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MACWORLD

The Macintosh® Magazine

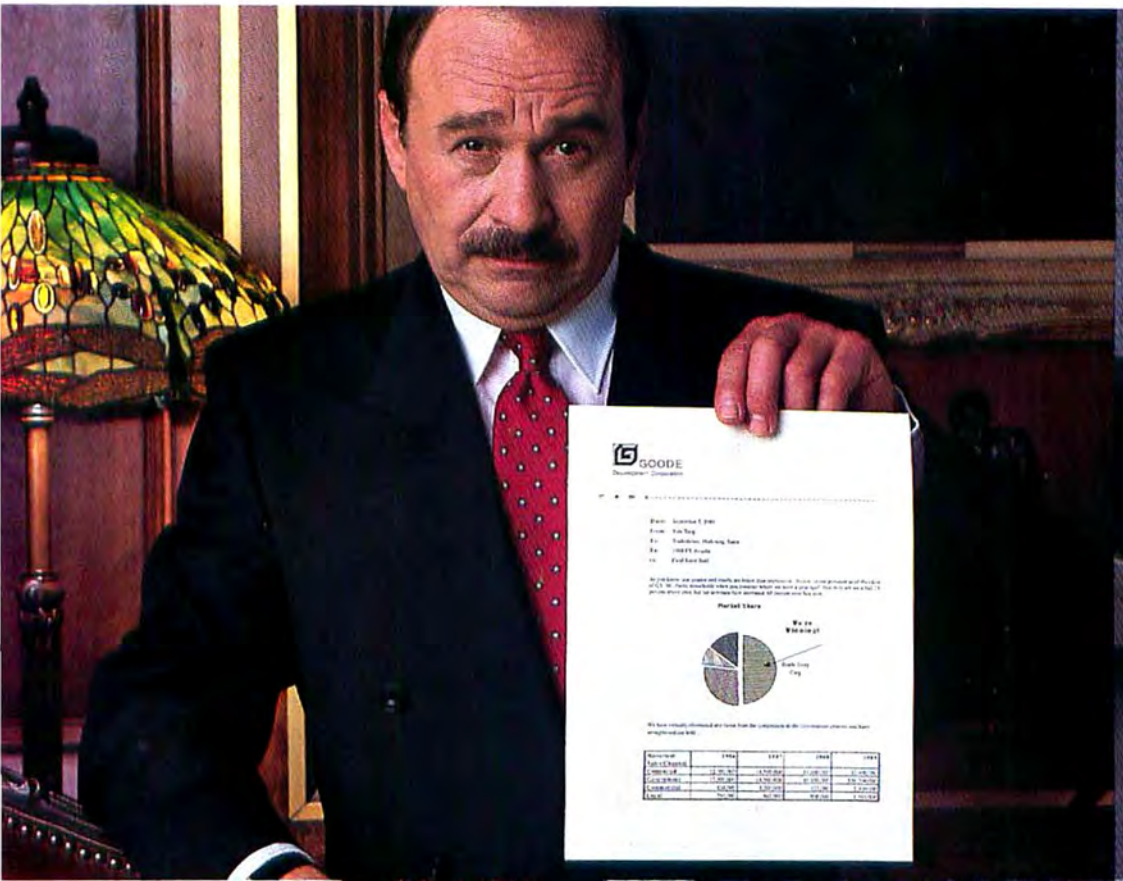
October 1990 $3.95 Canada $4.95

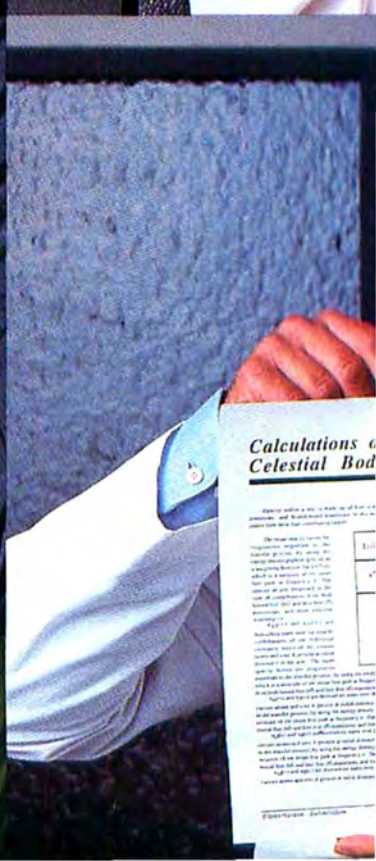
SPECIAL ISSUE

PUBLISHING

OUT WITH THE OLD, IN WITH THE NEW

There's a Word fo





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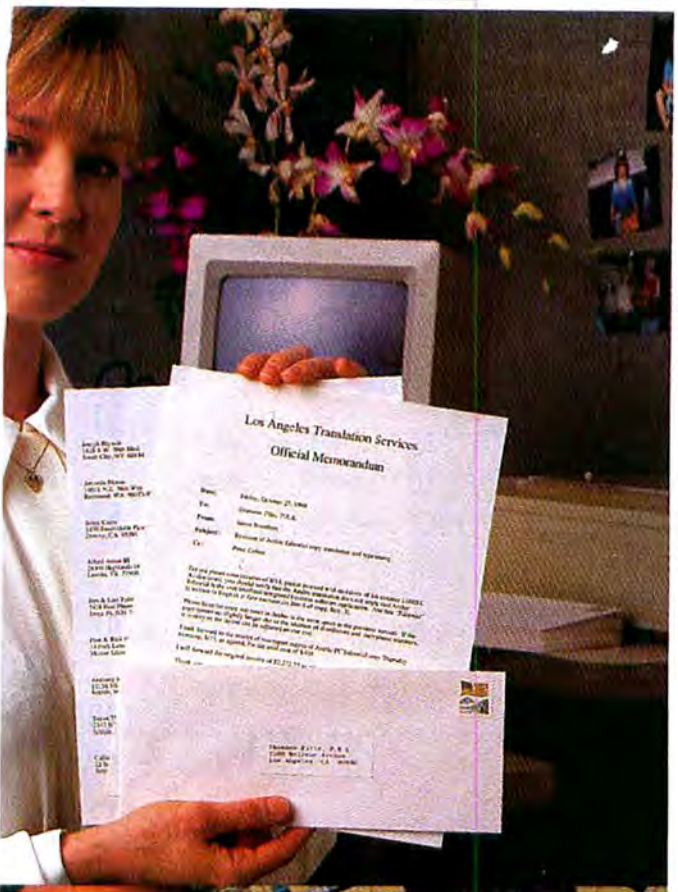

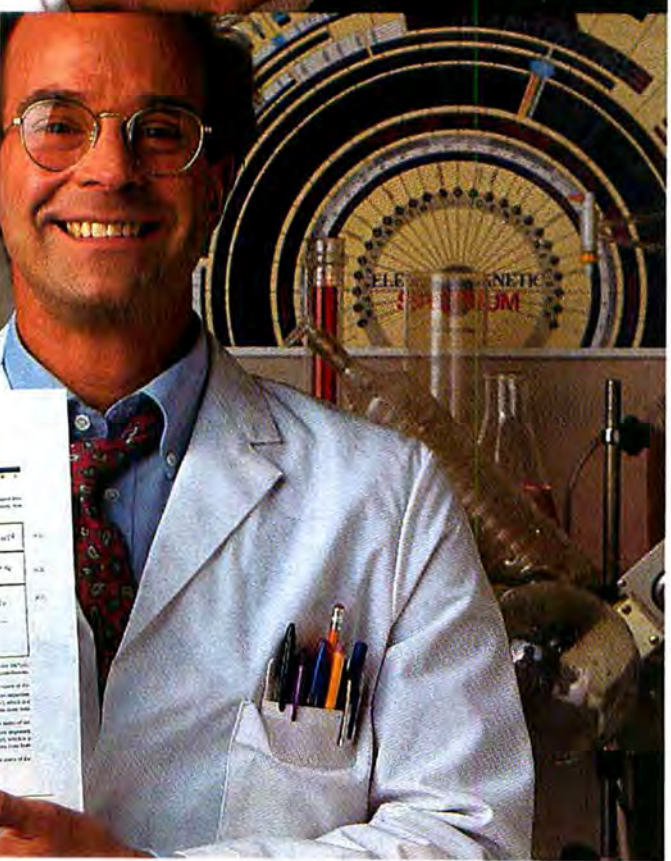

Whether you're a marketing maven on your way up, a scientist knee-deep in formulas, or a temp trying to cope with an unfamiliar corporate mindset, when it comes to putting thoughts to paper, Microsoft is the Word for you.

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.

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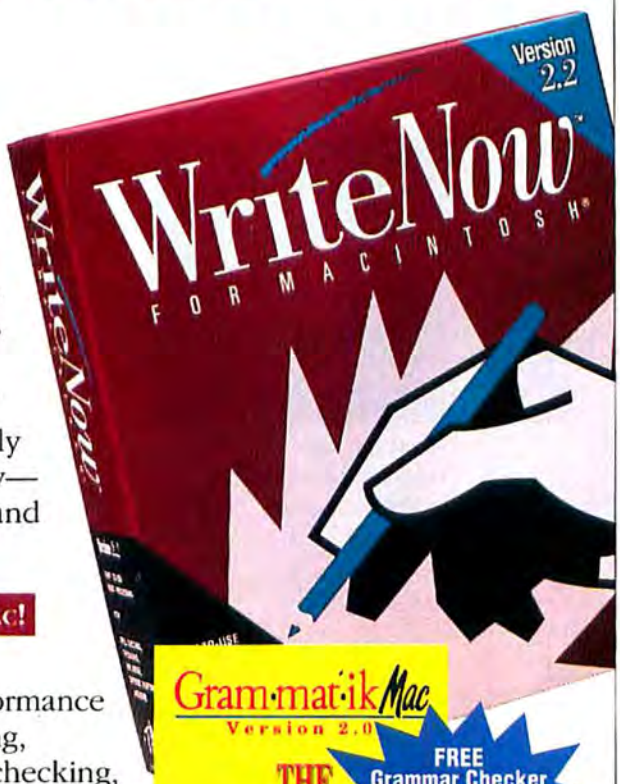

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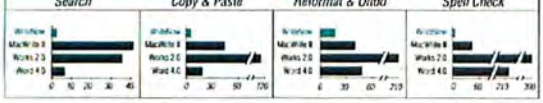
Quick Comparison of Leading Word Processors

	WriteNow 2.2	MacWrite II	Works 2.0	Word 4.0
Disk space needed:	(2) 800K	Hard disk	Hard disk	Hard disk
Thesaurus (Size in responses):	1.4 million	220,000	No	220,000
Spell Checker (Size in words):	135,000	100,000	60,000	130,000
Grammar Checker (Bundled):	Yes	No	No	No
Retail Price:	$199	$249	$295	$395

Speed Comparison Charts (in seconds)



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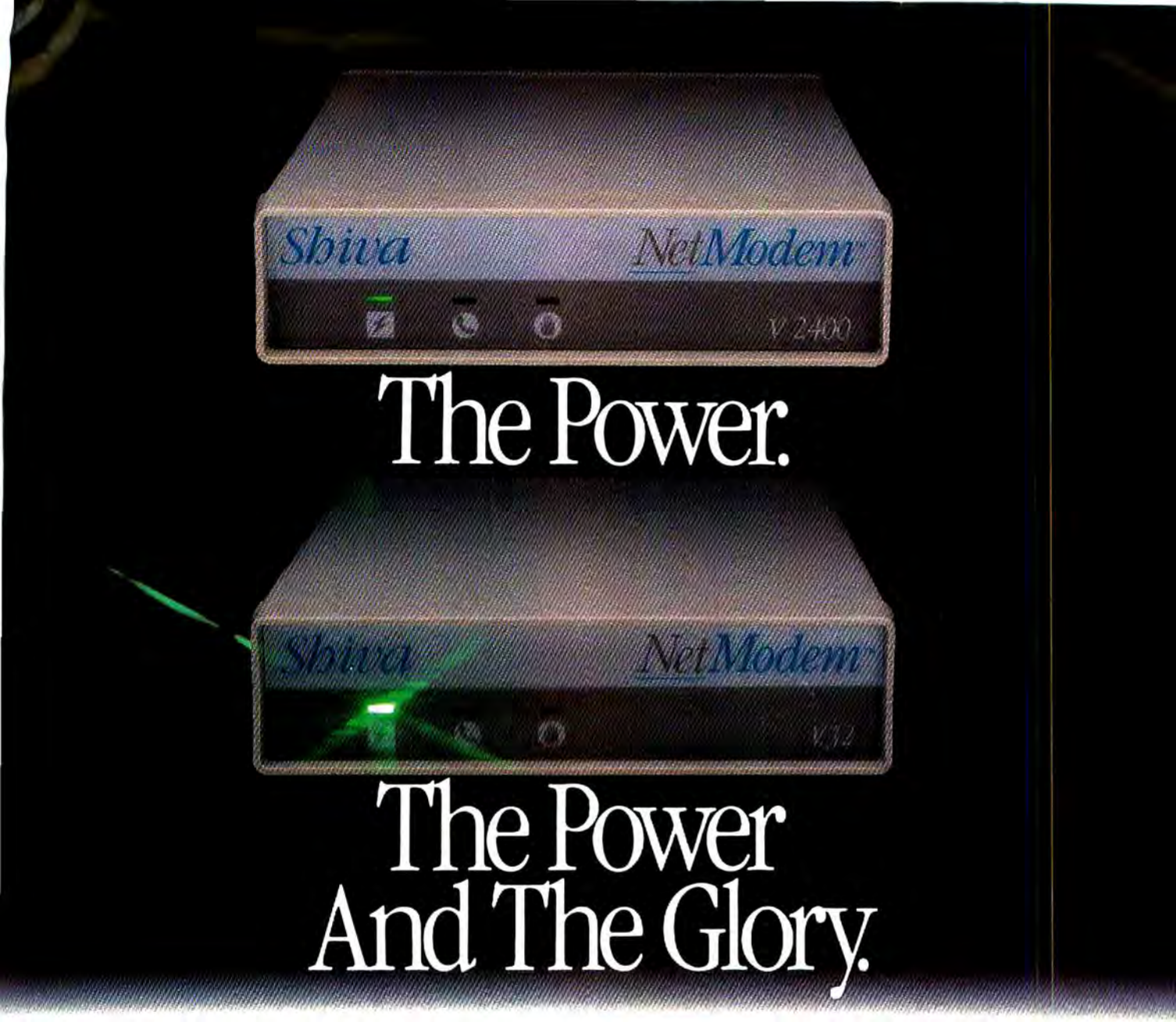

The Power of Shiva NetModems
Power is one Shiva NetModem doing the work of many modems and phone lines on your LocalTalk network. Power is access to network resources, even if you're out of the office, just by dialing in.

The Glory of NetModem V.32
Shiva's new NetModem V.32 has all that power and the glory. The glory of speed — up to 9600 bps with full V.32 compatibility. Plus the glory of freedom — freedom to bridge any two remote networks and transparently create a wide area network, so you can share files, mail, printers, or other network resources, even if you're halfway around the world. You could purchase a software solution that simulates the NetModem's Dial-In Network Access feature, but that product requires unwieldy file transfers and only accesses a single computer. You could bridge remote networks by installing software that acts like NetModem V.32's remote router, but those applications require a dedicated Mac and are vulnerable to system crashes.

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Shiva's NetModems are complete stand-alone solutions. So if you have a LocalTalk network, ask us about the power of NetModem V2400. And if you need speed or the freedom to bridge remote networks, ask us about the glory of NetModem V.32. Call Shiva at **1-800-458-3550.**

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True Color Calibrator Display System™

ROSES ARE X=0.7344, Y=0.2656; VIOLETS ARE X=0.1566, Y=0.0177.

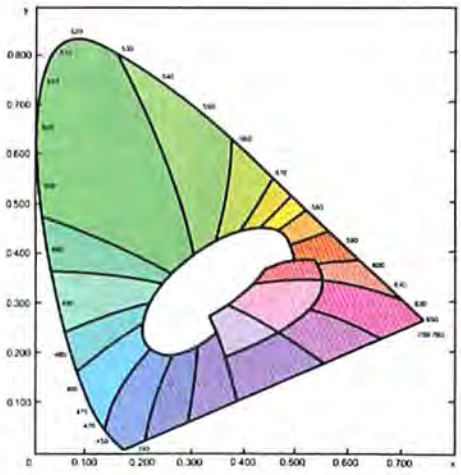
Owing to variations in human perception, color, like beauty, is very much in the eye of the beholder. This being true, if we want to communicate accurately about color, we need to convert the language of art into something considerably more objective and exact: the language of science.

Some time ago, an international scientific team developed a mathematically reliable color system, known as CIE. This model is the basis for the new RasterOps® True Color Calibrator Display System.™

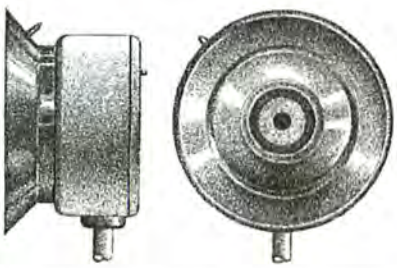
Due to temperature, humidity, and as yet-imperfect CRT technology, even the best and brightest display colors

can drift and fade over time. To compensate, the True Color Calibrator display has a built-in microprocessor which monitors performance on a continual basis and corrects instabilities with its own internal calibration routines.

This self-calibration is performed automatically, *75 times a second* — well before the sharpest eyes would detect any variation in color. The net result is that roses and violets on a True Color Calibrator display will always remain true to their mathematically-defined color values. Whether three minutes, three days, or three months from now. And the system has a communication port which can send these scientifically precise formulas to other monitors and printers.



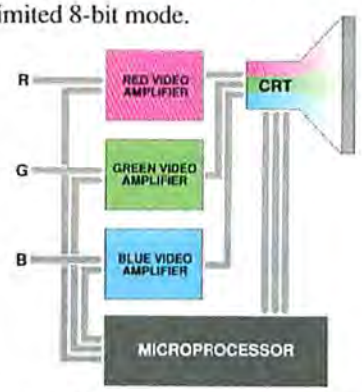
The True Color Calibrator is based upon the CIE model which mathematically defines all available natural colors.



Unlike other optical sensors, RasterOps' Optisense is thermally stabilized to insure consistently accurate measurements.

The True Color Calibrator also comes with an Optisense® optical sensor which, used just once a month, adjusts the system's self-calibration scheme for the inevitable aging of screen phosphors.

The makers of other calibration systems may make a big to-do about the optical sensor they provide. This is understandable, since that's all they provide. With no microprocessor in their display, they cannot offer automatic, continual calibration. The moment you remove the sensor, colors begin to drift and fade all over again. Which means their system is only as accurate as the number of times *per day* you stop and use the sensor. What's more, they recommend that calibration be performed only while in the more limited 8-bit mode.



Only the True Color Calibrator has a built-in microprocessor which continually recalibrates the display—75 times per second.

In deciding which calibration solution is in fact the most effective, it might be helpful to know that the world's most sophisticated electronic pre-press systems use the same microprocessor-controlled calibration we do. And further, that *MacUser* has hailed the RasterOps True Color Calibrator as "the most sophisticated monitor ever built".

Now you can upgrade anytime. Or extend your warranty with RasterCare.™

If your application calls for a truly stable and precise color environment, your best call would be to a RasterOps dealer. Or you can phone 800.468.7600 to find out more about the True Color Calibrator from RasterOps. The people who've got the art of color down to a science.

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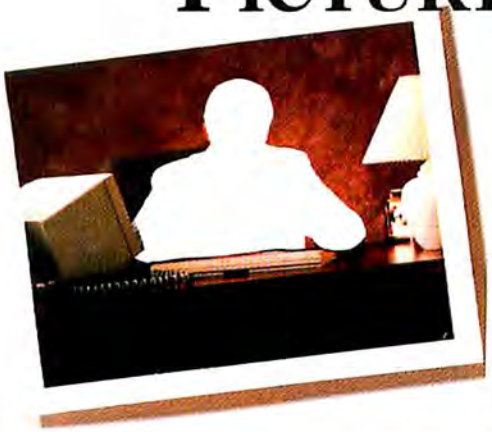

Your newsletter is on the Mac in Microsoft Word. The boss submits a story written on his PC in WordPerfect... **complete with illustrations.** *MacLinkPlus translates the file easily,* **text and graphics,** *with your MacLinkPlus cable connection between the two machines.*

Contributors to your weekly sales update just put their DOS files on the Novell server—the letter's in Wordstar, the pricing in Lotus Symphony, and the mailing list in dBase. With MacLinkPlus, you can translate all the files into MacWrite II on your Mac and do your update in no time.

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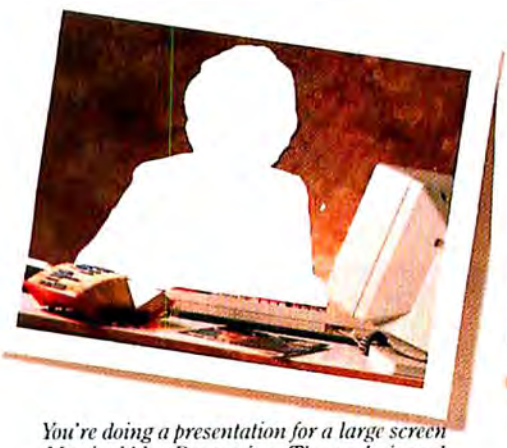

You're doing a presentation for a large screen Mac in Aldus Persuasion. The analysis and graphics from the regional office look great... **but they're in Harvard Graphics on a DOS diskette.** *Just use MacLinkPlus to translate the contents of the disk directly into graphics files for Aldus Persuasion.*

You run a next day desktop publishing service. You have a Mac with a modem and DOS drive to receive customer files. Pictures, text, and spreadsheets arrive in DOS, Mac, or NeXT formats. With MacLinkPlus, everything gets translated directly into the program of choice.

You publish a weekly ecological survey on your Mac. Maps are in AutoCAD on the PC, sketches from PC PaintBrush on the PC, and tech writers use XYWrite on DOS laptops. With MacLinkPlus, everyone uses what they've got, while you pull it all together in your favorite Macintosh applications.

MacUser 1989 EDITORS' CHOICE AWARD WINNER

Solve these and thousands of other file exchange problems with award-winning MacLinkPlus software. With more than 150 translators, the possibilities are endless. Transfer and translate files in either direction between programs on the Mac and programs on the PC running under DOS or Windows.

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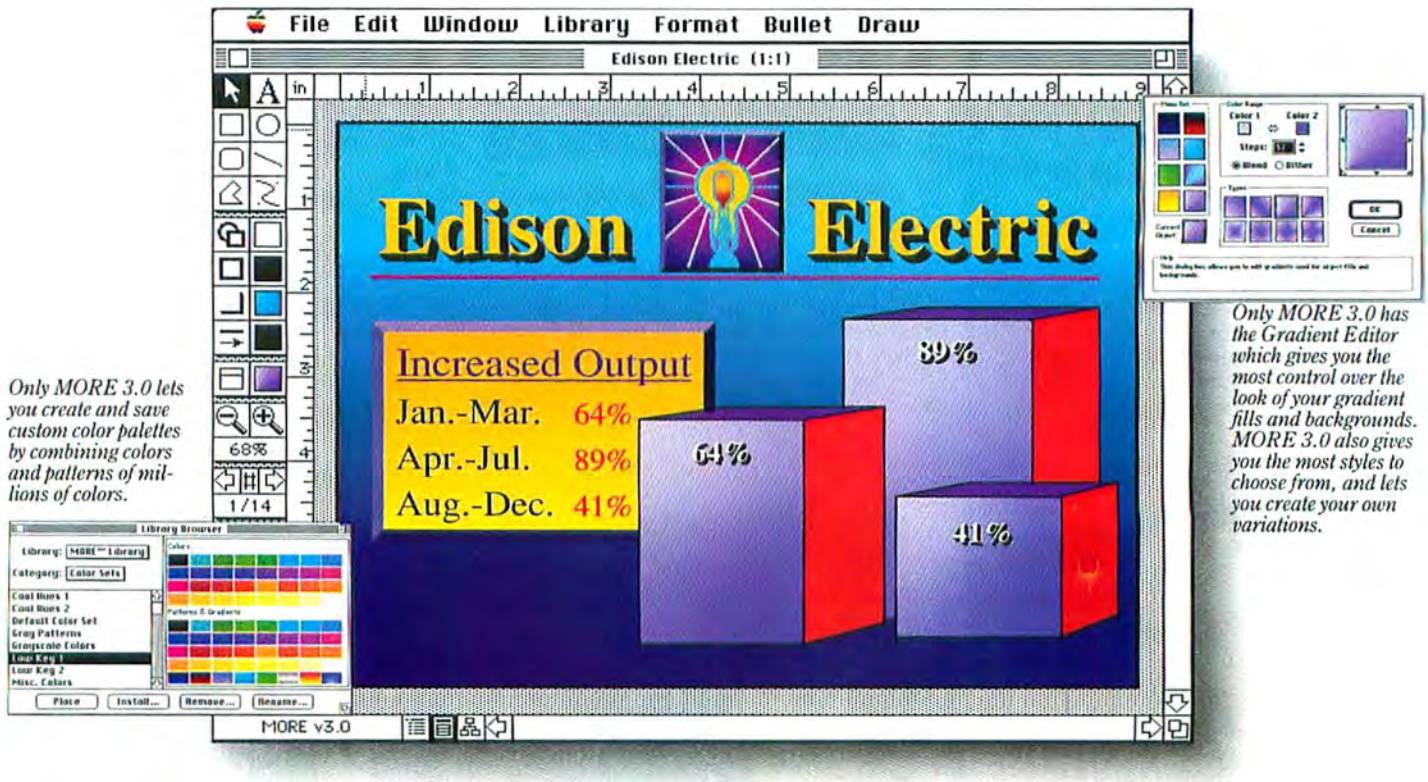
The New MORE 3.0 Vs. All The



Only MORE 3.0 lets you create and save custom color palettes by combining colors and patterns of millions of colors.

Only MORE 3.0 has the Gradient Editor which gives you the most control over the look of your gradient fills and backgrounds. MORE 3.0 also gives you the most styles to choose from, and lets you create your own variations.

(Exhibit A)

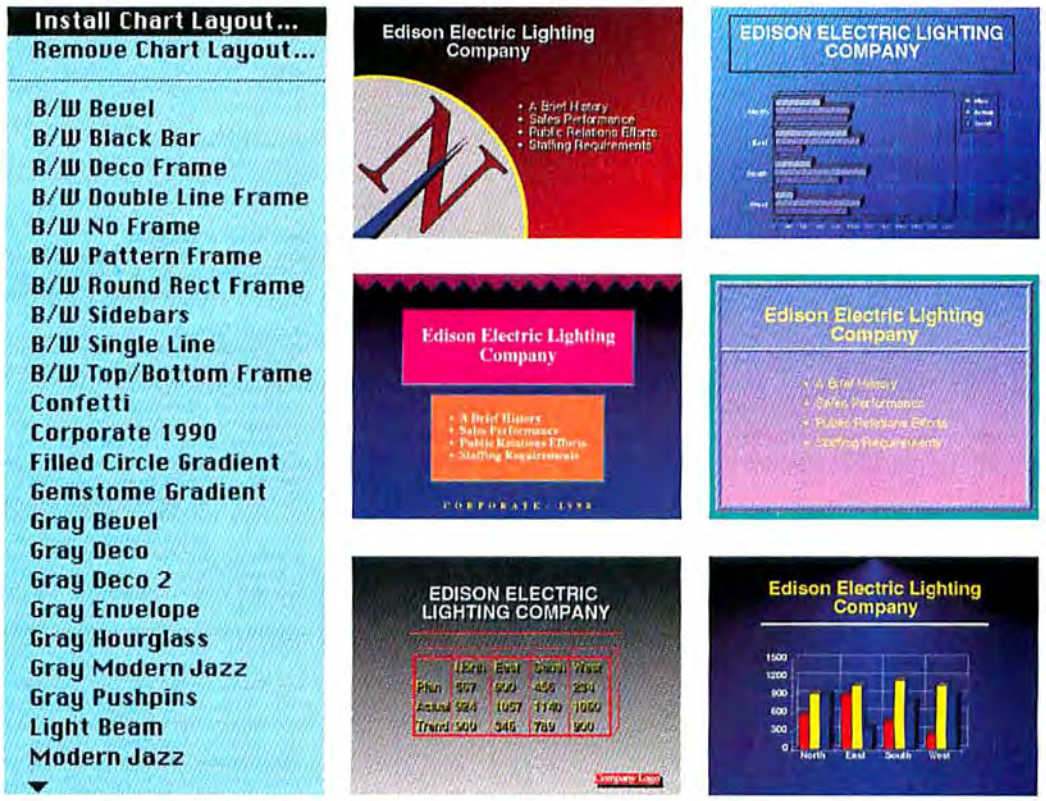
Examine The Evidence, In Graphic Detail.

You've seen the evidence. Here are the facts. First, because it gives you the flexibility to create or import graphics, new MORE 3.0 can create more colorful, creative, and persuasive presentations than any other Macintosh® presentation program.

Second, MORE 3.0 has a library of over 100 templates, and a unique Library Browser feature to help you choose the look you need in seconds. And apply it to your entire presentation instantly.

Finally, MORE now includes Chart Tutor, which guides you step-by-step through the process of creating any kind of presentation.

Trial:
Other Presentation Software



MORE 3.0 includes a complete library of over 100 templates designed by graphic artists. Use our Library Browser feature to find the look you need in seconds, then just click on it to apply it to one, ten or a hundred slides or overheads instantly.

(Exhibit B)

The verdict? The presentations you create with MORE 3.0 will be faster, more colorful, more impressive, and more persuasive than with any other software.

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All video display terminals (VDTs) emit electromagnetic radiation (EMR) through the screen. The photo on the left is a visualization of EMR in red from the screen. The photo on the right shows that the NoRad Shield™ virtually eliminates screen-emitted E-Field EMR and better than half of magnetic EMR.*

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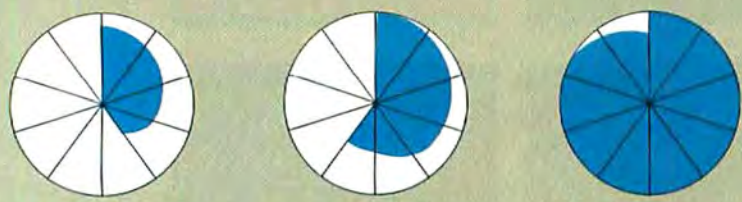

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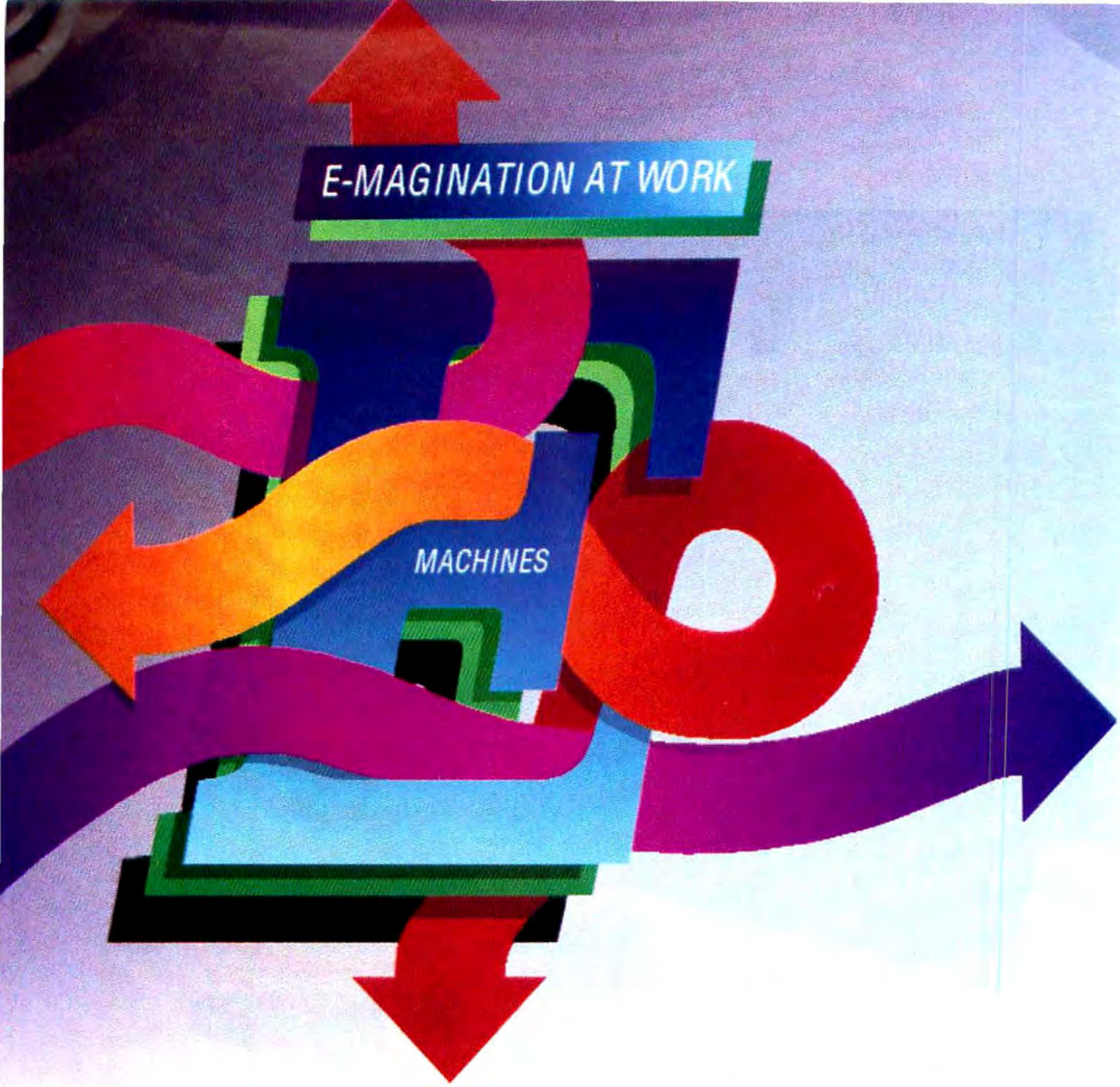

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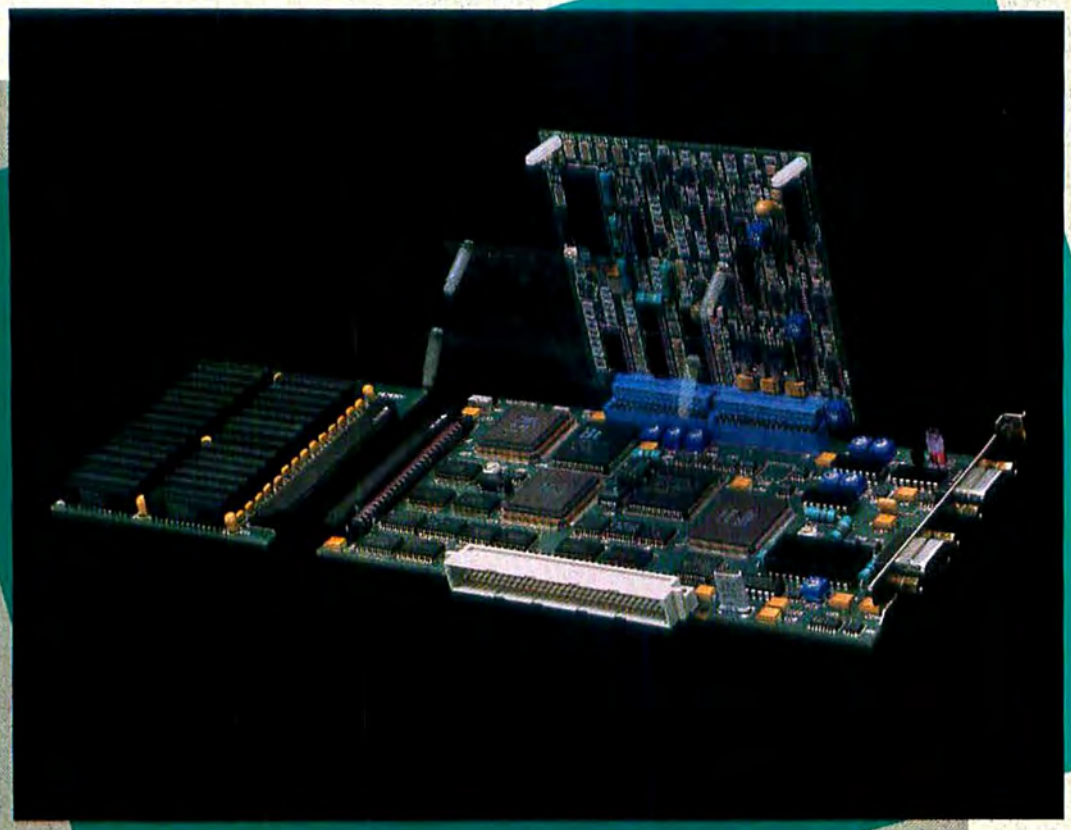

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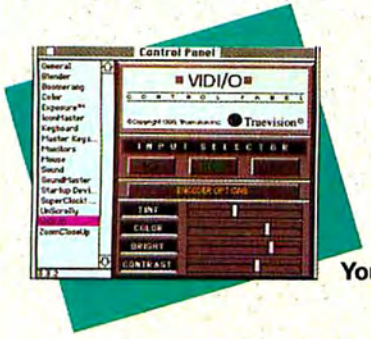

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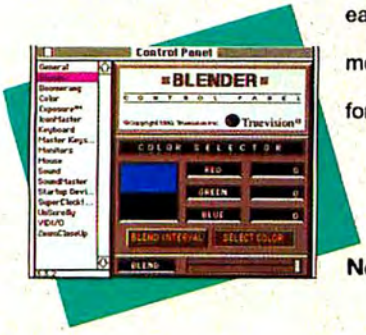
Making the right connections simplifies most projects. So the NuVista+ now offers composite and S-Video encoding and decoding on-board, making it easy for you to connect to any video source. The encoder and decoder adjustments are accessible from any application through the Control Panel. Controls for signal source selection, hue, saturation, and contrast are all easy to use.



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The new linear keying functions are accessible from the Control Panel and let you fade to any color or blend live video with computer generated text and images. And now you can choose any color, even in 32 bit/pixel mode, to overlay a computer-generated image or animation onto live video.

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MACBULLETIN

Trojan Horse May Attack PostScript Printers

A Trojan horse embedded in clip art or a font may be disabling PostScript laser printers and imagesetters by changing their passwords. Once the password has been changed, imagesetter owners must replace the chip that contains the password, and laser printer owners must replace the printer's system board. Two service bureau operators have developed PostScript routines that keep the Trojan horse away from the password. For more information, fax (don't call) Kathleen Tinkel at Laser Letter, 203/454-4962.

Supporting Computer Users' Civil Rights

Concerned that a national crackdown on computer crime is threatening the civil rights of computer users, Lotus and On Technology founder Mitch Kapor is establishing the Electronic Frontier Foundation (EFF). Initially funded by private contributions from Kapor and Apple cofounder Steve Wozniak, and based in Cambridge, Massachusetts, the EFF will support public education and legal efforts to provide First Amendment protection for electronic media such as bulletin boards, online information services, and computer networks. For two years the United States Secret Service has been pursuing an investigation called Operation Sun Devil that has resulted in 7 arrests and seizure of 40 computers and 23,000 floppy disks in 14 cities. For more information, contact EFF at 617/577-1385 or on Internet at eff@Well.sf.ca.us.

Did Apple Out-Pirate a Pirate?

Apple Computer has purchased rights to the design of Outbound Systems' Mac-compatible docking laptop and licensed the design back to Outbound, according to sources close to the companies. Apple reportedly threatened to sue Outbound for infringing on Apple's intellectual property, and simultaneously offered a considerable sum of cash for the rights to part or all of Outbound's design. The relatively lightweight Outbound laptop requires the ROM chips from a desktop Mac, but can attach to and drive the desktop system when the user is in the office. Several sources cited $3 million as the sum paid for the technology, but Apple refused to confirm the amount. In any case, Apple no longer considers Outbound to be in violation of Apple's intellectual property rights. Apple says it will not manufacture the Outbound design under the Apple label.

Apple Spins Out New Company

One former and two current Apple employees are packing their bags and taking their show on the road—but with Apple's support. Bill Atkinson, Andy Hertzfeld, and Marc Porat have founded General Magic, with Apple as the largest shareholder. General Magic plans to design what the founders call Personal Intelligent Communicator products. Apple has the first nonexclusive license to manufacture and market General Magic's technologies, and Apple CEO John Sculley is a director.

Now, 3-D Numbers

Tri-Millennium Software is developing a new spreadsheet, called Equator, that is unique in two ways: it is the first three-dimensional spreadsheet available on the Macintosh, and it is being written to take advantage of the Levco 3 Transputer parallel processing board. Equator has a 1000-by-1000-by-1000-cell cube-shaped grid; supports complex numbers and unusual operations such as rotate; and will provide 2-D and 3-D graphing, and a macro language. Tri-Millennium plans to sell Equator in a beta version at $129; at $439 for the final product; and bundled with a Levco 3 Transputer for $1895. Equator requires an SE/30 or Mac II–family machine but does not require a Transputer board. For more information call Tri-Millennium at 617/789-3996.

Macro Changes at Microlytics

Microlytics is developing a unified compression scheme and search engine for all of its products. The company is introducing the Random House Encyclopedia, which takes advantage of the improved compression and searching capabilities and provides the same features as Microlytics' Inside Information, including the ability to find a word from a rough definition. Microlytics is also developing a grammar and style checker called Writers Suggestions and Reminders (WSR), which the company may license to third-parties instead of publishing. WSR checks punctuation, abbreviations, grammar, and context. Inside Information 1.1 takes up less disk space than version 1.0, can store its dictionaries anywhere on a hard disk (previously they had to be in the System Folder), and searches faster. Microlytics has long-term plans to develop user-modifiable dictionaries. Inside Information 1.1 and the Random House

(continues)

Encyclopedia will list for $119 each with the search engine or $59 for each database alone. For more information, contact Microlytics at 716/248-3868.

Crystal Ball on Time

Market Engineering is developing vertical risk-analysis models for its Monte Carlo simulator Crystal Ball. The first package, the Constructive Cost Model (CoCoMo), is for estimating software-development costs and schedules. Other vertical models under development include an inventory-management model and an oil-and-gas financial model. Crystal Ball version 1.04 lists for $395 and requires a spreadsheet that can save in SYLK format. The CoCoMo module lists for $299, or $499 bundled with a copy of Crystal Ball. Pricing on other models was undecided at press time. Market Engineering is also developing a generic project-management analysis package that will take advantage of an upcoming version of Crystal Ball that will have greatly improved time-analysis capabilities. For more information, call Market Engineering at 303/298-0020.

The Posters with the Mostest

The new version of PosterWorks adds a pasteboard-like layout environment for arranging, scaling, stretching, and cropping text and graphics. It displays page breaks; has a virtual-memory scheme for working with large 24-bit color files; reads TIFF, EPS, and Scitex format; prints in color and generates separations in OPI and DCS format as well as its own PostScript separations; provides color-correction tools; and supports plug-in halftone screens (several will ship with the package). Version 2.0 will list for $295. For more information, call S. H. Pierce & Co. at 617/395-8350.

The Diversified VersaCAD

Version 3.0 of VersaCAD lists for $2395 and adds user-defined, pop-up attribute fields for recording nongraphic information about objects that can be sorted like a database or exported to spreadsheets and databases. Version 3.0 also has an automatic parallel boundary feature, supports Apple's Macintosh Display Card 8•24 GC, and reads and writes MS-DOS VersaCAD files. VersaCAD was formerly distributed by VersaCAD Corporation, a subsidiary of Prime Computer, but was recently moved under the umbrella of Prime's Computervision personal computer CAD/CAM unit. For more information, contact Computervision at 617/275-1800.

Qume Unveils 12-ppm Laser Printer

Qume Corporation's recently introduced CrystalPrint Express is a 12-pages-per-minute, high-resolution laser printer designed for networked environments. The PostScript-based CrystalPrint Express incorporates a RISC processor for faster processing of complex documents. It can print at either 300 by 300 dpi or 600 by 300 dpi. The printer carries a suggested list price of $5595 including 3MB of RAM. The company expects to begin shipping CrystalPrint Express in August. For more information, call Qume at 408/942-4000.

RasterOps Downsizes Color Boards

At Macworld Expo in Boston, in August, RasterOps Corporation announced two color graphics boards for 13-inch monitors. The 24-bit RasterOps 24S and 8-bit RasterOps 8S are less expensive versions of the existing RasterOps 24L and 8L boards, both of which support displays up to 19 inches. Both new boards support NuBus block-mode transfer and both work with the recently shipped RasterOps Accelerator board. The company expected the RasterOps 24S and RasterOps 8S to be available beginning in September. Prices had not been finalized at press time. For further information, contact RasterOps at 408/562-4200.

Paint Under Pressure

Creative Software's version 2.0 of Easy Color Paint will join the ranks of those programs that can use the Wacom pressure-sensitive tablet. Easy Color Paint also features gradient fills; a bucket tool that can be used for selecting as well as painting; boundary fills that are intelligent about surrounding colors; and complete undo and redo. For kids, version 2.0 can lock windows to keep them from being dragged off screen; can display paint colors in 16 extra-big swatches; and can turn off hierarchical menus. The new version will list for $89. For more information, contact Creative Software at 201/665-9361.

SuperMac Announces TekColor-Compatible Calibration

SuperMac Technology has announced SuperMatch, a color-calibration system that uses Tektronix's TekColor color-matching software. SuperMatch includes monitor-calibration hardware and the SuperMatch Color Picker, software that helps you choose colors that both your monitor and your output device can both produce. SuperMatch is slated to ship on October 1 at a list price of $699. For more information, contact SuperMac at 408/245-2202.

Spare Changes

Ashton-Tate has sold dBase/Mac to New Era Software (305/670-4844), where dBase/Mac's original developer, Michael Rosetti, is now employed. Meanwhile, A-T admits plans for a true dBase-compatible Mac product. SuperMac has sold SuperLaserSpool to utilities marketer Fifth Generation Systems (504/291-7221). Infosphere has sold Liaison to Farallon and plans to release a final version of MacServe before discontinuing support for that network file server. Infosphere president and communications programmer extraordinaire Evan Solley will follow Liaison to become a Farallon employee. Peachtree Software, of Atlanta, Georgia, has acquired Layered Software. For more information call 404/564-5700. ■

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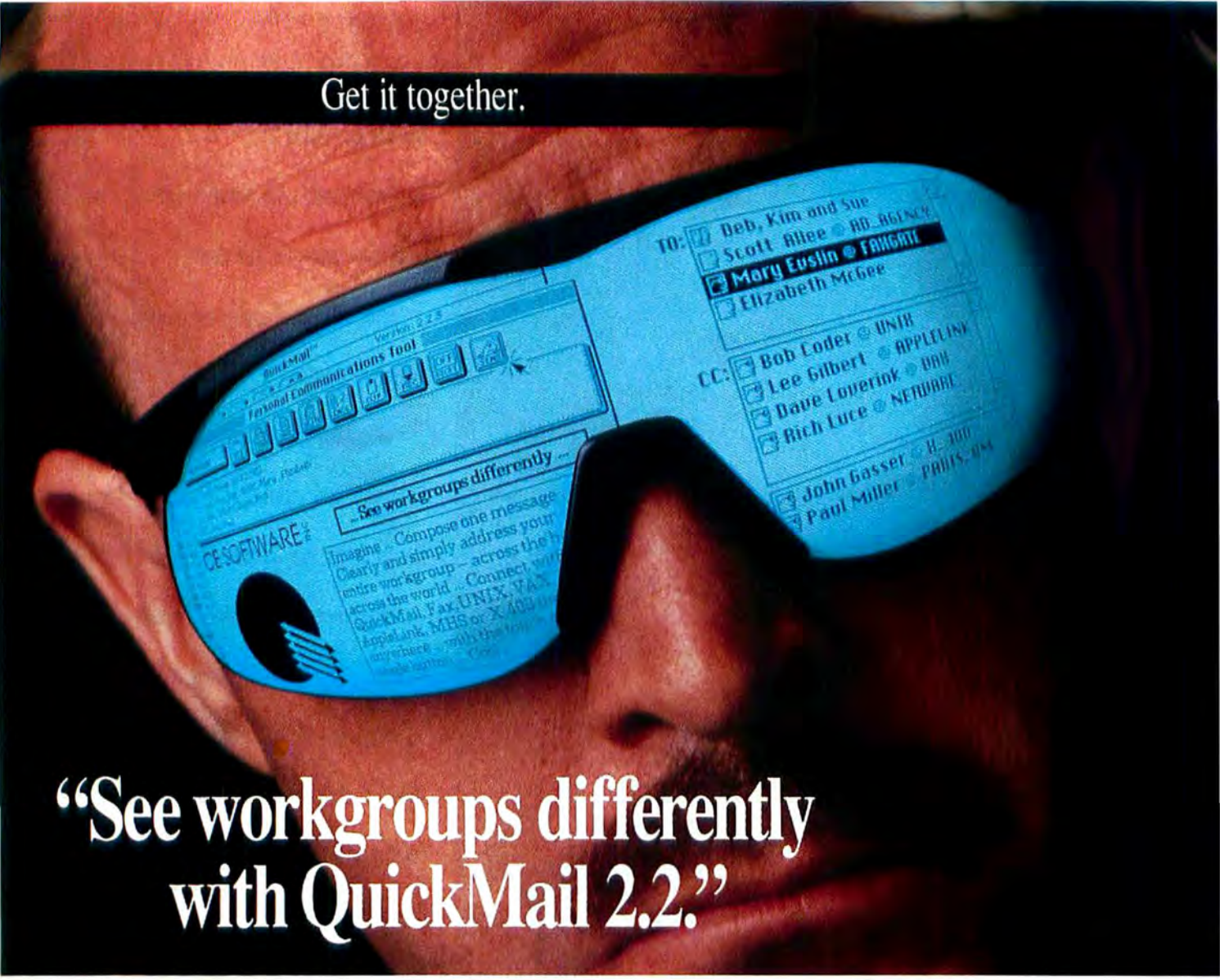

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Can America Compete in Asia?

A COMPUTER CALLED MACINTOSH SHOWS THAT AMERICA CAN STILL LEAD

BY JERRY BORRELL

We all hear or read about the problems the United States faces when it competes in the Japanese market: language barriers; cultural barriers; a closely held and inefficient distribution system and retail channel; copyright and patent problems; close ties between government and business, creating collusion that favors products manufactured in Japan; and a growing suspicion that the rigidly formal and frustrating ways of doing business in Japan are actually a smug clubbiness used to great advantage by Japanese businessmen.

Despite all that, Apple Computer and the Macintosh are succeeding in Japan. Apple has become one of Japan's five largest sellers of personal computers. This success comes in the wake of IBM's falling market share and unsuccessful efforts by Microsoft to make it there. Apple's success is largely due to insight shown in the Macintosh Operating System. The Mac's developers recognized the need to localize the Mac OS for local markets. Apple has improved the ability to localize over the last several years with the ability to modify the Mac OS for foreign character sets. There are other factors such as prescient international marketing, and the establishment of subsidiaries in foreign countries, but it is truly astonishing that Apple has been so successful in Japan over the past year.

Which brings me to the question of whether or not Apple can succeed in other Asian markets. On recent visits to our sister publications in China and Taiwan I have come to understand something more of how Apple's overall strategy will take it into the 1990s. Taiwan is the most computerized market in Asia (outside Japan), while China is the most populous market in Asia. Taiwan has a population of about 20 million people and about 1 million computers. About 10,000 of these are Macintoshes. China's latest census is due later this year, and the population of the country—which has 500,000 personal computers—is expected to pass the 1.1 billion mark. About 2000 of these computers are Macintoshes. How does Apple fare in these two countries and what problems does it face?

AP/WIDE WORLD

Charlie Chang, editor-in-chief of *PC World Taiwan* (standing), watches as Jeff Wu, of the Taiwan AppleCenter, demonstrates PageMaker for Jerry Borrell.

Little Trouble in Big China

Why isn't the Mac doing better in China? Part of the sad truth is that China is not what economists call an industrialized economy. Rather it is industrializing, a step above the ethnocentric sobriquet of Third World. And as such China discourages the import of foreign manufactured goods. When I asked why there aren't more Macs in China, my Chinese colleagues raised their brows and exclaimed that "Apple won't sell its technology," a not-unfamiliar refrain. But in this case I thought of my conversations with Mike Spindler, Apple's COO and former president of Apple International. Spindler expressed to me Apple's dislike for selling the ability to manufacture its products to Third World countries. To paraphrase his answer, "If we sell

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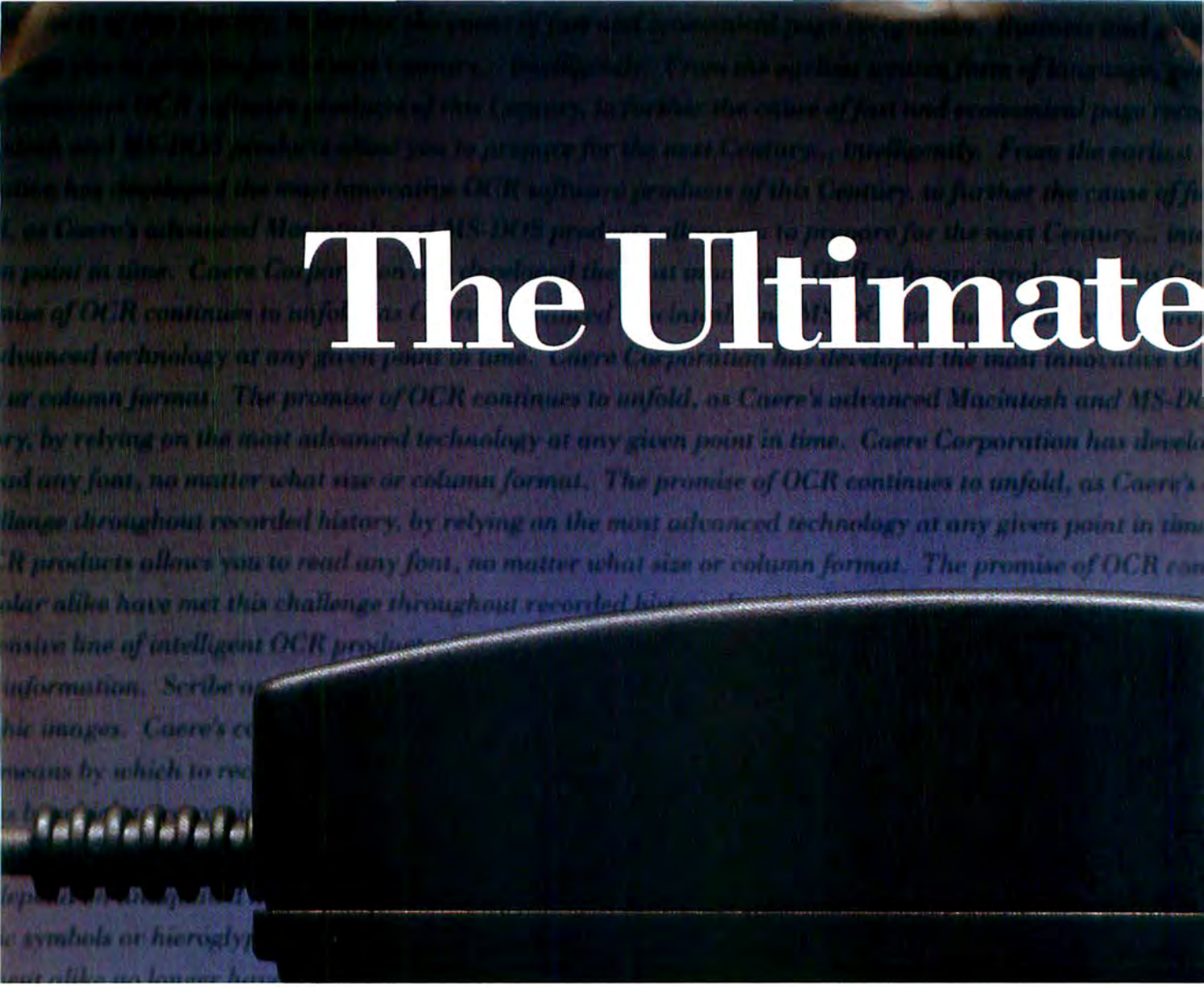

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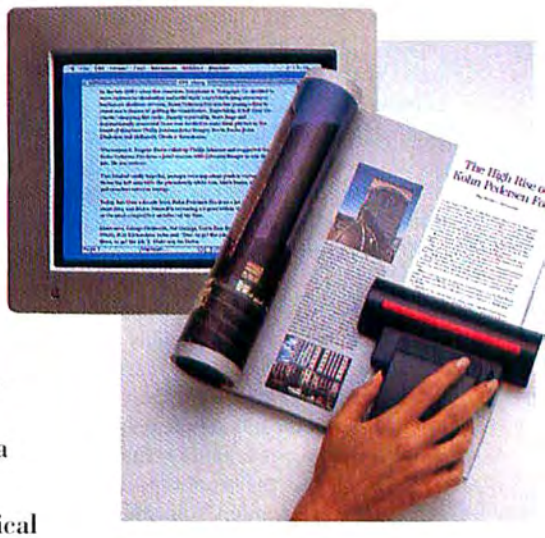

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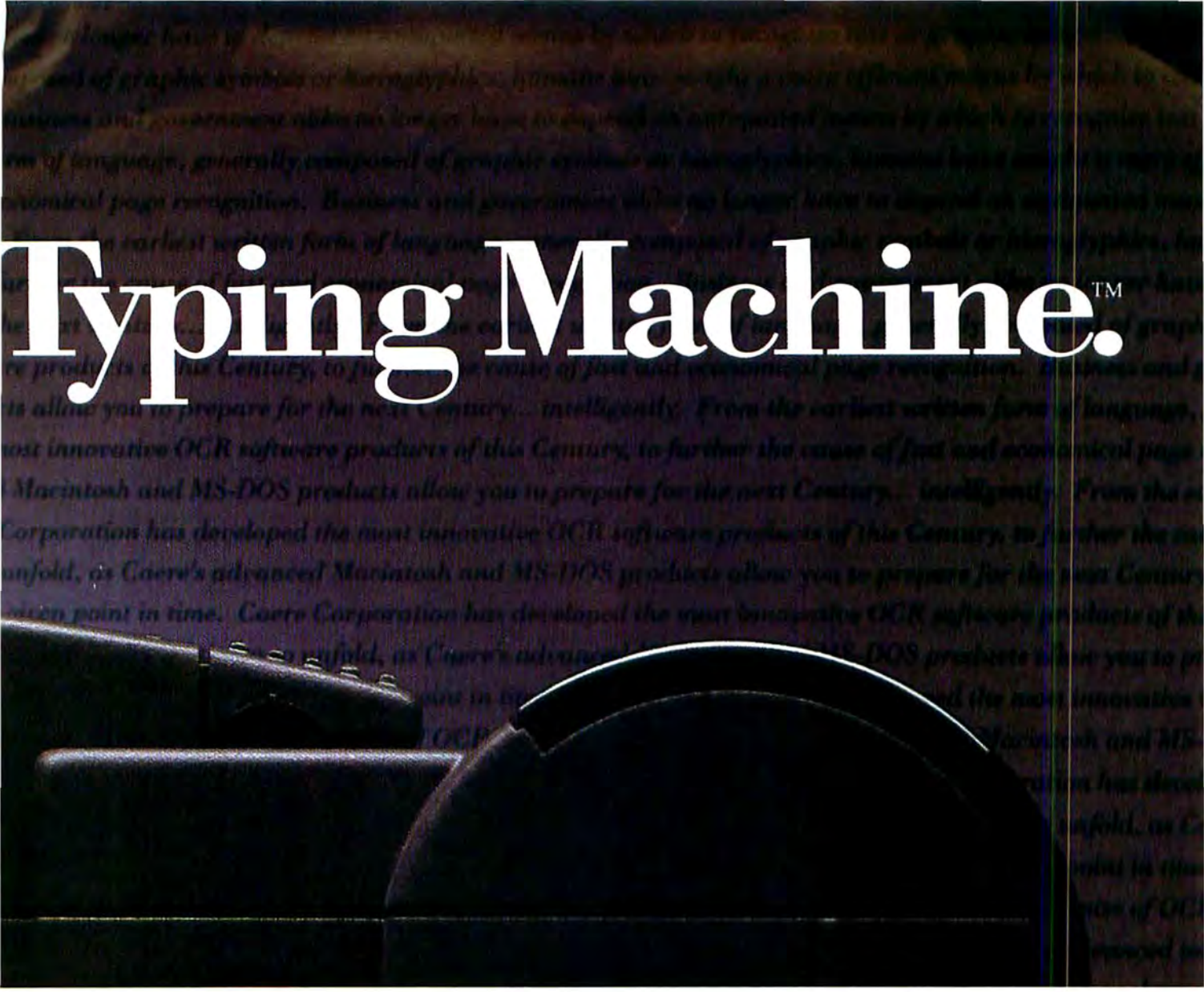

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to them they are likely to use our technology for reexporting our products to other countries and end up competing with us in other markets." It seems an overstatement in the case of China, but indeed, possible.

So to understand why PCs outnumber Macs I went computer shopping in Beijing. Tang Baoxing, the editor-in-chief of *Computerworld China,* and I trudged along in the heat and dust of a hot July day, visiting one store after another.

The first place we visited, the Computing Technology Corporation of the Institute of Computing Technology, sold AST, Compaq, and Chinese-produced IBM-clone computers. Most of the 30-odd computers in the store were being used. We asked for a demonstration and were shown a locally developed Chinese word processor, written for DOS. It was connected to a Canon laser printer and I was dutifully shown a copy of a laser-printed document. I looked at a nearby computer, saw the familiar English language of DOS, and typed in a few commands. Syntax error. Yep. It was DOS. "What about that one?" I asked, pointing to a machine connected to a 19-inch Moniterm portrait monitor. That machine was running Windows 2.0 for desktop publishing. And there, in fact, was PageMaker. I asked about fonts and graphics—there are four of the former and none of the latter. I was shown another laser-printed sheet as proof that desktop publishing exists.

Next we were off to Legend and Stone, which together with Great Wall are the three leading computer producers in China. Stone's origin lay in its development of a board set for DOS computers that allows these machines to convert ASCII Latin characters into Chinese characters. The boards also support several input techniques that allow Chinese characters to be created with English-language keyboards. (I was also surprised to learn that proficient typists can enter Chinese characters faster on an English-language keyboard than an English-speaking typist can enter English words—a statement often repeated to me.) No mean feat—opening up the Chinese market to most English-language applications. Then it struck me that this is exactly what ChinaTalk, the Chinese-language version of the Mac OS, does for the Macintosh. So again, why isn't the Mac successful here?

Low-Cost Macs?

Price leapt to mind. Macs face a host of issues that make their cost higher abroad than when sold in the United States. These include freight (they are not assembled in host countries), localization, production of collateral sales and advertising materials, support of local Apple staff or Apple dealers, import taxes, higher cost of distribution due to smaller local markets, and the need to make a profit. So I asked what a Legend clone with DOS would cost. The answer, to my surprise, was about 10 percent higher than the price for a Compaq computer in Stone's own store! The reason is that despite production of its own PC clone, in reality Stone is assembling parts imported from Japan, Taiwan, or Hong Kong. Most buyers in the Chinese market are universities or government agencies required to buy the higher priced local computers.

Software might be a factor for the popularity of DOS machines, but the selection of documentation and software for PC clones I saw in stores was dismal. There were perhaps 50 different products, a large portion of which were translations of operating system information and languages and Microsoft and Ashton-Tate applications. Not really compelling reasons to buy PCs or clones (yes, I know I'm biased).

Then it occurred to me that sheer momentum might be the crucial factor. PCs were sold there years before the Mac and they've made the most progress, as in another industrializing economy, that of the USSR. But in the Soviet Union, government and business alike are shedding their PCs for the Mac as fast as possible because of the need for non-Latin characters. I heard no such sentiment in China. In the end I thought that the strongest reason for a general attitude of ignorance about the Mac is more due to the oldest PC user syndrome—"Hey, I've invested a lot in setting up my PC, don't screw with it or me no matter how much better your computer solution is supposed to be."

(continues)

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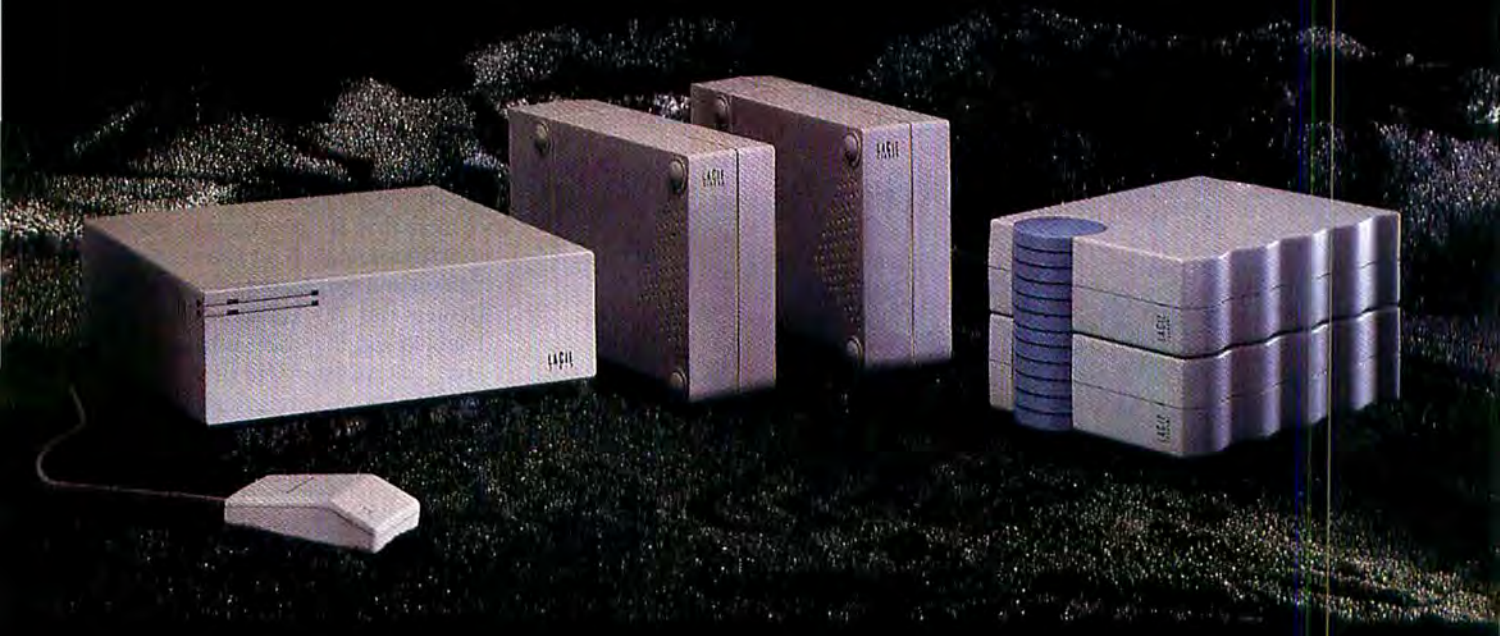

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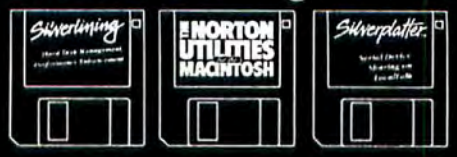

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Apple itself admits that the company has been slow to go after the Chinese market. Apple's first dealership and AppleCenter there opened just last year, only a week after the Tiananmen Square massacre. Operated by Atoztec, a Hong Kong–based distributor, the center was designed and built in Denmark, disassembled, shipped to Beijing, and reassembled. It is a remarkable effort comparable to any Western standard.

Tang of *Computerworld China* and I visited the AppleCenter for a demonstration of the newly announced Chinese version of PageMaker. IDG publishes *Computerworld China,* which at 64 pages per week is one of the largest publications in the country and the largest computer publication, with over 300,000 readers. For production, *Computerworld China* uses Aldus's Chinese version of PageMaker for the PC so I hoped for a knowledgeable review of the Mac version.

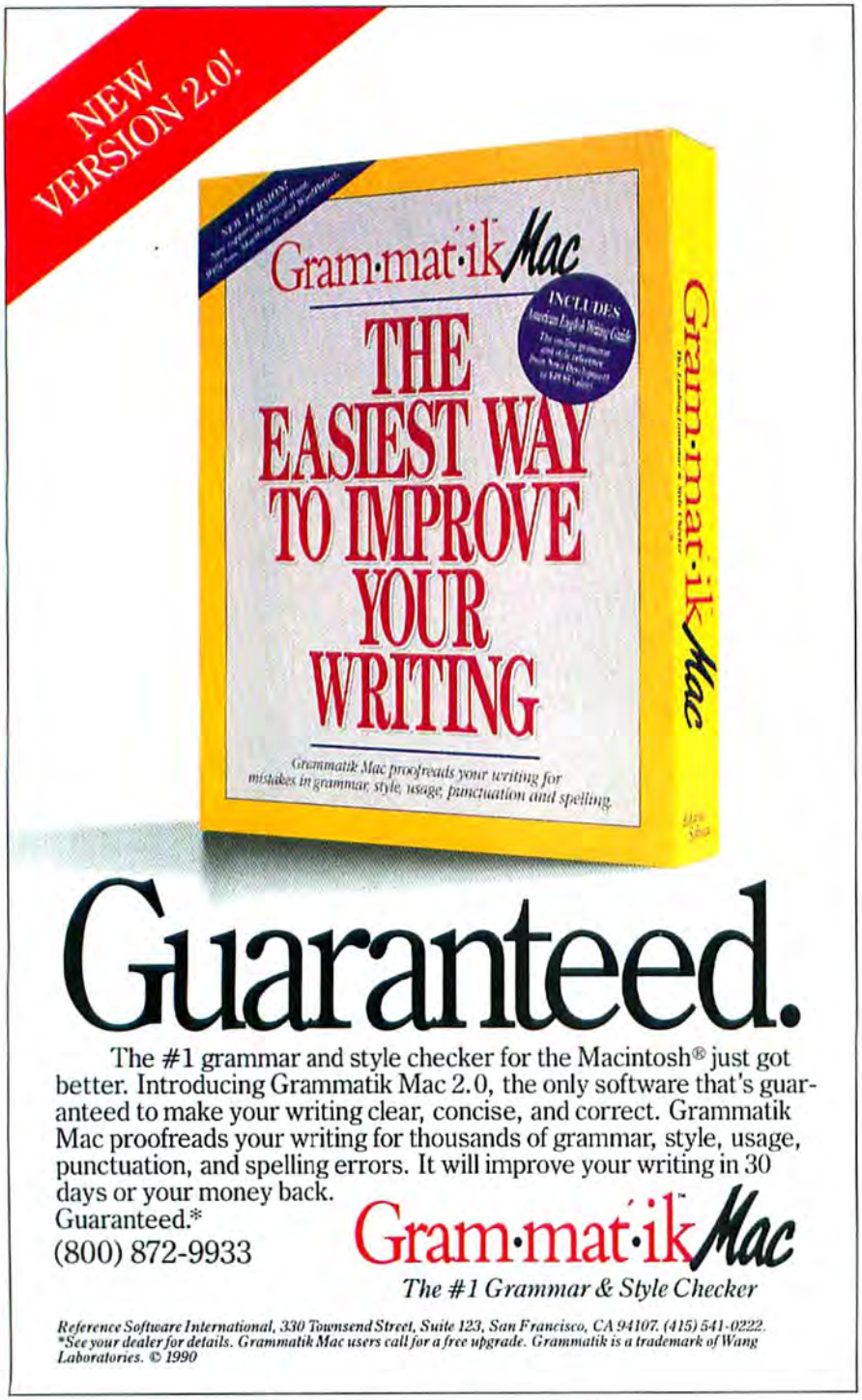
The overall response was . . . a yawn, I'm afraid. The Mac's advantages in color, speed, and graphics are not outstanding in a market where the country's largest daily newspaper costs about 2 cents. The Mac's faster processing of PostScript might be a factor, but to date there are no PostScript imagesetters in Beijing. At least none in what we call a service bureau that can be used by any client. *Computerworld China* is produced by photoenlarging PageMaker output from a laser printer and creating photographic plates for offset printing. That pretty much seals the case for DTP on the Mac at present.

Taiwan

Taiwan is both similar to and different from the Chinese market. It's a much bigger market, dominated by PC clones with names like ACER and Mitac. But in Taiwan Apple has a 10-year history of selling computers and a base of more than 500,000 Apple IIs, mostly in schools. Apple has eight dealers in Taiwan and two sparkling new AppleCenters with Apple's latest hardware. I should add that there is (like in Beijing) a dismal shortage of third-party software in the AppleCenters. Claris products and an ancient copy of WriteNow were visible on the shelf in Taipei, actually more products than were in the Beijing center. AppleCenters are, after all, showcases for Apple, not third parties.

When I remarked about the notable absence of Microsoft software in both centers I was told a remarkable story about a historic visit by Bill Gates to the Far East to make a speech at a major computer conference. At that conference, I was told, Bill asked the major software companies when Microsoft would be receiving royalty payments for all of the copies of the DOS operating system they were selling. A not-unreasonable question. To which the average reply was, "Isn't he an arrogant SOB to affront us in our own country in this manner?" Ah, the inscrutable East. Microsoft, it appears,

(continues)



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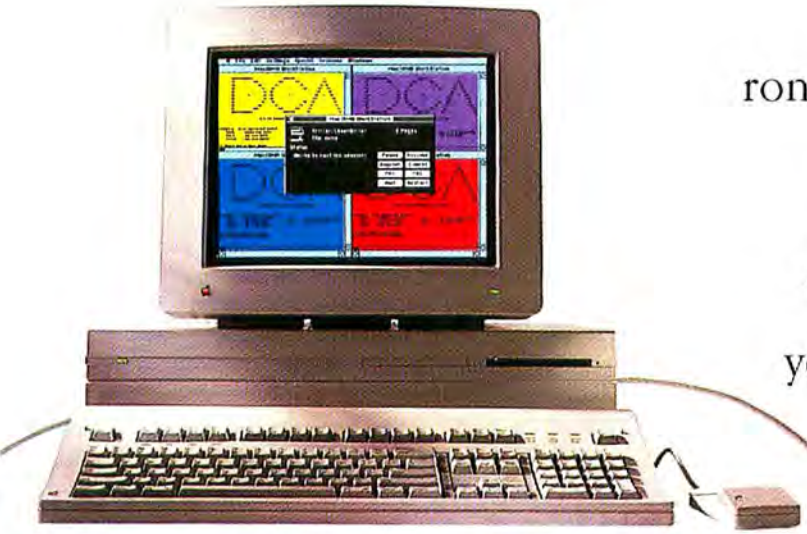

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has not been proactive in having its applications translated into Chinese, due, I assume, to this lack of enlightened attitudes with regard to the principle of copyright.

In determining Apple's success in Taiwan, the largest factors appear to be aggressive marketing, the need for a cost-competitive Mac (note how I avoid mentioning Apple's upcoming low-cost machine), and the need for localization of more applications.

The Character Conundrum

The issue of representing Chinese characters is often discussed, although, as I pointed out, the keyboard-entry issue appears less important than I thought. The need to develop Korean, Chinese, and Japanese character sets is also problematic. One problem I was not aware of is the fact that Taiwan and Hong Kong use traditional Chinese characters (14,000 or so) while China has shifted to a simpler, modern character set of some 7000 characters. Aldus's Chinese version of PageMaker for Taiwan is yet to be released, for example, so the market is complicated in ways I had not foreseen. Still, Taiwan appears to be a market where Apple will do well.

The company even appears to have the illegal clone market under control. Akkord, the company said to have reverse engineered the Mac's ROMs (but never proved to have done so), has become a much more benign reseller of Mac Portables that use ROM chips from 512KEs and Mac Pluses. If Apple can get something more on the dealer shelves than MacroMind Director it will be a leader.

Can Apple Compete? Claris Holds An Answer.

Apple can, and clearly will, more effectively compete. It has localized the Mac OS for Korea (HangulTalk), Thailand (ThaiTalk), China (ChinaTalk), Pakistan (UrduTalk), and India (Devanagari). Its upcoming low-cost machines will effectively open the Third World market to the company. Its new regional headquarters in Hong Kong for China and the rest of Asia is growing (Japan is a separate market from the rest of Asia and has its own headquarters). Apple's biggest problem (outside of broader local economic issues) appears to be a lack of localized application software. There is little incentive for Apple's third-party developers to make the expensive investment in these developing markets.

So if I were a planner at Apple, I would be thinking of how I could insure that demonstration applications for the Macintosh such as MacPaint, MacDraw, Claris CAD, MacWrite, and so forth would be localized for international markets. It seems clear to me in hindsight that in large part the move to return Claris to Apple has been done to help Apple compete in world markets where only Apple is in a position to compete. By that interpretation, Apple is planning to do what no other American personal computer manufacturer has been able to do in international markets—make the United States a global leader. M

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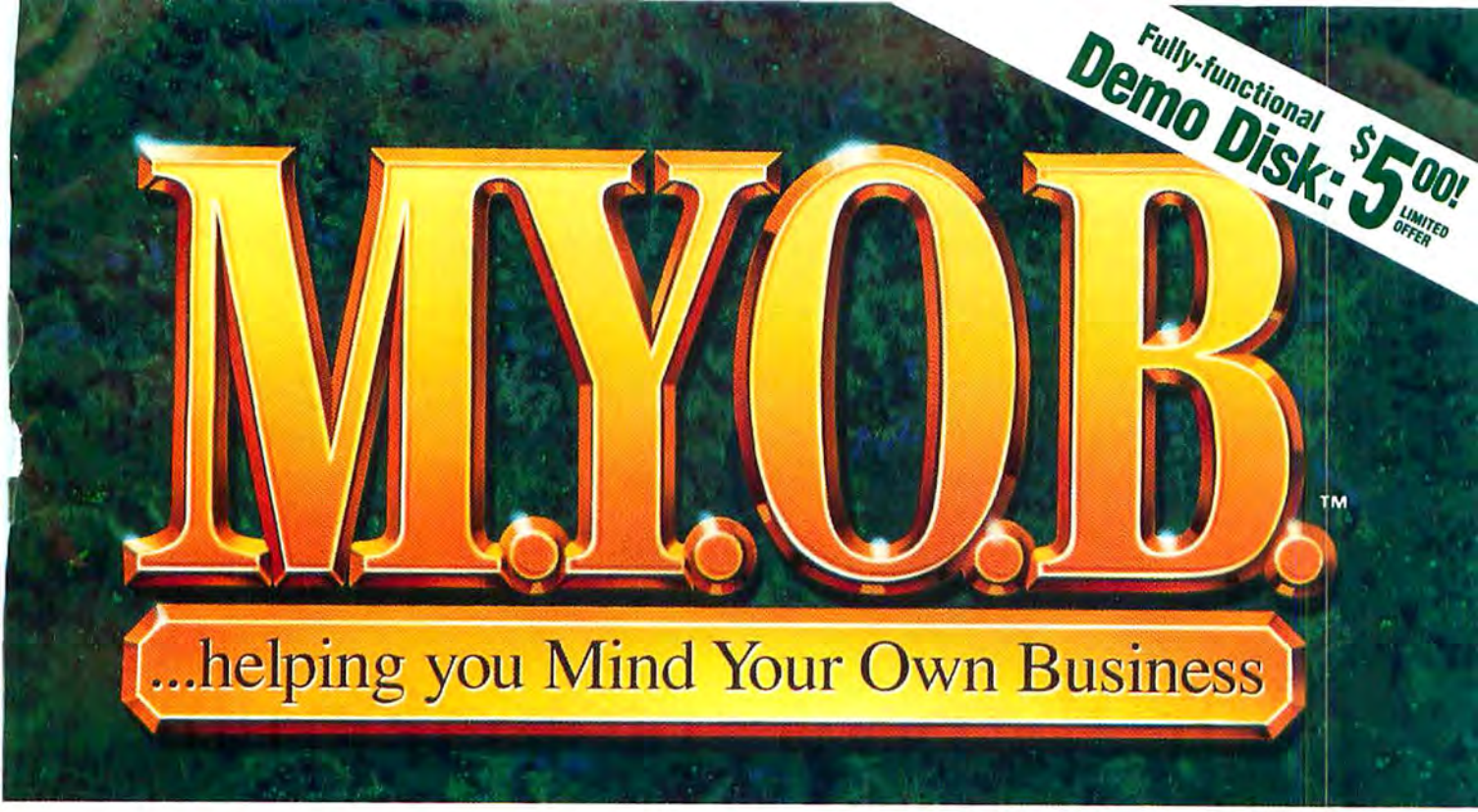

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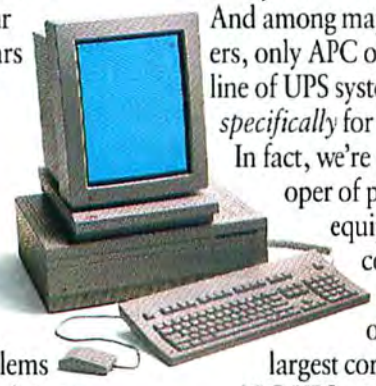

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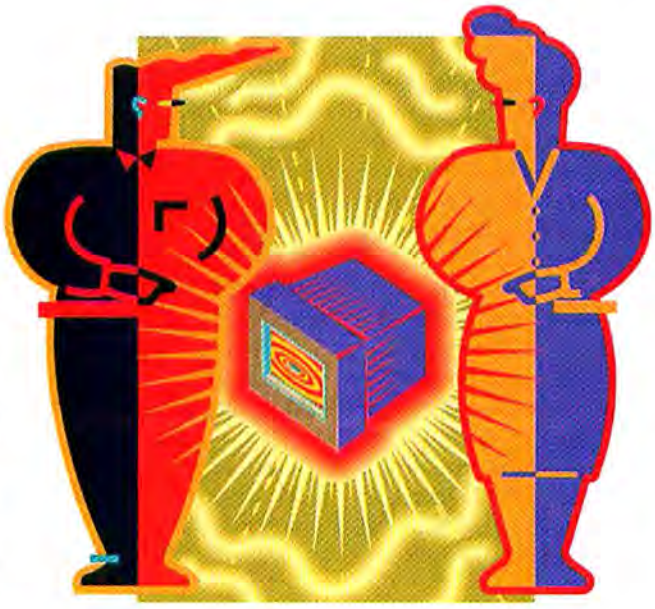

Monitoring Emissions

Your article "The Magnetic-Field Menace" [July 1990] was well researched, evenhanded, and contained much-needed information that has been lacking in the media.

We can expect to receive the usual denials and disclaimers from computer manufacturers. They will tell us that there is no conclusive "proof" of any connection between magnetic-field radiation and certain illnesses, and they will discount or ignore studies that establish strong statistical links between the two.

Do the same problems apply to television sets? While my computer screen is dimmed—either using the hardware dimmer or a screen saver—is the magnetic-field radiation level the same as when it's not dimmed?

Kenneth J. Cohen
Toronto, Canada

Televisions, like most computer monitors, contain cathode-ray tubes (CRTs) that emit low-frequency electromagnetic fields. Computer monitors are considered a greater health hazard because users generally sit closer to the screen. In tests conducted at *Macworld*, dimming the computer screen did not mitigate the emissions.—Ed.

Alarmist Views

You have used *Macworld* to communicate unreasonably alarmist views. The cover of your July issue pictured—atop a VDT—the universal symbol for ionizing radiation, an explicitly illegal use where nonionizing radiation is present. Don't you or your invited expert know the difference? Why doesn't the author discuss exposure of the public to the electric and magnetic fields around electric razors, hair dryers, and electric blankets? Should medicine abandon magnetic resonance imaging (where the fields are measured in gauss, not milligauss)?

I suspect Brodeur's epidemiology is more hazardous than the electromagnetic fields around any computer.

David E. Drum, M.D.
Department of Radiology
Harvard Medical School
Boston, Massachusetts

Our July cover art included the symbols for ionizing radiation and toxic waste to support our belief that monitor emissions should be viewed with the same degree of seriousness as established health hazards. In his books and his series of articles for the *New Yorker*, Paul Brodeur details the possible dangers inherent in all appliances run with 60Hz electric power; at our request, Brodeur focused on CRT monitors. Other sources of emissions—such as high-power lines and magnetic resonance imaging—may produce fields more intense than those generated by computer monitors, but until comprehensive research proves otherwise, we cannot assume that exposure to any emission level is innocuous.—Ed.

ELF Power Frequency Meter

In "The Magnetic-Field Menace," you mentioned a piece of test equipment used to measure ELF—a Holaday HI-3600-02 ELF/Power Frequency EMF Survey Meter. We would like to run some tests of our own but cannot locate this

(continues)

Corrections

In the sidebar "Speed Tests: IIfx at a Blur" ("Power at a Price," May 1990), SuperMac's Spectrum/24 with Graphics Accelerator should have read ColorCard/24 with Graphics Accelerator. The video board tests (page 289) should have been conducted in 24-bit, not 8-bit mode. SuperMac did not claim superior speed in 8-bit mode.

Survivor Software's MacMoney allows multiple bank accounts, credit cards, and cash categories for a complete accounting system ("Automating Your Small Business," May 1990).

RagTime was developed by B&E Software (Reviews, *August 1990). RagTime USA markets the program in the United States and Canada; MacVonk publishes and markets it elsewhere.*

The correct phone number for TeleTypesetting, maker of T-Script, is 617/734-9700 (New Products, *August 1990).*

The file-transfer utility Mac-to-Mac is manufactured by Caravelle Networks Corporation ("File Services," August 1990).

Upbeat 2.01 and Jam Factory (Reviews, *August 1990) are now available from Dr. T's Music Software, 617/244-6954.*

HyperCard can print mailing labels ("Rolodex Roll Call" table, Roll Over Rolodex, *May 1990).*

STEVE LYONS

type of equipment from any of our normal vendor channels. Could you help us to locate Holaday or another vendor that markets a similar device?

Paul H. Mitchell
Pitney Bowes
Shelton, Connecticut

The following vendors sell meters for measuring low-frequency electromagnetic emissions:

- Combinova AB, Ergonomics Inc. (U.S. agent), P.O. Box 964, Southampton, PA 18966; 215/357-5124.
- Electric Field Measurements, P.O. Box 326, Rte. 183, West Stockbridge, MA 01266; 413/637-1929.
- Holaday Industries, Inc., 14825 Martin Dr., Eden Prairie, MN 55344; 612/934-4920.
- Safe Computing, 368 Hillside Ave., Needham, MA 02194; 617/444-7778, 800/222-3003. —Ed.

Do Monitor Filters Work?

Paul Brodeur states in "The Magnetic-Field Menace" that both extremely-low-frequency (ELF) and very-low-frequency (VLF) electromagnetic waves penetrate everything. On your back cover, Kensington Microware advertises a monitor filter that it claims will filter out ELF and VLF radiation as well as dissipate static. Have these claims been confirmed? If the filter does work, could internal shielding to eliminate ELF and VLF emissions be installed without interfering with the monitor's performance?

Is *Macworld* going to do similar tests of other monitors and print the results?

Can it be assumed that monitors with higher scan rates (70Hz or greater) will always have a larger electromagnetic field?

Joseph F. Reinke
Mounds View, Minnesota

Screen filters do shield against static and electric fields but not against magnetic fields in the ELF or VLF ranges discussed in Brodeur's article. (For a thorough discussion of the claims made by screen-filter makers, see *Conspicuous Consumer*, July 1990.) Higher scan rates generally do increase field intensity, but because component placement within the monitor casing greatly affects emissions, there are exceptions. We do plan to publish emission levels for other monitors in future articles. Our recent test subjects included a number of IBM, Compaq, and NEC models for which we measured ELF levels comparable to those emitted by Macintosh monitors. No Macintosh monitors currently reduce ELF magnetic-field emissions, although several vendors are working on designs for such products, including Sigma Designs, which recently began selling monitors for both Macs and IBM compatibles that it claims will meet the VLF emissions standards set in Sweden. Sigma expects to introduce low-VLF and low-ELF monochrome and gray-scale monitors in the first quarter of 1991.—Ed.

Shielding Against Emissions

What was clearly intended to be a comprehensive analysis of emissions from various displays and the potential risks involved has several important flaws:

1. The range of emissions—both electric and magnetic—emitted by a display is enormous, with vastly differing waveforms and power levels, and is not simply limited to the ELF and

(continues)

THE BEGINNING OF SWIVELIZATION.

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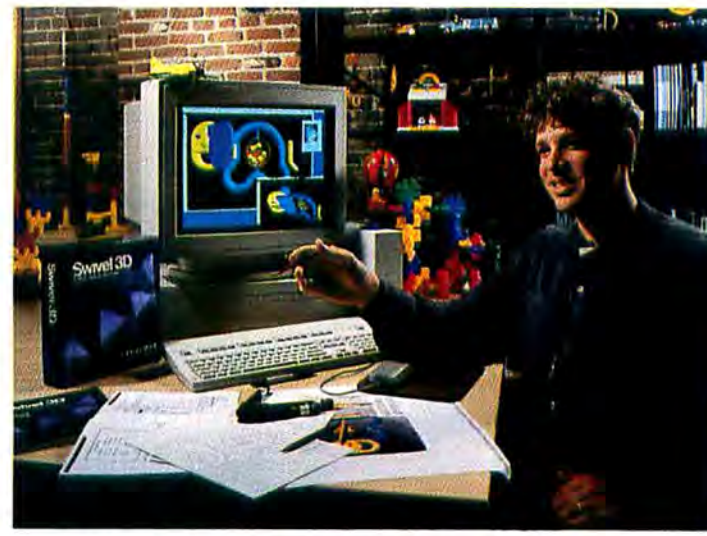

Swivel 3D, the award-winning 3D graphics program, helped Dan Klitsner from Klitsner design land a major project with Discovery Toys. His ideas were quickly brought to life on the Macintosh and ready for his clients to view. Using Swivel 3D, Dan built a working model of the rattle that behaved just like the final product. Convincing each department was easy– marketing understood how to sell the product, engineering saw how the parts would fit together and move, and the product development team was able to efficiently move the project along to completion. First conceived with Swivel 3D, the elephant rattle, named Tons of Fun®, became one of Discovery Toys' top-selling products.

PARACOMP 1725 Montgomery Street, 2nd Fl., San Francisco, CA 94111
Tel: 415-956-4091 x100 Fax: 415-956-9525

Requirements: Apple® Macintosh® personal computers. Min. 1 meg. Swivel 3D is a trademark of Young Harvill/VPL Research, Inc. ©1990 Paracomp., Inc. All rights reserved.

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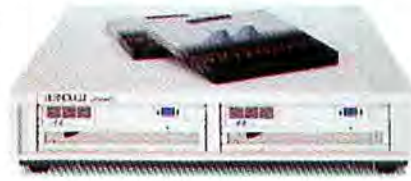

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VLF frequency bands. The test equipment used by *Macworld* is wholly inadequate to accurately characterize these emissions or to judge the ability of a radiation shield to block them.

2. Your commentary "Is Your Computer Killing You?," the sidebar "Rating Radiation Screens" [*Conspicuous Consumer*], and the article by Paul Brodeur appear to take the position that the electromagnetic radiation issue is restricted to the ELF range of frequencies and limited to the magnetic fields of that narrow range. Substantial research has implicated a wide range of frequencies, waveforms, and power levels with health risks of various types. Given the complexity of the issues and the uncertainty of the data, NoRad's view is that all nonionizing radiation is suspect, and exposure should be reduced or avoided. The existing NoRad shield does protect against magnetic fields at higher frequencies. It has been tested and shown to attenuate at a rate greater than 50 percent above 30kHz. No other product provides any protection against magnetic fields.

Michael Hiles
NoRad Corporation
Santa Monica, California

The weight of the literature implicating 60Hz magnetic fields demands that we emphasize these emissions. As verified by an outside testing facility, our test results are accurate for ELF magnetic-field emission levels.—Ed.

Health and Profits

Thank you for the excellent exposé of the radiation hazards produced by computer monitors. As you state in your editorial ["Is Your Computer Killing You?," *Commentary*, July 1990], corporations would be better off in the long run to take the potential health risks associated with ELF and VLF radiation seriously. Although manufacturers' short-term profits may be squeezed by developing and implementing new cathode-ray-tube technology that is safer to users, long-term profits and public relations will be greatly enhanced.

As you indicate, class-action suits are often the result when manufacturers become aware of health hazards but do nothing to protect consumers or users from those dangers. Such suits, which may drag on for years in the courts on appeal, seriously undermine public confidence in the manufacturers and drain corporate earnings. As with most large businesses, management would be wise to realize that environmental and health concerns are not contrary to profits and growth.

Mark Ottenad
Assistant Editor, Legal Publications
Oregon Supreme Court of Appeals
Salem, Oregon

Write Your Representative

Despite *Macworld*'s excellent coverage of ELF and VLF problems, this is an issue that will remain esoteric to most people, even those directly affected by it. Thus, I strongly suggest that *Macworld* readers take the first step by making sure the

(continues)

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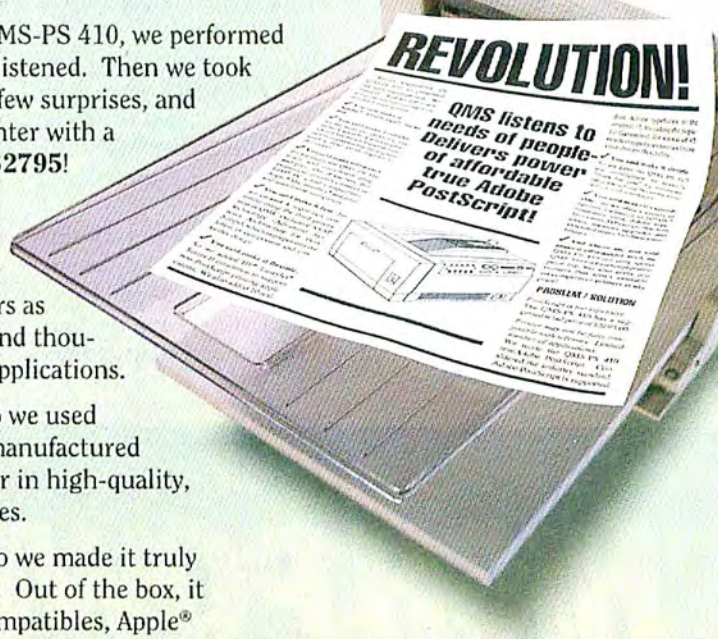

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Circle 104 on reader service card

right people start hearing the proverbial squeaky wheel. Unfortunately, unlike consumers who are dissatisfied with their credit cards, it would be a little too expensive for Macintosh users to cut up their computers and mail them back to Apple. Believe me, as one who knows from experience, legislators are influenced by their mail, and if they suddenly get a deluge of letters asking for action to protect computer consumers, somebody will at least get around to forming a committee or drafting legislation.

Be clever: write your congressional representative with pen and paper, saying it's too dangerous to use your word processor, and that you wish they'd do something about it. If you are too busy, just clip this letter and send it with your name and address and a note about how you feel something should be done to make computers safer to use. Getting the gears moving requires a mighty push sometimes, and we might as well start shoving here.

John C. Towler, Jr.
Computer Director/Legislative Assistant
U.S. House of Representatives
Washington, D.C.

Emissions and Data Security

We read with interest Jerry Borrell's column on health hazards associated with VDTs. As the leading independent manufacturer of Tempest equipment for government and the aerospace industry, we are well aware of hazards not only to human health, but also to the health of organizations that stand to lose significant data from compromising emanations associated with computer equipment.

Phillip C. Thomas
Steven R. Lewis
Mitek Systems
San Diego, California

The Evidence Is Lacking

We were extremely dismayed to see the sensational and often poorly supported claims that appeared in both Paul Brodeur's article and your editorial. The horrific statements that low-level electromagnetic fields (EMFs) are linked to several forms of cancer and birth defects are simply not proven. Nor is there evidence to support a conspiracy between government, scientists, and computer manufacturers for the purpose of suppressing information about these hazards. Publishing such statements leads to unwarranted public concern, and even panic, about the use of VDTs and personal computers.

While some effects have clearly been demonstrated in laboratory animals or in vitro under specific conditions, what implications these have for humans, *if* any, are very unclear. Anyone who smokes tobacco while worrying that his VDT is giving him cancer is clearly worrying about the wrong thing.

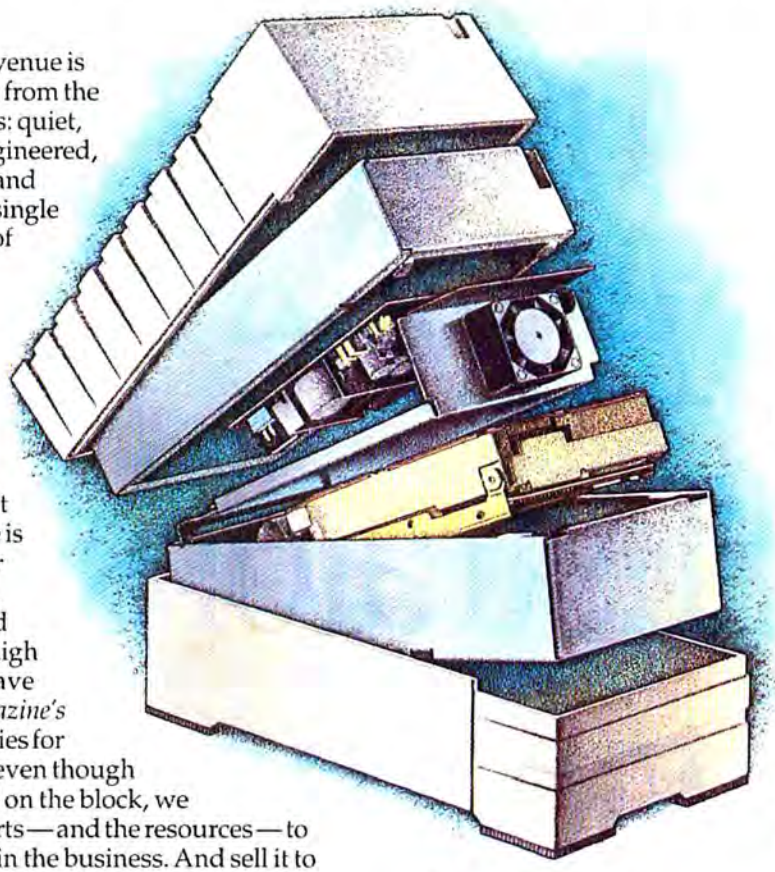
Your recommendations to increase one's distance from any VDT to an arm's length from the front and four feet from the back and sides are probably reasonable. In addition, it would be prudent for manufacturers to pursue efforts to reduce EMF

(continues)

Circle 315 on reader service card.

How The New Kid On The Block Made The Best Drive In The Business

The Protegé from MacAvenue is everything you'd expect from the best drive in the business: quiet, cool, quick, elegantly engineered, tough enough to travel, and priced to move. But the single most important feature of this handsome little box has more to do with its ancestry than with its aggressive price.



The Protegé hard drive features an out-standing pedigree. That's because the parent company of MacAvenue is CompuAdd, a computer industry leader in value, performance, service and support. CompuAdd's high quality and low prices have made it one of *INC. Magazine's* fastest-growing companies for three years running. So even though MacAvenue is a new kid on the block, we showed up with the smarts—and the resources—to build you the best drive in the business. And sell it to you for the best price on the market.

