	2.02	1MB/4.1		*
Aldus Persuasion	2.0	1MB/6.0	6/89	*
AmPack Plus ★	4.2.2	512K/3.2	1/90	$29.95
Analog Connection WorkBench	3.0	1MB/5.0		$50
Anatool ★	3.1	512K/3.0	7/89	$35
AntiToxin	1.2	512KE/4.2	2/90	Free
APL.68000	7.0	512K/3.2		*
AppleShare File Server	2.0	512K/3.2		*
Archie	2.0	1MB/6.0		$75
ArchiText	2.0	1MB/6.02	7/89	Free
Arstotle's Politics	2.0	2MB/6.03		Free
The Art Importer	2.0	1MB/6.0	8/89	$20
ArtRoom	3.0	512K/3.2		$199
AutoCalc	2.0	1MB/6.0		$95
Aztec C	3.6	512KE/4.2		*
Back to Basics: Professional	2.0	512K/3.2		$75
Ball & Stick ★	2.2	1MB/6.0		Free
Bill-It	2.0	1MB/6.03		$29
Bridge	6.0	512K/3.2		$17
Business FileVision ★	1.5	1MB/6.02		*
Business Sense ★	1.2	1MB/6.0		*
Business Session ★	3.2	512K/3.2		Free
CA-Cricket Presents	2.0	1MB/6.0		Free
Calculator Construction Set ★	2.06	512K/3.2	4/90	$25
Canvas	2.1	1MB/6.0	4/89	*
Capture	2.0	1MB/6.0	2/90	$15
ChromaScan	1.1	4MB/6.02		Free
Colorset ★	1.2	1MB/6.0		Free
Comment	2.02	1MB/6.0	2/89	*
Commtact	2.0	1MB/6.0		Free
CompileIt	1.2	1MB/6.02		Free
CompuServe Navigator ★	2.1	512K/3.2		*
Control	1.5	1MB/4.1		Free
Cue	3.0	1MB/6.03		*
DataDesk	3.0	512K/4.02		$125
DataMerge	2.0	512K/3.2		Free
Deluxe Music ConstructionSet	2.5	512K/6.02	9/89	*
D.E.S.	4.0	1MB/6.0		*
Design Dimensions ★	2.15	5MB/6.03		Free
DeskPaint ★	2.1C	512ME/4.2		Free
DiagramMaker★	1.1	1MB/6.02		*
Digital Darkroom	1.1	1MB/6.02		Free
DiskFit, Network DiskFit ★	1.5	512K/4.1		*
DiskTop	4.0	1MB/6.0		*
Display	1.1	1MB/6.03		*
AdBuilder				
Dollars and Sense	4.1	512KE/3.2		*
DragonWave	1.1	1MB/6.03		*
Empower ★	2.05	1MB/5.0	6/89	Free
EndLink	1.1	512K/3.2		Free
EndNote	1.2	512KE/3.2	6/89	Free
Extender GrafPak	3.0	1MB/6.02		$30
Falcon	2.1	1MB/3.2		Free
Fastback II	2.1	512KE/4.1	12/89	$25
Fast Forms ★	1.2	512K/3.2		$25
Ferrari Grand Prix ★	1.6	512K/3.2		$10
FileMaker II ★	1.1	1MB/4.2		*
Finale ★	1.2	1MB/6.02		Free
Financial Analysis	3.0	512K/3.0		*
Findswell	2.0	512KE/3.2	3/90	*
Fontographer	3.0	1MB/6.0		*
FontShare	2.0	1MB/6.0		Free
FoxBase+/Mac ★	2.10	1MB/6.0		$75
Freedom of Press ★	2.2	1MB/6.0		Free
FreeFlow	3.0	1MB/6.03		Free
Full Impact ★	1.1	1MB/6.0		Free
FullWrite Professional ★	1.1	2MB/6.02		Free
Gofer ★	2.01	1MB/4.1		$25
Grafpoint	2.0	2MB/6.0		*
Help DA	3.0	1MB/6.0		Free
HFS Backup	3.0	512K/3.2	8/89	$35
Hybase ★	1.1	1MB/6.0		Free
HydroMac	2.0	1MB/6.0		*
HyperAnimator ★	1.5	1MB/6.03	6/89	$29.95
HyperCard ★	1.2.2	1MB/6.03		$10
HyperDA ★	1.2	512K/3.2		$10
HyperEngine Developer's Tool ★	1.1	1MB/6.03		Free
HyperLibrary	2.0	1MB/5.0		*

(continues)

Bold = *first time the product is being listed.*

★ = *minor update.*

Req. = *min. RAM and system software required.*

Rev. = *last time(in past year) reviewed this or an earlier version.*

Price = *cost for update to registered owners.*

* = *contact your dealer for update policy.*

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PRODUCT COMPARISON

Product	V.	Req.	Rev.	Price
HyperPort Chess	2.0	1MB/6.0		$10
HyperWindows ★	1.1	1MB/6.02		Free
Icon-It ★	1.2	1MB/6.0		*
Iconia ★	7.0	1MB/6.0		*
Igor ★	1.1	1MB/6.0		Free
ImageStudio	2.0	1MB/6.0		Free
ImageWriter LQ Print Driver ★	2.0	512K/3.2		Free
In-CAD	2.0	2MB/6.0		*
InfoLogic Envelope ★	6.0	512KE/4.0		$5
Insight Expert Accounts Payable	2.2	1MB/6.0		*
Insight Expert Accounts Receivable	2.2	1MB/6.02		*
Inspiration	2.0	1MB/4.2		Free
Instant-Expert Plus	3.0	1MB/5.0		Free
JetLink Express ★	1.01	1MB/6.0		Free
KidsTime ★	1.2	512K/3.2		$15
KiwiEnvelopes	3.0	512KE/4.1		$10
Language Systems FortranCompiler ★	1.2	1MB/6.03		*
LapLink Mac	2.0	512K/2.0		Free
LaserPaint Color II ★	1.02	1MB/6.03		Free
LetrTuck+	2.0	512K/3.2		$20
Lookup	2.0	1MB/6.0		*
Mac86	2.0	1MB/6.02		$10
Mac286	2.0	1MB/6.02		$10
Mac3270	2.0	1MB/6.03		*
MacArchitrion	4.0	2MB/6.03		Free
MacAtlas Paint	2.0	512K/3.2		$35
MacClint★	1.1	1MB/5.0		Free
MacConcept	3.0	1MB/6.03		*
MacDesigner	2.0	1MB/3.2		$297
MacDrawII	1.1	1MB/6.0		*
MacEnvelope	4.1	512K/3.2		*
MacFalcon	2.1	1MB/6.03		*
MacFlow	3.0	1MB/6.03		$30
MacFortran	2.4	512K/4.2		*
MacFortran/020	2.4	512K/4.2		*
MacFortran forMPW	1.1	2MB/6.02		Free
MacHerbal	2.0	512K/3.2		$49
MacHotel	3.3	1MB/6.03		Free
MacLine	3.0	512K/3.0		$25
MacLinkPlus/ Wang VS	4.0	512KE/3.2		$45
MacMainFrame 3270/CUT	2.1	2.5MB/6.02		$100
MacPhonebook	2.0	512KE/3.2	1/90	*
MacPrint	1.1	1MB/6.02		Free
MacProject II	2.0	1MB/6.0	8/89	*
MacProof ★	3.2.1	1MB/6.02	2/90	$30
MacRecorder	2.0	512K/3.2	12/89	*
MacSchedule	2.0	1MB/6.0		$30
MacSmarts	3.0	1MB/6.0		*
MacTell	3.5	512K/3.0		*
MacTerminal ★	2.31	512K/3.2		Free
MacVision	3.0	1MB/6.0	7/89	$79.95
MacWrite II	1.1	1MB/6.0		Free
Managing Your Money	2.0	512K/6.03		$49.95
MapGrafix	2.0	4MB/6.03		Free
MarketMaster	II+	1MB/6.03		$25
Master Tracks Pro	4.0	1MB/4.1		$45
MathType	2.0	512K/6.02	11/89	*
Matlab	1.2	1MB/3.0		*
MaxPage ★	1.2	512K/3.2		Free
McMax	2.0	1MB/5.0	8/89	*
Memorybank Manager	3.0	1MB/6.0		Free
MGMStation ★	2.5	512KE/3.0	4/89	*
Microsoft File	4.0	512K/3.2	4/89	*
Microsoft Mail	2.0	1MB/6.02	1/90	*
Microsoft Word	4.0	512KE/3.2	10/89	*
Microsoft Works	1.2	512K/6.0	4/89	*
MindWrite ★	2.1	512KE/4.2		*
MiniCad +	2.0	1MB/6.0	11/89	*
MiniDraw	4.0	512KE/4.2		$17
MockPackage Plus Utilities	4.4	512KE/3.2		$15
Modern Artist	2.0	2MB/6.02		$150
Monte Carlo	2.0	1MB/6.03		$60
Morell ★	2.01	1MB/4.1	6/89	Free
MSFL: Pro League Football	2.0	1MB/6.0		*
MultiLedger ★	1.1	512K/3.2		Free
Multi-User Appointment Diaries	3.01	512K/3.2		*
Music Publisher	2.0.3	1MB/6.0		Free
MyTimeManager	2.0	1MB/6.0		*
Navigate	2.0	1MB/6.0		Free
Nemesis Go Master	4.0	512K/4.1	6/89	*
The NightWatch ★	1.03	512KE/3.2		*
Nisus	2.0	1MB/6.02	9/89	Free
NuPaint ★	1.04	512K/3.2	5/89	Free
Nutrition Stack	2.0	1MB/6.02		$20
OmniPage	2.0	4MB/6.02	2/90	$150
Omnis 3 Plus/ Express	2.0	512KE/3.2		*
On Schedule	2.0	1MB/3.0		*