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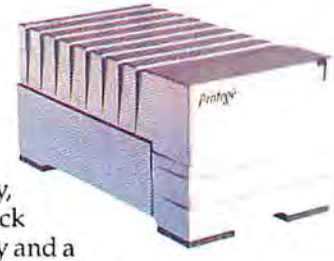
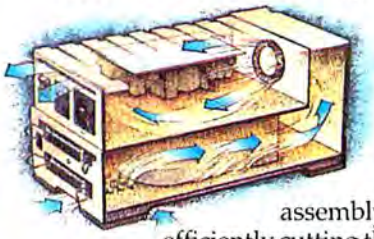
Your MacAvenue Protegé is the only drive on the market to come bundled with On Location, the amazing file-finding utility that will search your entire hard disk and find a lost file in seconds. Just type in a file name or even a few words within the file. On Location does the rest. This utility was created by Mitch Kapor, developer of Lotus 1-2-3. ***A $129.95 value.***



Here's how the Protegé will turn you on:



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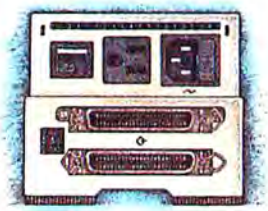

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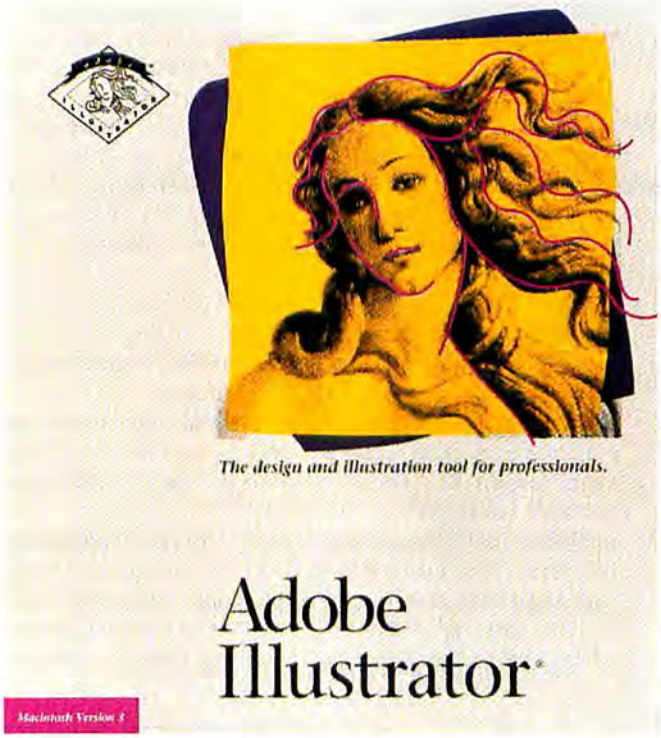

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emissions, in the event that more solid evidence of deleterious effects is discovered.

Before any of your readers consider trashing their monitors or picketing Apple's headquarters with copies of Brodeur's book *Currents of Death* taped to their signs, we strongly recommend they read two less inflammatory publications on the subject of EMFs. One is M. Granger Morgan's review of Brodeur's book in the April 1990 issue of *Scientific American*, and the other is *Biological Effects of Power Frequency Electric and Magnetic Fields*, published by the Office of Technology Assessment, U.S. Congress, May 1989 (OTA-BP-E-53).

David R. Arday, M.D., M.P.H.
Susan L. Arday, M.H.S.
Stone Mountain, Georgia

In the Policy Implications section of its *Biological Effects of Power Frequency Electric and Magnetic Fields*, the Office of Technology Assessment found that "it is now clear that 60Hz and other low-frequency electromagnetic fields can interact with individual cells and organs to produce biological changes . . . the implications of these interactions for public health remain unclear but *there are legitimate reasons for concern*" (our emphasis).—Ed.

The Politics of Science

As a planner and moderator of last November's Health Risks of Computers conference at MIT, I have seen few in the press—beyond Louis Slesin (he publishes *VDT News*, which has been targeting EMF problems for many years) and Paul Brodeur—willing to admit that we may in fact have a chilling problem.

One clear example of science bending to industry politics was "hit man" M. Granger Morgan's 6-page denial of Paul Brodeur's book. James Ledbetter, writing in the *Village Voice* ("Media Blitz: Currents of Death," June 5, 1990), points out that *Scientific American* neglected to inform its readers that Morgan is on the payroll of the Electric Power Research Institute (EPRI), one of the historic dike builders of EMF hazard containment.

Despite the containment policy, the issue has flared among the "great unwashed." One example is the public forum "Computers: Do They Cause Cancer?" that the Public Health Department of Brookline, Massachusetts, plans to hold on October 16, 1990.

Harris Barron
Brookline Village, Massachusetts

In addition, a recent Environmental Protection Agency draft report on the potential hazards of electromagnetic fields found that "there is reason to believe that the finding of carcinogenicity in humans is biologically plausible."—Ed.

. . . . . .

Letters should be mailed to *Letters, Macworld*, 501 Second St., San Francisco, CA 94107, or sent electronically to CompuServe (70370,702) or MCI Mail (294-8078). Include a return address. We regret that, due to the high volume of mail received, we're unable to respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of *Macworld*.

"1989 Best Word Processor" MacUser U.K.

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A & M RECORDS              LOS ANGELES    CA90028   2134480037C365200275
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The sample above shows fixed length fields and fixed length records that are common in some mainframe files. That means you can not simply tell your conversion program to drop in tab or comma delimited spaces at the end of the text in each field. For most programs converting this would be complete chaos. And that's without eliminating the duplications and extracting just the information you want.

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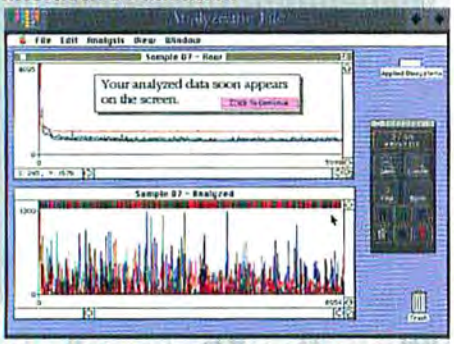

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ART BEAT

by Cathy Abes

The tools and the talent behind Macworld's graphics and the techniques that make them possible

Artist: "For me, Photoshop is a great tool," says Erik Adigard, of the San Francisco–based graphic design firm M.A.D. "I like to create a visual language that combines photography with the boldness of graphic symbols," he says, "and that's what Photoshop allows me to do."

Hardware: Mac II with 8MB RAM and 105MB internal hard drive; Barneyscan slide scanner; a SyQuest 45MB removable-cartridge hard disk (one cartridge was used to store the raw elements of the illustration; another was used to build up the different segments of the illustration).

Software: Adobe Photoshop; Adobe Illustrator 88.

How It Was Done: In creating the illustration that opens our feature "Mac Art Mart" on page 194, Adigard found his greatest challenge was building and manipulating a very large file.

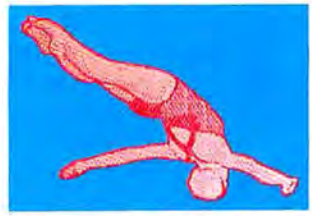
"It was critical to design the piece in fragments so that I could work on files of manageable size," he explains, "performing complex operations that would have taken much longer on a 16-megabyte file." For the background alone, he had to create four distinct sections: the left and right sides, the top, and the bottom—each taking up between 3MB and 6MB.

Adigard compiled most of the clip art for his illustration—about 25 separate images—from collections contained in *Canned Art* (Peachpit Press, 1990), a compilation of Macintosh clip art by *Macworld* contributing editor Erfert Fenton, who also wrote the feature. "There is not one clip art image in the illustration that has not been altered," he says. He began by altering the images he used for the background, Illustrator patterns that he resized and imported into Photoshop; once they were in Photoshop, he stretched them and altered the line weight.

Still in Photoshop, Adigard created separate files for the window image and all the elements that were to go inside the window, including the checkerboard.

(continues)

The clip art image of the diver in its original Illustrator 88 form.



The image as it looked after the artist added color and thickened the body's outline in Photoshop.

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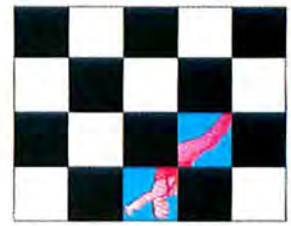


This is how the diver looked after it was pasted into two squares of the black-and-white checkerboard and its shape had been stretched to completely fill both squares.

The checkerboard after all the images were pasted into the squares and all the colors had been added.

Adigard made good use of Photoshop's ability to select by color. Because the checkerboard was made up of black squares and white squares—two colors he purposely avoided using anywhere else in the illustration—he could select the squares in which he planned to paste the images by specifying either black or white areas. Then, once he had pasted in a particular image, he could change it as often as he liked.

One of those images was the figure of a diver, a black-and-white Illustrator 88 file he imported into RGB format in Photoshop. Adigard wanted to create a gradient of dark to light pink for the white pixels, and he decided that the quickest method was to fill the entire area with a transparent overlay. To do this, he selected, copied, and pasted the body (which placed a copy directly on top of the original). After choosing Paste Control (from the Edit menu), he selected Darken Only, which filled the copy with a transparent gradation.

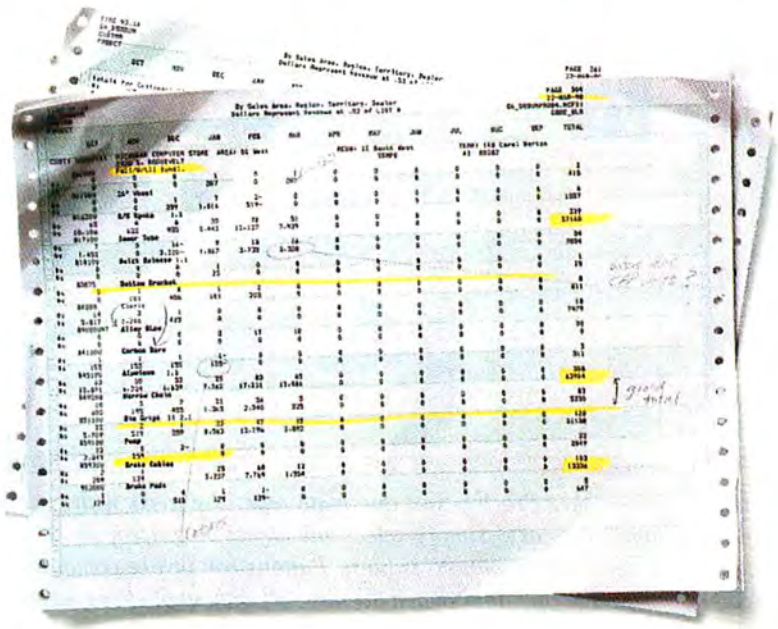
Next Adigard selected all the black pixels in the figure and changed them to red. To thicken the outline of the body, he selected the outline and used the Fringe command to make it 2 pixels wide.

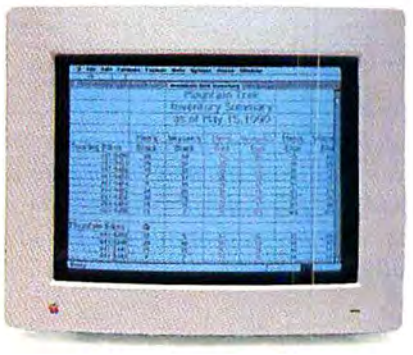
To bring the image of the diver into the black-and-white checkerboard *background*, the artist copied the diver and pasted it into two squares he had just selected. Then he stretched the image of the diver to make it fill both squares from corner to corner. To create the dotted lines around the squares, he typed a column of capital *i*'s, copied it, and pasted it on every vertical line. Then, to form the horizontal lines, he rotated one of the vertical lines 90 degrees and repeated the copy-and-paste process.

Adigard fine-tuned the colors of the images within the squares, lightening the colors and reducing their saturation, to get a more subdued appearance. Then he made a gradation for the checkerboard by creating an overlay going from white to black. Using Paste Control, he selected Lighten Only with an opacity of 66 percent. Finally, after specifying a perspective view for the checkerboard, he imported it into the window image.

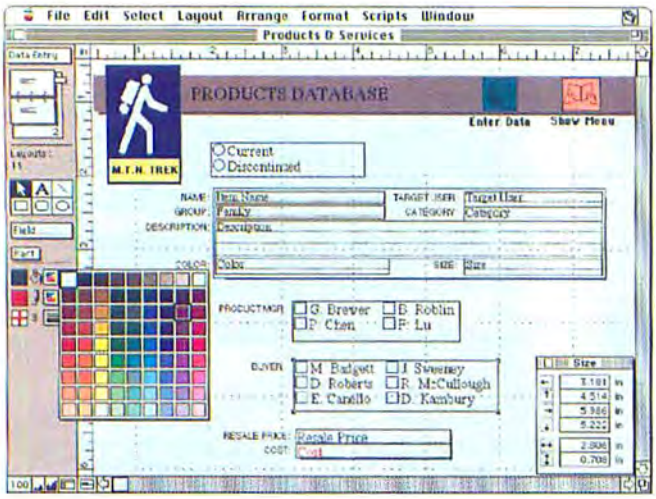
The final illustration after the artist fine-tuned the colors, created the dotted lines, and added gradation and perspective.

You can't always choose the data you have to manage.

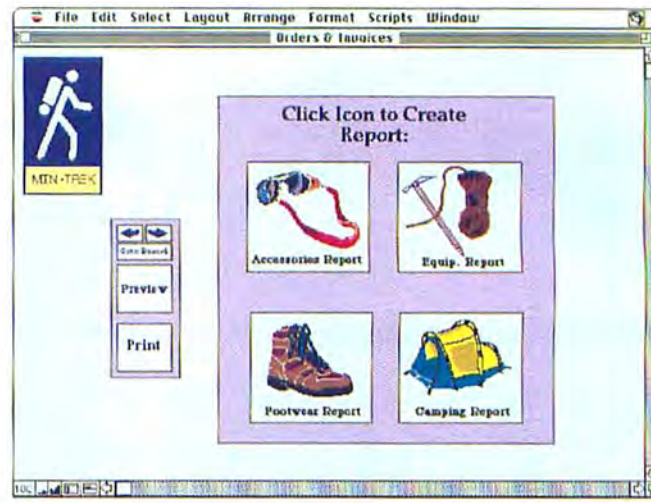




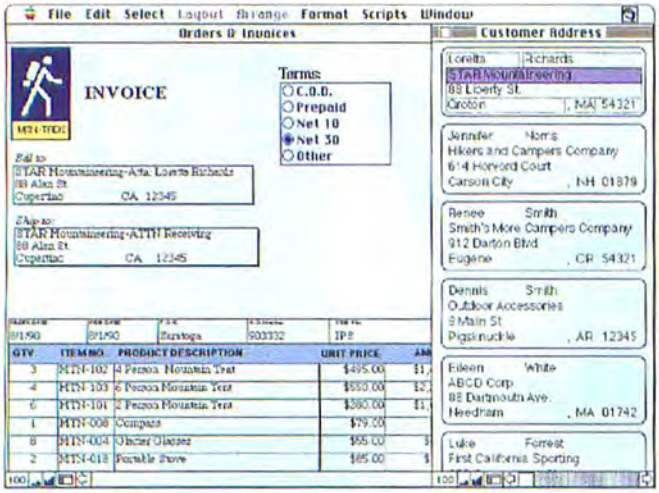
But you can choose how to manage it.



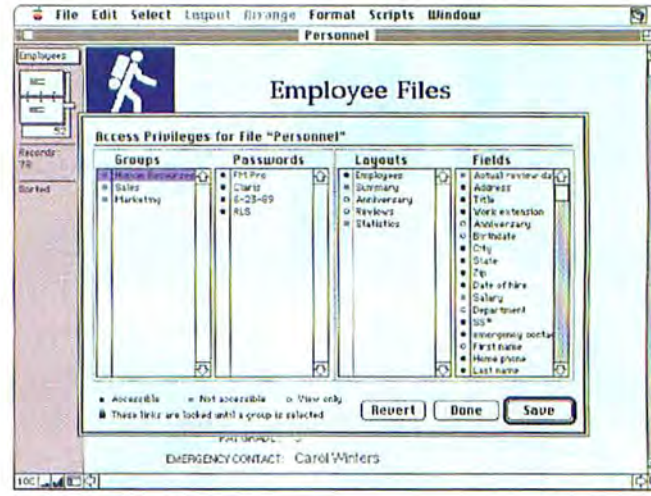
FileMaker® Pro software includes sophisticated drawing tools so you can create layouts in any form you choose. Pop-up menus, radio buttons and checkboxes make entering data fast and accurate. And a full palette of colors helps people vividly see your thoughts.



FileMaker Pro lets you automate repetitive tasks with "buttons." It's easy. Simply select any object or graphic on the screen and a "button" is born. Buttons can invoke commands, trigger scripts, and switch layouts—all without plodding through a programming language.



Multiple-file lookups let you relate data. For example, when you want your monthly invoices to each show customer address, FileMaker Pro looks at the customer name, searches the customer address file and fills in each address for you—all automatically.



You can share files on a network and control exactly who sees what on their screen. For example, if you want to share the hire date of an employee, but not his salary, simply check the appropriate boxes in the access dialog box. The hire date field will be shown. The salary field will not. Security is this simple.

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Your job demands information, not data. FileMaker Pro includes a range of calculation functions: It turns raw data into business information. And with MacDraw®-based tools built in, you can display this information on the page any way you want.

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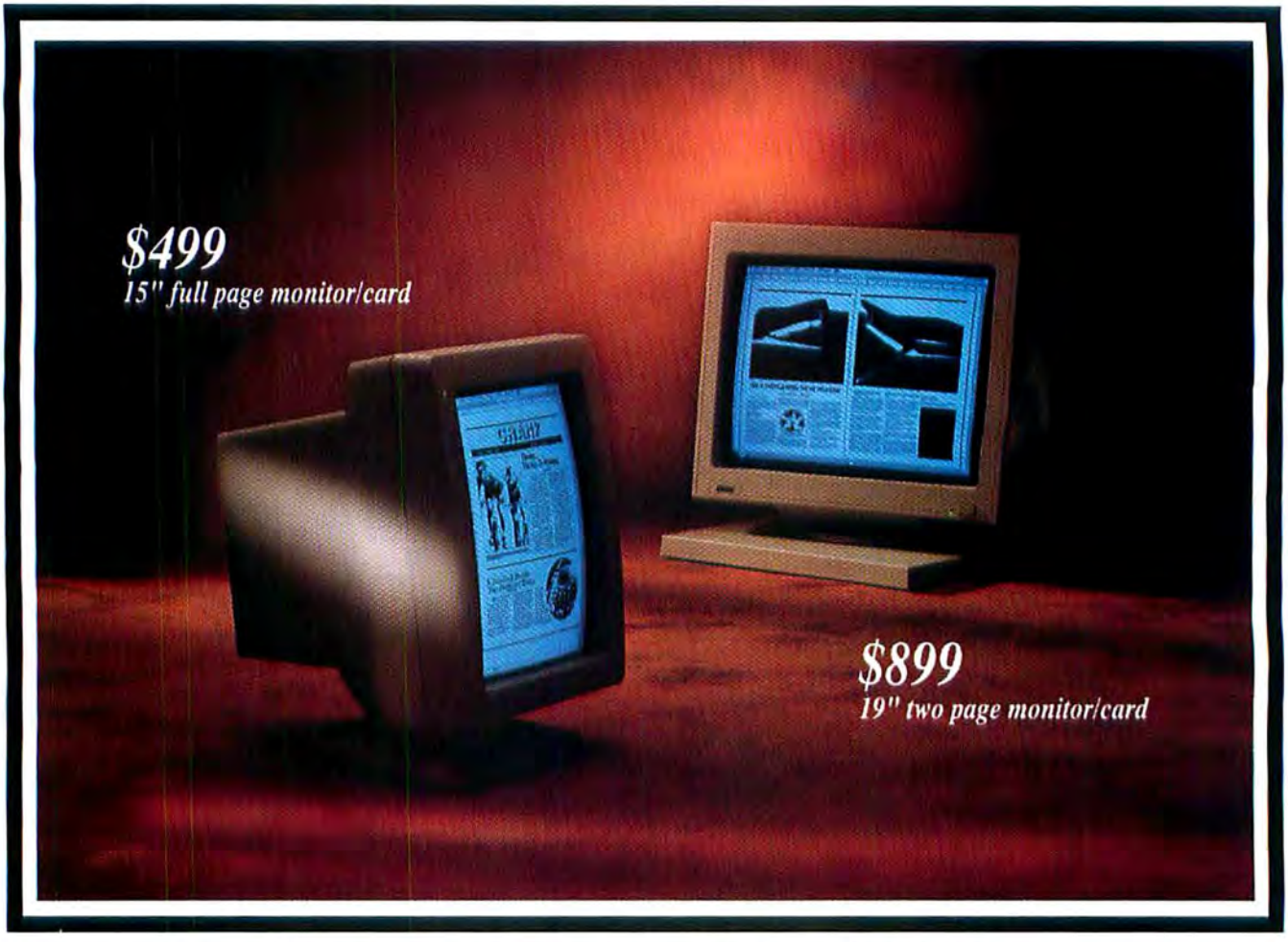

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Mitch's Manifesto

ONE MAN'S CRUSADE TO REHABILITATE SOFTWARE DESIGN

BY STEVEN LEVY

Ask Mitch Kapor who his role models are, and he pauses momentarily. Then comes a cascade of luminaries, delivered in what must be ascending order. There is Doug Engelbart, Thomas Edison, Martin Luther King Jr., and Mahatma Gandhi.

The first two are relatively predictable: a pioneer in congenial computer interfaces and a dreamy, wildly successful inventor and entrepreneur. Quite fitting for the fellow who devised software's biggest hit, Lotus 1-2-3. But the next two—activists and martyrs who stood up for the oppressed—hint at another side of Mitch Kapor. The crusader.

Both sides were available for study at the Macworld Expo last spring. As head of a young software company, On Technology, he was hawking a new product. But he was also doing something rather unusual for an industry figure of his stature—booth duty. This is the task at a computer show requiring one to be positioned beside the computer screen, navigating through a product's alleged high points, belittling the significance of program crashes, promising features that will appear in the next release, and subtly disparaging the feature set of competing products. All the superstars of personal computers have done it at one time or another. But at a certain point of celebrity and wealth, they usually retreat to private offices and hospitality suites.

NANCY PAYNTER

For Kapor, though, bumping heads with Joe and Jane User is important. This developer has noted their suffering, has felt it keenly himself. He insists, in fact, that about once a week some variety of disaster erupts while he is dispatching his own computer tasks—and he must stifle the urge to toss the marvelous device out the window. The problem, he's concluded, is not in our hardware, but in ourselves: specifically, the computer industry's patent disregard for real people. Thus his current crusade: the need for intelligent software design. All right, Martin Luther King Jr. and the Mahatma had juicier complaints. But Kapor has a point. Bad software design can't kill, but it can waste your time, or lay waste to your work.

"Nobody wants to talk about it," he says, "but the fact is that the average person who uses a computer sees a lot of negative components in the process. It's the secret shame of computers." The first part of the statement is not entirely accurate—after all, Mitch Kapor wants to talk about it and in fact chose to give the keynote address at the Macworld Expo doing just that. It was not the first time he delivered this particular message, which is evolving into a stump speech of sorts. Kapor calls it a Software Manifesto.

Though it is a serious talk, there is something delicious about it. Here is Mitch Kapor, a millionaire many times over from people buying his software, standing up before a group of computer people and saying things like, "It's not that programs are poorly designed—it's that they are not designed at all."

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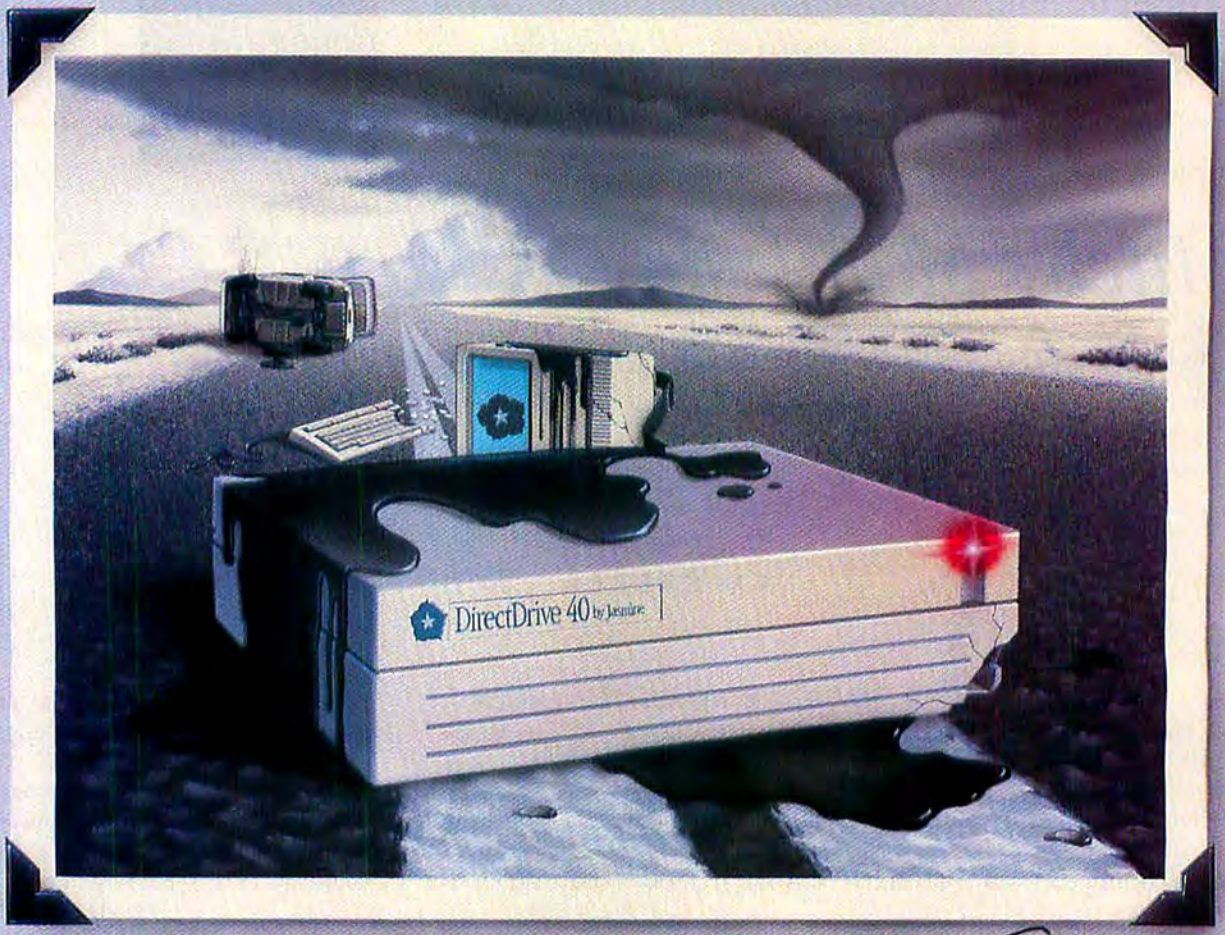

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After I was released from the Hospital, my wife and I went to the Police Station where some "valuables" had been rescued from the disaster scene. There was my Macintosh SE with its Jasmine drive. The hardware was in sad shape; the front SE surface was bashed in, there was a big piece missing from the Jasmine Drive, and both were coated with a mixture of motor oil, antifreeze and water. The insurance company agreed that it was a total loss. But, realizing that the damage was finite, I began cleaning and straightening out everything. I jokingly powered up—IT WORKED! The bashed-in Jasmine drive booted the straightened out SE giving me a happy Mac, displaying the partitioned icons and sat there waiting! The clock was even right! So far, the drive has yet to fail.

I'm writing this letter (on the Jasmine drive) of appreciation to all of you in hope that you will be as pleased as I am that your products survived the forces of a major tornado that was blowing manhole covers around like frisbees. I don't have the foggiest idea where the drive ended up, but judging from all the junk coating it, it must have been found under one of the piles of destroyed cars.

In summary: the car was totalled, I was almost totalled, but the Jasmine drive made it O.K. Congratulations on making some darn good stuff. I plan to take the scarred hardware to work and continue to use it there as a reminder of one of the positive aspects of that unfortunate experience.

Sincerely,

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"Products come out with hundreds of features," Kapor notes. "Thousands! And people wind up using only six or seven." It isn't only a problem of interfaces, either. "The interface is overrated," he asserts. "Some great-looking programs are terrible—it's like sticking a wonderful dashboard on a lousy car."

Things won't change until software is not merely produced, but also *designed*. "Design is a perspective, a sensibility," he says. "It's complementary to engineering." Kapor refers back to the Romans, citing Vitruvius, apparently the Thomas Hoving of his day, who figured out that well-designed objects should have firmness, commodity, and delight. If you apply these virtues to software applications, that means that (1) it shouldn't crash, (2) you shouldn't have to be a wirehead to use it, and (3) every so often you should say, "Gee, this program actually did what I wanted it to do! And now I find out that it does something else neat that's really useful that I never would have thought of asking for."

We as users have a right to those three factors in our software, according to Kapor. Now, how do we get them? That's the hard part. "I'm not necessarily an optimist on this," Kapor told me. "I think there's a prolonged struggle to come. I'm not sure we'll win."

Complications by Design

Kapor's efforts come at an interesting time in the history of Macintosh software development. The Mac Operating System has long been celebrated as a boon to good software design. In effect, a lot of decisions formerly left to individual program crafters were transformed into no-brainers. The default answer was "do it the Mac way," with the familiar windows and dialog boxes and other standard fare. That's why a lot of Macintosh programs seem to look alike, and also why a lot of them are so intuitive to those already familiar with the interface.

But in the past few years, as programs take on more features, the Mac platform has been creaking somewhat. In a digital form of the football violation of piling on, formerly elegant programs have become Byzantine. Your average word processor or spreadsheet now is called upon to perform multiple functions. Look at the latest version of Wingz, or Nisus, or MicroPhone—you'll find more menu items there than on restaurant row in Chinatown. A prime example of this problem was version 2.0 of the outline processor More. That incarnation does many more things than outline—you can even try to use it to craft sophisticated presentations—but if all you want to do is make a nice outline, you're fishing for trout with a nuclear submarine.

Charlie Jackson, president of Silicon Beach Software, is among those who have grappled with these issues. It's not just a matter of eschewing change, he explains, because every few months or so a new competitor runs an advertisement that pits its program against yours, boasting more features—as if that really made a program more useful. If you don't fight back and add those dubious features, and figure out new, maybe even more bizarre features to throw in, you'll lose the war of the comparison charts, Jackson says.

On the other hand, Jackson feels that adding complications to, say, a once-elegant program like SuperPaint can diminish the zeal of loyal users. Version 2.0 of that best-seller added many goodies, but at the price of simplicity. So in an upcoming release of the program, Jackson intends to return to the basics, hoping that users will respond positively to a simpler, more intuitive interface—and something less than a gaudy blizzard of new features. He admits that ducking out of the feature wars is a gamble, "but supposedly this is what people want. We're eager to see the results of giving them what they want."

If the marketplace responds, perhaps that will send a message to developers. But Mitch Kapor has some more immediate ideas for fomenting change. He has teamed with another respected software guru, Andrew Singer of Radius, as cohost of the online Software Design Conference. Among topics discussed on that private conference are plans for a professional organization of designers, but the subjects cover a gamut of issues,

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from whether nonprogrammers should be actively involved in design, to an ongoing consideration of the best tools for software development. As with many online conferences, however, the signal-to-noise ratio is annoyingly high; there are endless flames on arcane software-development projects, and rhapsodic paeans to the design brilliance of Braun coffee makers. "It's an endlessly discursive cocktail party, but it's producing a lot of raw material," Kapor contends. (If you are on The WELL, where the conference is located, and feel qualified to participate, send Kapor an E-mail telling him your interest and he will consider you for inclusion.) Also in tandem with Singer, Kapor is making an effort to convince the academic community that the study of software design should be treated as a discipline, granted the same institutional clout as, say, architecture.

And then there is Kapor's desire to instruct by example. Toward that end, Kapor has forwarded his own product, On Location, as an example of what software design can be; its very being is a kind of manifesto.

Is On Off?

As it turns out, taking a close look at On Location is indeed instructive, though not always in the way Kapor intends. It demonstrates how difficult it is to conceive and implement software design in the real world, where deadlines and economics elbow their way into the equation.

The product itself was born in an atmosphere of confusion at On Technology. Kapor originally founded the company in 1987 to develop an ambitious software platform, sort of a "system software for media," says Kapor, purposely vague on the specifics. "As a vision it was great," he says, "as a business strategy it was fatally flawed." As Kapor and his team got deeper into the development process, their goal became increasingly elusive. In other circumstances, investors in the company might have protested the lack of progress, but, Kapor says, "I took a gun to my investors," in effect telling them to bug off and leave him alone. Unwilling to second-guess the creator of Lotus, the investors unwisely backed off. It was not until Pearl Harbor Day, 1988, that Kapor realized that the project was hopeless, and as he puts it, "We executed it."

From the ashes came the humbler On Location, a utility designed to find files and, as the concept developed, to search the text within those files. (Kapor informs me that a larger, more significant project is in the works at On.) On Location's main selling point is its speed, accomplished by creating an index of all text on the disk, which remains resident on the disk. Indeed, the lightning quickness of the program—it starts finding files before you can finish typing the words you're searching for—single-handedly justifies On Location's street price of $85. It makes the program a joy to use, and I use it all the time.

Kapor's pursuit of design excellence led him to do some smart things in the development process. For instance, he made a habit of showing prototypes to potential users early on, when there was still time to incorporate significant changes. So when an executive at Boston's WGBH television station, which harbors 400 Macintoshes, complained that the installation process was frustratingly baroque, Kapor's programmers drastically simplified it, and now On Location is as easy to install as any other desk accessory.

Aesthetics aside, it's a dumb idea to tamper with the Mac's familiar look, which users rely upon and feel secure with

But there was an annoying flip side to this process. Perhaps because Kapor was self-consciously trying to satisfy some Roman concept of perfection, On Location sometimes sacrifices power for elegance, or even slickness.

A case in point is the unique look of the program. Unlike just about every other successful Macintosh program, On Location eschews the standard visual cues provided by Apple

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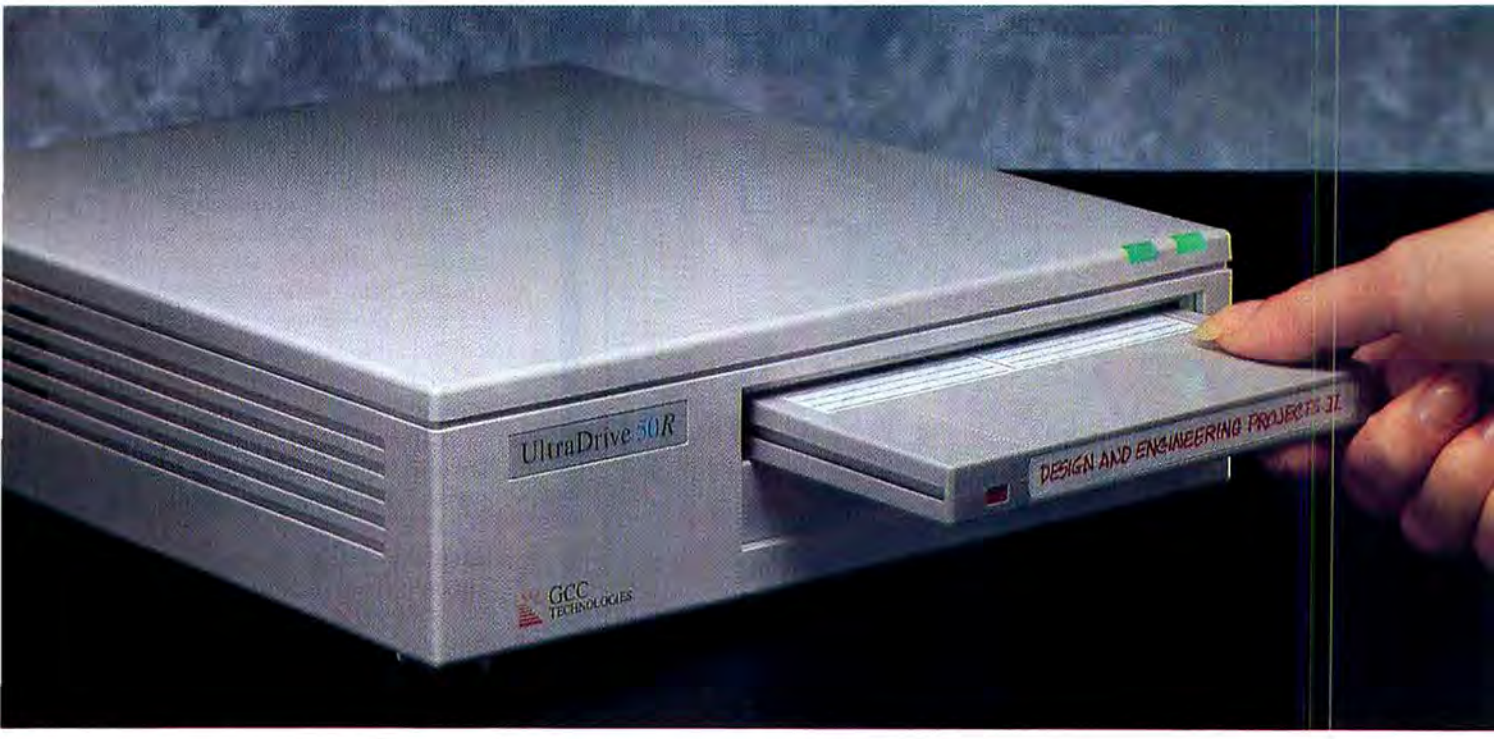

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Puts	02/23/89	100	$3.75	$211.25	$[illegible]	03/[illegible]/89	$[illegible]	$245.00	$48,565.00	$18,793.75
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Puts	02/21/90	100	$4.25	$226.25	$42,726.25	02/26/90	$2.94	$106.88	$29,108.13	($13,530.13)
Calls	03/16/90	100	$6.63	$297.50	$66,547.50	03/20/90	$10.00	$398.75	$99,601.25	$33,053.75
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Puts	04/19/90	100	$5.00	$248.75	$50,248.75	04/27/90	$10.00	$398.75	$99,601.25	$49,352.50
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Computer; instead, dialog boxes, sliders, and the like are redrawn with a faux three-dimensional look. It resembles a sixth-generation photocopy of the interface of the Next computer. Aesthetics aside, it's a dumb idea to tamper with the Mac's familiar look, which users rely upon and feel secure with. Kapor now admits that this variation was a mistake, and vows it will be purged in the next release.

How did it get there in the first place? "We thought that something visually distinctive would be an asset," he says, explaining that the inspiration for this screw-up came from a "naturally creative" guy who was in charge of the user interface—a guy who apparently felt compelled to be creative when simply doing nothing was the right thing to do. Kapor freely makes a remarkable admission here. "Actually, I felt all along that we shouldn't have done it," he says.

Naturally, I jump on Kapor for this. Weren't you the boss? Hadn't you proved yourself as someone who knew a few things about software design? Why didn't you put a stop to this artsy-fartsy miscue?

"I've always done things collaboratively," Kapor explains. "Lots of give and take—I see software design as more like what goes on between directors and cinematographers, who collaborate on the look-and-feel of the movie."

But the lesson here is not how team effort can help, but how seemingly unrelated considerations can undermine good design. To keep his group moving along happily, Kapor allowed a destructive element to creep into his software. And this cosmetic frill was no triviality: one potential customer, Liberty Mutual, told one of Kapor's salespeople that it would place a large order—if and only if that interface were changed.

An even more serious problem with On Location came directly from Kapor's urge to release a product with a clean design. While the program's major competitor, the desk accessory Gofer, allows you to search for text using powerful Boolean functions (like AND, OR, and NOT), On Location's searching tools are extremely limited. Recently I wanted to search for files

(continues)

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that mentioned something called the genetic algorithm. On Location found them, but also cited every file on my hard disk that included both words, even in cases where *genetic* was used on the first page and *algorithm* came 10 pages later. This is a result of Kapor's design concepts; specifically his intoxication by the simple-is-beautiful philosophy expressed in Donald A. Norman's *The Psychology of Everyday Things* (Basic Books, 1988). Under that spell, Kapor felt that introducing such complicated matters as Boolean searching would gum up the simplicity of his software. And as a result, "we probably cut a few features too many." That trusty panacea, the upcoming release, will remedy the problem, he promises.

Family Feud

You want to know why software design is hard? Remember that Mitch Kapor was hoping to make this product absolutely exemplary. He gave a lot of thought to good design and hoped to implement it every step of the way. Yet major changes have to be included in a second release. What hope does that give us that the vast majority of programs—with only a small fraction of thought given to design—will ever improve? Will we always want to throw our computers out the window? Will Kapor's efforts make a difference?

Some people are skeptical, and one software luminary even questions Kapor's motives.

"I heard him give his talk and didn't find it enlightening or inspiring," says Dave Winer, a Macintosh guru best known for ThinkTank and More, and Kapor's friend, kind of, since they both worked for Personal Software in the late seventies. Winer admits that he "tends to go negative" on Kapor; that he believes that after Lotus, Kapor has creatively gone to seed. "What's he done lately?" he asks. "If you want to have a league of software designers, fine—but I don't think Mitch Kapor would get in. The idea of a school for software design is great—if he did that and wasn't just on an ego trip, I'd support him. But I don't see any evidence of that."

One of the dirty chores of colum-

(continues)

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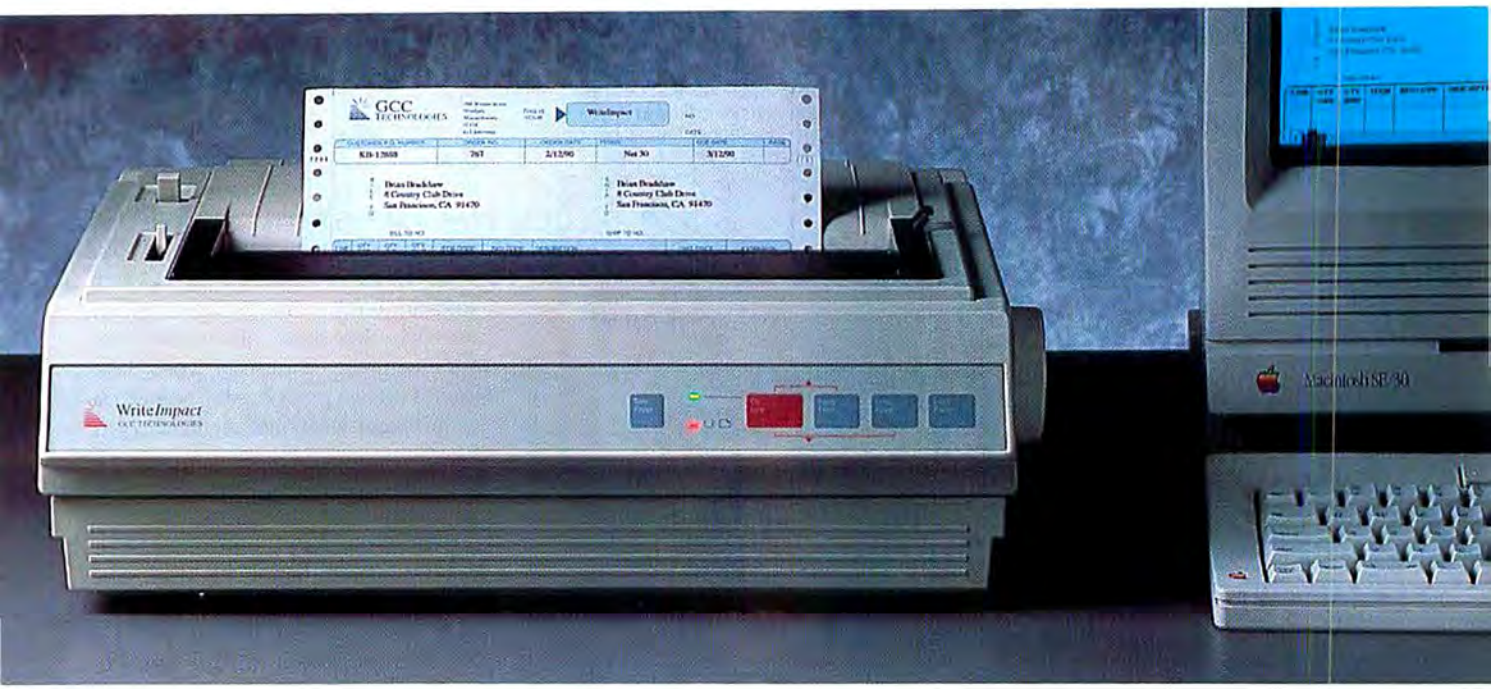

Finally there's a Macintosh® printer that works as hard as you do to stay ahead of the game. With the WriteImpact™ from GCC Technologies,™ you can focus more on your business and less on your paper work. That's because WriteImpact is designed to handle the tough work loads associated with printing payroll checks, labels, large client mailings, and multi-part forms such as invoices and statements.

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nists when they hear spirited invective like that is to solicit comment from the object of vituperation. Kapor was sanguine at first: "Dave likes to do this," he says, "act like my conscience when he thinks I'm getting ego-inflated." Are you? "Considering that this has been in the works less than six months, things are moving along quite nicely."

And then Kapor provides evidence: a major American institution known for its innovation in the arts has tentatively agreed to host an elite conference on the foundations of software design. It would bring together software creators with celebrated figures in other areas of design, from architecture to industrial work. If it comes off, we may one day point to it as an event as significant in its own humble manner as, say, the birth of the Bauhaus, and Kapor's efforts will have borne a cornucopia of fruit. "This [crusade] has met the market test of validity," insists Kapor, his voice getting a bit stronger. "It's not a function of my ego."

Then he uses a word in connection with his unauthorized conscience Dave Winer that Thomas Edison might have uttered when he hit his hand with a hammer—a word probably not found in Gandhi's vocabulary, even in translation. Sometimes we don't live up to our heroes.

But at least Mitch Kapor is trying. And not just in software design. Lately, he's taken up another crusade: the idea of civil liberties in the computer age (see *MacBulletin*, in this issue). Kapor is cofounder and a chief funder of the newly minted Electronic Freedom Foundation; the nonprofit organization is dedicated to defending the rights of people perhaps unfairly accused of electronic crimes and, more broadly, explaining to the general public the benign and beneficial nature of classic computer hacking.

I hope that the energies devoted to this worthy cause don't take Kapor's eyes off the prize: good software design. And an upgrade to On Location. ■

Steven Levy, a Macworld *columnist, is currently at work on a book on artificial life.*

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Pat Gallup, President

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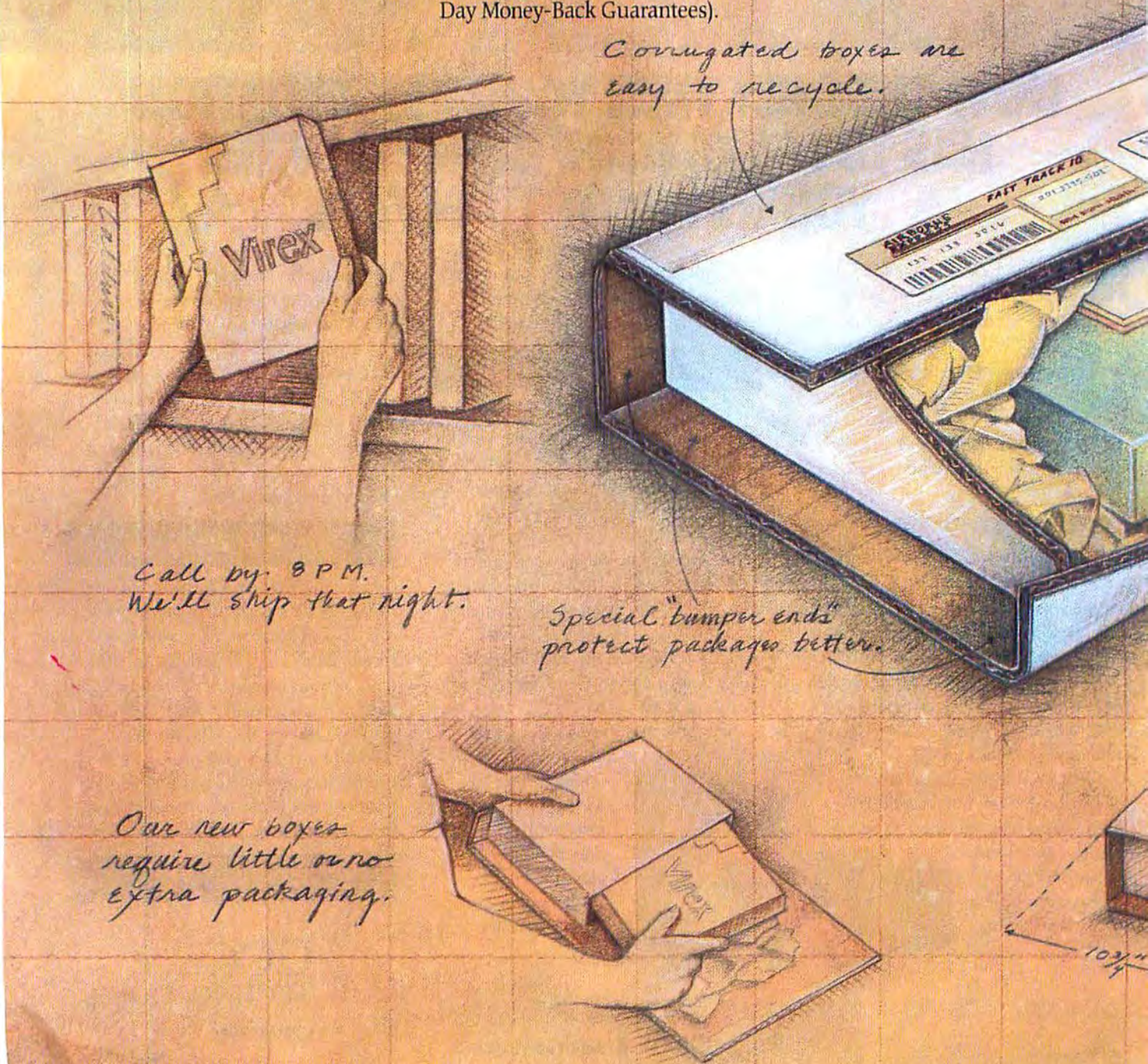
...to the less the better. But times change. Even here in Marlow, NH where tape backup means having two copies of the Pat Boone Christmas album. These days a great way to give



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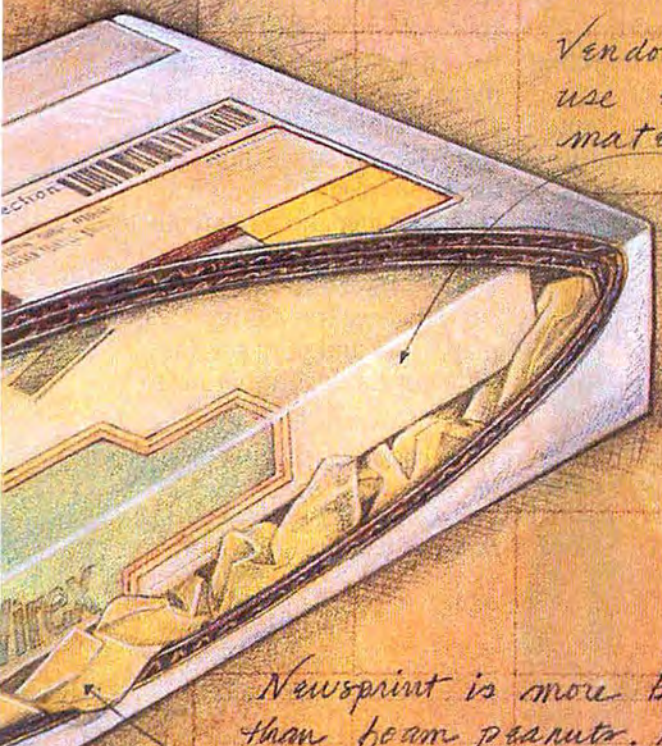
Whether you're a one-person business or have more employees than Marlow has residents (563 at last count), we hope you find our new packaging more convenient.



Vendors are starting to use easier-to-recycle materials.

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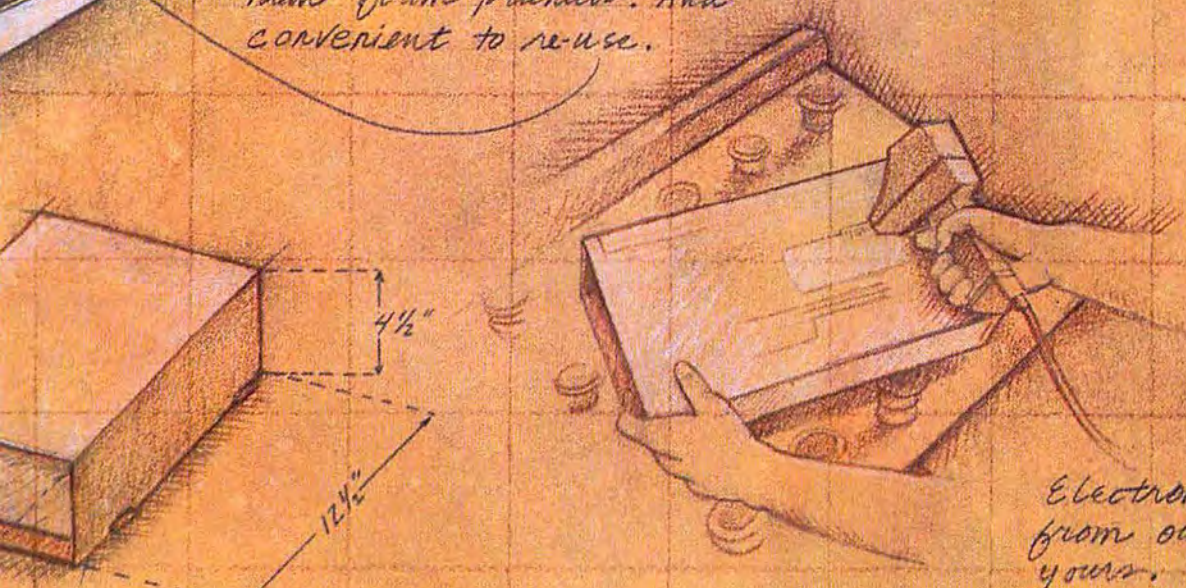
Newsprint is more biodegradable than foam peanuts. And convenient to re-use.



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Actually, we work in a dump.
In New England's early days, the few things that couldn't be re-used were "landfilled" out back. That's why the archaeological digs we do around our headquarters turn up so many old bottles and tools. These artifacts tell us a lot about the early days of Marlow.

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We had been doing some recycling already. But truckloads of garbage were still going to the dump. So we started looking for markets for all those thousands of cubic feet of corrugated, hundreds of pounds of steel banding, and huge stacks of miscellaneous styrofoam and plastic. We also began sorting office paper for efficient recycling and making better use of electronic mail (and other forms of source reduction). Overall, in just four months we've reduced waste by 75%.

We even have a compost pile behind the utility shed so food scraps from our lunch-room can be transformed into delicious dirt for the local flora. Yum.

Pass it on.
Our recycling program has been coordinated by *Toni Suarez*, Wade Greeley, and Frank Shlauter. Frank actually sorted, weighed, and measured all our trash for weeks to help develop recycling strategies. Give that man a medal. Give that man a shower! (Just foolin', Frank.) If you have any suggestions or questions please drop us a note. Or save paper and *fax* directly to our computer by dialing 1-603/446-7981.

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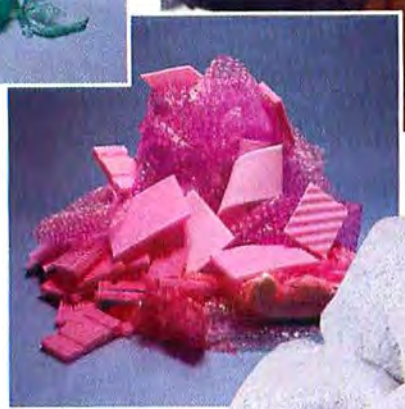
A 220-lb. bale of pallet wrap, ready for recycling. This stuff would have filled six dumpsters.



Wade Greeley sorts all sorts of packing materials that come into the warehouse for re-use or recycling.

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nd less to the dump, too.

also concerned with ways to recycle these papers. We've found a company that transforms our "mixed paper" into a fine tissue for the fabric industry and a sludge by-product that's being used experimentally as a soil conditioner.

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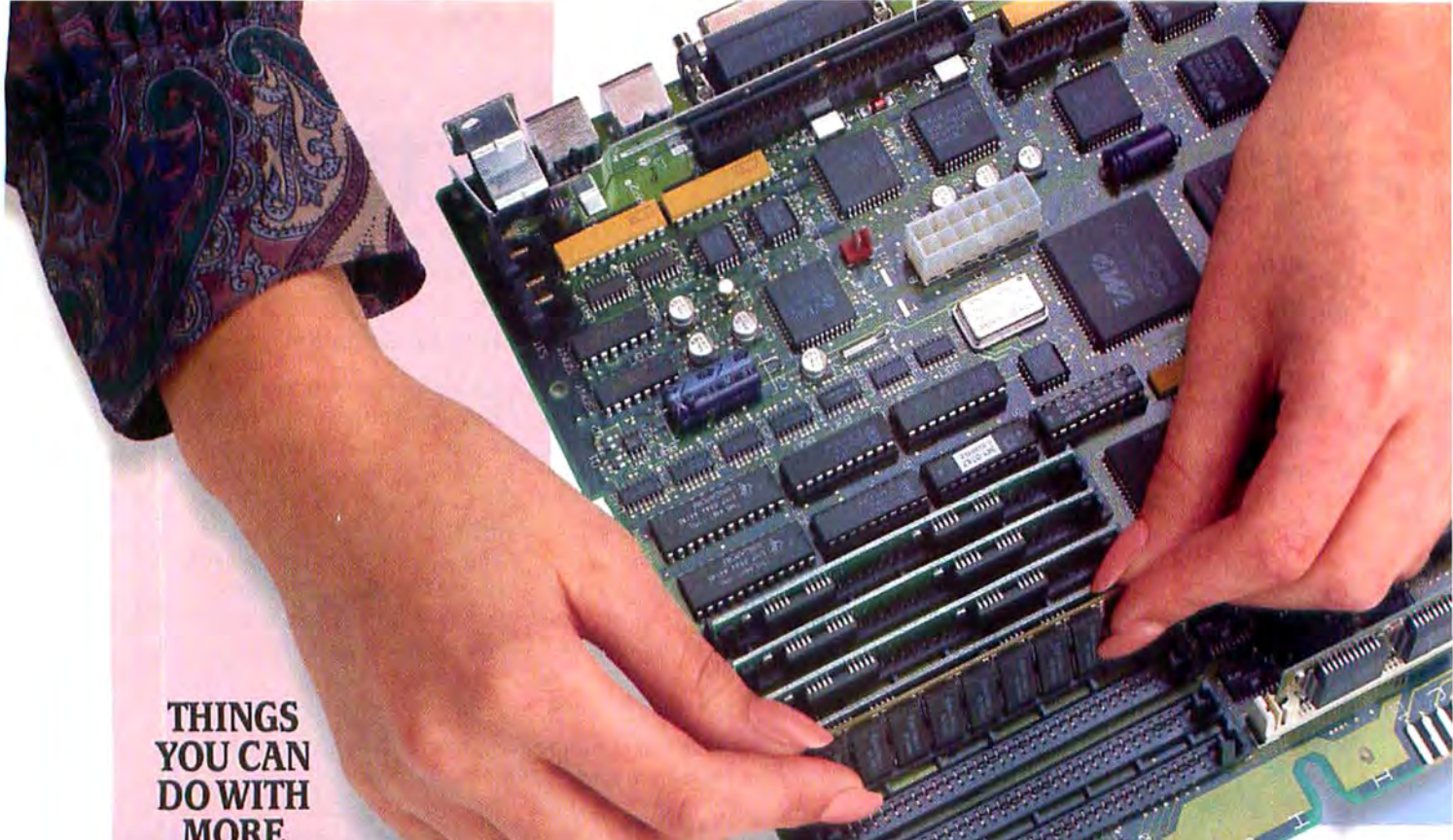

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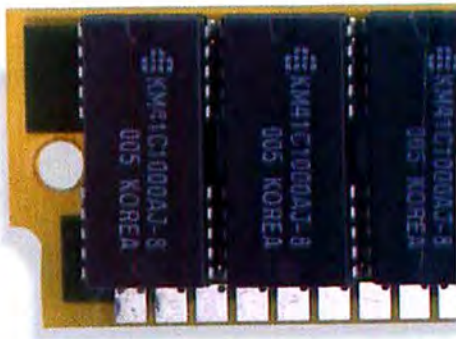

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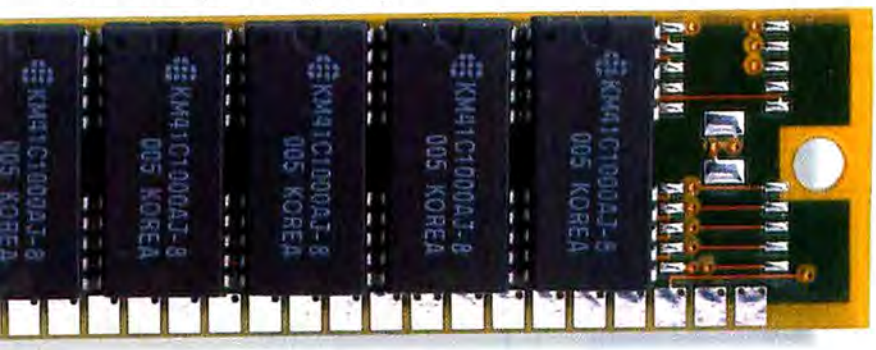

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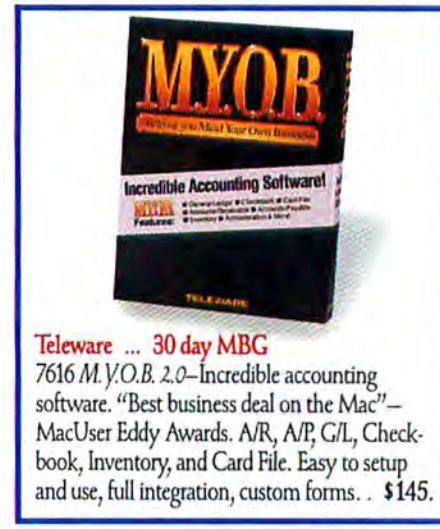

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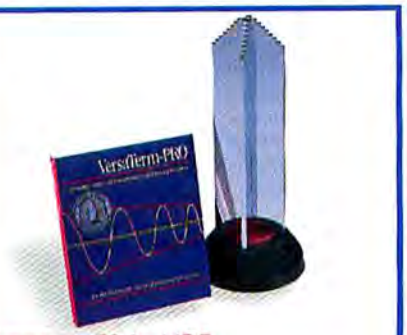

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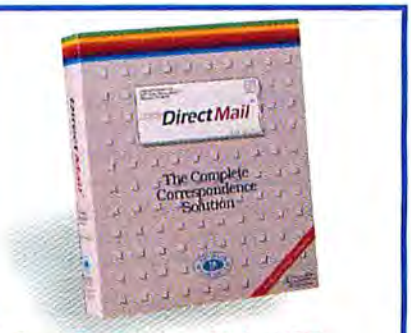

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7430 SharpenUp 1.0. . . . . 62.
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6692 PLUS 2.0. . . . . 115.
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3421 THINK Pascal 3.0 . . . . . 165.
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6748 Norton Utilities for the Mac 1.0 . . . . 84.
★Symmetry ... 30 day MBG
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★Synex ... 30 day MBG
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6666 MacEnvelope Plus 2.0 . . . . . 159.
★TGS Systems ... 30 day MBG
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3549 TML Pascal II 3.1 *(w/MPW 3.1)* . . . 109.
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4976 StickyBusiness 1.2 . . . . . 89.
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5886 Star Wars *(CP)* . . . . . 23.
4540 Ancient Art of War at Sea *(CP)*. . . . . 26.
6516 The Playroom *(CP)* . . . . . 29.
4229 Carmen Sandiego Series *(CP)* . . . *ea.* 29.
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1544 Ferrari Grand Prix *(CP)* . . . . . 31.
4074 P51 Mustang Flight Simulator *(CP)* . 31.
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5726 Voyager 1.2 . . . . . 88.
★Casady & Greene ... 60 day MBG
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7495 Mission Starlight . . . . . 29.
7498 Sky Shadow . . . . . 29.
Coda Music Systems
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5604 Finale 2.0 . . . . . 549.
Davidson & Associates
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6128 Math Blaster Mystery *(CP)*. . . . . 29.
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6297 Halls of Montezuma . . . . . 26.
6663 Sands of Fire . . . . . 32.
4064 Chuck Yeager Flight Simulator . . . . 32.
6594 Starflight. . . . . 39.
1846 Deluxe Music Construction Set 2.5 . 84.

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6604 Verbal Aspect - Inter. *(Russian)* . . . . 42.
7472 Russian Noun Tutor *(w/sound)* . . . . 59.
6611 Kanjimaster - Beg. *(Japanese)*. . . . 105.
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2765 Fool's Errand . . . . . 32.

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2743 Crossword Magic *(CP)* . . . . . 29.

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4842 MacLink Plus/Translators 4.5 . . . . . 99.

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★Dow Jones ... 30 day MBG
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1785 Desktop Express 1.03 . . . . . 95.

★Farallon Computing ... 30 day MBG
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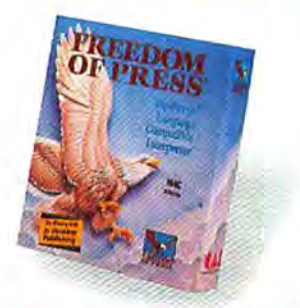
4867 Timbuktu 3.1 30-Pack. . . . . 1285.
4866 Timbuktu/Remote 2.0 . . . . . 123.
6371 Timbuktu/Remote Access Pack . . 845.
2202 PhoneNET to LocalTalk Adapter . . . . . 8.



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4869 PhoneNET Connector 10-Pk *(DIN-8)* 198.
2204 PhoneNET Connector *(DB-9)* ..... 31.
5251 PhoneNET CheckNET..... 64.
2206 PhoneNET StarController 300..... 825.
6687 PhoneNET StarController-EN .... 1599.
5893 Portable Pack..... 329.
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6768 MediaTracks Multimedia Pack.... 319.

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5119 2400EX Modem ..... 179.
6265 2400EX with QuickLink II ..... 195.
6420 2400EX MNP Modem..... 229.
6650 2400EX MNP with QuickLink II... 249.

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4347 NetBridge..... 339.
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3443 NetModem V2400 ..... 429.
6917 NetModem V32 ..... 1429.
6519 EtherGate..... 1629.

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3455 MicroPhone II 3.0 ..... 215.

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4308 BackFAX *(reqs. Apple FAX modem)*. 139.
6720 FAXGATE Plus 1.1 ..... 239.

★Synergy ... 30 day MBG

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6619 VersaTerm-PRO 3.1.1 ..... 174.

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6264 TOPS Networking Bundle 3.0 .... 187.

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6661 OmniProof ..... 105.

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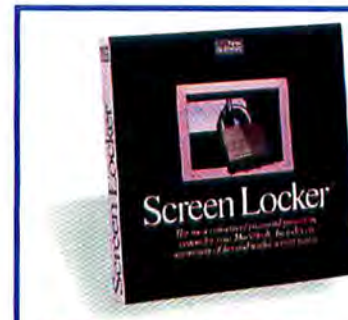

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Dear MacConnection,

Last month Control Data had the pleasure of hosting President Gorbachev. He and about 6,000 security agents, press, and on-lookers came to look at the new computers the Soviet Union bought from us. The day before the visit, someone realized we needed name badges in Russian and no one had a Cyrillic font to make them! The computer dealers in the phone book couldn't get us the font we needed. That afternoon we placed a call to MacConnection. By 10 a.m. the next day the name tags were coming off the printer. Thanks to your ability to deliver product overnight, and by stocking a lot more than just mainstream applications, you really helped us. Thanks comrades!

Carol A. Morse

Carol Morse
Control Data Corporation
Minneapolis, MN

1-800/334-4444

MacConnection®

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2566 System Saver Mac *(platinum)* ..... 63.
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4623 Solid Oak Disk Case, made by New England craftsmen *(holds 90 disks)* . 32.

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3261 ImageWriter II Ribbon Multi-4-Color . 9.
3270 ImageWriter II Rainbow 6-Pack .... 20.
3260 ImageWriter LQ Black Ribbon..... 17.

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4018 LaserWriter II Series Cover *(navy)* .. 17.
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4013 High Trek Mac Plus Carry Case .... 59.
4014 High Trek Mac SE & Ext. Kybd. Case 69.
4862 SE Protection Pak *(ext. keyboard)* .. 75.

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3617 Mac Plus/SE Carry Case..... 55.
4015 Mac SE & Ext. Kybd. Carry Case .. 69.
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6148 3½" DS/DD Disks 3 Pak *(30)* ..... 30.
3298 3½" HD Disks 1.44 Meg *(10)* ..... 22.
6375 3½" HD Disks 3 Pak *(30)* ..... 56.
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- To order, call us anytime Monday through Friday 8:00 AM to 1:00 AM EST, or Saturday 9:00 AM to 5:30 PM EST. You can call our business offices at 603/446-7711 Monday through Friday 9:00 AM to 5:30 PM EST.

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7149 Xceed IIci - 128 Cache Card ..... 589.

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6240 30/2 Interface *(SE/30 video board)* 499.
2994 15" Monitor for Mac SE ..... 599.
6168 15" Monitor for Mac SE/30 ..... 599.
2993 15" Monitor for Mac II ..... 599.
4003 19" Monitor for Mac SE ..... 995.
7152 19" Monitor for Mac SE/30 ..... 995.
4004 19" Monitor for Mac II ..... 995.

Olduval Software

3034 Read-It! OCR 2.1 ..... 245.

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3036 Grappler *(9 pin)* ..... 78.
6229 Grappler LX ..... 128.

Pacific Data Products

7412 Pacific MacPage PE ..... 459.
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7463 ColorBoard 264 for Mac II ..... 595.
7469 ColorBoard 264 for SE/30 ..... 719.
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7468 ClearVue/GE System for Mac II .. 1759.
7458 ColorBoard 708+ 16" Monitor .. 3599.
7462 RasterOps 8L ..... 799.
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4561 SAFE 250 Watt Backup ..... 219.
6747 SAFE 400S Watt Backup ..... 399.

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6104 Half-Page Scanner/400 ..... 295.
6103 Full-Page Scanner *(w/OmniPage SE)* 758.

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3648 ThunderScan Plus ThunderWorks. 199.
4994 LightningScan 400 ..... 385.

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5133 20+ Meg Hard Drive ..... 309.
3990 30+ Meg Hard Drive ..... 379.
3991 45+ Meg Hard Drive ..... 435.
5275 60+ Meg Hard Drive ..... 469.
5276 80+ Meg Hard Drive ..... 529.
5456 45 Meg Removable Drive ..... 699.
5736 45 Meg Removable Cartridge ..... 89.

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1801 SCSI Interface/Port ..... 109.
6726 MaraThon MultiComm ..... 319.
6725 MaraThon 030 for Mac II ..... 449.
6724 MaraThon 030 for SE ..... 449.
6723 MaraThon 030 for Plus ..... 449.
7305 MaraThon 030 for Mac IIx ..... 449.
1809 MacSnap 524S ..... 239.
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5631 Rapport ..... 195.
7588 Drive 360 ..... 249.
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7149 Xceed IIci-128 Cache Card ..... 589.

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7352 Battery Pack for CDR35 ..... 59.
6744 CDR35 CD-ROM Portable Drive .. 399.
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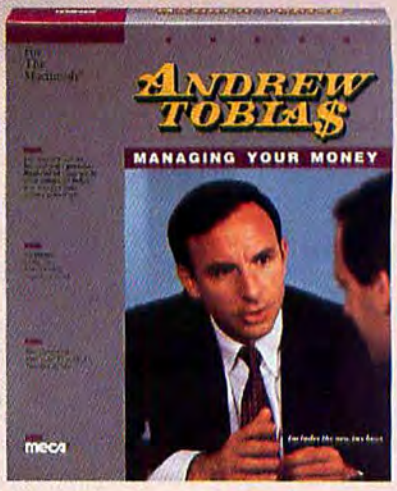

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The Keyboard Conundrum

A SURVEY AND A LAWSUIT ADD FUEL TO THE DEBATE OVER COMPUTER SAFETY

BY DEBORAH BRANSCUM

Are computer keyboards hazardous? "As designed, I think they're safe," says Dr. O. Bruce Dickerson, executive director of the industry-sponsored Center for Office Technology in New York. *Newsday* editor Sandra Peddle disagrees. Peddle, who became disabled while working on an Atex computer system, says that had she known the danger, "I wouldn't have continued typing on that keyboard."

Two recent events are making computer users—and makers—more aware of the keyboard safety debate. Last year the National Institute of Occupational Safety and Health (NIOSH) surveyed 834 employees at *Newsday*, a Long Island, New York–based newspaper. According to the survey, released in June, 40 percent of the employees reported symptoms consistent with cumulative trauma disorders in the past 12 months. That same month eight journalists, including Peddle, sued Atex Publishing Systems for $320 million over cumulative trauma disorders they say were caused by working on Atex systems. Atex's parent company, Eastman Kodak, will not comment on pending litigation.

Reportedly the fastest-growing occupational injury in the United States, cumulative trauma disorder (CTD) is a term used to describe upper body musculoskeletal injuries of the shoulder, neck, back, arms, and hands (see *Conspicous Consumer*, October 1989). CTDs have been around for some time, notably in the automobile and meat-packing industries, but office workers have become increasingly vulnerable as close to 30 million of them now use computers.

ROBIN HOLLAND

A recent lawsuit claims the popular Atex computer system, being used above, caused the injuries of eight journalists. Computer-safety activists hope the suit will spur manufacturers to offer more-ergonomic keyboards.

According to the NIOSH report, there was an association at *Newsday* between CTD symptoms and typing on a computer keyboard. And the likelihood of symptoms increased as either the percentage of time spent typing or the typing speed increased.

Typing may contribute to health problems because it involves several risk factors for CTDs, according to the report. "Typing on computer keyboards requires repetitive motions, prolonged static postures, and awkward postures. Holding the arms in position over a keyboard for a prolonged period can result in fatigue of the neck and shoulder area. Prolonged awkward positions such as holding a telephone receiver between the ear and shoulder while typing or flexing and turning the neck to read documents on a desk can also result in muscle fatigue and symptoms. When typing on a keyboard, the wrists must be held in an awkward position. . . . Direct pressure on the wrists can occur if they are rested on the edge of a table or other hard surface."

Dry reading, but alarming words to those of us who make a living pounding a keyboard. Why the debate if typing obviously causes CTDs? Alas, it's not that obvious. An association is not the same thing as a cause. Human factors expert Dr. Barbara Silverstein headed the University of Michigan team that collaborated with NIOSH at *Newsday*. Are computer keyboards safe or not? "I'm really sorry to say that we don't know," says Silverstein.

Until there's a definitive answer,

(continues)

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KEYBOARD INNOVATIONS

Although the typewriter was not designed with the comfort of typists in mind, it has remained remarkably constant since its manufacture began in 1874.

Dr. Johan Ullman would like to see a different fate for computer keyboards. The Swedish physician has developed a prototype for the Macintosh that features sloping sides and palm rests to support forearms and hands while typing. The keyboard uses the standard QWERTY keys but places half on either side of a number pad. Ullman works half-time in occupational therapy and devotes the rest of his time to his company, Medical Inventions, in Göteborg, Sweden. Although an ergonomic chair he developed has been successful, Ullman is having less luck in finding a manufacturer for his keyboard, which was originally invented to speed learning to type.

American inventor Tony Hodges is encountering similar obstacles. His keyboard, which lets users keep their wrists in a more comfortable position, was reviewed favorably by a team of doctors this summer. Atex Publishing Systems and other companies have expressed interest in the product. Hodges would like to see his Mac keyboard on the market soon, but there's no manufacturer on the horizon—yet.

MEDINOVA AB

Dr. Johan Ullman's keyboard looks sleek, but only testing will tell if it's an actual improvement over the standard design.

the debate will rage on. Bob Keane, assistant managing editor at *Newsday*, and John McDonald, an investigative reporter, have very different opinions about the results of the NIOSH survey. "There was no smoking gun, no smoking keyboard," says Keane, who stressed that education, new office furniture, and knowledgeable doctors have already brought down the injury rate. But according to McDonald, "My interpretation of what NIOSH says is that none of the keyboards used at *Newsday* are better at mitigating the problem—all are equally dangerous." Both men belong to the newspaper's labor-management committee investigating the problem. And both agree that the company has done a lot in response to CTDs, which have affected managers and workers alike.

Sandra Peddle is one of the more than 100 *Newsday* employees who have sought medical treatment for their injuries. Hers include carpal tunnel syndrome and tenosynovitis. In October 1989, "I was editing copy on a Friday afternoon when I felt a burning pain sear my arm," Peddle says. "I tried to put my hand back on the keyboard but it was like putting my hand on a branding iron." Before assistant editor Peddle was injured, she oversaw 30 employees, dispatching photographers and reporters to breaking stories, taking phone calls, maintaining a story budget, and editing copy. Peddle stayed at work until May, when "I reached the point where I couldn't write, I couldn't hold a pen, I couldn't hold a teacup." Once a physically active journalist with a red belt in tae kwon do, Peddle now receives occupational and physical therapy five to six times a week.

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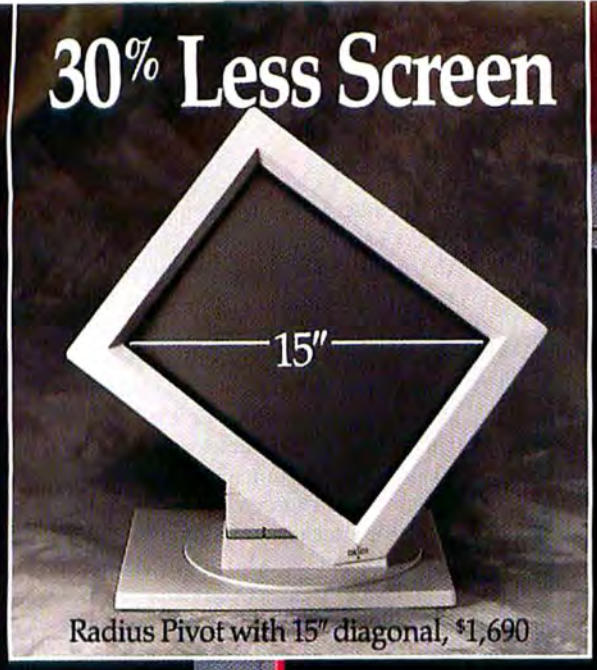

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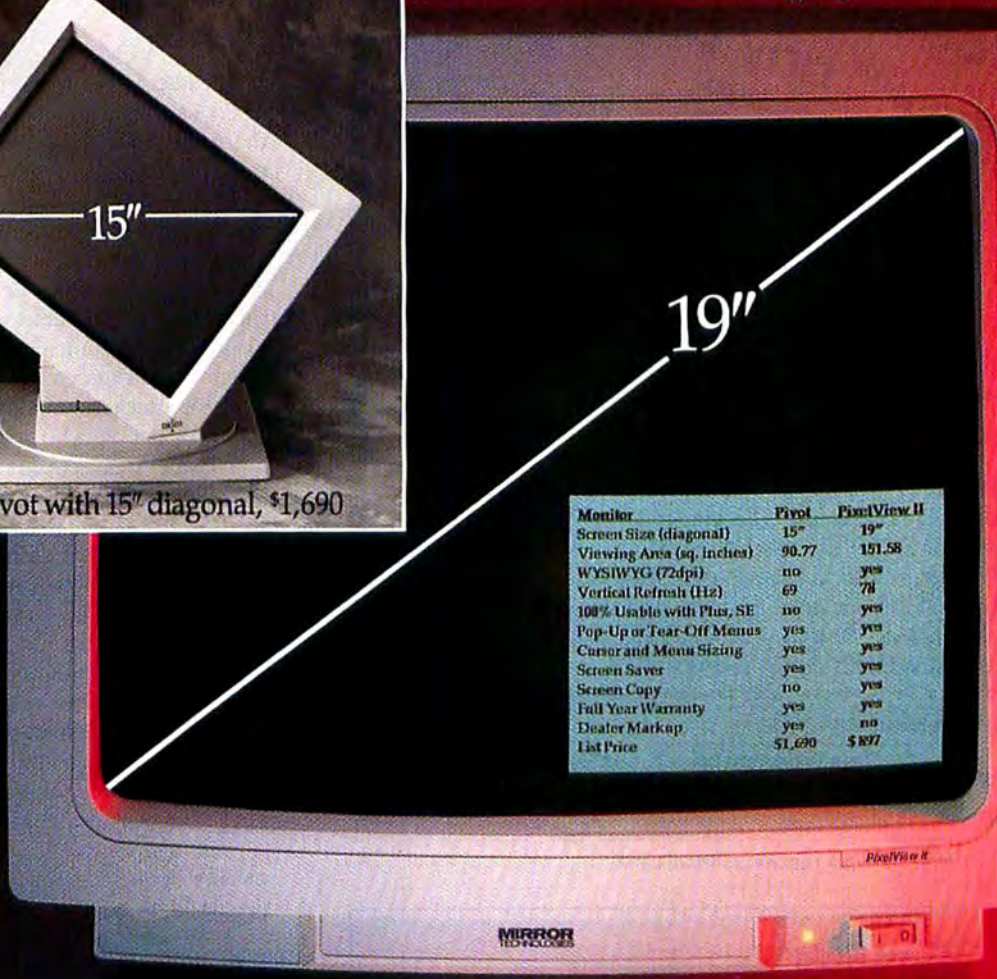

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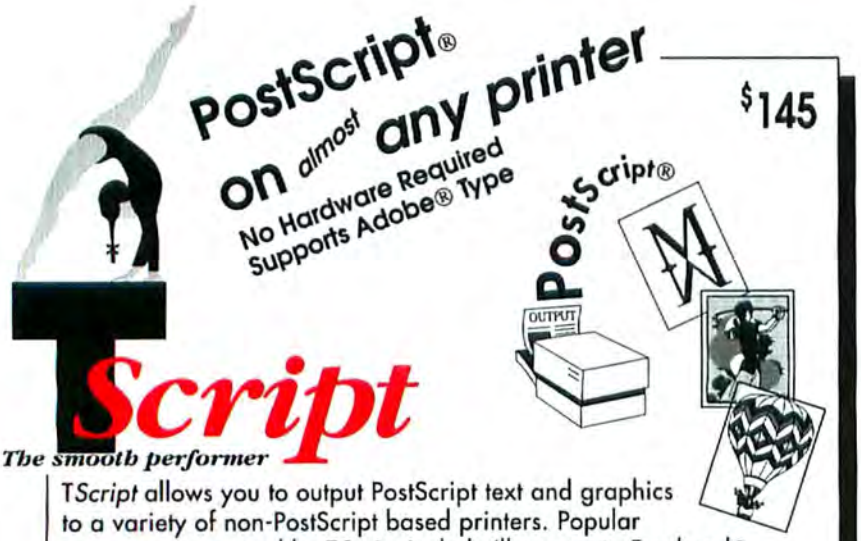

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Peddle wasn't protected by state or federal standards for VDT work; there are virtually none in the private sector. Although there's been little luck in legislating safeguards, some unions have pushed for VDT protection in their contracts. A case in point is New York's District Council 37 of the American Federation of State, County, and Municipal Employees, which won an agreement on the issue this year after ten years of effort. "It's easier for people who are in unions," says Diane Stein, coordinator of the New York City VDT Coalition. "We tried for legislation; what we came up with is collective-bargaining language. Workers are discovering they can win on this and it makes a difference to their lives."

District 37, which represents city workers, won an agreement that covers all full-time and part-time workers who regularly and continuously work on VDTs for 20 or more hours per week. The main elements include

- A 15-minute period of less–visually demanding work after each two-hour period of VDT work
- An effort to reassign full-time VDT workers to alternative duties for up to one year if they are unable to do their job because of injury, disability, or pregnancy
- A standing VDT subcommittee to develop recommendations on procurement and ergonomic's standards for equipment and furniture
- An additional committee to recommend a citywide program for baseline eye exams and follow-up care

Ergonomic furniture and 15-minute breaks are a start, but the work itself must also be examined. "CTD may develop when the work demands habitually exceed a worker's capacity to respond to those demands," according to *Cumulative Trauma Disorders*. "The solution is to balance work demands with worker capacity." *Newsday*'s union is concerned about work patterns, according to McDonald, who is also an officer of the Graphics Communication International Union. "We don't want people spending 14 hours a day at a keyboard without a break because there was a change in deadline. We have to be a little more thoughtful about how we use the staff

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Recommended Reading

Cumulative Trauma Disorders: A Manual for Musculoskeletal Diseases of the Upper Limbs ($18.95; Taylor & Francis, 1988) is a 151-page manual that defines and describes CTDs, discusses prevention, and offers a list of references. This NIOSH publication does not use office work in its examples, but it's a terrific overview of the problem and related factors.

NIOSH health officer Susan Burt recommends *Improving VDT Work* for suggestions on ergonomics. The book is available from The Report Store (913/842-7348) for $15 plus $3.50 postage and handling.

The VDT Book: A Computer User's Guide to Health and Safety is a 48-page booklet offering solutions to common VDT problems. Get it for $6 (includes postage and handling) from the New York Committee for Occupational Safety and Health, 275 Seventh Ave., 25th Fl., New York, NY 10001.

Computer Comfort is the name of a small company and its two products: an $8.50 spiral-bound book and a $35 HyperCard stack that give basic advice on working on computers with less strain. Written by two occupational therapists, the book and stack are nearly identical, with the exception that exercises in the book are animated in the stack. Write to Computer Comfort at 1117 Woodland Ave., Menlo Park, CA 94025.

The title of *Your Guide to Health and Productivity in Today's VDT Intensive Environment* is almost as long as the brochure itself, which illustrates exercises for computer users. The Hamilton Sorter Company (513/870-4400; 800/543-1605) sends out free copies on request.

in the future because the NIOSH report made it very clear this is not a low-risk occupation."

Too little recuperation time from repetitive, forceful work can help establish or worsen CTD. *Newsday* discovered that employees with CTDs were using the three-month sick leave with pay, then returning before their injuries were healed to avoid a dramatic drop in income after the third month. Early this year the union negotiated a long-term disability policy that pays about 85 percent of employees' take-home salary for up to five years, according to McDonald.

Union contracts protect some VDT workers, but not many. As a result, activists are counting on the suit against Atex to spur computer manufacturers to develop safer keyboards. Inventor Tony Hodges says the suit has triggered a deluge of phone calls about his ergonomic keyboard (see *The Iconoclast*, February 1990). Even so, few companies want to try

(continues)

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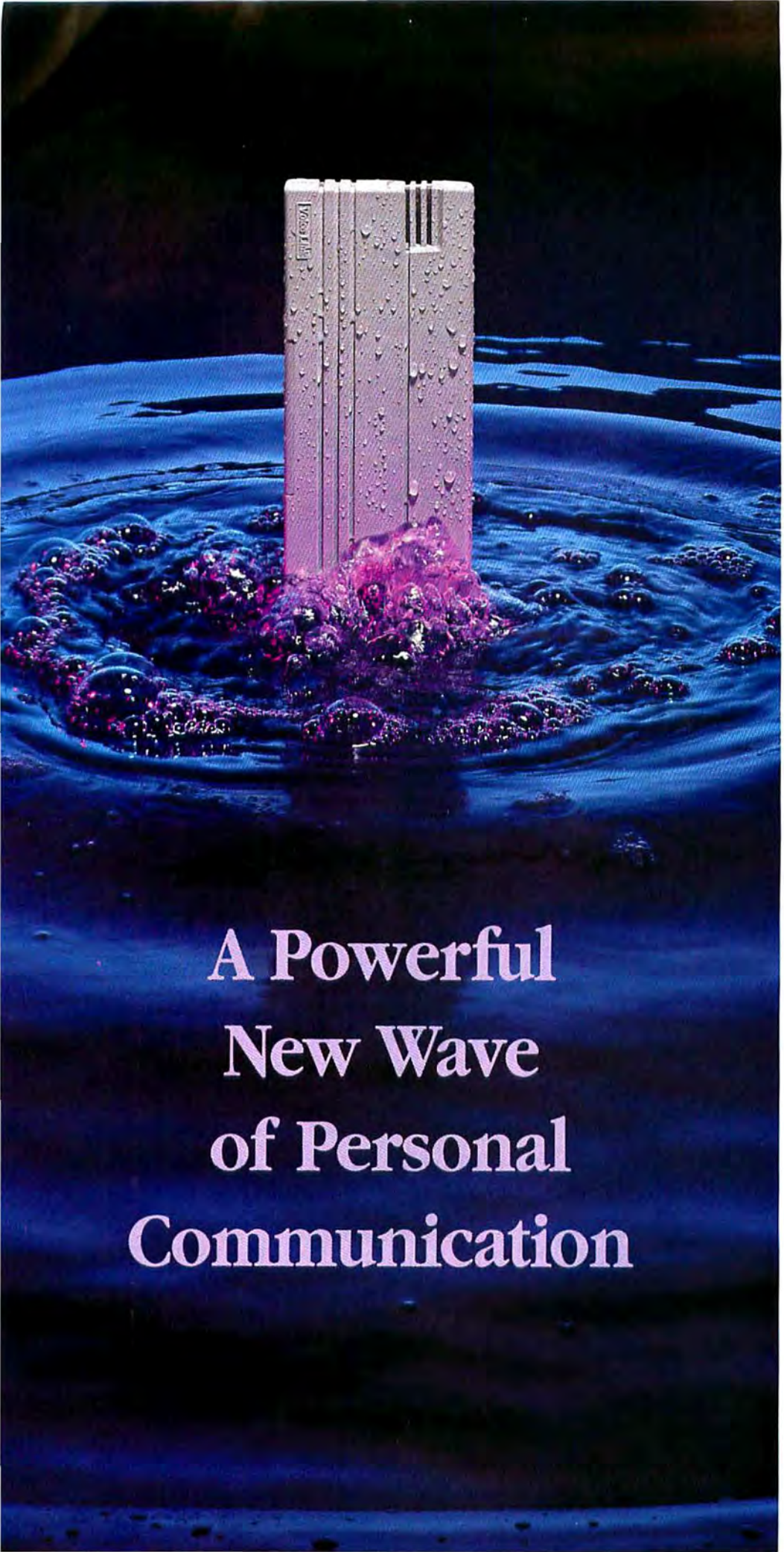

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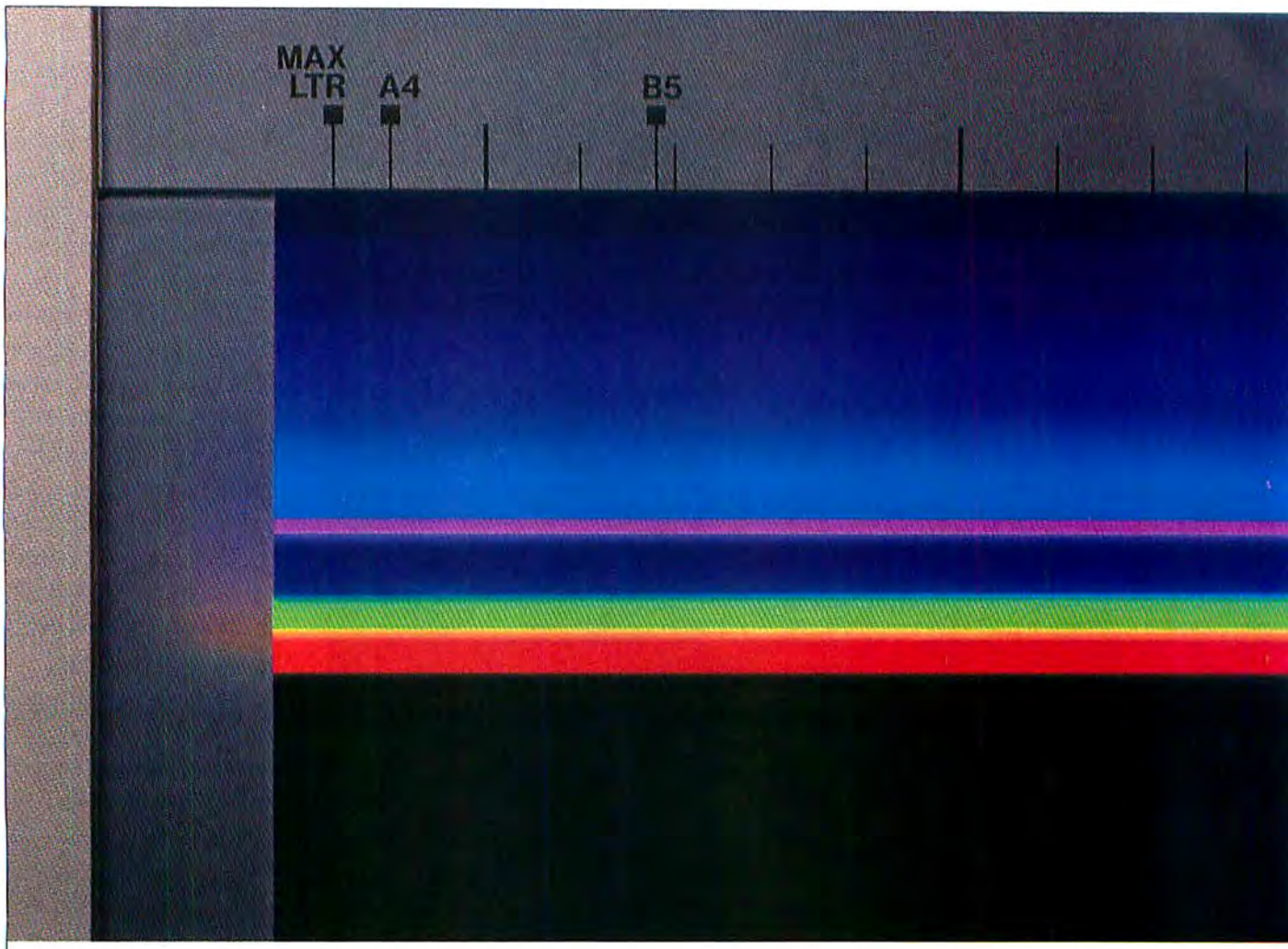

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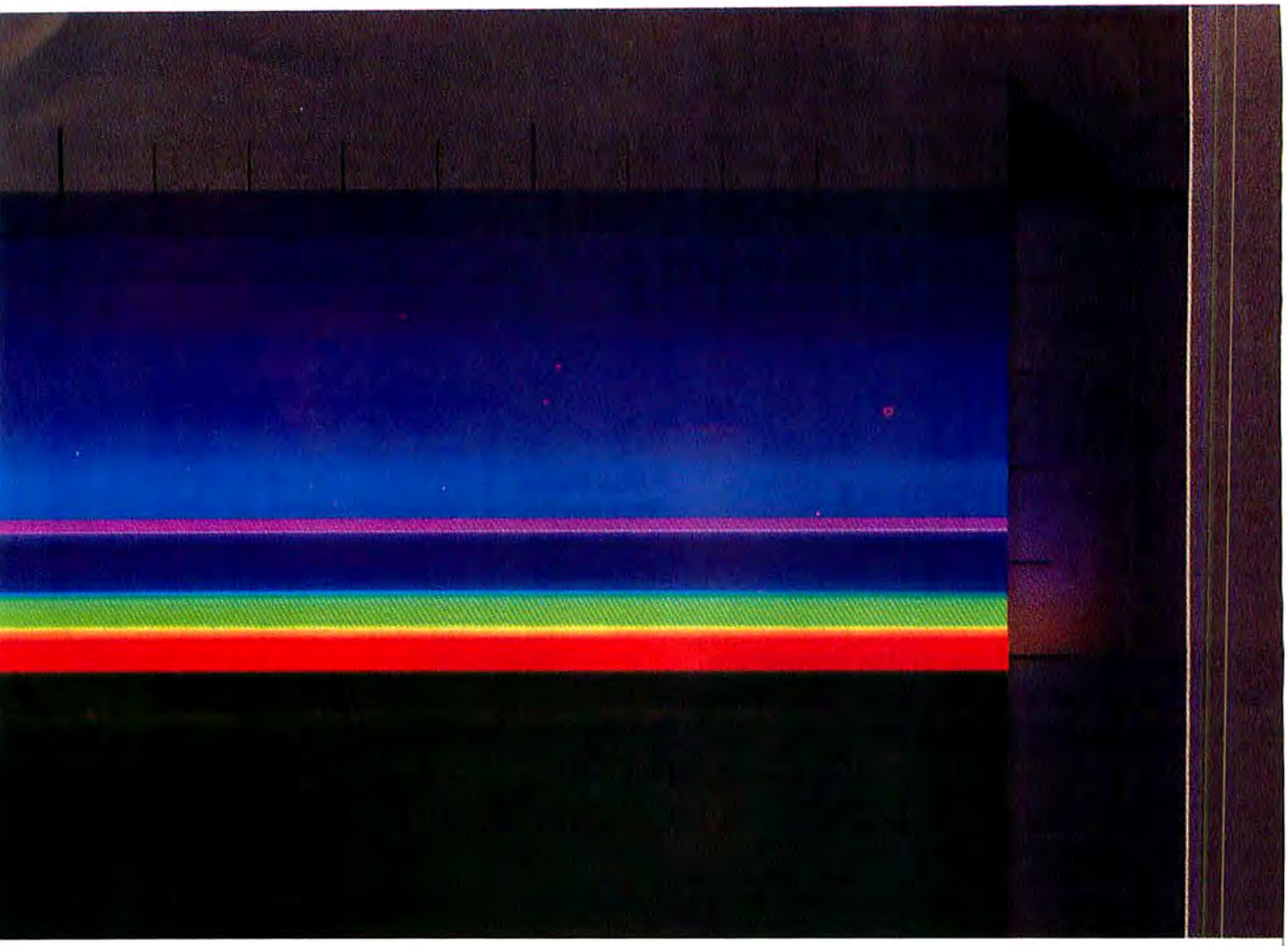

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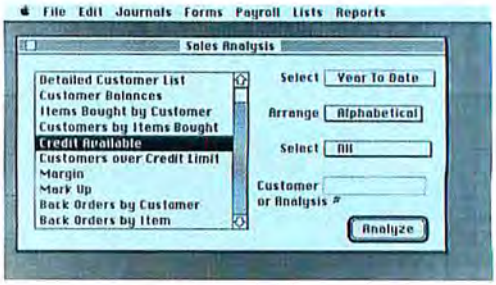

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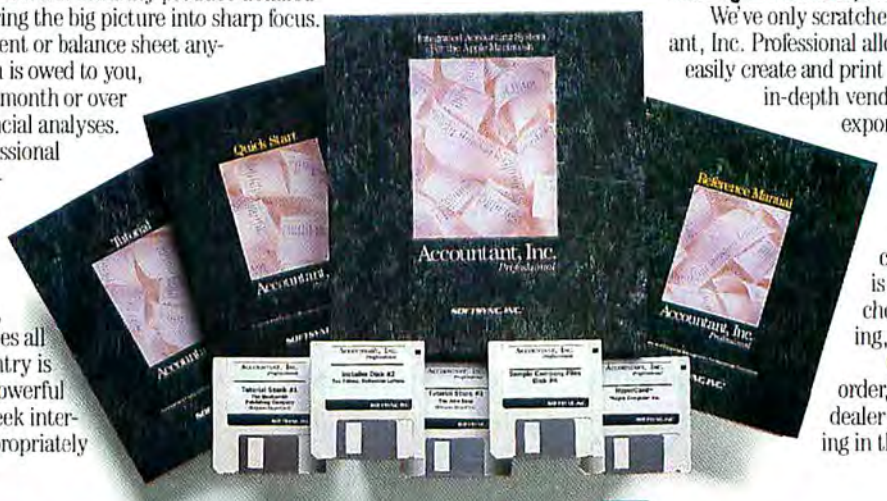

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something new, he says.

Apple Computer, which pioneered something new with the Macintosh, has the perfect opportunity to do the same with its keyboards. According to Robert Brunner, Apple manager of industrial design, the company is currently evaluating and studying its keyboards, "trying to develop something that's going to help solve the problem but will appeal to a wide variety of users." Understandably, Apple and other companies are wary of changing the layout known by millions. But at least two experimental ergonomic keyboards use the standard QWERTY layout—with a twist. And both are designed for the Macintosh (see "Keyboard Innovations").

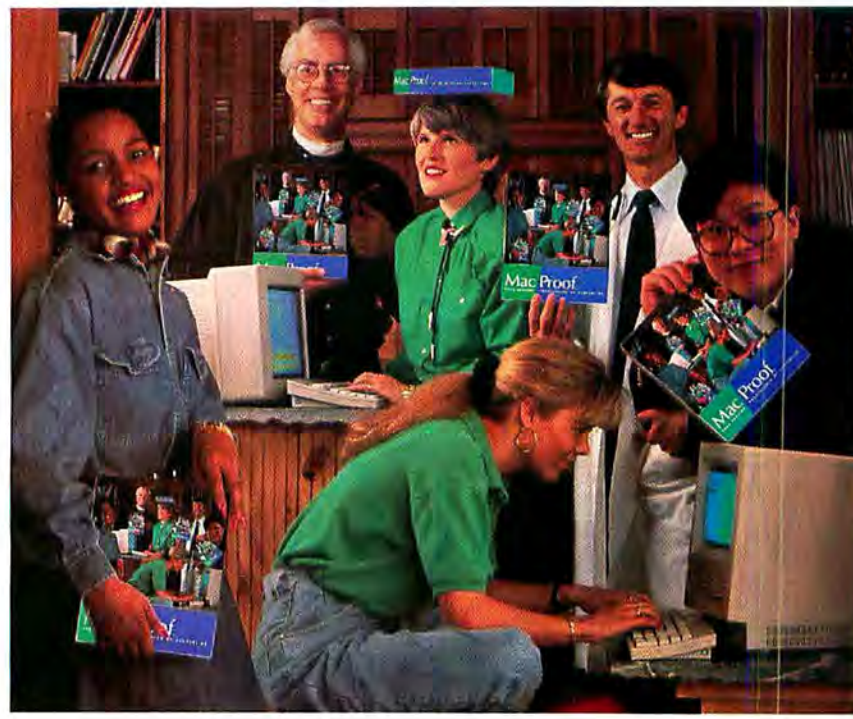
Brunner insists that Apple has long been concerned about ergonomics issues and says that even meeting European standards isn't good enough. "We're trying to take the high road," say Brunner. "The main thing that I keep coming back to is adjustability. We want to be able to have something that people can configure more to their own physique and work environment." Apple could take the high road—and become a real market leader—by moving quickly with its research and pioneering a real choice in keyboards.

Service Hero

Michael Scoville of New York wants to nominate Direct Peripherals Inc. (DPI) as a service hero for the terrific service he received. He bought a removable disk drive from the company, but a problem occurred after it was delivered. "They immediately said return it for replacement, and even paid the freight both ways. Their service department apologized and even took the time to explain what had happened. Upon the receipt of the new drive, they phoned me to see if everything was OK." Another boon to buying by mail was the 800 number, says Scoville. "Other companies should take courses from these fine people."

When I call Sandra Peddle for an interview, she sounds alarmed to discover I am typing notes on my Macintosh. In a voice full of concern, she interviews me first. Am I using a headset when I talk on the phone? A wrist rest? What's the keyboard like? Clearly, Peddle doesn't want anyone else to be hurt the way she was. "Be careful," she says. "I wish I had known the kind of hazard I was dealing with." ■

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.*



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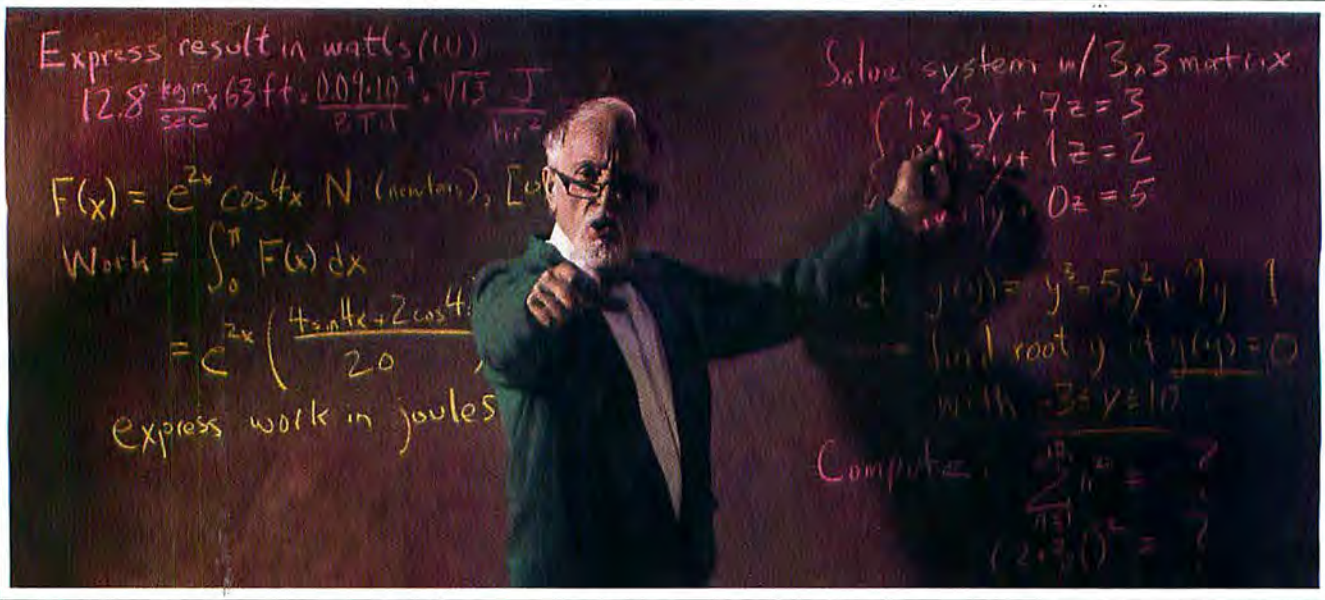

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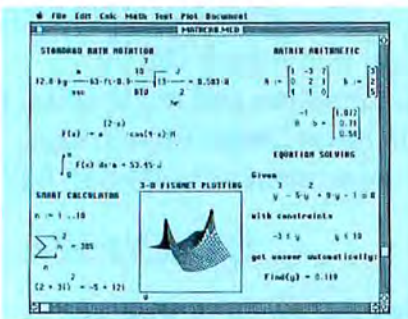

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Flawed by Design

MANY LIMITATIONS OF THE MAC HAVE YET TO BE CORRECTED

BY BRUCE F. WEBSTER

Apple has a long history of shortsighted hardware designs and limitations, starting with the bizarre memory-mapping scheme of the Apple II's graphics display and continuing up to the present day, with numerous examples from the Apple, Lisa, and Macintosh product lines (such as the Lisa's Twiggy drives and the closed architecture of the original Macintosh). Apple is always ready to offer reasons and excuses for these shortcomings; some are legitimate compromises, and in many cases corrections have been made. But the product-development cycle appears to have institutionalized this approach to the degree that Apple seems unable to bring a product to market without one or more such flaws.

The real issue, though, is not that mistakes are made, but that they persist even after being identified, and they are often compounded. Let's take a look at two specific and somewhat related examples, one involving hardware and the other, software. The first is the lack of block-transfer capabilities between NuBus boards and main memory; the second is input/output (I/O) performance limitations in Mac system software.

The NuBus Standard

When designing the Mac II, Apple had to pick a bus to use for its slots—a mechanism by which data gets moved between components of a computer system and by which those components control one another. In the most general sense, a bus includes both physical components (such as data, address, and control lines) and a defined protocol (agreed-upon sequences and signals) for doing the actual transfers. Expansion boards designed for a given bus can communicate with each other and with the host computer.

Apple had two choices: to invent its own bus (as it did with the Apple II) or to use an existing design. Deciding on the latter course, Apple selected the NuBus architecture, developed by Texas Instruments and standardized by the IEEE. The NuBus standard allows for two types of data transfer: random and block. In random-transfer mode, you can move up to 4 bytes of data to a given address, with a maximum transfer rate of about 12 megabytes per second and an effective transfer rate of roughly 3MB to 5MB per second.

In block-transfer mode, you can move up to 32 bytes at a time; the maximum data-transfer rate is 37.5MB per second. However, block-transfer mode requires special circuitry on the part of the device initiating the transfer (the master) and the other device involved (the slave). More and more NuBus boards for the Mac have at least slave-level circuitry, and many (such as graphics accelerators) have master-level capabilities.

No Support for Block Transfer

Given the performance advantages of block-transfer mode, it is surprising that Apple chose not to support this type of transfer between NuBus boards and main memory when designing the Macintosh II. This omission might have been a legitimate engineering trade-off, that is, a combination of factors involving expense, time, and available technology. But that doesn't explain why Apple didn't correct the limitation when it designed the Mac IIx. Or the Mac IIcx. Or the Mac IIci. Or—most surprisingly—even its speed demon, the IIfx. Not a single one of those platforms supports block transfers.

This limitation underlies Apple's current recommendation to developers that they use off-screen bitmaps for updating video displays to avoid video glitches. The video image in main memory gets moved (using random mode) into an off-screen bitmap on the destination video board. Once the image is in place, the video board can copy it into active video RAM at very high speed, avoiding "tearing" and other video artifacts. However, while this approach minimizes video glitching, it limits the update rate from main memory (that is, how fast new images can be displayed), and it also requires

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sufficient extra RAM on the video board to hold the bitmap.

Updating the NuBus

There is an effort under way to update the NuBus standard to something called NuBus'90. The major change will be a doubling of the block-transfer rate to nearly 80MB per second. Here's how: First, some existing lines will carry a 20MHz clock signal, double that of the regular NuBus clock rate. Second, the size of a single block transfer will increase to 512 bytes. Third, special control protocols will avoid transfer overflow, allowing the destination device to suspend the transfer if it can't handle the data coming in. NuBus'90 is designed to be largely compatible with boards designed for the existing standard (NuBus'87), so that you can use boards created for the old standard in a NuBus'90 system. (Interestingly enough, the NuBus'90 committee's current president, Michael Teener, and secretary, John Atwood, are both from Apple.)

Will the Mac's existing NuBus limitations disappear in the future? Apple's presence on the NuBus'90 committee gives hope that the company will make the needed changes in Mac architecture for full support of block transfers. This is particularly important in light of Apple's strong push into desktop video, which requires moving large amounts of data very quickly.

The System I/O Bottleneck

Not all the Mac's design flaws lie in its hardware. One persistent bottleneck in Macintosh system architecture has been the Operating System's lack of asynchronous input/output. Asynchronous I/O permits a program to set up an I/O operation (moving data to or from a particular location or device). The program can then continue execution, doing other tasks while the I/O transfer is taking place. Without asynchronous I/O, the program is forced to a halt until the I/O operation is completed. Asynchronous I/O is essential for implementing direct memory access (DMA), which allows peripherals connected to various I/O devices (serial and SCSI ports, and NuBus slots) to transfer data to and from main memory without the central processing unit (CPU) having to move each byte. Without asynchronous I/O, the CPU remains the main bottleneck of the entire system, limiting performance and throughput.

Some developers have run into problems caused or exacerbated by the Operating System's lack of asynchronous I/O. Consider the case of Golden Triangle Computers of San Diego, California. It focused on the poor performance of the Mac SCSI port, used primarily for external hard disk drives. The solution? A SCSI accelerator to speed transfers between hard disk and memory. This accelerator was a NuBus board with an external SCSI port. You plug the SCSI cable into that port, install the Golden Triangle software, and away you go . . . in theory, at least.

The results? Well, transfers speeded up, but not by much. After exhaustive tracing, Golden Triangle found two bottlenecks, neither of which was caused by its product design, the company claimed. The first was the lack of block transfer between NuBus slots and main memory. However, the second—and according to Golden Triangle, the real bottleneck—was the Mac Operating System, particularly the File Manager. The impact on performance was twofold. First, the increase in data-transfer rate was limited, since most of the time was spent waiting for the Macintosh Operating System to handle the data coming in. Second, the lack of asynchronous I/O meant that the application requesting the SCSI read or write had to wait until the transfer was complete.

Golden Triangle finally decided not to offer its SCSI accelerator in general release; instead, it's sold to value-added resellers (VARs) that can customize software to take advantage of the hardware boost. Meanwhile, Golden Triangle has adapted the same technology for its Disk Twin product, which the company says allows a continual, automatic backup of hard disks without any performance loss.

Lack of Special Effects

When it released the Macintosh IIfx, Apple touted the addition of DMA capabilities to the IIfx's SCSI port, while giving a sotto voce disclaimer that current system software (that is,

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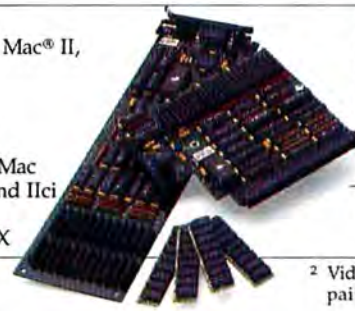

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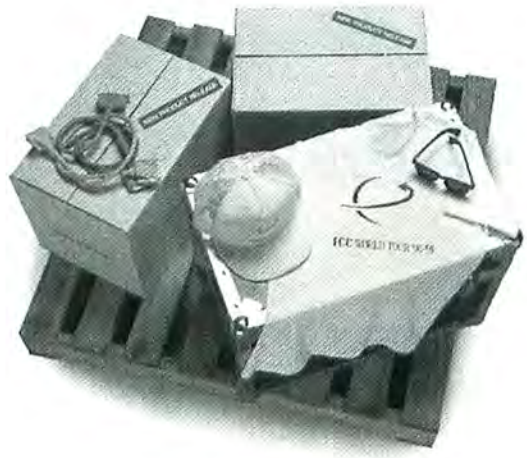

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6.0.x) didn't support DMA. The underlying reason for this limitation: the Macintosh Operating System has only a single execution thread and does not support preemptive multitasking, so there's no inherent mechanism for System 6.0 to support the asynchronous I/O required by DMA.

More disturbing—and less excusable—is Apple's confirmation that System 7.0 won't support the SCSI DMA either. One source suggests that the problem isn't lack of work, since a group within Apple did develop DMA support for System 7.0. Instead, the problem is a lack of coordination. It seems that the developers implementing virtual memory for System 7.0 weren't told about the need to support DMA, and so their approach made no allowances for it. When the error was discovered, there wasn't time to go back and redesign the virtual-memory implementation to support DMA.

The Mac IIfx also missed the boat—though just barely—for support of the NuBus block-transfer mode between main memory and NuBus slots. Block-transfer support was designed into the NuBus control circuitry, but not into the memory-management hardware. In short, the Mac IIfx—Apple's flagship product, touted as the fastest Mac ever—has the same basic bottlenecks as the other models.

How Long Must We Wait?

In the past, Apple has been self-serving and somewhat arrogant in its response to criticism. But recent developments—including slumping U.S. sales, greater pressure from competing firms, and growing discontent among developers—appear to have brought some humility and flexibility to Apple's upper management. There's nothing unusual in the fact that Apple makes mistakes. In that respect, Apple is in good company with the rest of the industry. The real issue is whether Apple will finally acknowledge those mistakes and get on course to correct them with all due speed. ■

Contributing editor Bruce F. Webster is vice president of R&D at San Diego–based Pages, Inc. He can be reached via BIX (bwebster) and via MCI Mail (Bruce Webster).

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27680	MS Mail 20 Pack *(Microsoft)*	$959
27678	MS Mail Server *(Microsoft)*	$246
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27696	Quickmail 10 Pack *(CE Software)*	$313
27695	Quickmail 5 User v2.2 *(CE Software)*	$210
27692	Quickmail Remote *(CE Software)*	$32
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27988	KidsTime *(Great Wave)*	$24
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28712	SpaceQuest II *(Sierra-On Line)*	$28
28664	Star Wars *(Broderbund)*	$23
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22513	PhoneNet Connector Din-8 *(Farallon)*	$31
22517	PhoneNet Repeater *(Farallon)*	$313
22515	PhoneNet Star Conn. 10 pk *(Farallon)*	$138
22512	PhoneNet Star Connector *(Farallon)*	$18

Communications - Network *(continued)*

22516	PhoneNet Star Controller *(Farallon)*	$888
22514	PhoneNet to Localtalk Adapt. *(Farallon)*	$31
22534	PhonNet Din-8 10pk *(Farallon)*	$215
22519	Portable Pack *(Farallon)*	$373
22518	Star Wiring Kit Harmonica *(Farallon)*	$64
22506	TeleBridge *(Shiva)*	$339

Monitors & Video Cards

22006	19" Mon. w/Color Bd. 208 *(Rasterops)*	$3,990
22008	L-View Multi. Mon. w/card *(Sigma Designs)*	$1,495
22002	14" Color Monitor w/o card *(Seiko Inst.)*	$595
22000	19" Colormax w/card *(Sigma Designs)*	$4,999
22100	PageView 15" Mon. Mac II *(Sigma Designs)*	$1,050
22101	PageView 15" Mon. SE *(Sigma Designs)*	$999
22106	PageView 15" Mon. SE/30 *(Sigma Designs)*	$1,050
22005	14" Mon. w /Color Bd. 208 *(Seiko/Rasterops)*	$909
22001	14" Mon. w/Color Bd. 264 *(Seiko/Rasterops)*	$1,119
22103	SilverView 21" Mon. SE/30 *(Sigma Designs)*	$1,599
22104	SilverView 21" Mon. Mac II *(Sigma Designs)*	$1,599
22107	SilverView 21" Mon. SE *(Sigma Designs)*	$1,599
22007	GS30 Grey Scale 19" Mon. *(Rasterops)*	$1,614
23538	Color Board 208 *(Rasterops)*	$344
23531	Color Board 264 *(Rasterops)*	$554
23539	Color Board 264/SE-30 *(Rasterops)*	$690
23530	Multiscreen Card *(Mobius)*	$295

Accelerator & Expansion Boards

23632	Acc. 030 25mhz II w/co 68882 *(DayStar)*	$1,149
23633	Acc. 030 33mhz II w/co 68882 *(DayStar)*	$1,539
23638	Acc. 030 40mhz II w/co 68882 *(DayStar)*	$1,919
23639	Acc. 030 50mhz II w/co 68882 *(DayStar)*	$2,309
23644	Acc. 030 25mhz IIx w/co 68882 *(DayStar)*	$1,149
23645	Acc. 030 33mhz IIx w/co 68882 *(DayStar)*	$1,539
23646	Acc. 030 40mhz IIx w/co 68882 *(DayStar)*	$1,919
23643	Acc. 030 50mhz IIx w/co 68882 *(DayStar)*	$2,309
23647	Acc. 030 50mhz IIcx w/co 68882 *(DayStar)*	$2,309
23640	Acc. 030 25mhz IIcx w/co 68882 *(DayStar)*	$1,149
23641	Acc. 030 33mhz IIcx w/co 68882 *(DayStar)*	$1,539
23642	Acc. 030 40mhz IIcx w/co 68882 *(DayStar)*	$1,919
23636	Acc. Dove 33mhz SE-30 board *(Dove)*	$445
23637	Acc. Dove SE 020 w/881 & 1MB *(Dove)*	$777
23634	Acc. IIci CACHE Card *(DayStar)*	$754
23733	DigiVideo B/W Card *(Aaps)*	$399
23735	DigiVideo Color Card *(Aaps)*	$644
23731	MicroTV *(Aapps)*	$275

Memory Expansion

25480	2 X 1MB SIMMS (80ns) *(Technology Works)*	$138
25482	4 X 1MB SIMMS (80ns) *(Technology Works)*	$276
25481	4 X 4MB SIMMS (80ns) *(Technology Works)*	$1,900
25484	4 X 1MB SIMMS FX *(Technology Works)*	$436
25483	4 X 1MB SIMMS NTX *(Technology Works)*	$436

Keyboards, Mice, Etc.

25184	15 function key module *(DataDesk)*	$37
25283	Little Mouse *(Mouse Systems)*	$77
25180	Mac-101 Keyboard, ADB *(DataDesk)*	$134
25181	Mac-101 Keyboard (beige) *(DataDesk)*	$134
25282	Mobius Cordless Mouse *(Mobius)*	$89
26885	Bit Pad Plus *(Summagraphics)*	$318
25183	Switchball *(DataDesk)*	$115
25182	Switchboard *(DataDesk)*	$174
25284	Trackball ADB *(Mouse Systems)*	$72
25280	Turbo Mouse Plus *(Kensington)*	$107
25281	Turbo Mouse ADB *(Kensington)*	$107

Power Supplies & Fans

26880	Fanny Mac (fan) *(Mobius)*	$58
26888	System Saver Mac Plus *(Kensington)*	$62
26889	System Saver Mac SE *(Kensington)*	$62
26293	Powerchute Ntwk UPS Software *(A.P.C.)*	$99
26292	UPS, Uninterruptible supply *(A.P.C.)*	$275

Sound Interfaces

23730	MacRecorder *(Farallon)*	$162
23732	MIDI Interface *(Passport Designs)*	$76

Accessories

41753	Keyboard drawer *(CompuAdd)*	$19
41019	Kleen Keyboard Kit *(CompuAdd)*	$10
26883	SE Anti-Glare Filter (platinum) *(Kensington)*	$32
26882	SE Anti-Glare Filter (beige) *(Kensington)*	$32
26891	Apple RGB Anti-Glare Filter *(Kensington)*	$62
26886	HyperDialer *(DataDesk)*	$32
26895	Imagewriter II Dust Cover *(Cover-up)*	$8
26897	LaserWriter II Dust Cover *(Kensington)*	$12
26898	MacAvenue Carrying Case *(Pace)*	$65
26901	MacAvenue Carrying Case Ext. Kbd. *(Pace)*	$76
26892	Mac II Stand & Cable Kit *(Kensington)*	$63
26887	Mac II System Stand *(Kensington)*	$20
26894	Mac Plus/SE Dust Cover *(Cover-up)*	$8
26893	Masterpiece Mac II *(Kensington)*	$103
26896	Universal Printer Stand *(Kensington)*	$15
25580	Mac II Monitor Stand *(Kensington)*	$62
25582	Tilt/Swivel Stand *(Kensington)*	$21
26884	Security Kit *(Kensington)*	$33
41752	Teak KB Drawer PSK 132 *(CompuAdd)*	$69
26903	The Library (grey) *(Innovative Technology)*	$12

Software

Writing & Publishing

Word Processing (Writing)

30600	FullWrite Prof. *(Ashton-Tate)*	$253
30586	MacWrite II 1.1 w/ ATM *(Claris)*	$157
30582	Microsoft Word *(Microsoft)*	$245
30580	Microsoft Works *(Microsoft)*	$177
30584	Microsoft Write *(Microsoft)*	$77
30602	Nisus *(Paragon Concepts)*	$236
30590	WordPerfect Mac *(WordPerfect)*	$229
30588	WriteNow *(T/Maker)*	$116

Page Layout (Publishing)

29792	Letraset Ready-Set-Go *(Letraset)*	$273
29781	Pagemaker *(Aldus)*	$497
29822	Publish-it *(Timeworks)*	$223
29802	Quark Xpress 2.11 *(Quark)*	$455
29796	Silicon Press *(Silicon Beach)*	$51
29814	Springboard Publisher *(Springboard)*	$107

Utilities for Writers/Publishers

30606	Acta Advantage *(Symmetry)*	$63
30618	Big Thesaurus1.0 *(Deneba Software)*	$63
30594	Findswell *(Working Software)*	$35
30440	Letter Writer Plus *(Power Up)*	$54
29820	MacKern *(ICOM Simulations)*	$113
30604	More II *(Symantec)*	$265
29786	PageMaker Color Ext. *(Aldus)*	$133
29800	QuarkStyle 1.0 *(Quark)*	$165
30598	QuickLetter *(Working Software)*	$72
30622	WordFinder 2.0 *(Microlytics)*	$31

Spelling Checkers

30620	Spelling Coach Pro 3.1 *(Deneba Software)*	$112
30596	Spellswell *(Working Software)*	$44

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30444	Freedom of Press *(Custom Applications)*	$255
29824	Type Manager *(Adobe)*	$55
29828	Type Mgr/Type Align *(Adobe)*	$88
29830	Type Reunion *(Adobe)*	$38
29826	TypeAlign *(Adobe)*	$58

Business Software

Integrated & Bundled Applications

30182	Microsoft Office Bundle *(Microsoft)*	$525
30580	Microsoft Works *(Microsoft)*	$177

Accounting/Bookkeeping

28481	Accountant Inc. Prof *(Softsync)*	$348
28466	Business Sense *(Monogram)*	$265
28468	Checkwriter II *(Aatrix)*	$37
28464	Dollars & Sense *(Monogram)*	$78
28474	Easy-Light *(DAC)*	$41
28440	Insight Accounts Payable *(Layered)*	$395
28442	Insight Accounts Receivable *(Layered)*	$395
28454	Insight At Once *(Layered)*	$283
28444	Insight General Ledger *(Layered)*	$395
28446	Insight Inventory *(Layered)*	$395
28448	Insight Payroll *(Layered)*	$395
28450	Insight Time Bill *(Layered)*	$395
28478	MacMoney 3.5 *(Survivor Software)*	$58
28462	Managing Your Money *(Meca)*	$122
28458	Quicken *(Intuit)*	$35

Data Analysis & Presentation

28470	StatView II (Mac+,SE, II)*(Abacus Concepts)*	$278
28472	StatView SE + Graphics *(Abacus Concepts)*	$199

Database

27780	4th Dimension *(Acius)*	$511
27782	4th Dimension Runtime *(Acius)*	$85
27789	Claris Filemaker II*(Claris)*	$216
27804	Double Helix *(Odesta)*	$369
27790	FoxBase II *(Fox Software)*	$292
27792	FoxBase II Runtime *(Fox Software)*	$176
27796	FoxBase Mltuser Runtime *(Fox Software)*	$293
27794	FoxBase Multiuser *(Fox Software)*	$385
27798	Microsoft File *(Microsoft)*	$123
27808	Panorama (ProVue)	$246

Office Productivity Programs & Utilities

30442	Address book Plus *(Power-up)*	$52
27812	BulkMailer 3.3 *(Satori Software)*	$76
27814	BulkMailer Plus *(Satori Software)*	$187
30432	Calender Creater + Mac *(Power Up)*	$36
30358	Calender Maker *(CE Software)*	$30
27818	Data Desk 3.0 *(Odesta)*	$347
30438	Fast Forms 2.0 *(Power-up)*	$116
30372	Kiwi Envelopes *(Kiwi Software)*	$34
30440	Letter Writer Plus *(Power Up)*	$54
27816	MailList *(MySoftware)*	$27
27806	Milo (Paracomp)	$156
29200	Smartforms Designer *(Claris)*	$291

Time & Project Scheduling

29744	Fast Track Schedule *(AEC)*	$108
27810	KeyPlan *(Symmetry)*	$243
29740	MacProject II 1.1 *(Claris)*	$366

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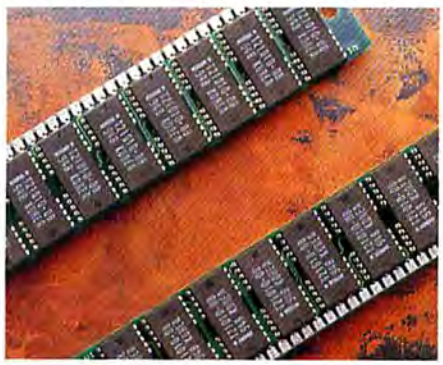

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PageMaker 4.0 *29781*—$497

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Circle 194 on reader service card

Verbatim

An interview with Gordon Eubanks, president of Symantec Corporation

BY JERRY BORRELL

Gordon Eubanks, who was a peripatetic child growing up in more than 12 locations across the United States, obtained his degree in electrical engineering from State University of Oklahoma. Then, after working for IBM, he enrolled in Naval Officer Candidate School. He went on to become one of the elite corps of engineering officers serving under Hyman Rickover and spent six years on nuclear submarines. Along the way he earned a master's degree in computer science from the Naval Postgraduate School in Monterey, California. He founded his first computer company, Compiler Systems, while still in the navy. After selling the company to Digital Research in 1981, he spent two years working there. He founded C&E Software in 1983 and then merged it with Symantec Corporation. As president of Symantec, Eubanks oversaw the acquisition of Living VideoText, Think Technologies, and Breakthrough Software. Symantec, which recently acquired Peter Norton Computing, employs 420 people, and about one-third of its annual revenues of over $100 million are derived from the sale of Mac products.

MW How in the course of preparing to become a nuclear engineer on a submarine did you make the transition to computers?

EUBANKS I spent three years on the submarine USS *Gunard* before enrolling in the Naval Postgraduate School where I studied computer science. Gary Kildall, who had written PL/M as a consultant for Intel, was my thesis supervisor. We were using the CP/M operating system on 8-bit 8088 microprocessors with 16K of memory and hand-wired disk drive controllers, then we graduated to 24K machines. My master's thesis was to write a compiler called BASIC-E, a Pcode interpreter and compiler.

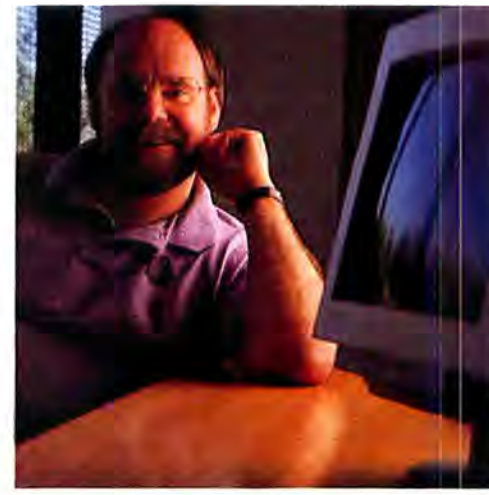
MW How did you keep up with computers on your next tour of duty?

EUBANKS My second tour was as an engineering officer in charge of nuclear propulsion on the USS *George Washington*, the first ballistic-missile submarine. While it was being overhauled in Vallejo, I talked to some companies about consulting. One was Imsai, where I worked with Seymour Rubenstein to develop CBASIC. I kept the rights to the product, as well as selling it to Imsai—they didn't believe there would be any other hardware companies competing with them. [I founded] Compiler Systems to sell CBASIC, sold through OEMs. My mother ran the company and provided tech support. About 35 companies had a license, including Tarbell and Digital Micro. Application developers like Structured Systems Group used CBASIC, and it became a standard for writing applications under CP/M. Over time dBase gained momentum as a development environment, eventually beating out CBASIC.

I got out of the navy in the late seventies, and sold Compiler Systems to Digital Research where I stayed on for two years and ran the product group. DRI was real grim then. Concurrent CP/M was started under my tenure, but I didn't see eye to eye with management, especially John Rowley, who caved in to Apple on the interface lawsuit.

MW What then?

EUBANKS I decided that to succeed in the software business you had to run



a company efficiently and take the business side seriously. That would be the only way to win in the eighties. A business could no longer be run by a bunch of wild-eyed programmers. I founded C&E Software with Denis Coleman and merged it with Symantec in 1984. Symantec had burned through its capital but had a lot of good people, including its founder Gary Hendrix.

We washed out the venture capitalists and formed the new Symantec. Then we set out to do a product that

(continues)

PHOTOGRAPHS BY DAN ESCOBAR

became Q&A. The former Symantec had a concept for a product called WordBase. They were right to believe that people wanted easy-to-use software, but that did not mean it should also be simple in its abilities. We at C&E Software had an idea for a product code-named TouchStone. Both products were targeted at the PFS [Personal Filing System] line. However, we believed that customers wanted software that also offered full functionality and allowed them to get more from a program as they became more proficient.

We started shipping Q&A [for DOS machines] in 1985. I saw my first Mac in that period. People were saying it was a machine that would change the world, but I was incredibly underwhelmed. It had no hard disk, little memory, and no applications. But I was interested.

MW What was the next development at Symantec?

EUBANKS In 1986 we sat down to rethink company strategy and decided there was a need for a broader product line and that it was necessary for us to focus on becoming the leader in those product segments in which we compete.

We hired Tom Byers and created the Turner Hall Publishing brand name to avoid any confusion with Q&A. We were in the odd position of being a well-known company before we had even shipped a product, so people were expecting something big from us. We had already had a cover article on Symantec in *InfoWorld*.

Tom broadened the product line with add-ons for Lotus 1-2-3. Then in 1987 we acquired Breakthrough Software, Living VideoText [LVT], and Think Technologies.

MW Which do you think was the best acquisition?

EUBANKS They all helped build the company, but Breakthrough was financially the best. That deal was awesome. It was financed all on the come, with little cash down; we really paid off at the time of our initial public offering. It gave us critical mass and didn't dilute our stock.

MW How did your acquisition of LVT come about?

EUBANKS Venture capitalist John Doerr convinced me that the future was in Macintosh architecture. He dragged me to the 1987 Macworld Expo in San Francisco and afterward made me buy and use a Mac Plus. I really liked it. It was a hot machine.

That experience started us looking at Think and LVT. Also, one of our young marketing managers, Ted Schlein, was really pushing us to look at Macintosh software. These acquisitions gave us a lot of expertise in how to develop in graphical environments. Developing for the Mac and Windows are really similar. Both are a clear indication of the direction in the future.

A head of lettuce wouldn't bring out a Mac product that's not compatible with its PC version

In 1986 we developed the strategy of the multiplatform product line and of interoperability—that is, of the accessibility of products across platforms.

In 1988 we worked hard on making a single company out of the four individual groups that formed Symantec. We strengthened our management team during 1988 and 1989 by bringing in Bob Dykes as chief financial officer and John Long as head of our worldwide sales organization. And we did the IPO [initial public offering] in June of '89.

This year we acquired Peter Norton Computing and brought in Robert Lee as the executive vice president of products for all our product groups.

MW How do you rank your product sales on the Mac?

EUBANKS SAM is number one in volume. It ships in excess of 10,000 or 15,000 per month. SUM is second, More is third, C comes next, and then Pascal. Norton Utilities for the Mac will tie SUM when it ships, and eventually we'll merge the two.

MW You have said that More II was a brain-dead product.

EUBANKS Well, I don't think I said quite that. But it wasn't as successful as we had thought it would be. It had some design problems, and its being rule-based made it difficult to use. It was very modal, not intuitive. But once you knew how to use it, it was very powerful. More III addresses the presentation market better. More II did not allow for enough flexibility. More III brings presentations up to the level of any other Mac presentation product. The development team did a great job of correcting a lot of the things that were wrong with the older product.

MW Why the Norton merger?

EUBANKS It's consistent with our strategy of offering a premium brand name, and it allows us to leverage our sales organization. Norton is a leader in corporate America and a good name in international markets, which has become a more important consideration. Norton Utilities 5.0 and Norton Utilities for the Mac are great products. Bottom line, it was a good financial transaction for both parties. We get great software and a great brand name. It integrates well with what we're doing, how we work together, and how we grow the product line.

MW Was the LVT acquisition equally successful?

(continues)

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EUBANKS Not as successful as Breakthrough, but that's a tough one to match. Looking back though, I would certainly do it again. But knowing what I know now, some things would be different.

MW What do you think about Apple pulling Claris back into the fold?

EUBANKS You know, Apple is a little like that saying about the weather. If you don't like Apple, or what Apple is doing, stick around. Things will change. It's hard to tell what they want to do. I think Apple shows a lack of focus and direction. First, they tell software developers they don't want to [develop applications]. Now we have them competing again. I don't lose any sleep over the matter. We certainly won't reject the Mac as a development platform as a result.

Actually Claris is viewed as a better competitor if it's independent and not mired down in the layers of bureaucracy at Apple. I think the potential for this [pullback] to be good or bad for third-party developers really depends on what Apple does with Claris.

MW Why are utilities so important?

EUBANKS Because computers are reasonably complex and because there are larger hard disks now. People use their computers more than in the past. And they have a larger investment, in that their data no longer fits on a single floppy. Also, utilities are a great value.

Take SUM. Just considering the encryption and partitioning software, and not the recovery utilities, makes it worth the price. Instead of having a folder for Excel data, users now have a partition for all their data, which is all encrypted. They only have to back up that partition, not each individual data folder. The benefit versus the cost is significant.

Different types of users may not use the same application, but they have the same utility needs.

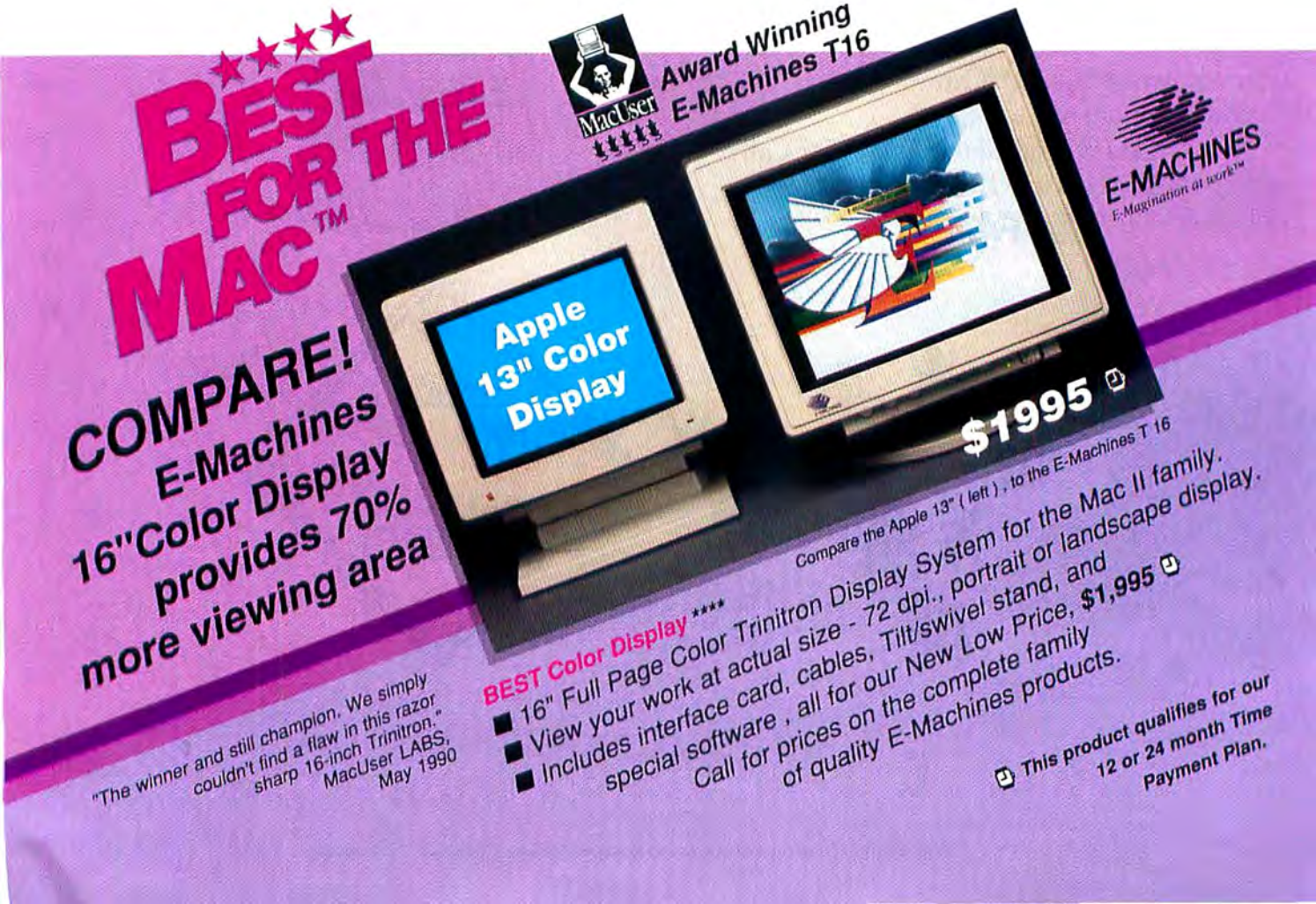
MW Lotus and Software Publishing are two notable absentees from the Mac market. Why?

EUBANKS I don't think Lotus has had the right vision on what product to create. And they got beat out by Microsoft with Excel. Their new work is exciting. I hear they're committed and working on a Mac product.

MW They have an entire research group in Sausalito working on products for the Mac that may never see the light of day.

EUBANKS I don't know about the Sausalito group. Lotus has had lots of problems; the Mac didn't make it to the top of the priority list. Jazz wasn't the right product and had a bad name. They really should have done what they're doing now, 1-2-3 for the Mac.

Of course it's easy to second-guess, but I think Software Publishing missed a great opportunity by not seeing the need to develop for multiple



platforms or to invest energy in the Mac or graphical user interfaces. It's really damaging to develop [for the Mac] by porting a DOS product. It would be great to get a copy of their original Mac product. After that failure, they haven't had anything going on the Mac.

MW Why did Ashton-Tate fail to have a major impact on the Mac market?

EUBANKS I wonder if they bothered to ask what their customers wanted. The average head of lettuce would make a better decision than to bring out a Mac product that's not compatible with its PC version. What caused them to do something totally inconsistent with their PC market products? It's mind-boggling to contemplate dBase Mac not being compatible with their DOS product. I don't know if dBase was a good product, but if ever there was a time the customer was let down, this was it.

Just as Ashton-Tate should have owned the database market on the Mac, Software Publishing should have owned the presentation market as they do on the PC. And Lotus should have owned the spreadsheet market on the Mac. Look at the success FoxBase has had. If we do a Mac file manager, it will definitely be compatible with our Q&A product for DOS.

MW Symantec was late on the entry list of utility producers for the Mac.

EUBANKS Yes, but we were the first general-purpose package on the Mac. SUM was based on MacZap and shows how we add value to good products. Ted Schlein worked with the developer to design a better interface, make it friendly, and add features. We went to the person who knew the most about utilities and built on that.

It was the same with SAM. The program's author, Paul Coza, had the vision. In addition, we went to people doing shareware to fight viruses and asked what we could do to help make SAM and its author a success.

MW Aston-Tate went to Randy Wigginton, author of MacWrite, for Full Impact.

EUBANKS And it's a good product that entered the market late against dominant players. They also made some strategic errors.

MW Will Symantec develop for the Next market?

EUBANKS We think the Next computer is an incredibly innovative machine, but our resources are committed to other players. That's not a vote against Next but an acknowledgment that we can't do everything.

MW Gordon, that sounds like a lot of corporate boilerplate. What's it mean?

EUBANKS You get nowhere in life bashing people like Steven Jobs. We don't

(continues)

think Next will have a big market share, and we allocate our market resources based upon market share. Right now we're putting all of our resources on Windows and can't afford to dilute [that effort]. Besides, Next doesn't make it easy for you to develop for that platform.

MW You've had remarkable success with Symantec. How many millionaires have you made?

EUBANKS Not many. Excluding the venture capitalists, maybe four, five, or six. And the VCs are extremely happy with their return from the companies we've acquired.

MW Dave Winer is said to have made $6 million out of his sale of More.

EUBANKS Dave did well and deserved to do so, but he could have had $12 million if he hadn't bailed out so early. But it's Steve Jobs who gets the prize for leaving the most money on the table. He sold out [his Apple stock] at exactly the wrong time. Still he founded a part of this industry, and he deserves credit. Without the Mac, the emphasis on the graphical user interface wouldn't have happened so soon. Even with the Mac to copy, it took Microsoft forever to do Windows. It's hard to believe Jobs did what he did when he did it, and how good the Mac really is.

MW Have you any reflections on Apple's directions?

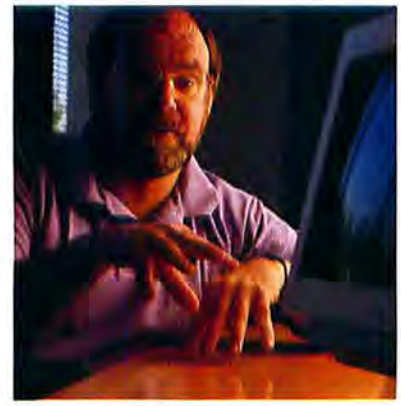
EUBANKS They're having some trouble these days. Of course you have to realize that I speak from the viewpoint of Symantec, so I'm saying things that would best represent our interests. My position is not to blast them. I would just say that Apple is not presenting an aggressive enough challenge.

The "Macintosh Way." There is nothing more irritating than to hear that said. It is self-centered and internally focused. Maybe that [attitude] was needed in the dark days of the Mac, but today Apple is a leader and that attitude holds them back.

MW Where do you see Apple going in five years?

EUBANKS I think that depends on the decisions that the company makes over the next year or two. Apple is at a crossroads and can go in any number of directions. The decision they have to reach is whether to be open or closed. In this world of standards where information is exchanged, their culture—and their system software—is closed.

Apple has the opportunity to open the Macintosh to a market where others can participate. Two years ago, John Sculley had a vision of satellite companies surrounding Apple, and that was a very good model. He seems to have lost that vision. If Apple continues bringing in and handling all opportunities themselves, they run the risk of letting Windows become the second source for the Mac and relegating the Mac to niche markets like graphics or multimedia where their features are needed.



We don't think Next will have a big market share; we allocate our resources based upon market share

On the flip side, Apple has superior solutions and people, along with a better awareness of the graphics environment. But Apple can't leverage a better market share without moving to an open environment.

MW So where will they be in five years if they don't open up?

EUBANKS Similar to the position they're in today, but less significant in the overall market. I don't see them exploding in five years.

MW What about Microsoft in five years?

EUBANKS They'll keep growing at a strong rate. The risk to Microsoft is a split with IBM and a loss of control of system software. In five years I see Microsoft supporting a number of companies with system software and IBM supplying *its own*. Microsoft will be a major force in the industry.

MW Are there more viruses in store for the personal computer?

EUBANKS Worms, viruses, Trojan horses—they're all the same. People will always write code to create viruses, and system software technology will keep up. They'll always be around, but are not a significant threat on the Mac if you use SAM. We keep up with the situation. The next level of operating system will better protect against viruses.

Finding out there's a new virus is not difficult. We're active on the bulletin boards and word travels fast. With SAM's totally new architecture we don't rewrite the entire program to prevent one virus, we just send out an update.

MW Is innovation slowing in personal computing?

EUBANKS Yes, it is. There's a quote I credit to Bill Gates that what the industry needs now is evolution not revolution. This reflects the importance of the installed base of users. The press wants to see changes because that creates news to report, but the customer is concerned with the opportunities for upward migration and with software updates. In other words, with making the most of their investment.

I think evolution is a key as the industry gets bigger and bigger. The industry is so big now that some innovations would appear bigger if not for its size.

What we are doing now is fanning out along the edge of the market

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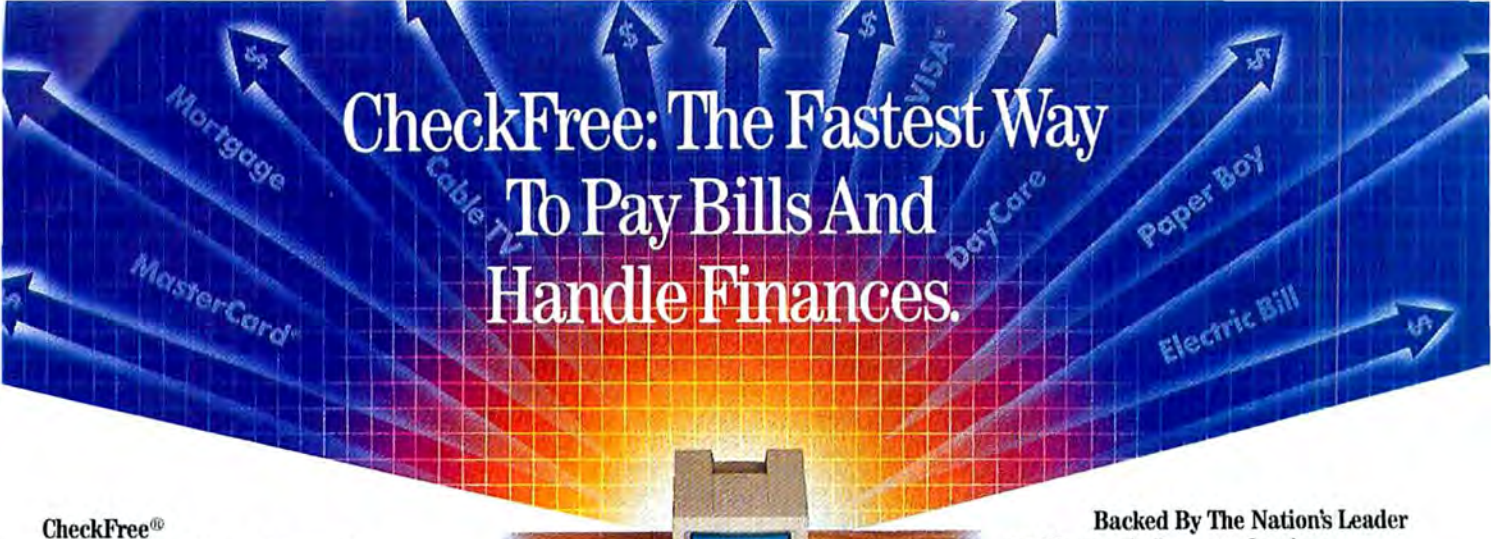

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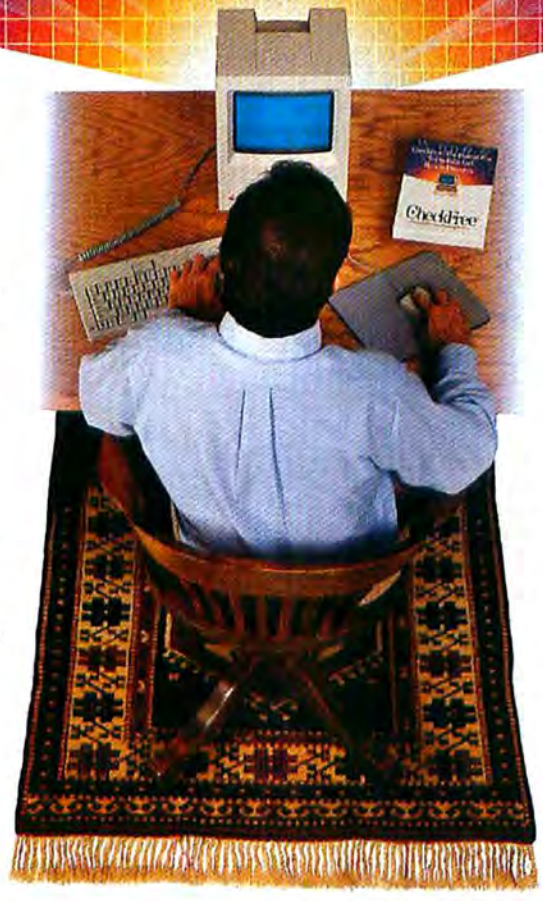

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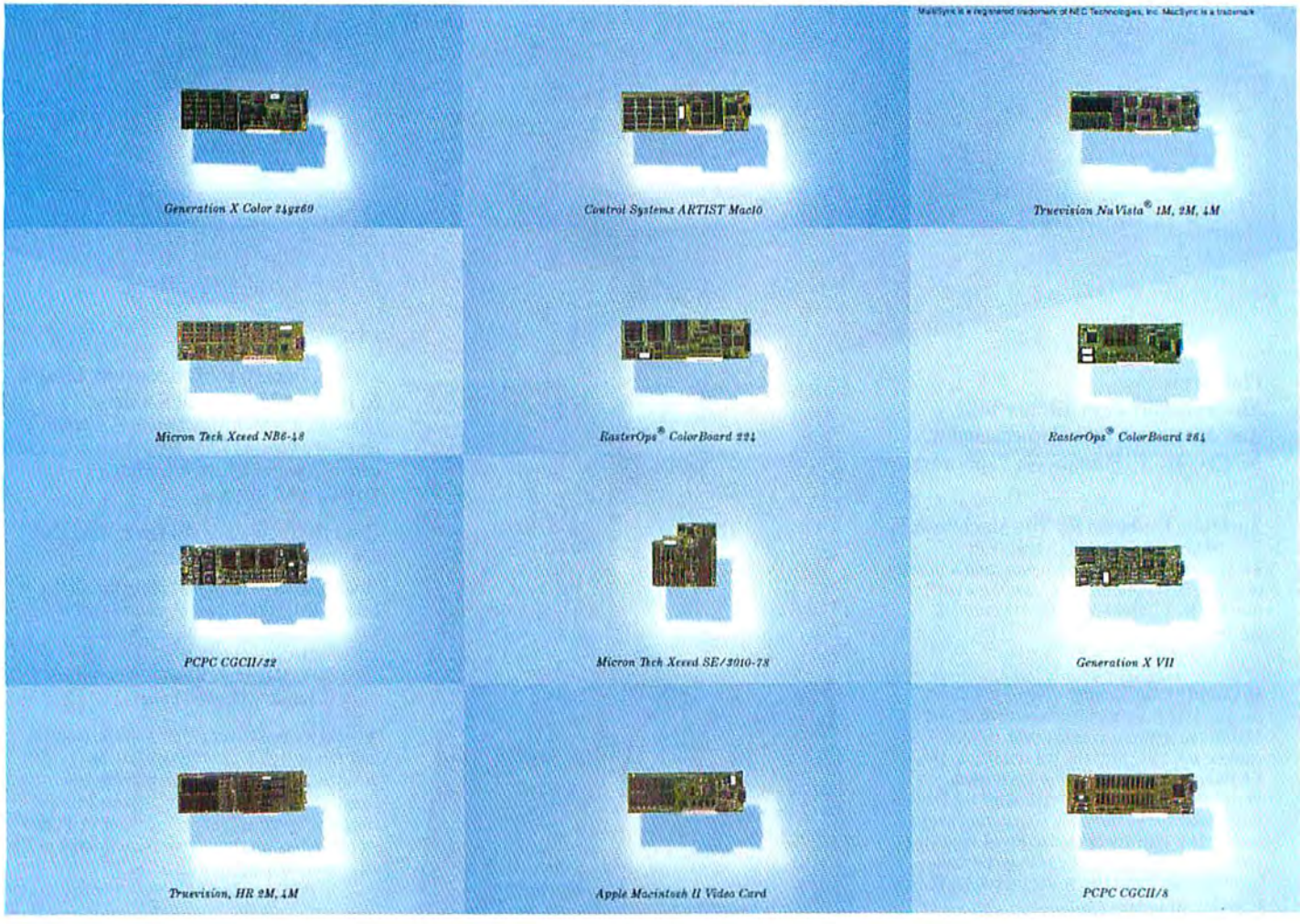

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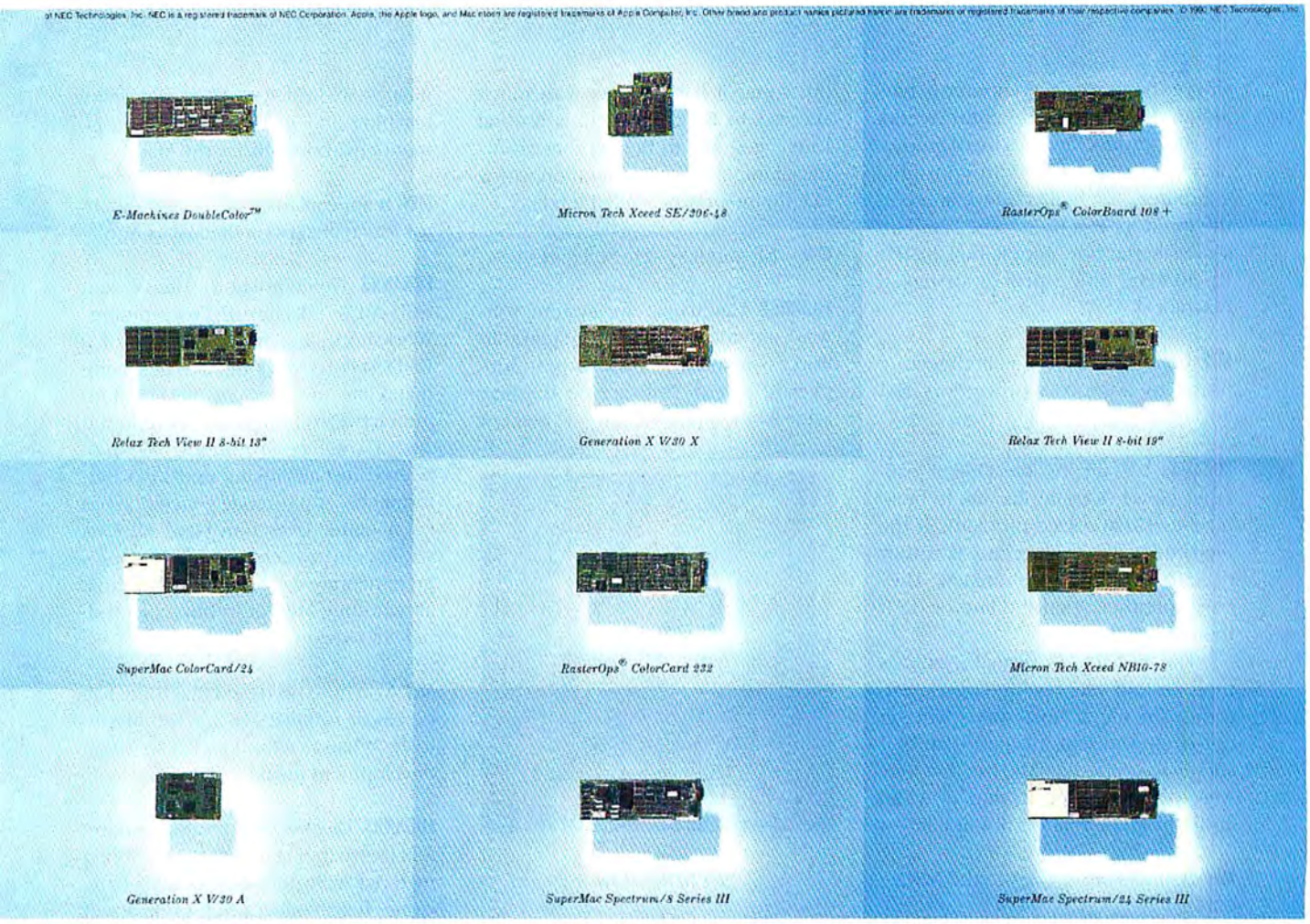

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where the personal computer is having an effect upon the entire world. On the borders there's a lot of innovation going on. Like with portable computers, or high performance on the desktop. PCs used to be standard 4 megahertz; now people buy 20MHz to 30MHz [microprocessor-based machines].

MW Can Apple evolve an architecture based on Motorola processors fast enough?

EUBANKS It's still possible. One of Jean-Louis Gassée's triumphs was to build machines that solved problems at the high end of the product line. Now they need to broaden their entire line. They have to either open the line or do it themselves.

The Portable is dismal. Apple is three or four years behind other platforms. So much time was spent on not compromising this and that, that someone overlooked the fact that they were compromising so much on the entire machine that it's not usable.

MW Will you move Q&A to the Mac?

EUBANKS We have continually made it clear that we will move it to other platforms. The Mac would be a logical extension. Over 100,000 people already use Q&A on the PC.

MW *Forbes* says that Q&A is "one of the great steps forward in making computers friendly" and goes on to attribute that to its use of natural language. What does natural language refer to?

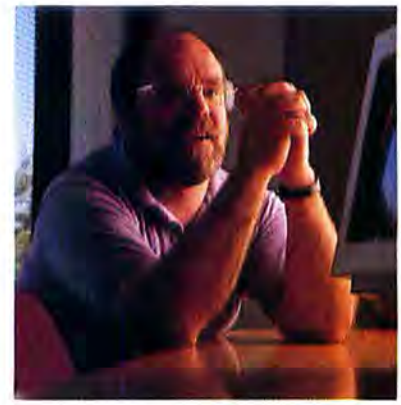
EUBANKS Natural language refers to the use of the English language as a means to query a database. Say you have a field of key words in a database. You can say *phone numbers, hardware*, and *CEO*, hit Return, and it will give you the phone numbers. Gary Hendrix [the developer of Q&A] is one of the world's experts on natural languages.

MW Are there other companies out there with natural-language products?

EUBANKS Natural-language technology is difficult. It holds a lot of promise but so far it has not met with much success. In Berkeley there is Natural Languages, and in Boston there is Artificial Intelligence Corporation with a mainframe product called Intellect.

MW What about system software?

EUBANKS Languages are system software and utilities are really system software. Symantec has the largest supplier of system software on the Mac aside from Apple. We have 80 percent



People will always write codes to create viruses and system software will keep up

of the utility market and we certainly are the leader in the language market. Borland has no serious commitment to the Macintosh and Microsoft has no languages for the Mac.

MW Where do you see Symantec in five years?

EUBANKS As a major player in the industry, continuing to grow as a provider of applications and system software to major corporations.

MW How important are languages for the Mac?

EUBANKS Really important, especially for professional programmers and students. And [the market is] growing 20 percent to 25 percent per year. Languages are widely used in university teaching and in interactive development environments for the Mac.

MW It appears that your only competitor for languages on the Mac is Apple?

EUBANKS We compete to some extent with MPW [Macintosh Programmers' Workshop], but MPW is more of a UNIX-style development that's command-line driven. Symantec is more interactive, offering fast turnaround and a total environment. We pioneered instant linking and high performance. Apple's code generation has been better over time, and MPW is stronger in projects where a lot of programmers are working. We believe that all who buy MPW also buy our product. So we don't really compete.

MW You have predicted that there will be *clean room* ROMs for the Macintosh. What exactly does clean room development mean?

EUBANKS Clean-room development refers to separating access to the cloned material from the developers of the clone. It's a concept that came about as a result of the development of IBM's BIOS. IBM had one set of people developing code, and another group who did not have access to the source code working with the specifications.

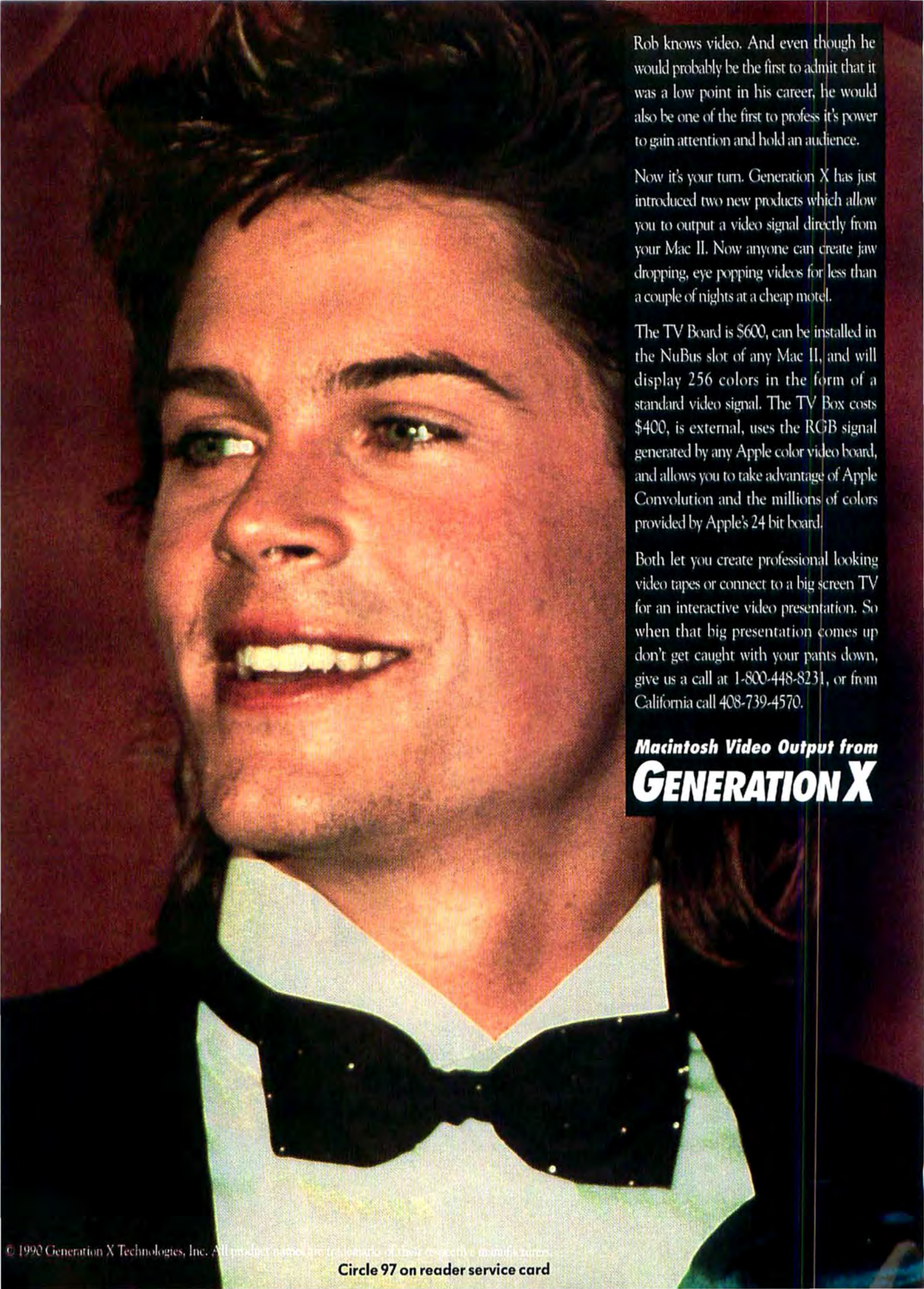
MW You're saying that Apple will license its ROM?

EUBANKS That's difficult to answer. Apple could license its ROM chips and sell its operating system. It could put the system on a chip and sell that to others. The point is that there isn't one specific thing to be done, but that to succeed in the 1990s Apple has to be more open.

IBM's and Sun Microsystems' approach [to the market] is more attuned to the nineties than Apple is with its closed operating system and closed architecture. Apple is the only provider, and they use litigation to defend their software.

MW So you think others will provide a clone of Apple's ROM?

EUBANKS It's just a matter of time. M



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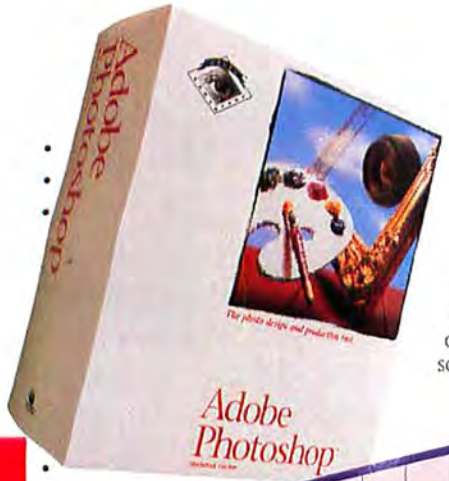

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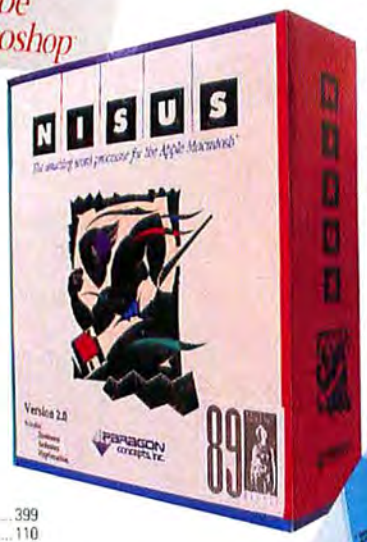

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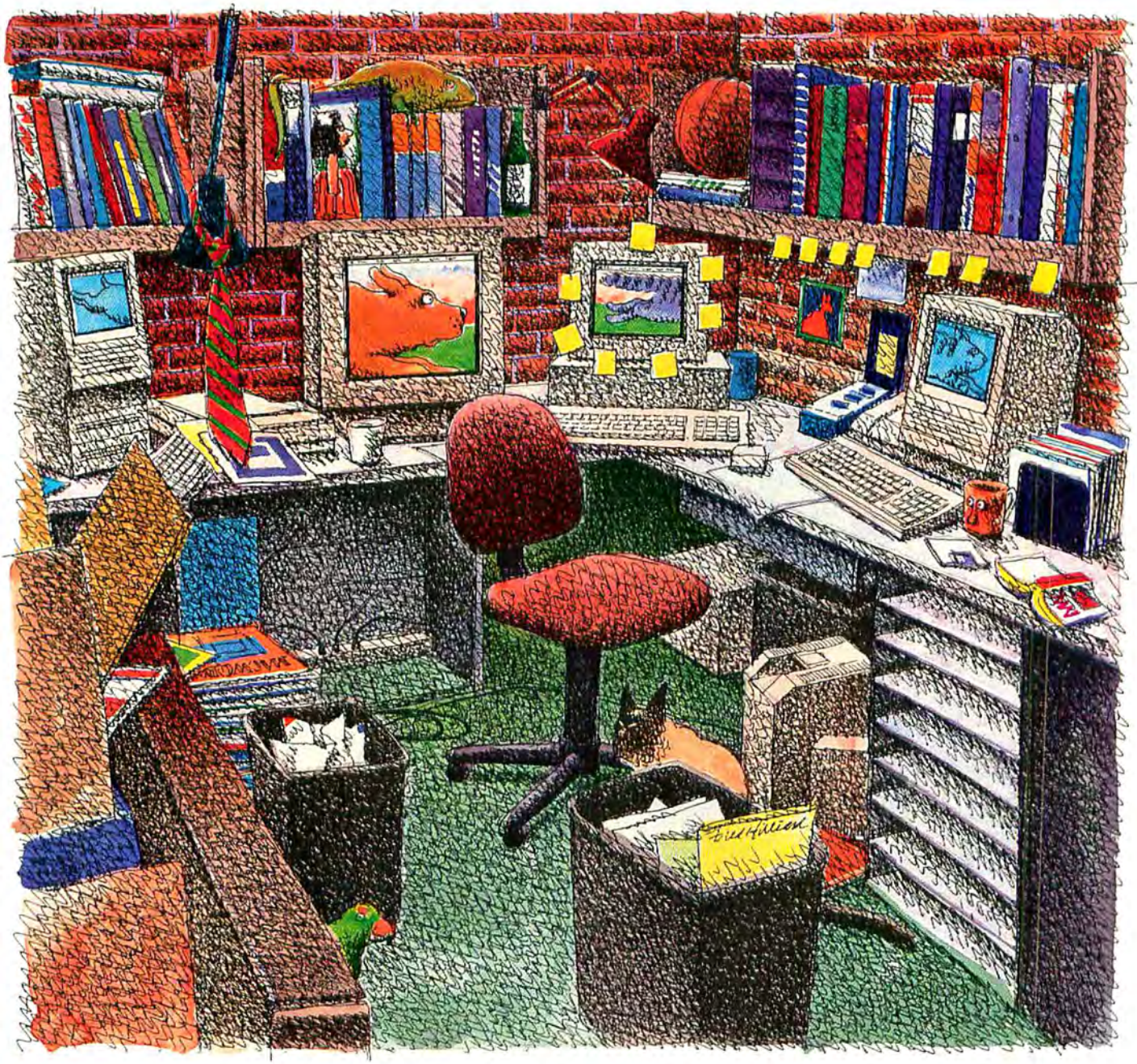

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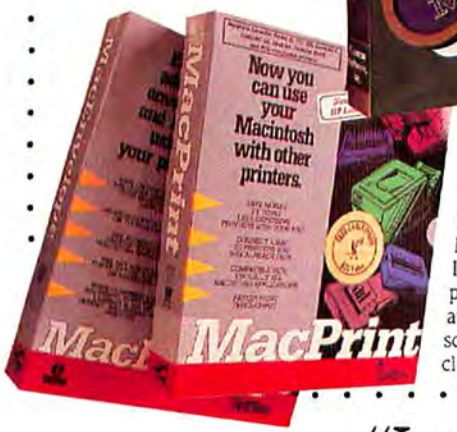

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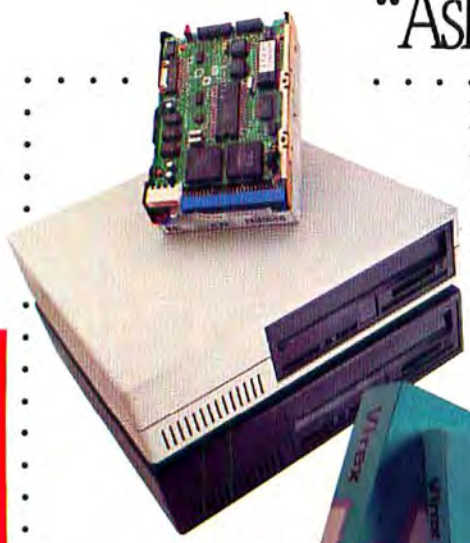

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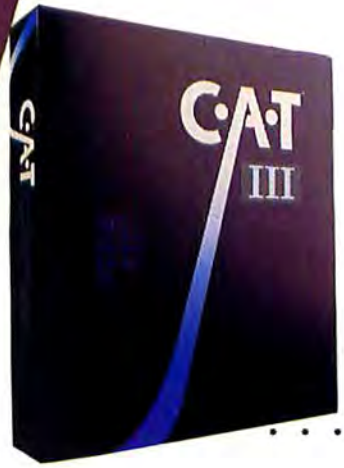

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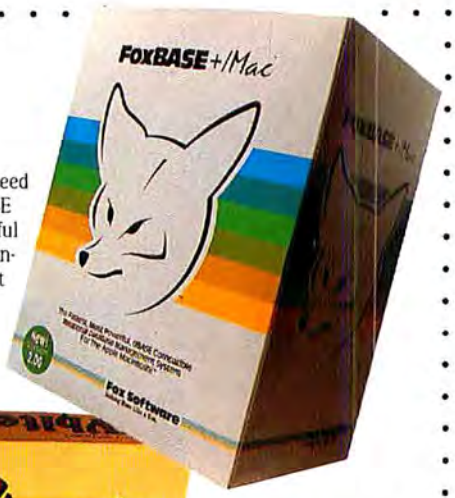

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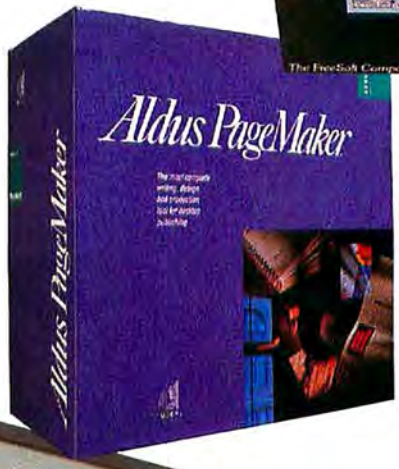

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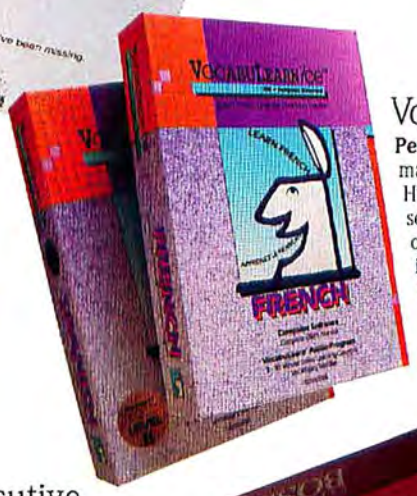

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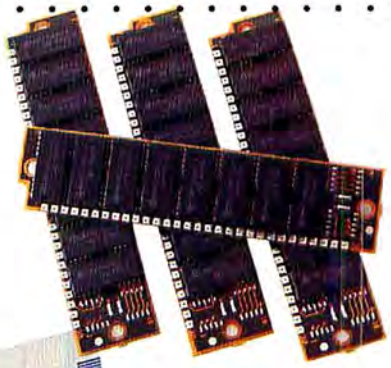

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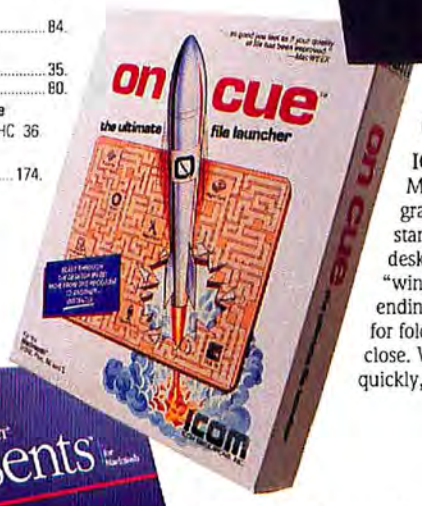

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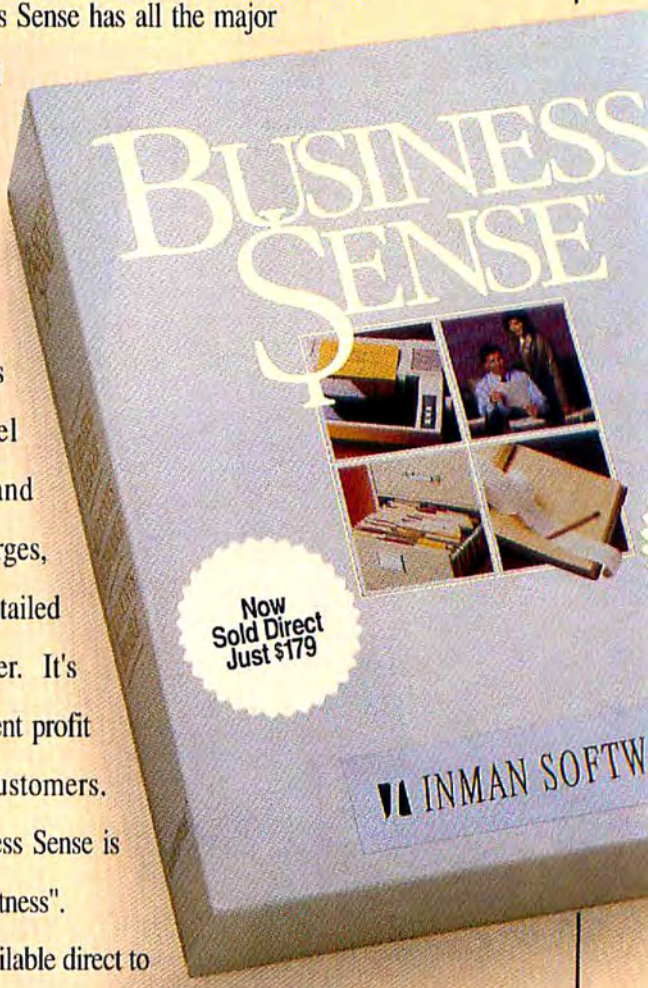
Mac'sPlace

Since 1985, One Mac Accounting Program Has Made The Most Sense For Small Businesses.

If you've got a small business with under fifty employees, you want an accounting program that you can trust. one that has withstood the test of time. Since 1985, some 10,000 businesses have placed their trust in Business Sense.

Unlike other programs with separate modules, Business Sense has all the major functions, including GL, AR, AP, Payroll, Budgeting and Invoicing, built into a single integrated program. Moving from one to another is as simple as pointing and clicking. Business Sense is intuitive and easy to use, because it was designed exclusively for the Mac.



Business Sense has every feature your small business might need including multi-level passwords, customer invoicing and statement generations, finance charges, full income and job cost reports, detailed account histories and general ledger. It's powerful enough to handle 99 different profit centers, 500 vendors and 2000 customers. MacUser Magazine said that Business Sense is "an excellent effort on the verge of greatness".

Feature Highlights
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Business Sense is an extraordinary bargain and is now available direct to the end user at just $179 including a 30 day, no questions asked, money back guarantee. A complete fully functional demo disk is available for just $10. All you have to do is give us a call today at 307-789-7257. MasterCard and Visa are accepted.

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MACWORLD NEWS

by Dan Littman and Tom Moran

Chromakey for the Mac

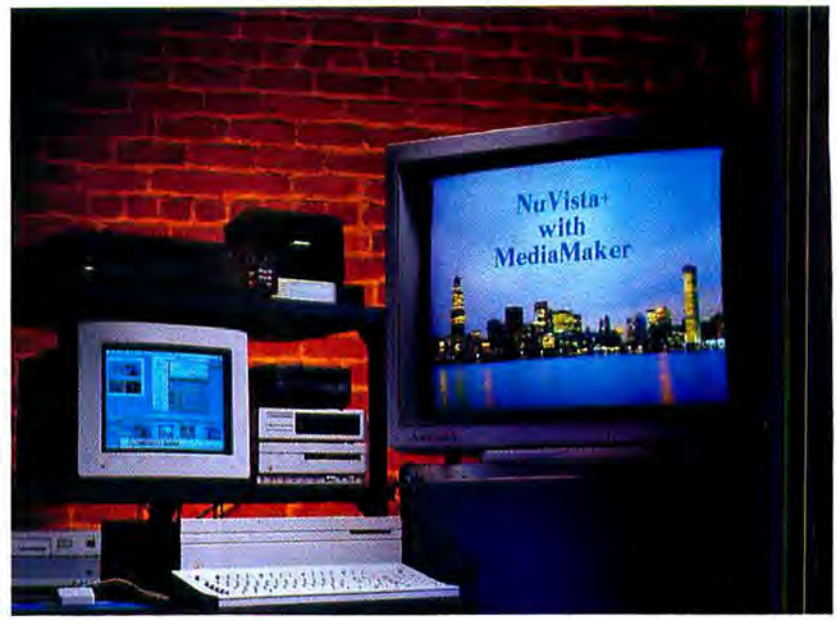
Truevision, maker of the popular Targa graphics boards, has introduced a professional-quality video processing board for Macintosh IIs, called the NuVista+. The NuVista+ board adds chromakey capability, which enables the user to create sophisticated video overlays, and a linear keyer for inserting live or still images.

The NuVista+ operates at 1, 2, 4, 8, 16, and 32 bits per pixel, and the device can also transfer computer-generated art to videotape. It is compatible with Apple's 32-bit QuickDraw.

Other features supported by the NuVista+ include fades and dissolves, advanced genlock for working with a number of different video sources, and a display-line index for higher-quality wipes and fades. The board comes in two versions, one designed to work with NTSC (the U.S. standard), and another that works with PAL (the European standard).

The NuVista+ board offers programmable capture and display resolutions, and includes a piggybacked board with all the functionality of the company's existing VidI/O switching source controller. The VidI/O controller is an external box.

The NuVista+ board should retail for $2995 including 1MB of RAM. The device was expected to begin shipping in August, according to Truevision. The company will also offer 2MB and 4MB RAM upgrade boards that snap onto the edge of the NuBus board and do not take up an additional slot. Prices for the upgrades were not set at press time. For more information, contact Truevision in Indianapolis, at 317/841-0332.—**T.M.**



LUIS DELGADO

Truevision's NuVista+ video processing board brings chromakey capability to the Mac II series. Here it displays an image created with MacroMind's MediaMaker software.

Voice-Activated Jam Session

Musicians usually prefer MIDI keyboards to Mac keyboards, and artists usually feel the same way about digitizing tablets. With Articulate Systems' Voice Navigator, musicians can talk rather than type, leaving their hands free to create. Composer and *Macworld* music writer Christopher Yavelow and visual artist Brentano Haleen like voice control so much that they use it not only to compose but also to perform. In April, at *Verbum Magazine*'s "Digital Be-in," the two artists announced that they would control a collaborative piece entirely by the words they spoke into their headsets; Yavelow's verbal commands would trigger and transform MIDI fragments, while Haleen's would trigger and transform animated fragments in MacroMind Director. The two then "play" their hard disks in an audio-visual jam session, talking to each other as well as to their machines. "In the tradition of John Cage and Merce Cunningham, who wrote pieces that they didn't look at until they actually performed them," explained Yavelow, "this is entirely interactive."

In the ensuing 15 minutes, a succession of largely abstract forms changed shape and color while the music went through transformations of style, mood, and instrumental ensemble. Not everyone will care for this sort of free associative art, but the technology used to create it is a valuable addition to the stock of electronic tools now available to artists with all sorts of aesthetic intentions.

Voice Navigator includes a box the size of an external drive, which connects to the SCSI port, and a headset microphone with a noise-canceling

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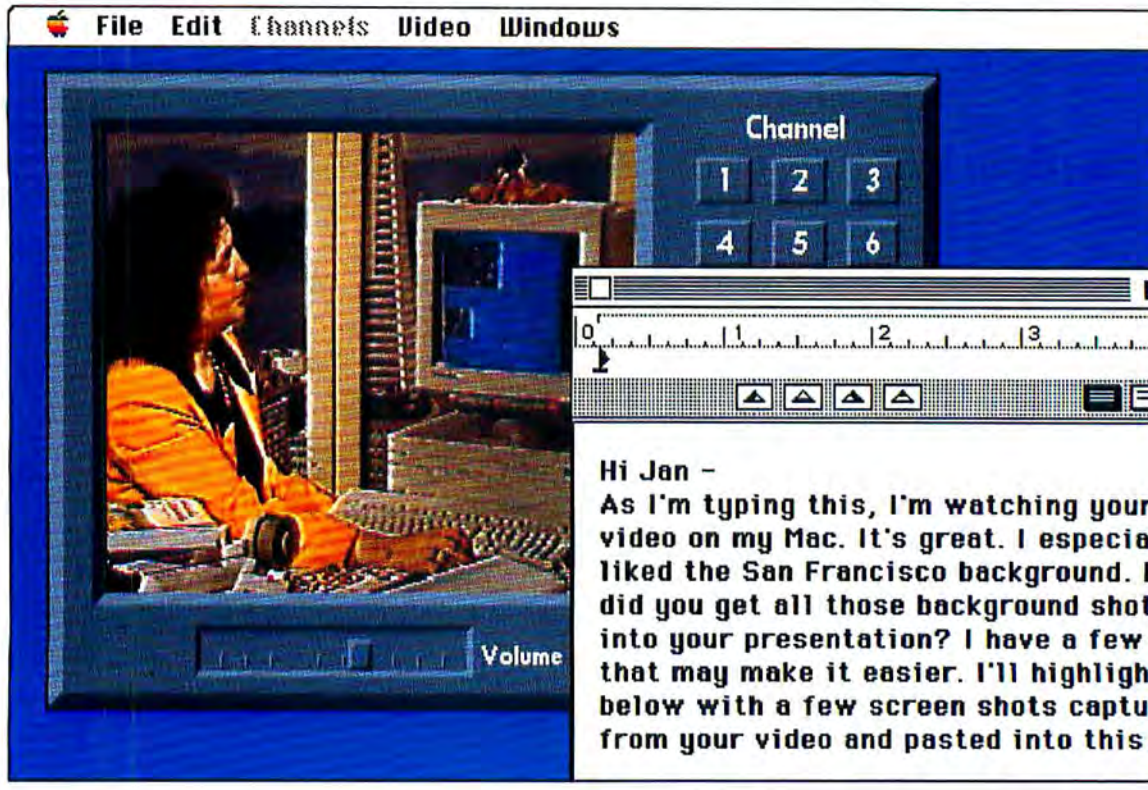
DO YOU KNOW A MAJOR VIDEO FEATURE WHEN YOU SEE ONE?



The video board industry is developing so fast, it's hard to know which product features are really significant. And which features apply to your specific needs.

Look at the DigiVideo™ Color screen shown above. Can you tell what the most important features are? Well, don't feel bad if you can't. Because the most important features are invisible.

First we see a real-time video screen running in the background under MultiFinder. Then notice the overlapping window. The beauty here is that the window doesn't stop the video from being displayed or heard. Allowing DigiVideo to be used at any time while you work.

But most importantly, you're looking at the only video product that is *fully integrated* into the computer's operations. That means DigiVideo functions seamlessly in your computer environment. Video images can be saved to hard disk, or captured, saved, and pasted into most standard applications without ever interrupting or changing the way you work.

And DigiVideo will work with the 8 bit video board and monitor combination that you already own, regardless of the screen size. So you don't have to pay for any additional hardware. That's part of another unique DigiVideo feature. Value.

The DigiVideo line of products start at just $395. And with the fully integrated DigiVideo Color at just $995, you won't find a better bang for your video dollar anywhere.

Finally, no one else can offer you all of these advantages in one video package. So if you're excited about video technology, it pays to look at the features behind the screen too.

Ask to see the DigiVideo line at your local dealer. Or for more information call Aapps™ Corporation at 408/735-8550.

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CYNTHIA MOORE

Composer Christopher Yavelow (left) and visual artist Brentano Haleen used Voice Navigator to help create voice-activated digital art (VADA) in an audiovisual jam session.

feature. The box includes a built-in speaker and a jack for a pedal- or hand-operated on/off switch. The software has three parts: Voice Control, an INIT linking the Voice Navigator hardware to the Mac Operating System; Language Maker, a DA for voice-activating the language and menu structure of any standard Mac application; and Voice Train, a utility that trains the system to recognize words spoken with distinctive voice modulations. Any standard Mac application can be adapted for voice control in 15 minutes or less. Yavelow and Haleen both found that their voice macros triggered responses more quickly than either Quick Use or Tempo macros.

Voice Navigator should be widely available in the fall. For further information, call Articulate Systems in Cambridge, Massachusetts, at 800/443-7077. For information on Yavelow and Haleen's voice-activated digital-art performances, call 213/871-6869.

—Ann Garrison

Ventura Mac: When Dreams Are Real

Rumors set Mac users to dreaming two years ago of a Mac version of Ventura Publisher, the DOS world's leading publishing package. But reality is never as perfect as dreams. Ventura Publisher for the Mac, which will essentially match the DOS version feature for feature, would have amazed in 1988, but today it's simply a solid long-document-publishing tool with few surprises.

In place of a PageMaker-like pasteboard metaphor, Ventura Publisher uses a frame metaphor, which is more appropriate for long, structured documents. Ventura documents don't save imported files internally, instead remembering where the originals are stored and how to place and format them. These warm links automatically bring in the current source files each time you open a Ventura file, adding more pages if the source files have grown. Ventura documents can incorporate files across mixed Mac and DOS networks (this requires using DOS file-naming conventions on the Mac).

Ventura Publisher is packed with features for preparing long documents. It can index and create a table of contents across multiple documents (as can PageMaker 4.0) and automatically insert user-defined terms in index items, but it lacks FrameMaker's powerful search-and-replace capability, forcing you to manually embed special codes page by page. Ventura can update page numbers, numbers for figure captions, footnotes, and cross-references across a document. Figures, figure captions, subheads—anything in a frame—can be anchored together flexibly so that, as a page's contents shift, the page rewraps intelligently (only FrameMaker matches this feature).

For text formatting, Ventura uses paragraph tags (similar to Word's styles). Except for its 10-level-deep military-specification-compatible outline numbering, tags cannot be set up hierarchically, a key element for preparing extremely complex technical documents. (It would be fairly simple to map Ventura tags to SGML's truly structured tags.) Kerning, leading, and tracking can be set to hundredths of a

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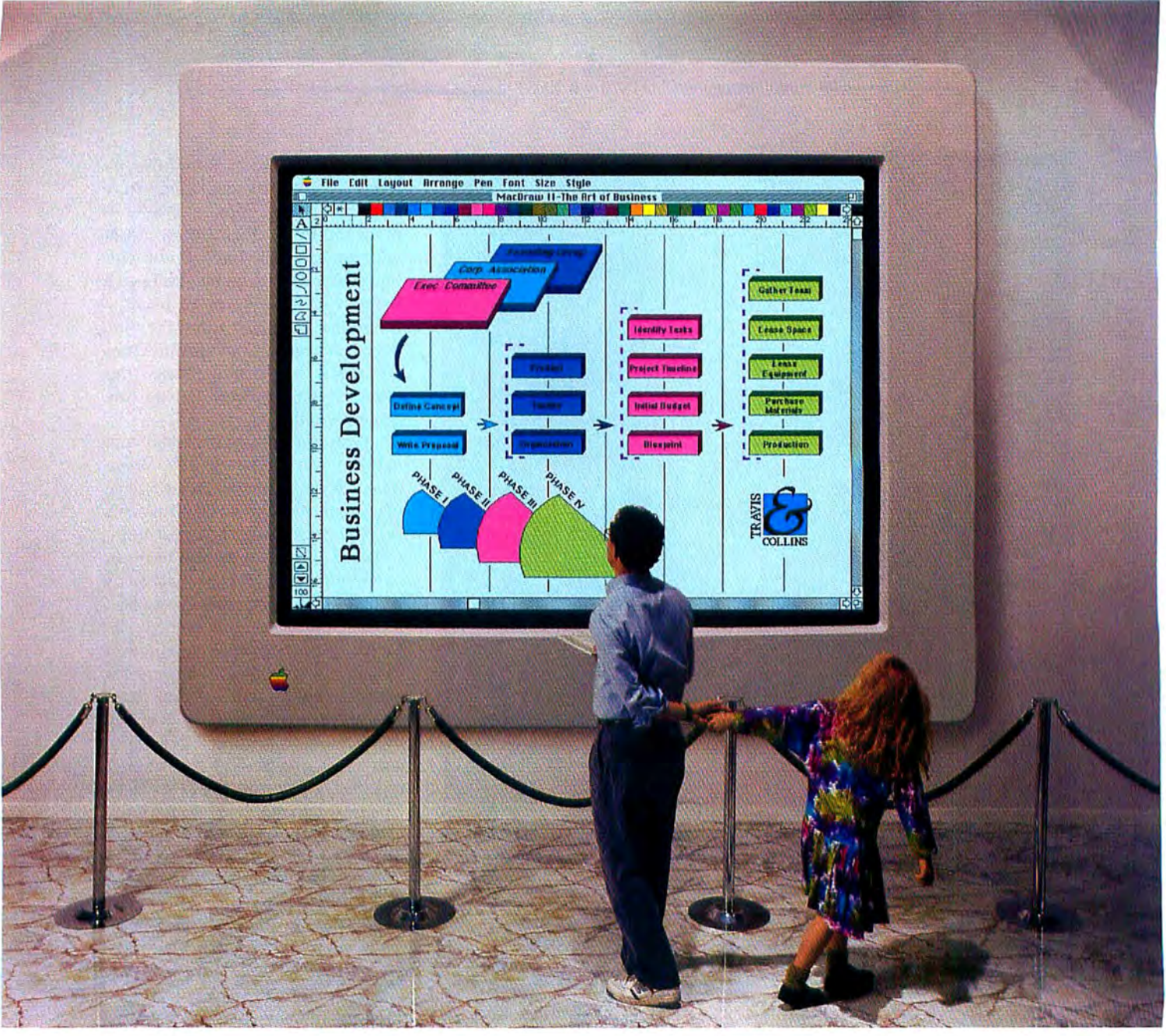
IAN CUMMINGS

Imagesetters West, a San Diego–based typesetting and printing house, beta-tested the Mac version of Ventura Publisher.



The art of business.

Have you ever noticed the way your colleagues use graphics? How they seem to make their reports and presentations come alive?

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With MacDraw II you can illustrate reports, design products, publish flyers, and present proposals in a way that makes people sit up and take notice.

Even if you've never used a drawing tool before.

What's more, MacDraw II is advanced enough to keep you going even as you get better at using graphics. Its power and depth have made it a standard for corporations who need a tool that beginners can start with and expert designers can stay with.

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But why not see for yourself. Just ask a colleague to show you MacDraw II. Or stop by an authorized Claris dealer to find out how effective you can be at the art of business.

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point, and type sizes can be set in half-points. Text can wrap around rectangular picture frames, but not around irregularly shaped images inside frames (FrameMaker also suffers from this shortcoming).

Other notes: Ventura has a table editor and special tools for rules, drop caps, and bullet items. Its mathematical typesetting can't evaluate expressions, one of FrameMaker's niftiest features. Ventura's color capabilities, like FrameMaker's, are no match for the design-oriented PageMaker and QuarkXPress, though high-end color is usually considered unnecessary in technical publishing. Pricing was not decided at press time. For more information, contact Ventura Software in San Diego, at 619/673-0172.—**D.L.**

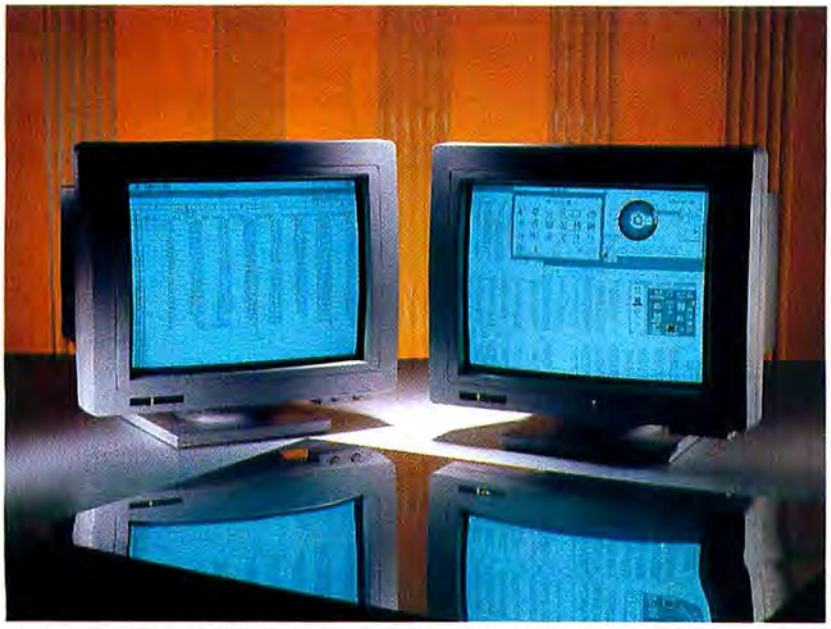
Variable-Resolution Monitor Squeezes Spreadsheets

For those who would like to see more cells of a spreadsheet at once, or display larger type while word processing, Sigma Designs has introduced a 19-inch monitor that lets you choose from 6 different resolutions on the fly. When you want to squeeze that spreadsheet, you can select 92 dpi. If you want large type, you can opt for 36 dpi. The monitor also supports 46 dpi, 60 dpi, 72 dpi, and 120 dpi. However, the company cautions that not all applications currently support resizing of windows on the fly. The number of applications that do support this kind of resizing should increase when System 7.0 becomes available from Apple, according to Sigma Designs.

Called the Sigma L—*View Multi-Mode (honest!), the monitor works with the Mac II series. To reduce flicker and eyestrain, it has an extremely high vertical refresh rate of 92Hz (at 72 dpi). The 120-dpi mode is intended for CAD or other graphics and imaging applications. The 92-dpi mode lets you see two text pages side by side.

The L—*View Multi-Mode began shipping in June. Its suggested list price is $1999 for the monitor and adapter board.

For more information, call Sigma Designs in Fremont, California, at 415/770-0100 or 800/933-9945.—**T.M.**

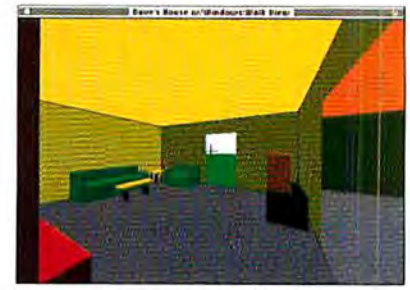


LUIS DELGADO

The Sigma L—*View MultiMode monitor from Sigma Designs supports a range of resolutions so you can display larger type or cram more spreadsheet data onto the screen.

Virtually Like Being There

It's something everyone building a house would like to do: walk through the house while it's being designed. Now software from Virtus lets you do just that. With Virtus WalkThrough, users can design a three-dimensional model and move through it interactively. The program is, in effect, electronic modeling clay for quickly and intuitively creating an environment.



Three stills from a Virtus WalkThrough animation of an architectural design. Notice how after entering the house the camera turns right and looks into the windowless room.