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PRODUCT COMPARISON

Product	V.	Req.	Rev.	Price
P51 Mustang FlightSimulator	2.04	512K/3.2	4/89	$10
PacerLink	5.0	512K/5.0		*
Panorama	1.1	1MB/4.2	5/89	Free
PEGASYS II	3.2	1MB/6.03		Free
Performer Sequencer ★	3.2	1MB/6.0		Free
Personal Golf Stats	2.0	512K/3.2	2/90	Free
Personal Reference Catalog	2.0	1MB/6.0		$10
PICT Detective	2.0	512KE/6.0		$20
PixelPaint ★	1.2	2MB/4.1		Free
Plains & Simple ★	1.06	1MB/3.2		*
PowerDraw	3.0	1MB/6.0		*
PowerStation ★	2.5.2	512K/4.1		Free
PowerTools	3.0	4MB/6.0		*
Practica Musica	2.1	512K/3.2		$10
Printer InterfaceIII	2.0	512K/6.02		$22.50
Pro-Cite ★	1.3	512K/4.1		*
Professional Composer	2.3	1MB/6.03		Free
Professional Image II	2.0	1MB/6.0		$22
PropsForms	2.0	1MB/6.03		Free
Prototyper ★	2.01	1MB/4.1	9/89	$79
Publish or Perish	3.0	512KE/3.2		$10
Pyro ★	3.31	512K/4.1		$10
QuarkXPress	2.1	1MB/6.02	1/89	*
Quicken ★	1.5	512K/3.2	1/90	*
QuickLetter ★	1.01	512KE/3.2	10/89	Free
QuickMail	2.0	512KE/3.2		*
QuickShare	2.0	512KE/3.2		$75
QuickShot ★	2.1	1MB/4.2		$5
Read-ItOCR	2.1	1MB/6.03	12/89	*
Reports ★	1.2	1MB/6.0		Free
Retail Engine	3.0	1MB/6.0		*
Sales Associate	1.10	1MB/6.03		Free
SAM	1.1	512KE/3.2	12/89	*
ScheduleMaker	3.0	1MB/6.0		$25
ScreenSnap ★	2.2	1MB/4.2		*
ScriptEdit	1.1	1MB/6.04		*
Sentinel	2.0	512K/4.1		$20
Shanghai	2.0	1MB/6.02	2/90	$13
SimpleSpan	2.5	512K/3.2		*
Smart Alarms	2.9.1	512K/3.2		$12
SmartForm Assistant ★	1.1	1MB/6.0	7/89	Free
SmartForm Designer	1.1	1MB/6.0	7/89	Free
SmartScrap & The Clipper	2.0	1MB/6.03	8/89	$20
Snap ★	3.1	1MB/3.0	9/89	*
SoftPC Mac ★	1.3	2MB/6.0		*
Sound Designer Universal ★	1.5	512K/6.03		$45
Spellswell ★	2.3	512K/3.2		*
Springboard Publisher	2.0	1MB/6.0		*
Stepping Out II	2.0	1MB/4.1	4/89	Free
StickyBusiness	1.06	512KE/6.03		Free
Still Light	3.0	1MB/6.0		Free
StrataVision3d ★	1.02	2MB/6.03		Free
Suitcase II	3.0	512KE/4.1	10/89	$25
Super 3d	2.0	512KE/6.02	10/89	$200
SuperGlue II with GlueNotes	2.1	1MB/6.0	1/90	*
SuperLaserSpool	2.0	512K/4.1		$20
SuperPaint	2.0	1MB/6.02	8/89	$50
SuperSpool	5.0	512K/4.1		$20
Synchronicity	2.0	512KE/3.2	12/89	$5.00
Systat ★	3.2	1MB/6.0		$75
Teacher's Rollbook ★	2.2	512K/3.2		$17.95
Ternary Plot	3.0	512K/3.2		*
TextPert ★	3.01	1MB/6.0		Free
Think C	4.0	1MB/5.0	2/90	*
Timbuktu	3.0	1MB/4.1		Free
TimeMinder	2.0	1MB/4.2	9/89	$50
Timeslips III	1.2	512KE/4.2	2/90	$50
TML Pascal II	3.0	1MB/5.0	6/89	$79.95
TMON ★	2.8.1	512K/4.0		*
TOPS/Mac	2.1	512K/3.2		*
Trapeze ★	2.1	1MB/6.0		$35
TrueBASIC ★	2.02	1MB/6.0		Free
TrueForm ★	1.1	1MB/6.2	4/90	Free
Turbosynth	2.0	1MB/6.03		$35
UNITize ★	1.3	512KE/3.2	10/89	$20
VersaCAD/ Macintosh Edition ★	2.11	1MB/6.0		Free
Virex ★	2.2	1MB/4.2	1/90	*
Virtual	2.0	1MB/3.2	10/89	Free
VMacS	2.0	1MB/6.0		$25
Wall Street Investor	3.0	1MB/5.0		$150
Wingz ★	1.1	1MB/6.0	6/89	Free
Word Finder	2.0	512K/3.2		*
WordPerfect for theMacintosh ★	1.0.3	1MB/4.2		Free
WorksPlus Spell	2.0	1MB/6.03	1/90	*
WriteNow	2.0	512K/3.2	5/89	*

To have products listed in this section, send upgraded software, an outline of changes since the previous release (indicate if it's a maintenance upgrade), upgrade price, minimum RAM and system software, suggested retail price, company name, mailing address, and phone number to *Updates, Macworld,* 501 Second St., San Francisco, CA 94107.

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701 **3DWorks/RenderWorks** MacroMind, Inc.; 415/442-0200.

A

702 **America Online** Quantum Computer Services, Inc.; 703/448-8700, 800/227-6364.

703 **The Animation Stand** Linker Systems, Inc; 714/552-1904.

704 **ArchiText** BrainPower, Inc.; 818/707-1712, 800/345-0519.

705 **Audiomedia** Digidesign, Inc.; 415/327-8811, 800/333-2137.

706 **Authorware Professional** Authorware, Inc.; 612/921-8555.

707 **AVID/1 Media Composer** Avid Technology, Inc.; 617/221-6789.

B

708 **The Big Picture** E-Machines, Inc.; 503/646-6699, 800/344-7274.

709 **BigTime TV** Hyperpress Publishing Corp.; 415/345-4620.

C

710 **Calculator Construction Set** Dubl-Click Software, Inc.; 818/700-9525.

711 **ClearVue/II Display System, ClearVue/SE Display System** RasterOps Corp.; 408/562-4200, 800/468-7600.

Reader Service

713 **ColorBoard 224, ColorBoard 232, ColorBoard 264** RasterOps Corp.; 408/562-4200, 800/468-7600.

716 **Color Capture** Data Translation, Inc.; 508/481-3700.

717 **ColorSnap-32** Computer Friends, Inc.; 503/626-2291, 800/547-3303.

719 **ColorSpace II, ColorSpace FX** Mass Microsystems, Inc.; 408/522-1200, 800/522-7979.

720 **Complete Undelete** 1stAid Software, Inc.; 617/783-7118, 800/843-3497.

721 **Computer Eyes, Computer Eyes Pro Color Digitizer** Digital Vision, Inc.; 617/329-5400.

722 **Course Builder** Telerobotics International, Inc.; 615/690-5600.

723 **Crystal View SE Display System, Crystal View II Display System, Crystal View SE-30 Display System** Taxan USA Corp.; 408/946-3400, 800/829-2641.

D

* **D5-SCX Video Scan Converter** Dimension 5, Inc.; 503/293-7775.

724 **DataFrameXP100** SuperMac Technology; 408/245-2202.

725 **DeskPaint and DeskDraw** Zedcor, Inc.; 602/881-8101, 800/482-4567.

726 **Digital Darkroom** Silicon Beach Software, Inc.; 619/695-6956.

727 **DirectDrive 130** Jasmine Technologies, Inc.; 415/282-1111.