Instead of traditional CAD elements such as polygons and vectors, Virtus WalkThrough provides familiar objects for modeling—such as doors, rooms, and furniture—whose shapes and colors users can edit. To place a door, you select the door tool and position it in the program's two-dimensional Plan View window. As WalkThrough assembles the two-dimensional plan, a three-dimensional perspective of the design space updates automatically in the WalkView window, so after placing a door, a user can immediately walk through it into an adjoining room simply by moving the mouse. Completed WalkThrough models can be exported to CAD pro-

(continues)

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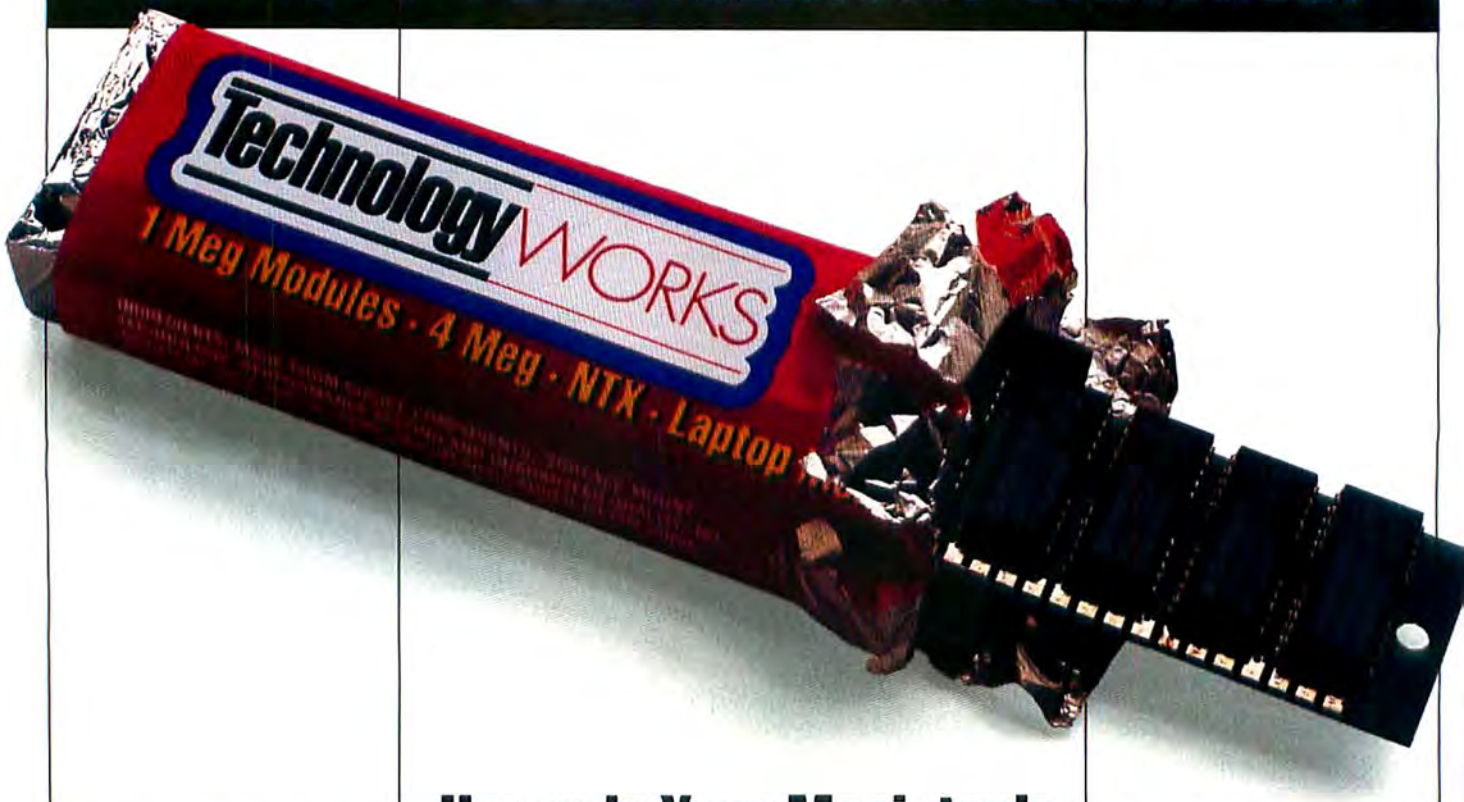

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JOHN WILLIAM LUND

The Road E kit from Macadam Computer converts an SE or SE/30 into a transportable Mac. An optional NTSC driver hooks the Road E to a TV so you don't have to tote a monitor.

grams for construction specifics.

While Virtus WalkThrough's most obvious users might be architects, space planners, or interior designers, others are also enthusiastic about the program's possibilities. Designers for *The Abyss* used Virtus's technology to lay out the movie's underwater set. And author Tom Clancy, who is a member of Virtus's board of directors, says, "The FBI was quite taken with the program because they . . . and hostage rescue teams could use it to plan missions. And the Navy could use it to train damage-control parties, for example, if a ship catches on fire."

Virtus WalkThrough will list for less than $900. It will run in wire-frame mode on a Macintosh Plus but require a Mac II or above with 2MB of memory and a hard disk to display solid objects. For more information, contact Virtus in Cary, North Carolina, at 919/467-9700.—**Brita Meng**

Mac Transportable Plugs in to TVs

Road E, a conversion kit from Macadam Computer Corporation, lets you convert an SE or SE/30 into a transportable, modular Mac. You install the logic board, hard disk drive, and floppy drive inside the Road E system box, which has the same footprint as an SE but lacks an integral monitor. The process takes about 30 to 40 minutes following included instructions, according to Macadam. Once the conversion is done you have a system box weighing 9 pounds, 2 ounces, that you can move from home to office.

But the Road E kit also lets you connect the system box to another Mac and use just the hard drive if, for instance, you are visiting an office equipped with a more powerful system. And with an optional $175 NTSC driver, you can plug the Road E box in to a TV with RCA jacks, use the TV as the display, and not have to lug a monitor around.

The Road E's $999 price tag includes a 15-inch, full-page monochrome monitor, a monochrome adapter board, an international switching power supply, and a SCSI cable. A color option sells for $600 including monitor and graphics adapter board.

The Road E kit has begun shipping, according to the company. For more information, call Macadam in San Francisco, at 415/863-6222.—**T. M.**

Animated Debate Over 3-D

Where should modeling, rendering, and animation meet? Levco founder Duane Maxwell is busy writing a 3-D modeling and animation package—code-named Mickey, in Disney's honor—that he expects will redefine how the 3-D pie is divided up.

Says Maxwell: "Mac animation is coupled wrong—it should be modeling and animation, then rendering should be separate." In packages that emphasize rendering at the expense of modeling or animation, "the emotion in animation is lost." Mickey will leave the rendering to RenderMan, providing only an interface to set shader parameters and concentrating on advanced tools for modeling and animation.

Maxwell says animation conveys emotion by how objects deform as they move, interact, and collide. Mickey will provide tools for creating effects, familiar to Pixar fans, like squash and stretch—effects that other Mac animations simply ignore.

Mickey will offer several kinds of intelligence that are new to Mac 3-D. For example, using constraints you will be able to create a sphere and then define a second sphere as simply twice its size; make the first one bigger and the second sphere will grow in proportion. Using implied values will

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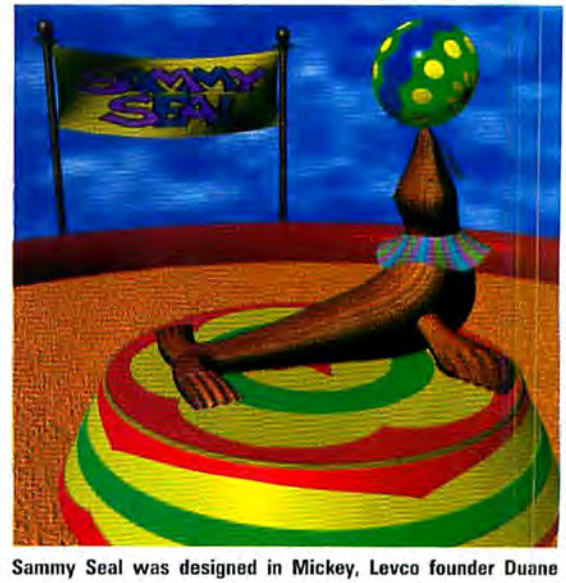
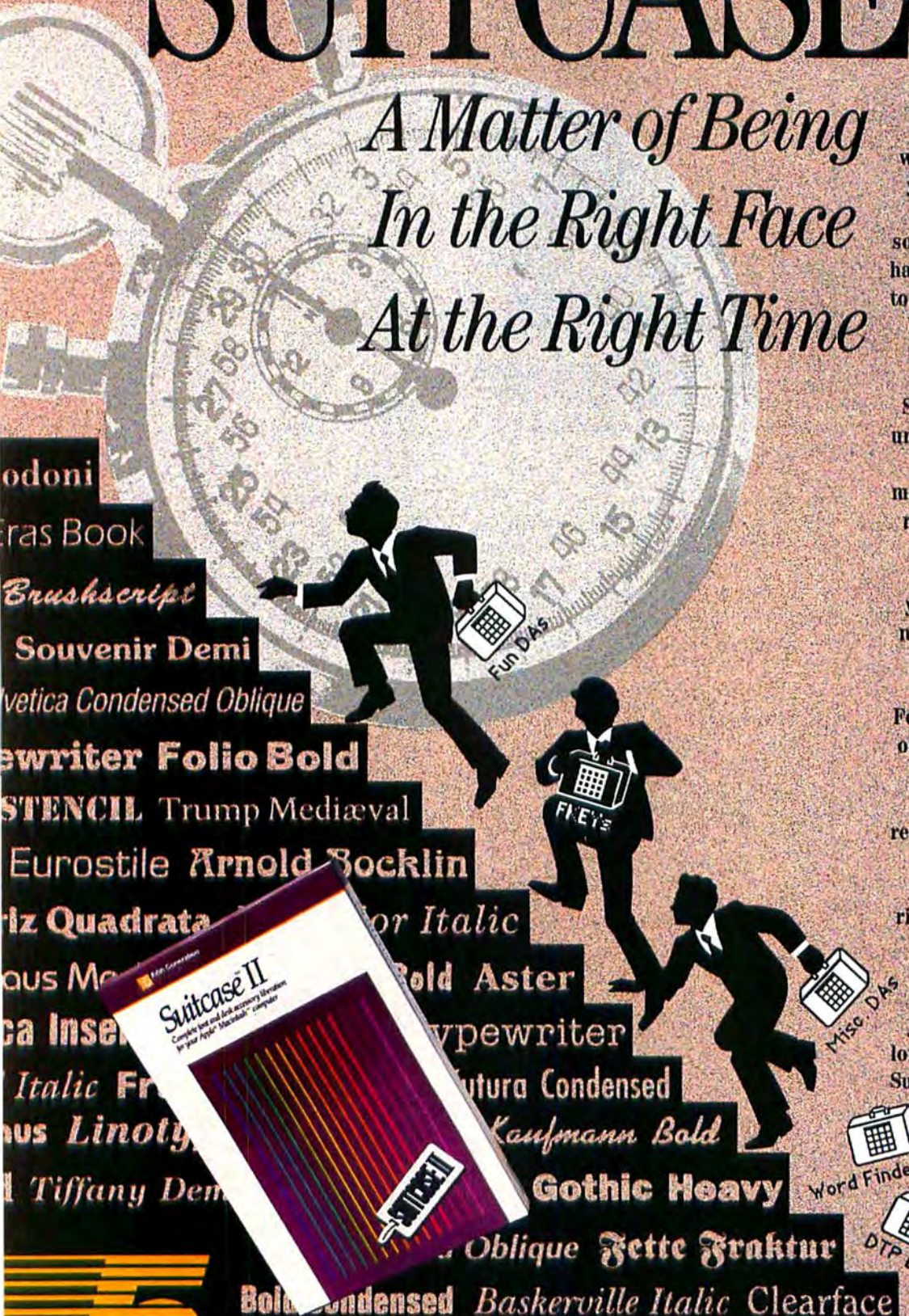


COPYRIGHT 1990 BY DUANE MAXWELL AND GABRIEL WILENSKY

Sammy Seal was designed in Mickey, Levco founder Duane Maxwell's new 3-D modeler, and then rendered with RenderMan.

SUITCASE II:

A Matter of Being In the Right Face At the Right Time



Suitcase II is the award-winning software that gives you unlimited access to *all* your fonts and desk accessories, *all* the time. Without having to use Font/DA Mover to install and deinstall them. Without cluttering up your system file.

Suitcase II lets you view an unlimited number of fonts *in their own typefaces* at any moment, so you can pick the right face at the right time, without breaking stride. You'll never have to reboot your Macintosh to install a new font, or search through a cluttered System File to find what you need. Font ID conflicts are a thing of the past with Suitcase II.

And you'll never have to restart your system to install a Desk Accessory, because whatever you need will be right in your face, whenever you need it!

So why spend your time juggling fonts and DAs any longer? Now is the time to put Suitcase II on *your* Macintosh!

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eliminate the need to describe all of an object's parameters. For example, the length of a tube equals its end point minus its beginning point; if you stretch the tube, its length is still defined.

Mickey will have an expression parser, which may evolve into a full-blown programming environment, to set parameters for anything in the program—for example, you will be able to control a ball's trajectory with a parabolic function. Using the parser will require some knowledge of math and physics, but Maxwell considers that essential to creating animation. Actually, Maxwell says, "There are two kinds of physics: cartoon physics and real physics . . . [and] cartoon physics works better." But until someone converts cartoon physics into math, Mickey will provide some nonmathematical click-and-drag methods for setting simple animations.

Maxwell is undecided about starting a new company to publish Mickey or licensing Mickey to an established company, but he expects it to list for less than $1000.—**D.L.**

LUIS DELGADO

The 5000CX PC Viewer LCD Projection Panel from In Focus Systems produces up to 5000 on-screen colors.

The Software Instrument

As a musician takes the stage and begins hammering with a pair of drumsticks on a small set of circular pads, the room fills with intricate rhythms, soon joined by a string section and a series of blazing solos—first guitar, then piano, then flute.

Behind the musician is an inexpensive piece of electronic music equipment and a Mac running a program called Sybil. Sybil is not a MIDI sequencer—one of those programs that works like a multitrack tape deck for recording arrangements one track at time. Sybil works like a musical instrument, allowing you to produce complex, multipart compositions on the fly. In short, you don't use Sybil, you play it.

Sybil lets you play back series of notes and chords that you assign to the pads on a MIDI drum controller, the keys on a MIDI music keyboard, the frets on a MIDI guitar, or even the keys on the Mac's keyboard. For example, you can assign a chord to a pad and play back that chord by striking the pad, or set up Sybil to play one set of notes when you strike a pad gently and another set when you strike it hard.

You can also tell Sybil to play your stored notes differently when you strike a particular pad twice in succession, first playing a chord, then transposing the chord to a different key. By combining stored notes with these toggles, as they're called, you can create remarkably rich compositions with surprisingly little effort.

Sybil 1.0 required HyperCard, but version 2.0, now shipping, is a standalone program. It retails for $299 and requires a Mac Plus with a MIDI interface and a MIDI instrument. A demonstration video is available for $10, and demonstration disks are in the works. For more information, call Scorpion Systems in San Francisco, at 415/864-2956.—**Jim Heid**

Projection Panel Puts 5000 Colors In Focus

For more colorful presentations, In Focus Systems has announced an overhead LCD projection panel that can show nearly 5000 colors at once. Called the 5000CX PC Viewer LCD Projection Panel, the device uses a Triple Super Twist Nematic (TSTN) technology that the company says it has patented. The technique involves three LCD layers stacked on top of each other.

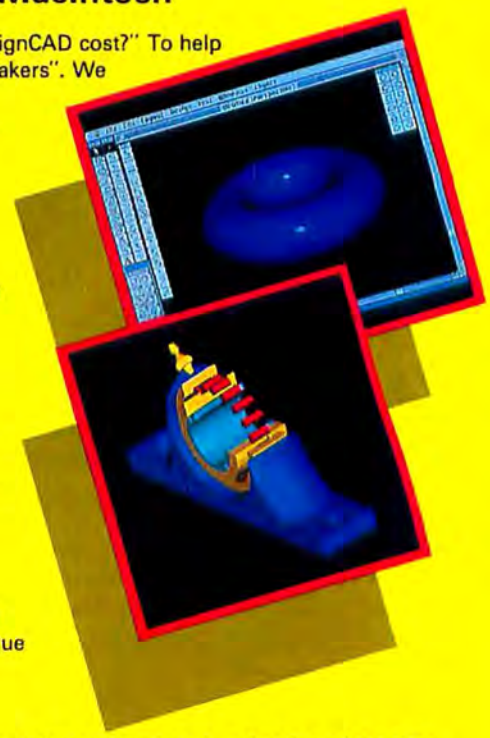
Intended for use with PCs or *(continues)*

AW...WHAT THE HECK!

DesignCAD 2D/3D

Professional CAD System for the Macintosh

When we introduced this product we had to ask ourselves, "What should DesignCAD cost?" To help with our decision we hired accountants. We consulted with industry "movers and shakers". We purchased the finest spreadsheets available. Many people said, "The software should sell for $3,000.00 or more." Others said, "It's good, darn good—sell it for at least $2,000.00." Opinions varied. Finally we said, in the Great American Tradition, "Aw . . . What the Heck! Let's see the competition beat this **$699.00.**



DesignCAD has disproved a common misconception about computer software: you don't always have to spend a lot of money to get high-power quality software. DesignCAD for the Mac has features of CAD systems costing thousands of dollars! Yet, DesignCAD is priced at least 50% to 80% BELOW comparable CAD packages . . . **AND DESIGNCAD IS BETTER!**

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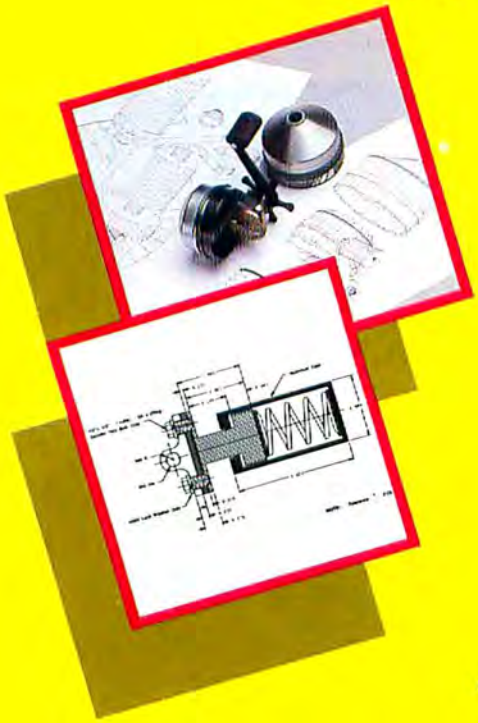

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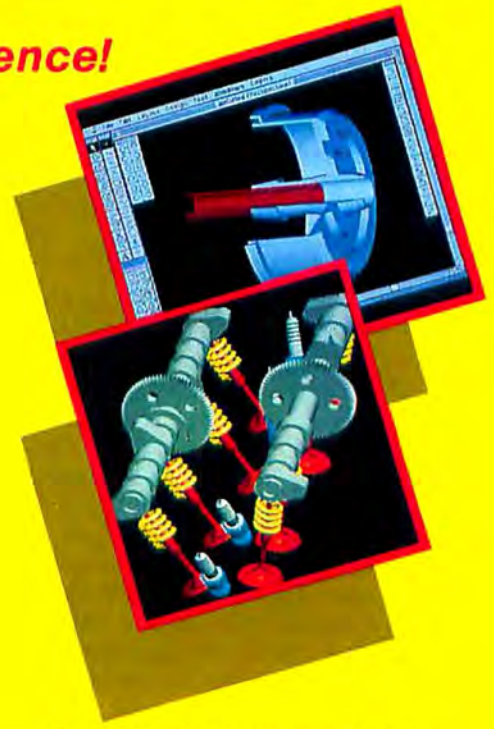

The list goes on and on!

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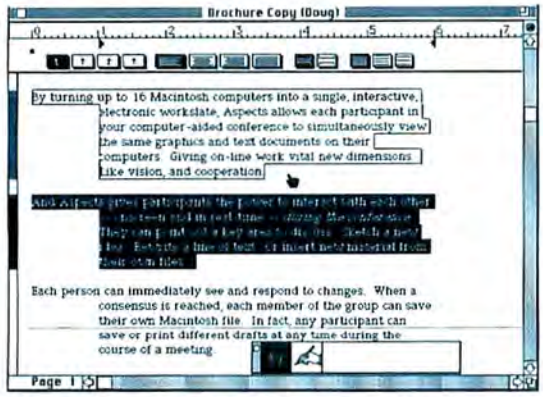
Macs (with an optional adapter), the 5000CX offers an image area that's 640 by 480 pixels with an aspect ratio of 1.33:1. It displays up to 4913 colors and produces photographic-quality images, according to In Focus.

The company has also introduced the LiteShow II, a new version of its portable presentation manager. The LiteShow II is a box that contains RAM and a floppy disk drive and weighs less than 7 pounds. It can store about 30 images per disk, letting you leave your computer at home. The LiteShow II and 5000CX are designed to work together.

The 5000CX and LiteShow II were slated to ship beginning October 1. At press time, In Focus estimated that the 5000CX would have a list price of around $6495, including a remote control that allows you to adjust the color settings. The LiteShow II should list for under $2000. A 5000CX adapter for the SE will list for $119, while an adapter for the Mac II series will list for $249. The adapters are also scheduled to be available on October 1. For further information, call In Focus Systems in Tualatin, Oregon at 800/327-7231.—**T.M.**



The outlined paragraph in this shared Aspects word processing document is controlled by someone else on the network.

Meeting Like This

More evidence that groupware is finally arriving: a new application lets groups work together across a network using most of the protocols and paraphernalia common to real meetings.

Group Technologies' Aspects provides several standard applications—paint, draw, and word processing—in a very unusual context. As users join a meeting they step into a virtual conference room and see all the paint, draw, and text documents other participants are using. When any participant changes a document, it updates for everyone in near real time (the company says people participating by modem are updated almost as quickly).

To prevent online meetings from degenerating into chaos, Aspects provides three levels of formality, and the person who initiates the meeting (the *moderator*) decides which level to use and sets a password for joining. At the most basic level, useful for two or three people, pretty much anything goes and more than one person can work on a document at the same time; for bigger meetings, you can arrange to pass control from person to person or let the moderator recognize people as they request the floor.

Aspects is missing some pieces that users are likely to want, such as a spreadsheet, an outliner, presentation tools, and a way to schedule and notify participants about conferences. System 7.0 will make it possible to distribute some of those needs to other applications, but an open-architecture or application-programming interface—and support from big developers—would be a cleaner solution.

Aspects lists for $299. It does not use a server, but each workstation must have its own copy of the program and a megabyte of memory for Aspects' partition. For more information, contact Group Technologies in Arlington, Virginia, at 703/528-1555.—**D.L.**

User-Hostile Interface

A Macintosh-based animation appears in the recent movie *RoboCop 2*, but the animation is not only done on the Mac, it *is* the Mac's user interface—or perhaps its evil twin. Mac users in the audience can be heard to chuckle when they first look through the eyes of the bad-guy robot, which features a menu bar in the Chicago font. But the robot's programmers must have followed user-interface guidelines of their own: the menu commands are Mode, Control, Status, Target, Memory, and Record, and in place of the usual menu-bar apple is a skull icon. (Apple would never sanction such a design; it has the forbidden word *mode* in it.) The original script called for pull-down menus, but they would have obscured

(continues)

Go ahead, Mac my day. A cyborg's-eye view from the movie *RoboCop 2* reveals what we already knew: powerful technology may be used for good or evil.

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the renegade robot's view, so a compromise was agreed on. Pop-up status readings appear as the robot centers its crosshairs on unfortunate targets.

Although Mac animations have been used as storyboards for major films, and have even appeared on monitors in a spaceship scene or two, *RoboCop 2* marks the first time Mac animation has been juxtaposed with live-action shots. Los Angeles animators Lynda Weinman and Ann Monn employed Studio/8, Adobe Photoshop, MacroMind Director, and Electric-Image to create the Monstervision scenes for the production company Visual Concept Engineering (VCE).

VCE used a customized Matrix film recorder, equipped with software from Synthesis, to transfer the Macintosh animations to motion-picture film. Those film elements were later composited with the live-action scenes and an overlay that gives the appearance of viewing the world through a video monitor. "It was kind of tricky to figure out how to match up the registration between the live-action film and the computer scenes," says Weinman. "There were certain scenes where we had target crosshairs that tracked people. We created a grid on the Mac, then film-recorded it, projected it, and traced it. We then projected the live action onto the tracing, got grid coordinates, and fed them into the computer."

Now that Weinman and Monn have shown it can be done, maybe we'll see more Mac animation on the big screen. Let's hope it's used for good instead of evil.—**Erfert Fenton**

KELLY LADUKE

Florida teachers met this summer to practice using ABC Interactive's AIDS videodisc in the classroom. Former Surgeon General C. Everett Koop narrates parts of the disc.

VIRUS ● WATCH

Current viruses, Trojan horses, and worms affecting the Macintosh community.

MDEF (a.k.a. Garfield)
Type: Virus
First listed in Virus Watch: 10/90
Info: Bears no resemblance to WDEF
Impact: Nondestructive. Can cause crashes; infects both the System file and applications.

Steroid
Type: Trojan Horse
First listed in Virus Watch: 10/90
Info: Steroid is a disk-destroying INIT circulated with the false claim that it speeds up QuickDraw on Macs with 9-inch screens.
Impact: Destructive.

Anyone who encounters a new software virus is urged to contact Dan Littman at *Macworld News*, 415/978-3209.

Help with AIDS Education

Florida law requires educators to teach abstinence as a means of protection against AIDS, though teaching about condoms is left to the discretion of each school district. In 23 Florida school districts, health teachers faced with educating students about AIDS will have access to ABC Interactive's AIDS videodisc with a HyperCard interface, running on 23 Macs donated by Apple.

What will the kids learn? The videodisc covers the science of AIDS; its social, political, and economic contexts; and what students need to know to protect themselves. One side of the disc is devoted to science. Animations illustrate text explaining the biology of AIDS, scientists describe the challenge of developing drugs and vaccines, doctors discuss the way that AIDS is straining health resources, and former Surgeon General C. Everett Koop presents facts and fiction about how AIDS is transmitted. The frank treatment includes descriptions of how the AIDS virus passes through torn tissue during vaginal and anal intercourse and explains condom use, in both text and illustration, even stressing the superiority of latex condoms.

The disc's other side looks at the social context of AIDS. A time line details the disease's progression, teenager Ryan White and others answer questions about what it is like to be living with and dying from AIDS, and kids discuss self-protection. Some discuss opting for abstinence, and others discuss overcoming their shyness about using condoms.

It is inevitable that some parents and school authorities will object to the AIDS disc's frankness. But half its information is better than none, and using HyperCard or the videodisc player's controller, teachers can provide at least the half that parents or authorities won't object to. The Florida teachers are the AIDS disc's best evangelists, and they are already planning to use ABC's upcoming discs on teenage pregnancy and illegal drugs.

The AIDS videodisc has closed-captioned text in English and Spanish, and costs $395 with its HyperCard interface. For further information, call Optical Data Corporation in Warren, New Jersey, at 201/668-0022.

—Ann Garrison

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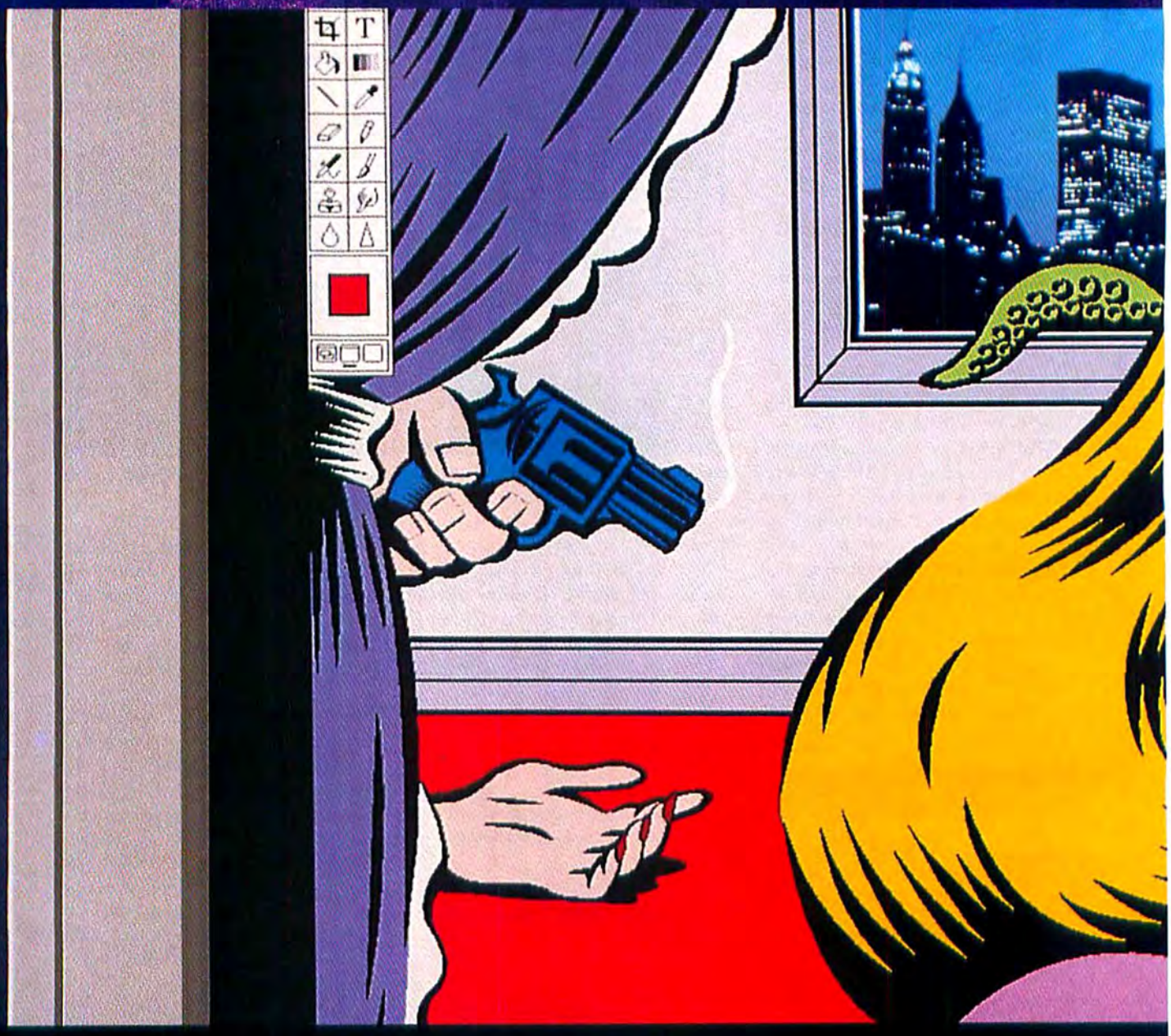

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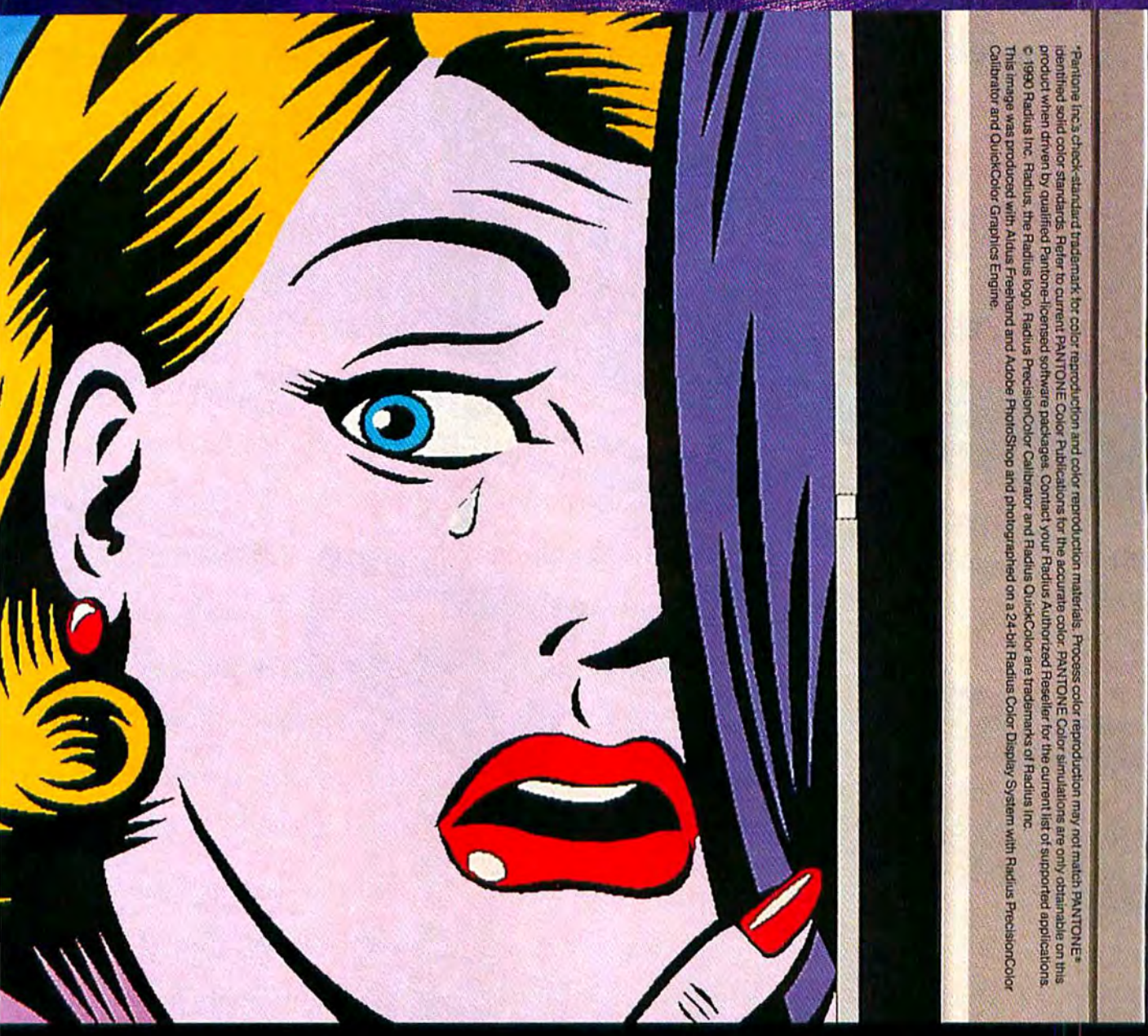
He didn't want just any colors. No, that wouldn't do. They had to be perfect. PANTONE® perfect. His color monitor was a limitation. He knew that. ● Then along came this thing called Radius. It had colors down cold. The colors he saw on his display were the colors he got. A special Precision-Color™ Calibrator made certain of that. When his proofs got back from the printer, there weren't any surprises. He hated surprises. He hated gunplay, too. ● Now he had more time for his passion. No, not Brenda. Color.

radius™



*Pantone Inc.'s check-standard trademark for color reproduction and color reproduction materials. Process color reproduction may not match PANTONE-identified solid color standards. Refer to current PANTONE Color Publications for the accurate color. PANTONE Color simulations are only obtainable on this product when driven by qualified Pantone-licensed software packages. Contact your Radius Authorized Reseller for the current list of supported applications.
© 1990 Radius Inc. Radius, the Radius logo, Radius PrecisionColor Calibrator and Radius QuickColor are trademarks of Radius Inc.
This image was produced with Aldus Freehand and Adobe PhotoShop and photographed on a 24-bit Radius Color Display System with Radius PrecisionColor Calibrator and QuickColor Graphics Engine.

"From Her Big Process Blue. Her Skin Went Pantone 263."

He had a big 19" display and his choice of 8, 16, or 24-bit color. He chose 24. He also went with QuickColor,™ a graphics engine that allowed his screen to fill and scroll up to six times faster. ● That was good. It was all good. Except for Brenda's evil twin. He was gonna fix her, all right. Make her hair gray. Turn her lips purple. He wasn't sure, but he was gonna get that dame. ● For your nearest Radius reseller, or for a color systems brochure, call 1-800-227-2795. In Canada, call 1-416-738-3920.

Circle 178 on reader service card

MAXimize Your Macintosh...

Until recently, high-resolution output also meant high cost. Not anymore.

Personal Typesetting by LaserMAX lets you maximize your Macintosh — at an affordable price.

LaserMAX 1000 Personal Typesetter

- Produces camera-ready type on plain paper.
- Delivers precise 1000 x 1000 TurboRes output.
- Eliminates the use of toxic chemicals, photo paper and the expense of traditional typesetting.
- Includes 135 world-class typefaces.
- Affordably priced at $7,995.

LaserMAX MX6 Printer Controller

- Produces Near-Typeset Quality on plain paper from your Apple LaserWriter™.
- Delivers crisp 800 x 800 TurboRes or 400 x 400 TurboRes output.
- Three models to choose from: 2, 4 and 6MB of RAM. All models are upgradable t the LaserMAX 1000 Personal Typesetter.
- Prices start at only $2,795

Plain Paper

Our TurboRes technology gives you camera-ready copy on plain paper. This means no more last-minute trips to the Lino shop. No more hoping the Lino shop is still open. No more special paper, messy bottles and toxic chemicals. And no more costly typesetting bills.

No Jaggies

Our LaserMAX 1000 Personal Typesetter provides 1000 x 1000 TurboRes output at an affordable $7,995. Or if you already own any Apple LaserWriter™, our MX6 printer controllers upgrade your output to either 400 or 800 dots per inch.

High Performance

If low cost and high resolution are not enough, then consider our printing speed. Using our Advanced Printing Mode, our products communicate directly with applications and can print up to 20 times faster than a PostScript™ printer.

135 Typefaces

Every LaserMAX Personal Typesetter includes 135 typefaces and Adobe Type 1 font support. The LaserMAX 1000 and MX6 printer controllers work with the entire Macintosh II line of products (II, IIx, IIcx, IIci, IIfx, and beyond).

Apple Laserwriter
(300 x 300)

Abc

MX6 Controller
(800 x 800 TurboRes)

Abc

LaserMax 1000
(1000 x 1000 TurboRes)

Abc

All text for this ad was printed from a LaserMAX 1000 Personal Typesetter at 1000 x 1000 TurboRES

For more information, Call LaserMAX at (612) 944-9696 Dept. #13

SEE US AT SEYBOLD BOOTH #1716

LM LASERMAX SYSTEMS

First in Personal Typesetting

7150 Shady Oak Road Eden Prairie, MN 5534
612-944-9696 FAX 612-944-9151

Circle 342 on reader service card

Uncommon Wisdom

What's the difference between a notebook-size computer that speaks English and a network database/development tool that makes writing groupware like snapping Lego blocks together? Well, soon there may be no difference at all. But for now the groupware generator Communal Spaces is becoming code under the typing fingers of the people who wrote FullWrite Professional, while Yellow Pad, the notebook computer, lives only in their dreams.

Communal Spaces will have two parts: a pool of data that is stored on a server, and what the Communal Spaces programmers call an entity-oriented development environment for knocking together such network programs as E-mail or a project-management system.

Communal Spaces differs from a traditional database of fields and records. Users will dump free-floating items of information—items could be paragraphs, pictures, E-mail messages, outlines, digitized voice or even SQL queries—into Communal Spaces and assign them properties that control them. For example, a user might assign an outline the properties of belonging to a group and being backed up nightly, or give a memo the property of being encrypted and sent to a colleague. The server would know how to execute properties, so users wouldn't even perceive data items as residing in a database.

Applications will combine icons representing properties, items, and interface objects in a sort of flow chart with no programming code. (Skilled programmers will be able to write HyperCard XCMD–like extensions to go beyond Communal Spaces' set of properties or to use a new kind of item, such as a custom file type.) Communal Spaces will also work with System 7.0's interapplication communication and AppleScript.

Common Knowledge has not decided how to market Communal Spaces. It may appear in its own shrink-wrap, or it may only be incorporated in other companies' products. For more information, contact Common Knowledge in Saratoga, California, at 408/741-5220.—**D.L.**

DRAKE SOREY

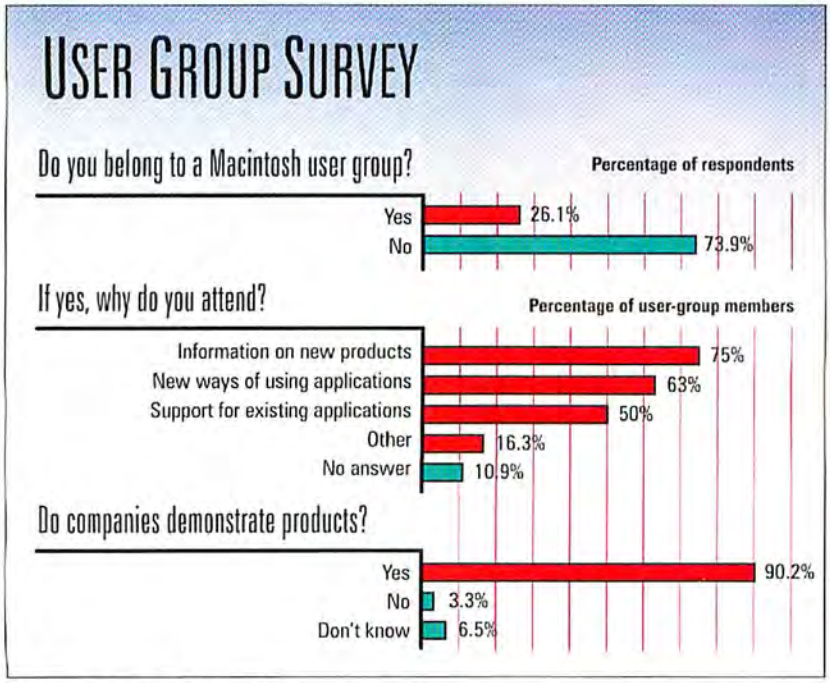
FullWrite authors Roy Harvey (left) and Scott Weiner are back at work with an idea for a new way to store information.

Survey: Macintosh User Groups

This month's survey explores the popularity of user groups and the reasons for joining them. Among readers responding to our inquiries, 26.1 percent say that they belong to a Mac-related user group.

Among respondents who belong to a Macintosh user group 75 percent say that they attend to get information on new products. The second most frequent reason for attending is to learn new ways of using applications, which is cited by 63 percent of readers. Fifty percent of the user-group members say that they go to find support for existing applications. (The figures add up to more than 100 percent because multiple answers were allowed.) Ninety percent of Macintosh user-group members say that companies visit the group to demonstrate their products.

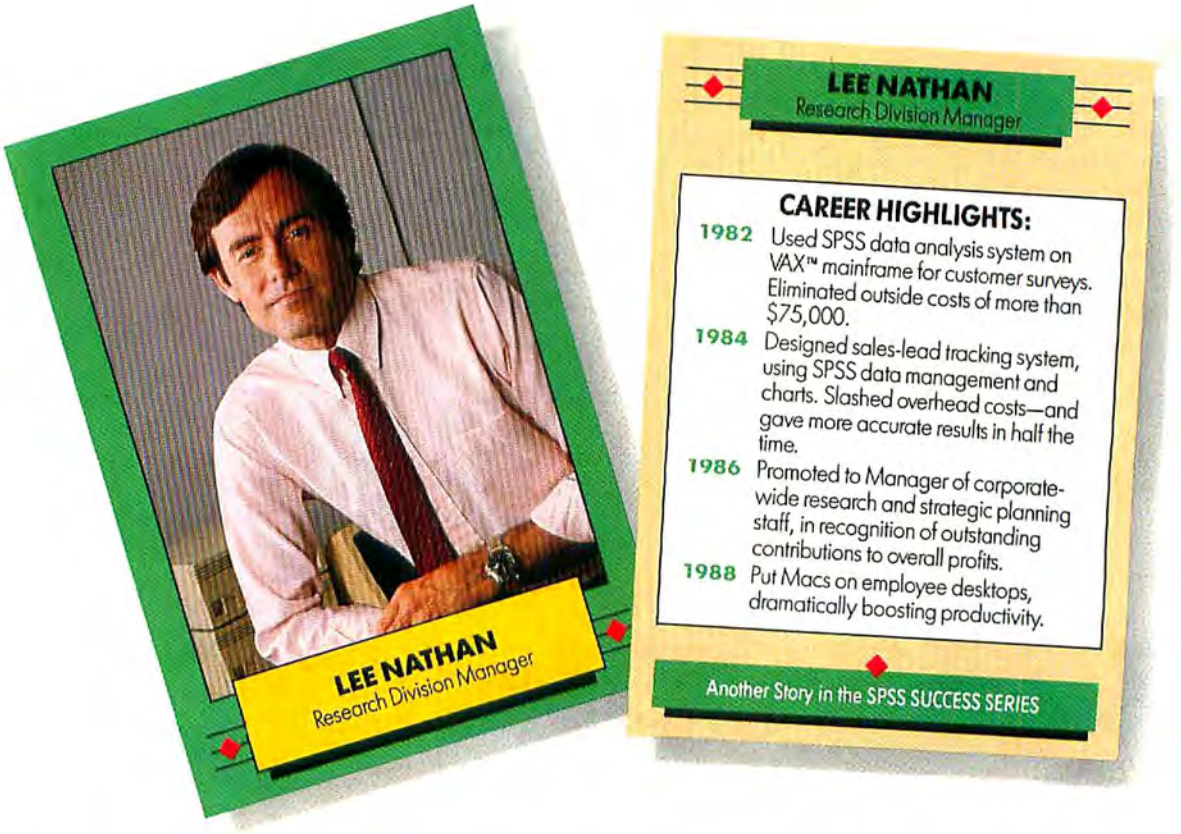
Most of the user-group members (59.8 percent) belong to groups with more than 100 members. The majority of user-group members (78.3 percent) say their group has special interest groups (SIGs). Among those readers, 50 percent claim to attend one or more SIGs. Most groups meet monthly (71.7 percent), with 10.9 percent meeting weekly. Of readers belonging to a user group, 30.4 percent say they go sometimes, 29.3 percent say they go often, and 14.1 percent say they always attend meetings.—**T.M.**



About one-fourth of *Macworld* subscribers belong to user groups, and of those many go to special interest group meetings.

Call Now For A Free Brochure Diskette

Big-league stats for the serious player.



When you want more data analysis power from your Macintosh®, the only game in town is SPSS.®

When you've got to know the score, you need more than an ordinary stat package. You need the most powerful data analysis software ever created for the Macintosh: SPSS.

Only SPSS for the Macintosh gives you all the same analytical capabilities as our legendary SPSS mainframe and workstation software. So you get more ways to turn data into knowledge.

Our Macintosh user interface puts you in control of data and file management. Basic and advanced statistical procedures like time series analysis and forecasting, nonlinear regression, discriminant analysis and more. Plus award-winning presentation graphics and tables to let you display your results.

In short, you get more statistical methods and features with SPSS than with any other Mac software.

And SPSS also gives you one other vital feature: the SPSS support team that's come through for over a million users in the last 20 years.

So if you're serious about winning, don't settle for anything less than the power you need. Find out more about SPSS by calling

1-312-329-3323.

And get the knowledge to be first in your field.

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Best in the final analysis.

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The Netherlands

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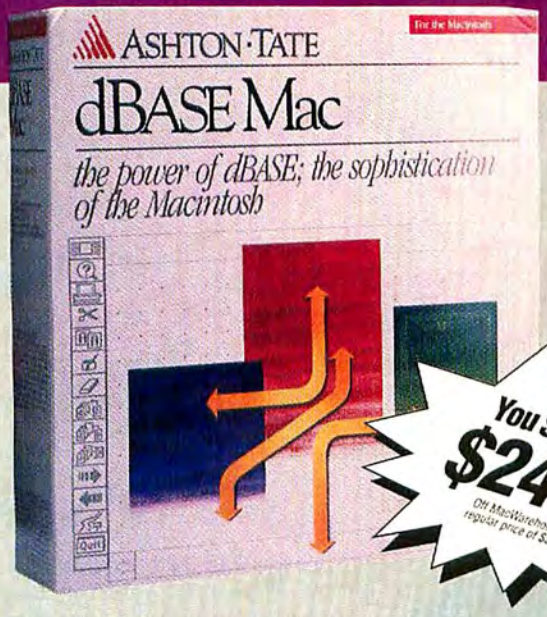
Circle 210 on reader service card

WHILE OUR SUPPLIES LAST!



dBASE Mac for only $49!

You SAVE $246! Off MacWarehouse regular price of $295.

It's hard to believe, but for a limited time only, dBASE Mac is available from MacWAREHOUSE for only $49. That's right $49 — not much more than a cheap game, and less than many utilities.

It's dBASE power with a friendly Mac face.

dBASE Mac makes it easy to understand and use a fully-relational database. Working with the intuitive Mac interface, files and their relationships are displayed visually — right on your Mac screen — so you can take full advantage of the program's power to manage information, even if you've never used a database before.

Unsurpassed flexibility.

With dBASE Mac, entering, viewing and accessing data is a breeze. Multiple views of your files let you find exactly the information you need — when you need it! Then, use the layout templates provided (or make your own) to create professional-quality reports and forms. You can even have multiple fonts, sizes and styles!

Compatible and versatile.

dBASE is the industry standard for database management, so compatibility is never a worry. dBASE Mac easily accesses data from dBASE II, III and Plus. You can also import or export data from Microsoft Excel, Microsoft File, Omnis 3, and Double Helix for maximum versatility.

Overnight delivery only $3.00!

Combine this special low price with MacWAREHOUSE's great service, and you just can't miss. Order before 12:00 midnight (E.S.T. weekdays), and we'll ship dBASE Mac to you overnight for only $3.00. But hurry — this offer is only good while supplies last!

System Requirements:

To use dBASE Mac, you'll need a Mac Plus or higher, and a hard disk drive. If you've been waiting for just the right opportunity to buy a hard disk drive, the time is now! See our special offer below.

---

dBASE Mac
MacWAREHOUSE Special Price:..... $49

MacWAREHOUSE™
1-800-255-6227
24 hours a day, 7 days a week.
Inquiries: 1-908-367-0440
Fax: 1-908-905-9279
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BONUS OFFER!

To use dBASE Mac, you'll need a hard disk drive. Now's your chance to take advantage of these MacWAREHOUSE Sale prices!

Power User 20MB Hard Drive .....only $309!

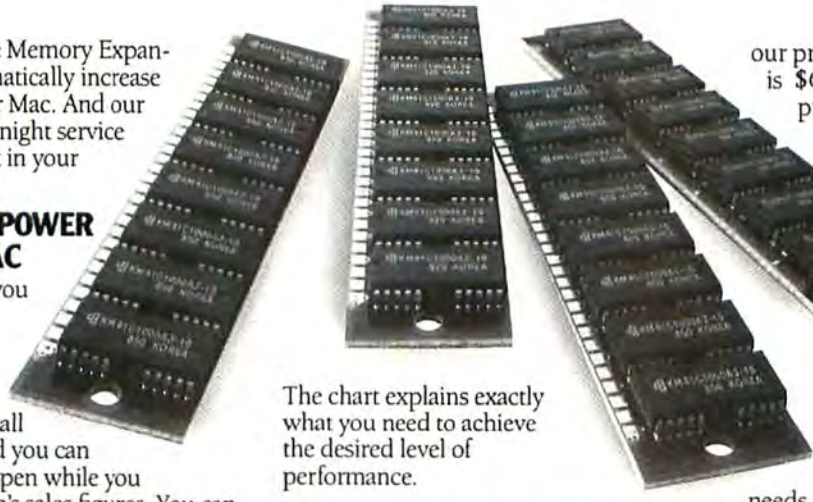
Power User 45MB Hard Drive .....only $399!

MWKØB

Tomorrow's Upgrade For Your Mac Is Only $69*

FREE! STEP-BY-STEP VIDEO INSTRUCTIONS**

A MacWarehouse Memory Expansion Kit will dramatically increase the power of your Mac. And our fast, reliable, overnight service will have your Kit in your hands tomorrow!



MORE BRAIN POWER FOR YOUR MAC

Never again will you have to quit your word processor just to answer a question about a spread-sheet. Install extra memory and you can leave your letter open while you refer to last month's sales figures. You can edit those monstrous scanner files with advanced graphics applications or develop your own custom HyperCard stacks. More memory means more power at your fingertips.

PLUG IN INSTALLATION

Adding memory doesn't require technicians in lab coats. Just open your Mac, slide out the main circuit board and plug in your SIMMs. Our FREE video will give you STEP-BY-STEP installation instructions. Every type of Mac is covered and we think we've made it a breeze.

WHAT DO I NEED?

Our helpful sales and technical staff is standing by to answer any questions and take the mystery out of memory upgrades. Memory cards come with one megabyte on each card and are usually sold in pairs — (2@$69each).

The chart explains exactly what you need to achieve the desired level of performance.

To upgrade a 4-socket Mac Plus or SE to this amount of memory	Do this: (install in multiples of two only)
2 MB	Remove all four existing 256K SIMMs, install two 1M SIMMs, leave two sockets for future expansion.
2½ MB	Remove only two 256K SIMMs, install two 1M SIMMs.
4 MB	Replace all four 256K SIMMs with four 1M SIMMs.
To upgrade an 8-socket Mac II, IIx, IIcx, or SE30 to this amount of memory	**Do this: (install in multiples of four only)**
4 MB	Remove all four existing 256K SIMMs, install four 1M SIMMs, leave remaining sockets for future expansion.
5 MB	Keep existing 256K SIMMs, install four 1M SIMMs in remaining sockets.
8 MB	Remove all four 256K SIMMs install eight 1M SIMMs.

To open your Mac Plus or SE, you'll need a specially designed tool – it's available from us as part of a handy tool kit for just $9.

WHAT YOU NEED TO KNOW

Memory chips come factory-installed on plug-in cards, called SIMMS (Single In-line Memory Modules). Each one megabyte SIMM card holds eight top quality, memory chips. We carry chips by all the major manufacturers like Texas Instruments, Intel and Samsung. We also carry the full line of Dove memory products.

Prices can vary a lot, based on quality, speed and demand. At press time our price for 1MB, 120 ns SIMMS is $69. Please call for the very latest prices and availability. Our sales staff will tell you what you need and help make your choice an easy one.

SPEED

Do you need 80, 100 or 120 Nanosecond (ns) chips? Nanoseconds are billionths of a second, so an 80 ns chip responds faster than a 100 ns chip. The original Mac used relatively slow 150 ns memory chips. The 68020 processor needs 120 ns (or faster) chip, and the 68030 Macs like the speedier model.

OVERNIGHT DELIVERY

Place your order by12:00a.m.(E), weekdays and we'll deliver overnight for just $3.00. There's never been a better time to consider a memory upgrade. Call our toll-free number now and tomorrow morning your Mac will be off to a brand new start.

MacWAREHOUSE™

1-800-255-6227

Call toll-free
Twenty-four hours a day,
seven days a week.
Inquiries 1-908-367-0440
Fax 1-908-905-9279

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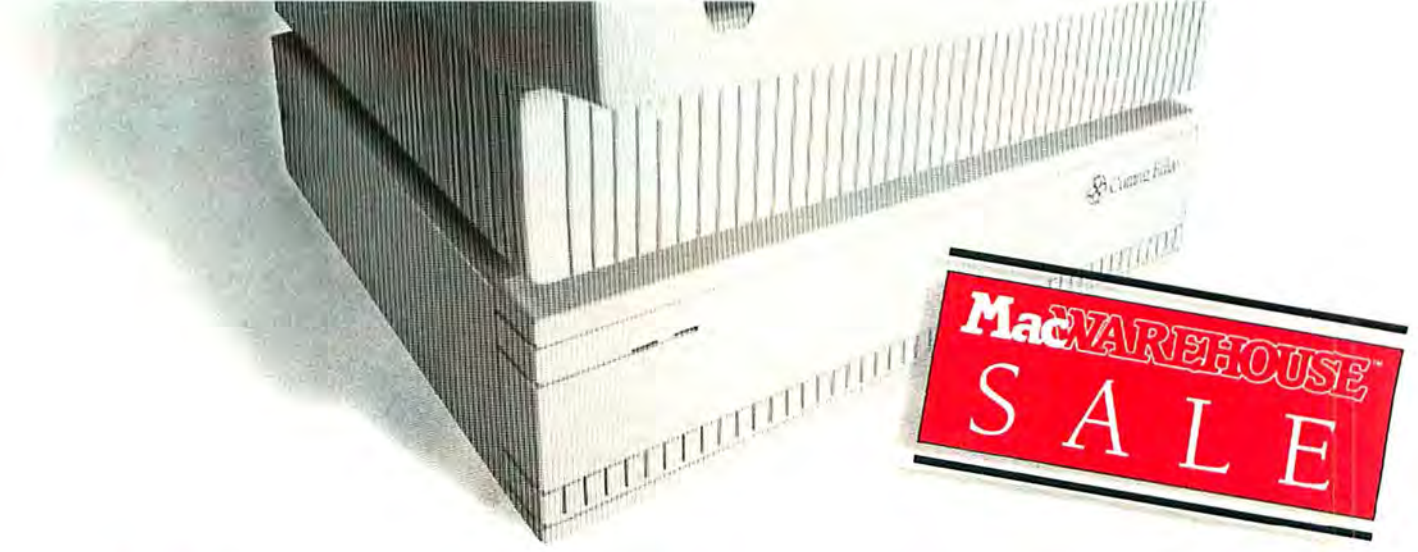
MACWAREHOUSE 30 DAY MONEY BACK GUARANTEE

If, for any reason, you are dissatisfied with your MacWarehouse Memory Kit, you may return it for a full refund within thirty days of purchase. All you have to do is call us for a return authorization number and return the product, postage paid, in its original condition, with the original packaging and documentation.

ONE YEAR WARRANTY. MacWarehouse also guarantees its Memory Kits against manufacturer defects for one year from the date of purchase. We will repair the item or replace it at our discretion.

MWKØP

* SIMMs prices vary. Call for latest information.
** Limited Offer! Free video with purchase of 2 or more SIMMs.

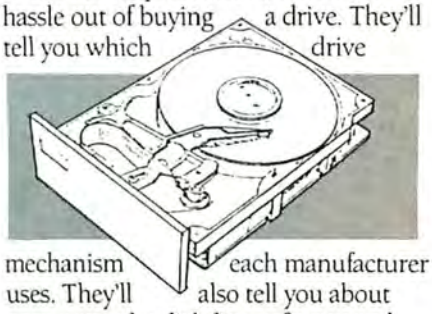


If You Can Find A Better Deal In Hard Drives . . .

Between now and September 30th. MacWarehouse is offering savings on every hard drive we sell. So, if you're thinking of buying a new hard drive, your timing couldn't be better. Check out our sale prices and your savings, compared to our December 1989 prices, in the chart.

We offer drives by leading manufacturers like Cutting Edge, C.M.S., Quantum, Power User, PLI Infinity Turbo and others — all at unheard of low prices.

Let our helpful sales staff take the hassle out of buying a drive. They'll tell you which drive



mechanism each manufacturer uses. They'll also tell you about access speed, reliability, software and the manufacturer's warranty.

	20+ MB		30+ MB		40+ MB		60+ MB		80+ MB		***40+ Removable	
	SALE PRICE	YOU SAVE	SALE PRICE	YOU SAVE	SALE PRICE	YOU SAVE	SALE PRICE	YOU SAVE	SALE PRICE	YOU SAVE	SALE PRICE	YOU SAVE
Cutting Edge	309	$100	379	$120	435	$114	469	$160	529	$210	699	$200
CMS, MacStack	429	$100	499	$46	589	$36	649	$50	769	$30	839	$36
Power User	309	NEW	359	NEW	399	NEW	459	NEW	499	NEW	679	NEW
PLI, Infinity Turbo	–	–	569	$20	619	** $26	–	–	–	–	999	$120
*Quantum Internal	–	–	–	–	399	$126	–	–	649	$220	–	–

Savings are calculated from MacWarehouse December 1989 published prices. *Quantum drives are for internal installation and require a 3.5 Internal Drive Kit for $75 **PLI is a 50meg turbo drive. ***40+ meg Removable Cartridge Drives come with 1 cartridge. Additional cartridges available.

MONEY BACK GUARANTEE

They'll tell you which drives come with the MacWarehouse 30-day money back guarantee. Try one at home. And if, for any reason, you're not 100% satisfied, just return it to us within thirty days and we'll refund your money.

Then there's the MacWarehouse Loaner Drive Program. Buy from MacWarehouse and if you ever have a problem, you won't be without a drive for more than a few hours.

READY TO USE

A hard drive from MacWarehouse couldn't be easier to use. We'll tell you which ones come pre-formatted — ready to use right out of the box. You just plug in, turn on your Mac and go!

If you do need any help, the MacWarehouse Technical Support staff is standing by our toll-free lines to assist you.

LIMITED TIME OFFER

MacWarehouse sale prices, based on capacity, are shown in the chart. Also shown are the savings from pre-holiday prices. (This is a limited time offer, valid through September 30, 1990.) Overnight delivery is just $3, anywhere in the Continental United States.

So call us now and tomorrow morning you'll be up and running with the best hard drive deal in the business!

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Call toll-free
Twenty-four hours a day,
seven days a week.
Inquiries 1-908-367-0440
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MacWarehouse 30-Day Money Back Guarantee

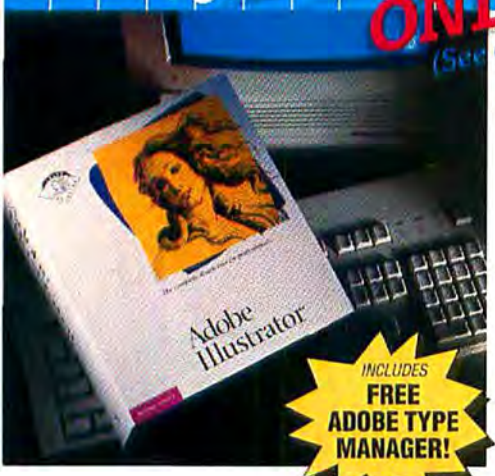
Many of our drives come with the MacWarehouse 30-Day Money Back Guarantee. If, for any reason, you're not completely satisfied, call us within thirty days of receipt for a return authorization number and full refund of the purchase price.

MWKØD

OVERNIGHT DELIVERY ONLY $3.00
(See details below)

GUARANTEE

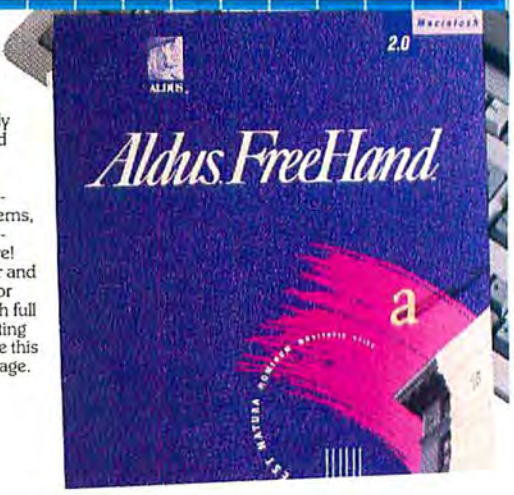
Many of our products come with a thirty day money back guarantee, if you are not completely satisfied. Ask for details when you place your order.



INCLUDES FREE ADOBE TYPE MANAGER!

Adobe Illustrator 3.0 (Adobe Systems, Inc.)
The page creation and layout solution! Features include technical illustration, freehand sketching, automatic scanned image tracing, blending tools and more. New text-handling tool allows direct, on-screen entering and manipulation of text. Use it to choose any number or style of typefaces in a single text block and gain complete character control. The new graphics tool lets you automatically create, manipulate and customize presentation quality charts and other graphics. Includes FREE copy of Adobe Type Manager. (desktop publishing). **$349.**

FreeHand 2.0 (Aldus)
The Graphics companion to PageMaker. Freehand 2.0 delivers the power of the best drawing software and works directly in PostScript to give printed artwork a clean, sharp appearance. New features include a blending tool, autotrace, customizable patterns, TIFF support, PICT to PostScript conversion and more! FreeHand displays in color and can produce separations for spot and process color with full PMS support. Flexible editing and text handling complete this outstanding graphics package. (graphics). **$329.**



ACCESSORIES

Abcom (full line available)
Dust Covers ..... starting at 10.
American Power Conversion
110 SE UPS ..... 219.
370 ci UPS ..... 349.
Apple
Toner Cartridge - Laser Printer II ..... 105.
Basic Needs, Inc.
HardTops Keyboard Covers ..... 15.
Keyboard Flip ..... 6.
Dust Covers - Grey Nylon Ripstop
Mac II and extd. keyboard ..... 12.
Mac IIcx/ci Monitor Stand ..... 40.
Universal Laser Printer Stand ..... 28.
Utility Pac ..... 11.
Computer Giftware
Mouse Pads ..... starting at 12.
Curtis
Command Center ..... 89.
Computer Tool Kit (52 pc.) ..... 49.
Ergotron
MacTilt-SE ..... 68.
MacTilt II-RGB ..... 75.
I/O Design
Imageware II Carrying Case ..... 49.
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.
The Neon Ultimate Carrying Case ..... 89.
Kensington
Anti-Glare Filter ..... 32.
Apple Security System ..... 34.
LaserWriter II Security System ..... 34.
MasterPiece Mac II ..... 105.
PowerBacker 360 UPS Line ..... 269.
SE Radiation Shield ..... 52.
System Saver Mac ..... 63.

Mobius Products
Fanny Mac QT ..... 55.
SE Silencer ..... 39.
Targus, Ltd.
Deluxe Plus/SE-XKB Case (black) .... 69.
ImageWriter II Case (black) ..... 45.
Mac Plus/SE Case (black) ..... 55.
IIcx /IIci Case ..... 75.
Premier Leather Case ..... 175.

Inman Software
Business Sense 1.3 ..... 175.
Intuit
Quicken 1.5 ..... 35.
Layered, Inc.
at Once! ..... 285.
MECA
Managing Your Money ..... 122.
Nolo Press
For The Record 2.0 ..... 31.
WillMaker 4.0 ..... 39.
Reality Technologies
Wealthbuilder ..... 165.

Softsync, Inc.
Accountant, Inc. Professional ..... 345.
Survivor
MacMoney 3.5 ..... 59.

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DS/High Density (1.44 Meg) ..... 24.
Sony
DS/DD (box of 10) ..... 13.
DS/HD (1.44 mb) ..... 24.

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ResumExpert (word vers.) ..... 39.
Cover Letters or Students ..... ea. 39.
Managers or Sales & Marketing .. ea. 39.
Healthcare or Finance & Banking ea. 39.
Education or Arts & Leisure ..... ea. 39.
Comp. Sciences & Engineering ..... 39.
AEC Management Systems
FastTrack Schedule 1.5 ..... 139.
Aldus
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Avery Label
MacLabel Pro ..... 49.

Mouse Pads (Computer Giftware)
For sophistication during hours-and excitement after! **Executive Pads** put the elegance of marble on your desk. Choose from White Italian Marble, Green Marble, Granite, and even Kentucky Burlwood. **$12.** After the grind why not invite a Bikini-clad California Girl or Volley Ball Hunk over to your **Bachelor or Bachelorette Pad? $15.** The truly daring may even opt for an exciting **Indiana Jones** adventure. **$13.** MacWarehouse is now your exclusive mail order source for new **Mickey Mouse** & **Dick Tracy** mouse pads! **$13.** (accessories)

ACCOUNTING & PERSONAL FINANCES

Aatrix
Checkwriter II 2.8 ..... 37.
Payroll 3.5 ..... 109.
Absolute Solution
Computerized Classic Accounting .. 225.

Macintosh SE/Plus w/Extended Keyboard Carrying Case (Targus)
Pamper your Mac with a Targus 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. (accessories) **$69. Full line available.**

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. Individual games **$27ea.** 5 game Casino Master Package **$49.** / Deluxe Mac II version **$55.**

NEW!
Black Jack Strategy Tester
Test your betting and playing strategies over thousands of hands. Card counting, 1-8 decks, 1-7 players. Develop a winning strategy, practice it with Casino Master or Blackjack Ace, then go off to the casino with confidence! (entertainment) **$65.**

INCLUDES SPECIAL **LAS VEGAS VACATION**
DISCOUNT OFFER WITH UP TO $1,000 IN CASINO ACTION BANKROLL!

FREE!

Stephen Bobker Presents...

The POWER USER'S TOOL KIT 4.0

ALL NEW!

NEW! Includes: Disinfectant 2.0, Public Folder and SmartKeys!

- Disinfectant 2.0 - Major new version. Many new features, including a new protection INIT.
- Tidy It Up-Great utility for organizing your system folder.
- Public Folder-Allows you to transfer files across AppleTalk.
- Disk Doubler Expand-Uncompresses DD, Stuffit and PackIt Files.
- And much more!

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Version 4.0, the very latest edition of Steven Bobker's Power User's Tool Kit is available now. Eight great programs on one handy disk. There's Tidy-It-Up! - a great utility to tidy your System Folder and Disk Doubler Expand - to extend all those compressed files.

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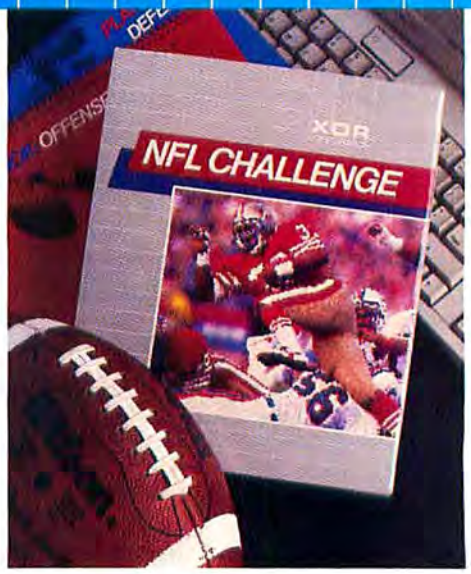

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XPress 3.0 ..... 519.
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Personal Press ..... 199.
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Omnis 5 ..... 519.
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FileMaker Pro ..... 219.
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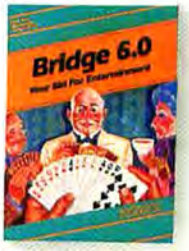

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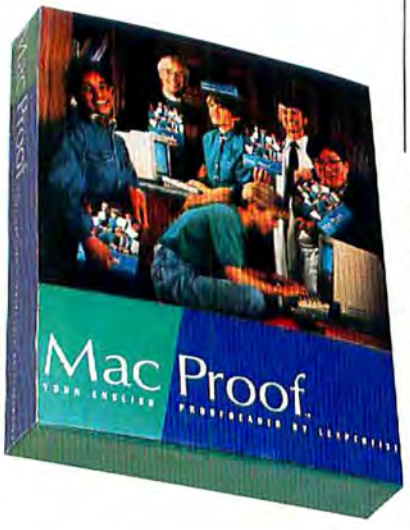

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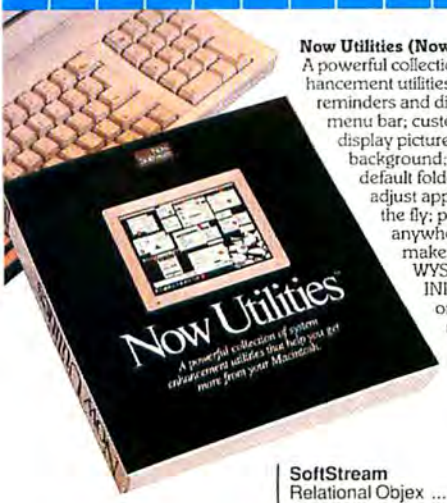

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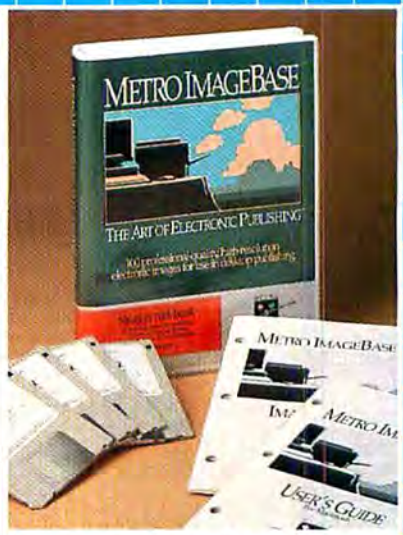

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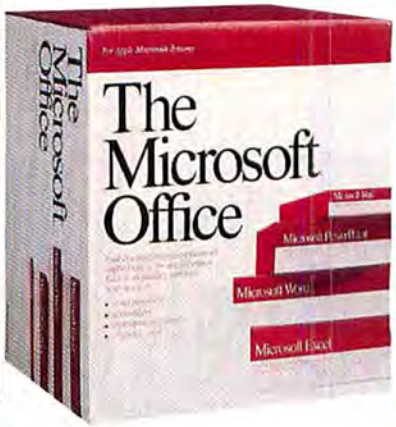

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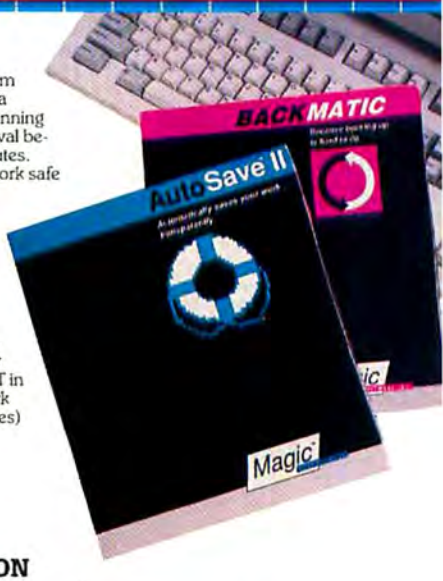

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PREPRESS PROGRESS REPORT

Conversations with Mac color publishers reveal what happens when the cutting edge meets the bottom line

A marketing service in Hawaii puts the finishing touches on a sporting goods catalog. A New York production house wraps up a thousand-page-plus textbook job. A San Francisco ad agency delivers a print campaign to a national client. In a Washington, DC, suburb, the production team on a national daily strips up an elaborate weather page. A Massachusetts designer finishes a literary poster for a book publisher.

What do these individuals and businesses have in common? All are using Macintosh files to produce four-color film. Over the past year, Macintosh color has gone from being the pet project of publishing pioneers to a working reality for a diverse group of design and production professionals. It's too soon to say that Mac color is "here," if by that one means that it's become mainstream technology. But the problems associated with desktop color have gone from being Herculean to merely tricky, and for those with the will to make it work—even if their quality demands are high—the Mac is proving itself an irreplaceable production tool.

For whom is desktop color practical? How hard is it to get good quality? What are the hidden pitfalls—and what are the benefits that make the risks worth taking? To answer these and other questions, I spoke with scores of publishers, printers, prepress operators, and staff at imagesetting output bureaus across the country. Their insights paint a portrait of the current state of the art for desktop color. Their advice will prove useful for anyone attempting to put digital designs on paper.

Why Bother?

While doing your own prepress work on the desktop can be economical, few publishers stress cost savings when discussing the benefits of Mac color. For most, the advantages have more to do with improving the product and gaining control over deadlines.

In design firms and publications large and small, the Mac is changing how people think about design and art creation. Effects and elements that would have been prohibitively expensive before—intricate color tables, gradient fills, illustrations that mix photographs and line art—are becoming routine. "We simply couldn't do the kinds of things we do now without Macs," says Jeff Glick, graphics director at *US News and World Report*, where the Macintosh is used primarily to make maps and other illustrations. "Cutting Amberlith, you just can't get the same effects without days of stripping."

In addition to producing intricate color, the efficiencies of desktop production are inducing people to do *more* color. As John Seibt, manager of electronic imaging at the *Dallas Times Herald*, notes, "We now do well over 100 percent more illustrations than we were doing a year ago, with no increase in production costs, labor, or materials." The *Herald* publishes 20 to 30 Mac illustrations every day, as well as numerous Photoshop-enhanced photographs in the paper's advertising sections.

When it comes to deadlines, the chief advantage of desktop color is the control over scheduling that comes from bringing work in-house. By placing artwork or photographs in publishing software like QuarkXPress and outputting complete pages, publishers not only eliminate the often substantial fees paid to strippers and color separators, but they can cross these vendors' turnaround-time requirements off the production schedule. As Robert Goodman, publisher of *Whale Song*, the first coffee-table book to feature Mac scans, puts it, "No longer

TOM WOLF

BY JOE MATAZZONI

The staff at U.S. News & World Report *goes to "the wall" to plan issues by checking QMS color prints of layouts. Right now, the newsweekly imagesets four-color film only for Mac illustrations, tables, and graphs. By year's end, however, all layouts will be designed in Visionary, ripped through VIP, and output on a Scitex film plotter.*

will you be precluded from meeting a deadline because a stripper has too much work."

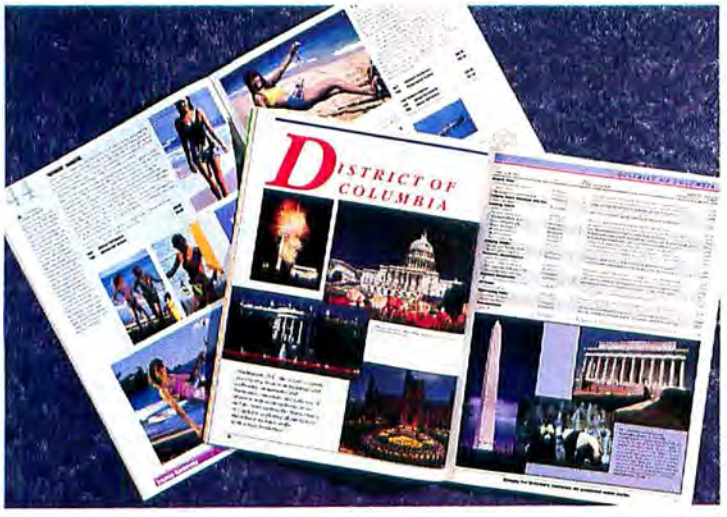
The reduction in turnaround times can be substantial. "When publishers can find no other way to get it done on time, they come to us," notes Irving Berman, president of the Electronic Publishing Center in New York City, which specializes in textbook production. He cites as an example a recent job in which he successfully produced 1200 four-color pages in three weeks. John Seibt observes that "previously we would have to release [artwork] to the composing room on Tuesday to do production for Friday. Now we can wait until 6:00 Thursday evening."

For most people, the greatest opportunity for outright cost savings comes from making their own color separations and *paginating* artwork (producing complete pages and thereby avoiding stripping charges). McKinley Williams, desktop publishing supervisor at Addison-Wesley in Menlo Park, California, estimates that he saved 25 percent off conventional production costs on a 350-page textbook he produced using QuarkXPress and Adobe Illustrator (he shaved 25 percent—two weeks—from his schedule as well). Whether or not paginating artwork will save you money depends on factors such as how complex the jobs you do are, how good a deal you now get for stripping, and how much time you spend doing everything yourself.

Another money-saving efficiency comes into play for publishers who regularly reuse artwork or photographs. David Lynn-Overby is director of special projects for Professional Catalog Production, of Oceanside, California. "You don't get a big cost benefit up front," says Lynn-Overby. "The savings kick in on the second or third catalog, because it's a similar format and you're using only 20 percent new photos and copy. You can revise copy, resize images—repackage everything—without having to redo the scans and separations."

While factors such as paginating and reusing art can have a direct bearing on the production budget, in most cases the financial benefits that come from doing your own color are the result of increasing overall efficiency and otherwise gaining a competitive edge. Designer Lance Hidy, who's done color work for a number of national accounts including Adobe, IBM, and Random House, says the biggest draw of Mac color is the excitement high-tech illustration generates among clients. "Our illustration commissions have skyrocketed since we started showing people Photoshop. Illustrators, art directors, and designers who manage to finance the cost of this platform will find that it will pay for itself pretty quickly."

Cataloging the Benefits These all-desktop catalogs feature QuarkXPress type and tints, Mac scans, and imagesetter output. Geeter Kyrazis of All Systems Color in Dayton, Ohio, says using the Mac to produce the guide on top cut film and separation costs by 50 percent ($50,000). David Lynn-Overby, whose firm did the bottom brochure, figures using the Mac has reduced production time for a typical catalog from 60 to 21 days.



PIERRE-YVES GOAVEC

PIERRE-YVES GOAVEC

Brilliant Prepress links enable Mac publishers to combine desktop convenience with high-end quality. Los Angeles artist Mark Jasin had these PixelPaint (left) and FreeHand files converted through VIP to Scitex format and output on a Raystar film plotter at 200 lpi.

The Quality Question

The conventional wisdom about Mac color is that it meets its quality limit at the "good enough" level—good enough for newsprint, lower-quality catalog work, and other jobs where the demands aren't high. Until recently this assessment was accurate. During the last year, however, Mac publishing has become a two-tiered market, with publishers following diverging paths characterized by two distinctly different quality levels. The more familiar route is the all-desktop approach that features Mac scans and PostScript imagesetters; the second, more recent path combines Mac technology with high-end prepress systems.

Everyone involved agrees that getting acceptable results from the all-desktop approach is far easier today than a year ago, when tints from a program like QuarkXPress could be off by as much as 30 percent and output times for even relatively small files could run to hours. Hardware and software have improved, and users and output service bureau operators have

built up a base of experience that enables them to work successfully within the technology's limitations. Yes, moirés still crop up consistently, banding in object blends and gradients can be apparent, scanned photographs often look a bit murky and probably don't match the original colors, and files sometimes image incorrectly for no apparent reason. But with practice, users can learn to minimize these problems.

At publishing's high end, national magazines, ad agencies, high-quality catalog houses, and prestigious design firms have just as much need for the control and flexibility desktop publishing offers as anyone else. During the last year, it's become possible for them to meet those needs, without sacrificing quality, by exploiting the improving links between Macs and high-end film plotters, retouching stations, and scanners. Some publishers use schemes such as Scitex's Visionary or Crosfield-LightSpeed's Color Layout System. *Time* magazine, for example, produces 100 to 130 pages a week using Visionary in conjunction with an Atex system. But such setups are pricey and often impose unwanted limitations; Visionary, for example, locks users into using Scitex suppliers for film.

More promising for the average desktop publisher are the links that enable users to exploit off-the-shelf software. For example, the San Francisco ad agency Foote, Cone & Belding, one of the largest on the West Coast, recently produced a Levi's promotion that ran in *Sports Illustrated for Kids*, a new spin-off of the popular magazine. The entire double-sided piece—a page of ersatz sports trading cards—was designed in PageMaker using low-resolution desktop scans. Once color printouts of the design were approved, the PageMaker document was saved as PostScript and converted (*ripped*, in prepress parlance) via Scitex's VIP PostScript interpreter into Scitex format. The low-resolution scans were replaced by high-quality scans on a Scitex Assembler station, where trapping was also accomplished; a Scitex Raystar was used to output the film. Crosfield and Hell offer similar capabilities through their StudioLink and ScriptMaster systems, respectively (ScriptMaster is currently limited to 128 shades per film layer).

Adobe Photoshop (which reads and writes Scitex format) and Letraset's ColorStudio (which reads and writes Scitex and Crosfield formats) give Macintosh users direct links for high-end output of Mac bitmapped illustrations. San Francisco computer artist Nick Fain recently used VIP and Scitex to output a promotional brochure featuring his elaborate Photoshop photo illustrations and QuarkXPress type. He used Nikon scans, but had he wanted to, he could have used Photoshop to read scans in Scitex format directly into his Mac for manipulation (see "Direct Connect").

Taking the high-end route isn't as cheap as imagesetter output. Los Angeles illustrator Mark Jasin recently paid $300 for film and a proof of an elaborate Aldus FreeHand file he output through VIP. (He notes that while a service using an Optronics ColorSetter 2000 charged under $150 for the same job, the ColorSetter was unable to image the complex illustration correctly, misinterpreting certain elements and dropping others completely.) Other estimates put the cost of one 8-by-10-inch page with Mac-specced tints and type, a single scan, and any necessary trapping and color correction in about the same range, $250 to $300. Still, this price is less than half what one might pay to have a complex page stripped up by hand.

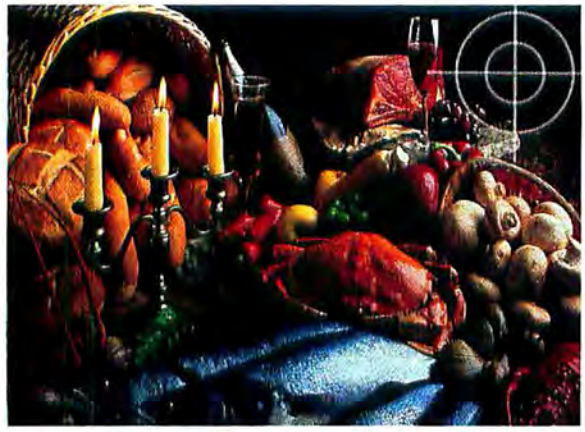
One final output option offers illustrators in particular a solution that combines high quality with breathtaking simplicity. New film printers such as Afga's Forte and Management Graphics' Solitaire Image Recorder can produce

STEVEN MECKLER

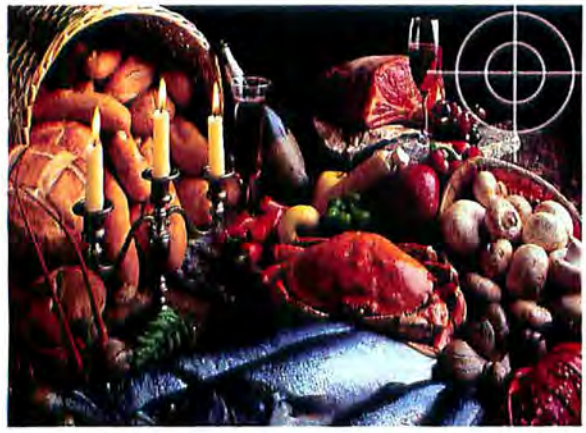
Quality in Quantity American Color, one of the nation's largest prepress and separation services, bears witness to the convergence of high-end and desktop technologies. According to director of electronic imaging, Grant Hall, the firm processes 800 Mac-generated color pages a month through its Crosfield StudioLink rips, and prints as many more on its PostScript imagesetters. Pictured is the data processing room in the Phoenix plant, with StudioLink software running on the Sun workstation at left and banks of 300MB removable disks in the background.

ILLUSTRATIONS: NICK FAIN

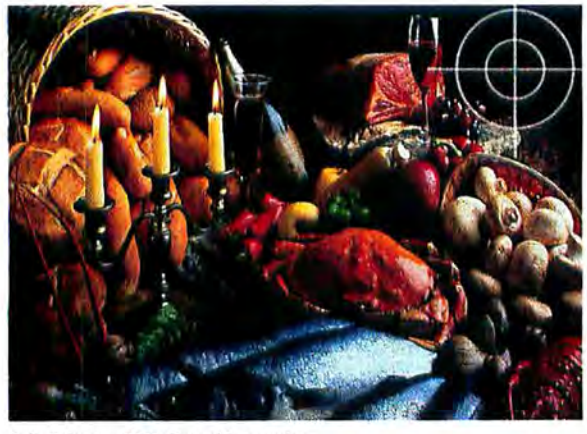
Direct Connect Photoshop and ColorStudio can open and save Scitex files. This brochure, with its Photoshop illustrations and QuarkXPress type (ripped through VIP), was output on a Scitex plotter.



Linotronic L300, standard Adobe angles



Linotronic L300, Flamenco angles



Agfa Selectset 5000, Emerald screening

Surprise Examples printed using state-of-the-art versus standard imagesetters and three different halftoning systems yield similar results. The reasons? High-end (Crosfield) scans and a skilled operator. Paul Beyer of JCH Color calibrated ColorStudio, which he used for the separations, for both imagesetters so that they would accurately reproduce a gray scale. While these results prove that quality is possible on any imagesetter, that doesn't mean the new-generation machines aren't better. Over the long haul, and with difficult images, the Selectset's accuracy and consistency will tell.

24-bit transparencies of bitmap or PostScript files at up to 8000-lines resolution. These transparencies are easily good enough to hand over to a prepress service for standard scanning and separation. They cost only $5 to $20, make beautiful comps, and as Mark Jasin points out, "get artists out of the prepress business."

Tips from the Trenches

The conversion to microcomputer color taking place today is akin to the conversion that has transformed the typesetting business over the past eight years. Just as designers switching to desktop publishing have had to learn not only about the mechanics of using layout programs but also about the tenets of good typography, so they must now learn not only how to use color software but the principles and practices of the color printing business. The following, usually hard-won, tips should help you avoid trouble in both spheres.

Moirés Mac color and moiré patterning go together like summers at the beach and sunburn: where there's one, there's a good chance of finding the other. The fundamental cause of Mac moirés is the rounding errors inherent in PostScript's halftoning algorithms. These errors routinely cause PostScript imagesetters to be off—even according to Adobe's estimation—by a degree or two when reproducing printing industry–standard screening angles. A year ago Adobe gave color publishers a break by announcing a set of optimal PostScript angles; results improved, but moirés continued and the recommended angles were resolution-dependent.

New technology *may* soon make the Mac moiré a thing of the past (see "Missing Pieces"). Until that happy time, however, you'll do best to observe the following pointers, all of which apply to CMYK tint builds produced in programs like FreeHand, Illustrator, and QuarkXPress.

- The more screens you include in a tint, the more chance for moirés. Using fewer than four screens restricts color choice, but moiré patterns are impossible in tints made from 100 percent of one color and a screen of another, and they're virtually unknown in tints that include only two screens. Be careful when using three, and avoid using all four colors whenever possible. (When you do use fewer than four plates, you can save money by remembering to notify the service bureau. All bureaus print—and charge you for—all four layers unless otherwise instructed in writing.)
- If you must use three screens, avoid the problem colors: dark grays, browns, and purples. Stay away from using black to make gray tints. Use combinations instead.
- The only way to ensure that the values you spec will produce the colors you want and won't

MISSING PIECES

During the next year, a number of significant pieces of the Mac prepress puzzle are scheduled to fall into place.

- ***Imagesetting*** A new generation of PostScript imagesetters designed specifically for the demands of color work will be faster and more precise than the current crop. Many have resolutions well above 3000 dpi, which will enable them to handle line screens above 150 lpi. Announced color imagesetters include the Varityper 5330 Photomedia Imagesetter, the Linotronic 330, the Agfa Compugraphic SelectSet 5000, the Scitex Dolev PS, and the Optronics ColorSetter 2000.
- ***Scanning*** Scanners, now one of the weakest links in the desktop-color chain, are improving. As this article goes to press, some service bureaus are already installing Optronics ColorGetters. The ColorGetter is a drum unit that works with transparencies and reflective art; like many of the new color scanners, it captures 12 bits of information per color channel, boiling that data down in software to achieve an optimal 24 bits. Scheduled for release are the CIS 4520 Multi-Format Scanner, which can scan transparencies from 35mm to 4 by 5 inches, and the Agfa FocusColor, which scans both reflective and transmissive art at up to 2400 dpi. Scitex is readying something called the SmarTwo, which handles 35mm to 2¼-inch transparencies. In its initial release, however, the SmarTwo will be available only as an adjunct to high-end color-correction stations (Scitex hints this will change).
- ***Halftoning*** A number of releases during the next year will address the problem of halftone-screen accuracy on PostScript imagesetters. Adobe has announced that its new Emerald Controller will include algorithms capable of calculating screen angles to within a few hundreds of thousandths of a degree. A RISC-based device, Emerald, should also speed output of color files. Agfa, Autologic, Monotype, and Varityper have all announced imagesetters based on the Emerald Controller.

  Optronics claims that by early next year its imagesetters will incorporate proprietary halftoning technology capable of quality superior to that of today's high-end systems. (Optronics already uses proprietary algorithms that supersede PostScript and improve results somewhat; the company says that the new technology produces far more significant improvements.)

  A final non-PostScript halftoning scheme from the Color Group in Richmond, California, eschews rosettes entirely, laying dots down in staggered rows all at the same angle (see example, facing page). At this point, the new technology, dubbed Flamenco, is being licensed individually to publishers. Since it makes the biggest differences at low resolutions, expect to see Flamenco offered as a consumer product first in color printers.
- ***File compression*** The JPEG file-compression standard probably won't be finalized by the relevant international committee until late 1991, but products incorporating the format may be out before then. According to C-Cube Microsystems—a developer of compression hardware and software—JPEG is capable of compressing color files by a ratio of 25:1 without noticeable quality loss. If things go according to C-Cube's plans, scanners, printers, and imagesetters will all include JPEG chips that pack and unpack files quickly. Adobe has announced that JPEG compatibility will be a part of PostScript Level II.
- ***Calibration*** Another advance associated with PostScript Level II is Adobe's attempt to create device-independent color definitions. Believe it or not, makers of devices like monitors and printers don't agree as to the exact values of things like the R in RGB or the Y in CMYK. If the industry follows Adobe's lead, devices may still miss the mark, but at least everyone will be aiming at the same target.
- ***Comps*** Soon Mac users will be able to get printouts that look as good as color photocopies—in fact, they will be color photocopies. By year's end, Canon will be selling a PostScript interpreter for its Color Laser Copier 500. The setup will be too expensive for most users, but output, which is on plain paper, will be cheap, and many service bureaus have units on order.

produce moiré patterns is to test. Standard tint books, which aren't produced on imagesetters, aren't very helpful. It's a good idea to create a color chart with a few hundred of the combinations you use frequently and have a match print made. In addition to making a general color book, some designers work out the palettes in advance for specific jobs (see "Mapping It Out"). On a big project, this can save considerable time and expense. As you continue to try new PostScript tints, keep notes on which combinations work and which don't.

- Never spec colors by selecting Pantone shades in programs like Illustrator or Photoshop and then asking the software to convert those colors to CMYK. The conversion routines are unreliable, never having been optimized to produce combinations that actually work on press.

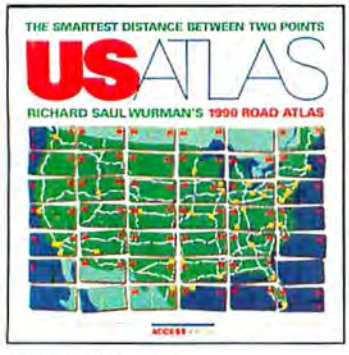
Scanning If you're getting poor results separating scan files, the most likely problem is that you're starting with poor scans. Photo retouching programs are a mixed blessing in this respect: they can do a lot to improve a picture, but at the same time all corrections throw away image data and degrade quality. In short, you can't make the proverbial silk purse from the almost equally proverbial garbage in.

- One obvious solution is to make color bal-

ance and other adjustments during scanning. But beware: most scanners that appear to offer on-the-fly adjustment do not actually do so. For instance, the capture programs that come with the Sharp JX 450 and Microtek MSF-300Z scanners include controls that appear to alter the scan parameters; in fact, changing the settings merely causes the software to filter data once it has been captured. The net result is a scan with less than the full 24 bits of captured data. If that's all you want, you can do a better job correcting the scan in an image editor like Photoshop or ColorStudio, where you have more sophisticated controls (though on-the-fly correction might be more convenient). The moral: if you're buying a scanner, look for one like the CIS 3515 or Nikon LS-3500, both of which offer true correction during scanning.

Blitz! Papers like the *San Francisco Examiner*, which publishes five daily editions, love the Mac for its ability to cut turnaround times. Separating and stripping one photo used to take hours; using QuarkXPress and Photoshop, the staff has gone from dry negative to paginated film in 23 minutes.

- Capture images at the scanner's highest resolution and then resample or resize them to the desired sampling ratio later. Although this takes a bit more time, images will include fewer scanning artifacts.
- Scan files will print faster if you don't include more data than is necessary. Recommendations for the proper ratio between sampling rate and halftone lines per inch (lpi) run from 2:1 for critical images at high resolutions to 1.2:1 for pictures that lack hard edges and are printed on newsprint. A happy medium is 1.5:1. So, at 120 lpi, for example, you need an effective scan rate (once you've sized up or down) of 180 samples per inch. Remember, a 1.5:1 file is almost half the size of a 2:1 file.
- When good results are critical, have scans made on high-end equipment. This may cost $60 to $100, but the pros have better equipment and usually know what they're doing. As better desktop scanners find their way into service bureaus, they will likely be a source of good scans at moderate prices (see "Missing Pieces").



Mapping It Out Understanding Company artists minimized moirés in the complex Illustrator 88 maps in this atlas by using only simple, pretested combinations of the five Pantone colors selected for the project. Often, only one color is used; three screens are a rarity.

Color Calibration For most people, color calibration comprises two main issues: calibrating the monitor so that screen display presages printed results acceptably, and calibrating the separation software to accommodate the requirements of the printing process. How difficult these tasks are depends on how close a match you're trying to achieve.

- First, the monitor. A lot of color software now comes with screen-calibration routines. Opinions vary on the effectiveness of these procedures, which usually involve adjusting the screen to match printed color swatches. In general, if you're working in a one-Mac environment or specing CMYK color—in which case you're aiming at a value in a color book rather than depending on screen values—rough-and-ready monitor calibration will be good enough. Experience will teach you what shifts to expect.

If you work in a multi-Mac environment, if your work is especially sensitive, or if you just crave the pleasure of being able to see what you're doing, you probably want to invest in calibration hardware. Compared to the cost of a color hardware setup, the Radius Precision Color Calibrator's $695 price isn't that significant.

Whether you're using a calibrator or not, be aware of ambient lighting conditions. You don't have to work in a darkened room with gray walls, as prepress professionals do, but you do want the Mac to be surrounded by neutral colors and in lighting conditions that don't vary from hour to hour.

- Calibrating the output process requires the cooperation of your output bureau and printer. Unless you really know what you're doing, the best policy is always to let the output service separate color files for you. The service bureau operator will need a few pieces of information from your printer to do this correctly. The most important is the expected dot gain, given the press and paper being used. The bureau might also want to know what the printer's tolerances are for the density of dots and clarity of film (the *Dmax* and *Dmin*, respectively—this is more important if you plan to mix conventional and imagesetter film) and possibly a figure for maximum allowable ink coverage.

Once the output bureau has adjusted its settings, the best course for most people will be to make film of some test images and gray-scale gradients and then show it to the printer. He or she can examine the film and make recommendations to the output bureau for calibrating the *transfer function* of the bureau's separation software. The transfer function controls how separation programs map CMYK data to halftone screens. Calibrating the transfer involves either boosting or cutting back exposure at selective

points on the transfer curve to compensate for dot gain on the press.

The Human Factor Not all problems associated with a new technology are strictly technical. The switch to desktop color will put new wrinkles in your relationships with clients, with your printer, and with your PostScript output bureau. This last relationship is liable to become far more important than it was when you only wanted to image type.

The lack of output services qualified to do color work is a serious bottleneck for Mac color technology. This situation is improving, but estimates of capable shops in the entire country range from a handful to a few dozen. Peter Fink, editor and publisher of the *Desk To Press*, a PostScript user newsletter, says his tests show that the tints from an average imagesetter are somewhere between 10 and 25 percent off.

Other problems associated with desktop prepress stem from the fact that in this field, as in so many, computers are redefining the limits of people's jobs and the nature of their responsibilities. Fink tells of a man with 22 pages of output for a brochure that are useless because the tints are off. "The client won't pay and the printer won't run it. The service bureau wants their money, of course. The job has come screaming down to the deadline, and in a few days it will be dead. Now someone is going to be sued. Who promised they could do this?"

Misunderstandings about who promised what can also lead to problems with printers. Horror stories about shops that have either refused to print jobs at the last minute because the film didn't meet their standards, or worse, printed jobs with obvious problems as a way to impress upon designers the hubris of thinking they can prepare their own film.

- In the long run, it will be faster and cheaper to use a shop that makes a specialty of color work, even if you have to send files to another state. The easiest way to weed out prospective service bureaus is to ask to see other color work they've done. Look for a good quantity and for jobs similar to your own. Also ask about the staff. It doesn't bode well if no one has worked in the printing business previously—as dot etchers, color separators, or the like. Finally, either run your own calibration test by sending the shop a gray ramp with values from 0 to 99 or ask to see a recent calibration test the shop has made. The bureau should use a densitometer to compare the imagesetter output against expected values. A good bureau will be able to guarantee tints accurate to plus or minus 2 to 3 percent across the scale.
- Communication with all parties is the key to avoiding misunderstandings. If you've solicited a printer's advice, he or she will be far less inclined to leave you to twist in the wind when problems occur. Before you sell clients on desktop production, make sure they understand the limitations. If possible, show them samples of the best and worst film you've produced and get them to sign off on that range of quality.

TOM WOLFF

Mixed Media Every color graphic in the liberally illustrated *USA Today* is drawn in Aldus FreeHand, converted to Scitex format using Scitex's VIP rip, and output to film as part of a complete page. According to Richard Curtis, managing editor for graphics and photography, the newspaper is experimenting with using Adobe Photoshop to process video images captured directly from the televisions shown here.

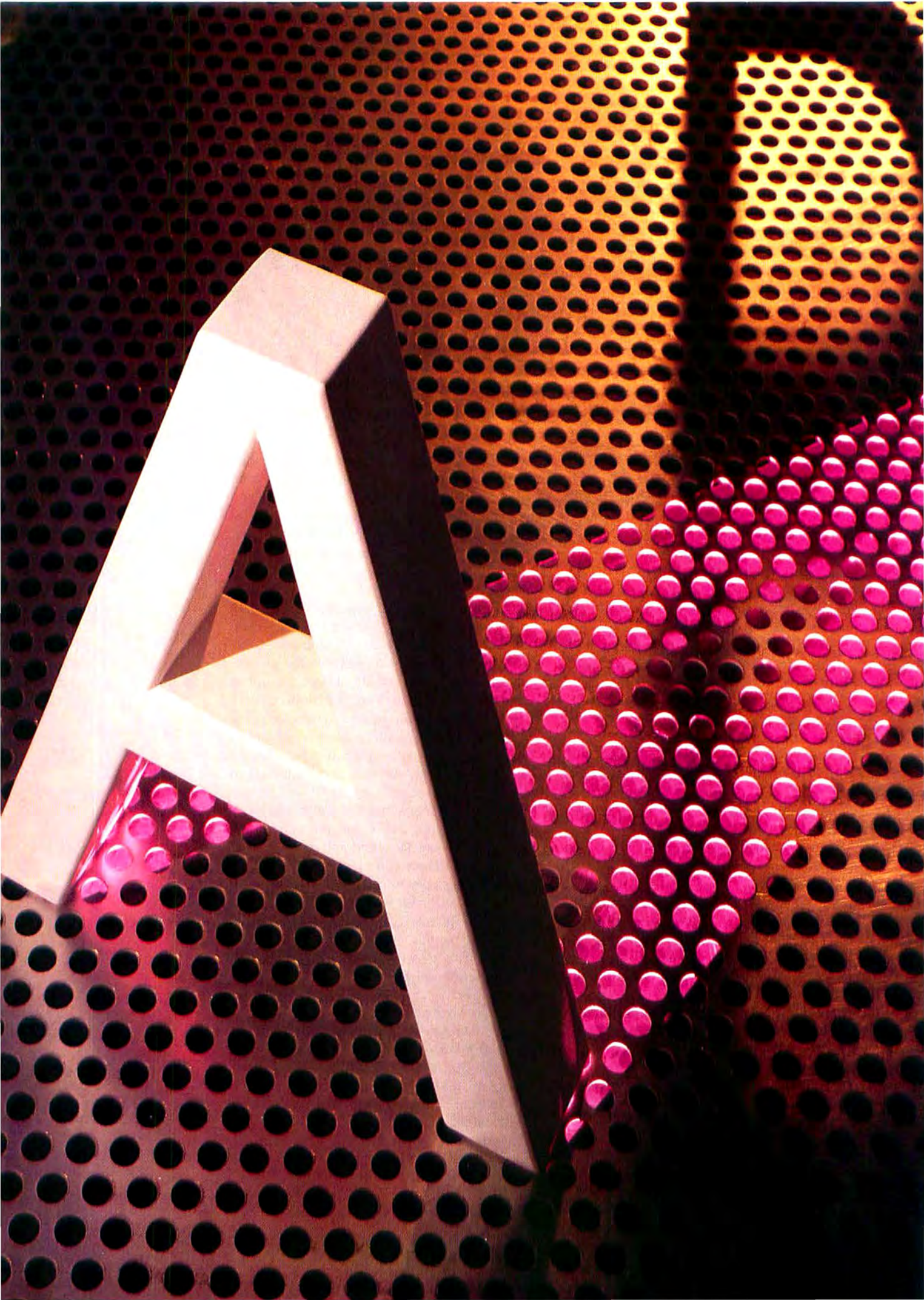
A Qualified "Go"

Macintosh color technology continues to improve rapidly, but today—right now—it's earning its keep in all kinds of publishing concerns. As the previous pages make clear, the process still isn't something you should get into unless you possess both the spirit of adventure and a strong interest in the printer's craft. Don't expect things to go smoothly, don't count on saving money until you've climbed quite a way up the learning curve, and never promise you can do anything you haven't tested.

Understanding all that, if you're still interested in exploring Mac color, this is an excellent time to start. High-end and desktop technologies are clearly converging, with the price of the former coming down and links between it and the PostScript world improving, even as the quality of PostScript output gets better by leaps and bounds. Within two years, most of the problems associated with Mac color will be solved, and PostScript will be a printing-industry standard.

Even when that day comes, it will still require a fair amount of education and experience to make color technology work for you. As Edgar Guttzeit of Goodsight Graphics in New York says, it's not the technology, "it's the person in front of the monitor who makes it a professional image." People who don't start gaining experience with desktop color soon risk being left behind while their competitors ride the wave of the future. ■

See *Where to Buy* for contact information.



MARK JOHANN

TEXT WITHOUT TYPING

Can OCR technology save an editor from drowning in a sea of paper?

Monday morning, 8:15 a.m., I arrived at the office and peered into my cubicle with a vague sense of apprehension. Sure enough, my worst fears were confirmed. Over the weekend, the stacks of paper littering my office had again multiplied through some inexplicable reproductive process. I couldn't see the chair, let alone the desk or my Mac.

When the phone rang, I started to dig a tunnel to the phone with a shovel. It was my early-rising boss demanding some crucial information. Unfortunately, actually finding something in the mess was out of the question. It was a bad case of I-know-it's-here-somewhere disease.

I bailed frantically, wondering about ways to stem the flood of paper that plagues my existence. A trash compactor? Lighter fluid? Fawn Hall? They all seem so—well—drastic. No, the situation calls for a more sophisticated solution: optical character recognition, or OCR for short.

I tackled my paper problem head-on by testing seven different OCR programs. To do the testing, I used a Mac IIcx with 5 megabytes of RAM (running under the Finder), a color monitor, and an Apple Scanner. All seven of the OCR applications I tested can recognize documents containing a variety of fonts, font sizes, and styles. Six support a variety of scanners. The seventh, meanwhile, is a high-end OCR system requiring not only software but a proprietary scanner (see "Fast and Furious").

Four of the OCR programs—Read-It from Olduvai Corporation, ReadStar II Plus from Inovatic, TextPert from CTA, and TextScan from Prism Enterprises—are trainable. (For an introduction to OCR, see "Getting Started with Optical Character Recognition," in this issue of *Macworld*.) Three programs, Xerox Imaging Systems' AccuText, Caere's OmniPage, and TopScan for the Macintosh from Calera Recognition Systems are automatic programs that require no training. (Another automatic program, CTA's ScanReader, didn't arrive in time for me to test it.)

Testing 1-2-3-4

I unearthed four different kinds of documents to put the programs through their paces. First to appear from the depths was a 10-page

BY BRITA MENG

manuscript, not an especially difficult document for OCR programs to recognize, but one common in offices. The next dusty document I found was a 1-page, landscape-oriented, legal-size table of *Macworld* deadline dates. It featured text and numbers. Numbers are especially tricky because you must proofread the scanned results carefully—otherwise, you don't catch recognition errors. But I was game to try—I had missed my last deadline and needed to scan that table into my Mac for easy access as an Excel spreadsheet.

The final obstacles in the quest for the surface of my desk were a stack of unfiled press releases and 200 pounds of magazines. First, I decided to scan a 3-page Apple press release. Although the press release's text was printed in a single column, it contained numerous subheads, indents, and special characters, even images. Finally, I decided to have the programs recognize a 6-page feature article printed in *Macworld*.

As I discovered, no single OCR package offers the perfect solution to all of my paper problems. The variety of documents I encounter in my fairly typical office is just too great for a miracle cure. But depending on the layout, quality, typeface, and style of documents you want to read, you should be able to find at least one OCR program with the potential to make life in the paper fast-lane easier—if you have the patience.

AccuText

AccuText takes an artificial-intelligence approach to OCR. Letters and words are recognized not only by their shapes but also by their context in the document. The longer the document, the better the chances that AccuText can use its dictionary to correctly identify a troublesome word or letter.

AccuText's context-recognition capabilities can give it an advantage over other OCR applications when trying to read less-than-perfect documents, for example bad copies. Since AccuText doesn't rely exclusively on *type tables* or *templates*, it sometimes does a better job of recognizing blurred or smudged shapes on a page. On the other hand, if the program has to rely too heavily on context, it will make more substitution errors simply because the dictionary can't contain every word in the English language.

AccuText can automatically analyze a page based on layout—1 column, 2 columns, and so on. But I liked the program most for its flexible handling of complex pages—those that combine multiple columns of text and headlines with graphics or images. You can also save images and text from one page in a single scan. Some OCR programs make you scan such pages twice—once for text and again for images. And if you want to read multiple complex pages, each with its own layout, AccuText lets you preview each page before it starts recognition (see "AccuText").

AccuText also lets you create special user dictionaries, or lexicons, to be used with its built-in dictionary when checking for context. A lexicon isn't hard to create: just open a word processor, type in a list of words, and save the file as a text file. The result is better accuracy from AccuText.

AccuText has some strange quirks, the most noticeable of which is how it formats recognized documents on disk. For example, my Apple press release (condensed plain Garamond) showed up as italicized Geneva. Bold 14-point headlines turned into plain 12-point text. In some cases, AccuText even changed typefaces and styles in the middle of the document—in places where the original didn't.

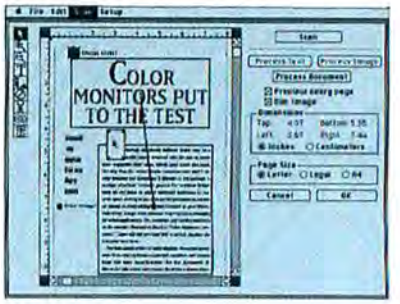
OmniPage

Like AccuText, OmniPage is an automatic OCR program. OmniPage works best on high-quality, well-printed pages like the pages from *Macworld*. That's because it doesn't have the advantage of a built-in user dictionary when recognizing difficult or unusual character combinations. Unlike AccuText, OmniPage recognizes a character only by its shape and features, not by its context.

In many ways, OmniPage is the easiest to use of all the OCR systems—primarily because it does most of the work for you. When you scan a page, the program automatically strips out any images. (You can save image files with OmniPage, but it requires a second scan if there's text to recognize on the same page.) OmniPage then automatically identifies blocks of text to read (see "OmniPage").

And therein lies my main complaint with OmniPage. Once OmniPage decides to include unwanted text in a block, there's no way to stop it from doing so. For example, in the double-spaced manuscript, each line became a separate text block. I had no problem with that because OmniPage was supposed to read all of the text blocks on the page. But with the *Macworld* article, OmniPage ran into trouble. It insisted on putting the author's name—set away from the main text—with the main text in the final file.

Three add-ons to OmniPage can help with character recognition. OmniSpell, a spelling checker, specializes in catching common OCR errors, such as recognizing *rn* as *m*. OmniDraft recognizes documents printed by dot matrix printers. Finally, OmniProof compares two text files and points out any differences between them.



AccuText

AccuText makes it easy to read complicated documents. In the Preview mode, you can isolate different blocks of text, and specify the order in which they're to be read. AccuText can also ignore areas if you tell it to, like the drop cap at the beginning of the second text block here.

OmniPage

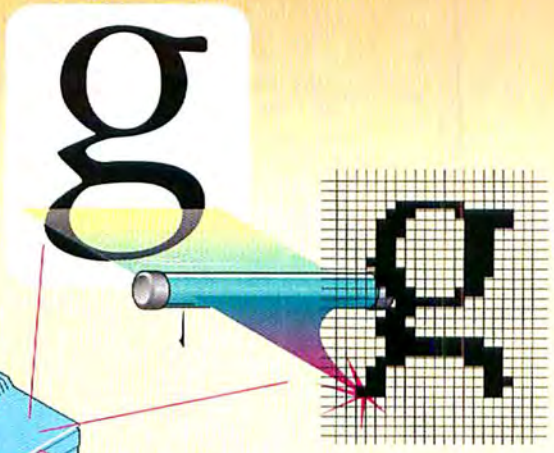
OmniPage lets you manually select and order text blocks to be recognized. But you can see that its text-block selection can be a little off. Text blocks labeled as 6, 7, and 8 are actually three lines of the same caption.

How OCR Works

The first step in OCR is scanning in the document. The quality of the document—as well as its type style—plays a big role in how easily it's recognized.

Coffee stain

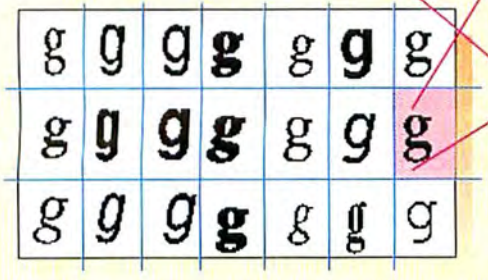
The scanner optically reads the page at 300 dpi, forming a large grid. Each cell in the grid contains a pixel that is either on or off. If a pixel is on, it forms a black dot that becomes part of a character.



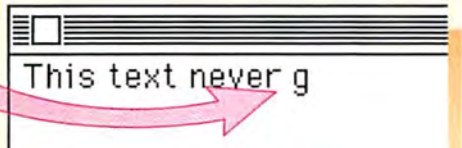
The scanned pixel image is called a bitmap. A bitmap of the entire page is stored in the Mac's memory so that the OCR program can work with it. You can also save the bitmap as a disk file that the OCR program can use later.

This text never got entered into the computer. Let's scan it in and use OCR.

An OCR program analyzes the file, isolating continuous areas of black (identifying them as characters). Some OCR programs can isolate areas of white to recognize reversed type.



Each continuous black area is then compared to type tables that are loaded into the Mac's memory. These tables contain bitmaps of characters in various fonts and styles.



If a match is found in the tables the appropriate ASCII character is entered into a standard Macintosh text file, where it can be edited. Some programs can even retain format information from the original document, such as the typeface, typeface style (bold, underlined, italic), typeface size, indentation, and justification.

OCR Errors

rn ↓ m	ti ↓ v	ri ↓ n	fi ↓ fl	oc ↓ x	e ↓ c	0 ↓ O	l ↓ 1

OCR programs do make mistakes. A *substitution error* results when the best match between a bitmap and a table isn't the right character. This can happen if the original document is of poor quality, if the scan isn't very good, or if the OCR program doesn't isolate individual bitmaps correctly. A *recognition error* occurs if the OCR program can't find a close enough match within its specified tolerance. The program usually substitutes some sort of dingbat for the unrecognizable character, making the error much easier to find.

Manuscript Test

The trainable OCR programs were trained on a 10-page document printed on a LaserWriter in double-spaced Courier 12-point type. The test document was a 10-page, double-spaced, 12-point Courier manuscript printed on the same LaserWriter.

Table Test

The training document was a 2-page listing of all alpha-numerical characters available in 10-point Times. The test document was a 1-page, landscape-oriented, legal-size table of dates, printed on a LaserWriter in 10-point Times.

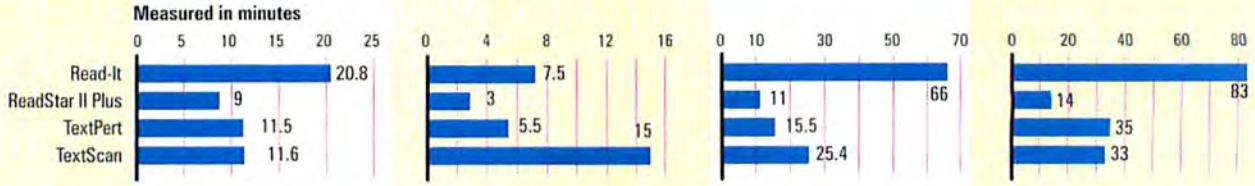
Press Release Test

For this test, the trainable OCR programs were trained on a 4-page press release from Apple, which also used the light condensed Garamond font found in the 3-page Apple press release test document.

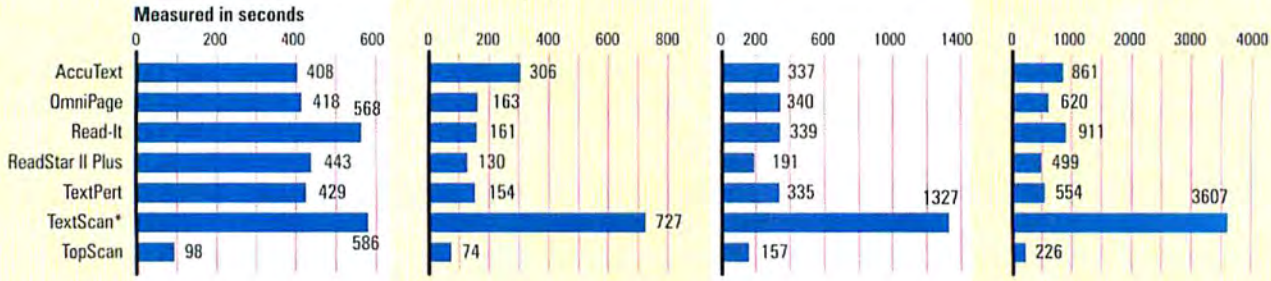
Macworld Test

For this test, all trainable OCR programs were trained using the same 4 pages from another *Macworld* feature article. The actual test was a 6-page feature article from the same issue of *Macworld*.

Some packages require training . . .



but all of them take time to read a page . . .



and all of them generate errors.

*TextScan requires two passes during reading for optimal results.
†Substitution errors are characters incorrectly recognized by the OCR program; recognition errors are characters not recognized by the OCR program.

Note: Training and recognition times include the time necessary to scan each page of the training and test documents.

Read-It

Having tested the two automatic OCR programs that work with the Apple Scanner, I moved on to the trainable programs. First up was Read-It, a slow but steady program. If you take the time to train Read-It carefully and completely, you'll be rewarded.

I was impressed with Read-It's EasyLearn training shortcut. EasyLearn lets you compare a scanned page with an identical file on the Mac. The program then automatically generates a type table. But you can't use EasyLearn with typefaces that have ligatures. You're forced to employ Read-It's tedious training process (see "Read-It").

Although Read-It lets you select multiple blocks of text, it only processes them in the order you select them. If you forget to select a block until last, and you want it recognized second, you must start over again. In addition, while you can resize block selections, you can't move them.

Read-It can also be frustrating because of the way it does prerecognition analysis. Before recognition takes place, the program isolates lines and characters, checks for kerned, monospaced, or ligatured type, and then averages character sizes. (Read-It needs that information to identify characters properly.) This takes a long time, and Read-It repeats the analysis separately for each text block selected.

A big problem with Read-It is that it puts each page of a multipage document into a separate file. This limitation is especially strange because Read-It lets you batch process several TIFF images for recognition. According to Olduvai, a new version of Read-It, Read-It Professional 3.0, will provide a Continuous Recognize mode for working with multipage documents and scanners with sheet feeders.

ReadStar II Plus

The next program I tested, ReadStar II Plus, was almost a shock to my system after Read-It. ReadStar II Plus, the only copy-protected program, is the fastest program to train by far. It also provides some instant gratification during the training process. Because the program immediately uses the letters you teach it, you can actually see the recognition rate climb as the program learns more letters.

ReadStar II Plus is fairly conservative in its character matching, opting for the unrecognizable-character marker whenever there's any uncertainty about a letter. Thus, ReadStar II Plus tends to generate more recognition errors and fewer substitution errors than some of the other programs. That's good if you want to make absolutely sure text is accurate. However, because ReadStar II Plus uses asterisks to indicate recognition errors, a spelling checker is useless.

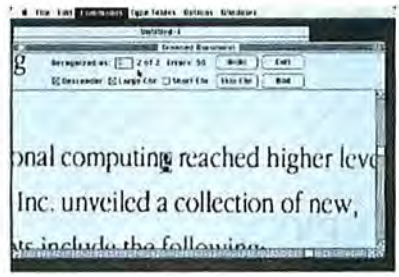
Surprisingly enough, ReadStar II Plus is the only OCR program I reviewed that provides an eraser for cleaning up stray marks on scanned images. Since coffee spills are an acute problem in my office, I find the eraser tool extremely helpful when working with messy documents. Unfortunately, the eraser isn't compatible with 32-bit Color QuickDraw; it leaves large black marks (the size of the eraser) wherever you use it. ReadStar II Plus then tries to recognize these marks.

Also on the downside, ReadStar II Plus isn't very flexible when it comes to selecting areas of text (see "ReadStar II Plus"). You can't resize or move text block windows, nor can you change the order in which those blocks are recognized. ReadStar II Plus doesn't support landscape scans. In addition, ReadStar II Plus only supports plain ASCII.

TextPert

TextPert combines features of both trainable and automatic OCR programs. It comes with an already-built general library for fonts—TextPert's name for a type table—which you can use for recognition. Or, you can train the program by creating your own libraries. The program also has a context-checking option to improve accuracy. TextPert is an all-around good OCR program, recognizing every document consistently.

Training in TextPert doesn't go as fast as training in ReadStar II Plus. On the other hand, it is nowhere near as painful as training Read-It. Instead of displaying the degree of uncertainty associated with every character, TextPert lets you predefine how often it asks for your help in recognizing a letter. Sure, there are only three settings—often, normal, and seldom—but it was nice to let the program make error-tolerance decisions for me, especially during a long training session.

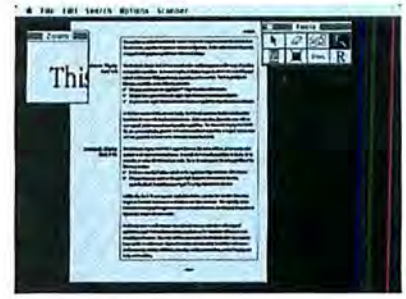


Read-It

If you decide to train Read-It without any shortcuts, you have to ensure that the program identifies each character correctly; check whether it has been classified as a descender, large character, or short character; check the degree of uncertainty (errors) associated with that character; and decide whether to add that character to Read-It's type table.

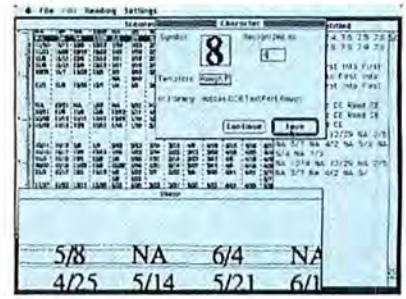
TopScan

Like other OCR programs, TopScan lets you select zones for individual processing (text recognition, image capture, or both). You can then save those zones as a template for use with other pages. A PostView window (not shown) lets you see OCR results.



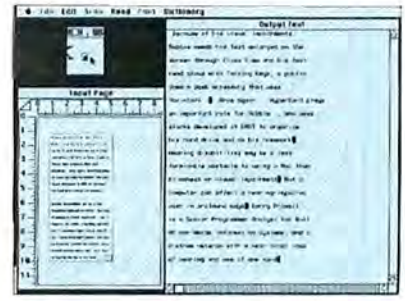
ReadStar II Plus

Using ReadStar II Plus's tool palette, you can scan and read documents, select multiple areas of text to read, cancel previously selected areas, and flip through each selected area. The Eraser tool, also available from the tool palette, is great, but you have to be careful when you use it: there's no undo.



TextPert

Formatting tables is a TextPert specialty. You can either select the format option Financial Forms, and the program automatically saves tabs, or for irregular tables, you can manually define tabs, as I did for this document during a training session. Unfortunately, TextPert lacks the capability for landscape scans, which limits its use in recognizing spreadsheets.



TextScan

After you teach TextScan a page, the program holds all the characters on that page in memory so you can fine-tune recognition. When you select a character to correct, TextScan shows you a closeup of that character and highlights all the characters affected by that selection. Here, TextScan initially recognized all the periods (selected) as commas. To correct that error, you type in the right character.

SETTING UP FOR OCR

Product	AccuText 1.1	OmniPage 2.1	Read-It 2.1	ReadStar II Plus 1.06d	TextPert 3.05	TextScan 3.08	TopScan 1.02
Company	Xerox Imaging Systems	Caere	Olduvai	Inovatic	CTA	Prism	Calera
Price	$795	$795	$495	$995	$995	$395	[1]
Minimum Mac	Mac II [2]	Mac II [2]	Mac Plus	Mac SE	Mac Plus	Mac Plus	Mac Plus
Recommended RAM	4MB	4MB	2MB	2MB	1MB	2MB	1MB
SCANNERS SUPPORTED							
Abaton	○	●	●	●	●	○	○
Agfa	○	●	○	●	●	○	○
Apple	●	●	●	●	●	●	○
Canon	○	○	●	●	○	●	○
Datacopy	●	○	○	○	○	○	○
Dest	○	●	●	○	●	○	○
Hewlett-Packard	●	●	○	●	●	○	○
Microtek	●	●	●	●	●	○	○
Other	○	AST, Complete PC, Fujitsu, Pentax Ricoh, Siemens	ScanMan[3]	AST, Ricoh	Complete PC, Epson, Howtek, Ricoh, Sharp, Siemens	Fujitsu, Princeton Graphic Systems, QMS, Sharp	CDP 6000, CDP 9000

[1] With CDP 6000 $19,950; with CDP 9000 $31,950; CDP upgrade only for Mac $2995. [2] Or with a 68020 accelerator. [3] Read-It Personal available for hand scanners, $395.

TextPert provides the most flexibility when setting up a scanned page for text recognition. You can select as many text blocks as you like, resize and move them at will, and change the order in which they're recognized (see "TextPert"). You can even change the way TextPert formats individual text blocks—without carriage returns, with tabs, and so on. That feature comes in handy if a page has both standard text and a columnar table.

TextScan

Finally, there's TextScan. TextScan demands the most user involvement not only for training but also for reading documents. As with the other programs, you identify unknown letters when the program asks you to. However, after each training page, you need to fine-tune recognition by proofreading the training document for mistakes and correcting them (see "TextScan"). TextScan then corrects its type table for that font. Similarly, to get the best performance from TextScan, you need to correct errors after each page or column is recognized in the program's read mode. These corrections are also recorded in TextScan's type table for future pages. In effect, TextScan requires two passes for every page it reads. While two passes aren't necessarily a drawback), they do take more time.

TextScan has a built-in predefined character table, so you don't have to start a type table from scratch. In addition, TextScan lets you use a dictionary in reading mode to improve recognition. The program can handle multiple pages, and you can select multiple text blocks with movable, resizable windows. The order in which you create the windows is the order in which TextScan reads.

TextScan can be finicky. It worked well on relatively simple documents, but using it to recognize typeset documents (especially on pages from *Macworld*) was tedious. Also, I found TextScan's recognition performance slowed with a large type table—like the ones for the Apple press release and the *Macworld* feature. There's not much of a zoom mode in the program, which can make it difficult to correctly isolate text to read. Nor does the program save text in tab-delimited format for tables, only in ASCII.

Coming Up for Air

After more than two months of testing, I came to several conclusions about OCR software. First, picking the

FAST AND FURIOUS

It's an imposing sight, the Calera Compound Document Processor 9000 (CDP 9000)—not something you'd typically call a desktop scanner. But one thing is for sure: the CDP 9000 scanner, and its accompanying OCR program TopScan for the Macintosh, is blazingly fast and offers accuracy to boot.

The credit for TopScan's recognition speed belongs to the CDP 9000, a combination page scanner and document-recognition processing system. The processing system includes multiple processors, each one of which performs a specialized task during document recognition, for example checking spelling accuracy.

The scanner portion of the CDP 9000, meanwhile, acts more like a photocopier than a scanner, taking less than 4 seconds to scan an entire page. The fast scanner makes it easier for you to determine the best scanner settings—always a trial-and-error process—for recognizing a page. An automatic document feeder holds up to 50 pages; you can even set TopScan to process batches of multipage documents by separating documents with a blank sheet of paper.

Because of its current design, TopScan only works with the CDP 9000, and vice-versa. But there is good news for folks who can't afford TopScan's steep $30,000 price tag. Calera has announced plans to bring its high-end OCR technology to the Mac as a software-only program. The company expects the new program, dubbed WordScan, to be available later this year.

OCR Software Compared

	AccuText 1.1	OmniPage 2.1	Read-It 2.1	ReadStar II Plus 1.06d	TextPert 3.05	TextScan 3.08	TopScan 1.02
Type	Automatic	Automatic	Trainable	Trainable	Trainable	Trainable	Automatic
Smallest character point size	8	8	8	6	4	8	6
Largest character point size	24	72	72	20	72	24	28
Portrait/Landscape orientations	●/●	●/●	●/○	●/○	●/○	●/○	●/●
INPUT FILE FORMATS							
TIFF	●	●	●	●	●	●	●
PICT	○	○	●	○	○	○	○
Bitmapped	○	○	●	○	●	○	○
Other	○	○	AppleFax, ThunderScan	Foto	Foto, Imag	○	Processor Document Architecture (PDA)
OUTPUT FILE FORMATS—TEXT							
MacWrite	●	●	○	○	●	●	●
Microsoft RTF	●	●	○	○	○	○	●
Microsoft Word	○	●	○	○	●	○	●
Text only	●	●	●	●	●	●	●
Text with line breaks	●	○	○	○	○	○	○
Excel	●	●	○	○	○	○	●
WordPerfect	○	●	○	○	○	○	●
Other	○	○	○	○	Tab-delimited	○	Wingz, WriteNow
OUTPUT FILE FORMATS—IMAGE							
TIFF uncompressed	●	●	●	○	○	○	●
TIFF compressed	○	●	○	●	○	○	○
TIFF PackBits/CCITT-3	●/●	○/○	○/○	○/○	●/○	○/○	○/○
MacPaint	●	○	○	○	○	○	●
PICT	●	○	○	○	○	○	●
Other	○	○	○	Foto	○	○	PDA

● = yes, ○ = no.

right program is itself something of a battle. There are lots of variables to consider, the most important of which is a program's ability to handle the types of documents you plan to read.

Whichever program you choose, don't expect 100 percent accuracy—in fact, not even 95 percent. For example, all of the programs have some trouble accurately recognizing quotation marks. That's because OCR programs tend to identify contiguous marks (scanned bitmaps) as one character and noncontiguous marks as two characters. Because quotation marks are composed of two marks, the programs sometimes recognize them as two apostrophes.

Be prepared to use a spelling checker, and to proofread. OCR programs make it easy to spot recognition errors, but they don't help you find substitution errors. While a spelling checker can catch lots of those errors, there's no substitute for proofreading, especially if you're recognizing a spreadsheet with numbers.

Remember to save often, since OCR programs test the memory limits of a Mac. Don't train for long periods without saving a type table. There's nothing like the anguished cries of someone who's lost an hour (or more) of training due to a crashed Mac.

You often hear OCR vendors touting how fast their products recognize. "Ten times faster than typing! 2500 characters per minute!" Be cautious, because such numbers usually don't include the time you spend actually scanning documents, training the program, selecting text blocks correctly, proofreading, or fixing mistakes. For example, the Apple Scanner I used took an average of 27 seconds to scan one page. That adds up if you're reading a 20-page document.

Complexity is another important consideration, since no program can recognize text without at least some assistance from a fallible—and easily frustrated—user. The fastest, most accurate program is worthless if no one ever wants to launch it.

For my purposes, I decided on OmniPage, with AccuText as a backup. No trainable program would be feasible for the variety of documents—I get. I'd try OmniPage on a document first because it requires the least amount of work. If OmniPage couldn't handle it, I'd move on to AccuText. If neither worked—and sometimes, with automatic OCR programs that happens—I'd go back to typing.

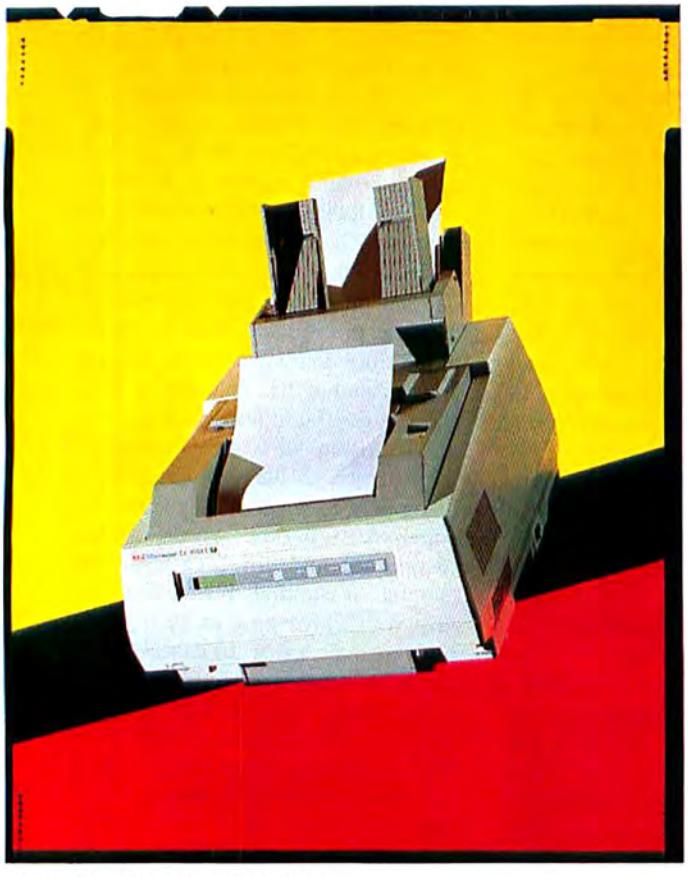
Of all the trainable packages, I'd pick TextPert. It offers the best combination of painless training, efficient operation, and page-setup flexibility. ReadStar II Plus, just doesn't have the file-output or page-setup options I need. It takes too much time and painstaking care to train TextScan for full-time use. I liked Read-It—much more since I discovered its training shortcuts—but the fact that it puts every page of a multipage document into a separate file is a real drawback.

I harbor no illusions about OCR being able to miraculously solve my paper crisis—in other words, I'm not tossing out my shovel. OCR can be painfully frustrating. But it can also save you from typing in all of a 50-page manuscript or 10-page spreadsheet. My office is still a mess, but at least I might be able to find the top of my desk. There's just one problem: if OCR technology keeps improving, I may soon find myself buried in floppy disks, not paper. ◘

See *Where to Buy* for contact information.

QMS-PS 820 turbo

Hewlett-Packard LaserJet III



NEC SilentWriter LC 890XL

Texas Instruments microLaser PS35

PIERRE-YVES CDAVIC

PAGE PRINTERS REVISITED

The latest monochrome page printers offer lower cost, faster performance, sharper output, and more options

Cheaper, faster, sharper—these three adjectives should warm the heart of anyone in the market for a laser printer. They also accurately describe the three major trends in the world of monochrome page printers, trends that had only just begun when I last examined the field (see "Paging all Printers," October 1989).

- *Cheaper* The new generation of reasonably priced laser printers is aimed at home users and small businesses who have had to settle for the crude results of a whining ImageWriter or the glacial pace and smear-prone output of an ink-jet printer, such as the Hewlett-Packard DeskWriter. Laser printers will probably never be as affordable as hard disks, but you can buy an entry-level laser printer at a street price of $1300. And between $2000 and $3000 buys a printer that outprints the original $6995 LaserWriter. You just couldn't make either statement a year ago.
- *Faster* Today's *controllers*—the circuits that drive a printer's photocopier-like print *engine*—are quicker than ever at processing pages. Many of these high-performance controllers use improved versions of Adobe Systems' PostScript interpreters. Some, however, use PostScript *clones*—interpreters that understand PostScript page-description commands but that are created by firms other than Adobe. Last year, I looked at one PostScript clone; this year, I review four.
- *Sharper* Finally, there's some relief for desktop publishers and designers who have been frustrated by the not-quite-typeset look of 300-dots-per-inch output. Several new printers use technical tricks to produce sharper text and finer halftones for scanned images. These sharper imagers aren't going to replace Linotronics and other imagesetters for publishing jobs demanding top-notch type, but they will attract buyers who can't justify an imagesetter's five-figure price tag.

In this year's look at laser printers, I've divided the contenders into four categories—Bargains, Best Performers, Sharper Imagers, and Paper Chasers. Near the beginning of each section, you'll find benchmark results (in seconds) for each of the printers in that category. For the Font test, I printed a 7-page Word 4.0 document containing a variety of fonts, sizes, and styles. The Courier test included a 20-page Word 4.0 document that contained double-spaced 12-point Courier type. The MacDraw document was a newspaper graphic containing over 2200 objects and several lines of Helvetica type. The FreeHand document was the Aldus sample file named Motorcycle. And the Newsletter document was a 4-page PageMaker file containing several fonts, three gray-scale scanned images, and one MacPaint image. The test machine was a Mac II with 2MB RAM, and with no MultiFinder and no cache.

The Best Bargains

Because cost counts for so much, let's look at the most affordable units first. The retail price of the six printers in this class ranges from $1399 to $3995, but this price is often discounted by dealers or mail-order houses. None of these six is particularly speedy by today's standards, but they all out-perform the original LaserWriter. All produce 300-dpi output.

Final production versions of Apple's new Personal LaserWriters were not available for this review, so the Personal LaserWriter SC and NT write-ups are based on experience with pre-production units. (For a more detailed look at the Personal LaserWriter family, see "LaserWriters for Less," *Macworld*, August 1990.)

Apple Personal LaserWriter NT

With the retail price expected to be roughly $3300, the Personal LaserWriter NT is the least expensive PostScript printer in Apple's line.

And its appeal goes beyond the price tag. The Personal LaserWriter uses Canon's compact P-110 print engine, which provides excellent print quality, a 250-sheet paper tray, and instead of a simple manual-feed slot, a novel multipurpose tray that holds 50 sheets of paper or 5 envelopes. Apple

BY JIM HEID

reports that major software developers intend to update their programs to allow you to switch between paper sources during a print job. Setting up the printer involves simply installing a disposable toner cartridge, which lasts for about 3500 pages.

On the test track, the Personal LaserWriter NT finished squarely in the middle of its class. Its 4-pages-per-minute (ppm) engine held it back in the Courier test, which depends more on engine speed than controller speed. Among the PostScript printers in this class, the NT did finish first with the typographically complex fonts document because the NT contains the Adobe Type Manager (ATM) font-rasterizing software routines.

(A printer's rasterizing routines create the type sizes needed from the original font outlines, those mathematic descriptions of a font's characteristics. The faster the routines, the faster a PostScript printer can generate a document's fonts. The ATM rasterizing routines are similar to those that are used in the popular Adobe Type Manager utility, which enables the Mac's screen to display sharp text at any size.)

The printer's HP LaserJet Plus emulation mode should also appeal to offices that mix Macs and PCs. In all, the Personal LaserWriter NT is an excellent printer.

Apple Personal LaserWriter SC The SC and GCC Technologies' PLP II are the only printers I reviewed that do not use the PostScript (or PostScript-like) page-description language. Rather than containing complex (read expensive) controllers, these printers rely on the Mac to process pages.

The SC is limited because of its reliance on bitmapped fonts (which don't require the extensive processing that outline fonts do). In a nutshell, the SC requires that the Mac's System file contain fonts that are four times larger than each size you plan to print. To print 12-point text, you need a 48-point font. Apple's System 7.0, with built-in outline fonts, will alleviate this problem; in the meantime, you can use Adobe Type Manager.

The SC will never offer all of PostScript's pluses. It can't be shared on a network and can't take full advantage of PostScript-oriented graphics programs such as Adobe Illustrator and Aldus FreeHand. It's also the wrong printer for offices that mix Macs and IBM PCs.

But the Personal LaserWriter SC does have a list price of about $2000, and it can be upgraded to the PostScript-based Personal LaserWriter NT. The SC did well in performance tests, thanks to its reliance on bitmapped fonts and thanks to the fact that it connects to the Mac's SCSI connector, which transfers data faster than the printer port. The printer's sprightly performance in the FreeHand test is misleading, though, because the SC's output quality from PostScript-based applications is substandard.

In short, the SC is a second-best choice for desktop publishing and graphics applications. But if you primarily print text-oriented documents, and you don't need a large variety of type sizes, it won't disappoint you. If the day comes that it does, there's the PostScript upgrade option.

GCC Technologies PLP II The PLP II is the successor to GCC's Personal LaserPrinter, the first non-PostScript printer designed for the Macintosh. The $1399 PLP II costs less than the original PLP and uses a different engine—an Oki Electric OL-400. The PLP produces blacker blacks and is easier to set up; it's a better printer for less money.

In the PLP II, a toner cartridge replaces the spill-prone hopper used in the original PLP's Ricoh 1060 engine. Because the cartridge disgorges toner when tilted, shipping the printer can still cause a mess, however.

Like a PostScript printer, the PLP II uses outline fonts, which let it print virtually any type size. But the PLP II's outline fonts are stored on the Mac's hard disk. At printing time, the Mac generates the required type sizes, creates a bitmap of the entire page, stores it on the Mac's hard disk, and then sends it to the printer via a SCSI cable.

In short, the PLP II's performance depends on the Mac it's used with. My font test document took over 17 minutes to print from a Mac SE, but only about 7 from a Mac II. On 1MB machines, you often face a two-step printing routine that involves quitting the application you're in and running a special print-manager utility.

On the plus side, the PLP II's Bitstream outline fonts are more attractive than the bitmapped fonts Apple includes with the Personal LaserWriter SC, and the Bitstream fonts include true italic and bold styles. (The SC derives those styles by modifying the plain-text version of a font.) Like the SC, however, the PLP II delivers inferior results with PostScript-oriented graphics programs.

The PLP II can be upgraded to the PostScript-based Business LaserPrinter II, which GCC had just announced at this writing (see "Coming Attractions").

Hewlett-Packard LaserJet IIP Hewlett-Packard's LaserJet IIP retails for only $1495, and can often be found for less than $1000. But wait! To use the IIP with a Mac, you need to add an AppleTalk interface ($275), a PostScript cartridge ($695), and a 2-megabyte memory board ($990), bringing the tab to $3455—for a printer that holds just 50 sheets of paper. You want the optional 250-sheet paper tray? Another $195, please. It brings to mind the car salesman who offers cars for $100, plus $5000 for seats and keys.

The IIP uses the same Canon P-110 engine that powers Apple's Personal LaserWriters. Apple, however,

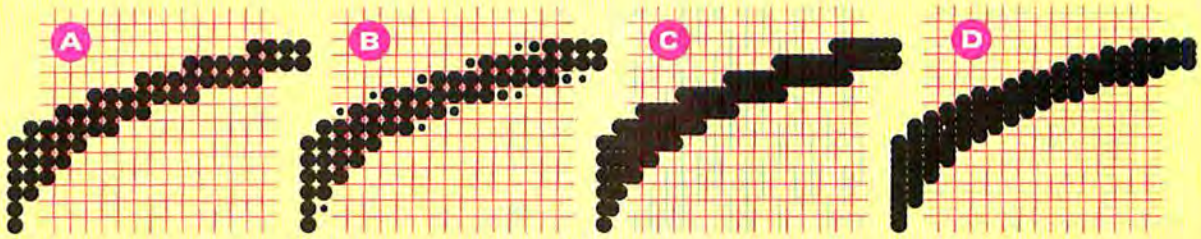
BEST BARGAINS

Percentage slower than the fastest

Fastest | 1%–10% | 11%–20% | 21%–30% | 31%–40% | 41% or more

Numbers are actual times in seconds	Font	Courier	MacDraw	FreeHand	Newsletter
Apple Personal LaserWriter NT	497	308	739	1274	203
Apple Personal LaserWriter SC	191	420	212	599	167
GCC Technologies PLP II	442	504	101	155	264
Hewlett-Packard LaserJet IIP	710	310	504	1811	317
NEC SilentWriter2 290	700	167	279	1027	154
Texas Instruments microLaser PS35	1037	192	356	1331	191

DIFFERENCES IN RESOLUTION



In most laser printers, the size of each dot is the same and its position on the 300-by-300-dpi grid is fixed **(A)**. Hewlett-Packard's LaserJet III can print smaller dots in certain positions to reduce jagged edges **(B)**. In the NewGen TurboPS/480 and TurboPS/360, the laser beam pulses at twice the rate of a standard laser printer, doubling the printers' horizontal resolution. In theory, this improves the appearance of round characters, such as *e* and *o*, as well as italics. However, because horizontal and vertical resolutions differ, the output quality varies depending on whether you print horizontally **(C)** or vertically **(D)** oriented documents. The tops of *o*'s and *e*'s often appear slightly flat when printed vertically.

builds the 250-sheet tray—and everything else you need to use the printer with a Mac—into the printer. The IIP's print quality is excellent, but the controller's performance is disappointing; the printer finished last or close to it in all but the Courier test.

NEC SilentWriter2 290 One way to do better is with the SilentWriter2 290, which features an 8-ppm engine and a processor that runs at 16MHz, versus the more common 10MHz or 12MHz. These features are normally found in midpriced laser printers, but the SilentWriter2 lists for just $3995.

Within the SilentWriter2's stylish case lies a Canon UX engine, a slightly repackaged version of the popular SX engine used in Apple's LaserWriter IIs and many other printers. The UX engine uses the same toner-and-drum cartridges as the SX, and it's just as easy and tidy to set up. Other similarities include a single paper tray that holds up to 200 sheets and a door that, when opened, provides face-up output and a nearly straight paper path for feeding heavy paper, labels, or transparencies.

In the fonts test, the SilentWriter2 took a good deal longer than Apple's Personal LaserWriter NT, but in every other test, the SilentWriter2 finished first among the PostScript printers in this class.

The SilentWriter2 provides the AppleTalk and RS-232C connectors common to most PostScript printers and adds a Centronics connector for PC users. A set of buttons on the printer's front panel lets you switch between ports and between the printer's LaserJet Plus emulation and PostScript modes.

The SilentWriter2 is accompanied by a complete package of documentation and support disks, which include Adobe Printer Description (APD) files used by programs such as Aldus PageMaker, FreeHand, and Adobe Illustrator. The screen fonts for each of the printer's font families are conveniently stored in separate Font/DA Mover documents. NEC clearly gave careful thought to providing the software and instructions needed to take full advantage of this well-designed printer.

Texas Instruments microLaser PS35 Texas Instruments' (TI) microLaser replaces the firm's OmniLaser 2106, which combined laggardly performance with mediocre output quality and a $4499 price tag. This time, TI did everything right. The microLaser PS35 provides competitive performance, several upgrade options, and excellent print quality in a compact package that retails for $2999. For tighter budgets, there's the microLaser PS17, which provides fewer built-in fonts (the Times, Courier, Helvetica, and Helvetica Narrow families, plus Symbol) and retails for $2499.

The microLaser uses the 6-ppm Sharp 9500 print engine. The engine provides a reasonably straight paper path when you open its rear output tray, and paper-handling options include a second tray, 500-sheet feeder, and an envelope feeder.

Like the SilentWriter2, the microLaser sports front-panel buttons for configuring the printer's ports, emulation modes, and other settings. The microLaser is unique, however, in that it lets you save up to four of these configuration settings.

The microLaser performed well, finishing ahead of the Personal LaserWriter NT in the newsletter, Courier, and MacDraw II tests. Its results in the fonts test were disappointing, but as I was writing this article, TI announced it would begin including Adobe's ATM font-rasterizing software in both PostScript microLasers. That should dramatically improve font-handling speed. An upgrade for microLasers built prior to June of this year will be available.

Recommendations The only loser among the PostScript printers in this class is the overpriced, underpowered HP LaserJet IIP. Apple's Personal LaserWriter NT, NEC's SilentWriter2 290, and TI's microLaser are first-rate prod-

ucts whose performance belies their relative affordability. If you need an 8-ppm engine, the SilentWriter2 is the best choice. The Personal LaserWriter NT has the edge in paper handling, thanks to its two paper sources. The likable little microLaser is the best all-around value.

As for the non-PostScript printers, it's a toss-up. GCC's PLP II offers greater typographic quality and versatility, but you'll do a lot of waiting if you don't have a fast Mac with at least 2MB of memory. The Personal LaserWriter SC isn't as demanding, but it doesn't deliver as much. Either printer is well suited to text-oriented tasks—correspondence, reports, and so on—but neither printer offers the flexibility of a PostScript printer. Fortunately, both can act as stepping stones to the PostScript world.

The Best 300-dpi Performers

If less than $4000 buys a capable printer, what does more than $4000 buy? The four printers reviewed in this section are built for speed. All but Qume's CrystalPrint Publisher II and Brother's HL-8PS use Adobe PostScript interpreters that contain 68020 processors and can use a SCSI hard disk to store fonts and improve performance. The Qume and Brother printers are PostScript clones. All four printers are well suited to demanding tasks such as printing complex illustrations or documents containing a large variety of fonts and sizes—but some are better suited than others.

Apple LaserWriter IINTX The aging, Canon SX–based LaserWriter IINTX no longer finishes first in every benchmark test. But it's still the standard against which all fast printers are measured. If you currently have Apple's LaserWriter IISC or IINT, by all means consider the NTX upgrade. If you have not purchased a high-performance printer yet, however, you might look elsewhere (unless you can line up a good discount or have a service contract with Apple).

Last May, Apple quietly began shipping the NTX with PostScript version 51.8. This newer version allows on-the-fly switching between PostScript and HP emulation modes and can recognize multiple SCSI hard disks. The new version is also faster. In my tests, most speed gains were minor, except in the fonts test, where performance improved 20 percent. The NTX's manual has also been expanded to cover printing from PCs.

An upgrade for existing NTX models is available for $119. The printer's speed remains the same, so there's no reason to upgrade an existing NTX unless you need the new features. If you're buying a new NTX, check its part number: the revised NTX is M6004/A.

Brother HL-8PS This PostScript clone from office-equipment giant Brother International isn't a major contender. It provides all the paper-handling reliability and output quality that goes with the Canon SX engine, and it handles Adobe Type 1 well enough, although not quite as well as an Adobe interpreter.

But of the printers in this class, the HL-8PS turned in the slowest times in the FreeHand, newsletter, and MacDraw II tests. Its documentation is mediocre, awkwardly translated from Japanese, and its accompanying disks contain outdated versions of Apple's PostScript drivers. Finally, its fonts don't accurately match those of a true Adobe PostScript printer. Combine these shortcomings with a $4495 price tag (plus $295 for the optional AppleTalk interface cartridge), and you're likely to say, "Brother, you're no clone of mine."

QMS-PS 810 turbo and **PS 820 turbo** QMS has earned a reputation for building fast printers that cost the same or less than Apple's equivalents. The QMS-PS 810 turbo, for instance, is generally faster than Apple's LaserWriter IINTX and it costs $1000 less.

I tested a QMS-PS 820 turbo, which contains a controller identical to that of the PS 810 turbo, and thus provides identical performance. The PS 820 turbo, however, uses a Canon TX engine, which provides two paper trays and is designed for heavy-duty use.

The PS 810 turbo uses the same Canon SX engine as the LaserWriter IINTX. Its controller's 68020, however, runs at 20MHz, versus the NTX's 16MHz. That faster clock rate pushed the PS 820 turbo ahead of the LaserWriter IINTX in all but the newsletter document.

Like all of QMS's PostScript printers, the PS 810 turbo includes a thorough package of documentation and support disks for the Mac and IBM PC. The disks include Apple's latest PostScript drivers and several utilities that let you align the printer's mechanism and print a fact-filled status page that shows the printer's vital statistics. Topping off the package is a sheet listing the name of the technician who packaged the printer along with a toll-free support number. Why can't Apple treat its customers this well?

In short, the PS 810 turbo and PS 820 turbo are winners. If you don't need top performance, consider the $4995 PS 810 instead. It's faster than Apple's LaserWriter IINT, and can be upgraded to the PS 810 turbo.

Qume CrystalPrint Publisher II Qume's CrystalPrint Publisher, which I reviewed in last year's laser roundup, was the first PostScript clone in the under-$5000 price class. But the CrystalPrint Publisher had some problems, including no manual-feed slot, a skimpy 100-sheet paper capacity, and some controller bugs that prevented the printer from processing certain documents.

The $3995 CrystalPrint Publisher II fixes two of the three shortcomings. This second-generation clone uses the same Casio LCS-130 print engine, which still uses that skimpy 100-sheet tray, but now offers a manual-feed slot,

BEST PERFORMERS

Percentage slower than the fastest

Fastest | 1%–10% | 11%–20% | 21%–30% | 31%–40% | 41% or more

Numbers are actual times in seconds	Font	Courier	MacDraw	FreeHand	Newsletter
QMS-PS 820 turbo	349	163	138	452	126
Apple LaserWriter IINTX	338	160	136	477	111
Qume CrystalPrint Publisher II	147	204	105	425	181
Brother HL-8PS	210	169	284	776	355

which has been grafted onto the back of the printer. A new controller fixes the bugs I found and improves performance. Indeed, the CrystalPrint Publisher II turned in some of the best times in this class.

But it's still hard to get excited about the CrystalPrint Publisher II. A paper tray—especially one on a printer with a fast controller—needs to hold more than 100 sheets of paper. The rear-panel manual-feed slot is inconveniently located. Worse, it doesn't provide a straight paper path, so using nonstandard paper stock is a risky proposition.

For some users, the most serious problem may be the printer's inability to use Adobe Systems' Type 1–format downloadable fonts, which many people (myself included) believe provide the best results on 300-dpi printers. The CrystalPrint Publisher II does support Bitstream Type B and Type C fonts, and Adobe Type 3 fonts. (For details on these formats, see "Battle Royal," *Macworld*, April 1990.)

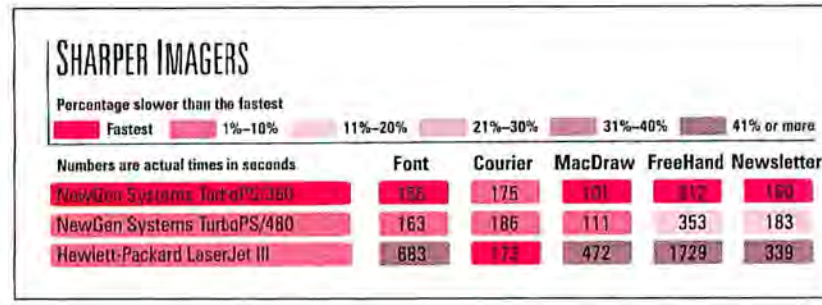
In the end, I can't recommend the CrystalPrint Publisher II. Its paper-handling features still fall short of the competition's, and its inability to use Adobe Type 1 fonts makes choosing fonts more difficult and confusing.

Recommendations The QMS-PS 810 turbo is the winner in this class, combining Canon SX quality with stellar performance. The LaserWriter IINTX remains a strong contender, but it's slower than QMS's turbo series. Qume's CrystalPrint Publisher II and Brother's HL-8PS are also-rans.

The Sharper Imagers

Two of the three printers in this category—NewGen Systems' TurboPS/360 and TurboPS/480—provide lightning-fast performance. But the common claim in this category is sharper output. All three printers promise to smooth the jaggies, produce sharper halftones, and deliver near-typeset-quality output. They only partially deliver.

NewGen Systems TurboPS/360 and TurboPS/480 The $3995 TurboPS/360 and the $7495 TurboPS/480 are PostScript clones that use Canon SX engines. (Prices quoted here are for models with minimum installed memory.) The TurboPS/480, however, uses a 400-dpi version of the engine. In both printers, special circuitry controls the laser beam to double the resolution in the horizontal direction (see "Differences in Resolution"). Thus, the TurboPS/360 provides 600-by-300-dpi output, while the TurboPS/480 produces 800 by 400 dpi.



Both printers can read Type 1 fonts, but they ignore the fonts' internal *hints*, which allow the characters' appearance to be fine-tuned to print attractively on low- and medium-resolution printers. As a result, Type 1 fonts printed on the TurboPS/360 look chunky. The TurboPS/480's higher resolution yields better results.

In the end, I'm more enthusiastic about the TurboPS/480 than the TurboPS/360. The 480's output is noticeably superior to that of its cousin; in many cases, it looks better than that of any printer reviewed here. And because its lowest resolution is 400 dpi, the difference in quality between horizontal and vertical output isn't as noticeable. Still, I recommend printing several of your own documents in both orientations for examination under a magnifying loupe.

NewGen also offers the $4495 TurboPS/300, a 300-by-300-dpi printer, and the $5495 TurboPS/400, which prints 400 by 400 dpi. Both can be upgraded to their higher-resolution counterparts—the TurboPS/300 for $995, the TurboPS/400 for $2295.

Hewlett-Packard LaserJet III HP's LaserJet III takes a different route to sharper output, one that dramatically improves output quality in both horizontal and vertical orientations. The LaserJet III's Resolution Enhancement Technology (RET) works by finely controlling the Canon SX engine's laser to adjust the size and position of individual dots to smooth the jaggies. HP doesn't claim increased resolution, just increased output quality. On the whole, I find it a superior, and more honest, approach.

The LaserJet III also boasts HP's Printer Control Language (PCL) version 5, which provides far more versatile font-handling features than the PCL version used by the LaserJet Plus and II series printers. This means little in the Mac world, but it's a significant plus for IBM PC–oriented shops. You equip the printer for PostScript by plugging in the same PostScript cartridge used by the LaserJet IIP and IID. Alas, the LaserJet III is not a swift PostScript printer, despite the ATM rasterizing software in its PostScript interpreter. Because the printer's 68000 processor runs at a rather sluggish 10MHz clock rate, the printer turned in some of the slowest times of any reviewed here, especially in the computation-intensive FreeHand and MacDraw II tests.

Still, the LaserJet III remains a strong contender, thanks largely to its superb output quality. It's also an excellent choice for offices that use both Macs and PCs. The printer retails for $4355 in its PostScript-and-AppleTalk configuration, but it's available through mail-order retailers for steep discounts.

Recommendations If you want output with consistent sharpness between horizontally and vertically oriented documents, the LaserJet III is the best choice—but be patient. If you can live with some inconsistency, consider the NewGen TurboPS/480—but don't buy until you've closely examined output from your own documents. Avoid the TurboPS/360; its lower resolution doesn't satisfactorily hide the flaws in its fonts and rasterizing software.

The Paper Chasers

The four printers in this class each offer two paper trays, which minimize feeding sessions and let you mix and

LASERWRITER ROUNDUP

	Apple LaserWriter IINT	Apple LaserWriter IINTX	Apple Personal LaserWriter SC	Apple Personal LaserWriter NT	Brother HL-8PS
Imaging language, version	PostScript, 47	PostScript, 47[4]	QuickDraw	PostScript, 51.8	PostScript, 47-compatible
Uses Adobe PostScript interpreter	yes	yes	NA	yes	no
Processor	68000, 12MHz	68020, 16MHz	68000, 7.45MHz	68000, 12MHz	TMS 34010, 40MHz
Number of built-in fonts	35	35	none	35	35
Accepts font-expansion boards/cartridges	no	yes	no	no	yes
LCD screen for status messages	no	no	no	no	yes
Front-panel configuration switches	no	no	no	no	yes
Hard disk for font storage	no	optional	no	no	no
RAM in base model	2MB	2MB	1MB	2MB	2MB
RAM in model tested	2MB	2MB	1MB	2MB	2MB
RAM expansion upgrades	none	to 12MB	none	to 8MB	to 6MB
Other controller upgrades	to NTX ($2899)	none	to NT ($2699) or NTX ($4699)	none	none
Interfaces[5]	A, ADB, R	A, ADB, R, SCSI	ADB, SCSI	A, R	A, P, R
Emulation modes	Diablo 630	Diablo 630, HP LaserJet Plus	none	Diablo 630, HP LaserJet Plus	HP Series II
Print engine	Canon SX	Canon SX	Canon P-110	Canon P-110	Canon SX
Resolution (in dpi, h x v)	300 x 300	300 x 300	300 x 300	300 x 300	300 x 300
Rated engine life (in pages)	300,000	300,000	150,000	150,000	300,000
Maximum speed (in ppm)	8	8	4	4	8
Imaging technology	semiconductor laser	semiconductor laser	semiconductor laser	semiconductor laser	semiconductor laser
Number of paper trays	1	1	2	2	1
Multiple-tray support software	NA	NA	no	no	NA
Paper tray capacity (in sheets)	200	200	standard tray, 250; multipurpose tray, 50	standard tray, 250; multipurpose tray, 50	200
Optional paper accessories	A4, envelope, legal cassettes	A4, envelope, legal cassettes	envelope cassette	envelope cassette	A4, envelope, legal cassettes
List price of model tested	$4999	$5999	approximately $2000	approximately $3300	$4790

[1] Specifications listed for the Hewlett-Packard printers reflect their Macintosh configuration. Base-model printers are considerably less expensive and have fewer features.

[2] Most specifications also apply to NewGen's TurboPS/300 and TurboPS/400, which produce 300-dpi and 400-dpi output, respectively.

[3] Most specifications also apply to QMS's single-tray PS 810 turbo.

[4] LaserWriter IINTXs produced after May 1990 contain PostScript version 51.8. Other features are unchanged.

[5] PLP II includes Courier, Helvetica, Times, Palatino, and Helvetica Narrow. GCC's $239 Fonts Plus package adds seven additional families.

[6] A = AppleTalk; ADB = Apple Desktop Bus; P = Centronics parallel; R = RS-232C/RS-422A serial; SCSI = Small Computer Systems Interface.

match paper types. The QMS and NEC printers also provide high-performance engines that accept font-storage hard disks.

Fujitsu RX7100PS+ The Fujitsu RX-7100PS+ is the only printer in this section that doesn't contain a fast, heavy-duty print engine. Its Fujitsu M3701 is rated at only 5 ppm, and the engine is rated at only 3000 pages per month. You wouldn't want to build an office print station around this printer.

You might, however, want it on your own desktop. Its two 150-sheet paper hoppers give it a larger capacity than most laser printers and allow you to mix and match paper types easily. Unlike the other dual-bin printers reviewed here, the RX7100PS+ includes a start-up document (an INIT) that modifies the Mac's standard print dialog box to allow you to specify that the printer switch from one hopper to the other after printing the first sheet. When you combine the printer with Working Software's QuickLetter desk accessory, which is included, you have a mean correspondence-printing machine.

Until you get to the envelope. In April's *Reviews* section, we incorrectly stated that the RX7100PS doesn't print envelopes. It does print them, but not particularly well; every standard-weight business envelope I printed came out with a few creases. The RX7100PS+ sets no speed records, either. Overall, it turned in relatively slow times, and it's a bit loud.

The RX7100PS+ is easy to set up and compact enough to transport. Its output quality is excellent, and its

Fujitsu RX7100PS +	GCC Technologies PLP II	Hewlett-Packard LaserJet IIP[1]	Hewlett-Packard LaserJet III[1]	Hewlett-Packard LaserJet IID[1]	NEC SilentWriter LC 890XL	NEC SilentWriter2 290
PostScript, 50.3	QuickDraw	PostScript, 52.2	PostScript, 52.2	PostScript, 52.2	PostScript, 50.5	PostScript, 52
yes	NA	yes	yes	yes	yes	yes
68000, 12.5MHz	none (imaging occurs in Mac)	68000, 10MHz	68000, 10MHz	68000, 10MHz	68020, 16MHz	68000, 16MHz
35	[5]	35	35	35	35	35
yes	no	no	no	no	no	no
yes	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes
no	no	no	no	no	optional	no
2MB	none	2MB	2MB	4MB	4MB	2MB
4MB	none	2MB	2MB	4MB	4MB	2MB
to 4MB	to 1MB	to 4.5MB	to 5MB	none	to 8MB	to 4MB
IBM, Diablo, Epson emulations	to BLP II	none	none	none	none	none
A, P, R	SCSI	A, P, R	A, P, R	A, P, R	A, P, R, SCSI	A, P, R
HP Series II	NA	HP Series II	HP PCL 5	HP Series II	Diablo 630, HP Series II	HP LaserJet Plus
Fujitsu M3701	Oki Electric OL-400	Canon P-110	Canon SX	Canon TX	NEC 890	Canon UX
300 x 300	300 x 300	300 x 300	300 x 300	300 x 300	300 x 300	300 x 300
180,000	180,000	150,000	300,000	NA	600,000	300,000
5	4	4	8	8	10	8
LED array	LED array	semiconductor laser	semiconductor laser	semiconductor laser	LED array	semiconductor laser
2	1	1	1	2	2	1
yes	NA	NA	NA	yes	yes	NA
150 (each tray)	200	50	200	200 (each tray)	200 (each tray)	200
face-up stacker	A4, B5, envelope, legal cassettes	250-sheet cassette	A4, envelope, legal, cassettes	A4, envelope, legal, cassettes	face-up output tray	A4, envelope, legal, cassettes
$3790	$1399	$3455	$4355	$5960	$5995	$3995

paper-handling features aren't available in any similarly priced printer. The 4MB RX7100PS+ sells for $3790; a 2MB version, the RX7100PS, is $3999.

Hewlett-Packard LaserJet IID Canon TX–based LaserJet IID is a sumo-sized printer with a unique talent—the ability to print on both sides of a sheet of paper.

The AppleTalk interface you need to access the printer from a Mac includes a utility that modifies Apple's PostScript driver to allow you to activate duplex printing and choose between short-edge or long-edge binding options. You can also choose to switch paper trays after printing the first page.

The IID delivers the same disappointing performance as HP's other printers—again, because the IID's processor runs at only 10MHz. But if you plan to print numerous copies of the same document for subsequent binding and distribution, the slow controller isn't a major drawback, since subsequent pages churn out at the engine's 8-ppm rate. The IID is a good choice for high-quantity office printing, and the only choice for duplex printing.

NEC SilentWriter LC 890XL The original SilentWriter LC 890 provided a rugged, 10-ppm print engine with two paper hoppers, but it was crippled by a slow controller. The LC 890XL replaces that tortoise with a hare. And the printer retails for just $5995—$1000 less than Apple's LaserWriter IINTX and QMS's dual-tray QMS-PS 820 turbo. Best of all, several mail-order

PAPER CHASERS

Percentage slower than the fastest

Fastest | 1%–10% | 11%–20% | 21%–30% | 31%–40% | 41% or more

Numbers are actual times in seconds	Font	Courier	MacDraw	FreeHand	Newsletter
NEC SilentWriter LC 890XL	351	163	143	474	118
Hewlett-Packard LaserJet IID	697	174	485	1773	373
Fujitsu RX7100PS+	1003	237	346	1275	181
QMS-PS 820 turbo	349	163	138	452	126

LASERWRITER ROUNDUP (CONTINUED)

	NewGen Systems TurboPS/480[2]	NewGen Systems TurboPS/360[2]	Qume CrystalPrint Publisher II	Texas Instruments microLaser PS35	QMS-PS 820 turbo[3]
Imaging language, version	PostScript, 2.7	PostScript, 2.7	HyperScript	PostScript, 52.1	PostScript, 51.7B
Uses Adobe PostScript interpreter	no	no	no	yes	yes
Processor	Intel 80960KB (RISC)	Intel 80960KB (RISC)	RISC (Weitek)	68000, 12MHz	68020, 20MHz
Number of built-in fonts	35	35	35	35	35
Accepts font-expansion boards/cartridges	no	no	no	no	no
LCD screen for status messages	yes	yes	no	yes	no
Front-panel configuration switches	yes	yes	yes	yes	no
Hard disk for font storage	requires optional interface	requires optional interface	no	no	optional
RAM in base model	3MB	2MB	2MB	1.5MB	2MB
RAM in model tested	5MB	3MB	3MB	1.5MB	2MB
RAM expansion upgrades	to 5MB	to 5MB	none	to 4.5MB	to 8MB
Other controller upgrades	SCSI interface	SCSI interface	none	Diablo 630, Epson FX emulations	none
Interfaces[5]	A, P, R	A, P, R	A, P, R	A, P, R	A, P, R
Emulation modes	Epson LQ-800, HP 7475A plotter, HP Series II	Epson LQ-800, HP 7475A plotter, HP Series II	HP LaserJet Plus	HP Series II	HP 7475A plotter, HP LaserJet Plus
Print engine	Canon SX	Canon SX	Casio LCS-130	Sharp 9500	Canon TX
Resolution (in dpi, h x v)	800 x 400	600 x 300	300 x 300	300 x 300	300 x 300
Rated engine life (in pages)	300,000	300,000	300,000	250,000	NA
Maximum speed (in ppm)	8	8	6	6	8
Imaging technology	semiconductor laser	semiconductor laser	LCD shutter	semiconductor laser	semiconductor laser
Number of paper trays	1	1	1	1	2
Multiple-tray support software	NA	NA	NA	NA	yes
Paper tray capacity (in sheets)	200	200	100	250	200 (each tray)
Optional paper accessories	A4, envelope, legal cassettes	A4, envelope, legal cassettes	none	second tray 500-sheet feeder, envelope feeder	A4, envelope, legal cassettes; 1000-sheet feeder; envelope feeder
List price of model tested	$8293	$4995	$3995	$2999	$6995

[1] Specifications listed for the Hewlett-Packard printers reflect their Macintosh configuration. Base-model printers are considerably less expensive and have fewer features.

[2] Most specifications also apply to NewGen's TurboPS/30 and TurboPS/400, which produce 300-dpi and 400-dpi output, respectively.

[3] Most specifications also apply to QMS's single-tray PS 810 turbo.

[4] LaserWriter IINTXs produced after May 1990 contain PostScript version 51.8. Other features are unchanged.

[5] PLP II includes Courier, Helvetica, Times, Palatino, and Helvetica Narrow. GCC's $239 Fonts Plus package adds seven additional families.

[6] A = AppleTalk; ADB = Apple Desktop Bus; P = Centronics parallel; R = RS-232C/RS-422A serial; SCSI = Small Computer Systems Interface.

houses discount the printer to as low as $4355. It's the best-priced heavy-duty, high-performance PostScript printer available.

The 68-pound SilentWriter LC uses an NEC 890 print engine, which employs a bank of light-emitting diodes (LEDs) instead of a laser to produce its images. Print quality is good, although halftones appear a bit muddy. It isn't as easy to set up as a Canon engine, but the process is straightforward and not too messy.

As with NEC's SilentWriter2 290, the LC 890XL includes an excellent package of documentation and support disks. The modified print driver lets you select which hopper to use for the current print job. Unfortunately, you can't switch hoppers after the first sheet has been printed.

QMS-PS 820 turbo The $6495 PS 820 turbo contains the same basic controller and delivers the same quick performance as its single-tray sibling, the PS 810 turbo. The primary differences are in the engine—the PS 820 turbo uses Canon's TX engine.

For applications that don't demand the PS 820 turbo's sizzle, there's the $5995 PS 820, which provides two paper trays but a slower controller with no SCSI hard disk connector.

Recommendations For light-duty applications that can benefit from two paper sources, consider the Fujitsu RX7100PS series, but shop around for the best price. For duplex printing applications and for Mac-and-PC offices, the LaserJet IID is the best choice. If processing speed is as important as paper handling, the PS 820 turbo can't be beat. The NEC SilentWriter LC 890XL isn't quite as fast and

COMING ATTRACTIONS

Here's the lowdown on several printers that were in development or had just started shipping at this writing.

• Abaton (415/683-2226) is shipping its $2995 LaserScript PostScript clone. LaserScript provides HP LaserJet Series II emulation; 3MB of memory (upgradable to 6MB); 35 Bitstream fonts (compatible with the standard LaserWriter Plus mix); and LocalTalk, parallel, and serial ports. The LaserScript's 15MHz processor should provide speedy performance, but the 6-ppm print engine may be a bottleneck for high-volume applications. The printer doesn't support Adobe Type 1 fonts, but Abaton says a future version will.

• Dataproducts (818/887-8000) has announced a printer that uses Adobe's PostScript Level 2 and the Weitek XL-8220 RISC processor to provide performance that will, Dataproducts says, allow the controller to keep up with the printer's 6-ppm Sharp engine. The printer (price and name not available at press time) will also accept a SCSI hard disk.

• GCC Technologies (617/890-0880) has updated the Business LaserPrinter to the BLP II. At $2299, it has the lowest retail price of any true Adobe PostScript printer. The BLP II uses the same 4-ppm engine as the PLP II. The controller boasts a 16MHz 68000, a LocalTalk connector, and a SCSI port for a hard disk. Optional serial and parallel interfaces will cost $50–$100. An 8-ppm version, the BLP IIs, will cost $2799. Both printers, scheduled to ship in August, sound hot.

• LaserMax Systems (612/944-9696) is shipping a new version of its $7995 LaserMax 1000 PostScript clone plain-paper typesetter that accepts Adobe Type 1 downloadable fonts. The printer requires a separate controller board that installs in any Mac II. For this reason, the currently shipping LaserMax 1000 cannot be shared on a network. (A network version should be available by the time you read this.) LaserMax describes the printer's resolution somewhat misleadingly as "1000 by 1000 TurboRes." Its actual resolution is 1000 by 400, but the company says the LaserMax achieves a "perceived resolution" of 1000 vertical dots per inch by carefully adjusting the position and size of the printer's dots. (The advertisements would be more honest if they stated this fact.) LaserMax also offers the MX6 Controller, a NuBus board that boosts a LaserWriter's resolution. Its price varies from $2795 to $5095 depending on configuration.

• PrintWare (612/456-1474) is developing a faster controller for its 720IQ Professional, a PostScript clone that accepts Adobe Type 1 fonts, provides true (not perceived) 1200-by-600-dpi resolution, and contains an internal 20MB hard disk for font storage. Last April the firm lowered the printer's price from $20,000 to $11,990. The faster model is scheduled to ship this fall.

its output isn't quite as crisp, but its rugged construction and 10-ppm engine will appeal to large offices—as will its low price.

What's Ahead

Last year, would-be printer buyers were worried about the effect Apple's System 7.0 would have on their investment. As of this writing, System 7.0 still hasn't shipped, and won't until later this year—at the earliest. In the meantime, Apple and Adobe have worked hard to reassure us all that a PostScript printer is still a sound investment. Apple's July introduction of the PostScript-based Personal LaserWriter NT and Adobe's continuing development of cutting-edge programs such as Photoshop prove that while the Apple-Adobe relationship isn't as torrid as it once was, the two firms can still make beautiful music together.

But Adobe may soon be dancing to a different tune. Last June, the firm announced PostScript Level 2, the first major overhaul of PostScript in the language's history. Among other things, PostScript Level 2 boasts faster processing speed, vastly improved features for printing forms, improved support for producing four-color separations on imagesetters, better support for specialized paper-handling features, and more efficient use of printer memory. Adobe has also announced new printer controllers that incorporate high-speed RISC (reduced instruction set computer) processors instead of the general-purpose Motorola 68000 series processors.

But don't let this stop you from buying a printer today. For one thing, printers that use PostScript Level 2 aren't expected until next year. (The Dataproducts printer mentioned in "Coming Attractions" may surface sooner.) For another, PostScript Level 2's most significant features will appeal primarily to the high end of the market, where sluggish imagesetters and color-separation hassles have frustrated publishing professionals who are already pushing today's technology to its limits.

Finally, just how a Level 2 printer will work with the Macintosh hasn't been thoroughly spelled out by Adobe or Apple. Adobe says it's writing its own printer drivers for Level 2 printers. It'll have to; Apple says it won't support Level 2–specific features in the LaserWriter driver unless Apple comes out with a printer that uses a Level 2 interpreter.

Perhaps next year at this time, we'll be covering a new crop of Level 2 printers and comparing them against the Level 1 scribes that dominate today's market. Perhaps not. If the long wait for System 7.0 has taught us anything, it's that purchasing decisions should be based on the technology and products that are available today, not on the rosy promises of company announcements. ◘

See *Where to Buy* for contact information.

Contributing editor and Getting Started *columnist* ***Jim Heid*** *has worked with over 40 laser printers since Hewlett-Packard's original LaserJet appeared in 1984. His latest book, coauthored with Peter Norton, is* Inside the Apple Macintosh *(Brady, 1989).*

MAC ART MART

Browse through clip art from more than 50 companies

Let's try a word-association exercise. Here goes: Macintosh clip art. Time's up. If you said something like "newsletters," or "mediocre drawings," or "Sports, Holidays, and Animals," you're out of date. Need a tawny frogmouth? Not to worry. How about an opah, a hoopoe, a horned corydalis? No problem. They're all in stock.

Mac clip art comes in three basic formats: bitmapped, TIFF, and EPS. If you're new to Mac clip art, the following descriptions should help you decide which format is best for you.

• *Bitmapped* Bitmapped, or MacPaint-format images are created with a low-resolution scanner or drawn in a bitmapped graphics program. These images are made up of a pattern of dots and have a resolution of 72 dots per inch; you can improve the appearance of bitmapped images by printing them at a reduced size on a 300-dpi printer such as the LaserWriter.

• *TIFF* TIFF (tagged-image file format) is a graphics format used by scanners. TIFF stores images at a resolution of 300 dpi. TIFF can also record gray-scale information, although most TIFF clip art is black and white. You can edit TIFF images if you have the right software (SuperPaint or DeskPaint, for example), but it's harder than editing bitmapped images since you're working with more dots per inch. TIFF images look very good when reduced and printed at a resolution of 300 dpi or higher (they don't look so great when enlarged, however).

• *EPS* EPS (encapsulated PostScript) is perhaps the most common Mac clip art format these days. An EPS file contains both the PostScript code needed to print the image and the QuickDraw information needed to display it on screen. An EPS image can be placed into a page-layout program, scaled to virtually any size (up or down), and printed at any available resolution. To modify an EPS image, you can open it with a PostScript drawing program such as Adobe Illustrator or Aldus FreeHand, make your changes, and resave it as an EPS file. If you have the hardware, software, and expertise necessary for color printing, you can add color to EPS images, or alter the colors of EPS clip art that comes in color.

• *The Rest* Less common clip art formats include PICT (created with draw programs like MacDraw or ClarisCAD), Illustrator, and paint graphics packaged as HyperCard stacks.

In the pages that follow you'll see examples of clip art from more than 50 companies. I tried to pick samples that were indicative of the overall quality of each company's offerings. The examples include the vendor's name; an overall rating—based on a representative sample of each company's artwork—of from one to five stars (★ = poor, ★★ = fair, ★★★ = good, ★★★★ = very good, ★★★★★ = excellent); the collection(s) from which the sample graphics were taken; which file formats the company offers; whether collections are offered on floppy disk or CD ROM; and the subject areas covered by all the company's collections to date. To have a given subject listed, a company must offer at least five images in that category.

Several companies specialize in certain subjects: medical images, maps, digitized photos, 3-D graphics. These vendors are listed in boxes.

For a comprehensive, indexed directory of Mac clip art, I recommend *Canned Art: Clip Art for the Macintosh* from Peachpit Press (1990) in Berkeley, California. I find *Canned Art* to be a handy reference, but I'm a bit biased, since I'm one of the book's authors. (If I knew of another such book, I'd recommend it too.)

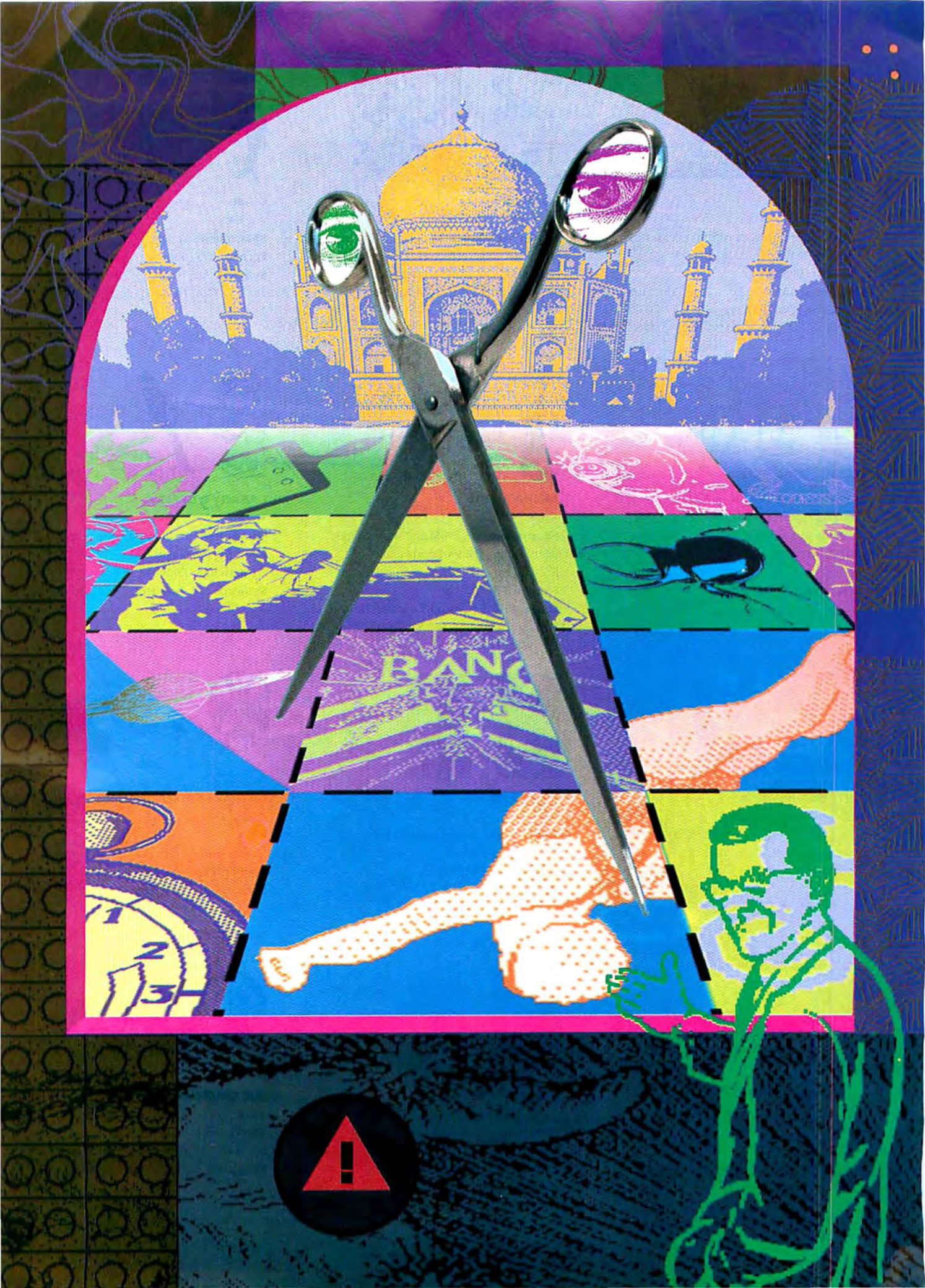
Happy clipping!

See *Where to Buy* under Clip Art for contact information.

Erfert Fenton, *a* Macworld *contributing editor, is a freelance technical writer who specializes in Macintosh typography and graphics.*

BY ERFERT FENTON

ERIK ADIGARD


BANG

3G GRAPHICS
★★★★★
Shown here: Images with Impact series: Accents & Borders 1; Business 1
Format: EPS (floppy)
Subjects: Ani, Bor, Com, Dec, Edu, Flo, Hol, Pro, Spo, Sym, Tra

ADOBE SYSTEMS
★★★★★
Shown here: Adobe Collector's Ed. series: Ed. I; Patterns and Textures
Format: Illustrator (floppy)
Subjects: Bor, Dec, Flo, Map, Sym

C.A.R.
★★★★
Shown here: Clipables
Format: EPS (floppy)
Subjects: Ani, Bor, Chi, Com, Dec, Edu, Fla, Foo, Gov, Hol, Map, Pro, Spo, Sym, Tra

MAPS

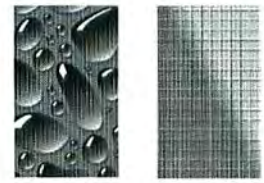
Although many companies offer U.S. maps in their clip art collections, if you need a wider scope—other countries—or a narrower focus—U.S. states by county—you can turn to companies that specialize in maps.

HYPERFORMANCE
Shown here: State-Smart
Format: Bitmapped, HyperCard (floppy)
Subjects: world, U.S. states: facts, political, topological

MICROMAPS SOFTWARE
Shown here: MacAtlas EPSF Version
Format: Bitmapped, PICT, Illustrator 88 (floppy)
Subjects: world, U.S. states, U.S. states by county; political boundaries

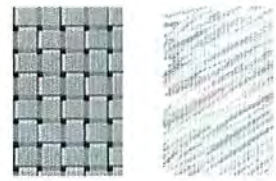
ARCHIVE ARTS
★★★
Shown here: Ed. 7—Music Masters and Instruments; Ed. 9—Sports and Recreation
Format: TIFF (floppy)
Subjects: Ani, Bor, Chi, Dec, Fla, Flo, Foo, Gov, Hol, Pro, Rel, Spo, Tra

CASADY & GREENE
★★★
Shown here: Vivid Impressions series: Vol. 1 Special Events
Format: EPS (floppy)
Subjects: Ani, Gov, Hol



ARTBEATS
★★★★
Shown here: Natural Images, Vol.1; Dimensions 2
Format: EPS (floppy)
Subjects: Dec, Flo

CATHAY EUROPA TRADING COMPANY
★★★
Shown here: GlobalArt Oriental Images
Format: Bitmapped (floppy)
Subjects: Ani, Dec, Flo



ARTFACTORY
★★★
Shown here: Textured Backgrounds, Vol. 1
Format: EPS (floppy)
Subjects: Dec

THE CHURCH ART WORKS
★★★
Shown here: Youth Art 1.0
Format: TIFF (floppy)
Subjects: Chi, Edu, Foo, Hol, Rel, Spo

COLLECTOR SOFTWARE

★★★★

Shown here: BearWare series: Recreation Bears; Working Bears
Format: Bitmapped (floppy)
Subjects: Ani, Chi, Hol, Pro, Spo

DREAM MAKER SOFTWARE

★★★

Shown here: Cliptures series: Vol. 2, Business Images 2; Vol. 1, Business Images
Format: Bitmapped, HyperCard, EPS (floppy)
Subjects: Ani, Bor, Chi, Com, Dec, Flo, Foo, Hol, Pro, Rel, Spe, Sym, Tra

DAVKA CORPORATION

★★★

Shown here: DavkaGraphics I; DavkaGraphics EPS: Jewish Holidays
Format: Bitmapped, EPS (floppy)
Subjects: Chi, Dec, Edu, Foo, Hol, Rel, Sym

DUBL-CLICK SOFTWARE

★★★★

Shown here: WetPaint series: Classic Clip Art; Printer's Helper
Format: Bitmapped (floppy)
Subjects: Ani, Bor, Chi, Com, Dec, Edu, Fla, Flo, Foo, Hol, Map, Mil, Pro, Rel, Spo, Sym, Tra

DEVONIAN INTERNATIONAL SOFTWARE

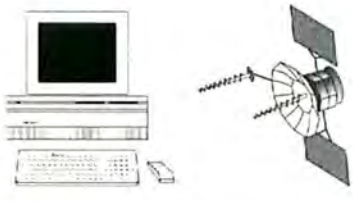
★★

Shown here: Artagenix series: Floral Accents I; Planes of Fame
Format: Bitmapped (floppy)
Subjects: Chi, Fla, Flo, Map, Mil

DV FRANKS

★★★

Shown here: ArtDisk series: Vol. 4, Aquatic Life; Vol. 2, People, Animals & Birds
Format: Bitmapped (floppy)
Subjects: Ani, Chi, Dec, Rel



ELECTRIC BANANA

★★

Shown here: Aerospace 1; Aerospace 2
Format: EPS (floppy)
Subjects: Com, Gov, Mil, Sym

DISKART

★★★★

Shown here: Flags of the USA; International Symbols
Format: EPS (floppy)
Subjects: Fla, Mil, Sym

DYNAMIC GRAPHICS

★★★★

Shown here: DeskTop Art series: Athletics 1; Design Elements 1
Format: Bitmapped, EPS, TIFF (floppy)
Subjects: Ani, Bor, Chi, Com, Dec, Edu, Foo, Hol, Pro, Spo, Sym, Tra

ELECTRONIC PEN

★★★★

Shown here: The Visual Arts
Format: EPS (floppy)
Subjects: Bor, Com, Dec, Foo, Pro, Spo, Sym, Tra

ENZAN-HOSHIGUMI/QUALITAS TRADING COMPANY

★★★★

Shown here: Japanese Clip Art series: Scroll 1, Heaven; Scroll 2, Earth
Format: Bitmapped (floppy)
Subjects: Ani, Bor, Dec, Flo, Hol, Rel, Sym

FOUNDATION PUBLISHING

★★★

Shown here: Comic People series: Vol. One, Office Days; The Comic Strip Factory
Format: Bitmapped (floppy)
Subjects: Ani, Com, Pro

INNOVATION ADVERTISING & DESIGN

★★★★

Shown here: International Symbols & Icons, Vol. 1
Format: EPS (floppy)
Subjects: Map, Pro, Rel, Spo, Sym, Tra

3-D

Three-dimensional images come with a program that lets you manipulate them before placing them in a file or animation. You can resize an image, rotate it, or change the lighting. Paracomp has announced SwivelArt, a set of Swivel 3D images that can be edited and then saved in PICT, bitmapped, or EPS format.

ENABLING TECHNOLOGIES

Shown here: Clip3D Library series: Business
Format: Proprietary 3D (can be saved as PostScript, EPS, TIFF, or PICT) (floppy)
Subjects: Com, Dec, Foo, Hol, Map, Pro, Spo, Sym

NEC HOME ELECTRONICS

Shown here: Clip Art 3-D
Format: Proprietary 3D (can be saved as PostScript, EPS, TIFF, or PICT) (CD)
Subjects: Com, Dec, Foo, Hol, Map, Pro, Spo, Sym

GENESIS SYSTEMS

★★★

Shown here: Advanced Visuals, Vol. 1
Format: Illustrator 88, EPS (floppy)
Subjects: Ani, Hol

INTERPRETIVE GRAPHICS TECHNOLOGIES

★★★

Shown here: SymbolWorks
Format: EPS (floppy)
Subjects: Sym

HIRED HAND DESIGN

★★★

Shown here: Moonlight Artworks series: Logo Master; Holiday Set
Format: EPS (floppy)
Subjects: Bor, Com, Dec, Foo, Hol, Sym

MAGNUM SOFTWARE

★★★

Shown here: McPic series: Vol. 1; Vol. 2
Format: Bitmapped (floppy)
Subjects: Ani, Fla, Flo, Foo, Hol, Map, Pro, Spo, Sym, Tra

IMAGE CLUB GRAPHICS

★★★

Shown here: DigitArt series: Vol. 19, Silhouettes; Vol.18, Celebrity Caricatures
Format: PICT, EPS (floppy, CD)
Subjects: Ani, Bor, Com, Dec, Foo, Hol, Map, Pro, Rel, Spo, Sym, Tra

MARKETING GRAPHICS

★★★

Shown here: PicturePak series: Executive & Management Ed.
Format: Bitmapped, MacDraw II (floppy)
Subjects: Bor, Com, Dec, Edu, Gov, Hol, Map, Mil, Pro, Sym, Tra

MEDIA CLIP-ART

★ ★ ★

Shown here: Vol. 1, Business/Sports/People

Format: EPS, PICT, TIFF (floppy, CD)

Subjects: Ani, Bor, Chi, Com, Flo, Foo, Map, Pro, Spo, Sym, Tra

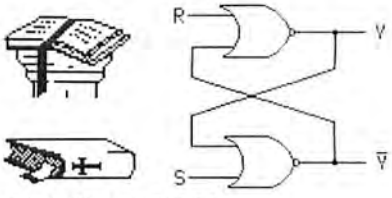
MULTI-AD SERVICES

★ ★ ★ ★ ★

Shown here: ProArt series: Food Collection; People Collection

Format: EPS (floppy, CD)

Subjects: Ani, Bor, Com, Dec, Edu, Foo, Hol, Pro, Rel, Spo, Sym



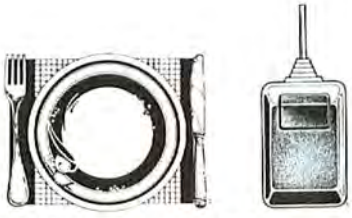
MEDINA SOFTWARE

★ ★

Shown here: Religious Art Portfolio; Electro Bits

Format: Bitmapped, HyperCard (floppy)

Subjects: Bor, Com, Dec, Edu, Hol, Rel, Sym



NEC HOME ELECTRONICS

★ ★ ★ ★ ★

Shown here: Image Gallery (note: graphics in Image Gallery are from Metro ImageBase)

Format: EPS, TIFF (CD)

Subjects: Bor, Com, Dec, Foo, Gov, Hol, Pro, Spo, Sym, Tra

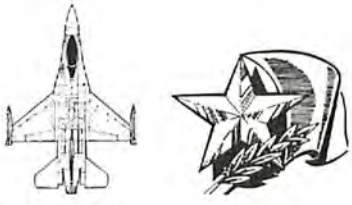
METRO IMAGEBASE

★ ★ ★ ★ ★

Shown here: Food; The Four Seasons

Format: TIFF (floppy)

Subjects: Bor, Chi, Com, Dec, Foo, Gov, Hol, Pro, Spo, Sym, Tra



NOVACUBE

★ ★ ★ ★

Shown here: Military Art

Format: Bitmapped, PICT, EPS, HyperCard (floppy)

Subjects: Mil, Sym

SILICON DESIGNS

★ ★ ★ ★ ★

Shown here: Art Nouveau Images

Format: EPS (floppy)

Subjects: Bor, Dec

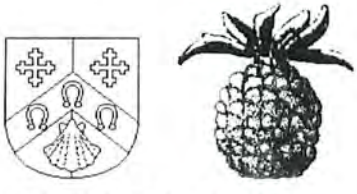
MILES COMPUTING

★ ★ ★ ★

Shown here: Mac the Knife series: Vol. 5, People, Places & Things

Format: Bitmapped (floppy)

Subjects: Ani, Bor, Com, Dec, Hol, Pro



PLEASANT GRAPHIC WARE

★ ★

Shown here: Heraldry III; SmArt Family/Foods

Format: Bitmapped (floppy)

Subjects: Ani, Bor, Chi, Dec, Fla, Flo, Foo, Hol, Mil, Rel, Spo, Sym, Tra

SOFTDISK PUBLISHING

★ ★ ★

Shown here: Art Gallery, Vol. 1

Format: Bitmapped, PICT (floppy)

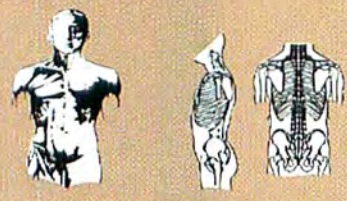
Subjects: Ani, Hol, Spo

SUBJECT KEY

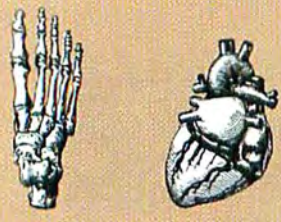
Ani = Animals
Bor = Borders
Chi = Children
Com = Computers
Dec = Decorative
Edu = Education
Fla = Flags
Flo = Flowers
Foo = Food
Gov = Government
Hol = Holidays
Map = Maps
Mil = Military
Pro = Professions
Rel = Religion
Spo = Sports
Sym = Symbols
Tra = Transportation

Medical

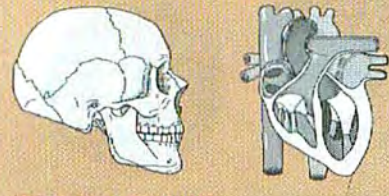
JAM SOFTWARE
M.E.D. Graphics (not shown)
Format: PICT (floppy)
Subjects: ear, eye, G-I tract, reproductive, skeleton



MACMEDIC PUBLICATIONS
Shown here: MacAnatomy series: Vol. IV, Bones and Joints, Miscellaneous
Format: Bitmapped, HyperCard (floppy)
Subjects: G-I tract, muscles, skeleton,



MACPDS
Shown here: Medical Application Clip Art series: Vol. I
Format: Bitmapped (floppy)
Subjects: ear, eye, G-I tract, muscles, reproductive, respiratory, skeleton, urinary



TECHPOOL STUDIOS
Shown here: LifeArt Human Anatomy Collection
Format: EPS (floppy)
Subjects: brain, endocrine, eye, G-I tract, reproductive, respiratory, skeleton, teeth, urinary

Digitized Photos on CD Rom

Because digitized photograph files are so large, CD-ROM technology has proven particularly appropriate for their distribution. Several companies now offer compilations of stock photos and some, like Discimagery, Image Club Graphics, and NEC allow you to order slides that correspond to their scanned images.

DISCIMAGERY
Shown here: Professional Photography Collection
Format: 24-bit color TIFF and 8-bit b&w TIFF (prints and slides also available) (CD or floppy)
Subjects: 100 images in categories including business, fitness, food, scenics, U.S. cities, women

MEDIA CLIP-ART
Shown here: CD ROM-650 Color Clip-Art Disc
Format: 8-bit and 24-bit color TIFF, EPS, and PICT2 (CD or floppy)
Subjects: photo categories include animals, buildings, cars, space, travel (CD includes drawings in many categories)

NEC HOME ELECTRONICS
Shown here: Photo Gallery
Format: 8-bit b&w TIFF (slides available from Uniphoto Picture Agency)
Subjects: 20 categories, including animals, buildings, computers, industry, people, scenics, and sports

IMAGE CLUB GRAPHICS
Shown here: DarkRoom
Format: 8-bit b&w TIFF (color slides available from Focus Stock Photo)
Subjects: people, industry, nature, scenics, sports, travel, wildlife

TSUNAMI PRESS
Shown here: The Photoclip Collection, Vol. 1: The Right Images
Format: 8-bit and 24-bit color, 8-bit b&w PICT2
Subjects: stars, planets, space vehicles

SPINNAKER SOFTWARE

★ ★ (Bitmapped) ★ ★ ★ ★ (EPS)

Shown here: Works of Art series: Education Series; Holiday Series

Format: Bitmapped, HyperCard, EPS (floppy)

Subjects: Ani, Chi, Com, Edu, Flo, Foo, Gov, Hol, Map, Pro, Rel, Spo, Sym, Tra

T/MAKER

★ ★ ★ (Bitmapped) ★★★★★ (EPS)

Shown here: ClickArt series: EPS Animals & Nature; Business Cartoons

Format: Bitmapped, HyperCard, EPS (floppy)

Subjects: Ani, Bor, Com, Dec, Fla, Flo, Foo, Gov, Hol, Map, Pro, Rel, Spo, Sym, Tra

STORM KING TECHNOLOGY

★ ★ ★ ★

Shown here: NavyArt, Naval & Marine Clip Art

Format: Bitmapped, PICT (floppy)

Subjects: Mil, Sym

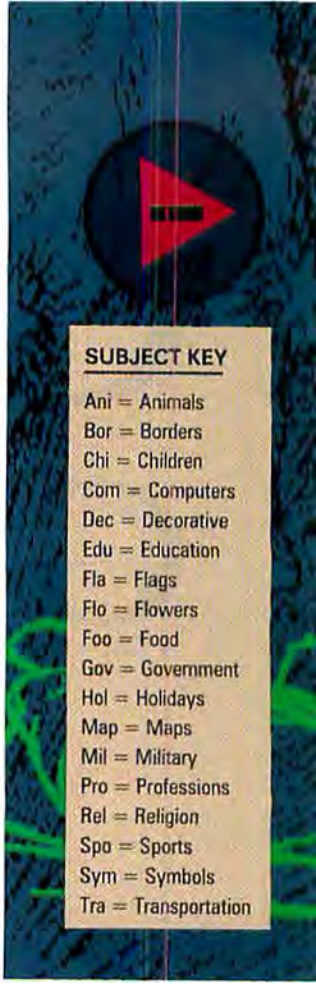
TACTIC SOFTWARE

★ ★ ★ ★

Shown here: Art Clips series: Vol. 2, Business Images

Format: EPS (floppy)

Subjects: Ani, Com, Foo, Pro, Spo, Sym, Tra



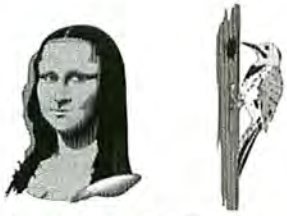
STUDIO ADVERTISING ART

★ ★ ★

Shown here: Click & Clip series: Road & Warning Signs; Medical/Health

Format: EPS (floppy)

Subjects: Ani, Bor, Dec, Foo, Hol, Map, Mil, Pro, Spo, Sym, Tra



TOTEM GRAPHICS

★ ★ ★ ★

Shown here: Totem Color Clip Art series: Vol. 2; Vol. 5

Format: Illustrator, FreeHand, EPS (floppy)

Subjects: Ani, Flo, Foo, Hol, Pro, Spo, Tra

VISATEX

★ ★ ★ ★

Shown here: Hollywood Greats

Format: Bitmapped (floppy)

Subjects: Edu, Gov, Pro

SUNSHINE

★ ★ ★ ★

Shown here: Vol. 8, Fanciful Animals; Vol. 1, Oriental Cutout Designs

Format: Bitmapped (floppy)

Subjects: Ani, Bor, Dec, Flo, Rel

THE UNDERGROUND GRAMMARIAN

★ ★ ★ ★ ★

Shown here: Typographers' Ornaments series: Vol. 10

Format: EPS, TIFF

Subjects: Ani, Bor, Chi, Dec, Flo, Pro

WEST STONE SOFTWARE

★ ★ ★ ★

Shown here: Chinese Clip Art

Format: Bitmapped (floppy)

Subjects: Ani, Bor, Dec, Flo, Hol, Rel

GRADE-A GRAY SCALE

Getting premium gray-scale halftones requires a premium scanner—as well as the know-how to use it to its fullest

BY STEVE ROTH

Buying a gray-scale scanner for high-quality imagesetter output is a catch-22 situation. You almost have to produce a few projects before you can figure out what you need—how to use it, what the efficiencies and pitfalls are, and how to tap the efficiencies and avoid the pitfalls. To choose the right scanner, you need to know four things:

(1) How to get good quality from PostScript imagesetters with gray-scale scanning. (2) How to save money while maintaining that quality. (3) How to cut down on the amount of time spent working with the images. (4) And finally, which scanners and software packages provide the tools necessary to accomplish the above.