728 **Double Helix** Odesta Corp.; 312/498-5615, 800/323-5423.

729 **DQ-Animax** Diaquest, Inc.; 415/527-7700.

E

730 **Electric Image Animation System** Electric Image; 312/498-5615, 800/323-5423.

731 **Enhance** MicroFrontier, Inc.; 515/270-8109, 800/388-8109.

F

732 **FrameGrabber 324NC** RasterOps Corp.; 408/562-4200, 800/468-7600.

* **Fujitsu RX7100PS** Fujitsu America, Inc.; 408/432-1300.

FONTS

733 18+ Fonts; 708/980-0887.

734 Adobe Systems, Inc.; 415/961-4400, 800/833-6687.

735 Agfa Compugraphic; 508/658-5600, 800/822-5524.

736 Allotype Typographics; 313/663-1989.

737 Alphabets, Inc.; 312/328-2733.

738 Altsys Corp.; 214/424-4888.

739 Bitstream Inc.; 617/497-6222.

740 Casady & Greene, Inc.; 408/624-8716, 800/359-4920.

741 Casey's Page Mill; 303/220-1463, 800/544-5620.

742 Davka Corp.; 312/944-4070, 800/621-8227.

743 Devonian International Software Co.; 714/621-0973.

744 Dubl-Click Software, Inc.; 818/700-9525.

745 Eastern Language Systems; 801/377-4558.

* Ecological Linguistics; 202/546-5862.

746 EmDash; 312/441-6699.

747 Emigre Fonts; 415/845-9021.

748 The Font Company; 602/996-6606, 800/442-3668.

749 Font World; 716/235-6861.

750 Giampa Textware Corp.; 604/253-0815, 800/663-8760.

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751 Ingrimayne Software; 219/866-6241.

752 Judith Sutcliffe: The Electric Typographer; 805/966-7563.

753 Kingsley/ATF Type Corp.; 602/325-5884, 800/289-8973.

754 Letraset Graphic Design Software; 201/845-6100, 800/343-8973.

755 LetterPerfect; 201/845-6100, 800/343-8973.

756 Linguist's Software, Inc.; 206/775-1130.

757 LinotypeCompany; 516/434-2000, 800/633-1900.

758 MacTography; 301/424-3942.

759 Monotype Typography, Inc; 312/855-1440, 800/666-6893.

* NeoScribe International, Inc.; 315/853-4427.

* Page Studio Graphics; 602/839-2763.

760 Springboard Software; 612/944-3915, 800/445-4780.

761 Studio 231; 516/785-4422.

762 Tactic Software; 305/378-4110, 800/344-4818.

763 T/Maker Co.; 415/962-0195.

764 Treacyfaces, Inc.; 215/896-0860.

765 Varityper; 201/887-8000.

766 Zipatone TypeXpress; 708/449-5500.

G

767 **Genlock Converter** Julian Systems, Inc.; 415/686-4400.

768 **Grayscale/Monochrome Display** SuperMac Technology; 408/245-2202.

769 **GS II, GS 30** Generation X Technologies, Inc.; 408/739-4570, 800/448-8231.

771 **Guide** OWL International,

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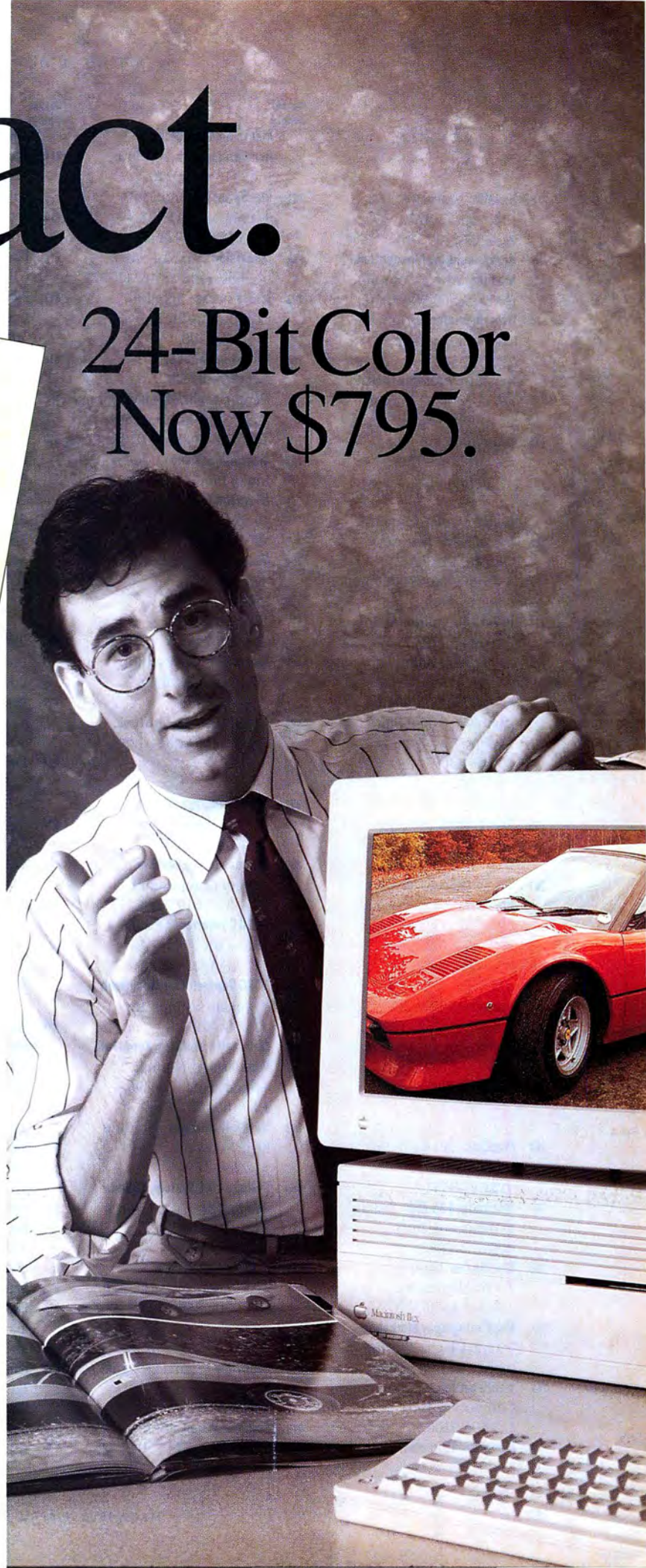

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772 **HandOff** Software Innovations, Inc.; 214/727-2329.

773 **High Resolution Monochrome Monitor** Apple Computer, Inc.; 408/996-1010.

774 **HyperAnimator** Bright Star Technology, Inc.; 206/451-3697.

• **HyperCard Videodisc Toolkit** APDA-Apple Computer, Inc.; 800/282-2732.

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776 **ImageStudio** Letraset Graphic Design Software; 201/845-6100, 800/343-8973.

777 **In/Out** CE Software, Inc.; 515/224-1995.

778 **Interactive Teacher** American Intelliware Corp.; 213/533-4040.

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780 **KaleidaGraph** Synergy Software, Inc.; 215/779-0522.

781 **The Kurta Studio for Aldus Products** Kurta Corp.; 602/276-5533, 800/445-8782.

L

782 **Leprechaun** Shodan; 415/849-9475.

783 **L-View** Sigma Designs; 415/770-0100, 800/933-9945.

M

784 **MacCalc** Bravo Technologies, Inc.; 415/841-8552.

785 **MacinStor 100-ZFP** Storage Dimensions, Inc.; 408/879-0300.

786 **MacMovies** Lapis Technologies, Inc.; 415/748-1600.

787 **MacPhotography Workshop** Joseph Ciaglia, Photographer; 215/985-1092.

788 **MacRecorder** Farallon Computing, Inc.; 415/596-9100.

789 **MacroMind Director, MacroMind Director Accelerator** MacroMind, Inc.; 415/442-0200.

791 **MacSprint II** Orchid Technology; 415/683-0373, 800/767-2443.

792 **MacVision** Koala Technologies; 408/287-6311.

793 **Media Tracks** Farallon Computing, Inc.; 415/596-9100.

794 **MegaScreen 2008, MegaScreen 3008, MegaScreen SE/3001 Rival** MegaGraphics, Inc.; 805/484-3799, 800/423-0183.

797 **Mentor/MacVideo** Edudisc, Inc.; 615/373-2506.

• **Microsoft File** Microsoft Corp.; 206/882-8080, 800/426-9400.

798 **MicroTV** Aapps Corp.; 408/735-8550.

799 **Midas I** Seehorn Technology, Inc.; 408/998-7961.

800 **Moonraker** Workstation Technologies, Inc.; 714/250-8983.

801 **MusicProse** Coda Music Software; 612/854-1288.

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802 **NEC Monograph System** Relax Technology; 415/471-6112, 800/848-1313.

803 **Neotech Image Grabber** Advent Computer Products, Inc.; 619/942-8456.

804 **NTSC Converter** Orange Micro, Inc.; 714/779-2772, 800/223-8029.

805 **NTSC Converter for Macintosh II** Julian Systems, Inc.; 415/686-4400.

806 **Nutmeg 19, Nutmeg/Xerox Full Page Display** Nutmeg Systems, Inc.; 203/966-3226, 800/777-8439.

808 **Nuts & HyperBolts** Sterling Swift Software; 512/280-2431.

809 **NuVista 1MB System, NuVista 2MB System** Truevision, Inc.; 317/841-0332, 800/858-8783.

811 **NuVista 4MB System** Truevision, Inc.; 317/841-0332, 800/858-8783.

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812 **PageView** Sigma Designs; 415/770-0100, 800/933-9945.

813 **PersonalVision** Orange Micro, Inc.; 714/779-2772, 800/223-8029.

814 **Personal Writer PWI0 SL** Personal Writer, Inc.; 213/556-1001, 800/322-4744.

815 **PhotoPress** Blue Solutions, Inc.; 805/371-4521.

816 **PixelGrabber** Perceptics; 615/966-9200.

817 **Portrait Display** Apple Computer, Inc.; 408/996-1010.

818 **POS-IM** Ensign Systems, Inc.; 801-546-1616.

• **Prodigy** Prodigy Services Co.; 914/993-8727.

819 **ProViz Video Color Converter, ProViz Video Scanner bw, ProViz Video Scanner color** Pixelogic, Inc.; 617/938-7711.

822 **Publish It** Timeworks; 312/948-9200, 800/535-9497.

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823 **QMS-PS 820 turbo** QMS, Inc.; 205/633-4300, 800/631-2692.

824 **Quick Capture** Data Translation, Inc.; 508/481-3700.

825 **Quicken** Intuit, Inc.; 415/322-0573, 800/624-8742.

826 **Quicksilver Videodisc Editing System** Sundance Technology Group; 214/550-8338.

827 **QuickView Z21, QuickView Z21 IQ** E-Machines, Inc.; 503/646-6699, 800/344-7274.

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829 **Radius Accelerator 16** Radius, Inc.; 408/434-1010, 800/227-2795.

830 **Radius Accelerator 25** Radius, Inc.; 408/434-1010, 800/227-2795.

831 **Radius Full Page Display** Radius, Inc.; 408/434-1010, 800/227-2795.

832 **Radius Two Page Display System** Radius, Inc.; 408/434-1010, 800/227-2795.

833 **Radius Two Page Grayscale Display** Radius, Inc.; 408/434-1010, 800/227-2795.

834 **RamDisk+ 2.08** Roger Bates; 503/645-3930.

• **RamStart1.4** George A. Nelson; 54 Brattle St., Arlington, MA 02174.

835 **RasterOps SFX** RasterOps Corp.; 408/562-4200, 800/468-7600.

836 **RecordHolderPlus** Software Discoveries, Inc.; 203/872-1024, 800/437-5200.

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837 **ShadowGraph** Personal Computer Peripherals Corp.; 813/884-3092, 800/622-2888.

838 **SilverView Grayscale** Sigma Designs; 415/770-0100, 800/933-9945.

839 **SilverView Monochrome** Sigma Designs; 415/770-0100, 800/933-9945.

840 **Sound Designer** Digidesign, Inc.; 415/327-8811, 800/333-2137.

841 **Spinnaker Plus** Spinnaker Software Corp.; 617/494-1200, 800/826-0706.

842 **Stepping Out II** Berkeley Systems, Inc.; 415/540-5536.

843 **Storyboarder** American Intelliware, Inc.; 213/533-4040.

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845 **Studio/1** Electronic Arts; 415/571-7171, 800/245-4525.

846 **SuperCard** Silicon Beach Software, Inc.; 619/695-6956.

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847 **Traveller 40Mac** Aströ Systems, Inc.; 408/727-5599.

848 **TrueForm** Adobe Systems, Inc.; 415/961-4400, 800/833-6687.

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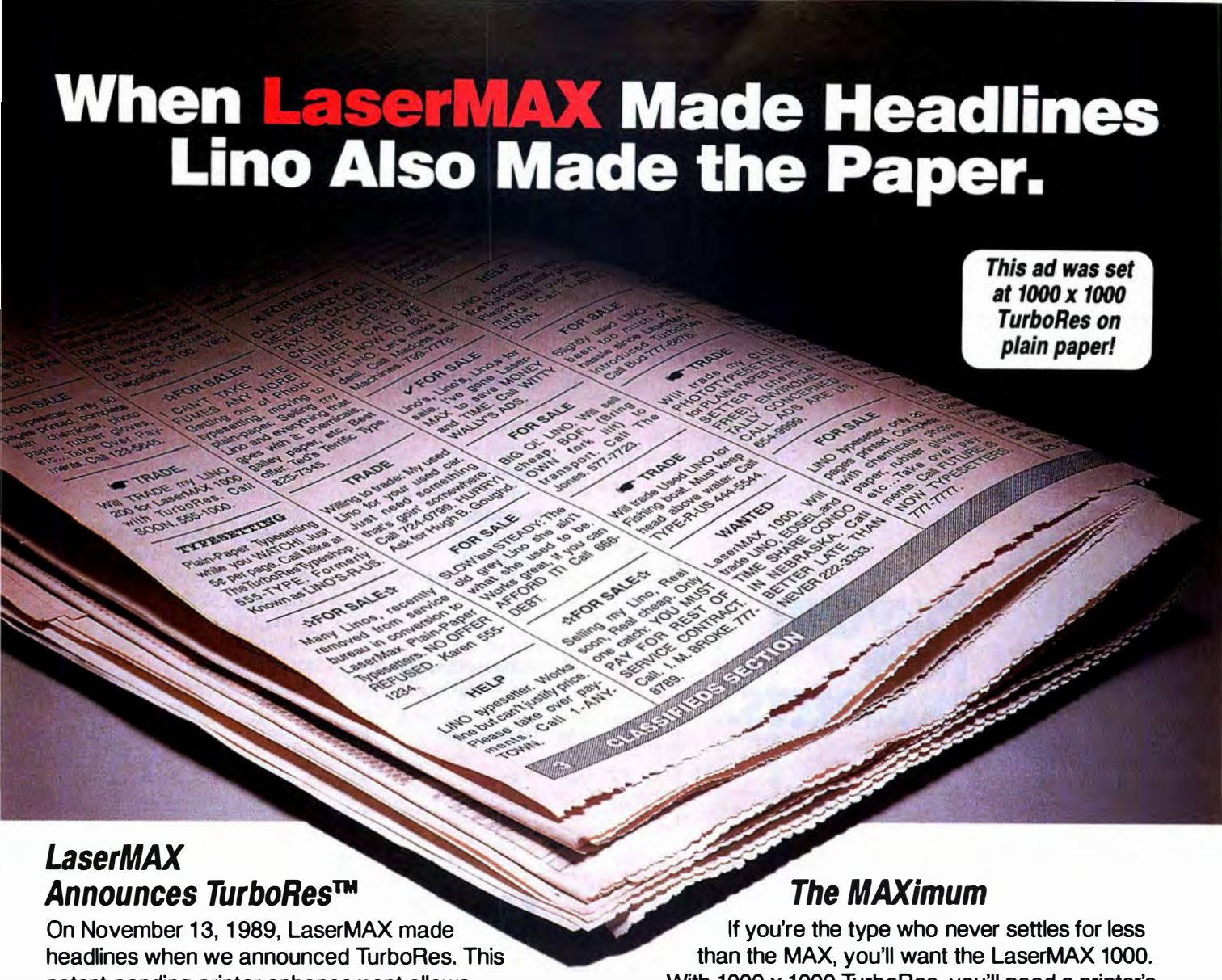

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854	**VideoWorks II, VideoWorks II HyperCard Driver**	Macro-Mind, Inc.; 415/442-0200.
856	**VIDI/O Box (NTSC Version)**	Truevision, Inc.; 317/841-0332, 800/858-8783.
857	**VIDI/O Box (PAL Version)**	Truevision, Inc.; 317/841-0332, 800/858-8783.
858	**Virtual 2.0**	Connectix Corp.; 415/324-0727.
859	**Voice Navigator**	Articulate Systems; 617/876-5236, 800/443-7077.
860	**Voice Navigator XA**	Articulate Systems; 617/876-5236, 800/443-7077.
861	**The Voyager CD AudioStack**	The Voyager Company; 213/451-1383.
862	**The Voyager Video Stack 2.1**	The Voyager Company; 213/451-1383.
863	**Wacom SD-420L**	Wacom, Inc.; 201/265-4226, 800/922-6635.
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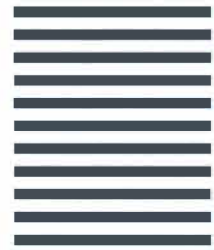