Since you're probably anxious to know the answers, here they are.

(1) To produce high-quality imagesetter output, you need a scanner and software with good dynamic range, good sharpening features, and good gamma controls. (2) You save money by reducing the imagesetter output time. (3) You save time by automating scanning and manipulation, preferably with software that permits sharpening and gamma correction at scan time. (4) None of the scanners on the market provide the perfect solution, though the Agfa Focus II and the Xerox GS Plus (combined with Adobe Photoshop) come close.

For this article I've chosen to evaluate the one overhead and five flatbed scanners that bear the most serious consideration. Those choices were based on several factors—including price, software convenience, and features—and on my experience working with all the scanners on the market over the past several years. I chose two expensive offerings (the Agfa Focus II and the Truvel TZ-3 overhead), two popular and inexpensive units (the Hewlett-Packard ScanJet Plus and the Microtek 300G), and two inexpensive newcomers (the Xerox Datacopy GS Plus and the Umax UG80).

I tested the six scanners extensively for their usefulness in producing high-quality halftone images from PostScript imagesetters. The conclusions here reflect that bent. (For general information on scanning and scanners, see "Shopping for Scanners," May 1989 *Macworld*).

One Con, One Pro

Before I go any further, let me say that virtually all Mac scan halftones are mediocre compared to their photographic counterparts. Even with 400-dpi, 8-bit scanners, and 2400-dpi output, the final results are generally disappointing. The halftones are blurry compared with the crisp images that result from photographic processes or high-end scanning and film printing, and details in highlight and shadow areas tend to vanish.

Because of these failings, many publishers simply use scanners to grab images for position only (FPO). Inexpensive black-and-white scanners are perfect for scanning low-resolution images that print quickly and don't monopolize disk space. FPO scans make it easy to position images, wrap type, and see how a page will look. They also let the printer know exactly which image goes where, at what size, and with what cropping. High-quality halftones are either pasted down on boards to be shot along with the rest of the black-and-white work, or are stripped in as negatives by the printer.

Of course, the process just described is a bit more expensive than placing halftones in page-layout software and outputting complete pages. Done conventionally, a page with five photographs costs between $80 and $125, including the photo halftones and imagesetter output for the non-photographic part of the page. If you

What's wrong with this picture? Hints: the antihumor warning, the notice about Ethyl and Fred, and the unusual—especially in the forties—news headline. In fact, this time-warped scene is a collage constructed in Photoshop from four photographs: the car, gas pump and attendants, Exxon station, and sky. The pavement and hillside were extrapolated from small samples using the clone tool.

1) 200 dpi

2) 300 dpi

3) 200 dpi, sharpened in Photoshop

The Crisper Image Higher resolution doesn't do much to overcome the problem of blurry imageset halftones. Image 2 has 50 percent more resolution than the others, which translates to more than twice the file size. But as can be seen in image 3, sharpening is a much more important factor in achieving crisp output.

Special Collections Division, University of Washington Libraries, Todd; Negative no. 10511

scan those five images, place them on the page, and send the whole page to the imagesetter for film output, you can figure to spend between $10 and $50, depending on how long it takes to print. Most service bureaus charge a per-minute premium for pages that take more than 10 minutes or so, and pages with lots of scans often exceed that limit. At 30 minutes per page with a $10 base price and $1-per-minute overtime charge, you're at $30 a page—a $50- to $95-per-page savings.

No discussion of savings is complete, however, without mentioning time. The more scans in a job, the more potential savings. On the other hand, the more scans, the more time you have to spend scanning and placing the images, and probably manipulating them for better quality.

Resolving the Resolution Question

The goal with gray-scale scans, then, is to reduce the time you spend working with the images, limit the imagesetter output time, and still achieve the quality you want. True quality is elusive, but there are several techniques and technologies that let you improve quality considerably—approaching that of photographic halftones—without raising your output costs or the time you need to spend on the job.

The very best thing you can do to reduce your imagesetter costs and the time you spend working with images is to use lower-resolution scans. When you double the resolution, you increase the file size by a factor of four. What's more, bigger files are a pain from which you'll derive little gain. Contrary to what you might expect, the difference between 200-dpi and 300-dpi gray-scale scans is often insignificant (see "The Crisper Image"). If you scan at lower resolutions, you spend less time looking at the Mac's little hourglass, pages print a lot faster, and you don't lose much quality at all.

The one exception is images with hard edges and prominent diagonal lines, such as a white line passing through a dark area. With lower-resolution scans you often see *aliasing*—stair-step jaggies—in these areas. In softer images with smooth transitions, such as a person's face, it's almost impossible to distinguish between output from a 150-dpi scan and output from a 300-dpi scan.

The axiom for maximum image resolution is to scan at twice the intended screen frequency. So if you're using a 120-line screen for output, you should scan at 240 dpi. In practice, however, ratios from 1.2:1 to 1.5:1 can yield results virtually identical to scans at 2:1, with files less than half the size.

When you're scanning, don't forget that any scaling you apply on the page affects the image resolution. So if you scan an image at 150 dpi and then reduce the photograph 50 percent, the net result is a 300-dpi image. You may not know at scan time the exact scaling you're going to use, but do a little arithmetic and try to guess. Just be careful about how you scale a file. Many scaling functions throw data away when sizing down; if you're not sure how your scaling features function, it's always safe to wait and scale during printing.

Scanning at high resolutions is necessary if you're going to enlarge an image. Many scanners boast *logical* resolutions up to 1500 dpi, even though they're limited to 300-dpi true optical resolution. Above that value they interpolate dots. Scanning at rates beyond the optical resolution doesn't add information, so the image doesn't come out any sharper.

Look Sharp

So if higher resolution doesn't give you the sharpness you're looking for, what can? The answer is sharpening. Several programs on the market—ImageStudio, Digital Darkroom, Enhance, ColorStudio, Aldus Preprint, and Adobe Photoshop, for instance—have sharpening filters. Using varying degrees of intelligence, these filters accentuate the differences between adjacent light and dark pixels.

There are a couple of problems with sharpening, though. First, it takes time. You have to scan an image and then run it through the sharpening filter. Some scanners let you scan an image directly into one of the programs mentioned above, which saves a step; but with other scanners you have to scan the image, save it to disk, open it with the program, sharpen it, then save it. It's hardly an automated process, and with big files you spend

a lot of time drumming your fingers. The Agfa Focus II with its McView Plus software is the only exception. It lets you sharpen an image as you scan it, so a moderate increase in scanning time gets you a significant increase in quality.

The other problem with sharpening is sharpening itself. Macintosh programs are only so smart, and they often sharpen areas that shouldn't really be sharpened. The diagonal jaggies mentioned above, for instance, are often accentuated by sharpening. Of course, you can sharpen key sections selectively while avoiding the areas where jaggies are a problem, but doing so takes time. Another common sharpening artifact is speckling—myriad white dots appearing in darker areas. Despeckling filters don't do a very good job of removing this problem, which is especially egregious with poor scans.

There are many different sharpening algorithms around, some better than others. Photoshop offers four sharpening filters, for instance, each of which can be modified in various ways. ImageStudio offers one type of sharpening filter, Enhance offers three, and Digital Darkroom offers one. My tests show that the Unsharp Masking and Sharpen Edges filters in Photoshop 1.06 (alone or in combination) do the most good while introducing the fewest difficulties of their own.

Agfa's McView sharpening stands out for being effective without being intrusive (though its results are not as good as Photoshop's).

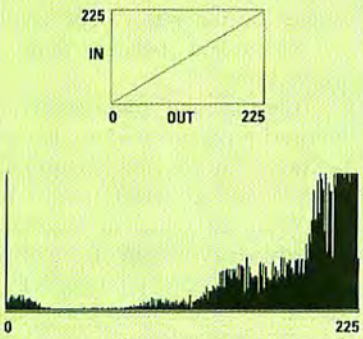
The Value of Gray Values

The next important area to consider is the gray values you're capturing and printing. Almost all the gray-scale scanners on the market this year capture 8 bits per sample point, which theoretically results in 256 distinct shades of gray. That's as many as PostScript knows how to handle, and more than the human eye can distinguish, so it should be ample. You need all of those 8 bits, though (and more if you could get them), because unfortunately not all bits are created equal.

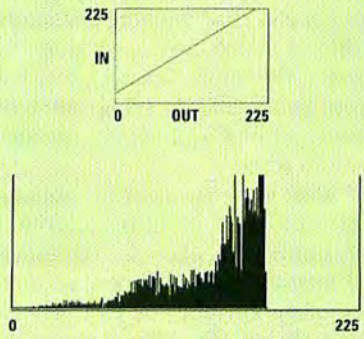
The problem is that most 8-bit

CORRECT CORRECTION

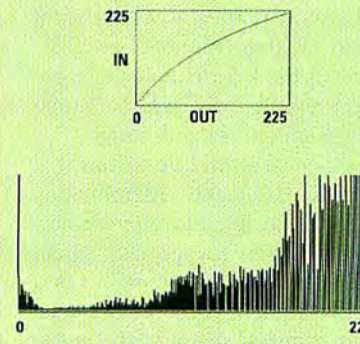
The pairs of graphs next to these images help to tell the story of the difference between linear and gamma correction. The *gray maps* (top graph) describes the relationship between scan values (input) and values sent to the printer (output). The *histograms* (bottom graph) show the distribution of gray values in the image. Each line represents a value from 0 to 255; the length of a line indicates how many pixels of that value the image contains.



As Scanned The image is dark, as the massing at the high end of the histogram confirms. Since no corrections have been performed, input and output values on the gray map are in a 1:1 correspondence.



With Brightness Correction Linear adjustment pushes all values up indiscriminately. Light values, like the text in the Joan of Arc billboard, fade to white; true blacks also wash out—note how the histogram now stops well short of 225.



With Gamma Correction The gamma is curved, devoting less output to the dark end of the spectrum. Shadow detail is enhanced without loss of contrast. The histogram shows how dark values have been shuffled down.

SCANNERS COMPARED

Company	Model	Price	Type[1]	Internal SCSI Interface	Resolution Settings/ Increments (in dpi)	Maximum Optical Resolution	Gray-level Options
Abaton	Scan 300/S[2]	$1595	FB	●	75, 100, 150, 200	300	2, 16
	Scan 300/GS	$1995	FB	●	72–300/1	300	2, 16, 256
Agfa Compugraphic	Focus S800GS	$4345	FB	●	100–200/25, 200–400/50, 400–800/100	400	2, 64
	Focus II S800GSE[3]	$6945	FB	●	100–200/25, 200–400/50, 400–800/100	400	2, 64, 256
Apple Computer	Apple Scanner	$1799	FB	●	300	300	2, 16[4]
Asuka Technologies	256G[7]	SCSI $599, NuBus $499	HH	○	100, 200, 300, 400	400	2, 16, 256
Canon USA	IX-30F	$1545	FB	●	75, 150, 200, 300	300	2, 256
DEST Corporation	PC Scan 2000	$1395	SF	●	38–300/1	300	2, 256
	PC Scan 3000	$1595	FB	●	38–600/300/1	300	2, 256
Hewlett-Packard	ScanJet Plus	$1595	FB	○	12–1500/300/1	300	2, 16, 256
Microtek	MSF-300G/GS	$2195	FB	○ (G)	75–300/3	300	2, 256
	MSF-400G/GS	$3995	FB	● (GS)	100–400/4	400	
Mouse Systems Corporation	PageBrush Professional[7]	$795	HH	NuBus	75–300/1	300	2, 4, 16, 64
Thunderware	ThunderScan Plus	$249	PH	NA	18–576/1	288	2, 64
Truvel Corporation	TZ-3	$7785[5]	OH	○	75–900/1	900	2, 4, 16, 256
Umax Technologies	UG80	$1995	FB	●	3–300/3	300	2, 16, 256
Xerox Datacopy	Datacopy GS Plus	$1995	FB	●	75–300/1	300	2, 16, 256
	730GS	$1995	FB	●	60–450	300	2, 16, 64
	830	$3495	FB	●	180, 200, 240, 300	300	2, 64

● = yes, ○ = no [1] FB = flatbed, HH = hand-held, OH = overhead, PH = print head, SF = sheetfed. [2] Can upgrade to 300GS for $595. [3] Digital Darkroom or ImageStudio available for $100. [4] Except when scanning with Digital Darkroom. [5] Price includes $595 interface. [6] Can increase to 256 with Abaton upgrade. [7] Prerelease; specifications subject to change. [8] 8.5 x 14 inches with automatic document feeder. [9] Optional Picture Pac holder for books and magazines, $525.

scanners really only capture about 6 or 6½ bits of usable information. Bit 8 is quite inaccurate, bit 7 only somewhat better. Another way to look at this is to say that scanners have a lot of noise in the information they capture. Yet another way to say it is that they have limited dynamic range.

In practical terms, this means that scanners have difficulty differentiating between subtle differences in gray levels. The problem is especially apparent in shadow areas; it's hard to bring out details in dark parts of an image. Another common result of this noise is speckling in the image—especially apparent if you increase contrast and brightness in a scanned image.

Needless to say, some scanners capture more good data than others. In my tests, the Umax UG80, Xerox Datacopy GS Plus, Agfa Focus II, and Truvel TZ-3 scanners did the best job. The Microtek MSF 300G had quite a bit more difficulty; and with the HP ScanJet Plus (based on the ubiquitous Canon scanning engine, which is also used in the Apple Scanner) it was almost impossible to bring out dark details without washing out the light areas to white.

What we really need are scanners that capture 10 or 12 bits and then use software to filter out the excess information, leaving 8 good, accurate bits of information for each sample point. Outside the color-scan market, however, such a beast doesn't currently exist.

Using the Bits You Have

Since 8-bit scanners don't really capture 8 good bits of data, what can you do to take advantage of the information that is there to bring out details in highlight and shadow areas? To answer that, it's first necessary to understand the difference between linear correction and nonlinear, or *gamma*, correction.

Contrast and brightness controls in most programs perform linear correction. They're only so useful, because any adjustment you make throws away detail in highlight or shadow areas or both. If you brighten an image to bring out details in dark areas, light areas wash out. If you increase contrast to bring out details in midtones, the dark areas go black and the light areas go white.

Nonlinear correction, on the other hand, lets you reassign image values without chopping off the ends of the spectrum. The concept is simple, the results sophisticated. By reassigning

Bundled Software	Scanning Modules	Memory or Disk Limited?	Gamma Control During/After Scanning	Sharpening During/ After Scanning	Maximum Image Size (in inches)
Abaton Scan (DA)[3]	Digital Darkroom, ImageStudio, Photoshop	disk[4]	●/○	○/○	8.5 × 14
Abaton Scan (DA)[3]	Digital Darkroom, ImageStudio, Photoshop	disk[4]	●/○	○/○	8.5 × 14
McView Plus (application)		disk	●/●	●/○	8.5 × 13
McView Plus (application)		disk	●/●	●/○	8.5 × 13
AppleScan (application), HyperScan (application)		disk	○/○	○/○	8.5 × 14
MyScan (application)		memory	○/●	○/●	3.5 × 14
ScanDo (application)		disk	○/○	○/○	8.5 × 11[5]
Publish Pac (application)		disk	○/○	○/○	8.5 × 14
Publish Pac (application)		disk	○/○	○/○	8.5 × 11.7
DeskScan (DA), DeskPaint (DA)		disk	○/○	○/○	8.5 × 11[5]
Microtek (DA), Digital Darkroom (application)	Digital Darkroom, ImageStudio, Photoshop	disk[4]	○/●	○/●	8.5 × 14
PageBrush (application)	Digital Darkroom	memory	○/○	○/●	9 × 9
ThunderWorks (application)		memory	●/●	○/○	11 × 14
TruScan (application)	Photoshop	memory	○/○	○/○	12 × 17
ImageStudio (application)	ImageStudio	disk	○/○	○/○	8.5 × 14
MacImage (application), ImageCopy (DA)		disk	●/●	○/○	8.5 × 14
MacImage (application), ImageCopy (DA)		disk	●/●	○/○	8.5 × 11.5
MacImage (application), ImageCopy (DA)		disk	●/●	○/○	8.5 × 11.5

the relationship between input and ouput values, nonlinear correction puts data where it's needed most.

Gamma refers to the line that describes the relationship between input and output values (see "Correct Correction"). When these values are proportional, such that an input value of 5 produces an ouput value of 5, input 10 produces output 10, and so on, the gamma is linear. By curving the gamma, however, you reassign values in such a way that in the light tones 5 might now output 1 while 10 outputs 3, but in the dark tones small differences in input values produce large jumps in output. Such a gamma curve is precisely what you would construct to bring out the shadow detail in a dark image. Because you control the curve of the gamma, you can distribute tones where you choose. Because the gamma is curved, it can stretch in the desired range to add data but still make it back to its end points, preserving the blacks and whites that give a picture punch.

As always, it's more convenient to correct the image as it's scanned rather than afterwards. A note about this, however: for any of the scanners listed in this article, quality will be the same whether gamma correction is performed during or after scanning. The scanners that do offer on-the-fly correction simply pass the data through a correction table after it's been digitized. Optimal quality is achieved on machines that correct data while it is still in analog form or that enable you to actually adjust hardware values such as scanning speed. Only some of the better color scanners currently offer this feature.

Whether the correction you're making is on the fly or not, it's important to be able to have good controls to make it with (see "Throwing Curves"). While Xerox's MacImage has had excellent gamma controls for years, this software worked only with Xerox scanners, which, until the release of the GS Plus, were a bit pricey given their capabilities. The gamma controls in programs like ImageStudio and Digital Darkroom are of the primitive, MacPaint-like variety.

That has changed with the release of the new breed of gray-scale and color-image editors, notably Photoshop and Enhance (see "Gray-Scale Contrasts," *Macworld,* April 1990). Both offer powerful controls that enable you to measure, examine, and adjust values accurately and easily.

Because controls are numerical,

Agfa Focus II

Hewlett-Packard ScanJet Plus

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The Shadow Factor These two images—the first from the Agfa Focus II and the second from the Hewlett-Packard ScanJet Plus—show how much better the Agfa does in differentiating subtle differences in gray shades.

you can adjust values more precisely than with earlier programs. Readouts offer useful image data, telling you such things as precisely where an image's high, mean, and low values fall, or exactly where a photograph fades to black. Program controls are able to use *histogram* (a type of gray-value plot) and other data to reassign values in a way that's more measurable and repeatable.

MacImage and Photoshop are the only packages that let you save gamma curves for application to other images, a useful feature. As with sharpening, Agfa's McView offers good, on-the-fly controls, but not as good as those of stand-alone image editors.

Calibration

The one other piece of the gray-map picture is calibration. You want to be sure that a 10 percent value as measured numerically on the screen comes out at 10 percent. For ultimate control, look for a new scanner feature called *closed-loop calibration.*

With this technique, you print a canned test sample with the scanning software, run the sample on the printing press or make a proof, then scan that printed output. The software examines the values it captures and adjusts the gamma curve for ensuing scans to compensate for any variations from the nominal values. The Xerox and Agfa scanners both offer closed-loop calibration and let you save curves from your calibration runs for use with different devices and printing presses.

What You Need, Who's Got It

So now you know what you need for cost-saving, convenient, high-quality gray-scale scanning for imagesetter output. The next question is where to get all these things. Here's what to look for in gray-scale scanners and image-manipulation software, and where to find it.

- Best overall value: Xerox
- Good shadow detail: Agfa, Truvel, Umax, Xerox
- Sharpening while scanning: Agfa
- Good sharpening: Photoshop, Agfa
- Gamma control while scanning: Agfa, Xerox
- Good gamma controls: Enhance, Photoshop, Xerox
- Save and load gamma settings: Xerox, Photoshop
- Closed-loop calibration: Agfa, Xerox

It's difficult to recommend the Truvel, Umax, Hewlett-Packard, or Microtek scanners for high-quality halftoning. None of them offer on-the-fly sharpening. The HP, Umax, and Truvel units don't offer on-the-fly gamma correction. The Truvel is expensive and limited to scanning in memory—a serious flaw when gray-scale files can go to 8 megabytes even without the Truvel's ultrahigh resolution. And the HP and Microtek don't do a good job of differentiating gray levels. While some of these scanners are winners for other applications, they aren't good choices for imagesetter-quality gray-scale images.

The Agfa Focus II is the best overall choice, with one major reservation,

a price three times that of the competitors ($6945), and one lesser one, so-so gamma controls. The Agfa does a good job of distinguishing gray levels in shadow areas, and it lets you use nonlinear correction as you scan. You can even scan an image, make adjustments based on measurements of highlight and shadow areas, and then apply those values to the next scan. Perhaps most important, this scanner has the only setup that provides sharpening on the fly. Add its 400-dpi resolution (which is useful when you're enlarging small images), closed-loop calibration, and several useful features for non–gray-scale scanning, and you've got a good production scanner.

The other lead contender is the Xerox Datacopy GS Plus. It differentiates gray scales well, has closed-loop calibration and some of the best gamma correction around (as you scan, or after), and the price is right in there at $1995. The only thing missing is sharpening, so you also need Photoshop, at $895, and you need to go through the scan-save-open-sharpen-save routine for every image. You end up with better results than with Agfa's scan-time sharpening, but it's a lot more work.

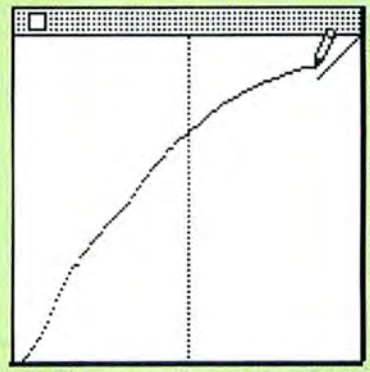
With the kind of controls and capabilities discussed in this article, it is possible to generate very good quality imagesetter halftones, at significant savings, without spending your whole life making it happen. It's taken a long time for all the pieces to fall into place (and they aren't all in the right place yet), but with good gamma-correction tools, good sharpening filters, and good scanners, high-quality PostScript halftoning is almost there. M

See *Where to Buy* for contact information.

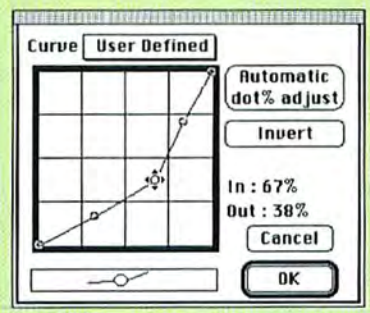
Contributing editor **Steve Roth,** *who began writing about scanners in 1984, believes his appreciation of things gray may be inspired by his residence in Seattle. His company, Open House, develops, writes, and produces books and articles about desktop publishing and computers. Titles from Open House include* Real World PageMaker 4 *(Bantam Books),* Real World PostScript *(Addison-Wesley), and* ScanJet Unlimited *(Peachpit Press).*

THROWING CURVES

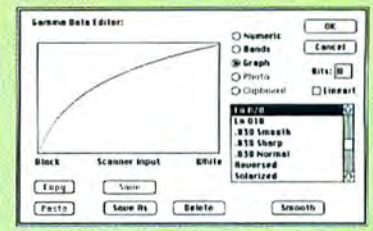
Gamma correction, as opposed to linear correction, enables you to adjust image values with great flexibility (see "Correct Correction"). Not all gamma editors offer the same level of control, however.



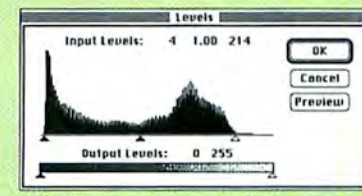
The most common, but least useful, approach is the MacPaint-like pencil-and-graph tools that you'll find in such programs as ImageStudio and Digital Darkroom. The lack of numerical readouts and inability to interact with a histogram make it difficult or impossible to predict or repeat results with any precision.



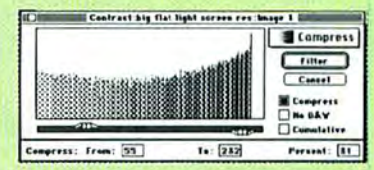
A better method—one used by QuarkXPress and Agfa's McView—is to enable the user to move control points on the curve. In McView, the control points are associated with numeric values. Here you see McView's gamma-correction dialog box. Readouts tell us that at the selected point, an input value of 67% will be mapped to an output value of 38%.

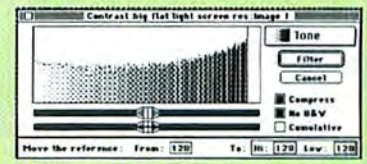


Xerox's MacImage provides a whole set of canned curves that you can simply select. You can also draw a curve, then smooth it out with the Smooth button, or load a numeric curve from a database.



Some programs, such as Adobe Photoshop, take a different approach, allowing you to look at a histogram of the image and adjust sliders to remap gray values without ever actually seeing the curve. In this example, input values ranging from 4 to 214 are being stretched to run the full gamut from 0 to 255.





Enhance from MicroFrontier stands out in offering all these methods. Here you see two of Enhance's gray-level control boxes. Note the attached numeric information and gray-level readouts.

Anthony Borruso, vice president and associate director of computer systems for BBD&O New York, one of the largest advertising firms in the country, relies on SPSS to keep track of market and media research.

MARK HANAUER

The STATS of the Mac

The Macintosh finally emerges as a major league statistics platform

BY CHARLES SEITER

The Macintosh got off to a fast start in the world of statistics, offering programs that implemented new, intuitive approaches to data analysis. Just as many early Mac users bootlegged a Mac into organizations that used other computers, in order to do desktop publishing or graphics, statisticians often defied tradition in order to take advantage of the Mac's superior data display. ▫ By 1990, the popularity of the Macintosh in statistical and academic circles had persuaded the vendors of leading minicomputer and mainframe statistics packages to follow the trend, giving the Mac a final seal of legitimacy in this important computing area. The SAS Institute, Minitab, and SPSS all brought out Mac statistics programs within a few months of each other. In this review I'll show you how these compare to the popular earlier programs DataDesk, StatView, and Systat. ▫ For convenience, these programs can be grouped into three categories. The Explorers—JMP and DataDesk—emphasize exploratory data graphics, quick analysis of sample data sets, and the essential unity of most types of statistics. The Solid Citizens—StatView II and Minitab Statistical Software—offer a large set of tests, covering most traditional

analyses and offering radically different interface approaches. The Authorities—Systat and SPSS for the Macintosh—attempt to provide definitive versions of every test you are likely to find in a large statistics handbook.

These six programs are all designed for serious, general-purpose computation on moderate to large data sets. For alternatives to these, whether simpler and smaller programs or more specialized, see "Alternatives."

As you look through this review of statistics packages, please consider three factors that are important selection criteria. First, does the package handle your typical data sets easily? In some statistics programs, it's easy to tackle small problems but hard to manage large data sets; other programs are geared toward handling tens of thousands of cases but are awkward to use on little 15-case analyses. Second, can you get data in and out to other software? If you're importing text from an Excel spreadsheet, almost any statistics program will do; if you want convenient export of data and methods to minicomputers or mainframes, the choice is more restricted. Finally, how do you need to present your results? Available report options range from statistical graphing with business presentation features down to painfully austere character-based plots.

MARK HANAUER

Robert P. Annechiarico, the research program manager for the University of Rochester, uses MiniTab to help analyze data relating to seat-belt legislation for the state of New York.

Two Explorers

▪ *JMP,* from the SAS Institute, is the most surprising Mac product in years. The SAS Institute has long been a major vendor of minicomputer and mainframe statistical software. Coming from this environment, one might expect SAS to paste a few Mac-like features over a command-line interface. In fact the company wrote a data-analysis program from scratch, with the most helpful Mac interface of all the statistics programs and one of the best interfaces ever produced for scientific software. It's nothing less than dazzling.

JMP assumes that what you really want in a statistics program is a convenient way to perform regression, correlation, and ANOVA studies. You import existing data, or type it into a spreadsheetlike structure, and use pull-down selector boxes to assign and classify variables. (JMP provides special import and export formats for SAS data files but makes no attempt to link to SAS command structure.) Then you simply select one of the five possible test suites from a pictorial menu, and JMP does the rest, including preparing statistical summary tables and graphs. The menu structure, menu items, and data-manipulation tools are models of self-explanation. Although the manual is clear and helpful, a user familiar with both statistics and the Macintosh might never need to consult it.

When you consider both the ease of operation of JMP, and the extreme likelihood, for example, that you will want to see a plot of any regression analysis you do, you begin to wonder why all statistics programs don't do things this way—the standard procedure in other programs calls for you to make four or five separate menu selections to collect the same information. In some areas (display of means circles and leverage plots) JMP offers seldom-seen but worthwhile extras. Besides the expected tools for selecting, coloring, grouping, or otherwise marking data points, and tools for modifying and spinning three-dimensional views of data, there is a help tool (which is represented by a question mark) that calls forth interpretation of calculations, plots, and menu choices.

▪ *DataDesk 3.0* from Odesta is now the oldest widely marketed Macintosh statistical software. Fortunately, because the product reflects the energetic approach to statistics of its developer, Paul Velleman of Cornell University, it's one of the freshest and least conventional statistical products for the Mac.

Basically, DataDesk started as an implementation of exploratory data analysis, a graphical approach to data interpretation. Over the years, more calculational capabilities have been added—most recently a particularly easy-to-use general linear-modeling feature—and the package now approaches the general-purpose range of StatView.

In comparison to a spreadsheet, the basic data structure of DataDesk is a somewhat-more-cumbersome collection of data elements (its style at least makes for easy links to Odesta's database Double Helix). As you select elements for analysis, previously grayed-in items under the Calc and Plot menus become available. DataDesk emphasizes the use of evocative displays rather than tables of results as a way of finding connections among the data elements. To this end, DataDesk has the most responsive 3-D display of any of the six packages reviewed: unique sliding axes for easy expansion of plot regions of interest, and nearly automatic facilities for coloring plot points by group identity. This last feature makes it possible to inspect multidimensional correlations in a standard 3-D plot and is a nontrivial advance in the Macintosh statistical state of the art.

Although DataDesk offers a respectable selection of tests, including clustering and nonparametrics, this program actually addresses a special

statistical audience. Many Macintosh users fall into this special class: they need to do statistical analysis from time to time, they have small data sets to analyze (fewer than several hundred points), and they have little formal training in statistics. DataDesk amounts to a short course in statistical procedures as well as a program—its three separate manuals constitute an introduction that takes you from the simplest descriptive statistics through multivariate ANOVA.

The Solid Citizens

• *StatView II* and its cousin StatView SE+Graphics are enhanced versions of the original StatView, a program with features familiar to any second-year stat student. Abacus Concepts, in refining the product, concluded that rather than expanding the laundry list of possible statistical tests, the way to make StatView more useful was to provide the kind of presentation graphics tools found in business charting programs. In StatView II, once you are satisfied with a regression analysis, you can take the corresponding scatterplot and glamorize it until it looks like advertising art.

In StatView II you select tests by name from menu lists, direct the details from a dialog box, and view test results in a separate window. There's a separate set of directives for graphs, and a solid selection of graph types (omitting the more specialized kinds such as Systat's Chernoff faces). The interface and underlying statistics engine have not been modified since the appearance of the original StatView several years ago and now don't look quite as modern as those of JMP or DataDesk, but the program is relatively easy to operate and respectably fast. It's awkward for repetitive (batch-style) analyses, or for series of analyses that call for lots of small changes in details, but as a program for making statistical sense of data on its way from being a mass of numbers to being a finished business graph, it's the best choice. When Abacus introduces some of the interface features—notably Do-It files, a super-macro facility—that the company developed for SuperAnova (see "Alternatives"), this already strong program will be a first choice for cost-effectiveness.

ALTERNATIVES

You may not have the money or the need to buy one of the packages covered in the main body of this article, but nonetheless you might want to do a bit of analysis or simply refresh yourself on statistical concepts. Fortunately, there are alternative programs.

The simplest is Mystat, a program from Systat that is essentially offered free (depending on promotional activity, there may be a $5 fee at times). It's a working scale model of Systat that handles only 50 variables and has only a few nonparametric tests and no multivariate analysis, but its price is certainly hard to beat. Systat, of course, hopes you will graduate to the real product, but Mystat is so ominously useful that it's pretty much the reason there's no commercial competition at the low end of the Macintosh statistics market. You could also contact Odesta about current price and availability information on the much cheaper student version of DataDesk.

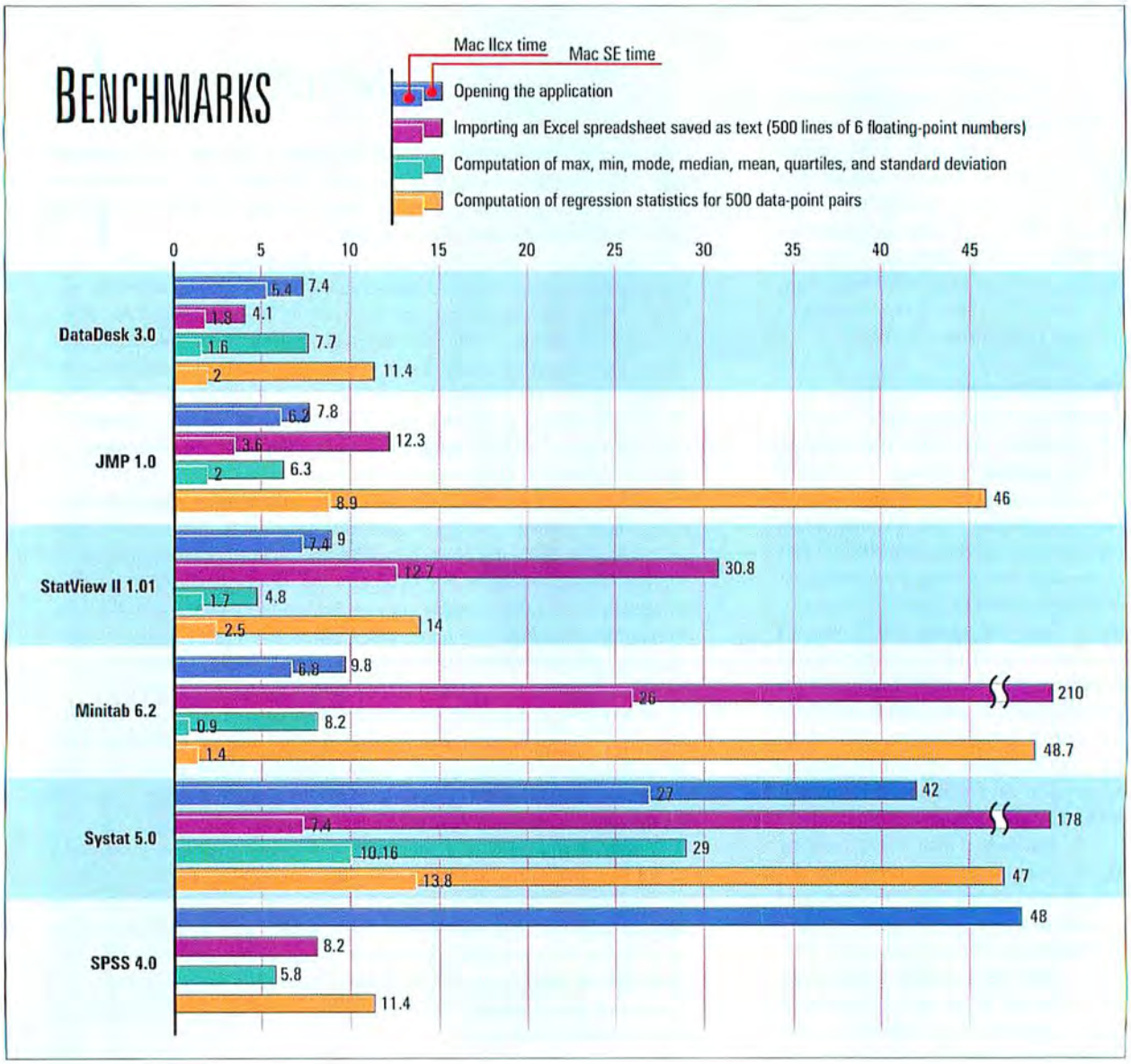
SAS, realizing that $695 represents a lot of money to weekend statisticians, offers a limited version of JMP (500 cases, no phone support) called JMP IN for $89. Since this product includes the excellent standard manual and offers all the capabilities of JMP except for the data-set limitation, it's a formidable bargain. The only possible contraindication for student use is that SAS's program is sufficiently innovative and modern that it takes a bit of work to match up standard textbook exercises with JMP IN's array of tests. It's worth the effort, though—it's a glimpse at the future of computer statistics.

The next step up in price is Fastat, a $195 program from Systat that offers a large selection of Systat's tests, with a limit of 50 variables. If you have a Mac SE or Plus and are doing something less magnificent than multidimensional scaling on a data set with 137 variables, Fastat is probably a better choice than its big sister and more convenient to use anyway.

Finally, if you know what you need to do and it's ANOVA/regression in one of its many forms, you should consider bundling up your funds and getting SuperAnova ($495) from Abacus Concepts. For the thousands of statisticians who simply don't need Chernoff-face diagrams or time-series analysis, SuperAnova offers a superior package. It includes preprogrammed models of every type of analytical design, facilities for producing elegant reports, and a manual that gently reminds you of everything you might have forgotten about ANOVA since you left school.

• *Minitab Statistical Software,* the statistics pride and joy of State College, Pennsylvania, has arrived on the Macintosh nearly unmodified from its text-only minicomputer version. Minitab's goal was cross-platform compatibility with IBM PC and minicomputer versions of its programs, and that goal has been achieved at the expense of many expected amenities. For example, the only graphics available in Minitab are simple character-based plots of the kind you could obtain 30 years ago at a Teletype wired to a minicomputer. For editing and file manipulation, Minitab provides a custom version of Maitreya Design's MiniWriter DA—as long as there are no graphics, there might as well be no color support too. And when Minitab promotes itself as command driven, it means precisely that: you type in the commands yourself. There are no scrolling lists of commands for selection (the earlier Systat style) or intelligent command generators (as in SPSS).

Implausible as it may seem to Mac traditionalists, Minitab is actually fun to use; it's reminiscent of the first stages of programming in BASIC. Minitab's copious instructional materials have been perfected over decades of student use, and the rudiments of Minitab language are easy to learn, assuming you know a bit about matrices. By sticking to a plain-text inter-



face, Minitab also enables user groups to contribute macros that work across all platforms; a selection of macros is provided. On a Mac IIcx, Minitab is also the computational speed champ, and a researcher whose work includes batch processing of large files will find lots of value here. Still, this program has limited appeal for statisticians who weren't trained on Minitab. It has its own strong points—table manipulation and a special set of statistical process control commands—but you have to believe in the Minitab approach to statistics to justify the extra cost.

The Authorities

• *Systat* was the first of the Invaders-from-the-Other-Platforms, and it enjoyed several years as the undisputed biggest Mac statistics package. In its first appearance, Systat consisted of a set of separately loaded modules, directed from a command line, and the program simulated as nearly as possible the experience of using a Mac as a dumb terminal. Systat, Inc., then experimented with more Mac-like programs in a student version of the program, Mystat (see "Alternatives"), which offers graphical menus and bypasses text commands entirely.

In the new look for Systat 5.0, graphical menus are everywhere, although in a Command Window the program dutifully records all your choices from the flashy menus as text commands. In one way, this gives you the best of both styles—you can learn to operate Systat quickly, but when you become more experienced you can modify command files to automate your work (perhaps even dipping into the powers of Systat BASIC). The downside of the best-of-both-worlds arrangement is that you need a garage for parking the second world; Systat is now big enough and slow enough on a 68000-based Mac that it's no longer convenient for Plus/SE use.

But it's a better program for the II series than its earlier versions. Systat has done good work in designing icons to represent its large test set, and in organizing that test set so that most tests—or graphs, in Systat's luxuriant graph set—are immediately available

GRAPHICALLY SPEAKING

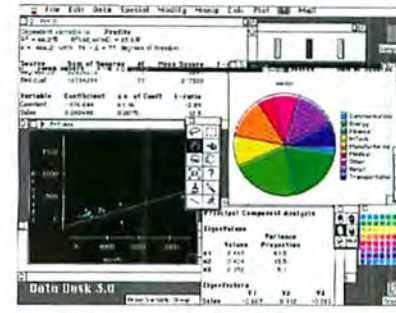
	JMP 1.0	DataDesk 3.0	StatView II 1.01	Minitab Statistical Software 6.2	Systat 5.0	SPSS 4.0
CHART TYPES						
Bar	●	●	●	●	●	●
Pie	○	●	●	○	●	C
x-y scatterplot	●	●	●	●	●	●
Line	●	●	●	●	●	C
3-D scatterplot (spin)	●	●	○	○	●	○
Regression	●	●	●	○	●	C
Density	●	●	○	○	●	○
Probability	●	●	○	○	●	○
Boxplots	●	●	●	●	●	○
Stem-and-leaf plot	○	○	○	●	●	●
Surface plot	●	●	○	○	●	○
Scatterplot matrix	●	●	○	○	●	○
FEATURES						
Color drawing tools	○	○	●	○	●	C
Color titles	○	○	●	○	●	C
Title fonts	○	●	●	○	●	C
Label overlays	○	●	●	○	●	C

● = yes; ○ = no; C = part of $395 CricketGraph option.

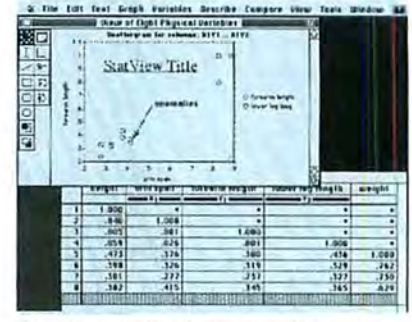
(in the earlier version, you used a transfer menu to switch from module to module). Popular exploratory-analysis features, data-point brushing in 3-D scatterplots, for example, are implemented in a straightforward way: Systat has learned by field-testing smaller programs to make its features behave the way Macintosh users expect. The Instant Statistics/graphics option and suggestions for further or alternate analyses built into Systat's extended interactive help feature are uniquely useful. It should also be noted that the company constantly updates its informative and idiosyncratic manuals—the Graphics manual's jeremiad against 3-D bar charts in particular should be reprinted as required reading for all newcomers to statistical graphics. In short, if you have the hardware to use it, Systat offers the most capability you can get for the price in a Mac statistics program.

▪ *SPSS* has been a major vendor of statistics software for decades. Starting with a strong academic base (the name derives from the phrase "statistical package for the social sciences"), SPSS became, along with SAS and a few specialized others, a standard in government and commercial markets; you may confidently expect that the flow of millions of social-services and advertising dollars is directed by computations in SPSS. A random check of employment ads in the *New York Times* on a Sunday shows that about half the advertisements for statisticians or senior market-research directors call for familiarity with SPSS.

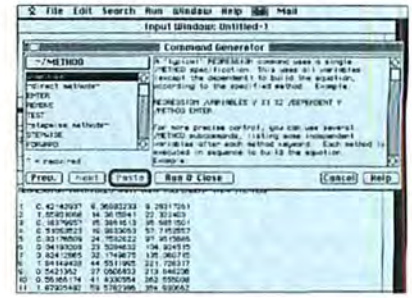
The Macintosh version of SPSS is designed for professional use by people familiar with SPSS's command language. Although the Command Generator developed for the Mac program makes it relatively easy to learn a bit of SPSS command structure, the real value of this product is that it allows complex command files already developed (by you or by coworkers) on other platforms to be used on the Macintosh. This professional orientation is underscored by the price ($795) and the relative simplicity of the basic package. To get some procedures that are typically included in other packages—MANOVA, for example—you must buy the $395 Advanced Statistics program. To be fair, Advanced Statistics includes superior probit and survival analysis routines and a complete sublanguage for analysis of data arrays. The same is true for the additional packages SPSS Categories (conjoint analysis, nonlinear principal-components analysis, homogeneity analysis), SPSS Trends (time series), and SPSS



Data Explorers Still the champion at exploratory data analysis, DataDesk also provides the most useful manuals for users who aren't primarily statisticians.



Presenting StatView is the only statistics program with built-in presentation graphics. Considering its extensive test list and good computational performance, StatView II qualifies as one of the few bargains in Mac statistics.



From Mainframe to You SPSS, a market leader in mainframe statistical computing, offers a command-driven Mac application that can be extended with extra-cost modules to make the most complete system available.

World in a Box The most statistics you can buy in a single box, Systat now combines an encyclopedic collection of tests and graphics styles with a streamlined picture-menu interface.

STATISTICALLY SPEAKING

	JMP 1.0	DataDesk 3.0	StatView II 1.01	Minitab Statistical Software	Systat 5.0	SPSS 4.0
PRICE	$695	$395	$495	$695	$795	$795
BASIC DESCRIPTIVE STATS						
Mean, standard deviation	●	●	●	●	●	●
Minimum/maximum	●	●	●	●	●	●
Frequency distribution	●	●	●	●	●	●
Percentiles	●	●	●	●	●	●
Paired, unpaired t	●	●	●	●	●	●
REGRESSION/ANOVA						
Linear	●	●	●	●	●	●
General nonlinear	○	○	○	○	●	●
Polynomial	●	●	●	●	●	●
Multiple linear	●	●	●	●	●	A
One-way ANOVA	●	●	●	●	●	●
N-way ANOVA	●	●	●	●	●	●
Repeated measures ANOVA	●	●	●	●	●	A
ANCOVA	●	●	●	●	●	●
Factor analysis	●	●	●	●	●	●
Principal components analysis	●	●	●	○	●	●
Discriminant analysis	○	●	●	●	●	●
Logistic regression	●	○	○	●	●	A
CLUSTER ANALYSIS						
Hierarchical	○	●	○	○	●	●
Single-linkage	○	●	○	○	●	●
Complete-linkage	○	●	○	○	●	●
Centroid-linkage	○	○	○	○	●	●
TIME SERIES						
Lin, nonlin smoothing	○	○	○	○	●	A
Autocorrelation	○	○	○	●	●	A
Moving average	○	○	○	●	●	A
ARIMA	○	○	○	●	●	A
Fourier analysis	○	○	○	○	●	A
NONPARAMETRIC						
Kendall rank	○	●	●	●	●	●
Spearman rank-order	○	●	●	●	●	●
Pearson	○	●	○	○	●	●
Wald-Wolfowitz	○	○	●	○	●	●
Mann-Whitney U	○	○	●	●	●	●
Kolmogorov-Smirnov	○	○	●	○	●	●
Wilcoxon signed-rank	○	○	●	●	●	●
Kruskal-Wallis	○	○	●	●	●	●
Lilliefors	○	○	○	○	●	●
Goodman-Kruskal	○	○	○	○	●	●
Friedman	○	○	●	●	●	●
Cochran Q	○	○	○	○	●	●

● = yes; ○ = no; A = part of Advanced Statistics option ($395).

Tables (crosstabs and general data manipulation). All of these additional packages offer some types of analysis that are included in Systat, but offer as well formidably complete test sets in each area. The SPSS custom of partitioning statistics capabilities in this way certainly discourages casual use (you must, for example, buy Cricket Graph and use SPSS's built-in Cricket Graph interface to get decent presentation graphing); it's clear that this pricing policy is one way SPSS finances its excellent customer support.

To Sum Up

Earlier in this review, I suggested that three criteria were helpful in selecting a statistics program: data-set size, interface to other programs, and reporting capabilities. For small data sets, DataDesk 3.0 and StatView II are probably the most appropriate: they let you perform a great variety of preliminary investigations without setting up much machinery. For analyzing 2000 sets of 4000 cases each, you have to turn to a program with command-language capabilities (Minitab, Systat, SPSS) so that you can program an analysis and subsequent summary. The data interface with other programs is equally competent in all six of the programs reviewed, and if you're importing tabbed text or Excel spreadsheet data, the facilities are comparable. The other aspect of program interface, of course, is that if you work in an office committed to SAS, SPSS, Minitab, or Systat software on another platform, you benefit from having the corresponding Mac package, particularly when the Mac program accepts command files. Finally, StatView II emerges as the top program for data presentation, although Systat should be recognized for its variety of useful, albeit offbeat, graphics (Voronoi tesselations, for example) and SPSS for its simple if-you-can't-beat-'em-join-'em logic in offering a CricketGraph option.

It's harder to choose a statistics package than it was a few years ago, because the range of options on the Macintosh now encompasses nearly every possibility the world of computer statistics has to offer. If you have been active in statistics all along, everything you may have wanted is now available on the Mac, and if you're just starting out, the introductory programs will prove more helpful than all but the best of printed texts. Sometimes, not often but occasionally, in a precisely defined area of activity, all we have to report is good news. ■

See *Where to Buy* for contact information.

Charles Seiter *is an analytical instrument designer who uses statistics for scientific data analysis. He has taught university statistics classes for chemistry and biochemistry majors.*

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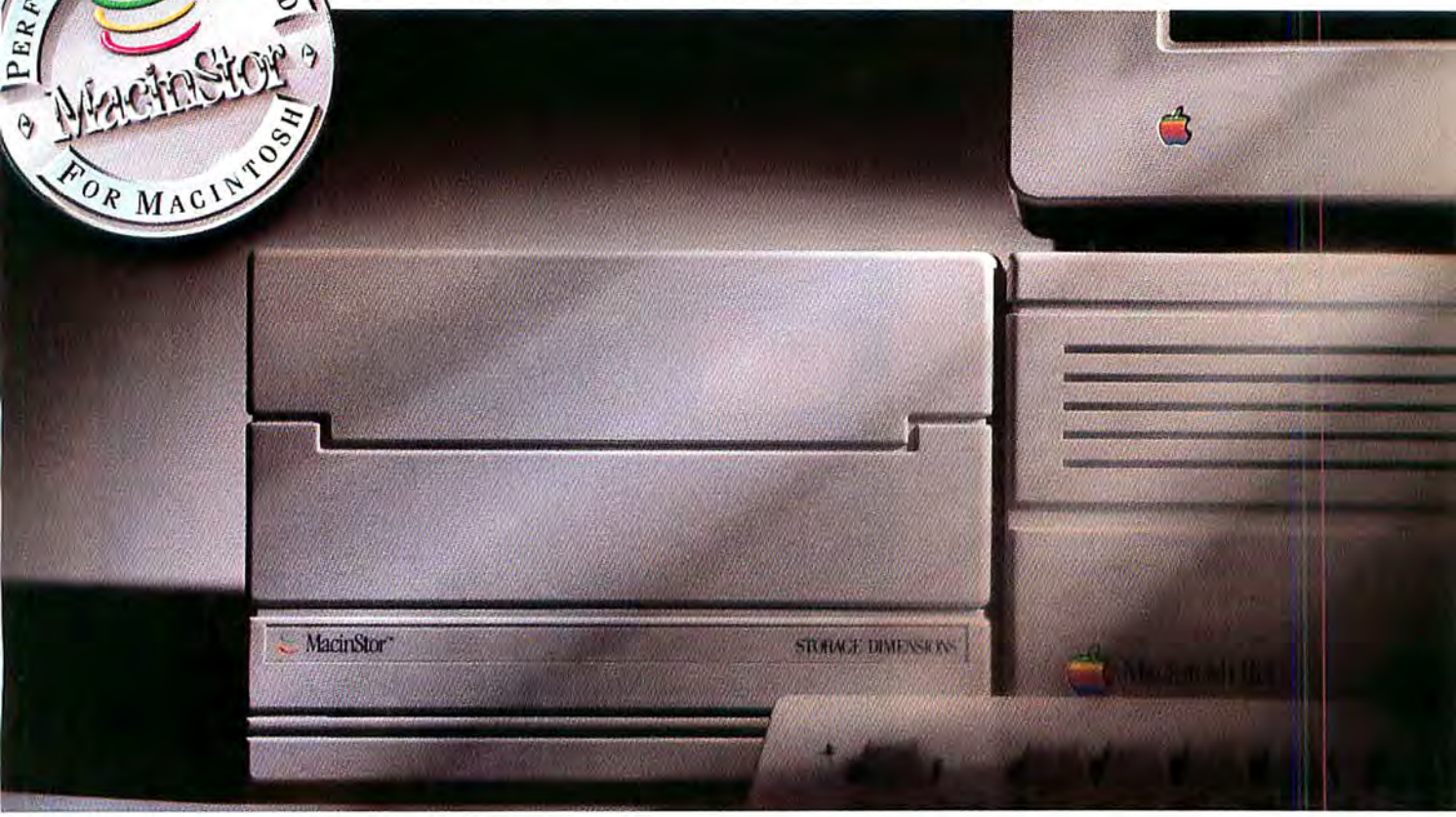

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REVIEWS

8-bit Gray-Scale Scanners

DATACOPY GS PLUS

Pros: Good differentiation of subtle gray differences; excellent gamma control in MacImage application; ImageCopy DA lets you copy scans to the Clipboard; good selection of dither patterns. **Cons:** No percentage scaling; no diffusion dither; ImageCopy DA has no gamma controls. **Company:** Xerox Imaging Systems, Datacopy Division. **Requires:** Mac Plus, System 6.0.2, Finder 6.1. **List price:** $1995.

UG 80

Pros: Can scan from within ImageStudio (bundled with the scanner); allows scanning from Apple Scanner–compatible applications; good differentiation of subtle gray differences. **Cons:** Confusing, unwieldy scaling and resolution controls; no DA for scanning; cannot scan to the Clipboard; no diffusion dither; no gamma correction. **Company:** Umax Technologies. **Requires:** Mac Plus. **List price:** $1895.

MARK JOHANN

Umax Technologies' UG 80 (right), and Datacopy GS plus

There are a lot of uses for a gray-scale scanner, including on-screen multimedia, low-resolution laser output, and high-resolution imagesetter halftoning; and you need different features for each. Two new 8-bit gray-scale scanners, the Xerox Datacopy GS plus and the Umax UG 80, address these needs in different ways but at similar price points.

In evaluating gray-scale scanners these days, however, you also have to consider the market leader, the Hewlett-Packard ScanJet Plus. It's a $1595 gray-scale scanner with excellent features for laser output and on-screen multimedia work, but somewhat disappointing performance for high-quality imagesetter halftoning (see "Grade-A Gray Scale," in this issue).

Two Ways to Scan

Both the GS plus and the UG 80 have built-in SCSI interfaces, so unlike the ScanJet and some other scanners, they don't clog up an office with SCSI boxes, power supplies, and cables.

The GS plus comes with two scanning programs—MacImage (an application) and ImageCopy (a DA). MacImage is one of the best scanning programs for high-resolution imagesetter output. It offers excellent gamma controls (including canned curves that work great), but unfortunately it has no sharpening filter. ImageCopy is a handy DA for quick-and-dirty scans, but it doesn't give you nearly the control you get from HP's DeskScan DA for the ScanJet. And no image-editing software is provided for either bilevel or gray-scale scans.

The UG 80 offers two ways to scan, as well. It includes a special version of ImageStudio that lets you scan directly from within the application, and there's an INIT that lets you use the UG 80 with Apple Scanner–compatible applications (such as RagTime). The ImageStudio scanning approach is the better of the two, since it lets you take advantage of all the UG 80's features; with Apple Scanner emulation you are limited to the features of the Apple Scanner.

When using ImageStudio for scanning with the UG 80, you can choose from line-art mode; gray-scale mode (4-bit or 8-bit); several dithered halftone modes; and a Virtual Gray mode that uses a halftone cell of a given size (you choose the size—4 by 4 pixels, 8 by 8, and others), which, unfortunately, can result in huge files.

Scaling, Resolution, and Laser Output

Neither the GS plus nor the UG 80 addresses the problems of scaling and resolution well. Both let you set resolution in 1-dpi increments (with independent horizontal and vertical controls on the UG 80), but neither integrates that control well with scaling. Neither has an explicit percentage scaling control. So if you want to

scan a dithered halftone at 44 percent reduction, with a final image resolution of 300 dpi, you have to do the arithmetic yourself. (In contrast, the ScanJet's DeskScan Plus does it for you.)

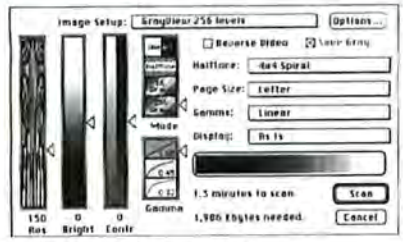
The UG 80 is especially difficult to figure out; the scaling dialog box's slider is marked with dpi, not with percentages of image size. It scales the image according to the resolution you choose; so if you try to capture a 2-by-2-inch area at two different resolutions, the two scans come out at two different sizes. This makes for confusing arithmetic, especially if you add the imponderable (and poorly documented) Virtual Gray mode.

The lack of this simple feature—automatic arithmetic for scaling and resolution—makes it hard to recommend either of these scanners over the HP ScanJet Plus for laser output. The ability to scan a dithered halftone at a precise size and resolution is essential for high-quality laser output that doesn't take up a lot of disk space or printing time, and neither of these scanners makes it simple to achieve that. Both do a better job than the ScanJet of picking up detail in dark areas of photos, but the ScanJet makes it much easier to get a dithered halftone onto a page without the telltale patterns that result from improperly scaled dithers.

Should You Buy One?

No matter what your application, there's little reason to choose the Umax UG 80 over either the ScanJet or the Datacopy GS plus. The ScanJet is still the top choice for laser output because of its great scaling and resolution controls and its diffusion dither (unavailable for either the UG 80 or the Datacopy GS plus). The ScanJet is also arguably the best for screen-display work, because you can scan straight to the Clipboard.

The Xerox Datacopy GS plus, though, is a good choice for imagesetter halftoning because it does a good job of differentiating between subtle gray differences in dark areas (the ScanJet is weak here); the GS plus also has excellent gamma-correction controls, as well as closed-loop calibration that lets you adjust for the gray variations of your output device. For laser printer output the GS plus also



MacImage and ImageCopy

The Datacopy GS plus comes with MacImage, a powerful scanning application, and ImageCopy, a less-powerful DA that's handy for scanning from within other applications.

Scanning from ImageStudio

The Umax UG 80 comes with a version of ImageStudio that lets you scan directly into the application.

works well (because of its control over dither patterns), and its ImageCopy DA lets you copy a scan to the Clipboard for on-screen work (though without the nice gamma-correction control you get in MacImage).

—Steve Roth

See **Where to Buy** *or circle 774 (Datacopy GS plus), 876 (UG 80) on reader service card.*

Color Hand-Held Scanner

CLEARSCAN

Pros: Scans color and gray-scale images flawlessly (256 shades per image).
Cons: Narrow scan width; weak software; incoherent, incomplete manual.
Company: NCL America. **Requires:** Mac II.
List price: $795.

Just as hand-held black-and-white scanners are starting to become practical desktop publishing tools, hand-held color scanners are becoming available. The concept is sound: the least-expensive flatbed scanner is about $2500, so a hand-held scanner for a third that much could be a practical compromise. But the technology is still very new, and the NCL ClearScan, for one, still needs time to mature.

Hardware Hopes

The ClearScan, with its rounded top surface and two cylindrical protuberances at the front, is connected to a SCSI controller box—with internal termination—that plugs in to the Mac. Plug the AC transformer in to the SCSI box, and you're ready to roll.

Scanning is simple: choose Start Scanning from the ClearScan program's menu and drag the scanner across any page, photograph, or piece of artwork. But there's no see-through window in the unit to let you see what you're scanning, as there is in most hand-helds. Beneath the scanner, a strip of intense white light bounces off the image and reflects back into some color sensors. The movement of a roller tells the software how fast you're moving the scanner (and you have to move it very slowly).

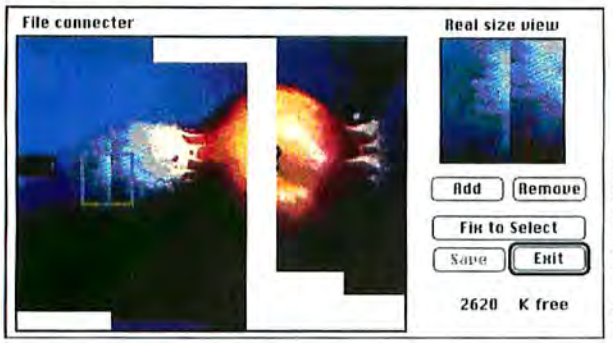
As you drag, a color image appears on the monitor in a thin vertical strip—a maximum of 2½ inches wide and 5 inches long. When you finish, you'll probably be alarmed: the image on the monitor has a rather sickly coloration, as though it were a photo left a little too long in its chemicals. That's because an 8-bit Mac monitor can only display 256 colors at a time, and the ClearScan initially uses the default System palette—a set of rainbow-pure hues like the icon colors in the Finder.

Choose the Create Image command, however, and the ClearScan software performs its neatest trick: it builds a custom 256-color palette for the picture you've just scanned. A second image window appears, this time in brilliant, far more accurate colors. Because the ClearScan is actually a 12-bit color scanner, its software has more information to go on when it selects the colors to display on an 8-bit monitor. The first time you see this color-corrected image you'll probably break out in a smile—or at least you'll quit hunting for your receipt.

Part of the Process

Once you've scanned an image, you can process it in a number of ways. For example, a standard set of filters is

(continues)



PHOTOGRAPH BY HAROLD E. EDGERTON

Joint Strips
Using ClearScan's Gather command, you can assemble several 2 ½-inch scans into one wider picture. It is not as simple as it looks because your strips may not align quite right—but it's a good idea anyway.

available (Blur, Sharpen, Shadow, and so on). A gamma-correction window and a palette-control dialog box let you adjust the overall brightness, contrast, and distribution of colors in the image. Once you figure them out, all of these commands work well.

There are some other features, too, but the ClearScan manual is less than helpful in explaining what they do. According to the manual, for example, the Select Format command "displays the dialog to select the fixed size of area. It is useful for selecting the fixed format." That morass is typical of the manual's incoherence. Want to read up on the Reduce Noise command? "This command," says the manual, "reduces noise." Thanks a bunch.

Saving Disgraces

Nonetheless, you can usually muddle through enough to save a scanned image as a MacPaint, PICT, or TIFF file. If you choose TIFF, however, you get a dialog box never even mentioned in the manual. It offers you a choice of resolution, and the default is 90 dots per inch. (Don't ask why it's not 72 dpi, the Mac screen resolution; just smile and type in 72, unless you want a shrunken image.) You also have to specify whether you want to save the TIFF file as 24-bit color or 8-bit gray scale—a conundrum indeed, especially since what you've scanned is in 8-bit color, a choice not offered.

Incidentally, don't underestimate the importance of saving your work. The ClearScan software doesn't say anything like "Save changes?" if you close a scanned image without saving it. Furthermore, pay attention to which image is the real thing. Some of the ClearScan commands—Create Image or Rotate Window, for example—open a new window containing a duplicate of the image. After several operations, then, there may be four or five windows cluttering the screen containing the scan in different states.

Gather Ye Images

There is, however, one redeeming quality of the ClearScan program: its Gather command. Because the maximum scan width is so narrow (2½ inches), this command provides a means of combining several adjacent scanned strips into a single larger image. You see, at first, a blank window. Each time you click the Add button, you can choose a scan you've saved on a hard disk; each image you select appears on the screen, piled on top of any previous images. By dragging the strips into position, you can theoretically assemble one image out of the many partial ones (see "Joint Strips").

If you make the scans very slowly and very carefully, this process works fairly well. But because any fluctuations in the speed of a scan result in slight expansions and compressions in the scanned image itself, you may get stuck with strips that don't align properly. You wind up wishing, in fact, that this image-combining feature had a Skoogy tool like the one in Thunderware's LightningScan software—which allows you to join scans easily—to eliminate this problem.

MARK JOHANN

The ClearScan handheld color and gray-scale scanner from NCL America

Color Me Frustrated

Let there be no mistake: the ClearScan creates brilliant, professional-quality images. The colors are bright and accurate, and the scanning process itself is easy. In fact, the ClearScan makes a dazzling gray-scale scanner, too—it re-creates black-and-white photographs with astonishing clarity and depth (using 256 grays).

But there's more to a package than its hardware. The ClearScan scanner itself gets an A , but everything else in the package—such as the software and the SCSI box—is just above C level, except for the manual, which flunks. For an $800 product, the least NCL could provide is a proofreader.

— David Pogue

See* Where to Buy *or circle 710 on reader service card.

Facial-Animation Programming Kit

INTERFACE 1.0

Pros: Synchronizes animation to Macintalk or digitized speech; thorough manual; excellent import/export capabilities; full color support. **Cons:** Requires some programming; feeble drawing environment; limited usefulness. **Company:** Bright Star Technology. **List price:** $499.95. **Requires:** Mac Plus; 2MB RAM; hard disk.

Nobody asks "What's INTERFACE?" without getting told about Disney's "The Absent-Minded Professor" TV series, which features a Macintosh with a cartoony image of Albert Einstein on its screen. *(continues)*

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Circle 356 on reader service card

Speaking Up

To make an actor pronounce the word *Macworld,* InterFACE only needs to display four or five facial images in rapid succession, as shown here. Between words, you can program your actor to display a random assortment of resting (nonspeaking) expressions, such as the rightmost image above.

This animated Albert talks, interacting with the show's live actors, in the slurred accent we know as Macintalk. When Albert's facial muscles aren't carefully forming the syllables he's speaking, he blinks, smiles, and registers surprise.

Albert is a product of InterFACE, a unique Facial Animation Construction Environment for generating such talking heads, known in the computer-interface world as *agents.* This is *random-access* animation; in other words, you don't have to create a complete sequential movie that lasts as long as your actor talks. You need to draw 8, 16, or 32 images, each showing your character's mouth in a different speaking position. Once you've equipped the program with this set of basic images, InterFACE creates the animation automatically, displaying the proper images at the proper instants, so that the face syncs up with the words you've given it to say.

Macintalking

There are two ways to tell InterFACE what you want your agent to say. If you use Macintalk, all you have to do is type up the script. InterFACE is smart enough to analyze what you've typed and animate your actor accordingly (see "Speaking Up"). Even if you follow the manual's instructions for tweaking your text's spelling to make the Macintalk speech more intelligible, however, your on-screen alter ego still sounds like a computer.

Your alternative is to use digitized sound, recording what you want your agent to say using the MacRecorder (a plug-in microphone and sound digitizer from Farallon that retails for $249). Your agent now not only sounds more human—it also sounds like *you,* with the exact timing, inflection, and emphasis you want. And InterFACE has a MacRecorder interface built right in (such hooks to outside programs and products are one of InterFACE's best characteristics).

The Sounding Board

The drawback to using digitized sounds is that the computer has no way of knowing what consonants and vowels were used to form the words in your recording. InterFACE can't tell where one word ends and another begins, and therefore it doesn't know how to animate the agent to match the speech.

To synchronize the facial animation with the words you've recorded, you go to Speech Sync mode. You type a transcription of the recorded speech, and InterFACE encodes what you type into a series of RAVE (InterFACE programming language) commands that control the animated face on the screen (see "Getting RAVEs").

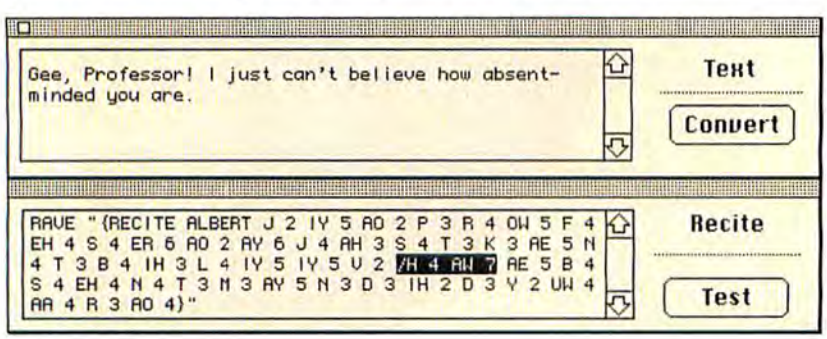
For example, if you type **Yikes!** into the text window, the program writes "**Y 4 AY 9 K 3 Z 12** " in the RAVE-command window. The letters represent spoken sounds, and the numbers are timing values in 1/60 second increments. Now, listening to one fragment of the digitized speech at a time, it's your job to edit the timing values of the RAVE commands—make the *Y* last a little longer, the *K* a little shorter—until the lip movements of your actor are synchronized with the digitized voice.

To hear a syllable you must precisely highlight its letter and number combination, or the program won't play any sound at all. To edit a timing value—which you must do for nearly every vowel and consonant in the recording—you must carefully retype the number. Because the RAVE commands you're editing appear in the 9-point Monaco font, all of this text-highlighting is tedious and difficult. There is, to be sure, a sort of cloak-and-dagger thrill in making an imaginary electronic person speak real English; and, with practice, it becomes less of a trial-and-error process. Nonetheless, the synchronization process requires patience and artistry.

The Drawing Board

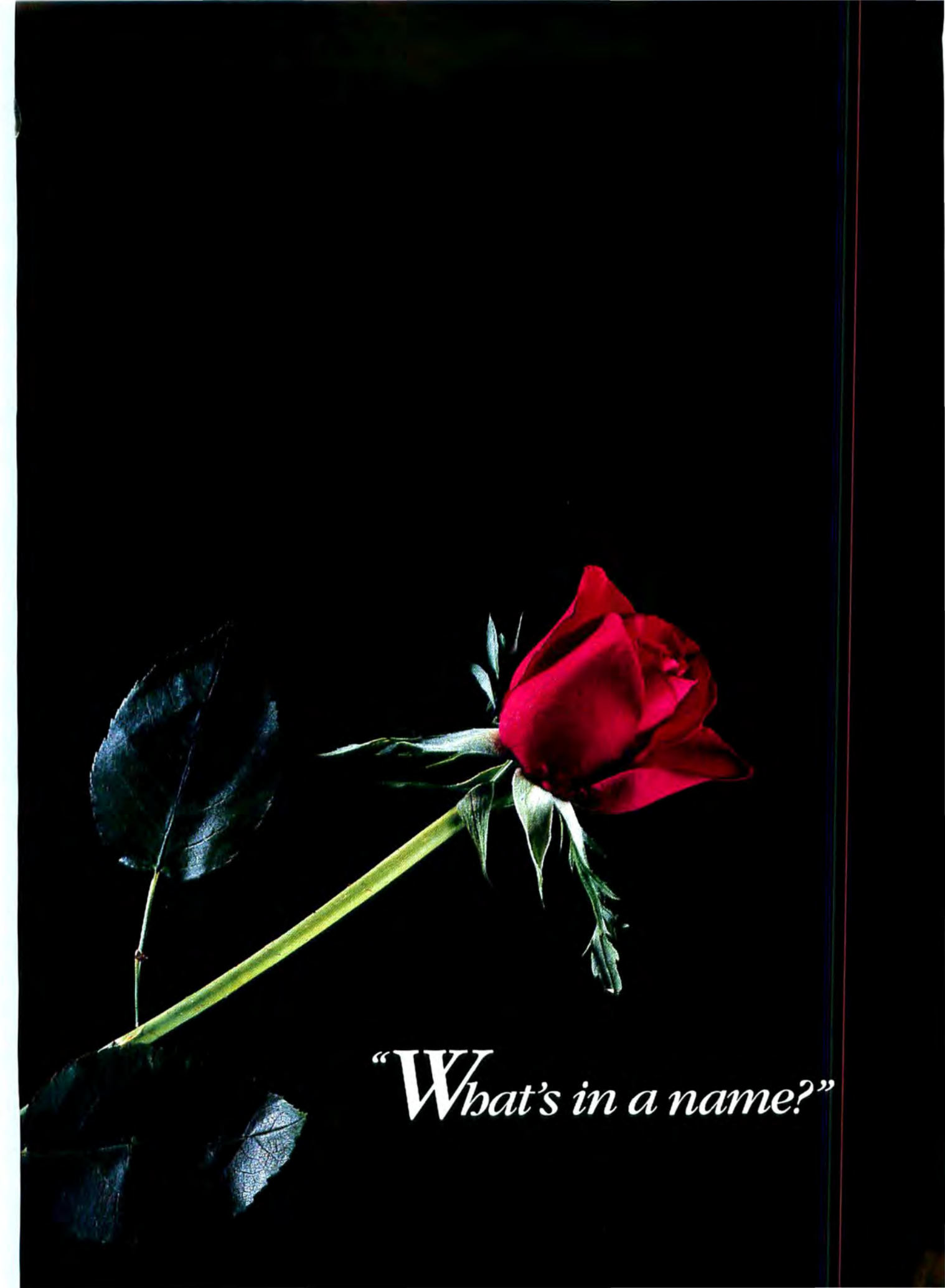
Creating the individual facial images is fraught with pitfalls of a similar nature. You can draw the images freehand in any Macintosh graphics program, or—for greater realism—you can digitize a real person's image. As you might guess, it takes some effort to create digitized images; the easiest method might be to use a digitizer like Digital Visions' ComputerEyes ($395) and an ordinary camcorder or VCR. Some video systems include a frame-grabbing feature so that your

(continues)



Getting RAVEs

When you're trying to synchronize an actor's lip movements to a sound you've digitized, you see English in the top window and the RAVE commands in the bottom one. Several features help you; for example, you can select a word in the top window (such as *how*) and InterFACE will highlight the corresponding RAVE command (*/H4 AW 7*).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Everything, If You're in the

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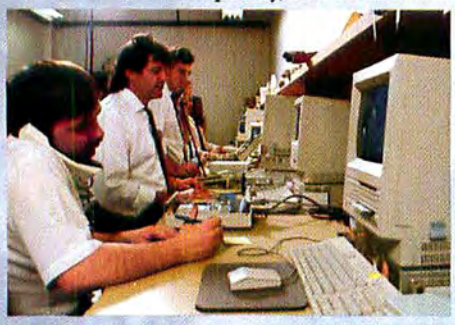

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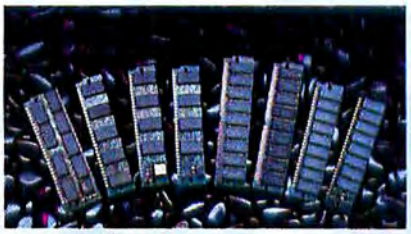
Memory — *Macworld* Best Seller List



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subject needs to hold each facial position for only a second or two; others require the subject to hold each position, stock still, for as long as 30 seconds, until the digitizing is done.

In any case, you'll certainly want to avoid creating your images within InterFACE. Even though the program offers a color, pseudo-MacPaint environment, it's been hastily assembled and has some spectacularly feeble aspects (no Undo and a useless FatBits mode, for example). Once again, InterFACE's powerful import and export features prove to be its most valuable.

The result of all this work—creating the actor and synchronizing speech—is an animated, talking image on your screen. The effect isn't completely convincing; even the most carefully created agents vaguely remind you of the jerky, computer-generated Max Headroom. But they're visually arresting: you can't take your eyes off them.

Agents and Actors

With the exceptions of its dreadful pseudo-MacPaint mode and the tedium of synchronizing digitized sounds, InterFACE is polished and well executed. The manual, for example, goes far beyond explaining menu commands; it includes intelligent, thoughtful chapters on, for example, Using Foreign Languages, Digitizing a Live Subject, and Choosing the Right Vowel (for Macintalk).

Bright Star Technology has even provided examples, ideas, and software hooks to make the agent technology useful. You get over 10 megabytes of sample applications, actors, and clip art. Instructions are provided for installing your agents into Wingz, MicroPhone, MacroMind Director II, FoxBase+/Mac, HyperCard, or any Pascal or C program. There's also a list of possible uses for this technology, such as online help systems, business presentations, and education. A chapter in the manual even claims that the computer interface of the future will sport smiling, articulate agents on the screen. In the meantime, you may have to use your imagination to find a use for this unique, clever, carefully assembled toolkit—unless, of course, you work for Disney.—**David Pogue**

See **Where to Buy** *or circle 795 on reader service card.*

Hand-Held Scanners

LIGHTNINGSCAN 400

Pros: Outstanding new software (including DA version); gray-scale support; easy image-size controls; software special-effect filters; external SCSI termination; snap-on straightedge for straight scanning. **Cons:** Unwieldy SCSI box and enormous AC transformer. **Company:** Thunderware. **Requires:** Mac Plus. **List price:** $549.

SCANMAN MODEL 32

Pros: Dramatically improved software (including DA version); gray-scale support; extremely simple to use; improved case design with straight edges. **Cons:** Internal SCSI termination. **Company:** Logitech. **Requires:** Mac Plus. **List price:** $499.

The hand-held scanners introduced a few months ago by Logitech and Thunderware were identical twins riddled with problems. The curvy case design made it impossible to scan in a straight line. The software seemed half-done. Neither package showed you what a scan really looked like; you either saw a gargantuan screen rendition, four times actual size, or a muddy, illegible actual-size view.

Both the ScanMan Model 32 and the LightningScan 400, however, have been vastly improved. The hardware and the software have recently been overhauled, raising these scanners' status from novelty gadgets to professional tools. The LightningScan's new software even offers a bold and brilliant feature for joining side-by-side scans, overcoming the 4-inch width limit that is usually imposed by hand-held scanners.

Case Closed

The new scanners are longer than their predecessors. LightningScan's case is still rounded, but it now comes with a snap-on plastic bezel which, when installed, lets you drag the scanner across a page in a perfectly straight line as long as the unit is pressed against a ruler (also provided). The ScanMan's case has been redesigned with flat surfaces parallel to the unit's line of travel, again making it possible to use a ruler as a guide. The ScanMan's see-through window has also been widened, so it's easier to see what you're scanning.

Except for the case designs, the scanners' hardware hasn't changed. The controls are the same: a switch to control scanning resolution (100 dots per inch, 200 dpi, 300 dpi, or 400 dpi); a Line Art/Gray Scale switch; a brightness wheel; and a Start button. Both units still have a single roller on the bottom. (Three-roller hand-helds, like the one from The Complete PC, make it easy to scan straight even without a ruler.) Both scanners also require a SCSI controller box between the scanner itself and the Mac. The ScanMan's sleek, small box locks its SCSI terminators inside; the LightningScan's terminator is conveniently external, although the box is still huge and not very attractive.

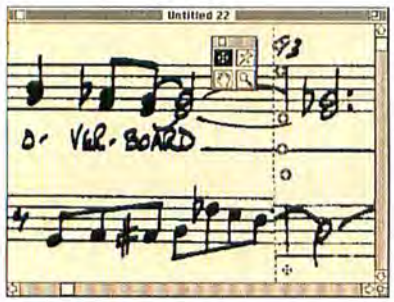
Software Solutions

It's the new software, however, that evidences real effort and clever design. Neither scanner actually detects grays in the image you're scanning. Instead, the software first converts the lights and darks of the image into *dither*

(continues)

MARK JOHANN

The ScanMan Model 32 from Logitech (left) and the LightningScan 400 from Thunderware



Skoogy and Pushpin

ThunderWorks' Join command at work. The dotted line shows the seam between two separate scans. You can see that even when the top parts of the scans are aligned, the bottom parts are slightly mismatched; the lower sets of staff lines don't connect, because the right-hand scan was made at a fractionally faster speed. Using the Skoogy tool (lower right), you stretch the misaligned portions into position, then tack them in place with a ⌘-click.

Good Directions

ScanMan's software automatically converts a scan to gray scale, making it slightly smaller in the process. A handy, unique feature lets you tell the program which direction you'll be dragging the scanner across the page.

patterns—collections of black dots and white dots on the screen, mathematically calculated to approximate the original shade.

The scanners scan at resolutions up to 400 dpi, but the Mac screen is limited to displaying 72 dpi. To show you a dot-for-dot representation of what you've scanned, the software shows you a screen image that's quadruple the size of the original (because the Mac's screen dots are so much larger than the scanned dots). If you have a gray-scale (or color) monitor, however, the new scanning software can reverse this gray-to-dither process and display one screen dot in the correct shade of gray. The upshot is that the scanning software reproduces the original gray-scale image on the screen with amazing clarity—and, in the process, restores the image almost to its original dimensions.

ScanMan's software converts dither to gray scale instantly upon completion of a scan. The LightningScan software only makes the gray-scale conversion when you ask it to. Once the image is displayed in gray scale, both programs offer a set of brightness and contrast controls to touch up the image before saving it in TIFF or PICT format. Remember, though, that no laser printer can print grays; true grays are of most value on the screen (or when printed by a color printer). But both programs offer various halftone options for laser printing, resulting in a good approximation of what you see on the screen.

Both programs also let you enlarge or reduce an image for easier editing—and the new software eliminates the superfluous dots that used to produce coarse, blackened images at reduced sizes. A basic set of editing tools is also available—a marquee for cropping, a pencil, paintbrush, eraser, and palette of grays.

Pushpins and Skoogy

There is, however, one dramatic difference between the LightningScan and ScanMan programs. The LightningScan comes with an elegant new program called ThunderWorks. It offers all the gray-scale editing, scanning, and image-control features of the ScanMan package but also has something rare indeed: the Skoogy.

Although it may profoundly offend the professional's mouth to pronounce the name of this tool, it's a feature of tremendous usefulness. It exists for the purpose of joining two side-by-side scans—for example, the left and right halves of a single page. No matter how steady a hand you have, if you paste two adjacent scanned images next to each other, you'll notice minute misalignments, caused by slight accelerations and decelerations in the movement of the scanner across the page.

The Skoogy tool, in effect, stretches the right-hand image vertically as though it were on a rubber sheet. When you align one portion of the scan correctly, ⌘-click, and a pushpin appears on the screen; that part of the image is now locked in place. You continue to scroll down the seam between the images, inch by inch, Skoogy-stretching the right-hand image into alignment and tacking it in place. When you are finished tacking the screen into position, it's virtually impossible to tell that the images were originally in two parts (see "Skoogy and Pushpin"). Using this method, I was able to scan in a full page of text and then run it through an OCR program, turning the scanned graphic into true word processor text. True, I could have typed the page three times over in the time it took for the whole process; nonetheless, it was an accomplishment for a hand-held scanner.

The ThunderWorks software also offers a series of special-effect filters: Darken, Diffuse, Posterize, and so on. One striking effect, Relief, hasn't been seen in Macintosh graphics software before (see "What a Relief").

Scanned Goods

These new scanners may be called professional graphics tools for the *first* time. Both come with new manuals that go to great lengths to explain the complexities of resolution, gray scale, image size, dithering, and so on. The delightful ThunderWorks software makes the LightningScan slightly more attractive than its rival, despite the $50 price differential. But in these scanners' new incarnations, having either one in the hand is worth spending the cash.—**David Pogue**

See **Where to Buy** *or circle 805 (LightningScan 400), 847 (ScanMan Model 32) on reader service card.*

What a Relief

LightningScan's software has excellent image-control filters, including Relief. An elaborate histogram system lets you precisely balance grays.

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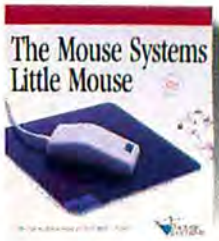

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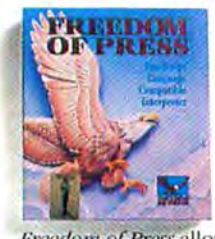

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Business Mapping Software

GEOQUERY 2.01

Pros: Allows map-based reporting of database files and interactive analysis of geographically linked data. **Cons:** Deceptively complex; some procedures counterintuitive.
Company: Odesta Corporation.
List price: $395. **Requires:** Mac Plus.

GeoQuery lets you analyze all types of business data in terms of maps. Version 2 offers several new features: the ability to display data from different kinds of files at the same time; the ability to shade regional maps; support for PICT images, hairlines, and legend text for presentations; faster performance; a new standard information set (from the U.S. Census Bureau's *State and County Data Book—1988*); support for Apple's Data Access Language (CL/1); and new data-analysis tools.

Geography Class

GeoQuery operates by linking maps, which you view on screen, and Atlas files, which use zip codes to locate data on the maps. With this linkage you can call up, for example, a map of the United States that displays your name and zip code in the correct location. To do so, you would call up the Landmark item under the Map menu, and through a simple dialog box, enter your zip code and name. This creates a one-record, two-field data file that the program can interpret geographically because it knows where all the zip codes are located on the map.

GeoQuery's strength is that it can display on a map the selected fields from any data file that contains a zip code. If you have a file containing the names of your six regional sales offices, their total sales for last year, and their zip codes, you can pop this data up on a map of the United States. Once data has been loaded "behind" the map in this way, you can extract information about individual map spots with the Snooper tool. The Who? Box tool lets you retrieve information about several map spots at once. You can load data from several kinds of files and present them at the same time.

You can also encode data by regions if you prefer, either by grouping states into regions or by defining new regions on existing maps. Regional maps can now be shaded in the map view—for example, for a presentation graphic you could indicate hot sales regions with bright orange and slower ones with a muddy grayish brown. The shading and presentation features are significantly more impressive in color than in monochrome. All in all, however, GeoQuery's ability to let you use flexible criteria to select the data you want to present makes it a valuable business tool (see "Pick and Choose").

You can manipulate the provided map files in a variety of ways, but all are basically variations on the theme of creating subsets of the files and storing them as templates. Despite the assistance of excellent online help, the manipulation procedures sometimes seem contrary to Mac-interface expectations, but they can be mastered with a brief study of the thorough documentation. Although you can't create or expand maps yourself, if the maps provided meet your needs, GeoQuery's presentation of location-linked data in pictures is certainly easier to review than tables of data. Besides using colorful graphics, GeoQuery summarizes data about selected locations in a report window, which when saved becomes a tabbed text file. This may, in fact, be the facility with which GeoQuery earns its keep. With a few clicks on a map, you can define a region, generate a report, and use the report to generate form letters (detailed instructions thoughtfully included) to all the data sites in the region.

Because release 2.0 provides support for Apple's Data Access Language, GeoQuery can also access SQL databases residing on mainframes. Beyond these data sets, however, Odesta offers atlas files for Area of Dominant Influence (broadcast areas), Designated Market Areas, and Metropolitan Statistical Areas.

Given the amount of computation involved in positioning and redrawing map elements, GeoQuery is a quick performer; on a Mac IIx, data selection, including a small calculation and map drawing based on a 2000-record file, took 18 seconds.

Mark It in the Market

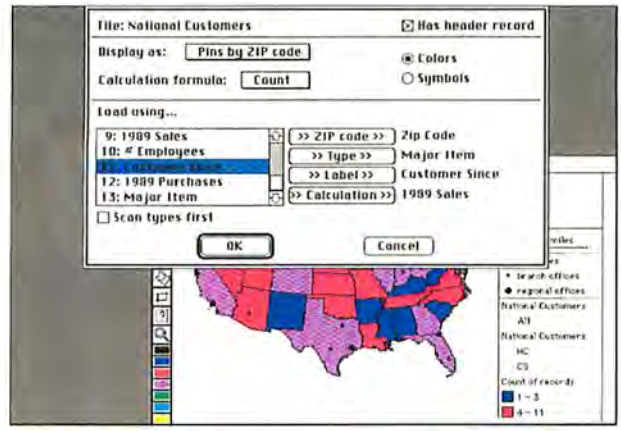
The ability to pinpoint U.S. economic data on a map and generate form letters for sales prospects is another valuable feature. GeoQuery 2.0 offers a standard information set—the Census Bureau's *State and County Data Book—1988*—for purchasers of state and regional atlas files.

A version of GeoQuery 2.0 will also be included with the CD ROM–based product Lotus Marketplace, a product that can be tailored to provide data on selected groups of U.S. businesses and households. Thus, sometime in 1990 a marketer may just lasso a section of your zip code in GeoQuery and generate a form letter for your perusal ("Our research shows that you are an especially credit-worthy individual of exquisitely refined tastes, and we are thus pleased to offer you . . .").

Graphic Investigations

Beyond its obvious use as a visual reporting tool, GeoQuery provides a way

(continues)



Pick and Choose
The dialog box that appears when you select Load From under the Data Menu allows you to apply a range of database selection criteria to the data that appears in the map view.

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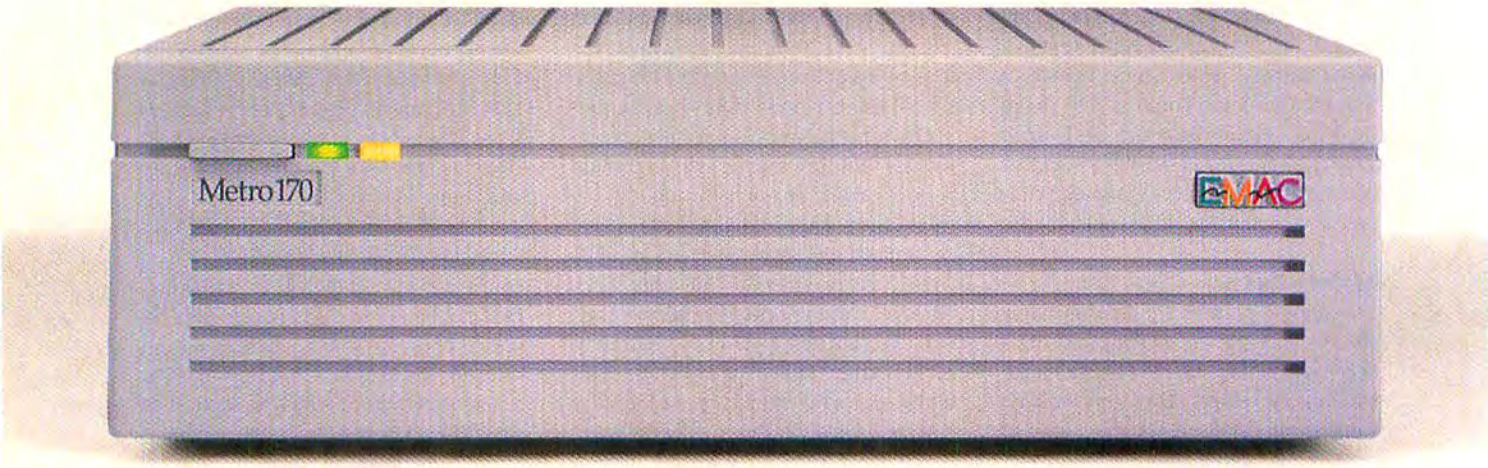

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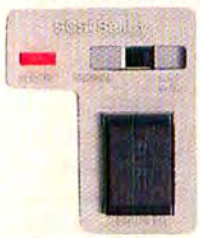
EMAC has found a way to prevent unnecessary Macintosh hard drive fatalities with SCSI Sentry,™ an engineering breakthrough in disk drive reliability. It protects your disk drive from damaging shorts that can trap data inside your hard disk. Which makes any drive with the SCSI Sentry substantially more reliable.



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of investigating location-linked data that no other database product can match. Whatever misgivings one may feel about the prospect of household-by-household targeted sales pitches issuing from tens of thousands of Macs, GeoQuery is likely to be in the forefront of this latest example of progress. It's a business tool that does what it does quite well.—**Charles Seiter**

See **Where to Buy** *or circle 791 on reader service card.*

Molecular-Modeling Software

ALCHEMY II 1.01

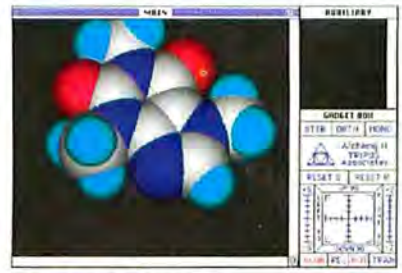
Pros: Easy-to-use drawing facilities; simple energy minimization. **Cons:** Limited calculational models; some bugs in handling very large files. **Company:** Tripos Associates. **Requires:** Mac II, 2MB RAM, color display. **List price:** $950 ($650 for educational institutions).

Molecular modeling means building 3-D computer models of molecules to see how they might interact or react with each other. Tripos Associates is a leading vendor of molecular modeling software (Sybyl) for minicomputers and mainframes, and Alchemy II is Tripos's offering for the Macintosh.

Ought to Be in Pictures

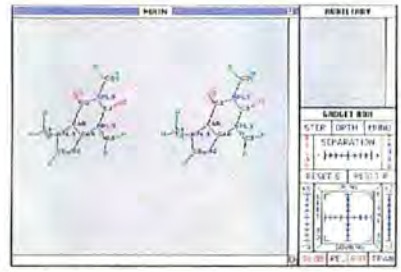
The strong point of Alchemy II is its graphical capability. Tripos has had enough experience in user-interface design, on less-friendly computers, to provide molecular assembly tools that require no explanation to anyone with even a cursory chemistry background. The Build menu, besides having the commands for adding and connecting atoms (using a standard selection under the Atoms menu) and specifying bond types, lets you pull out a lovely collection of prepared molecule fragments (there's also an amino-acid file for researchers building proteins). Build also lets you change bond angles and lengths from standard values, twist groups about bonds, and establish chiral centers in molecules.

The Build menu also contains most of the molecular mechanics capability of Alchemy—this is the part of molecular modeling in which you search for the most favored conformation of a complex molecule or look for lock-and-key fits between one molecule and another. Using the Measure command, you can perform a simple analysis of a docking maneuver (Tripos reports that drug-receptor-binding studies are possible on a Mac with enough memory) by tracking distances between atoms as you move two molecules toward each other on screen. The Minimize command, also part of Build, performs Tripos's own version of a molecular-conformational energy minimization after you have closed a ring or fused two rings on screen. On a Mac IIcx, Minimize found an acceptable lowest-energy form of a simple 40-atom molecule in six minutes—not Cray speed but better than one gets on most overloaded modeling-lab VAX 8700s. For other minimization work, Alchemy II provides file exchange to and from MM2 (a program licensed at most academic sites from the Quantum Chemistry Program Exchange) but does not bundle MM2 with its own program.



Looks Great, More Filling

Alchemy II displays beautiful space-filling molecular models and manipulates them at impressive speed, even on a Mac II.



Seeing Double

This Ortho view in stick format with labeled atoms is useful for computing by eye. One common use of Alchemy II is rapid visual survey of molecules whose atomic coordinates have been saved in standard data files.

Desktop Molecules

Once you have built a molecule, you can display it as either a space-filling (see "Looks Great, More Filling"), wireframe, or ball-and-stick model, and manipulate it with a little control panel that lets you spin and translate the molecule on screen. Both the quality of the display and the speed of rotation make Alchemy delightful to use—it's quite dramatic to see a desktop computer outperform the typical dedicated graphics-terminal-and-minicomputer setup of the mid 1980s (see "Seeing Double").

Alchemy II can't transmute base metals into gold, but it can transmute screen models into plotter output. Most Mac users think of the LaserWriter as the premier output device, but for chemical drawings and pseudo–3-D ball-and-stick models the plotter is king of hard copy. Alchemy II lets you save screens as HPGL files (a widely used Hewlett-Packard standard format) or plot directly through choices in an elaborate plotter-control dialog box.

Philosopher's Stone?

Alchemy's competitors are Chem3D Plus, from Cambridge Scientific Computing, and MicroChem, distributed by Anthony Hopfinger (University of Illinois at Chicago). Chem3D Plus is a more complete stand-alone system, including MM2 with pi-electron calculation and a basic molecular dynamics capability; for the experienced modeler trying to get the most out of a Mac, Chem3D Plus may be a better choice. MicroChem consists of four modules that cover most of the same features as Alchemy with some extensions (making replayable motion pictures for example), but it is not commercially supported in the conventional sense. Alchemy II is the only Mac modeling program backed by a large company whose main activity is software for chemistry. Alchemy plays to the Mac's graphics strengths, in effect letting the Mac serve as a front end for serious computation on bigger machines, and it has a staff of chemistry Ph.D.'s with extensive software experience for customer support. For corporate or large-scale academic use, these considerations make Alchemy II the leading product in Macintosh molecular modeling.

—**Charles Seiter**

See **Where to Buy** *or circle 705 on reader service card.*

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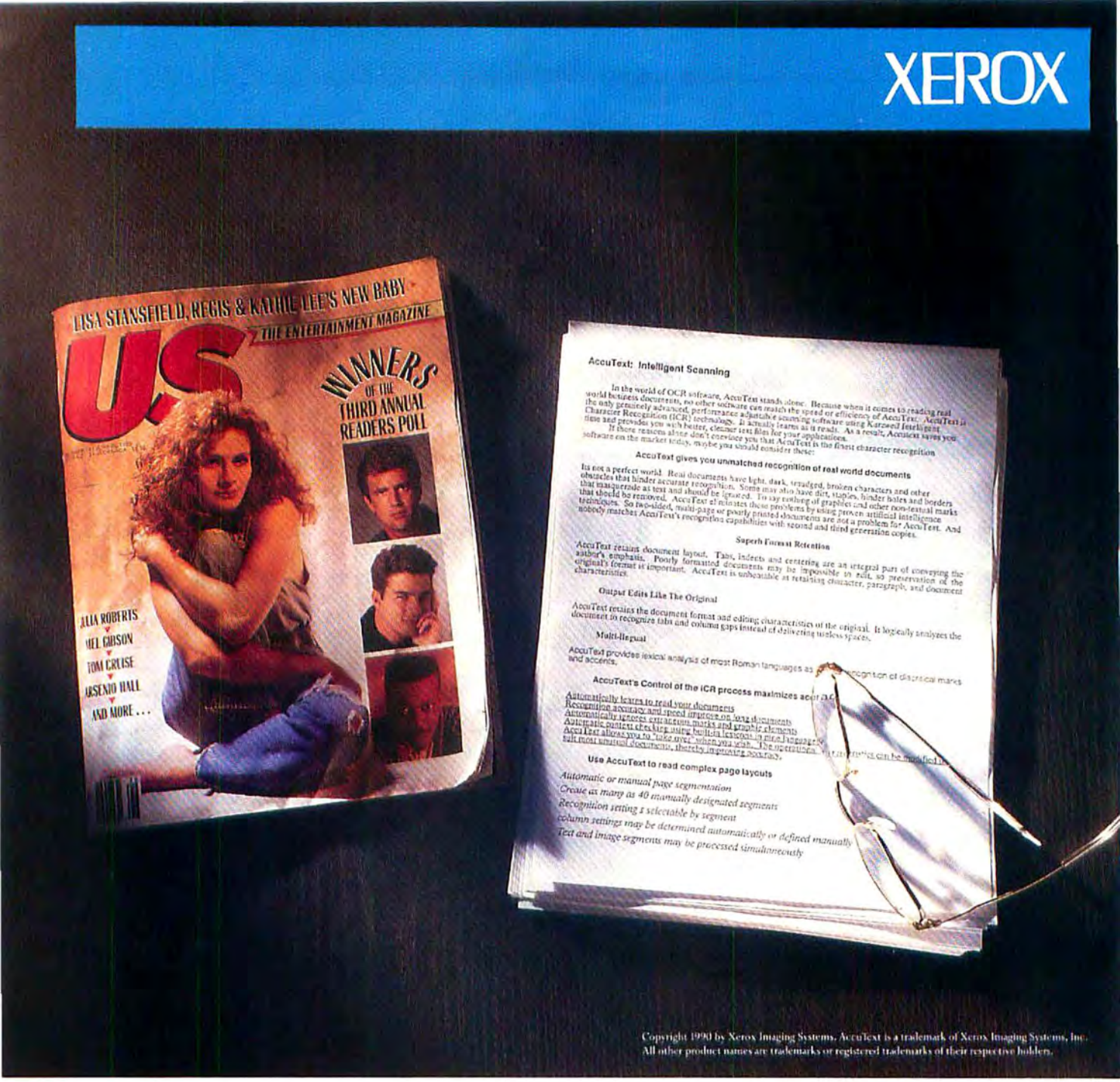

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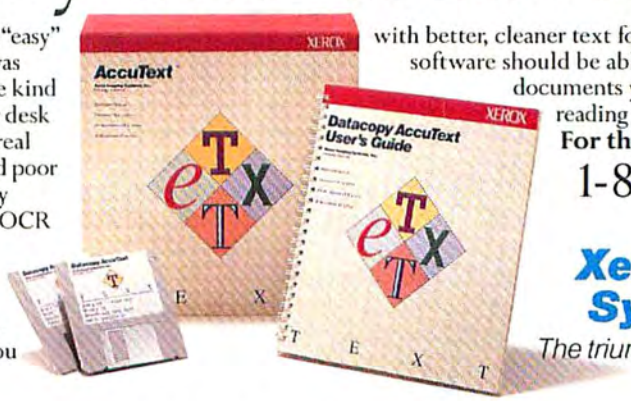

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Remote-Control Software

CARBON COPY MAC 1.0.4

Pros: Offers both network and dial-in/serial capabilities. **Cons:** Only one level of guest password protection; requires Mac to be either host or guest at any given time; doesn't permit multiple hosts per guest; serial number copy-protection scheme. **Company:** Microcom Software Division. **Requires:** Mac Plus; AppleTalk network; modem for remote access. **List price:** $199; 2-pack $299.