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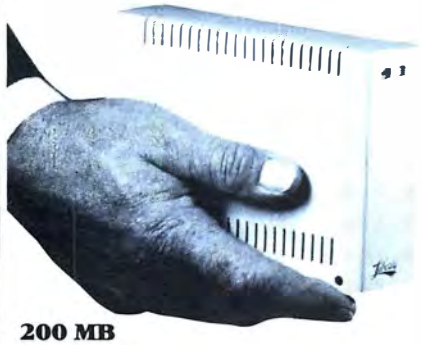

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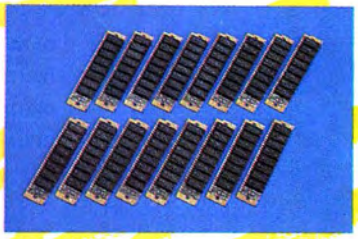

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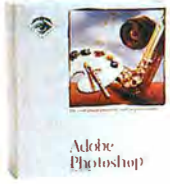

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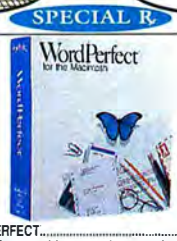

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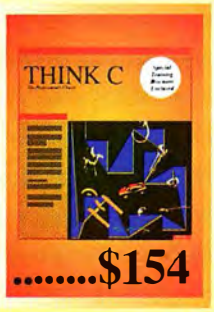

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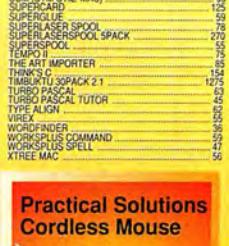

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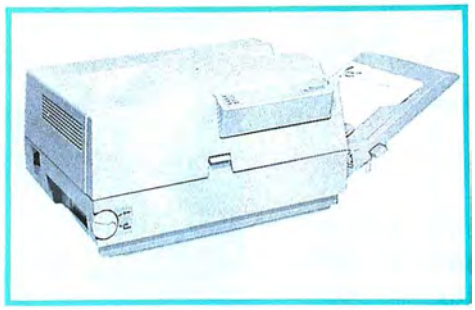

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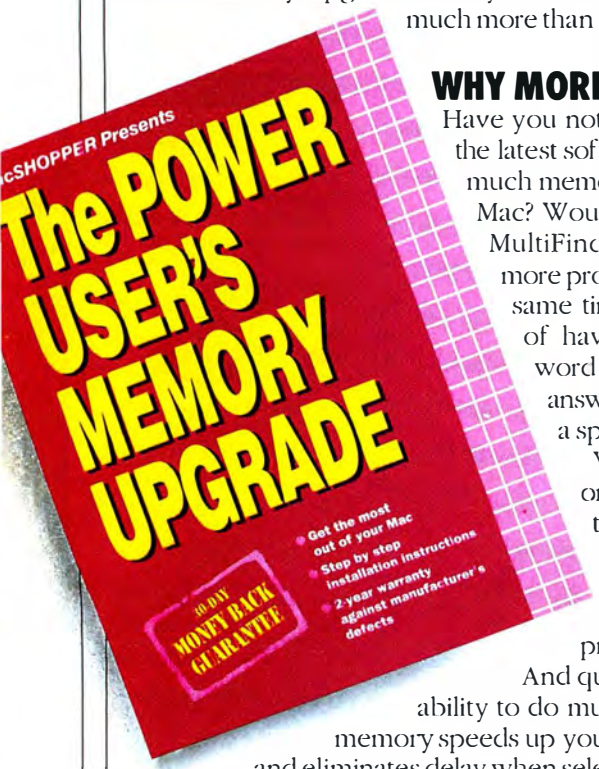

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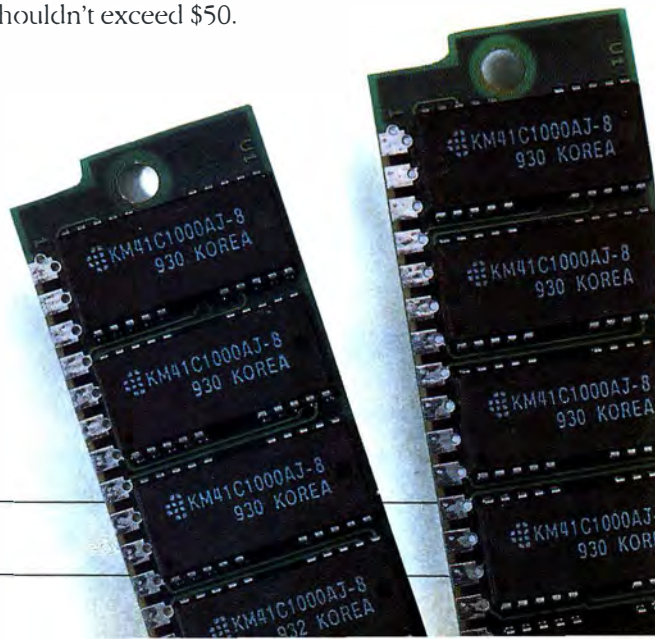
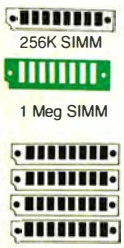


Circle 440 on reader service card

The Mac Plus and Mac SE have four available slots on the motherboard, which originally contain four 256K SIMMs modules — totalling 1 megabyte (1MB) of memory. To upgrade, you can replace each 256K module with a 1MB module, but you must do this in pairs.

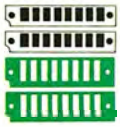
Replace two 256K modules and you will have a total of 2.5MB of memory. (That's the two new 1MB modules plus the original two 256K modules.) Replace all four modules and you'll have 4MB. (You should save the 256K modules for later use if you want to pass your Mac on to someone else.)



4-256K SIMMs
=1 MB of RAM
Standard Configuration

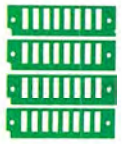
MACINTOSH PLUS/SE CONFIGURATIONS

2-256K, 2-1 Meg SIMMs
= 2.5 MB of RAM



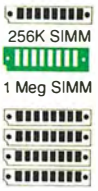
After 2 Meg Memory
Upgrade Kit has been
installed

4-1 Meg SIMMs
= 4 MB of RAM



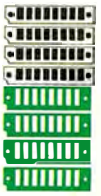
After 4 Meg Memory
Upgrade Kit has been
installed

MACINTOSH II CONFIGURATIONS



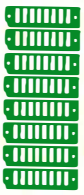
4-256K SIMMs
=1 MB of RAM
Standard Configuration

4-256K, 4-1 Meg SIMMs
= 5 MB of RAM



After 4 Meg Memory
Upgrade Kit has been
installed

8-1 Meg SIMMs
= 8 MB of RAM



After 8 Meg Memory
Upgrade Kit has been
installed

The Mac II, IIx, IIcx and SE/30 each come with a total of eight slots. The standard configuration has four 256K SIMMs modules, or a total of 1MB. Here, memory must be upgraded in multiples of four. This allows for expansion from 1MB to 4MB, 5MB or 8MB.

Remove the four 256K modules and replace with 1MB modules and you have 4MB. Leave the original modules and add four 1MB modules and you get 5MB. Removing the original modules and adding eight new 1 MB modules will bring you to 8MB of memory.

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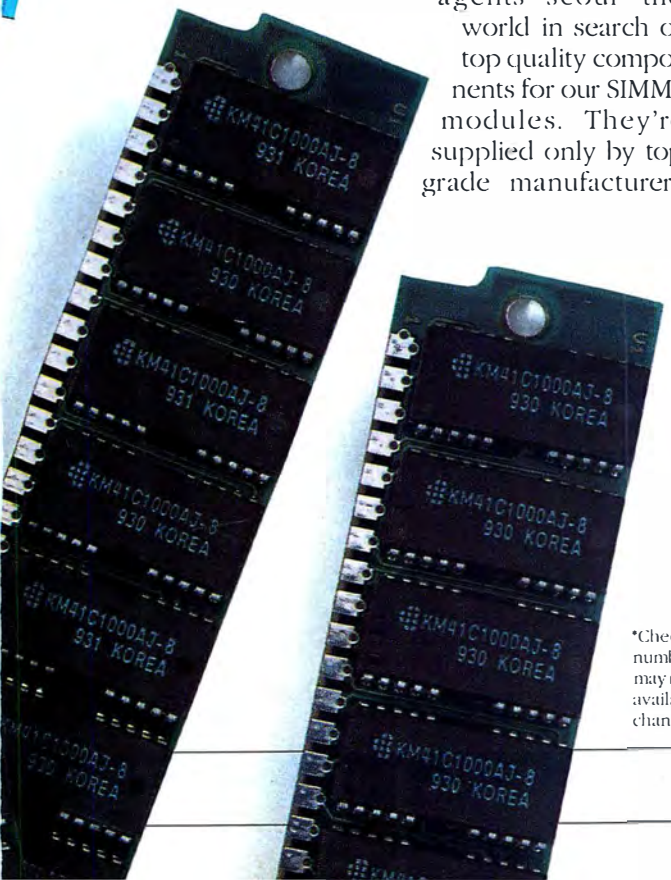
*Check the chart for the number of modules you may need. Price and item availability are subject to change without notice.