TIMBUKTU 3.1

Pros: Offers extensive password and security options; provides fast file transfers; supports multiple hosts per guest. **Cons:** No dial-in/serial capabilities; serial number copy-protection scheme. **Company:** Farallon Computing. **Requires:** Mac Plus; AppleTalk network. **List price:** $149; 30-pack $1995.

Ever wish you could see what's going on inside someone's head? Well, that's not possible (yet, anyway) but thanks to remote-control software like Farallon Computing's Timbuktu and Microcom's Carbon Copy Mac, you can see—and control—what's happening on another networked Mac. With Carbon Copy Mac, you don't even have to be on an AppleTalk network; you can do everything via modem.

With such capabilities you can train or support other users, collaborate with several people on a project, even manage a network server—all without ever leaving your chair. Both programs also let you transfer files to and from another Mac on an AppleTalk network.

Set to Share

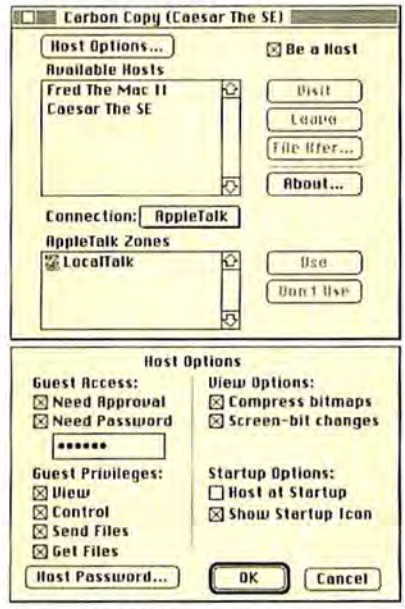
To use Carbon Copy Mac, you install the Carbon Copy DA with Font/DA Mover, then copy four files into the Mac's System Folder—the Carbon Copy INIT, CC Serial Setups, CC Help, and ADSP (AppleTalk Data Stream Protocol, which provides a reliable way for nodes to communicate over AppleTalk). Installing Timbuktu is just as easy. You can use the Apple System Installer provided on the Timbuktu floppy, or you can copy the Timbuktu, Timbuktu Help, and ADSP files to your System Folder and use Font/DA Mover to install the Timbuktu DA. If you're running either program on a Mac Plus, you must also copy an AppleTalk system document into the System Folder.

Both Carbon Copy Mac and Timbuktu employ serial numbers to make sure you're not using one copy of the program on two different networked Macs. If you plan to use either program on a large network, make sure you keep a list of serial numbers and corresponding Macs; it'll save headaches if you need to reinstall or update the programs.

Host with the Most

First, some terminology. When you are a *host*, you specify *guest privileges*, the extent to which guest users can control your machine. Guests can either control and view, just observe, or exchange files with the host Mac. Carbon Copy and Timbuktu each permit multiple guests to attach to a host.

To activate the host option in Carbon Copy Mac, check the Be a Host box; in Timbuktu you become a host by turning Guest Access on. In contrast to Timbuktu, Carbon Copy Mac requires you to uncheck the Be a Host box in order to become a guest of any other host Mac. Both programs have start-up options that allow the Mac to be a host when you start it up.



Carbon Copy Mac Dialog Boxes
You can be a host or a guest, but not both at the same time in Carbon Copy Mac. I find this restriction slightly inconvenient because I keep forgetting to become a host after I finish being a guest. That means no guests can attach to my Mac. All guest privileges in Carbon Copy Mac are set from the Host Options dialog box.

Once you have selected Control from Carbon Copy Mac's Guest Privileges list, all guests have the same degree of control over your Mac; the same situation occurs for the access options: View, Send Files, and Get Files. There is no way to permit certain guests to control and others to just view or exchange files. Carbon Copy Mac does show you how many guests are currently connected; it doesn't list their names, however, and you can't disconnect one guest and leave another connected.

Carbon Copy Mac's security is relatively simple. You can opt to approve each guest as he or she attempts to connect to your Mac, you can require a password, or you can do both (see "Carbon Copy Mac Dialog Boxes"). Because the program lets you specify only one guest password, however, every guest has to have the same password. Carbon Copy Mac does provide a separate host password so guests can't change host security options without permission.

Timbuktu, meanwhile, takes a more flexible approach to specifying guest privileges; this is possible because of its extensive security options. You can specify multiple passwords, each of which can be linked to a different set of privileges. For example, guests with password A could only observe or send files to your Mac; guests with password B could control, observe, send files to, and exchange files with your Mac. The exchange-files privilege can be further split into three subcategories: copy files from host, copy files to host, and delete files from host. Like Carbon Copy Mac, Timbuktu has a host password to restrict guest access to the Set Guest Privileges dialog box.

Timbuktu shows the names of guests attached to the host Mac in a pull-down menu. Using that menu, you can see each guest's privileges, and change them while the guest remains

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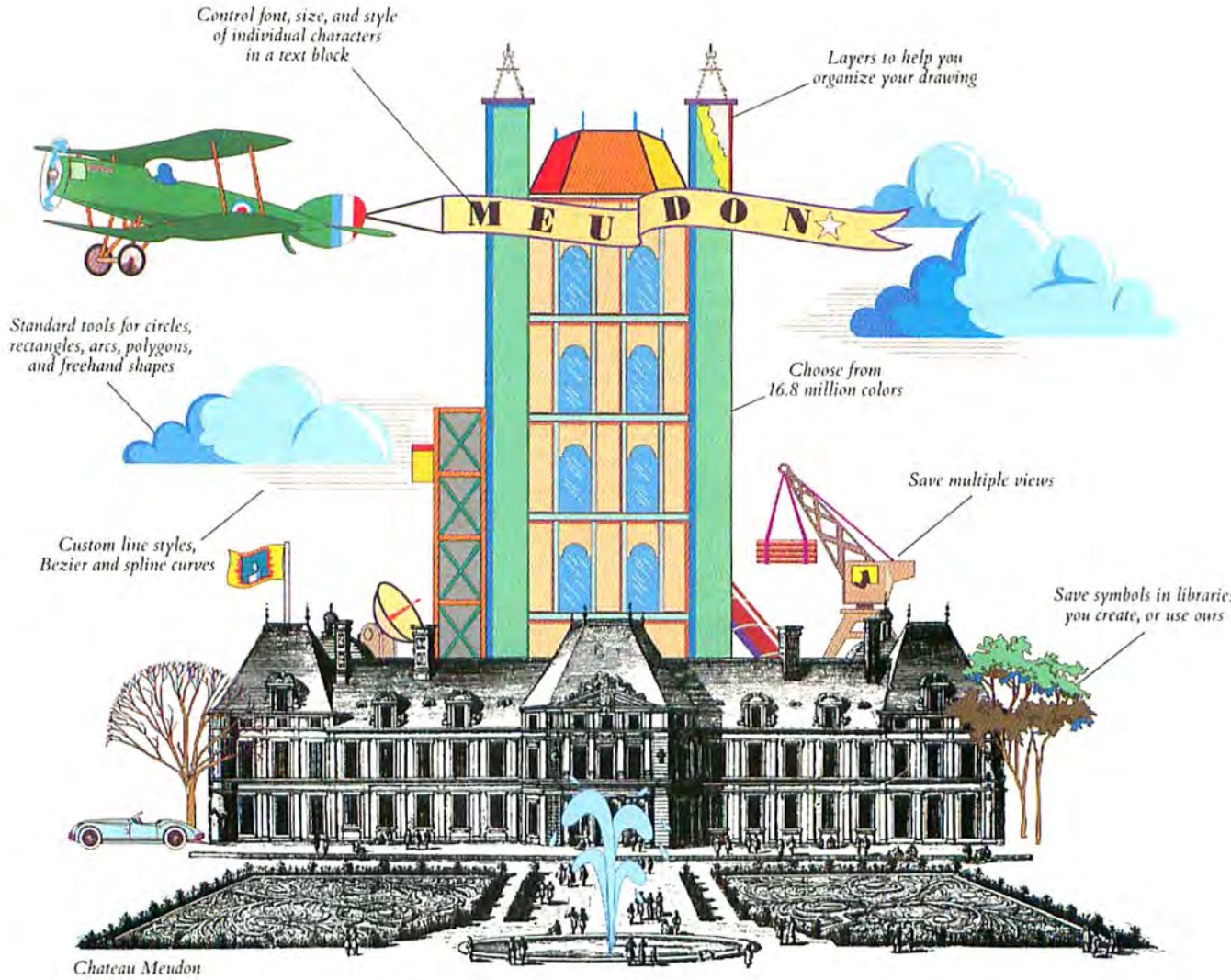

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Timbuktu in Action

There is one important difference between Carbon Copy Mac and Timbuktu guest capabilities. With Carbon Copy Mac, you can't connect a guest Mac to multiple hosts at once. With Timbuktu, you can. Here, the Timbuktu guest (an SE with hard drive, named Calvin) is currently connected to two hosts, Fred the Mac II (a Mac II with an AppleColor High-Resolution RGB Monitor) and Dinnesdale (a Mac IIcx with Radius Full Page Display).

connected. You can even disconnect guests selectively from the menu.

There are some things to remember when you're a host. First, if you want to run paint applications—MacPaint, HyperCard, and so on—over the network, you must turn on the option for screen-bit changes. Second, if you have a color Mac, guests might see either lots of black (if your desktop background is very dark) or nothing at all (if your text or icon colors are very light). Because guests receive host screens only in black and white, make sure there's enough contrast between foreground and background colors that guests can see what's on your desktop. Third, the host Mac slows down. Cursors get jerky, menus don't pull down as fast, and applications take a bit longer to launch.

Stupid Screen Tricks

To become a guest using either Carbon Copy Mac or Timbuktu, simply double-click on the name of a host. In both programs, the host Mac's screen appears in a separate resizable, movable window—on the guest Mac screen (see "Timbuktu in Action"). Once you're a guest, you can run any application, open any folder, and so on, just as if you were sitting in front of the host computer.

If the guest Mac has a larger monitor than the host, both programs display the entire host screen in the window. If, on the other hand, the guest monitor is smaller than the host's, Carbon Copy Mac scrolls with the cursor as you move it to previously hidden parts of the screen. An optional full-screen mode fills the guest screen with the host's screen so you don't see any of the guest's desktop. In contrast, Timbuktu's regular host windows include scroll bars that help you move around large screens; Timbuktu automatically scrolls with the cursor only in full-screen mode.

Here from There

Neither Carbon Copy Mac nor Timbuktu let you drag files and folders from the host window to a guest desktop, so you must make a special connection to transfer files. This doesn't mean you have to break the host-guest connection, you simply go back to the DA and click on the appropriate file-transfer option. You then see a list of files and folders available on both the host and guest, in a format similar to Font/DA Mover's column A and column B.

Carbon Copy Mac and Timbuktu both enable guests to send files to, and get files from, the host. However, only Timbuktu lets you transfer more than one file or folder at a time. Timbuktu also allows the host to specify a *drop folder* for all files sent by guests, and it automatically puts transferred files in subfolders labeled with each guest's name.

I timed two different transfers using a host Mac II running MultiFinder and a guest Mac SE running the Finder. It took Carbon Copy Mac 3 minutes, 27 seconds to transfer a 768K folder containing five files; the same transfer took Timbuktu 1 minute, 36 seconds. A single 27K Microsoft Word file took Carbon Copy Mac 14 seconds to transfer, and Timbuktu 8 seconds.

One If by Modem

Unlike Timbuktu, which only works over a network, Carbon Copy Mac lets a guest access a host (and transfer files, too) via either modem or AppleTalk. The only thing is that you can only use one type of connection at any one time. The program comes with prewritten connect scripts for several different modems, or you can write your own. You can also save connect settings. As always, the faster the modem, the better the performance.

I found that both Carbon Copy Mac and Timbuktu performed admirably. (I'm also happy to say that both Farallon's and Microcom's technical-support personnel are helpful and pleasant to deal with.) As far as guest viewing and controlling go, the two products are pretty close in speed. Timbuktu, however, has a definite speed edge for file transfers.

Both programs work across AppleTalk zones and support a variety of AppleTalk cabling schemes. But if you want to see what's happening on several Macs, Timbuktu is the only choice. Similarly, if you want different guests to have different guest-access privileges, Timbuktu is the program for you. I also like the way Timbuktu lets a host control guest privileges once guests are connected. On the other hand, Carbon Copy Mac is a better buy if you need both network and modem access to Macs.—**Brita Meng**

See* Where to Buy *or circle 869 (Timbuktu) on reader service card.

PostScript Font–Design Program

FONTSTUDIO 1.0

Pros: Well-stocked tool palettes for outline and bitmap font editing; anti-aliasing and color for bitmap fonts; can trace TIFF templates; good kerning control. **Cons:** Abundance of features plus, manual that's only adequate, make for a lengthy learning period; a few minor bugs. **Company:** Letraset. **Requires:** Mac Plus; hard disk. 2MB RAM recommended. **List price:** $595.

Look ma, I'm a typographer! Well, sort of. After all, typography is an art, and Letraset's FontStudio can't make me a typographer any more than Illustrator can make me an illustrator. I've yet to join the ranks of Goudy or Garamond, but FontStudio did allow me to turn out a passable PostScript typeface.

Building a Face

FontStudio offers several choices for starting a typeface. The easiest way is to import an existing typeface and modify it. You can import faces from almost any Macintosh type vendor. The

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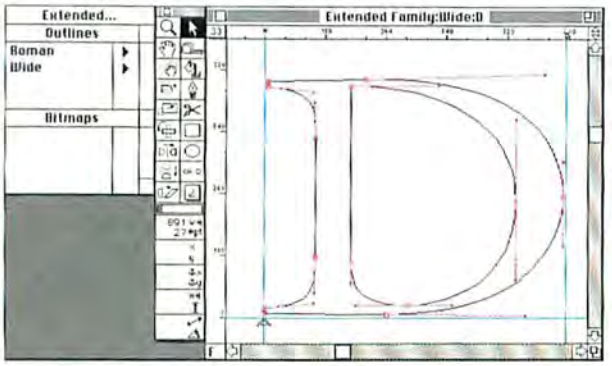


The Parts of a Path
FontStudio's outline characters are made up of a path of line and curve segments joined together by smooth points (indicated by circles) and corner points (indicated by squares).

program supports proprietary formats from Bitstream, The Font Company, and Monotype; other formats such as Ikarus M and Letraset's LetraFont; Type 3 PostScript faces from companies such as Casady & Greene and Image Club; and Type 1 PostScript faces from companies such as Compugraphic, Linotype—and, yes, Adobe. Once you've imported a face, you can modify the character outlines, copy and paste characters between faces, or make global modifications to the entire face, such as condensing or expanding it. FontStudio also lets you import Adobe Illustrator files via the Clipboard.

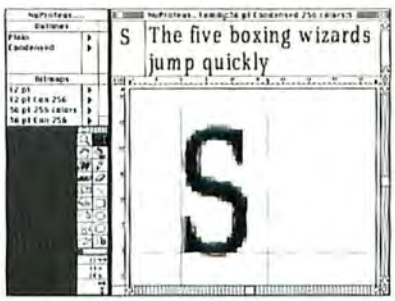
Alternatively, you can draw an outline font from scratch, drawing paths made up of straight and curved line segments. You use the rectangle and oval tools for regular shapes, and the pen tool for free-form shapes. FontStudio's pen creates two kinds of points as you draw a path: smooth points for curves, and corner points where segments join at an angle. Once you've drawn (or imported) an outline character, you can change it from a straight line to a curve or vice versa by dragging points on the path or by moving guide points, which change the tangent of a curved segment (see "The Parts of a Path"). If you've used PostScript drawing programs such as Illustrator, you'll be familiar with this method of drawing.

Additional outline-font tools let you rotate, slant, resize, and mirror portions of a character. You can borrow parts of one character and add them to another; a parts library lets you store serifs and other elements that are repeated throughout a typeface. A paint bucket tool fills outline characters with black for an on-screen preview.

Even with FontStudio's extensive tool collection, it's hard to draw a typeface from scratch. The preferred method is to scan in an existing electronic or hand-drawn typeface and trace the characters. FontStudio allows you to use a MacPaint, PICT, or TIFF file as a tracing template, placing the template in a background layer. You can move or resize the template if necessary, then use FontStudio's drawing tools to trace it. Better still, you can employ the program's autotrace feature, then use the other tools to touch up the outline. Although most characters need some retouching, I was impressed with the accuracy of the autotrace parameters were adjustable, though).

The Fine Points of Bitmaps

Once you've created an outline font, it's time to deal with the other half of the typeface equation: the bitmap, or screen font. FontStudio does a lot of the work for you; when you select Make Bitmaps the program automatically adds a screen font to the selected outline font at whatever sizes you set. You must fine-tune the raw bitmaps, but the program does a fairly good job of roughing them out. And FontStudio's bitmap-editing tools really shine. If you have a Macintosh II and work in color, you can use a palette of up to 256 colors. If you want bitmaps to look good on screen—for a multimedia presentation or for conversion to slides, for example—you can take advantage of FontStudio's antialiasing feature, which smooths the edges of characters with shades of gray or color blends (see "Hold the Jaggies").



Hold the Jaggies
To enhance displayed characters, FontStudio offers an antialiasing option that smooths jagged edges with subtle shading.

Fine-Tuning a Face

Once you have created the outline and bitmap characters, you have to work on font metrics and kerning. FontStudio's kerning window allows you to adjust each character's placement in relation to other characters. You can adjust a character's width and side bearings, as well as its distance from adjoining characters in kerning pairs. Take the visual approach, dragging characters in a sample-text box, or type the appropriate metrics in a chart (see "As the World Kerns"). A handy Kern As command allows you to apply the same kerning information you have assigned to one character to another character with a similar shape.

You might also want to consider fine-tuning the characters for printing at small sizes on low-resolution devices by adding *hints*, instructions that equalize stem weights and other character attributes.

When you're satisfied with your work, you ask FontStudio to generate a PostScript printer font file and a bitmap font suitcase. You then install the FontStudio face as you would any other PostScript typeface. FontStudio can also export fonts as Illustrator 1.1 files (and hence to FreeHand if you wish) or PICT files.

Designer's Dream?

Since I'm not a type designer, I asked several professional typographers their opinion of FontStudio. The response was generally favorable: the designers raved about the program's kerning capabilities and praised its outline drawing tools, multiple magnification levels, outline-fill tool, and the character-parts library. Criticisms were few, but included the only-adequate manual, the quality of the initial bitmaps (before editing), and slow response

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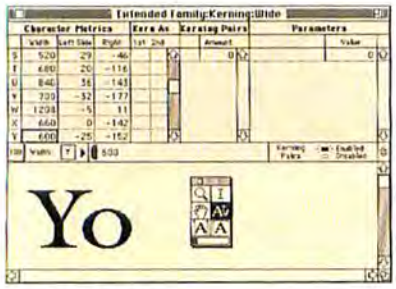
time for some operations. The designers' wish lists included interpolation from one weight to another, a slanted grid for creating italics, automatic hinting, and the capability to generate Type 1 PostScript (according to Letraset, the last two items are in the works for an upcoming version).

As for me, I'm not crazy about the program's user interface. It's not bad, but it seems convoluted and overly complex in places. Granted, FontStudio is a complex program, so in many respects a complicated interface is necessary, but I couldn't help but pine for the relative simplicity of Fontographer, Altsys Corporation's font-creation program. Similarly, I found Fontographer's pen tool easier to learn and use than FontStudio's pen, and Fontographer's documentation superior to FontStudio's.

But FontStudio is a fine program that I'd recommend to aspiring typographers. It's thorough, versatile, and pretty solid. I ran across a few glitches



As the World Kerns

FontStudio lets you adjust character positioning visually, by clicking and dragging, or numerically, by typing numbers in a table.

during my tests, but nothing too serious (it only crashed once). If you don't mind taking the time to master a complex program, FontStudio is a good choice, especially if you want to create deluxe bitmapped fonts as well as outlines. However, Fontographer is also a good program, and it's getting better as the upgrade race progresses. As one of the typographers I talked to pointed out, serious type designers may want to own both programs and capitalize on the strengths of each, just as many artists use both FreeHand and Illustrator. It's nice to have a choice between the better of two goods.

—Erfert Fenton

See Where to Buy *or circle 789 on reader service card.*

MIDI Sequencer

EZ VISION 1.0

Pros: Simple operation and uncluttered screen layout; Arrangement window permits quick changes to song structure; effective use of color. **Cons:** Inflexible quantize command; no criteria-based event selection. **Company:** Opcode Systems. **Requires:** Mac Plus; MIDI interface; MIDI instruments. **List price:** $149.

Vision, Opcode's high-end MIDI (Musical Instrument Digital Interface) sequencing program for the Mac, has features that put it at the top in terms of functionality; but its complexity can make the program hard to learn, and the sheer number of windows you wind up opening can make it impossible to use on a 9-inch screen. Since Vision was intended to be the do-everything professional sequencer, people with less-demanding needs have long gazed wistfully at the four or five of its features that they wanted and wished that they could get them in a more streamlined and cheaper package. Opcode has taken the hint and released EZ Vision, a vastly simplified spin-off that has many of its older sibling's good features as well as quite a few innovations of its own. Although EZ Vision has been priced modestly and kept simple, it is so much more refined than even its own sibling that high-end users as well as beginners will want to check it out.

The Legacy, Distilled

The most significant refinement in EZ Vision is the elimination of excess windows; only five windows can be opened, and Opcode has designed the program in such a way that this is a benefit rather than a hindrance. Most MIDI sequencers (including the more expensive Vision) have one window displaying play and record controls, another listing the tracks and their individual parameters, and still others that display the contents of each track in graphic form. With EZ Vision these functions are all united in a single window, with controls and parameters taking up a minimum of screen space in order to leave more square footage for the graphic display of the notes in a track. The notes are displayed as bars on a grid; a bar's vertical position indicates the note's pitch and its horizontal length represents its length in time.

To select which of the 16 available tracks you want to record, view, or edit, you simply click on one of the numbered buttons on the left side of the screen (or drag to select multiple tracks). The MIDI channel, instrument name, and other parameters for each track are assigned in a separate Tracks window, which is needed infrequently and therefore hidden most of the time. Each track's notes appear in a different color on color-equipped Macs, providing invaluable visual feedback (even Vision can't do that). A pop-up selector in the main window lets you choose which of the 25 separate sequences to look at, or you can simply type a letter from *A* to *Y* to select a sequence.

EZ Vision's graphic editing tools are virtually identical to those of its sibling and are the most functional and refined of any sequencer around. A unique Scrub cursor plays all events that you ⌘-drag across, and a bouncing ball and scrolling vertical line show where you are during playback and recording. You can select any region for editing with the Marquee tool, which lets you draw a box around the desired notes, and you can select discontinuous regions by ⌘-Shift-clicking. An I-beam tool selects all notes within a region of time, regardless of pitch, and a Cursor Quantize pop-up menu lets you set the grid resolution that cursor moves snap to. By setting the cursor-quantize value to quarter notes and using the I-beam tool you can quickly select rhythmically exact regions for cutting and pasting without having to be too precise with the mouse.

The bottom of the editing window can graphically display the key velocity of each note as well as tempo, program changes, and controller moves like pitch-bend or volume-change events. EZ Vision provides pencil tools for setting, scaling, adding and subtracting, and limiting the values of any data displayed in the Strip Chart. When combined with tools for drawing val-

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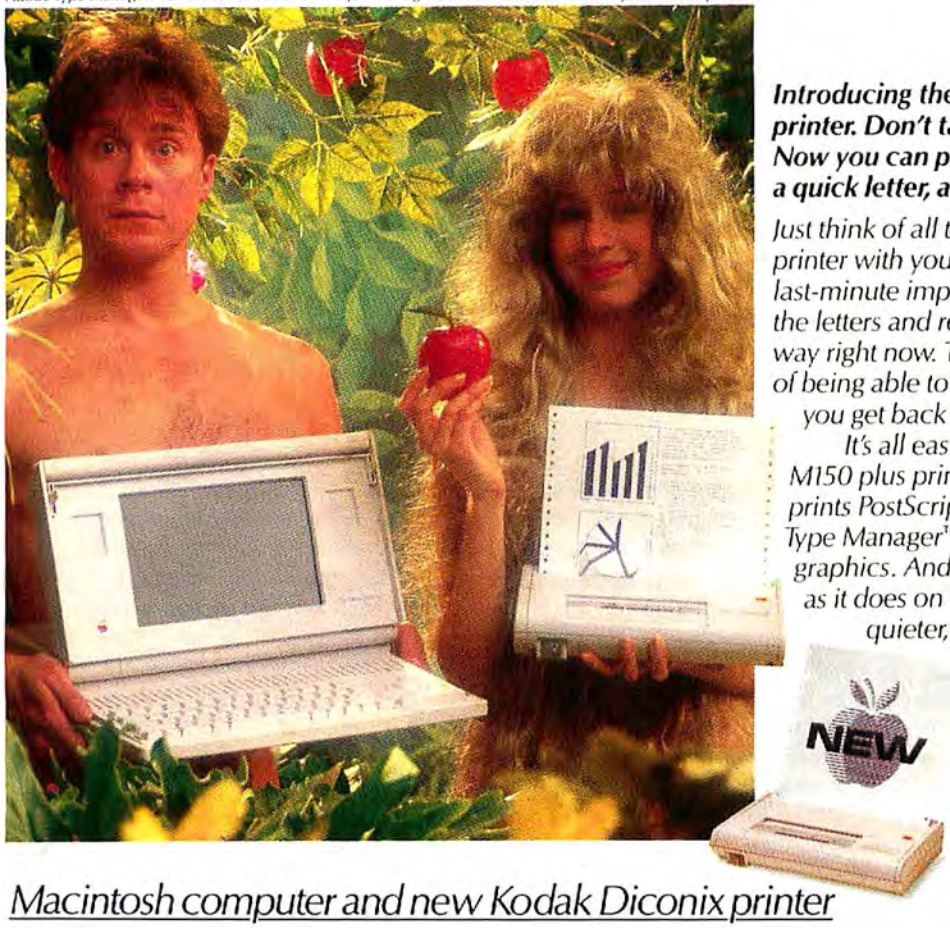

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ues in straight-line, freehand, flat-line, parabola, and random modes, you've got an incredibly sophisticated editing system that is controlled by only three pop-up selectors.

Menu, Please

EZ Vision's menu commands for editing a selected region of music are spartan compared to the wealth of options you have when doing on-screen edits. The usual cut, copy, paste, insert, merge, move, and delete time commands are present, but the quantize function simply moves all note events to line up with the rhythmic grid you select. The shortage of region-specific menu commands helps keep the program simple and quick to learn, but it would have been nice to see at least a Quantize Percentage parameter and perhaps a Select dialog box, similar to Vision's, that would let you highlight notes for editing based on their key velocity, duration, rhythmic placement, and so forth.

EZ Vision, like its sibling, can subscribe to a document created by Opcode's patch librarians. If you dump the sound patches from a synthesizer into the Mac, EZ Vision can read the sound names from the patch bank on disk and display those names whenever you're dealing with a program change event.

They Do Windows, but Not Many

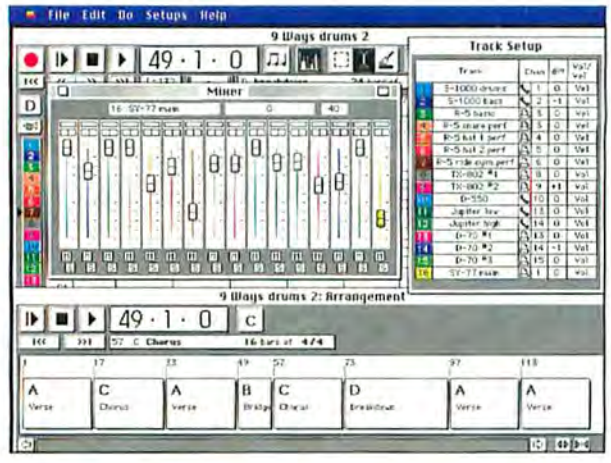
EZ Vision's other windows are the Mixer, which displays 16 sliders that you move with the mouse (they animate on playback) and that send MIDI volume-change commands for each track; the Program & Note Names window, which lets you name each note on the keyboard (useful for working with drum machines, since the pitch ruler on the left side of the main window can display names such as snare and tambourine instead of C2 and F4); and the brilliantly executed Arrangement window (see "A Nice Arrangement").

The Arrangement window shows an overview of a song as you build it by choosing from among the 25 available sequences; each sequence appears as a block on the time-line display. Rearranging a song is as easy as typing the letters representing the sections and deleting any extra sequences from the arrangement. Although Vision's often confusing Subsequence capability is more flexible, the Arrangement window is an excellent tool for chaining a group of sections into a complete song. After using EZ Vision for a while I found myself wishing that Vision had such a simple sequence-chaining feature.

EZ Vision can import and export songs to other programs that read standard MIDI files, is compatible with Apple's MIDI Manager system software, and has excellent online help. Although EZ Vision lacks a lot of features that professionals need, the program's simplicity makes it a great sketch pad, and even experienced users will find the Arrangement window a joy to use. For beginners or anybody looking for an inexpensive, entry-level sequencer, EZ Vision eats the competition for lunch, and you'll even have some change left over for dessert.

—Charles Clouser

See **Where to Buy** *or circle 782 on reader service card.*



A Nice Arrangement
EZ Vision's Arrangement window (bottom) shows a block diagram of your song permitting quick structural changes. The Track Setup window (right) is where you set instrument parameters, and the Mixer (left) controls the volume of the synths associated with each track.

Statistical Package

SPSS FOR THE MACINTOSH 4.0

Pros: Complete implementation of mainframe version; file interchangeability with all other versions; extraordinarily powerful and flexible. **Cons:** Unforgiving of syntax errors; no data-entry module; imposing documentation. **Company:** SPSS. **Requires:** Mac SE; 2MB RAM; hard disk with 6MB free space (15MB if installing all additional modules). 4MB RAM recommended for use with MultiFinder. **List price:** Base system $795; additional modules $395.

SPSS, Statistical Package for the Social Sciences, brings to the Macintosh the same statistical number-crunching power I had on a university mainframe. It is not a stripped-down version of the package that is also available for the IBM PC, UNIX workstations, minis, and a variety of mainframes, it's a full-blown implementation.

Statistics for Those in the Know

Unlike JMP (SAS Institute) and Data Desk (Odesta), SPSS doesn't suggest analyses for you. It's specifically designed for those who already know how they want their data analyzed. The routine is direct. Hand SPSS your data and tell it what statistics and options you want calculated. The base system manual discusses each statistic in depth. If you don't have a background in statistics, it provides excellent introductory material and examples.

True to its mainframe roots, SPSS for the Macintosh is command oriented. You select commands from a scrolling list in the Command Generator window, load an existing command file from disk, or type commands directly into the Input window (see "SPSS Windows"). Then, by selecting the lines in the Input window that you want to execute, you let SPSS know what tasks to perform.

If you've used SPSS before, you'll find the transition to the Mac version quite smooth. There's nothing new to learn. Even the font it uses, SPSSFont, will remind you of mainframe output.

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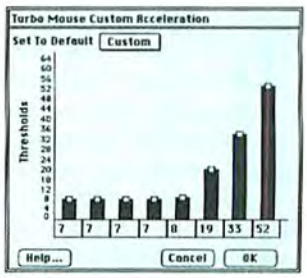

What's more, only Turbo Mouse has a Custom Control Panel that lets you adjust both acceleration and double-click speed to exactly match the way you work. Move the ball slowly and the cursor moves pixel-by-pixel. Move it fast and it speeds across even the biggest screen.

The next time you read another claim for a trackball, remember the one that has earned all the acclaims. Turbo Mouse.

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As an added bonus, command files created on other systems will run with few modifications. And the Command Generator's interactive approach is a tremendous improvement over the batch file–only setup of the earlier mainframe versions. As each command is processed, the results are displayed in the Output window along with an explanation of any errors encountered.

If you haven't used SPSS, however, you'll find it decidedly different from a standard Mac program. To calculate descriptive statistics with other programs, all you normally have to do is load a data file and select the tests to perform, along with the variables. That's what you do for SPSS too, but you also have to be sure that your syntax is correct, that the periods are in the right places (used as command terminators), and that the commands are in the correct order. Although the Command Generator provides most of what you'll need to know and is supplemented by an excellent help facility (see "Online Help"), there's still plenty of room for error. Mastering SPSS requires a significant investment of time.

Data Importing/Exporting

Although the Macintosh version data-entry facility is limited to the Input window (an ordinary text-editing window), SPSS easily reads and writes many useful file formats, including SPSS system and portable files (created by the Macintosh and other versions of SPSS), SYLK, text-only, and column binary (multipunch) data. These options allow you to create data and command files in most spreadsheets and word processors.

While using SPSS 4.0 (actually the first version for the Mac), I discovered that the program had difficulty importing a correlation matrix created as a tab-delimited text file. Although SPSS was designed to read such files, the current version is only able to do so if each row of the matrix is preceded by its variable and row name. SPSS is aware of the problem and should have it corrected by the time you read this.

A Big Package

SPSS is expensive, but you get a lot for your money. The base system includes aggregate (creation of grouped cases), ALSCAL (least-squares multidimensional scaling), ANOVA (analysis of variance for factorial designs), breakdown analysis, cluster analysis, correlations, crosstabs, descriptive statistics, factor analysis, frequencies, matrix processing, multiple-response data analysis, nonparametric correlations, nonparametric tests, one-way ANOVAs, partial correlations, plotting (two-dimensional, stem-and-leaf, boxplots), proximities (similarity, dissimilarity, and distance tests), random sampling, rank ordering, regression, reliability statistics, and t-tests.

SPSS has extensive sorting and data-transformation capabilities, and supports looping and conditional statements. It also has macro facilities and handles missing values with ease. Although the package does have some graphing capabilities (bar graphs, scatterplots, and factor plots), more-advanced options are provided by offering a direct link to CA-Cricket Graph (available from SPSS for $395, although its suggested retail price is only $195).

Four other modules (sold separately) allow you to expand your statistical horizons. The Tables module can produce high-quality tables and reports. The Advanced Statistics module adds discriminant analysis, hiloglinear (fitting hierarchical log-linear models to multidimensional contingency tables), logistic regression, loglinear (model fitting, parameter estimation, and hypothesis testing for categorical data), multivariate analysis of variance, nonlinear regression, probit analysis, and survival analysis.

The Trends module is for time-series analysis. It includes two-stage least squares, ARIMA and X11 ARIMA (autoregressive moving averages), autocorrelation, curve fitting, exponential smoothing, seasonal regression, spectral analysis, and weighted least squares. The Categories module is for conjoint analysis and optimal scaling, and includes conjoint analysis, correspondence table analysis, homogeneity analysis, nonlinear canonical correlation, and principal components analysis by means of alternating least squares.

For a new user, the documentation may be overwhelming. The base system manuals are over 1600 pages of material, only one-tenth of it Mac specific. A brief tutorial shows you how to perform your first analysis, but after that you're on your own. The manual has many examples, but until you read the base system manuals and learn the rules, it will be slow going.

Do You Need It?

Nothing I've seen on the Mac comes close to the statistical power and flexibility of SPSS. Real computing power, such as that offered by SPSS, still comes at a price. But if you know statistics and are willing to spend the time to master SPSS, you'll be pleased with the results.—**Steven A. Schwartz**

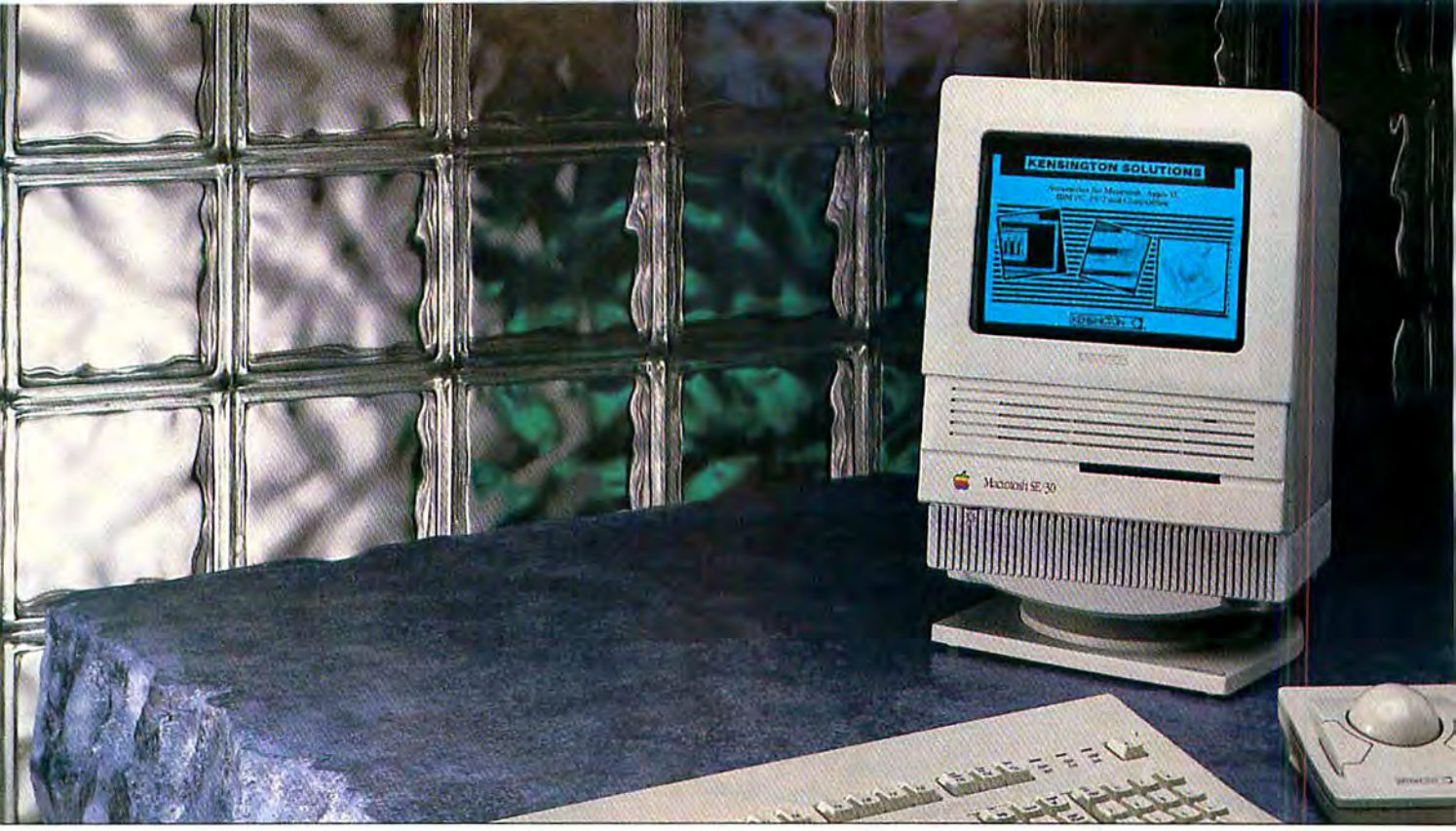
See **Where to Buy** *or circle 858 on reader service card.*

SPSS Windows

SPSS opens and shuffles windows as necessary. The Command Generator allows you to pick and choose variables, statistics, and options, which can be pasted directly into the Input window. Clicking on the Run & Close button in the Command Generator or highlighting the commands in the Input window instructs SPSS to execute the commands and direct the results to the Output window (bottom). If you're confused about a statistical term, you can look it up in the Glossary window (not shown).

Online Help

SPSS has a complete help system. Within the Command Generator are brief examples of each command and a description of each statistic and option. One feature of the normal help system is that you can check the syntax for any command.



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.

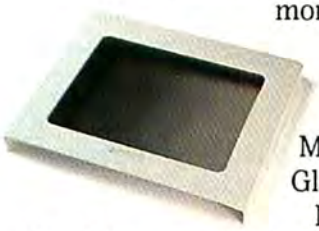
Yet, the irony is that something so good for your eyes can be such an eyesore.

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.

The styling is complementary. 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.

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DataLink/Mac™ (top) for the Mac II series, includes an extra serial port so you can add a peripheral, even when the built-in ports are occupied. **DataLink Express™** (left center) works externally with all Macintoshes and features another AE exclusive, our "Line Engaged" indicator to show a shared line is in use. Since DataLink Express works with all computers (w/serial port), we included both mini-8 and DB-25 ports. **DataLink/Mac Portable™** (bottom) includes AE Send-Fax™ and MNP-5 as standard features and incorporates an ultra-low power design to extend the Mac Portable's battery life.

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Multimedia Presentation Tool

MACROMIND DIRECTOR 2.0

Pros: Full programming language; excellent documentation; HyperCard driver included. **Cons:** Not all painting tools work in 24-bit mode. **Company:** MacroMind. **Requires:** Mac Plus; hard disk; 2MB RAM for color. **List price:** $695.

While MacroMind Director 1.0 was a complex product created with the professional animator in mind, it had many capabilities that allowed novices to create useful and attractive animations. Now Director 2.0 adds a full programming language, Lingo, which allows you to animate characters and create interactive presentations, as well as control external devices such as laserdisc players and CD ROMs.

First Take

Director consists of two separate modules, Overview and Studio. Overview enables you to quickly string together various types of files (including MacPaint, black-and-white and color PICT, Glue, normal and accelerated animation files from Videoworks and Director, and Overview shows) into a slide show, complete with visual transitions between each file. Studio gets down to the more exacting art of cel animation of graphic elements and text; Studio includes a full-color painting program and text handling.

A Quick Overview

Overview's main element is the Overview window, which displays a flowchart of the presentation being created. The icons at the top of this window represent the various types of data documents that Overview can put in a presentation. Operating Overview is simple—you drag document icons into the main window, and Overview prompts you to select a file for each icon (or in the case of the AutoAnimate, sound, tempo, and transition icons, you select corresponding data and/or effects). Transport controls (play, step, rewind, back, and loop) let you control playback of individual files or the entire presentation.

Any of the elements in the Overview window can be combined. Tempo changes and delays can be inserted between document icons, and animation files can either be played in their entirety or be linked to time—you can play just 10 seconds of a 30-second animation without modifying the original Director document in any way. You can also modify a document in its original application, and when you quit, be brought right back into Director's Overview window.

Studio Tour

Studio can handle up to 24 independently animated elements on the screen at any one time. The program accomplishes this by having 24 "channels" of animation (similar to the concept of multitrack audio), along with separate channels for sound, tempo changes, palette effects, and visual transitions.

You can create each separate graphic element of an animation in Director, copy elements through the Clipboard, or directly import them from disk. You can bring images and sounds directly into Director through the Import option, which allows you to open MacPaint and PICT files, PICS animation files, scrapbooks, color palettes, and sampled sound files.

To create an animation you simply record the movement of an object on the screen as you drag it around, or specify key positions of an object and let Director fill in the in-between frames.

You can view the resulting animation in detail in the Score window, which displays, on a channel grid, all of the *action codes*, including the cast-member number, ink mode, and motion indicator for each object. Studio lets you copy and paste animations between channels, allowing you to duplicate an animated object and copy it around the screen—a single flying moth turns into a swarm with a few mouse-clicks. You can also specify speed changes, delays, and palette effects directly in the Score window.

Local Lingo

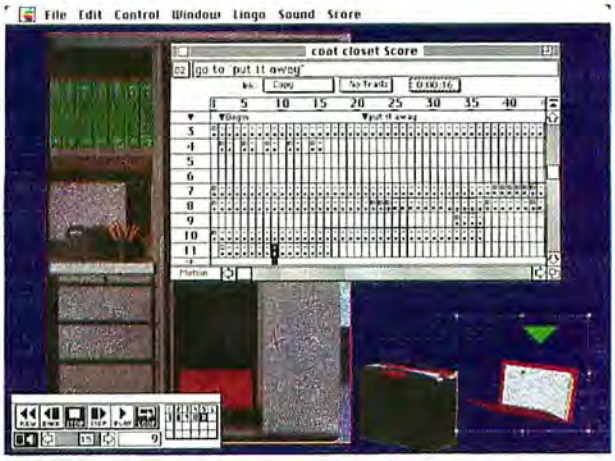
Director 2.0 is more than just a 2-D animation program: it includes a full HyperTalk-like programming language, Lingo. You can even create complex Lingo macros that can be called from an animation with the use of a single name.

Much like HyperCard, Lingo is extendable through the use of custom code segments called XObjects. XObjects are very similar to HyperCard's XCMDs; in fact, many XCMDs can be converted to XObjects through a straightforward procedure. The program ships complete with a variety of the most useful XObjects you're likely to ever need.

Paint My World

Director's painting module is actually a full-featured 8-bit color painting program that has many of the features found in stand-alone programs such as PixelPaint and Studio/8. All the standard goodies are here (primitive shapes, paint brushes, variable line weights, and so on), as well as some excellent new ones, such as the customizable air brush and numerous spe-

(continues)



Put It Away
Note the selected object on the Score Window screen, and the Lingo code (in the upper part of the Score window), which tells you that when the selected object is touched, the animation will skip to the frame labelled Put it Away.

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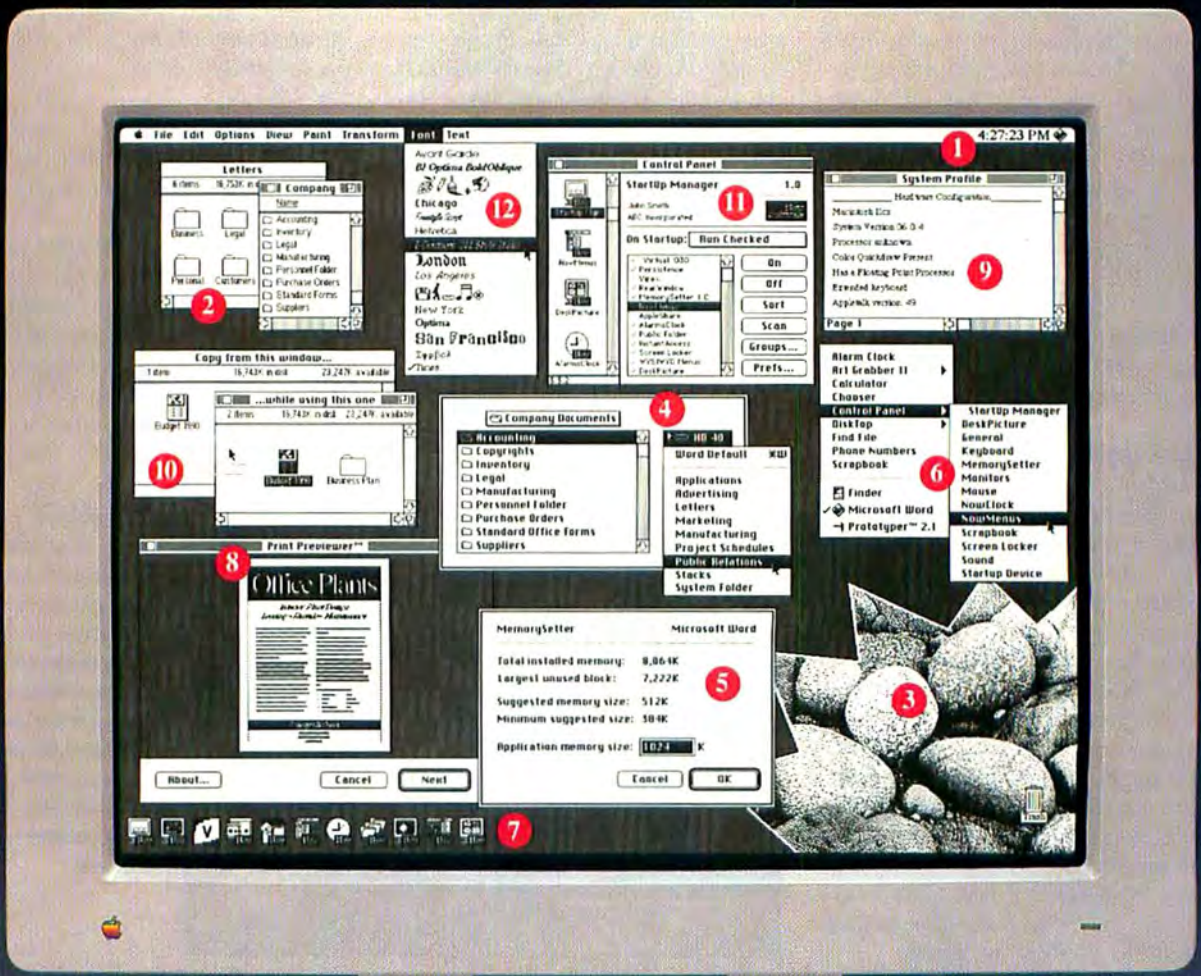

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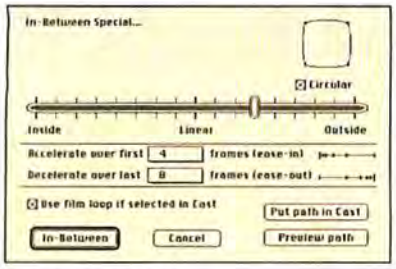

In-Between Special

You can automatically accelerate and decelerate the motion of an object that is animated with the In-Between Special command, as well as give the motion a less mechanical feel.

cial-effects modes for brushes and the airbrush. While many of the tools also work in 24-bit mode, some, such as the paint bucket, do not; for professional work, you still need a separate 24-bit paint program.

The real reason for using Director's 24-bit capabilities, though, is that you can sequence a series of 24-bit images and use a Lingo XObject to dump 24-bit color animations frame-by-frame to videotape in conjunction with third-party videotape control boards (such as the DiaQuest animation controller board). This way you can use Director to create animations that you can't view on a Mac screen, because they are too slow.

An Auto Transform command enables you to use the program's dynamic effects to create key frames and automatically generates a number of intermediate steps. For example, you can easily create 2-D spinning type by defining a beginning position, rotating the type 340 degrees, selecting Auto Transform, and typing in the number of frames desired.

Besides the tools in the painting module, Director also has some basic object-oriented drawing capabilities (rectangle, rounded-corner rectangle, circle, and line) that are useful for conserving memory, and you can create smooth interpolation effects otherwise difficult with bitmapped shapes.

Besides the paint module's bitmapped type, Director also has fully editable text, including variable colors, styles, justification, a find and replace command, the ability to place a border around a block of text, and more. Certain text castmembers are reserved for use with the fully supported Macintalk software speech synthesizer.

MacroMind Director 2.0 comes with excellent documentation. On the many disks provided with the program (which include all sorts of useful utilities) are also extensive samples of animations with Lingo programming, as well as a freeware Player application that enables you to distribute normal or interactive animations to people who don't own the MacroMind Director program. The HyperCard driver for Director movies, once a separate product, is also included with Director 2.0, enabling you to add full-color animation to HyperCard and SuperCard projects.

It's a Wrap

Director offers just about every feature anyone could possibly want from a 2-D animation package. The addition of the Lingo programming language turns Director 2.0 into one of the most powerful integrated color authoring systems available for the Macintosh. If you want to taste the whole world of Macintosh multimedia in one sitting, travel no further.

—David Biedny

See **Where to Buy** *or circle 809 on reader service card.*

Wireless Remote Controls

ON-COMMAND

Pros: Easy to create macros; uses modem port. **Cons:** Tiny, poorly arranged keys; clunky, three-part adapter kit; works in only one application per presentation. **Company:** Computer Support Corporation. **Requires:** Mac Plus. **List price:** $295.

SILENTPARTNER

Pros: Intelligent key layout; extremely smooth mouse motion; macros stored in the unit, not in the Mac. **Cons:** Buggy, unpredictable macro generator; expensive; not useful without commercial macro software. **Company:** Presentation Electronics. **Requires:** Mac Plus. **List price:** $399.

To anyone who makes Macintosh-based presentations frequently, a hand-held, wireless, remote-control might actually be worth several hundred dollars. Such a device could mean freedom from standing chained to the keyboard and mouse, and could lead to more relaxed, people-oriented presentations.

A handful of hand-helds are now available for the Mac. All use refined infrared TV remote-control technology. You hold the remote in your hand, and a small receiver box plugs into the Mac. You can wander about 35 feet from the receiver without having to have the aim of William Tell.

Otherwise, the approaches these remotes take differ vastly. The Remote Mouse (see *Reviews,* May 1990) offers no macro capabilities but does include a complete alphanumeric keyboard. Two new devices, On-Command and SilentPartner, have fewer buttons; and both require the use of preprogrammed macros to control your presentations. Of course, any of these remotes will suffice to advance your Persuasion or PowerPoint slides on cue. None, however, will thrill you with their other capabilities.

Command Performance

The first thing you won't like about the On-Command remote is its ungainly three-section, three-cable adapter-transformer chain. Unlike any of the other remotes, this unit requires AC power. Like the others, the On-Command is a remarketing of an IBM PC product. As a result, one segment of this tangled cable parade is a Macintosh converter cord for the modem or printer port. Unfortunately, both the converter cord and its receptacle have male screws; to connect them securely, you'll need some duct tape.

Much more thought went into the On-Command software. This desk accessory lets you teach the On-Command what mouse or keyboard action you'd like associated with each of the hand-held unit's buttons. You won't be able to select menu commands during your presentation, because On-Command's software limits you to clicks and keystrokes; but you can use the keyboard equivalents (⌘-S for Save, and so on). Furthermore, On-Command works well with third-party macro software such as QuicKeys, Tempo II, and MacroMaker. If you really want to type and format a letter, save, and quit, all with a single command, you can let your macro pro-

(continues)

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gram do the dirty work and then use On-Command to trigger the whole process. (Don't even think of creating a presentation that involves moving from one application to another, however; On-Command becomes completely nonfunctional if you quit the original program.)

All of this looks practical in theory. On the day of the presentation, however, you might be confounded by the design of the remote itself. The 28 buttons are spaced close together, and they're in seven identical rows. The problem with this generic layout isn't just that it's hard to remember what macro you've assigned to what key; it's also that there's nowhere (and no way) to label each key once you've prepared your show.

Silent and Clever

If the On-Command strikes you as easy to use but limited, consider its competition: the SilentPartner, a unit with easy installation but a far more ambitious software system.

The SilentPartner requires no AC power; its receiver plugs into a spare keyboard or mouse (ADB) port. The design of the solid-feeling hand-held unit might puzzle you at first: its 23 keys aren't as neatly clustered as the On-Command's. Indeed, some buttons seem to have been deliberately scattered. This layout, of course, is a great mnemonic aid. Like the lonely Escape key on the extended Apple keyboard, these buttons are easy to find in a stressful presentation situation; you can assign important functions to them (forward, backward, or even shut down).

Adhesive overlays are provided with the SilentPartner so you can label the buttons. Preprogrammed macros for popular presentation software (simple commands such as Previous Slide, Next Slide, and cursor arrow keys) are provided with both the On-Command and the SilentPartner packages. If you want to do anything more ambitious, you'll have to tackle SilentPartner's challenging software.

Buttoning Up

SilentPartner's Macro Recorder INIT places a special icon on the menu bar, much as Apple's MacroMaker does. You go through your presentation

MARK JOHANN

SilentPartner (left) from Presentation Electronics, and On-Command from Computer Support Corporation

complete with mouse movements, text entry, and so on; the SilentPartner macro generator is supposed to record each process. You're asked to name and save each sequence.

Once you've created all the macros you'll be using in your presentation, you use the Programmer application to assign them to the remote's buttons. When you're finished, you must download this configuration to the SilentPartner's base unit using a special cable from the serial port. The advantage of this system is that macros are conveniently stored in the receiver itself; you can now run your presentation on any Macintosh. The disadvantage is that the downloading makes an already complex process even more technical.

You're finally ready to test the downloaded macros. Unfortunately, the SilentPartner macro recorder has serious problems. For example, its icon doesn't show up at all in Excel. Furthermore, the recorder often fails to register clicks or dragging actions, thus throwing entire macros into chaos. Worse yet, the macro INIT sometimes doesn't know when to quit, and triggers unexpected beeps and keystrokes during your *non*presentation work at the office—even when the hand-held unit is safely stashed in a closet. You have to reboot the Mac, sans INIT, if you want to return the computer to its usable state.

Remote Possibilities

Unless all you need is a slide advancer, both On-Command and SilentPartner force you to run your presentation with the aid of macros. Because SilentPartner's macro generator is so treacherous, you might conclude that the far simpler On-Command could ultimately produce superior presentations. But On-Command stops working if you quit the program that you began a presentation on; its use of the modem port renders it incompatible with MIDI or telecommunications programs; and the AC power requirement is a hassle.

If you're willing to put some effort into the problem, therefore, consider this compromise: get SilentPartner for its good button layout, adhesive overlays, smooth mouse movements, and hardware programmability. But drag its macro creator to the trash. Instead, use the much more reliable QuicKeys or Tempo II to create your macros, and teach SilentPartner to "press" the appropriate function keys to trigger them. (Fortunately, you don't need the macro INIT to program keystrokes.) Then practice your presentation like crazy; the last thing you need at showtime is a system that makes you even more nervous.—**David Pogue**

See Where to Buy or circle 825 (On-Command), 851 (SilentPartner) on reader service card.

Audio Post-Production Software

Q-SHEET A/V 2.0

Pros: Unique feature set puts a variety of tools in one package; can record and play hard disk–based audio files and MIDI data simultaneously; effective use of color. **Cons:** No graphic editing of individual slider events; controls for each device appear in separate windows. **Company:** Digidesign. **Requires:** Mac Plus. For digital-audio capabilities Mac II; 2MB RAM; hard disk (28ms or faster); Sound Tools. **List price:** $995.

Q-Sheet A/V, Digidesign's upgrade to its unique tool for sound designers involved in audio postproduction for film and video, adds digital audio functions to an already successful product. In fact, *(continues)*

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Rodime Systems, Inc., 901 Broken Sound Parkway, Northwest, Boca Raton, Florida 33487

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Q-Sheet A/V has no real competition from any package running on any platform, since its feature set is so unique and its user interface so simple.

In a nutshell, Q-Sheet A/V is a specialized sequencer designed to trigger sound effects from MIDI instruments, automate effects like reverbs and delays by means of on-screen sliders, and play digital audio files recorded on the Mac's hard disk. The program is intended to be synchronized to an audio- or videotape machine using SMPTE Time Code and can import and export Edit Decision Lists (EDLs) from CMX-compatible video-editing systems via a special cable included in the package. (SMPTE Time Code is the universal synchronization standard for video work, though people working with film can select to view feet and frame numbers.)

Nuts and Bolts

Q-Sheet A/V's capabilities are similar to music-sequencing programs that let you record and play back performances from a keyboard or other MIDI device, but Q-sheet lets you do much more than that. Q-Sheet must be synchronized to a tape deck by means of a SMPTE-to-MTC converter. (MTC stands for MIDI Time Code, a protocol for communicating SMPTE Time Code information over MIDI.) Since it's intended for film and video applications, Q-Sheet A/V displays an event's location by referring to the hour, minute, second, and frame SMPTE number at which it occurs.

For each MIDI device you wish to trigger, you create a track that is assigned to any of 16 MIDI channels on either of the Mac's two serial ports (providing support for 32 channels in all). Each track can record MIDI-note-and-controller data in real time and has its own set of on-screen controls that are completely user configurable: you can create, move, and resize sliders, knobs, and switches with the mouse (see "Custom Control").

Each of the on-screen controls can be assigned to send any of 128 MIDI controller messages, as well as pitch bend and aftertouch, and can be given a name that is displayed under the control. For example, the MIDI messages sent by these controls can govern the master volume of a synthesizer or sampler, the faders on an automatable mixing console, or the parameters of an effects device.

The on-screen controls can be grouped (so that moving one slider also moves the others in that group) and assigned a color for quick visual identification. All control definitions are saved with each file, so each Q-Sheet A/V document can have a unique setup. When Q-Sheet A/V is recording, it is also recording when and how you move the controls, and on playback the on-screen sliders move to show the controller messages being sent. These functions are well implemented; no other program provides as simple and effective a set of tools for automation. The only drawback is that each track's controls appear in a separate window, and although you can record data into multiple tracks simultaneously, it takes an extra mouse click (to bring a window to the foreground) in order to adjust first one device's slider and then another's.

Cue It Up

The events in each track are displayed in the Cue List, which should look familiar to professional sound editors (see "Psycho Strings"). Each event appears as a single entry in the list; for visual simplicity a slider move is displayed as a single event (although it's actually made up of a series of discrete value changes sent in quick succession). Editing time locations, note events, and slider events is simply a matter of changing parameters in pop-up dialog boxes. You can name (or map) each key of a MIDI instrument for the sound it triggers, and while it takes a few minutes to do this, it's great to see descriptive terms like "tire screech 2" and "door slam" appear automatically as you record note events, instead of trying to remember what note triggers what sound. Keyboard Maps can also be exchanged between files, so you can easily create templates for commonly used setups.

To facilitate automated mixdown of sequenced music, Q-Sheet A/V can import a standard MIDI file, assign it a SMPTE start point, output port, and initial tempo, and play it in sync with everything else. This lets you load in a piece of music sequenced in another program and create the automation track around it, without using two computers or MultiFinder and Apple's MIDI Manager (which lets multiple programs run concurrently, sharing data and the Mac's serial ports in real time). Q-Sheet A/V does work with MIDI Manager, but importing a file into Q-Sheet A/V for playback saves you some CPU overhead.

Hard Disk Recording

Q-Sheet A/V's digital audio functions include the ability to record and play back a 16-bit stereo sound file (or two mono files) directly from a Mac II's hard disk, provided that you have Digidesign's Sound Tools. Sound Tools consists of the Sound Accelerator NuBus board (DSP functions and stereo audio outputs), AD-In (analog-digital inputs) or DAT-IO (digital audiotape input/output) boxes, and Sound Designer II software. Although you can play no more than two channels of audio at any given time, mul-

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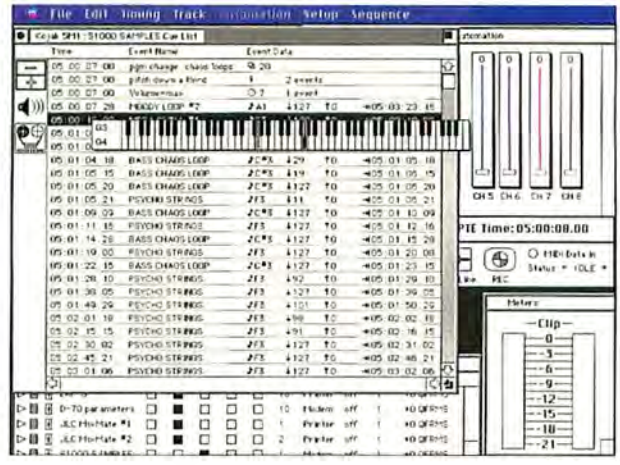
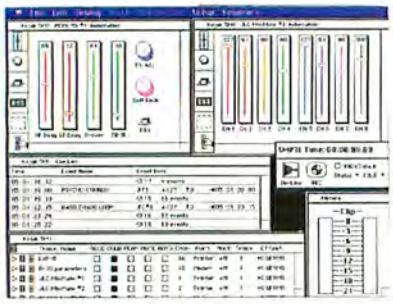


Psycho Strings
A Cue List for a MIDI events track, showing the pop-up keyboard used to edit the pitch that a MIDI note event triggers. The events named Psycho Strings and Bass Chaos Loop were created using the Repeat Events function, which can create any number of copies of an event with a single command.



Custom Control

A typical screen from Q-Sheet A/V 2.0, with custom control windows for two MIDI devices at top, the master Cue List showing events in all tracks in the center, and the track list at the bottom. The Meters window is for setting input levels for direct-to-hard-disk recording, and the small window just above it shows the current SMPTE time and the status of the program.

tiple files can play in succession, and you can trigger regions of a file (defined using Sound Tools software) as well. The length of a sound file is limited only by available hard-disk space; a 600MB hard disk can hold about an hour of stereo audio recorded with the same fidelity as a CD, without using data compression.

Q-Sheet A/V can record and play Sound Tools files, but Sound Tools has a host of audio editing features that aren't found in Q-Sheet A/V. Together they make quite an impressive system, providing programmable digital equalization, nondestructive editing, and other functions previously found only in dedicated audio workstations costing upwards of $60,000.

The Verdict

Considering the myriad tasks you can accomplish with it, Q-Sheet A/V is an amazingly simple program to learn and operate. While at first it appears that it would be most useful to people creating sound-effects tracks, you'd be surprised at how useful it is in a music-recording studio, even if you never work with video. Since it can be used as a general-purpose MIDI automation controller, Q-Sheet A/V makes a great addition to any studio that has a few effects devices capable of being controlled in real time via MIDI. While it won't replace the automation systems built into professional recording consoles (mainly because of limitations in the amount of data that can be transmitted simultaneously over MIDI), Q-Sheet A/V can put an incredible amount of control right at your fingertips. At $995, it's not a casual purchase for a small studio, but teamed with the Sound Tools package it can do things no other personal computer–based system can. If you need comprehensive MIDI automation control or if you need to assemble sound-effects tracks using MIDI instruments, Q-Sheet A/V is the only game in town.**—Charles Clouser**

See **Where to Buy** *or circle 840 on reader service card.*

Graph Programs

FLEXIGRAPHS 1.1

Pros: Includes a tool palette for manipulating graphs; provides different ways to constrain overall value of graphs. **Cons:** Only three graph types; limited formatting capability. **Company:** Tree Star. **Requires:** Mac Plus. **List price:** Version 1.1.2 $149.

GRAPH WIZ 1.0

Pros: Uses menus and keystrokes to enter expressions; includes many algebraic and trigonometric functions. **Cons:** Skimpy documentation. **Company:** William K. Bradford Publishing Company. **Requires:** Mac Plus. **List price:** $99.

FlexiGraphs and Graph Wiz do not compete with Microsoft Excel, Full Impact, or Wingz. Each offers a useful set of functions that are not available, or are extremely difficult to do, with spreadsheets.

FlexiGraphs reverses the traditional graphing approach. Using a spreadsheet, you create the table, and the program creates a graph based on the figures in the table. With FlexiGraphs, you manipulate the graph, and the program enters figures into a table.

Graph Wiz lets you type algebraic or trigonometric expressions; the program then draws a graph of the expression.

FlexiGraphs' Three Graphs

FlexiGraphs creates three types of graphs: pie, line, and bar. Imagine you have a $10,000 monthly advertising budget but haven't quite decided how much to allocate for television, radio, newspapers, direct mail, and magazines. To use the program, you might choose to work with a pie chart. FlexiGraphs can start you off with five equal slices, representing the five media. At the bottom of the screen, the program displays a table of data valuing each slice at $2000. As you resize the slices—trying to decide how much to spend in each area—the dollar values in the table change to reflect changes in the pie chart.

Dealing with constraints is one of FlexiGraphs' fortes. Because pie charts normally have an overall value, they are often used for budgets. When you allocate resources using FlexiGraph's constraints you're forced to remain within your budget. Whenever you increase the size of one slice, the size of the remaining slices—and the corresponding dollar values in the table—decreases in order to keep the total value of the pie at $10,000.

Conversely, FlexiGraphs can remove a pie chart's normally intrinsic constraints, so that when you resize a slice, the numeric values of the other slices remain the same and the overall value of the pie changes. FlexiGraphs can also constrain bar charts with a fixed overall value. Whenever you lengthen one bar, the remaining bars shorten in order to maintain the total value.

When you resize a slice or a bar of a constrained graph, the program changes the shape of the other slices or bars using either Even or Proportional distribution methods. If, in a four-slice pie, you lower one slice by $900, the Even method increases each of the remaining slices by $300. In the Proportional method, the larger remaining slices receive a larger share of the $900, and the smaller ones a lesser share.

FlexiGraphs has a palette of tools for manipulating the charts. The wand tool lets you directly manipulate the size of each bar in a bar chart or reshape the line in a line chart; the Floor tool lets you set a lower limit for all chart values; various Interval and Curve tools let you draw the overall shape of a chart; and the Ghost tool lets you simultaneously view old and new versions of a chart.

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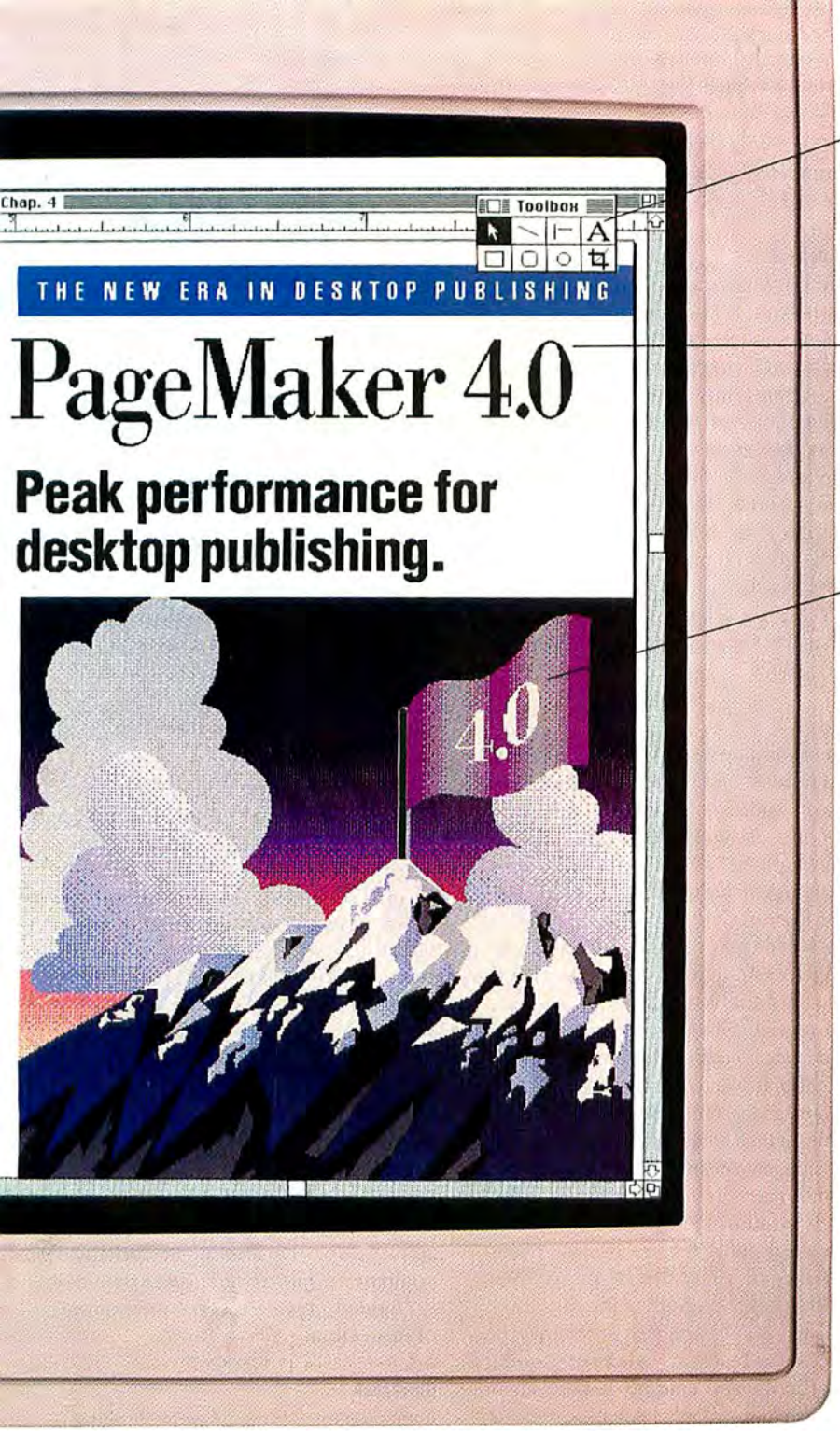

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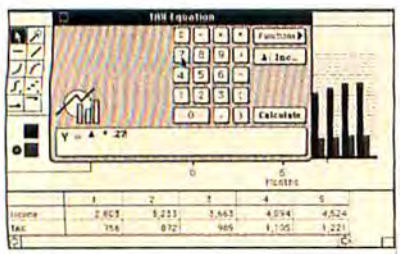
FlexiGraphs has limitations when compared with the charting capabilities of spreadsheets. First, FlexiGraphs has only three chart types: pie, line, and bar. Excel has those three plus scatter, area, and column. While FlexiGraphs lets you use functions and formulas to define the relationship between chart elements, you are limited to 11 functions, compared with over 100 in typical spreadsheets (see "FlexiGraphs"). FlexiGraphs does not provide arrows, shadows, overlays, and other formatting elements.

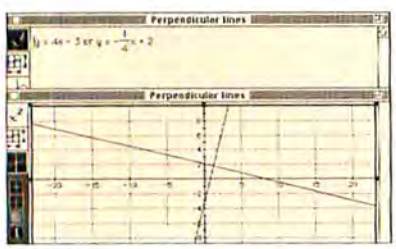
You can work around some of the problems by importing and exporting. FlexiGraphs imports spreadsheet tables in Text format and exports tables in Text and charts in PICT. But you lose formulas and functions when importing or exporting, and PICT charts must be completed using a draw or paint program.

If you need to manipulate charts directly and prefer to work with pictures and diagrams rather than abstract numbers, you will find FlexiGraph to be a great asset.



FlexiGraphs

You can enter equations that represent the relationship between elements of a graph using the Calculator window. In this example, *A* signifies Income and *Y* signifies Tax, set at .27 times Income. The chart at the right (Tax is represented by the shaded bars) and the table at the bottom reflect this equation.



Graph Wiz

This composite screen (you normally can't view these windows together) shows Graph Wiz's two major windows. You type an expression in the upper window. Then you click the chart button (third down on left) to view the graph of that expression.

Graph Wiz

Graph Wiz is a much simpler application with fewer functions. You use menus and keystroke combinations to enter an algebraic or trigonometric expression in one window, and you view the chart of that expression in a second window (see "Graph Wiz"). Anyone who has plodded through high school or college algebra or trig knows that graphing equations is a time-consuming exercise. Still, it is much easier to comprehend an ellipse plotted on graph paper than it is to visualize the same thing from the expression

$$x^2+\frac{5y^2}{8}=20$$

In my experience, however, plotting equations takes so much time that most students do only the minimum amount assigned. Graph Wiz lets you view graphs without drawing them. This might make students more willing to create charts of the expressions found in their textbooks, and as a result give students a better understanding of the subject matter.

Graph Wiz is easy to use. It provides menu commands and keystroke combinations to create such things as superscripts, numerators, and denominators. It also has 30 functions such as cosine, arc secant, and hyperbolic tangent. You can view a graph in a Preview window, and you can move the graph around the coordinate plane. Finally you open the Graph window, and the chart is waiting for you.

Graph Wiz's biggest problem is the lack of a teacher's guide or student textbook. The skimpy 19-page manual explains well enough how the program works, but it teaches virtually nothing about the underlying algebraic and trigonometric functions. Still, when the alternative is to have students use graph paper, rulers, protractors, and compasses, Graph Wiz is an excellent learning tool. It makes charting expressions easy and leaves students more time to concentrate on what the chart and the underlying mathematical principles represent.

—Lawrence Stevens

See **Where to Buy** *or circle 785 (FlexiGraphs), 792 (Graph Wiz) on reader service card.*

Password Screen Protector

QUICKLOCK 2.0

Pros: Quick, simple installation; easy to use. **Cons:** Protection can be bypassed; some visual glitches; a bit expensive. **Company:** Kent Marsh. **Requires:** Mac Plus. **List price:** $59.95.

Security Software

MACSAFE II 2.0

Pros: Quick, simple installation; easy to use; provides various levels of encryption and security; works well with groups. **Cons:** Some restrictions and problems with moving safes. **Company:** Kent Marsh. **Requires:** Mac 512KE. **List price:** $189.95.

Providing security for the Mac is no simple matter. Unlike UNIX, VMS, and other operating systems, the Mac Operating System has no concept of users, owners, passwords, and file protection. That means you have a simple, open system. It also means (as my sister found out) that your eight-year-old son can throw away all your files just to amuse himself with how the Trash icon works. An unattended Mac can have files removed, viewed, or modified, or can even have new files deposited (such as viruses and Trojan horses).

Kent Marsh specializes in security software for the Macintosh and the company's QuickLock and MacSafe II do indeed provide a certain measure of protection.

QuickLock

QuickLock is a screen saver (blanking the screen when it's not in use) as well as a security system (denying access except to those with the correct password). QuickLock is easy to install and allows you to customize the password display, settings, and hot spots. QuickLock cycles through up to 12 different animations provided in either color or black and white. The QuickLock cdev allows you to disable QuickLock or modify the options.

Once installed, QuickLock invokes itself automatically after a period of

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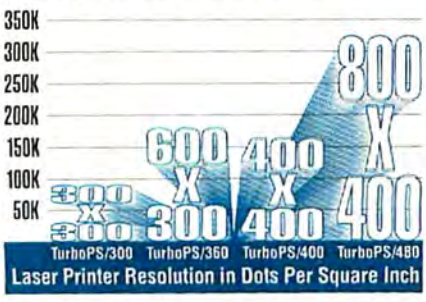

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inactivity or at a specified time, such as 6:30 p.m. (according to your settings). To launch QuickLock directly, just press the F-key you have previously selected or move the cursor to the selected hot spot. When QuickLock takes over, it turns all installed monitors black. One of the selected animations then appears on the main screen. When you press any key on the keyboard or the mouse button, a window appears asking for the password. If you give the correct password, the Mac returns to normal; otherwise, the window goes away, and the screen remains black. One option even has QuickLock shut down the system after a certain number of incorrect attempts. If you restart the system, QuickLock still has control of the screen and asks you for the password.

There is only one significant limitation to QuickLock, which the company freely acknowledges: you can bypass QuickLock by restarting from a different System floppy disk. One possible countermeasure, currently on the market, is a device that fits into the floppy drive's opening and locks with a key. Even without such a device, QuickLock is an inexpensive, flexible way to save the screen and provide a degree of privacy and security at the same time.

MacSafe

Because QuickLock can be bypassed and because there are times when multiple users will need access to a single system, some means of protecting specific files is essential. MacSafe II allows you to do just that, by permitting you to lock files within a safe and encrypt them at the same time if you want.

MacSafe II consists of the MacSafe II Administrator, a stand-alone application, and the MacSafe II cdev. The Administrator is used to create and delete safes, restore safes accidentally deleted, and override and change passwords. When you create a safe, you specify the passwords for the safe and its secret compartment. The secret compartment is like a safe within a safe, with one exception: anyone can move files into it. This means that anyone who knows the safe's password can move files into the secret compartment, but only those with the password to that compartment can open the files.

QuickLock

QuickLock brings up this dialog box and asks for the correct password each time someone tries to use the Macintosh.

MacSafe Administrator

The MacSafe Administrator program lets you create a new safe, giving it a name and selecting passwords and encryption method.

When you create a safe, you also select the encryption method: none, automatic (LightningCrypt), or manual (LightningCrypt, QuickCrypt, or DES). Automatic encryption means that every file is automatically encrypted when you move it into the safe and decrypted when you move it out. You select one code key when you create the safe, and that code key is stored with every encrypted file.

Manual encryption means that you select files to be encrypted or decrypted once they're in the safe. You must enter a code key each time, and you must remember the correct key for a given file, since it's not stored with the file itself. You can choose one of three algorithms to be used for a given safe: LightningCrypt, QuickCrypt, or DES. The first two are proprietary to Kent Marsh; the third is a U.S. government standard. Each is more secure—and more time-consuming—than the previous.

One important note: the MacSafe II Administrator should not be left unprotected on your hard disk because it can be used to delete or open any safe that it has created. You should set up a separate password for the Administrator. The question is, should you set a password for the copy on your master disk? If you do and then forget the password, you're in trouble. If you don't and someone gets hold of the master disk, you're in trouble. Suggestion: hide the master disk well, (but don't forget where you hid it).

To actually access a safe, you use the MacSafe II cdev. The Administrator has an option that lets you move MacSafe II (or any cdev) to the top of the Control Panel list so you don't have to bring up and scroll through the Control Panel each time you want to use MacSafe II. The Administrator also allows you to define a hot-key sequence to bring up the Control Panel.

With the MacSafe II cdev, you can open any MacSafe safe—even one created with a different copy of the program—if you know the password to get into that safe. Once there, you can move files in and out of the safe. When files are moved into a safe they are copied to another spot on the disk, renamed, locked, and made invisible. The original is then deleted. You can't copy a safe to another volume and still have it function correctly. Likewise, a file can only be moved to a safe if they are both on the same volume, and there must be space on that volume to make a copy of the file.

MacSafe II lets you define lists of files that can be moved together even if the files are located in different folders, thus making group moves fast and simple. You can't delete safes by throwing them away; the Finder always considers them locked.

The 120-page documentation is thorough and does an excellent job explaining MacSafe's uses and options. In addition, MacSafe has an online help feature with step-by-step instructions. (The Administrator, however, couldn't find the Help file, even though it was in the same folder. I had to help it find the folder.)

I have a few complaints about MacSafe II. The biggest is that it should allow you to move files from another volume into a safe, with the understanding that the invisible copies will be created on the same volume as the safe. You should also be able to move a file out of a safe onto another volume. The current approach limits the

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But there's more you can do. (The feature is called XTND.) You can import graphics, not only from Macs, but many computers, guaranteed. And you can scale and crop them, one and all, in your MacWrite II document. In short, MacWrite II with XTND is a powerful word processor that lets you freely exchange text and graphics. You'll find also that your MacWrite II lets you change fonts, styles, sizes and colors, as well as text with its find/change feature. And you can create custom styles and save them as stationery — with all formats preset. You'll share your reports and letters quickly.

But what good is freedom of expression if you find your editing to be a hassle? That's why the page layout and editing is fully WYSIWYG: the thoughts you see are the thoughts you get. This WYSIWYG feature, by the way, is found only with MacWriteII. It's another way Claris simplifies word processing for you, whether you're 52, 22, or 72.

Called upon daily MacWrite II smooths your writing assignments and other chores. There's MacWrite II spell checking, for example, and foreign dictionary programs that are optional, and a host of other features that come standard. (Like a thesaurus, and a mail merge feature you'll discover saves lots of time.)

What it adds up to, you'll find, is a simple and powerful tool designed for people. All the people. It is for writers, and it is for business people. And it is for those of us in between. The freedom to write is liberating. Now technology is, too.

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Circle 497 on reader service card

size and number of safe files on a floppy disk. Even with these complaints, I found MacSafe II to be a useful, well-written utility that should be seriously considered if you need to protect your files.—**Bruce Webster**

See Where to Buy or circle 810 (MacSafe II), 839 (QuickLock) on reader service card.

HyperCard and CD Audio Program

WARNER NEW MEDIA AUDIO NOTES SERIES: THE MAGIC FLUTE

Pros: Rich wealth of material; highly interactive structure; attractive graphic design. **Cons:** Uses a lot of hard disk space; poorly documented. **Company:** Warner New Media. **Requires:** Mac Plus; hard disk with 6MB free space; CD ROM player. **List price:** $66.

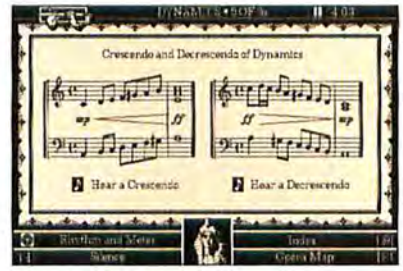
For those who love to leaf through a libretto while at the opera, or who always wished they had done so before attending one, a CD ROM that serves up fine opera plus synchronized libretto and measure-by-measure commentary should answer their every music-appreciation prayer. Warner New Media's The Magic Flute is the second product to take advantage of the Macintosh CD ROM device's ability to play back both audio recordings and computer information (see *Reviews*, June 1990).

The Magic Flute, a set of three CD ROM discs, contains a complete performance of the music of the Mozart opera, plus HyperCard stacks with more than 7000 screens full of opera text and commentary, plus an extra 77 minutes of recording that includes summaries of the spoken dialogue and music used to demonstrate points made in the commentary. The set also includes MIDI versions of some demonstration segments and a HyperCard link to the videodisc of the Ingmar Bergman film *The Magic Flute*. The opera, which can also be played on a normal CD player, is a Teldec recording of the Zurich Opera production directed by Nikolaus Harnoncourt, with a cast that features Matti Salminen, Hans-Peter Blochwitz, Edita Gruberova, Barbara Bonney, Anton Scharinger, and Peter Keller.

Audience Participation

Basically, once you've installed the program and set the opera in motion, as you listen you can jump around among notes and comments that point out musical niceties in the performance, provide historical background, or explain basic musical concepts. It's like flipping through a thick program book during a performance, but you don't have to worry about annoying the people near you with rustling pages. And some of the comments include buttons that let you play examples to demonstrate, say, a turn, or a decrescendo, or five kinds of cadences.

If you prefer to listen straight through without side trips—and the quality of the recording merits that attention—you can watch on screen the German or English libretto, a summary of the story's action, or a play-by-play musical analysis synchronized to the recording.



Learn by Listening

You can take side trips into The Magic Flute commentary, analysis, and notes on music fundamentals. Some of the notes include buttons, like the crescendo and decrescendo buttons here, that you click on to hear examples.

Synchronized Supertitles

With the Magic Flute Audio Notes CD, you can enjoy synchronized supertitles in the comfort of your own listening booth, in English or German. You can also view a summary of the story or a musical analysis of the opera. Buttons at the bottom of the screen take you to background information about the opera's music, meaning, or history.

The analysis zooms by at a pretty fast clip sometimes, but fortunately you can open a simple CD control panel that lets you rewind and replay or skip around among the tracks. There's also a more detailed musical analysis you can peruse that is not tied to the opera's progress; it's peppered with buttons that play musical examples.

Lost in Interface

The structure of The Magic Flute stacks lets you get at the information many different ways, through indexes, an outline of the opera, a glossary, and buttons that appear fleetingly at the bottom of the screen offering topics relevant to the current musical passage. This wealth of options really puts you in the driver's seat; but the dashboard controls don't look familiar; and it takes a bit of trial and error to figure out how to run the thing. The card graphics look tasteful and clean, but most of the buttons on the main opera card, however charming, aren't self-explanatory. For the first 40 minutes of fiddling with the program I wished for a legend to keep next to the Mac that pointed out the buttons and explained how they work.

This deficiency made starting up The Magic Flute the most frustrating thing about the program. When I double-clicked on the Magic Flute CD icon only an array of generic icons popped up. The brief insert was no help in figuring out the next step. After trying several generic icons and getting lots of error messages, I finally called Warner New Media for help. To save yourself the long-distance charges, double-click on the Installer file from the first CD to put everything you need on your hard disk. If you have enough disk space, do the same for all three CDs so you don't have to interrupt the opera for further installation. Thereafter you can start the program by double-clicking any Magic Flute stack icon in the CD window.

Fine Tuning

Another annoyance is really a matter of expectations: when you listen to a professional audio recording, no matter what the shortcomings of the performance, you don't expect to hear music stands toppling over, or divas

(continues)

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clearing their throats. And you don't hear that on the Magic Flute recording. But the accompanying stacks have a bit of a garage-band feel: sloppy audio edits in some examples, typos, obscured text in the Introduction stack, and of course the confusion when you try to start up.

These complaints, though, concern minutiae. Although I wish more than just a few snippets of the score were included, the substance of the product is worthwhile, covering the same range as the standard opera reference works with more depth, plus music fundamentals and a full libretto. And at only $20 to $40 more than most audio-only CD sets of the same opera, it's a good value. Warner plans to issue a full series of Audio Notes, ranging from counterpoint to jazz improvisation. I hope that future stacks show the same polish as the recordings they accompany.

For teachers, students, autodidacts, and opera fans who enjoy listening best while poring over a libretto, I heartily recommend this Magic Flute. Music lovers who eye what Virgil Thomson calls "the appreciation racket" with suspicion, on the other hand, will probably stick to listening, on the much cheaper audio-only CD players.—**Nancy E. Dunn**

See **Where to Buy** *or circle 812 on reader service card.*

Award Design Program

LASER AWARD MAKER

Pros: Simple to use; comes with wide variety of ready-to-use designs.
Cons: Expensive; prior to printing, document can only be viewed in greatly reduced print-preview mode.
Company: Baudville Computer Products.
Requires: Mac Plus. **List price:** $199.

Baudville's Laser Award Maker is designed to let anyone with access to a Macintosh Plus and a laser printer produce high-quality, single-page documents to honor people whose accomplishments warrant a pat on the back. Although the program is quite simple to use, it comes with a thick manual, half of which is actually a catalog of over 1000 templates, called award styles. These include patterns for formal-looking documents that recognize specific achievements in business, education, sports, and other endeavors and for light-hearted awards, gift certificates, coupons, and tickets.

Print Preview Screen
Print Preview lets you see the layout of a customized award but is not suitable for proofreading. The static window on the left lists the steps you follow to produce an award.

When you start the program, you are asked to enter the number of the award style (listed in the manual) that you want to produce. After you perform each step to customize the award style, the window for the next step appears. A checklist for designing certificates that stays on the left side of the screen allows you to go back and change entries at any time.

Some templates have built-in graphics, others provide a spot where you can import your own PICT image from the Clipboard. You can choose among 20 borders—including no border at all—or you can design and import your own. Laser Award Maker uses only its own four fonts—Old English, Coventry Script, Book Serif, and Modern—and will not access fonts in the System. Certainly an inflexible system, but it may be a blessing for those with no design sense, since it makes it difficult to engineer atrocious awards.

We the Undersigned

Most of the templates come with precomposed text, which you can use as is (but be on the lookout for typos), edit, or replace with something original. The space provided for text varies with each template, and although you might be able to change to a font that is more compact, you cannot change to a smaller size of the same font to squeeze in more words. Print Preview is the only mode that lets you see how the award will look before you send it to the printer (see "Print Preview Screen"). The image is too small to allow you to proofread the text; you need to do that in the windows where you enter and edit names and text.

A feature called Name List Printing makes it easy to produce identical awards for different people and in some cases saves time on the printer too. Laser Award Maker output is graphics intensive, so printing can take a long time; it took me more than 20 minutes to print a relatively simple award. If you are producing multiple awards using a Name List and you have a PostScript-compatible printer, fast Name List printing, which only images the basic award once, can speed up the process.

Added Costs

Output on ordinary laser-printer paper is rather drab, but Baudville suggests that you use its special papers, some of which have color borders or gold lettering. A sample packet is included with the program. The company also markets such "personal recognition accessories" as plaques for mounting certificates and personalized embossers for stamping gold seals. Users who plan to sell the awards and certificates they produce are required to pay a $100 annual commercial fee. In return, though, they get $100 worth of specialty papers.

If you plan to print your creations at a service bureau, you could run into some problems. The product comes on five disks, and unless the service bureau lets you temporarily install Laser Award Maker on its hard disk, you will be doing a lot of disk swapping as the program looks for the various templates, fonts, and borders. You will also need to be concerned that the service-bureau clerk puts the special papers into the cassette properly—so the color borders don't appear on the back of the award, for instance.

Not a Bargain Award

At $199, Laser Award Maker is pretty pricey for a single-function program. If you want to get the most out of it by using Baudville's special papers, it will be even more expensive, and a license for using the program on multiple computers will make the price even higher.—**Gerry Lukos**

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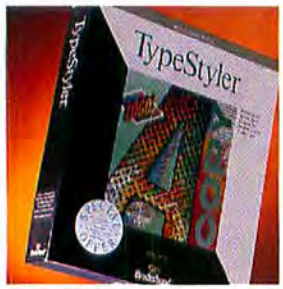

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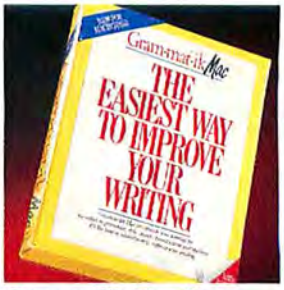

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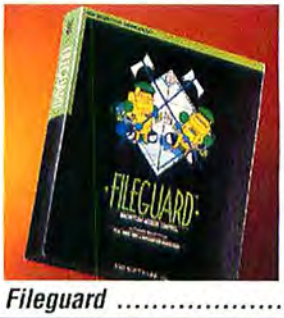

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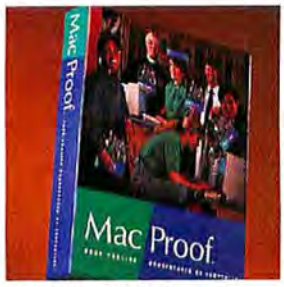

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Loop Software

Picture Book	38.

Mac Master

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Magic Software

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Magna

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Mainstay

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5 pack	517.
MarkUp single	127.
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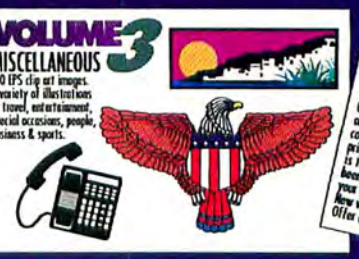

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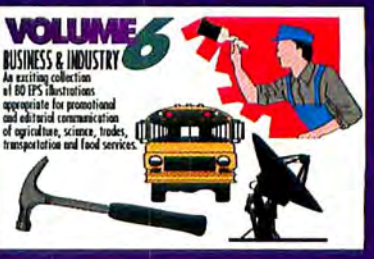

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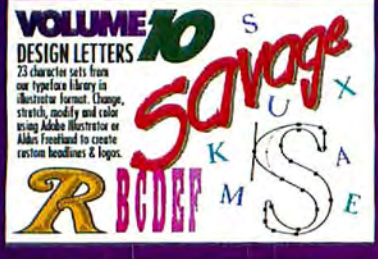

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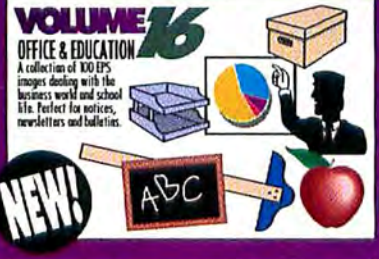

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WINDOW SHOPPING

by Lawrence Stevens

This month I'm writing about a potpourri of worthy programs Macworld has received in the past few months

Personal Reference Catalog 2.0

Many of the HyperCard databases that I see these days follow the same general format as in Focal Point. Typically, when entering data in HyperCard, you can assign a topic and a number of keywords to each card.

Personal Reference Catalog, or PRC ($79 from Delphinus), for storing bibliographic references, uses this basic topic-and-keyword format. But PRC adds two features specifically designed for bibliographies.

The first feature is the ability to temporarily link cards. Keywords and topics traditionally provide a more or less permanent association, but a stack that contains information about books and magazines needs associations that can be quickly added and deleted and that follow a specified order.

PRC provides a menu that lets you quickly create or delete associations in a specific order or chain structure.

PRC can print bibliographic citations for either magazines or books according to the bibliographic format of the *MLA Handbook* (Written by Joseph Gibaldi and Walter S. Achtert, published by Modern Language Association). When you create a new card in PRC, you indicate on the card if the citation is for a magazine article or a book. Then when you print the citation, all the punctuation marks are placed automatically. PRC provides a number of mail merge templates for Microsoft Word and MacWrite II so you can create a variety of bibliographic formats.

MacLit: The Guide to Macintosh Literature 1.0

MacLit ($119; $149 with Double Helix 3.0 runtime; $99 for a one-year up-

RON CHAN

date subscription from Black Gryphon) is a bibliographic database that includes over 4000 references to Macintosh-related articles. Because MacLit is written in Double Helix 3.0, it has powerful searching features, including Boolean logic.

You will need over 9 megabytes of disk space for MacLit, however, and if you don't have at least a 68020 processor, access can take a long time. Even with a 68030 processor, many of my searches took over five minutes.

The main alternatives to MacLit are dial-up database services. With MacLit you avoid the fees that dial-up services charge. Also, MacLit indexes 11 magazines, 2 of which, Active Window and MacTechQuarterly, are not available on dial-up databases.

Database of Mac Literature

MacLit provides author, title, and publication information for over 4000 articles written on Macintosh-related subjects.

If you need to look up Mac articles, have the computer resources to handle a large Double Helix database, and have access to the actual magazines, MacLit can be a cost-effective means of finding information (see "Database of Mac Literature").

Time&Money 1.0

While bibliographic research is a large part of my daily work, I frequently have to venture out into the business world. For example, my brother and I run a small book-packaging business.

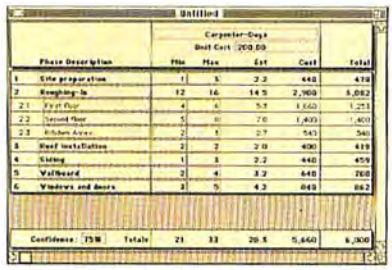
After we sold a book idea on computer-aided engineering, the editor invited us to bid on providing mechanicals. We won the bid, but we estimated our hourly wage too low.

Like many amateurs we valued each task about halfway between our high and low estimate of how much it would cost. So if we estimated page layout to take between 50 and 70 hours, we figured it at 60 hours.

Unfortunately, that technique fails to take into account some important factors that statisticians, but few other people, understand. You can arrive at a much more accurate cost estimate if you use statistical-analysis functions such as standard deviation, linear trends, and variance.

Time&Money ($125 from Arborworks) is easy to use because it applies statistical functions in the background. You only input four things: the resource (carpenter, typist, van, imagesetter) for each task, your estimate of the maximum and minimum units (hours, days, bricks, miles) needed for each job, the dollar value per unit, and a percentage that repre-

(continues)



Using Statistical Analysis for Cost Estimating

Time&Money uses statistical analysis functions to help you zero in on the probable cost of a project. The number you type in the Confidence box represents how sure you want to be that you will not go over budget. (If you type 50 percent in the box the chances are even that you will go over budget.) If you want to bid aggressively and are willing to take a risk, you can lower the Confidence percentage.

sents how confident you need to be that you don't run over budget (see "Using Statistical Analysis for Cost Estimating"). The program then gives you a total cost for the project.

The only thing I don't like about Time&Money is that each resource measured by a different unit or a different value-per-unit must be on a separate screen. So if one project requires a carpenter who costs $200 a day, a laborer who costs $10 an hour, and a truck that costs 45 cents a mile, you must flip through three screens to input the data for that project.

While this makes the program a bit cumbersome, being able to use statistical analysis to estimate the cost of your jobs is a big advantage.

MacSurvey 1.5

MacSurvey ($79.95; $45 with education discount, from CompStat Software) is another program that automates a statistical-analysis task. In this case, the task is inputting and tabulating information from public-opinion questionnaires. MacSurvey does not create the questionnaire form, rather it helps you tabulate the data once you have gotten the forms back from the respondents.

Entering Questionnaire Responses

MacSurvey allows you to tally responses to questionnaires using your mouse. Survey questions are identified by number. You click on the letter that represents the respondent's answer to the questions. The program keeps track of the results and tabulates them.

First you set up the program by describing the questionnaire: how many questions it is to have; how many possible responses for each question; and which questions it asks to obtain demographic data, such as age, sex, or income (MacSurvey can handle up to six demographic questions). When you have entered all the responses, the program displays a series of tables showing how each demographic group answered each question (see "Entering Questionnaire Responses").

The program provides a relatively painless way to enter and tabulate survey data. But it could use a text editor or some other way to format the tables (you can, however, export them as text).