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Display ads are sold by column inches (2" minimum). Standard red is available as a second color. Text-only listings are available for a minimum of three issues at $450 per issue.

For more information on *The Macworld Catalog*, **call 800/888-8622.**

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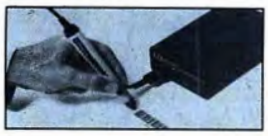

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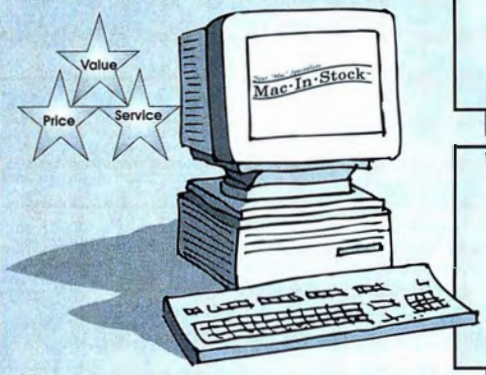

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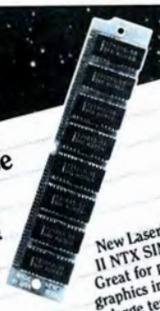

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January 1988

PSI
CDC
DMS

August 1988

PSI
Computer Care
SIMM City
Palo Alto RAM

June 1989

PSI
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800-622-1722 **408-559-8544**

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The Macworld Catalog
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CIRCLE 654 ON READER SERVICE CARD

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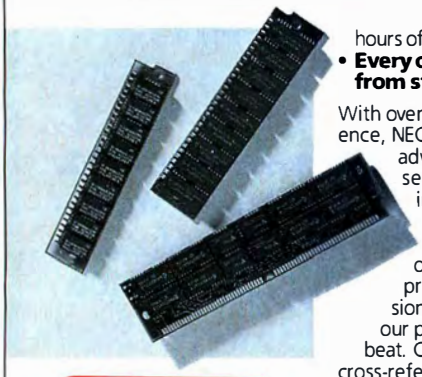
DEPEND ON OUR UNDERPRICES.



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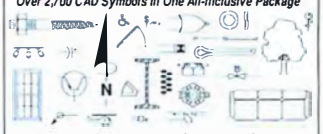

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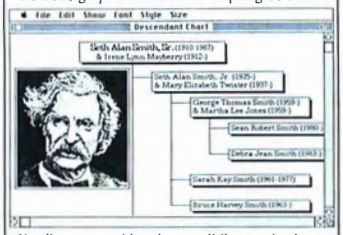

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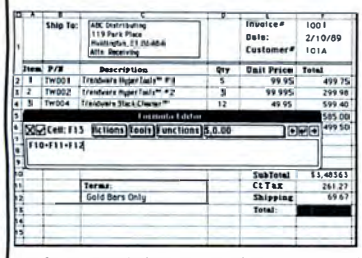

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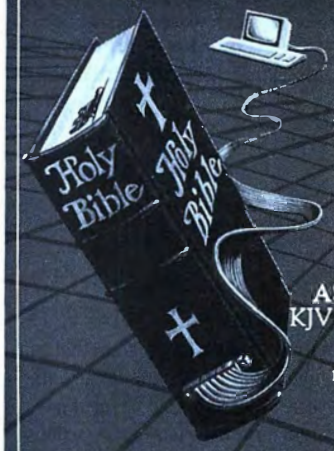

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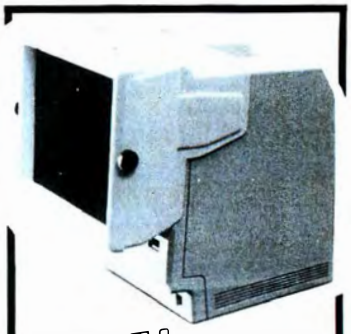

NUVU GIVES EYESIGHT TO THE MAC BLIND

ENLARGE YOUR MONITOR SCREEN OVER 70%!

High quality lens by 3M coupled with a Polaroid anti glare filter. In a sleek mounting hood designed specifically for Mac monitors.

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Choose from hundreds of thousands of users at residences, businesses, or schools, in any ZIP code range. 2¢ to 5¢ per name. Free selecting, sorting, delivery. Call for free custom counts.
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Cordura case has internal padded pockets for mouse, keyboard and drive. Available in six colors. Extended Keyboard version also available.
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Miscellaneous
Business Opportunities

In every growth industry there can be only one leader. One company with the best combination of product quality, management experience and proven success. In the promising world of toner recharging, only one company is at the top—LaserCharge.

And there is still room for you in our future. We've got the most advanced technology, training and marketing support in the industry. LaserCharge offers its licensees everything they need to get their business off to a strong start.

Find out more about the exciting growth opportunities in the toner recharging industry. Build a better bottom line by starting at the top. Call LaserCharge today.

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There's Still Room at the Top

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You Can Access More than 375,000 Macintosh Buyers

Put your product in front of the people who do more than just shop. Your ad in *The Macworld Catalog* links you instantly with more than 375,000 qualified buyers.

The Macworld Catalog is the direct response section for the Macintosh marketplace. It's action-oriented advertising that reaches the experienced users who know what they want, want it fast, and look for it here—each and every month.

The most readers. The least cost. Immediate access. Just call *The Macworld Catalog* at 800/888-8622 and place your ad—today!

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For your ad to appear on *The Macworld Catalog* screen, call 800/888-8622.

BEST-SELLERS

BUSINESS SOFTWARE

Months on chart	Last month	This month		
38	2	1	**Microsoft Works**	Microsoft
59	1	2	**Microsoft Word**	Microsoft
50	3	3	**Microsoft Excel**	Microsoft
46	4	4	**Aldus PageMaker**	Aldus
35	5	5	**MacWrite**	Claris
14	9	6	**QuarkXPress**	Quark
19	6	7	**WordPerfect for the Macintosh**	WordPerfect
47	7	8	**MacDraw**	Claris
12	—	9	**FileMaker II**	Claris
5	10	10	**Wingz**	Informix

EDUCATION SOFTWARE

13	1	1	**Where in the World Is Carmen Sandiego?**	Brøderbund
26	2	2	**Reader Rabbit**	The Learning Company
42	3	3	**Math Blaster**	Davidson & Associates
5	4	4	**Math Rabbit**	The Learning Company
32	—	5	**KidsTime**	Great Wave Software

ENTERTAINMENT SOFTWARE

42	2	1	**MacGolf**	XOR/PCAI
2	4	2	**Tetris**	Spectrum HoloByte
38	3	3	**Dark Castle**	Silicon Beach Software
4	1	4	**SimCity**	Maxis Software
16	—	5	**Beyond Dark Castle**	Silicon Beach Software

NETWORK/DATA COMMUNICATIONS

38	1	1	**TOPS**	TOPS
34	2	2	**AppleShare**	Apple Computer
41	3	3	**LocalTalk**	Apple Computer
26	4	4	**PhoneNet**	Farallon Computing
7	—	5	**NetWare for the Macintosh**	Novell

HARD DISKS*

Months on chart	Last month	This month		
19	1	1	**MacStack SD20**	CMS Enhancements
18	3	2	**FX20**	GCC Technologies
31	—	3	**Apple Hard Disk 20SC**	Apple Computer
1	—	4	**DataFrame XP60**	SuperMac Technology
7	5	5	**Rodime 45 Plus**	Rodime

ADD-IN BOARDS/MEMORY

27	—	1	**Apple 2MB Memory Expansion Kit**	Apple Computer
28	3	2	**Radius Accelerator**	Radius
24	2	3	**Apple 1MB Memory Expansion Kit**	Apple Computer
16	1	4	**Radius Interface Display**	Radius
3	—	5	**2MB Expansion Board**	Mac Products USA

PRODUCT WATCH

Recent or forthcoming products of particular interest.

ComputerEyes *Digital Vision* Low-cost 24-bit color digitizer

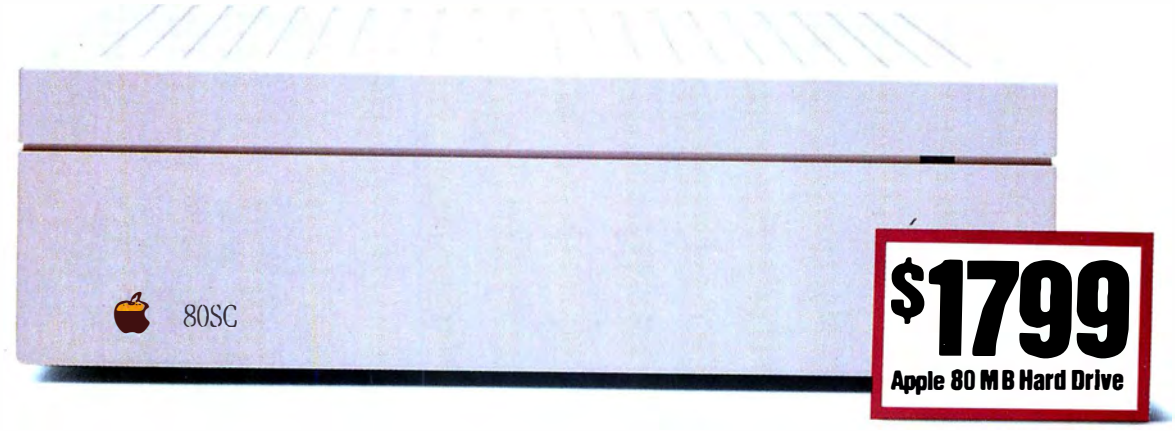
ParaFont *Design Science* PostScript font-editing software

PosterWorks *S.H. Pierce & Co.* Software for large-scale color PostScript images

Source: Exclusive InfoCorp survey of more than 125 Macintosh retailers and selected mail-order vendors. Covers sales during December 1989.

*Does not include hard disks installed at the factory.

This is Apple's Best Buy on a Big Hard Drive;



This is Ehman's.

The perfect hard drive would have unlimited storage capacity, be lightning fast and be as reliable as rain in Seattle in the springtime. And, oh yes, it would have all of the above, at a price that would make the stingiest Scrooge smile.

Using that criteria, the Ehman 45MB removable just may be the perfect hard drive.

Its storage capability expands with your needs. For more storage capacity all you do is buy another 45MB removable cartridge for just $99. Buy as many as you need. In fact you could buy 10 cartridges, almost 500MB of storage, and still pay less than an Apple 80MB fixed hard drive.

With an access speed of just 20 ms, the Ehman removable will hold its own with just about any hard drive on the market. And with a reliability rating of 30,000 hours and a warranty of 2 years, you can be assured that in this case, speed doesn't burn. For another $20, you can have complete assurance and overnight service, with the Ehman Express Service Program.

The best part is that our best buy on a big drive won't burn a hole in your pocket. At just $749 including one cartridge, the Ehman removable costs less than half of the Apple 80MB drive and comes with a 30 day, no questions asked, money back guarantee. Give us a call today at 1-800-257-1666 and see first hand why Ehman is now the fastest growing manufacturer of Macintosh peripherals.

Ehman

1-800-257-1666

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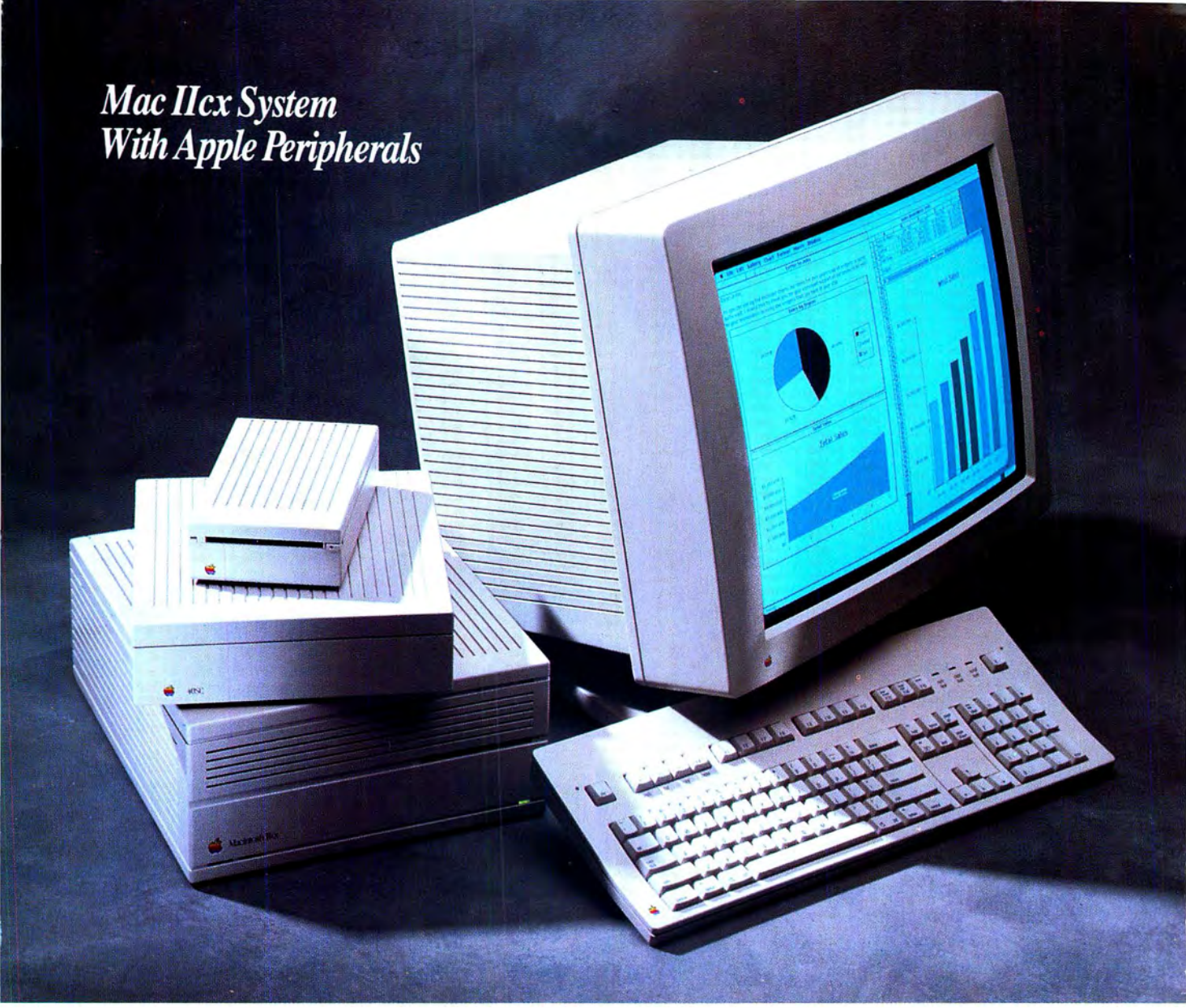


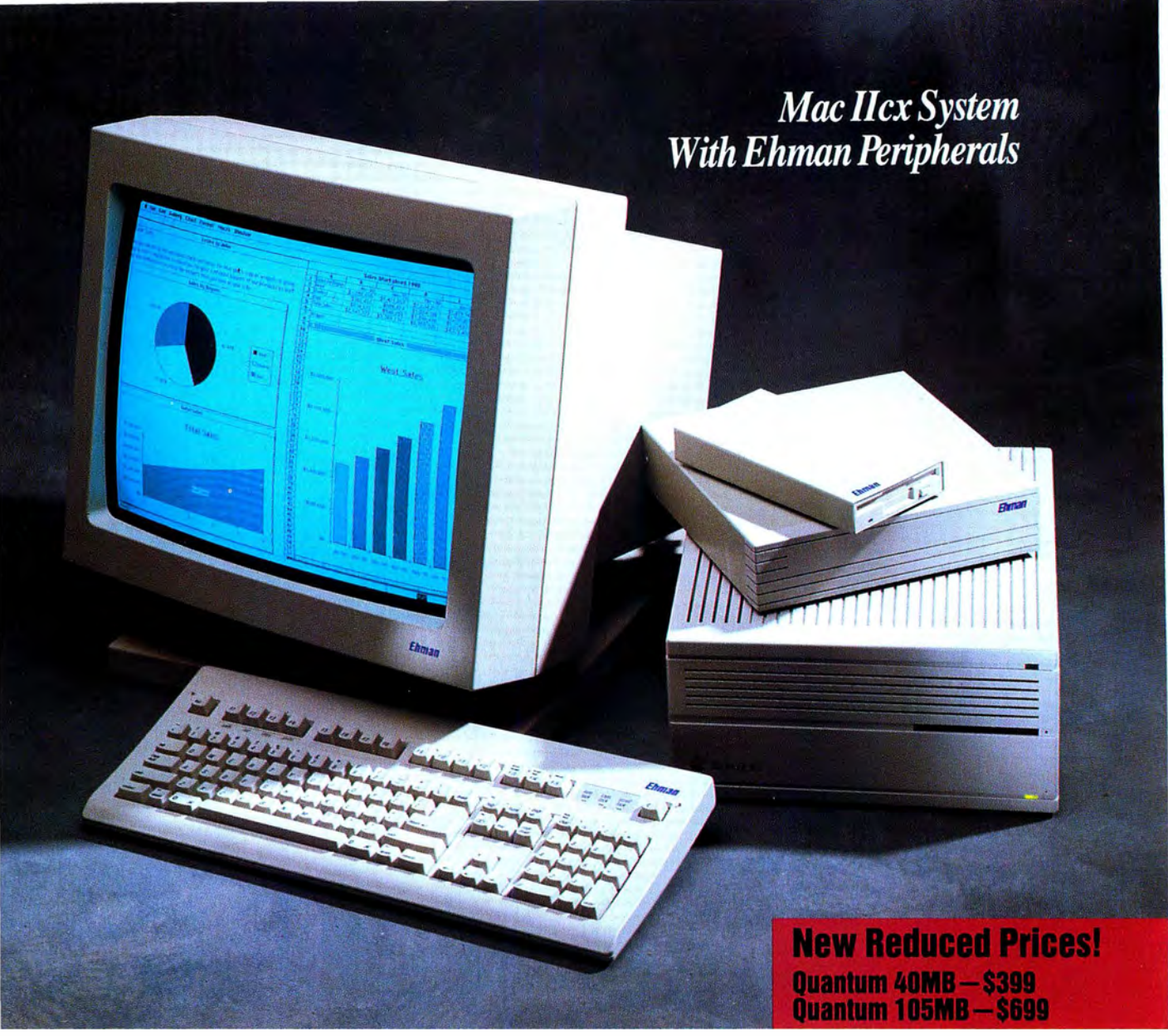
Most Users Won't No But All Buyers

Next time you buy peripherals for your Macintosh, make sure you look at the price tag and not just the label. You'll find big differences between Apple and Ehman.

First and foremost, Apple is in the business of making computers. Ehman is in the business of making computer peripherals. And since 1985 we've been out front in providing Macintosh users with the best combination of price and performance available. Like a 20 MB hard drive for just $299, or our new two-page monochrome monitor for only $899 including video card and tilt/swivel base.

We can save you hundreds of dollars over a peripheral with an Apple logo on it. What's more, you'll enjoy the added benefits of a lengthy warranty, free direct-telephone support, free third-party utility software, a 30 day moneyback return policy and even an optional, overnight loaner service program.

And, if you thought you would have to make major concessions in quality,



tice The Difference, Certainly Will.

think again. Our monitor has a flicker-free refresh rate higher than either Apple or Radius. And our hard drives are now significantly faster thanks to new caching software, and still come with reliability ratings up to 100,000 hours between failures.

So before you pay top dollar for a premium label, give Ehman a call at 1-800-257-1666 and see about an alternative that makes a very big difference—to your pocketbook. One look and you'll know why we're now the fastest growing peripheral manufacturer in the business.

Hard Drive Prices

Size (MB)	*Internal*	*External*
20	*$299*	*$349*
30+	*$349*	*$399*
40Q	*$399*	*$479*
45	*$399*	*$449*
60+	*$479*	*$549*
80+	*$529*	*$599*
105Q	*$699*	*$799*
135	*$899*	*$999*
180	*$1,049*	*$1,149*
45 Removable		*$749*

Ehman
The Apple Alternative

Call 1-800-257-1666
or 1-307-789-3830
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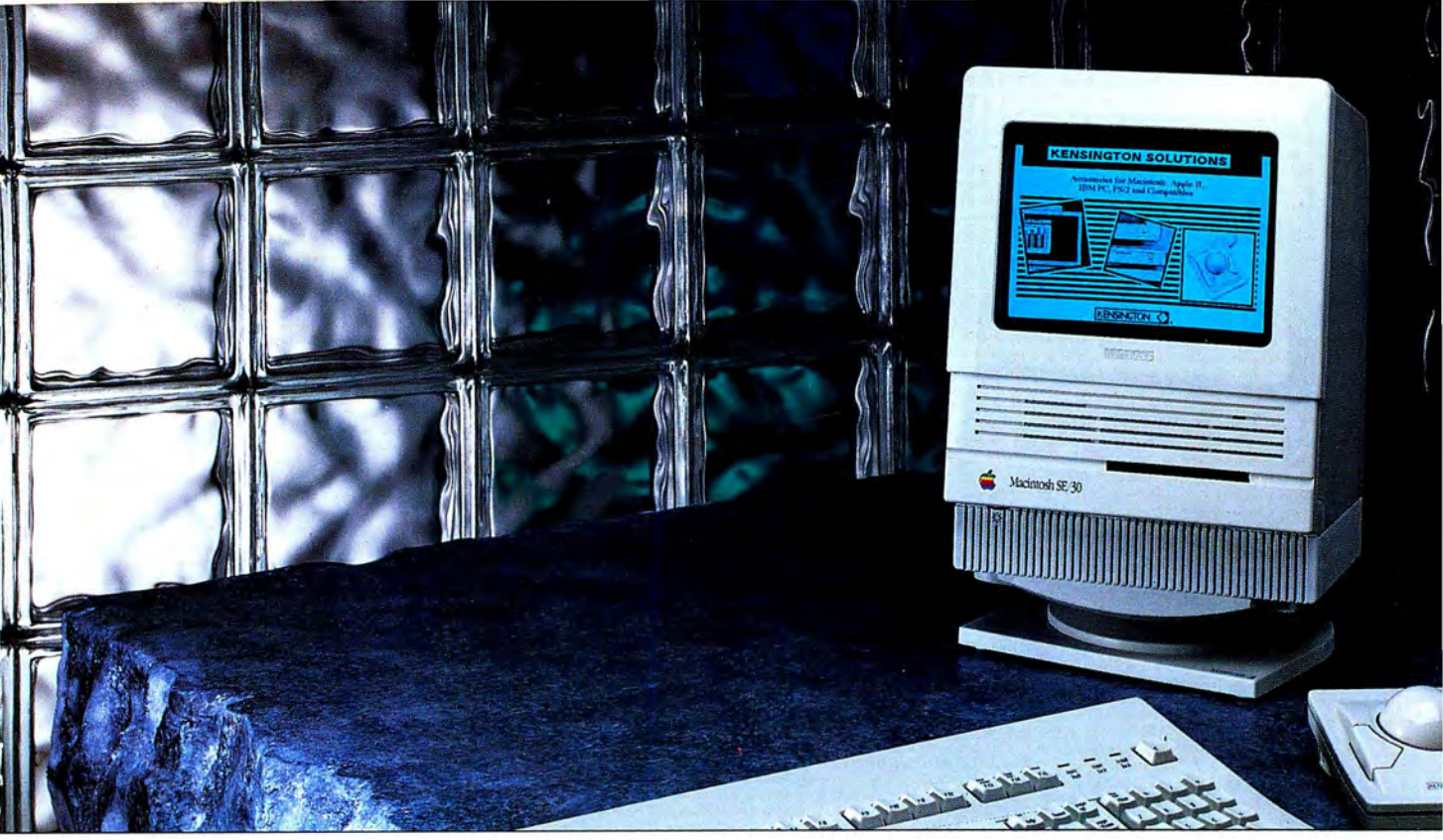


EYESORE VS. EYE PROTECTION

As today's monitors get bigger and brighter, anti-glare filters become less of an option and more of a necessity.

The right filter can combat eye fatigue, help eliminate headaches, even reduce overall body stress.

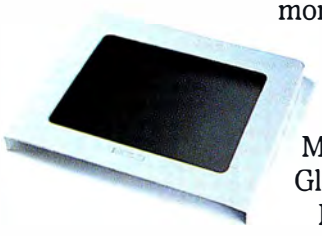
Yet, the irony is that something so good for your eyes can be such an eyesore.

In fact, most filters look like they belong to someone else's system.

The fit is sloppy. The colors don't match. The materials are different.

Kensington has a different idea.

Instead of making a filter that will fit on any monitor, we make filters that will only fit a *specific* monitor.



An example is our Maccessories® SE Anti-Glare Filter.

It looks so much a part of the SE, you would think it was designed by the same people who designed the SE.

Circle 30 on reader service card

The styling is complimentary. The color identical. Even the same material is used.

And unlike generic filters, the fit is perfect. So light passes through the filter, never around it.

Kensington uses only optical quality glass with a ceramic anti-reflection and scratch-resistant coating.

The result is a 96% reduction in glare. And an improvement in contrast and clarity of up to 20 times.

In short, the most advanced eye-protection system you can find today–it even filters out VLF and ELF radiation and dissipates static.

Kensington has custom designed screens for the Mac, Mac Plus, Mac SE, Apple IIGS, as well as for the entire Mac II family of large screen monitors.

For a free brochure, and the dealer nearest you, call 800-535-4242. In New York call 212-475-5200.

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