A second problem is that MacSurvey only identifies the survey questions and responses by number and letter rather than by the actual question or response. One exception is that you can identify demographic groups by name, but you are limited to five characters. So "woman" or "17–21" squeaks by, but "$15K–$20K" doesn't.

If all you need are the basics, MacSurvey does an excellent job. It's easy, fast, and accurate. But I do hope that future versions will allow you to input the actual questions and format tables.

StudyMate 1.0

When I was in high school, I used to write practice tests that I could study on the subway. This study method wasn't unique; I could see other students on the trains mouthing answers to questions scribbled on index cards or note sheets.

If my son and his friends are any gauge, students no longer create their own tests for study purposes. StudyMate ($49.95 from Compu-Teach), a HyperCard stack, might revive this study method.

After identifying each practice-test question as True/False, Multiple Choice, Question-Response, Fill in the Blanks, or Spell Scramble, you type the questions and answers in separate fields.

When you take the test, one question appears on the screen at a time. You type or, in the case of a true-or-false or multiple-choice question, click on the answer. Except for true-or-false questions, there are two chances to answer correctly. If you miss both times, the program displays the correct answer. After completing the test, you can go back to the questions that were answered incorrectly. The test can be printed with the answers next to the questions or at the end of the test.

Normally the two hardest questions to input in a test are multiple choice (because you have to type a selection of wrong responses along with the correct answer) and spelling (because you have to find a way to identify the word without spelling it out). StudyMate solves both these problems. When you create a multiple-choice test, all you have to type is the correct response for each question. The program fills in incorrect responses for each question by randomly selecting responses from other questions of the test.

With spelling questions, you just type in the correct spelling and specify that the program either scramble the letters or display the word with a few randomly selected missing letters.

StudyMate should not be confused with MakeTest, a test generator for teachers that I reviewed last month. StudyMate does not provide the selection of hard-copy formats for printing the tests that teachers need. It's strictly for students.

I'm really enthusiastic about StudyMate. It's hard to imagine a student using it for a few months without his or her grades improving.

Letter Writer Plus 1.0

ExpressWrite, by Exodus Software, which was reviewed last October, is now called Letter Writer Plus, and is available for $89.95 from Power Up Software. M

See Where to Buy *or circle 804 (Letter Writer Plus), 808 (MacLit), 811 (MacSurvey), 834 (Personal Reference Catalog), 863 (StudyMate), 870 (Time&Money) on reader service card.*

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PACIFIC
DATA PRODUCTS

*IID duplexing feature not supported in PostScript mode.

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Queen Victoria

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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

8L Display Board, 24L Display Board

24-bit true-color display boards for the Macintosh II family that support image resolutions of 640 by 480, 800 by 600, or 1024 by 768 pixels at screen-refresh rates of 60Hz or 75Hz. Both models support block mode transfer. 8L Display Board $1995, 24L Display Board $3995. RasterOps, 408/562-4200.

15" Full Page Display System

Full-page display system with monochrome monitor that can display an 8½-by-11-inch page with no need for scrolling or zooming. Designed for word processing, spreadsheets, and page-layout applications. Monitor is noninterlaced and includes a tilt-and-swivel base and a monochrome video board. $899. Cutting Edge, 307/789-0582.

Bernoulli Transportable

AC-powered transportable Bernoulli box that is a self-contained unit with retractable handle and stand. Comes with push-button SCSI ID select switch, line-voltage select switch, two 50-pin SCSI connectors, and a 5-volt power outlet for Bernoulli Parallel Port Adapter. $1799. Iomega, 801/778-1000.

BridgePort

Electronic switching device that allows Macintoshes or IBM PCs to connect to a PostScript printer without user intervention. Emulates the LaserWriter to enable Macintosh users to print PostScript to non-Apple printers. Compatible with HP LaserJet, Apple LaserWriter, IBM Laser Printer with PostScript Option, and QMS PostScript 810 Turbo Printer. $495. Extended Systems, 208/322-7575.

BridgePort

Concord 1050 Hard Drive

A 1-gigabyte hard disk subsystem that has 1050MB unformatted capacity and 990MB formatted capacity. Has disk-transfer rate of 23 megabits per second and an average seek time of 15 milliseconds. Has a small footprint and weighs 13 pounds. Has 3-year warranty. $9795. Optima Technology, 714/476-0515.

DAT-1300

Tape-backup system that uses a Sony helical scan 4mm tape drive. Provides access of up to 1.3 gigabytes with an average access time of less than 20 seconds. Ships with Retrospect backup utility. $3995. Pinnacle Micro, 714/727-3300, 800/553-7070.

DAT-1300

Ether-Route

Hardware LocalTalk-to-Ethernet gateway/router that provides a dedicated DMA channel for each of its two LocalTalk ports. Enables devices using the AppleTalk protocols on one network to communicate with devices using the same protocols on another, allowing transparent communication between computers, servers, and printers, throughout the connected networks. $1495. Compatible Systems Corporation, 303/444-9532.

Ether-Route

GPIB-SE/30 Interface Board

General-purpose interface bus instrument-controller board for the Mac SE/30 that is IEEE-488.2-compatible. $495. National Instruments, 512/794-0100.

Ideacomm Mac Card

Board with emulation software used to link Macintosh II or SE machines to IBM AS/400 or System 36/38 computers. Includes a file-transfer utility that allows users to access entire files or parts of files as needed. Enables the user to configure and display data retrieved from the host system in any order without the need for customized host programming. $1195. IdeAssociates, 508/663-6878.

ISDN H-Server

AppleTalk router/bridge with built-in ISDN terminal adapter. Permits direct connection to the ISDN basic rate line to provide high-speed AppleTalk links to distant locations. Includes a scripting language that permits data calls to be initiated from the network. Provides visible call status for monitoring calls. *(continues)*

ISDN H-Server

$3195. Solana Electronics, 619/573-0800.

Lasersafe

600-megabyte erasable optical drive that can be used with a Macintosh, Novell, or OS/2 network. Uses onboard caching and includes special disk utilities for archiving. $4995. Iomega, 801/778-1000.

MacProteus

NuBus board that when used as part of a MIDI system produces 32 voices of digitally sampled instruments. Can produce the sounds of 16 instruments simultaneously. $895. Digidesign, 415/688-0608.

Phaser PX

PostScript-compatible 300-dots-per-inch printer with multitasking connectivity that can automatically switch among its serial,

Phaser PX

parallel, and AppleTalk ports. Supports Hewlett-Packard Graphics Language, and has the ability to dynamically switch between PostScript and HP-GL emulation. $7995. Tektronix, 503/297-6762.

PortaRAM

User-upgradable memory board that gives the Macintosh Portable from 1MB to 8MB of additional storage. Uses the RAM slot and holds from 1MB to 8MB of pseudostatic RAM. Base unit with 1MB $795, each additional MB $495. Shadow Technologies, 415/548-0130.

The Portfolio

Hand-held portable computer. Has a built-in word processor, spreadsheet, calculator, telephone directory, diary, and alarm. Screen is 6 inches wide and 4 inches high. Unit is battery operated and fits in the palm of your hand. Comes with software and cable. Enables you to download IBM PC–based files into the Macintosh. $599. Computer Friends, 503/626-2291.

The Portfolio

Power II VGA Monitor

14-inch VGA monitor. Operates with 0.28mm dot

Power II VGA Monitor

pitch, and supports 1024 by 768 pixel resolution. Has horizontal scan frequencies of 31.5kHz and 35.5kHz. Supports all Mac II models. $599. Power II Technologies, 714/256-5000.

Rack Mount 100GB Tape Library

Rack-mounted, automatic, 8mm tape cartridge library that stores and retrieves up to 100 gigabytes of data. Holds 45 tape cartridges and contains an exchange mechanism that is built with few moving parts. Cartridges are accessible in 5 seconds via the front panel or in 3 minutes by exchang-

HP offers you the best things next

From input to output, Hewlett-Packard leads the way. With a full line of Mac-compatible printer and scanner choices.

For photographic-quality scanning, there's the HP ScanJet Plus scanner. Combine that with one of HP's high-quality printers. The DeskWriter, the new LaserJet III, the LaserJet IIP, or the LaserJet IID. HP even has color printers. The PaintJet and the PaintWriter XL.

Plus, HP stands behind all their products with exceptional service and support. And a one year warranty. It doesn't get much better than that.

There is a better way.

HEWLETT PACKARD

Rack Mount 100GB Tape Library

ing the cartridge carousel. $19,800. Colorado Tech Designs, 303/449-0963.

Super Static 3

3MB memory module for the Mac Portable; uses static RAM to produce a true sleep mode to make efficient use of the machine's battery power. Fits in the RAM slot to leave the Processor Direct Slot open for the addition of accelerator boards. $1195. Technology Works, 512/794-8533

The TV Board

8-bit NTSC/PAL switchable NuBus video board that can be hooked up to cable-ready TV sets for use with desktop presentation applications. Board can also be hooked up to a VCR to enable taping of Mac output. $599. Generation X Technologies, 408/739-4570.

The TV Box

External NTSC device compatible with entire line of Apple's 8-bit and 24-bit color video boards to produce the same output as the TV Board, without using another NuBus slot. Has exclusive GX filter to suppress color-bar distortion. $399. Generation X Technologies, 408/739-4570.

The TV Box

Ultra 14

14-inch color monitor that supports VGA, Super VGA, and IBM's 8514/A graphics standards at 1024 by 768 resolution. Compatible with IBM PC, XT, AT, and PS/2 systems and with Mac II and SE. $899. Princeton Graphic Systems, 404/664-1010.

Ultra 14

Xceed

4MB memory-expansion kit for the Mac IIfx and the LaserWriter IINTX printer. Kits contain four 1MB memory modules. $509. Micron, 208/368-4400.

SOFTWARE

Accident Reconstruction Calc

HyperCard-based software that uses a series of standard formulas to reconstruct and evaluate auto accidents from written reports. Reference section can be used to determine which values to use in the formulas. Designed for attorneys, police officers, insurance adjusters, and private investigators. 1MB min. memory. $47. Hansen & Associates, 805/298-4341.

Agency/Studio

Ad-management software designed as a template package for use with Microsoft Works 2.0. Helps agencies and design studios automate tasks such as generating insertion orders and job tickets, controlling

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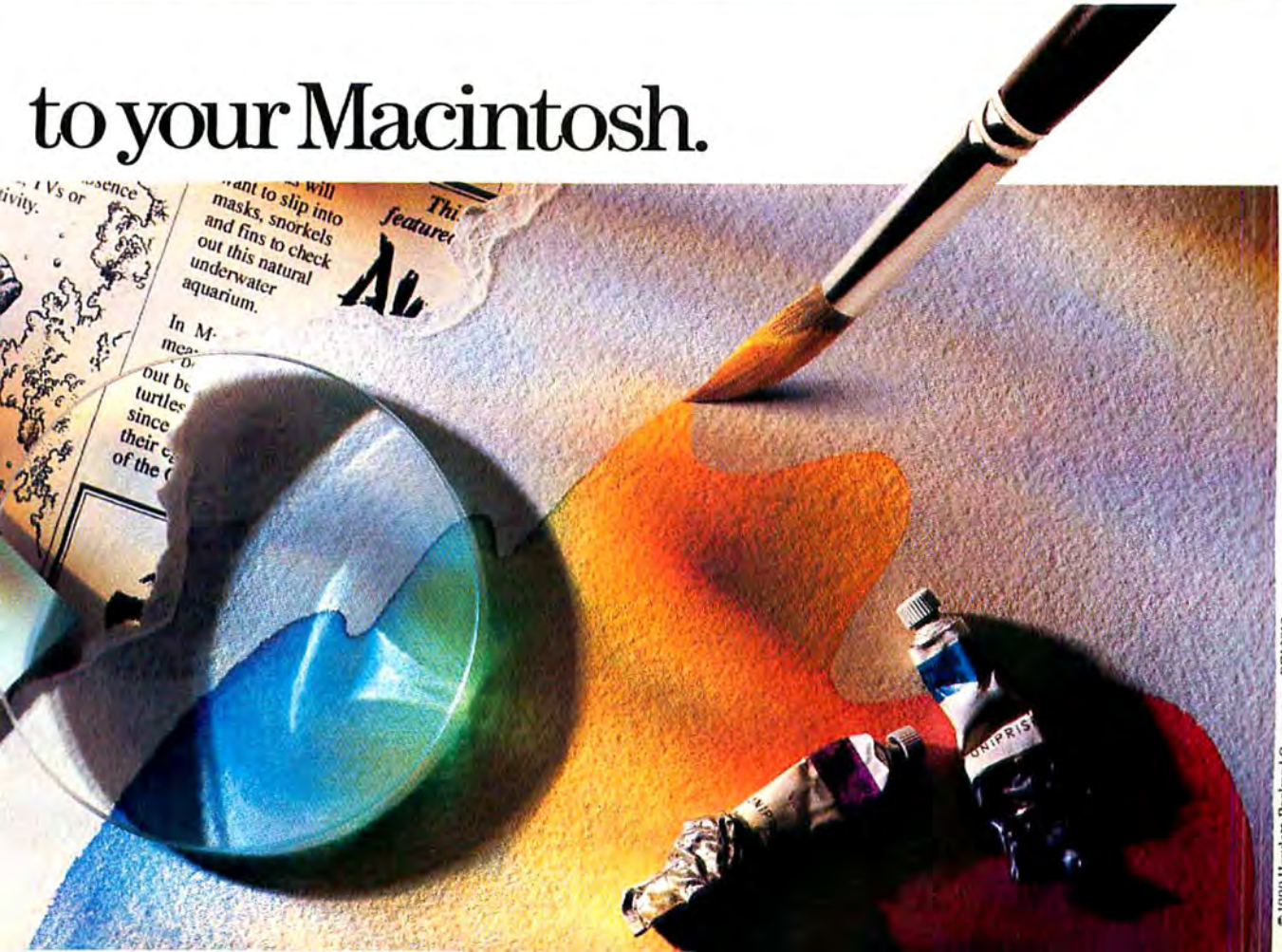
to your Macintosh.



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job scheduling and reporting, and providing automated job estimates. Supplies a range of reports that can be used for billing and management analysis. 1MB min. memory. $179. Garvey Associates, 508/224-7185.

Amazing Paint

Black-and-white paint program that can be used to create paint documents, modify scanned images, and copy or cut clip art. Includes a feature for multiple undos, has lasso and marquee selection tools, and includes a magic wand that enables the user to select an object with one click, and a shape selector to allow selections using different frames. 512KE min. memory. $99.95. CE Software, 515/224-1995.

Aspects

Software that enables networked or modem-linked Macs to simulate a conference-room environment. Lets from 2 to 16 users simultaneously create, modify, and review documents. As changes are made, each user sees those changes instantaneously as they appear on the the originator's screen. 1MB min. memory. $299. Group Technologies, 703/528-1555.

Cryptogrammar

Shareware electronic note pad that can be used to solve cryptograms, or quotes, jokes, or sayings that are encrypted by a letter-substitution code. Program provides a letter-frequency analysis and statistical information about the English language that is designed to help the user find solutions. 512KE min. memory. $12. Gary Kowalski, 714/543-5592.

Deck

Digital multitrack recording software that needs to be used in conjunction with Digidesign's hard disk recording board for the Mac II, Audiomedia, or Digidesign's Sound Tools product. Can play back MIDI simultaneously, has automated mixdown. Records to compact disc standards of 44.1kHz and 16-bit 1MB min. memory. $349. Digidesign, 415/688-0608.

Deck

Design Your Own Home, Interiors for the Macintosh

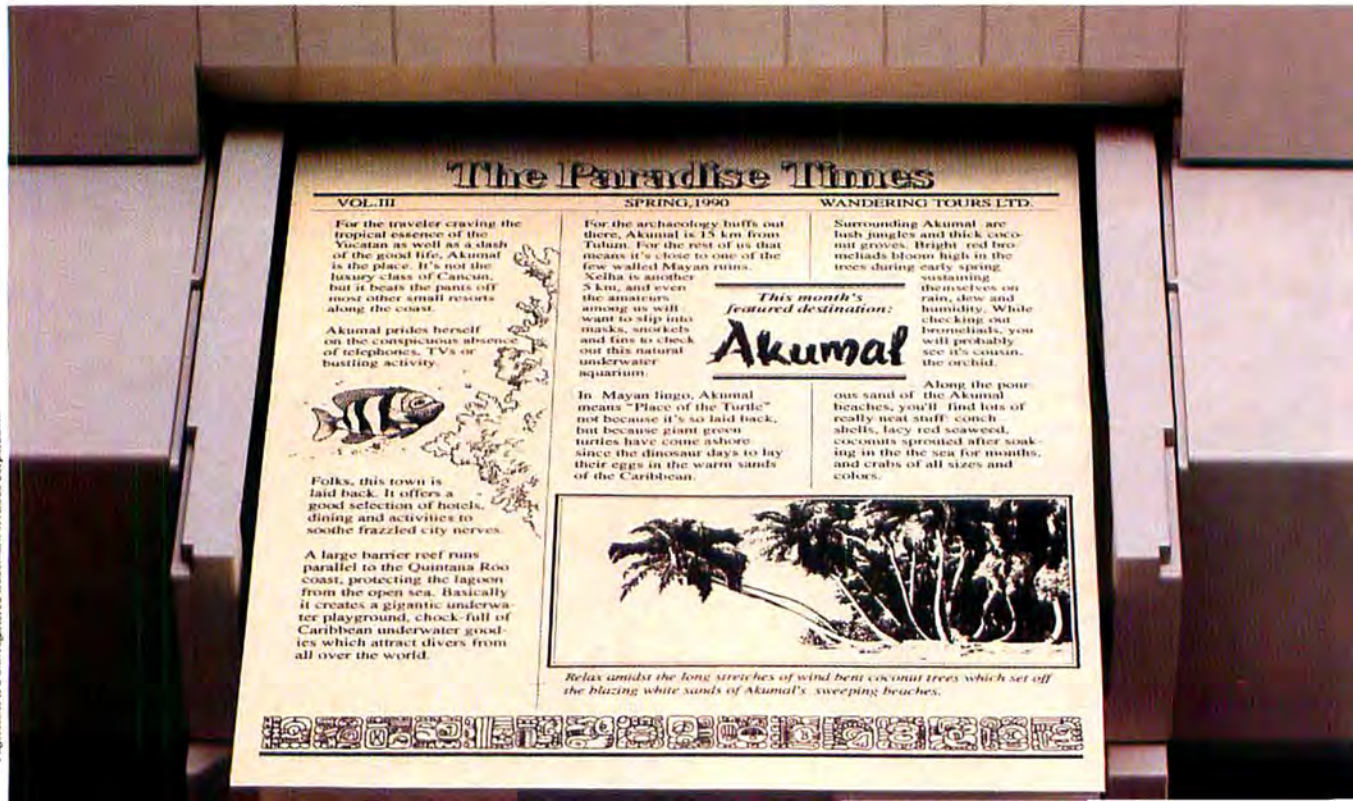
Object-oriented home-decorating and -furnishing software that includes a variety of drawing tools and a palette of colors and patterns that enable the user to plan the decor for rooms in a house. Program can display line dimensions and angles and can save custom-made objects to the Clipboard or disk for reuse. Comes with a library of furnishings. 1MB min. memory. $99.95. Abracadata, 503/342-3030.

Design Your Own Home

DocuKey

Electronic keynoting system assists design professionals in organizing and integrating written specifications and working draw-

With the HP DeskWriter, you can



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ings. Program restructures text (call-outs) contained in working drawings and creates a numbered keynote system for identifying items in drawing. Provides an audit trail for changes and updates. 1MB min. memory. Single user $395; site license $249 additional. Architectural Synthesis, 615/734-1500.

Earthquest

Earthquest

Software collection of information about social studies, science, history, environmental studies, geography, and the arts. Designed for home and educational use. User can customize and print any part of the program using built-in paint and draw tools in the Earthquest Workshop. Includes charts, tables, maps, and a list of 101 things people can do to save the environment. 1MB min. memory. $99. Earthquest, 415/321-5838.

Equator

Spreadsheet program that can be used with transputer board for faster operation. Is capable of producing 1000 rows by 1000 columns by 1000 planes and 26 circular, inverse circular, hyperbolic, and inverse hyperbolic functions. 2MB min. memory. $439. Tri-Millennium, 617/789-3996.

GodSpeed

Bible-search software that includes the King James version text, Nave's 640 Topic Bible, close to 200,000 cross-references from the *Treasury of Scripture Knowledge*, and the NCAN Modern Political Database. 512K min. memory. Basic edition $49, reference edition $99. Kingdom Age Software, 214/539-7855.

How to Make Money at Home by Mail

Instructional program that gives users information about the retail, wholesale, and mail-order businesses. Includes sections on obtaining free postage, printing, and advertising, as well as methods for raising cash quickly. 1MB min. memory. $29.95. Christensen's, 408/259-8695.

HyperBug

Set of HyperCard stacks for teaching the fundamentals of entomology. Includes illustrated summaries of the insect orders with information on biology, methods of collection, and sets of bibliographic references for each order. Includes a metamorphosis stack, addresses of supply houses, book dealers, and entomological organizations. 1MB min. memory. $20. Entomation, 313/971-6033.

HyperBug

HyperSpeller

HyperCard-based spelling checker that operates with an interactive dialog box similar to those found in spelling checkers in word processing applications. Includes Spell Finder, the same dictionary MacWrite

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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 $995* 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 has both serial and Apple Talk interfaces. It 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.

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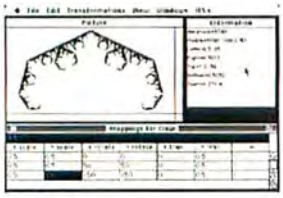
uses. 1MB min. memory. $49.95. Foundation Publishing, 612/445-9960.

IFS Explorer

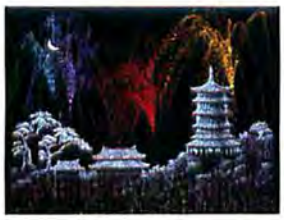
Fractal exploration program. Lets the user create fractals using iterated function systems. Comes with a fractal library of over 60 fractal images and a user guide. 512KE min. memory. $49.95 (introductory price $39.95). Koyn Software, 314/878-9125.



IFS Explorer

Ishido: The Way of the Stone

Game in which one or more players must accurately place 72 stones from a pouch onto a 96-square



Ishido: The Way of the Stone

game board. Each stone is decorated with a symbol and a color (pattern when used in black-and-white) and can only be placed next to another stone that matches either its symbol or its color. Play becomes more complex as the board begins to fill with stones. Can be played according to ancient or modern rules. 2MB min. memory. $49.95. Accolade, 408/985-1700.

Logo Math: Tools & Games

Software for the secondary school math curriculum; contains 14 programs to help students in grades 6 through 12 investigate mathematics. Consists of six games and eight tools, and contains a geometry construction tool and graphing program. Designed to enhance the study of geometry, algebra, trigonometry, probability, statistics, precalculus, and calculus. 512K min. memory. Single copy $39.95; site license $99.95. Terrapin, 207/878-8200.

MacNIX

Communications software that enables the Mac to access UNIX applications and operate using a standard Macintosh interface. Can be used with serial port or Ethernet connections. Operates under MultiFinder to enable UNIX processes and Mac applications to run concurrently. Emulates VT100 and VT220 terminals. Available for Sun, DEC, HP, NCR, and other computers running UNIX and Xenix. 1MB min. memory. $800 and up depending on configuration. UniPress Software, 201/985-8000.

MacSki

Skiing simulation that runs in black and white or color. User selects a course from 20 runs or designs an individual run. Program provides 256 different weather configurations. Game can be played at several levels of difficulty. 1MB min. memory. $69.95. XOR Corporation, 612/831-0444.

MacSki

Stratego

Computer version of Milton Bradley's Stratego in which

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.

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For all its amenities, ease of use, good image quality, and low price, *Publish!* recommends the HP ScanJet Plus as their "Best Buy."

one player competes with the computer. Each side has a 40-piece army made up of officers ranked in importance according to their position, one spy, six bombs, and one flag. Each opponent secretly sets up one side of the game board or battlefield, planning a defense and an offense. Whichever side captures the opponent's flag first wins the game. 1MB min. memory. $49.95. Accolade, 408/985-1700.

Stratego

Wedding Set

Color collection of still images and backdrops de-

Wedding Set

signed to be integrated into wedding videos or presentations. Images can be animated with a program such as MacroMind Director. Must be used with presentation, desktop publishing, or desktop video software. 1MB min. memory. $44. Video Visions, 617/391-9224.

Where in Time Is Carmen Sandiego?

Detective chase game that highlights leading people, events, and inventions of the past 1500 years. The player takes the part of a detective who has been as-

Where in Time Is Carmen Sandiego?

signed the task of searching for a band of renegades through history via a time machine. Game comes with a 1300-page reference book, *The New American Desk Encyclopedia* (New American Library Signet Book, 1989). Can be used in black and white and color. 1MB min. memory. $49.95. Brøderbund Software, 415/492-3200.

WordScan

OCR software package designed to scan all types of documents and read both text and graphics in a single pass. Uses omnifont technology and is designed to support a variety of scanners. 2MB min. memory. $595. Calera Recognition Systems, 408/986-8006.

WP Medical Spelling File

Medical terminology dictionary that includes more than 130,000 words and terms, and more than 600 medical prefixes and suffixes. Based on WordPerfect spelling dictionary. 1MB min. memory. $39.95 plus $2.50 s/h. MacHelp Associates, 302/734-7491.

Writing Process Workshop

HyperCard program designed for students in grades 6 through 12 as well as for use in remedial college courses and adult writing courses. Designed to help students develop writing and word processing skills. Provides instruction

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got it made in the shades.

*Suggested U.S. list price. ©1990 Hewlett-Packard Company PE12004

in various writing disciplines such as autobiography, persuasive writing, evaluative writing, and reports. 1MB min. memory. Individual skill program $69.96; set of four skill programs $229. Educational Activities, 516/223-4666.

ACCESSORIES

Defender LAN 600

Off-line, Novell-compatible uninterruptible power supply that is built with a Novell local area network interface. $363. Write Computer Power, 201/638-8000, 800/526-5088.

Essentializer

Desk organizer that combines a 3½-inch disk holder with accessory compartments; designed to hold up to ten disks and common desktop items such as pens, pencils, scissors, and notebooks. Comes in black and putty. $9.95. GP Technologies, 201/722-7117.

Faxsential

Fax station organizer for keeping everything necessary to send a facsimile in separate compartments of one unit. Can be set near a fax table, mounted on the side of a fax table, or mounted on a wall. Holds 8½-by-11-inch fax header sheets, a roll of tape, stapler, note pads, paper clips, and incidentals. Has built-in tape cutter. $19.95. GP Technologies, 201/722-7117.

The Mac Minder

Ergonomic stand for the compact Macintosh models and 12-inch to 15-inch monitors. Designed to raise and tilt the computer or monitor to a comfortable viewing height and angle and allows user to store the keyboard underneath the monitor. Unit slides easily on a desktop so it can be pushed aside when not in use. $49.95. Skene Design, 516/331-5060.

The Mac Minder

The Mac II Minder

Stand that lifts a Mac IIcx or IIci CPU and monitor off the desktop. Separate units are required for CPU and monitor. $39.95. Skene Design, 516/331-5060.

MediaMate Copy Holder

Copy holder that mounts to the side of the computer monitor and can be used on the right- or left-hand side. Includes a paper grip for one-handed document placement and removal; a copy arm with dual-rotation pivot points for convenient viewing angles; and can be set for letter-, legal-, and note-size paper. $6.95. Hunt Manufacturing, 215/732-7700, 800/446-7823.

MediaMate Copy Holder

Mouse Grip

Closed-cell foam pads that can be attached to the sides and button of the mouse. Models available for mice that are compatible with

Pigments for your imagination.

HP color printers let you draw splashy color from your Macintosh.

Entertain your thoughts with HP's PaintJet and PaintWriter XL color printers. Both are fully Mac-compatible and let you use all Quickdraw-based software applications. That means high-quality Macintosh II output in 16.7 million colors.

Print on paper or transparencies with 13 scalable outline fonts. And for shared use, the PaintWriter XL offers AppleTalk, faster speed, and auto sheet feed. For sample output and the name of your authorized HP dealer, call **1-800-752-0900, Ext. 1167.**

There is a better way.

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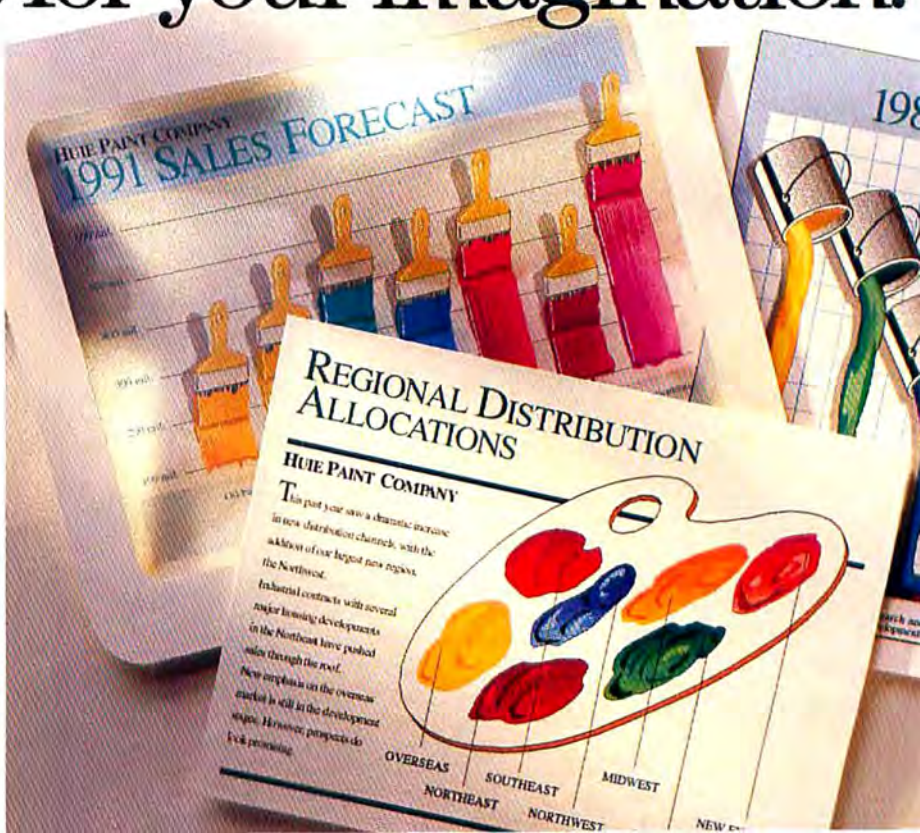

the Plus, SE, and Macintosh II. Comes in hot pink, violet, bright blue, lime green, and black. $2.95 per set. Santa Cruz Rip Grip, 408/728-5382.

Power Pause

Surge-suppressor device designed to protect electronic equipment from power surges after blackouts. Includes a time-delay relay that waits five seconds before reconnecting to AC power whenever line voltage is restored after a blackout. Comes with a two-year warranty. $69.95. Tripp Lite, 312/329-1777.

Security System

Security kit for the Macintosh Portable that includes a wire security loop, an 8-foot wire cable, a padlock, and two keys. $29.95. Kensington Microware, 212/475-5200.

The Supervisor

Friction fitting, thermoformed, plastic visor designed to help reduce glare from overhead lighting. Available in different sizes to fit various CRT widths. $19.95. Veino Ventures, 603/485-9613.

The Supervisor

Wrist Pillow

Naugahyde-covered foam wrist cushion to be used as a wrist-rest while working at a computer keyboard. Comes in two lengths: 22 inches or 29 inches. Platinum color. $44.95. Write Job, 408/370-2855.

Wrist Pillow

BOOKS

Designing Cards and Drivers for the Macintosh Family, Second Edition

Book that gives extensive hardware information on nine Macintosh models ranging from the Mac Plus to the Mac IIfx, and also contains information on the original Mac 128K, the Mac 512K, and the Mac 512KE. Devotes a chapter to each major feature such as processor, memory, and serial I/O, describing the way that feature is implemented on all the Macintosh models that support it and differentiating between the models. Written by Apple Computer. $26.95. Addison-Wesley Publishing Company, 617/944-3700.

PageMaker 4 by Example

Self-paced hands-on PageMaker tutorial. Authored by David Webster and Tony Webster. $24.95. M&T Books, 415/366-3600. Ⓜ

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Quick Tips

SAVING ENERGY WITH THE OFF SWITCH, ROTATING AROUND ANY POINT IN MACDRAW II, HANDLING OVERLAPPED OBJECTS IN ILLUSTRATOR 88, AND MORE

BY LON POOLE

As you may recall from a tip in June, you don't have to use the Finder's Set Startup command (Special menu) and restart the Mac to activate MultiFinder. Instead, you simply press the ⌘ and Option keys while double-clicking the MultiFinder icon in the System Folder. Adam Maestri of Chicago discovered that you can activate MultiFinder even more easily with On Cue, a utility by Icom Simulations (312/520-4440) that lets you open one program from within another without having to go back to the Finder and hunt for the right icon. You can add MultiFinder to the On Cue menu just as you would any other program—with either the Configure or the Other command (see the On Cue manual for help). Then to open MultiFinder you just choose it from the menu.

Wasted Monitor Space

Q Why is there so much blank space around my screen, especially on the top and bottom? I feel like I am being cheated out of the size of the monitor. Is there any way to make the image scan to the full size of the monitor? If not, then WHY NOT?!!@#!

Christi Cortina Evans
Kansas City, Missouri

A Monitors don't use the whole screen because focus is poorer and distortion greater in the corners and along the edges of a picture tube. You could have a technician adjust your monitor to use the whole screen area, but doing so would not give you more dots on the screen—only larger dots that are fuzzier and less square toward the edges of the screen.

Disparate Print Quality

Q I have noticed that text I print from WriteNow on an ImageWriter II is of poorer quality than MacWrite text I print on the same printer. I am a great fan of WriteNow. Can I improve the quality of text printed from it? Also, is there a French version of WriteNow or a French dictionary for the program?

Natalia Agapiou
Athens, Greece

A You can purchase a French copy of WriteNow 2.2, including a French spelling dictionary, directly from T/Maker (1390 Villa St., Mountain View, CA 94041; 415/962-0195). Because you already own the U.S. version, you will get a discount on the French version.

The disparity in print quality has nothing to do with WriteNow or MacWrite. You'll get the same print quality from these and most other programs if you set up the same formats in each:

- Use the same fonts and sizes
- Set the Print command's Quality option and the Page Setup command's Special Effects options the same way
- Have the same font sizes installed in the System file (or made available using a font utility like MasterJuggler or Suitcase II)

The first two conditions are fairly obvious. The last condition, however, can cause unexpected trouble when

you print in Best quality. To print in Best quality, the Mac needs fonts twice the size displayed on screen. For example, printing best-quality 12-point Helvetica requires 24-point Helvetica. The Mac reduces the 24-point font by 50 percent, resulting in 12-point text with twice the dots per inch of a straight 12-point font. More dots per inch yield better quality.

The System file on your MacWrite disk may contain double-size fonts that aren't installed in the System file on your WriteNow disk. You can copy fonts between System files (disk space permitting) using Apple's Font/DA Mover utility, which comes with the Macintosh system software.

If you use Suitcase II or MasterJuggler, some of your fonts are probably installed in files other than the System file. But make sure none of those fonts are also in the System file, because once the Mac finds a font there, it will not look for additional sizes of the same font in files you have opened with Suitcase II or MasterJuggler. Be alert for this potential conflict

(continues)

after updating your system software, because Apple's Installer program always puts Courier, Helvetica, New York, Times, and other basic fonts into the updated System file.

Wasted Energy and Accelerated Scroll Bars

Q My Mac SE and all of its pieces (hard disk, monitor, modem) are plugged in to a power strip. Can I turn them on and off with the power strip's switch, or should I use each device's on/off switch? Would it harm my system or waste much energy to run the system 24 hours a day? I normally use it 8 to 14 hours a day.

Also, I recently installed an accelerator in my SE and now my scroll bars work at warp speed. Is there any way to slow them down without sacrificing other speed?

Scott Junk
Costa Mesa, California

A Assuming your external monitor is a full-page monochrome display, your system probably uses about 100 watts of power. That's less than the number you'd get if you added up the wattage rating of all system components because most personal-computer equipment is rated at two to three times its actual wattage. The monitor alone uses almost as much power as the SE, hard disk, and modem combined. For comparison, a IIcx with an internal hard disk and color monitor uses 95 watts. A Mac Portable uses only 1 to 3 watts. IBM PCs and compatible systems use 50 to 100 percent more power than equivalent Macintosh systems.

Leaving a 100-watt system running and idle during nights and weekends would waste about 560 kilowatt-hours of electricity per year. That would cost between $45 and $84 depending on the rate per kilowatt-hour. According to Rick Heede of the Rocky Mountain Institute (a nonprofit resource-policy research institute), generating that much power would typically release half a ton of carbon dioxide per year into the atmosphere. (Average carbon-dioxide production is 1.89 pounds per kilowatt-hour. Actual carbon dioxide production depends on time of day.)

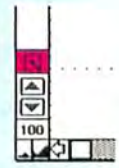
Think of it like this. If half of all personal computers in the United States were needlessly left on nights and weekends for a year, they would waste enough energy to equal the annual output of a small nuclear power plant. An average mix of power plants (not all nuclear) generating that much electricity would emit about 283 tons of carbon dioxide.

I suggest turning off your system when you expect it to be idle for a *(continues)*

OFF-CENTER ROTATION

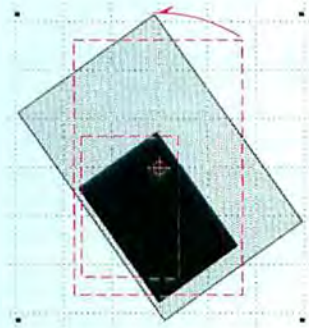
A simple mouse click tells MacDraw II whether you want to rotate an object around its center or around one of its corners. Rotating an object around any other point is not so easy. One method, submitted by Nahel Nabil Fahmy Said of Fakous, Sharkis, Egypt, is illustrated below. Note that the method also works when the center of rotation is outside the object to be rotated.

Suppose you want to rotate this shape around the arbitrary point shown.



Set drawing and rotating from center by clicking the Center/Corner icon near the lower-left corner of the MacDraw window.

From the arbitrary point draw a new rectangle just large enough to contain the first rectangle and group the two using the Group command (Arrange menu).



Choose Rotate (Arrange menu) and rotate the grouped objects to the desired angle. Then use the Ungroup command (Arrange menu) to separate the rotated objects, and delete the larger rectangle.

Once the larger rectangle is deleted you will find the original object has been rotated around the arbitrary point you selected.

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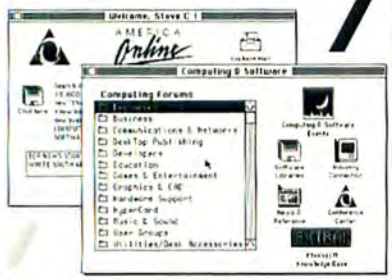

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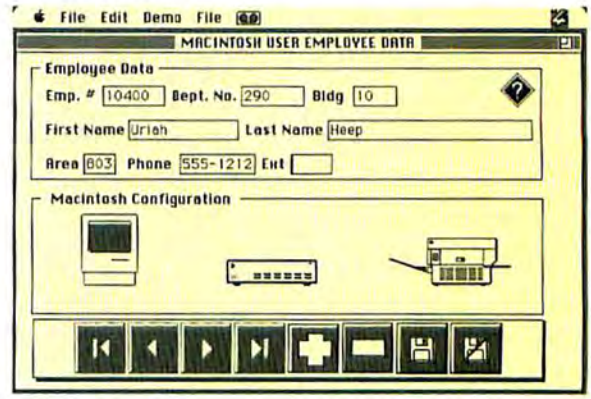
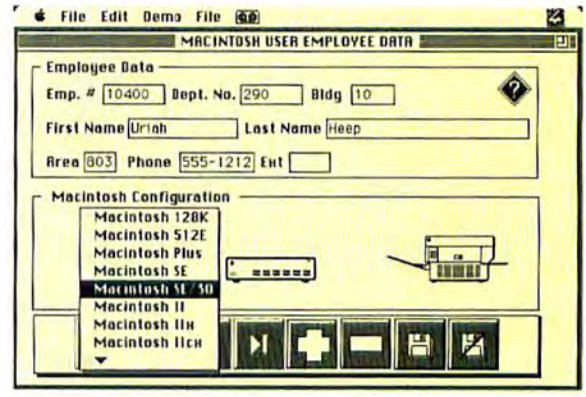




Graphic Pop-Up
The Macintosh Configuration section of this 4th Dimension data-entry layout contains an invisible pop-up menu behind each of the three pictures—the Mac, the hard disk, and the printer (top). Clicking on one of these pictures pops up a corresponding list of model names from which *to choose* (bottom). In addition, clicking on the large question mark in the upper-right corner reveals a list of help topics.

couple of hours or longer. Leaving it on all the time may benefit some electronic components slightly but will probably make the picture tube and hard disk wear out a bit faster.

You can slow down the scroll bars on a faster Mac by upgrading to System 6.0.5. If you prefer to use an earlier version of system software, put the start-up document Scroll Limit in your System Folder. It's available for the cost of distribution from many online services and user groups.

Mouse Ease

TIP: If you do a lot of illustration or other mouse-intensive work, give this a try. Place the mouse pad on a normal 1- to 2-inches-thick three-ring binder. Put this on your lap with the binder spine facing away from you and go at it. I find that having the mouse in my lap places my arm in its most relaxed position. Happy mousing.

Bob Cromwell
Tucson, Arizona

After a full day of working on illustrations using the mouse, *Macworld* designer Arne Hurty would regularly experience pain and tension in his button-pushing finger. Now that he's switched to a stylus and tablet, he says those problems have ceased.—L.P.

4D Invisible Pop-Up

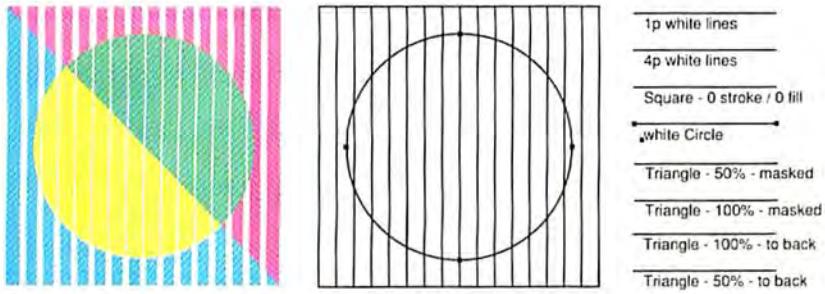
TIP: In 4th Dimension you can create an invisible pop-up menu for placing over a graphic so that the menu appears to pop up from the graphic, as shown in "Graphic Pop-Up." Simply type an exclamation point into the text-format area (labeled "not used.") of the menu-definition dialog box.

David Adams
Aptos, California

Managing Layered Objects in Illustrator

TIP: When using Adobe Illustrator 88, you can easily get frustrated trying to select an object at the back of a stack of overlapped objects. This is especially true when you use masks created with the Mask option of the Paint command (Style menu). To avoid this frustration, create *identifying* handles for the overlapped objects in your illustration (see "Layer Handles").

Start by creating a short, straight line with the Pen tool. Set the line's fill and stroke to None, and group it. You have created one handle. Make several copies and set them aside.



Layer Handles

The labeled horizontal lines you see in the Artwork Only view of this Illustrator 88 drawing (right) function as handles for selecting and manipulating layered elements in the drawing. These user-created handles are not visible when printed (left).

After completing a section of your illustration, group the object (or objects) in it and move one of the handles you created toward the perimeter of the illustration. Group the handle with those objects.

After repeating this process with all sections of your drawing, you can quickly and easily select any one of them by selecting the appropriate handle. You can drag a section aside by its handle, ungroup it, make adjustments to any of its attributes (size, shape, fill, or stroke), group it again, and finally put it back—in most cases, without changing its level in the layering hierarchy. If you add a new object to the section, Illustrator moves that section to the top of the drawing.

You may wish to label each handle, especially if different sections have the same shape. At the time you create the first handle, create some dummy text and send the text to the back. Do not group the text with the handle yet, but remember to set the fill and stroke of both handle and text to None. Select the handle and text and make copies. When you're ready to group a handle with an object, move a text-and-handle combination toward the perimeter of the illustration and change the dummy text to a description of the object. Then group the text with the handle and group them with the object.

Jeff Negran
New Brunswick, New Jersey

Secret DesignStudio Shortcuts

TIP: DesignStudio makes Letraset a legitimate competitor in the electronic prepress field. But as good as the program is, its manual lacks imagination as well as a collection of useful tips. For instance, DesignStudio has several undocumented arrow-key shortcuts. Although the manual mentions kerning with ⌘-left arrow and ⌘-right arrow (.05 em space per tap), it doesn't mention ⌘-up arrow and ⌘-down arrow for baseline adjustment (.1 point up or down per tap).

Arrow keys are also useful (as in many Mac programs) for moving through text. When the Caps Lock key is down, pressing an arrow key jumps you to the end of the line you're on. ⌘-Option plus an arrow key moves you one word at a time.

Arrow keys are also handy for other types of precise adjustment. A selected object (or group of objects) moves one point for each time you press an arrow key. If Caps Lock is down, the selected object jumps 10 points.

Richard Todd
Burnaby, British Columbia, Canada

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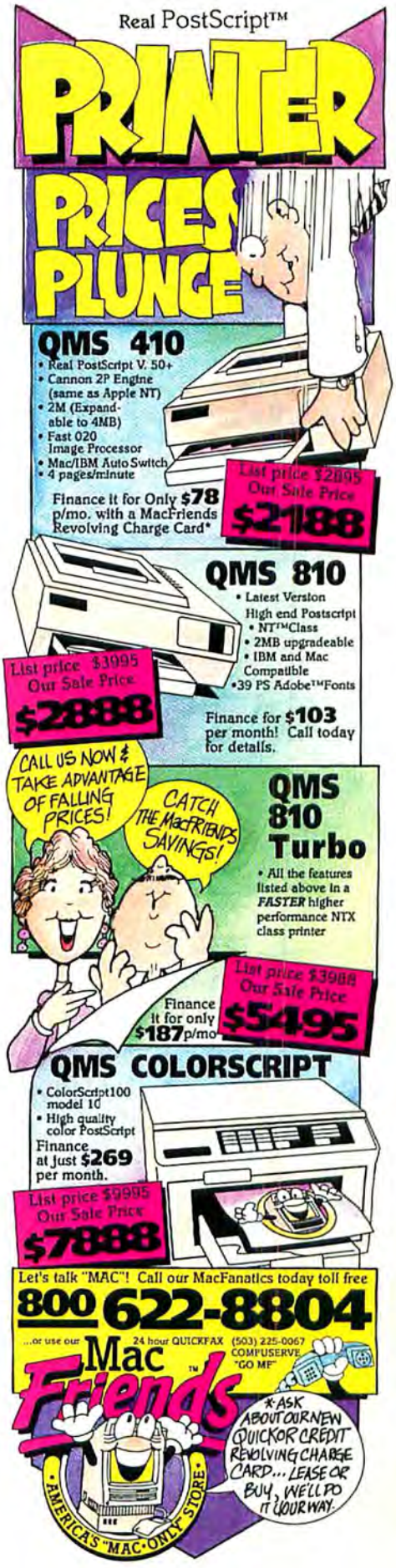
Lon Poole answers readers' questions and selects their tips for this monthly column. He has written many personal computer books, including the quick reference HyperTalk *(Microsoft Press, 1988), and a new book of Mac tips (to be published soon by Microsoft Press),* Amazing Mac Facts.



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HOW TO

Getting Started with Optical Character Recognition

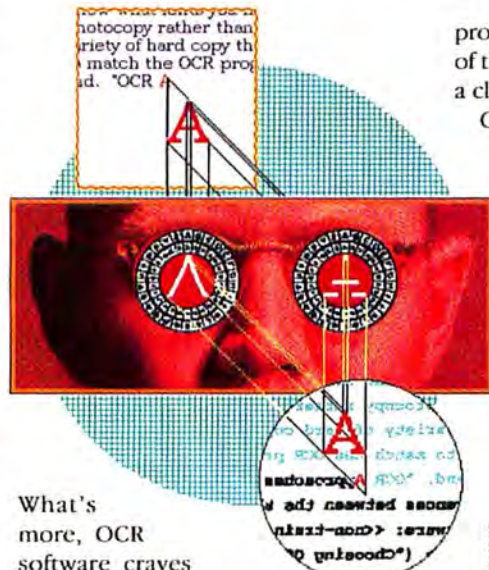
How to teach your Mac to read

BY JIM HEID

Every so often, you're reminded that the Mac is incompatible with the most widely used data-storage medium in the world: paper. This revelation might dawn when you have to laboriously retype a financial table from last year's annual report, or when you spend hours pawing through magazines to locate something you read a few months ago. Wouldn't it be wonderful if you could apply the Mac's sorting, searching, and storing skills to the printed material that touches your life every day?

I have some good news and some bad news. The good news is that you can bridge the gap between the Mac and the printed page, thanks to *optical character recognition,* or *OCR,* software. When teamed with a hardware add-on called a *scanner,* OCR software lets a Mac read, or *recognize,* printed pages and create files containing their text. You can edit the resulting text, reformat it, run it through spelling checkers, save it, or paste it into databases or HyperCard stacks for quick searching. Pop a page into your scanner, click a button, and voilà—instant text, ready to be sliced and diced as you see fit.

The bad news is that it isn't as rosy as all that. Some OCR programs read certain kinds of text better than others, and to get the fastest, most accurate results, you need to match the program to the OCR task at hand.



JOHN CRAIG

What's more, OCR software craves memory and processing power. Many OCR programs will run (albeit slowly) on Mac Pluses and SEs, but extensive OCR work almost demands one of the fastest Macs, the IIci or the IIfx.

Finally, OCR isn't a magic potion that automatically saves time and keystrokes. The best results come from practice and experience, and still require careful proofreading. If you're compiling a digital library of text scanned from publications, you must develop an electronic filing system that lets you find what you've scanned. You also need a hard disk that can hold it all, and a backup regimen to keep it safe.

This month, I describe how OCR programs work, and spotlight some of the features you'll find in them. For a close-up look at the current crop of OCR software, see "Text without Typing," in this issue.

Who Needs to Read?

OCR isn't a panacea, but that doesn't mean it isn't useful. Here's a sampling of OCR applications.

- A printing service bureau or typesetting company uses OCR for clients who submit copy on paper rather than on disk. Of course, proofreading is still essential—no matter how you use OCR—but not having to retype all that text can save a lot of time, thereby cutting typesetting costs.
- A law firm scans legal briefings and contracts that were produced before the office became computerized. Having those old documents on disk allows the firm to reuse sections of them as needed, and it allows for fast searching of client histories.

(continues)

• A stock brokerage scans company prospectuses and pastes the numeric data into Microsoft Excel to generate graphs that show companies' financial status. The text from the prospectuses and from annual reports is pasted into a HyperCard stack that brokers can use to advise their clients.

• An office that used to distribute weekly photocopies of newspaper and trade-magazine clippings now scans them and stores the resulting text files on a network file server, where they are available to everyone. Employees can quickly search the electronic clippings and copy key sections for inclusion in reports or distribution to others. The information is more accessible, and the office saves filing space as well as paper and photocopying costs. And cutting paper use benefits the environment as much as it does the bottom line.

• A corporation's human resources department receives hundreds of résumés each day. They're scanned, and the resulting text is imported into a database manager, which sorts them into job categories and then creates a text file for each category. The resulting files are forwarded via electronic mail to appropriate personnel managers in offices across the country. No photocopying, no express courier charges, just increased efficiency.

These scenarios share a common thread: OCR used department-wide or company-wide, not at individual desks. That isn't to say individuals can't benefit from OCR; they can, if they have enough text to scan or their typing is bad enough. But given its cost and the time required to use it, OCR makes the most sense when a group of people can share its benefits—as they do with the office photocopier.

How OCR Programs Work

The aforementioned scenarios involve a variety of hard-copy originals, from manuscripts and contracts to résumés and magazine pages. Manuscripts and contracts aren't too tricky; they are often produced in a simple typewriter font such as Courier. Magazine and newspaper pages are another matter. They can use just about any font and any format, from justified left and right margins to irregularly shaped columns that wrap around a photograph or illustration. And résumés might be the ultimate formatting wild card. You never know what fonts you'll find, and you might receive a photocopy rather than an original.

It's this variety of hard copy that makes it important to match the OCR program to the scanning task at hand. "OCR Approaches Compared" illustrates the differences between the three basic categories of OCR software: *nontrainable, trainable,* and *automatic,* also known as *omnifont.* ("Choosing OCR Software" describes some additional issues to consider when shopping for OCR software.)

Mix 'n' Match

Nontrainable programs generally use the simplest recognition technique, *matrix matching,* in which the program compares each character to a library of *templates, type tables,* or *matrices* for specific fonts and type sizes. Think of those tests where children insert different-shaped pegs into matching holes in a pegboard. Now imagine the OCR program trying to insert each character it has scanned into a hole shaped like a letter, number, or other symbol. When a character seems to fit a particular hole, the OCR program calls it a match.

Matrix matching is relatively fast and doesn't require a great deal of memory or processing power—matrix-matching programs run comfortably on a 1MB Mac Plus or SE. (Comparing each character to hundreds of shapes seems arduous, but it's a breeze compared to the recognition techniques used by automatic programs.) Matrix matching is also quite accurate—provided you try to read only those fonts and type sizes your program knows about. If you try to scan a different font or size, performance slows and

(continues)

CHOOSING OCR SOFTWARE

Here's a checklist of useful features to look for when you go shopping for OCR software:

• **Direct support for your scanner** lets you scan pages and recognize text using just one program. If an OCR program can not directly control your scanner, you need to scan pages using the software that accompanies the scanner, and then save them in a format the OCR program can read—a time-consuming approach.

• **A built-in editor** lets you review and alter the resulting text without switching to a word processor. Search-and-replace commands are useful for correcting problems that occur throughout, such as when a *w* is read as *vv*.

• **Format recognition** retains formatting attributes such as boldface, underlining, italics, centering, and justification. Some programs can also distinguish between multiple columns, allowing you to read them as a single table or as snaking (magazine-style) columns.

• **Support for multiple file formats** increases the odds that you'll be able to move recognized text into another application while retaining its formatting. Some programs can save documents in text-only format; others support popular word processing and spreadsheet formats.

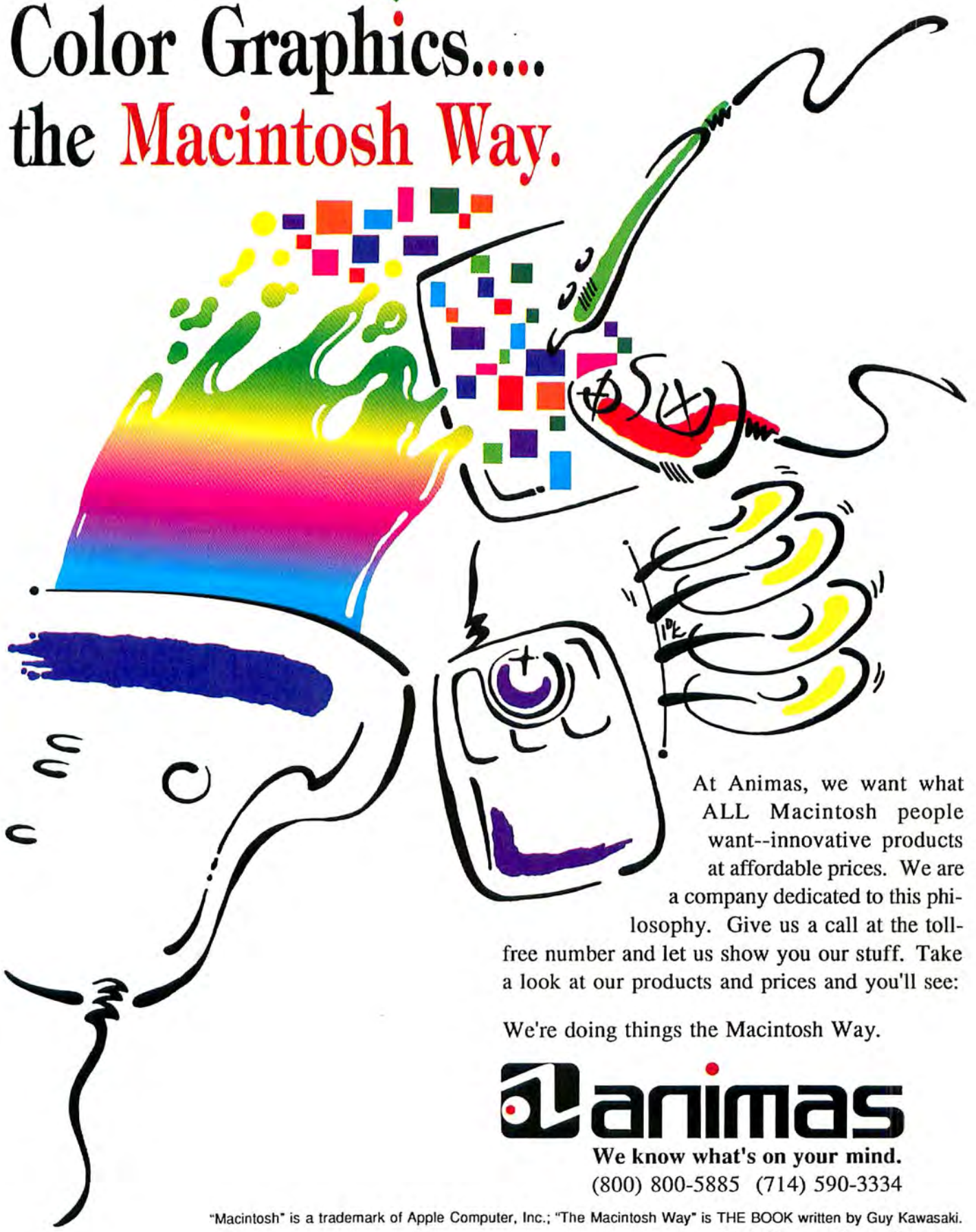
• **A spelling checker** helps with (but doesn't eliminate) proofreading. Some OCR programs provide spelling checkers that are tuned to look for substitution and other typical OCR-oriented errors.

• **Graphics recognition** lets you save the graphics that appear in an original document. This can be useful if, for example, you're producing a new version of a printed manual containing illustrations.

• **Background operation under MultiFinder** lets the OCR program decipher a page while you work in another application. Some programs also offer a *batch* mode that lets you scan a stack of pages, but defer the actual recognition process until a later time.

• **Landscape support** lets you scan documents printed in landscape orientation (for example, 11 by 8½ instead of 8½ by 11).

At Last, Color Graphics..... the Macintosh Way.



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errors soar as the program attempts to hammer characters into holes they don't quite fit in.

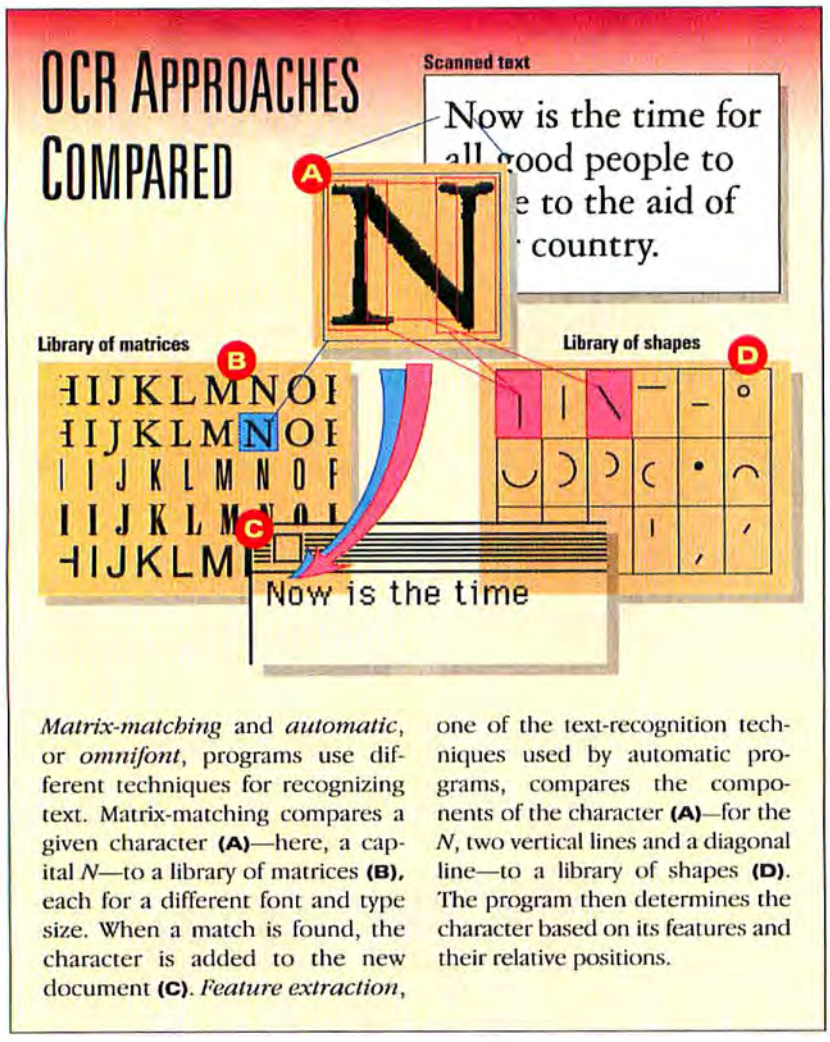
One of the better nontrainable packages for the Mac is DEST Corporation's Publish Pac. It recognizes common typewriter fonts—Courier, Elite, Letter Gothic, Pica, and so on—as well as 10-point Times Roman and the output of several popular dot matrix printers, including Apple's ImageWriters. DEST also offers an automatic program called Recognize, which is unique among OCR programs in that it works with Claris Corporation's XTND file-translation technology. This allows you to save scanned text in a vast variety of formats that can be read by Mac and IBM PC programs. Other OCR programs support only a few popular Mac word processing and spreadsheet formats. (For more information on XTND, see "Mac DOSsier," *Macworld,* July 1990.)

Reading Lessons

Trainable programs are matrix matching programs that can learn. With programs such as Olduvai Corporation's Read-It and Inovatic's ReadStar II Plus, you can create your own digital pegboards for new fonts as you encounter them. Trainable programs combine the less-demanding hardware requirements of matrix-matching programs with at least some of the flexibility of automatic programs.

But *trainable* means you train it, and that means work. It might take only a few minutes to train a program to read a document with one or two fonts, but it could take an hour or two to teach it to read a typical magazine page. The program will be able to apply its newfound knowledge to future documents, but that's no consolation if you never need to scan those fonts and sizes again.

Still, there are applications for which a trainable program is best. Consider a manuscript produced on a typewriter that types a defective character—for example, an *e* whose crossbar always prints too lightly. An automatic program will probably always misidentify the character as a *c,* but a trainable program can be taught to recognize it. Trainable programs are also well suited to large projects that involve a lot of scanning, such as books or catalogs. The program will be finely tuned to the fonts at hand, and that can boost performance and accuracy. Finally, if you don't have a multimegabyte Mac II, a trainable program might be your best bet; most will run on 1MB Mac Pluses and SEs.



Matrix-matching and *automatic,* or *omnifont,* programs use different techniques for recognizing text. Matrix-matching compares a given character **(A)**—here, a capital *N*—to a library of matrices **(B)**, each for a different font and type size. When a match is found, the character is added to the new document **(C)**. *Feature extraction,* one of the text-recognition techniques used by automatic programs, compares the components of the character **(A)**—for the *N,* two vertical lines and a diagonal line—to a library of shapes **(D)**. The program then determines the character based on its features and their relative positions.

Pick a Font, Any Font

The most versatile OCR programs are automatic packages, such as Caere Corporation's OmniPage, Xerox Imaging Systems' AccuText, and CTA's ScanReader. Instead of simply searching through those electronic pegboards to find a hole that seems to be a match, automatic programs use a whole bag of recognition tricks to read just about any font and type size.

With one such technique, *feature extraction,* the program studies the shape of a character's components—its stems, loops, bowls, and so forth—and compares them to the program's internal knowledge of letterforms. For example, if an automatic program sees a character with a vertical stem that descends below the baseline and has a loop attached to its upper-right side, the program knows it's found a *p.* There are significant variations between fonts—some have ornamental serifs, some have heavier stems than others—but generalized descriptions like this one apply to all characters.

But there are typefaces that bend these rules, and poor-quality documents that make them difficult to enforce. In such cases, an automatic program may resort to additional techniques such as: *topographical analysis,* which examines the character's shape for recognizable characteristics, and *context recognition* (also called *context intelligence*), which uses built-in rules and *dictionaries* that know, for example, that if the program recognizes a *q,* the next character is likely to be a *u.* Many nontrainable and train-

able OCR programs also use this latter technique.

Automatic programs employ other tricks in their quest for text, but just the techniques require a considerable amount of memory and processing punch. Caere's OmniPage and Xerox's AccuText, for example, demand a 68020- or 68030-based Mac and 4MB of memory.

And even setups like these don't deliver top OCR performance. For that, there are products like Calera Recognition Systems' TopScan for the Macintosh software and Compound Document Processor (CDP) hardware, which contains four 68020 microprocessors and a battery of other specialized chips designed for OCR. According to Calera, a CDP with TopScan can recognize about 2700 words per minute.

Another high-end package, Caere's Parallel Reader, uses not a Macintosh, but an IBM-compatible computer containing four processor boards, each of which packs the computing power of a Mac IIcx. The four processors work together to provide, according to Caere, a scanning speed of 2500 words per minute.

CDPs cost between $17,000 and $30,000, while the Parallel Reader goes for $10,995. They're steep, to be sure, but if shared in a large office where someone would otherwise do a great deal of retyping or photocopying, they can, over time, pay for themselves in labor savings.

Scanning the Field

I've said little about the hardware half of the OCR equation—the scanner, which uses a mechanism not too different from a photocopier or fax machine to examine a page and create a digital image of its contents. I explained scanner technology in detail in my November 1988 *Getting Started* column, but from an image-scanning, not OCR, perspective. Here's a quick recap of the field.

Sheetfed or *edge-feed* scanners such as DEST Corporation's PC Scan 2000 and the 2020 accept a page through a front-panel slot and move it through the scanner using a set of rubber rollers. *Flatbed* scanners such as Hewlett-Packard's ScanJet Plus and the Apple Scanner look like small copiers, with a lid covering a piece of glass upon which you lay the original document. Flatbed scanners can accommodate books and other originals too thick to fit through a sheetfed scanner's rollers. For accuracy, it's important to keep the glass spotless. Many sheetfed and flatbed scanners accept *automatic document feeders,* which hold a stack of pages and feed them to the scanner as needed—useful for high-volume OCR work.

Hand-held, or *hand,* scanners such as Logitech's ScanMan Model 32 and Thunderware's LightningScan 400 are small boxes that you roll across an original page. Costing only a few hundred dollars, hand scanners are inexpensive compared to the other types (whose prices start at $1000), but hand scanners have limitations. You need to move the scanner at a slow and steady pace—about an inch per second—to get good results, and you can scan only a few inches of a document at a time.

When you're buying a scanner for image-scanning tasks, it's important to assess how many levels of gray it recognizes—Apple's, for example, recognizes only 16 compared to 256 for Hewlett-Packard's ScanJet Plus. For OCR work, gray levels aren't important, since you always use the scanner's high-contrast, or *line-art,* mode. Still, you'll probably want to do some image scanning, too, so keep that gray-level figure in mind.

Meeting—and Adjusting—Your Expectations

When shopping for an OCR system, take along several test documents, preferably ones similar to the documents you plan to scan. Don't just take war-torn, barely legible documents in an attempt to stump the OCR software—you'll succeed. If you have trouble reading a page, an OCR program will, too.

After you scan a test page, proofread it carefully. Some errors are easy to spot—a capital *D,* for example, can be misread as a vertical bar (|). And the OCR program itself flags characters it doesn't recognize, usually by substituting a bullet (•) or tilde (~).

Substitution errors are the hardest to find. A *w* can become *vv,* an *m* can become *rn,* and *S* can become *5.* In one of my test documents, OmniPage turned PS/2 (a model of IBM personal computer) into P512. Catching that kind of blunder requires not only a watchful eye, but an experienced one. A secretary unfamiliar with IBM computers might not know that P512 isn't a valid model number. And every field—from law to medicine to plumbing—has these kinds of specialized terms and ciphers.

The moral? No OCR program is 100 percent accurate, regardless of its developer's claims. But no typist is 100 percent accurate, either. If you approach OCR with the knowledge that the results will not be perfect and will require careful proofreading, you won't be disappointed.

As for me, I'm sold on the keystroke-saving benefits of OCR, but I haven't made it a part of my business life. I once fantasized about scanning all the press releases that currently litter my office, but I soon realized that it would take far too long to be practical. A hand-held scanner might streamline the process by allowing me to scan just the portions of a press release that interest me, but as I mentioned before, hand scanners are second-best OCR devices.

That may change. Caere Corporation is developing the first hand scanner designed for OCR. Caere says the product, tentatively named Typist and scheduled for delivery this fall, will eliminate the slow-and-steady scanning requirements of other hand scanners. Better yet, Typist will insert the text it reads directly into whatever application you're using—no grappling with a separate OCR program, no cutting and pasting or fussing with file formats to move text into the program where it will ultimately be used.

It sounds appealing, but I'll believe it when I see it. That's a good way to approach OCR in general—believe it when you see it. And then proofread it. ◘

See *Where to Buy* for contact information.

Jim Heid is a contributing editor of Macworld. *His latest book, coauthored with Peter Norton, is* Inside the Apple Macintosh *(Brady, 1989). America Online subscribers can contact him by sending a message to Jim Heid.*

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Insights on PowerPoint 2.01

TRICKS AND TECHNIQUES FOR THIS POPULAR PRESENTATION PROGRAM

BY DAVID POGUE

You might say that the term *presentation software* became part of the Macintosh vocabulary the day Microsoft PowerPoint appeared. And even today, this unpretentious concoction of basic word-processing and drawing tools, with a clever slide-sorting interface, is the simplest presentation software you can buy.

Even so, there are still a few tricks that may give you more power to make your point. Thanks to Connie Clark and Keith Sturdivant of Microsoft for some of these tidbits.

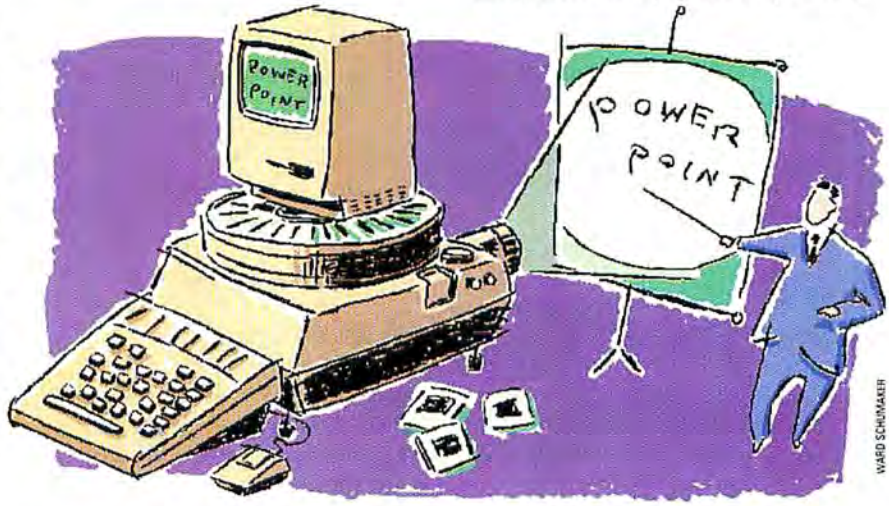
Pasting Charts

PowerPoint's drawing tools are enough to let you add graphic accents to your slides. But to design a logo, create a graph, or include a sketch on one of your slides, you must rely on other graphics programs and paste the images into your presentation.

That's not always as straightforward as it sounds. For example, Excel graphics pasted into PowerPoint lose all their color. However, PowerPoint's Recolor Picture command exists to remedy this problem. With the pasted-in chart selected, choose Recolor Picture from the Color menu. Click the Change Patterns button; you can now map each of the graph's black-and-white shading patterns to one of the colors in your color scheme.

If you want to copy formatted numerical or tabular data from Microsoft Excel so that a spreadsheet or table maintains its character and border formatting when you paste it into PowerPoint, press Shift while choosing Copy from Excel's Edit menu (the menu selection now reads Copy Picture). The disadvantage of this method, however, is that the resultant PowerPoint table is a bitmapped picture; you can't edit the numbers and you can't print the slide (or audience handouts) at high resolution.

In that case, you may prefer to paste the spreadsheet data into PowerPoint as plain text instead of as a picture. To do so, select the range of spreadsheet cells in the usual way and choose Copy from Excel's Edit menu. When you arrive at the proper frame in PowerPoint, click the Word Processor tool. Drag the mouse to create a text box of the appropriate size and shape; make your font, size, and style selections from the Font menu; and then, finally, choose Paste. The spreadsheet data tumbles into the text box pell-mell, looking completely out of alignment. Don't panic. Instead, select all the text you've just pasted (by dragging through it or choosing Select All from the Edit menu). Now choose Show Text Ruler from the Text menu to display PowerPoint's rulers. As you add tab stops in the usual way (by dragging the small triangles onto the ruler's edge), you see the figures in the table snap into neat rows and columns. If you want gridlines or other rules, use PowerPoint's Line and Rectangle tools to add them. Because this technique preserves the spreadsheet data as text, you can still edit the numbers at any time, and the table looks smooth and sharp when output on a laser printer (if you've selected an appropriate font).



Pasting Slides

Microsoft is especially proud of the ease with which you can copy slides from one PowerPoint presentation

(continues)

into another. For example, if you gave monthly sales-totals presentations in January, February, and March, it is a cinch to use selected slides over again in a quarterly report. Select one slide (or several slides) in the Slide Sorter view. Choose Copy from the Edit menu. Open the destination presentation, enter Slide Sorter view, click where the inserted slide(s) should appear, and finally, choose Paste from the Edit menu.

Working in Sequence

The order of the steps you take to create a presentation is crucial. For example, as suggested by the manual, you should specify the size and shape of the "frames" you'll be creating before you do anything else. If you create a few slides with the Slide Dimensions default format (Overhead Shape) selected, but change the format to 35mm or screen size, you have to adjust the placement of every object on every frame by hand.

Similarly, go to the Slide Master view and set the font, size, and style of the Title placeholder before you create a single slide. Then, as you create each new slide, PowerPoint does all that formatting for you. If you change your mind about the slide titles' character formatting after you've created a few, you have to change the font, size, and style of every slide by hand. This isn't true of graphics and colors, though; you can edit the Slide Master's nontextual elements at any time during the creation of a presentation, and all the slides update to reflect the change.

Finally, don't apply a graduated color fill for the background until you've created and edited all the slides. Because PowerPoint takes a few moments to calculate and draw such effects, you save a lot of cumulative time if you leave backgrounds a solid color, or white, while you're building and editing a presentation.

Grid Heaven

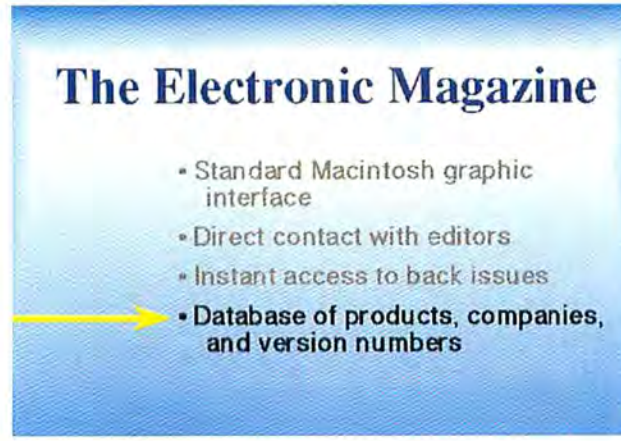
Don't underestimate the power of PowerPoint's snap-to-guide feature (guides are movable dotted lines). For example, there's no Align Objects command in PowerPoint, but you can use the guides to achieve the same effect. Position a horizontal or vertical guide with which you'd like several objects to align. As you drag each object near the guide, let go of the mouse button and the object's edge (or center, whichever is closest) snaps into alignment with the guide.

You may notice some small numbers appearing on screen when you drag one of these guides. They indicate the guide's current distance from the center of the slide. But if you press Option while dragging, the numbers indicate how far you've dragged the guide from its original position instead. In other words, you can use a guide as a measuring ruler: place it at one end of an object, Option-drag it to the other end, and PowerPoint displays the object's length.

It's easy to return the guides to their original center-of-the-slide positions—just drag them until the small measurement numbers read 0:00. Once the two dotted lines are in their default position, you can use their "magnetic" qualities to help you place any object exactly in the center of the slide; just drag it near the intersection of the guides and let go.

Build Slide Sequences

When you want to create several successive slides that *build*—add a new bulleted item (or bar of a graph) on each successive frame—create the final, complete slide first. Duplicate this slide several times, and then work in reverse, deleting appropriate elements from earlier frames. For better visual impact, assign a dimmer color to bulleted items that have already been introduced, so that each new point stands out as its slide appears. Along the same lines, you might want to add an arrow or some other attention-directing graphic to the latest bullet on each slide of a build sequence (see "Building Excitement").



Building Excitement
To call attention to each new item in a build sequence, make previous bullet items a dimmer shade of the text color. You might add an arrow, a pointing finger, or other accent to each new bullet point (or graph bar) as it appears.

Colors and Schemes

One of PowerPoint's most useful features is its color-scheme system. Each color scheme contains complementary, carefully chosen colors; as long as you assign the elements of your slides to colors in the scheme, the presentation will have a consistent, coordinated look.

Understanding how PowerPoint's color system works can make life easy for you if you ever need to adjust colors in all the slides at once. The program doesn't actually remember that the logo was blue and the text was yellow. Instead, it keeps track of each color according to its *slot position* in the color scheme. That is, it remembers that the logo was the third color in PowerPoint's color-selection grid, and the text was the fourth. So if 30 objects in the presentation are yellow, you can change all 30 to light green simply by editing the appropriate slot in PowerPoint's color grid.

Furthermore, you can apply the complete color scheme of one presentation to another presentation, recoloring an entire slide show in one fell swoop. First, bring to the screen a slide done in the color scheme you want to copy. Choose Color Scheme from the Color menu. Without closing this dialog box, open the presentation you're going to modify. Bring the Color Scheme window to the foreground (choose it from the Window menu). You'll notice that the scheme still contains the colors of the original slide; click Apply to transfer them to the new presentation.

Text FX
Using the Paste as Picture command (Edit menu), you can create text that's a stretchable graphic object. Once you've done so, however, you can't edit the text, and it prints out jaggedly on a laser printer.

Shaded Objects

It's not easy to create objects with graduated fills (as opposed to backgrounds), but it can be done. Start by creating an extra "scratch" slide. Using the Color Scheme command, fill the new slide's background with a graduated color fill as described on page 260 of the manual.

Now create the object you want to shade; make sure it has no fill of its own. Place it on the slide so that it covers an appropriate portion of the shaded background—in essence, it's going to take on the colors of the background directly behind it. With the object selected, choose Opaque from the Draw menu, then Copy from the Edit menu. Now that you've copied the object, go to the destination slide and choose Paste as Picture from the Edit menu. The object appears, shaded exactly as the background was behind it. (Don't forget to delete the scratch slide when you're finished.)

Text Tricks

You can create fancy special text effects if you copy some text and then paste it using the Paste as Picture command. To stretch and elongate the pasted text block, you drag its handles (see "Text FX").

If you're finding it hard to reposition text (or any object), remember that you have to drag it by its thick *selection box* outline. If you've been editing text (so that this selection box isn't visible), press Enter; the selection box will return.

Once the selection box is visible, press Enter again to select all the text inside the box—an especially handy technique when you need to edit or reformat any text. Just click on the text once (to display the selection box) and press Enter. PowerPoint highlights all the text in the box, ready for new formatting or retyping.

If you're patient, you can create the fancy embossed-text effect you may have seen in some of the PowerPoint sample files. Start by choosing Ignore Grid from the Draw menu (if the menu says Snap to Grid instead, you can skip this step). Now use the Labeler or Word Processor tool to create the text you want to be embossed. Make two additional copies of the text (use Copy and Paste from the Edit menu). Select the original text; from the Text submenu of the Color menu, apply a color that's slightly lighter than the background color of the slide (for example, the last color in the color scheme). Place one of the copies in front of the original, but offset it slightly downward and to the right; apply the background color to it. Now drag the third copy on top of the second, again offsetting it slightly downward and to the right; apply a color slightly darker than the background color to it. Finally, make sure you send the first and third copies to the back, so that the background-color text is in the foreground (see "Embossed Text"). It's sometimes tough to get the copies in the correct front-to-back and left-to-right order, but the results can be striking.

Quickies

Here are some simple tips you may find useful.

• There's only one way to delete a slide, and that's from the Slide Sorter

(continues)

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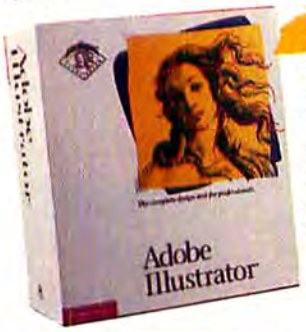

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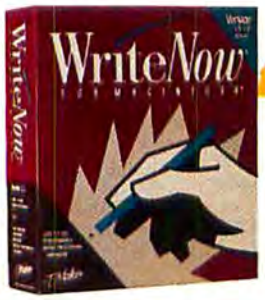

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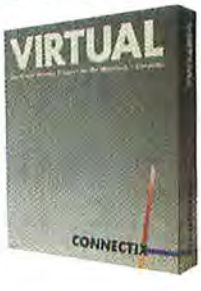

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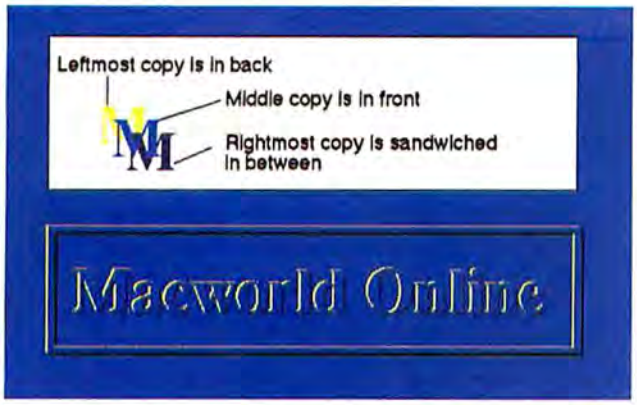

Embossed Text
To get this 3-D effect, place three copies of the text in the right front-to-back and right-to-left order, as shown. (Make sure the background is the same color as the middle object — in this case, blue.)

view. Select the thumbnail image of the slide and choose Clear or Cut from the Edit menu.

- If you stretch a graphic image out of proportion, double-click on one of its handles. It snaps back to its original aspect ratio.
- To give your presentations a consistent look, establish a default presentation template with your logo, favorite color scheme, font selections, and so on. Save it with the title Default Format, and put it in the System or PowerPoint folder. Now, every time you begin a new presentation, PowerPoint starts you off with an untitled copy of that template.
- If you need to export a presentation to another program—PageMaker, for example—remember PowerPoint's ability to save a presentation in the Macintosh Scrapbook format. (Choose Save As from the File menu, give the scrapbook file a title, click on "Save slides as pictures in a scrapbook," and click on Save.) Because the program comes with the SmartScrap desk accessory, you can easily retrieve slide images from different scrapbook files you've created. As a matter of fact, PageMaker's Place command will accept a scrapbook file as the placed material; thereafter, each time you click the Place cursor in the document, the next scrapbook image appears, saving you the trouble of copying and pasting each image individually.
- Press ⌘ while dragging a graphic's handles inward to crop out unwanted edges. This is a nondestructive procedure; at any time you can ⌘-drag a handle outward again to bring the cropped edges back into view.
- There's no way to delete a title from a slide—every slide must have a title. The manual suggests hiding the title by covering it with an opaque object. But an even simpler trick is to replace the dummy text, "Title," with a single space. Presto—the title is invisible.
- If you get impatient waiting for a screenful of thumbnail images to appear in the Slide Sorter, you can interrupt the drawing process by pressing ⌘-period. (Not-yet-drawn slides appear as crisscrossed rectangles.)
- If you use PowerPoint with Adobe Type Manager, you have much more freedom in creating the large text required for slides and on-screen presentations. Microsoft recommends using 18- to 36-point text for on-screen and 35mm slide presentations, and 12- to 24-point text for overheads or printed flip-charts.
- If you have a color monitor, don't be alarmed when selected text disintegrates into a wild rainbow of psychedelic colors—that's normal. When the text is no longer highlighted, the regular coloration returns.
- Don't forget that you can display (or hide) the arrow cursor when you're giving an on-screen presentation, by pressing the A key.

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

See *Where to Buy* for contact information.

David Pogue is a New York–based contributing editor for Macworld. *His writing has also appeared on television's "Late Night with David Letterman." (Actually, it was only a Viewer Mail letter.)*

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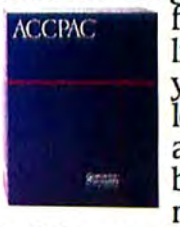

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UPDATES

Here's our list of the current shipping versions of Mac software at the time we went to press. We hope you'll find it useful—because these days, keeping track of the latest CPU is tough enough.

Chameleon version 3.0 contains over 200,000,000 possible conversions, offers several new dimensions and information screens, increases speed sixfold over version 2.2, and sells at a reduced price. Spectrum Computing, 305/665-0404. Free; $49.95 new.

More III has been made easier to use. This version adds a text ruler and selection bar to the outline feature; Library and Template systems have been updated. Ships with 100 templates that include presentation layouts, document styles, color sets, and graphics. Contains a financial charting module, Chart Tutor, which is an online tutorial for creating a presentation. Comes with a color-gradient editor. Symantec, 415/964-6300. Contact vendor for update policy; $395 new.

QuickLock version 2.0 comes with a NightWatch Connection control device that enables the user to change NightWatch shutdown preferences. NightWatch is now capable of automatically shutting down the Macintosh after a user-predetermined number of invalid password attempts. Version 2.0 includes 12 new color screen-saver modules including Moon & Stars and a Las Vegas cancan line. Kent Marsh, 713/623-8618, 800/325-3587. Free upgrade to registered owners; $59.95 new.

PRODUCT UPDATES

Product	V.	Req.	Rev.	Price
1st Aid Kit ★	2.8	512KE/3.0		*
4th Dimension	2.0.1	1MB/6.02	3/90	*
Aatrix CheckWriter II ★	2.01	512K/4.1		$10
Aatrix TimeCard	2.0	512K/4.2		Free
Accountant Inc., Pro	1.03	1MB/6.03	9/90	$19.95
ACCPAC Bedford Simply Accounting	1.1	1MB/5.1		$50
AccuText ★	1.1	4MB/6.02	2/90	*
Adobe Type Manager	1.2	1MB/6.02	2/90	Free
AdWriter	2.0	1MB/6.0		Free
After Dark	1.1	512KE/3.2	7/90	$5
Alchemy	1.1	1MB/6.0	10/90	$25
Aldus FreeHand	2.02	1MB/6.03		*
Aldus PageMaker ★	4.0	1MB/4.1	9/90	*
Aldus Persuasion	2.0	1MB/6.0		*
AmPack Plus ★	4.2.2	512K/3.2	1/90	$29.95
Analog Connection WorkBench	3.0	1MB/5.0	5/90	$50
Anatool ★	3.1	512K/3.0		$35
AntiToxin	1.3	1MB/6.0.2	1/90	$15
APL.68000	7.0	512K/3.2		*
Aperture	**1.7**	**2MB/6.0.3**	**7/90**	*
AppleShare File Server	2.0	512K/3.2		*
Archie	2.0	1MB/6.0		$75
ArchiText	2.0	1MB/6.02		Free
Aristotle's Politics	2.0	2MB/6.03		Free
The Art Importer	2.0	1MB/6.0	5/90	$20
ArtRoom	3.0	512K/3.2		$199
AutoCalc	2.0	1MB/6.0		$95
AutoSave II	1.1	512KE/4.2	7/90	$7.50
A/UX	**2.0**	**4MB/6.0.5**		*
Aztec C	3.6	512KE/4.2		*
BackFax ★	1.02	1MB/6.03	1/90	Free
Backmatic	**1.1**	**1MB/4.2**		**Free**
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	2.0.1	1MB/6.0		*
Calculator Construction Set ★	2.06	512K/3.2	4/90	$25
CanOpener	1.1	512K/3.0		Free
Canvas	2.1	1MB/6.0		*
Capture	3.0	1MB/6.0	2/90	$15
Central System Manager	2.1	1MB/5.0x		*
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ConcertWare	5.1	512KE/4.2		$35
Control II	**1.1**	**2MB/6.04**		**Free**
CopyFlow	2.0	2MB/6.0	6/90	Free
Cue	3.0	1MB/6.03		*
Data Desk	3.0	512K/4.02	6/90	$125
DataMerge	2.0	512K/3.2		Free
dBase Mac ★	1.01	1MB/4.1		Free
Deluxe Music Construction Set	2.5	512K/6.02		*
D.E.S.	4.0	1MB/6.0		*
Design Dimensions ★	2.15	5MB/6.03		Free
DeskPaint ★	3.0	1MB/4.2	5/90	Free
Developer Stack	2.0	1MB/6.0		$15
DiagramMaker ★	1.1	1MB/6.02		*
Digital Darkroom	1.1	1MB/6.02		Free
DiskDoubler	2.0	1MB/6.02		*
DiskExpress II	2.04	1MB/6.0	9/90	*
DiskFit	1.5	512K/4.1	12/89	$30
DiskTop	4.0	1MB/6.0		*
Display AdBuilder	1.1	1MB/6.03		*
Dollars and Sense	4.1	512KE/3.2		*
DragonWave	1.1	1MB/6.03		*
Dreams	1.1	1MB/6.02		*
DynaPerspective	2.0	2MB/6.04		Free
DynoDex ★	1.1	1MB/6.0	6/90	Free
Easy Color Paint	1.1	1MB/6.0	9/90	*
Empower II ★	3.03	1MB/4.2		Free
EndLink	1.1	512K/3.2		Free
EndNote	1.2	512KE/3.2		Free
Exodus	2.0	1MB/6.0		$50
Extender GrafPak	3.0	1MB/6.02		$30
Falcon	2.2	1MB/3.2		$3
Fastback II	2.1	512KE/4.1	12/89	$30
Fast Forms	2.0	512K/3.2	9/90	$25
FastLabel	2.0	1MB/6.0		$36
FastTrack	**1.5**	**512KE/5.5**		**$20**
FaxGate ★		1MB/6.0		Free
Ferrari Grand Prix ★	1.6	512K/3.2		$10
FetchIt	2.0	512K/6.01		*
FileMaker II ★	1.1	1MB/4.2		*
FilmMaker	2.0	5MB/6.0.3		*
Finale	2.01	1MB/6.02	5/90	$5
Financial Analysis	3.0	512K/3.0		*
Findswell	2.01	512KE/3.2	3/90	*
Flash	**1.1**	**1MB/6.0**	**8/90**	**Free**
Fontographer	3.1	1MB/4.2	5/90	*
FontShare	2.0	1MB/6.0		Free

(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.*

PRODUCT UPDATES

Product	V.	Req.	Rev.	Price
FormsProgrammer ★	2.03	1MB/6.02		$15
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 ★	2.0	1MB/6.0		$50
FullWrite Professional ★	1.1	2MB/6.02		Free
Gamblin' Times	3.0	1MB/6.0		$10
GatorBox	**1.5**	**NA**		**Free**
GeoQuery	2.0	1MB/6.0	10/90	*
Gofer ★	2.0	1MB/4.1		$25
GQL	2.0	1MB/5.0		*
Great Gantt	1.2	1MB/6.0		Free
Great Plains Accounting Series	5.2	1MB/6.0		*
HandOff	1.2	1MB/6.0	4/90	*
Handwriting Analyst ★	**3.1**	**512K/3.2**	**1/90**	**$24.95**
Hard Disk Partition	3.02	1MB/6.0		$30
Hard Disk Util	3.0	1MB/6.0		$65
Help DA	3.0	1MB/6.0		Free
HFS Backup	3.0	512K/3.2		$35
Hybase ★	1.1	1MB/6.0		Free
HydroMac	2.0	1MB/6.0		*
HyperAnimator ★	1.5	1MB/6.03		$29.95
HyperCard ★	1.2.5	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		*
HyperPort Chess	2.0	1MB/6.0		$10
HyperWindows ★	1.2	1MB/6.02		$20
Icon-It	2.0	1MB/6.02	9/90	$29
Iconia ★	7.0	1MB/6.0		*
Igor ★	1.1	1MB/6.0	5/90	Free
Image Grabber	2.0	1MB/6.02		Free
ImageStudio	1.5	1MB/6.0		$99
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
LAN Package	3.1	1MB/6.0		*
Language Systems Fortran Compiler ★	2.0	1MB/6.03		*
LapLink Mac III	3.0	512K/2.0	7/90	*
LaserPaint Color II ★	1.02	1MB/6.03		Free
LetraStudio	1.5	2MB/6.0		$45
LetrTuck+	2.0	512K/3.2		$20
Lightspeed Color Layout System	2.0	1MB		*
Lookup	2.0	1MB/6.0	5/90	$15
LXR.TEST★	4.0.11	1MB/6.0		Free
Mac86	2.0	1MB/6.02		$10
Mac286	2.0	1MB/6.02		$10
Mac3270	2.0	1MB/6.03		*
MacAnalyst	2.0	2MB/6.0		$125
MacArchitrion	4.0	2MB/6.03		Free
MacAtlas Paint	2.0	512K/3.2		$35
MacClassAds	4.0	1MB/6.0		*
MacClint ★	1.1	1MB/5.0		Free
MacConcept	3.0	1MB/6.03		*
MacDesigner	3.0	2MB/6.0		$125

How the right brain sees MacTools.®

If you drag one file too many and empty the trash, our file recovery tools make it a snap to get files back.

Fragmented files slow down your disk. MacTools Optimizer puts together the pieces and speeds up file access.

Encrypt financial data, employee records, and other sensitive information in a format nobody can crack. Except you.

Make exact copies of floppies fast. MacTools takes full advantage of your computer's memory to reduce disk swapping and lets you make as many copies as you like.

Forgot where you put a file? MacTools will find it by name or text in seconds and even let you view it to make sure it's the right one.

With MacTools daily backups are as quick and painless as taking your vitamins. Back up your whole disk or just the files or folders you want.

You wouldn't drive without a seat belt–don't operate your Mac without one either. MacTools copies critical volume information daily (or more often) to protect against hard disk crashes and accidental initialization.

Central Point Software INC™

Product	V.	Req.	Rev.	Price
MacDraft	2.0	2MB/6.0.2		*
MacDraw II	1.1	1MB/6.0		*
MacEnvelope	5.0	512KE/3.2		$25
MacEnvelope Plus	2.0	512KE/3.2	1/90	$50
MacFalcon	2.1	1MB/6.03		*
MacFlow	3.1	1MB/6.03		$30
MacFortran	2.4	512K/4.2		*
MacFortran/020	2.4	512K/4.2		*
MacFortran for MPW	1.1	2MB/6.02		Free
MacHerbal	2.0	512K/3.2		$49
MacHotel	3.3	1MB/6.03		Free
MacInUse	**3.0**	**1MB/6.0**		**$30**
MacLine	3.0	512K/3.0		$25
MacLinkPlus/Wang VS	4.0	512KE/3.2		$45
MacLotto	**2.1**	**512K/4.0**		**$10**
MacMainFrame 3270/CUT	2.1	2.5MB/6.02		$100
MacMoney	**3.5**	**512KE/4.0**		**$12**
MacPhonebook	2.0	512KE/3.2	1/90	*
MacPrint	1.1	1MB/6.02		Free
MacProject II	2.1	1MB/6.0		Free
MacProof ★	3.2.1	1MB/6.02	2/90	$30
MacRecorder	2.0	512K/3.2	12/89	*
MacroMind Director	**2.0**	**2MB/6.02**	**10/90**	**$100**
MacSafe II		512KE/4.2	10/90	*
MacScan	**1.6**	**1MB/6.0**		**$35**
MacSchedule	2.0	1MB/6.0		$30
MacSmarts	3.0	1MB/6.0		*
MacSpin	3.0	512K/4.2		$75
MacTell	3.5	512K/3.0		*
MacTerminal ★	2.31	512K/3.2		Free
MacToPic	2.0	1MB/6.0		$25
MacVision	3.0	1MB/6.0.2		$50
MacWrite II	1.1	1MB/6.0		Free
Managing Your Money	3.0	1MB/6.03	6/90	$49.95
MapGrafix	2.0	4MB/6.03		Free
Maple	**4.2.1**	**1MB/6.0**		*
MarketMaster	II+	1MB/6.03		$25
MarkUp	1.02	1MB/6.0	5/90	Free
Master Tracks Pro 4	4.12	1MB/4.1	6/90	$45
MathType	2.1	512K/6.02	11/89	*
Matlab	1.2	1MB/3.0		*
MaxPage ★	1.2	512K/3.2		Free
McClint	2.0	1MB/4.2		$25
McCPrint	2.0	512K/4.2		$25
McMax	2.0	1MB/5.0		*
Memorybank Manager	3.0	1MB/6.0		Free
Mesa Graphics Plotter Utility	1.03	512KE/5.0		*
MGMStation ★	2.5	512KE/3.0		*
MiBAC Jazz Improvisation	**1.2.2**	**1MB/6.0**		**Free**
MicroPhone II	3.0	512KE/4.2	7/90	*
Microsoft Excel	2.2	1MB/6.0.2		*
Microsoft File	2.0	512K/3.2		*
Microsoft Mail	2.0	1MB/6.02	1/90	*
Microsoft PowerPoint	2.01	1MB/6.0		Free
Microsoft Word	4.0	512KE/3.2		*
Microsoft Works	2.0	512K/6.0		*
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
Modem Artist	2.0	2MB/6.02		$150
MOMARS	3.1	1MB/6.03		*
Monte Carlo	2.0	1MB/6.03		$60
More III ★	2.01	1MB/4.1		*

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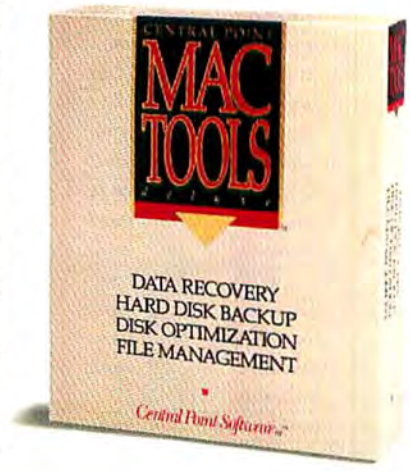
How the left brain sees MacTools.®

	MAC TOOLS	SUM II	FASTBACK II	RETROSPECT	DISK EXPRESS II	GOFER	SENTINEL
HARD DISK BACKUP	✓	✓	✓	✓			
Selective backup & restore	✓		✓	✓			
Data compression	✓		✓	✓			
Save file/folder selections	✓		✓	✓			
DATA RECOVERY	✓	✓					
Selective/intelligent search	✓						
Pause & view during undelete	✓						
Recover files in-place	✓						
OPTIMIZER	✓	✓			✓		
Visual display of fragmentation	✓				✓		
DATA PROTECTION	✓	✓					
FILE LOCATE	✓					✓	
HARD DISK PARTITIONING	✓	✓					
FILE ENCRYPTION	✓	✓					✓
FAST FLOPPY DISK COPYING	✓	✓					
DISK/FILE EDITING	✓	✓					
U.S. LIST PRICE	$129.00	$149.95	$189.00	$249.00	$89.95	$79.95	$149.95



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Central Point Software INC.™

Circle 357 on reader service card.

PRODUCT UPDATES

Product	V.	Req.	Rev.	Price
MSFL: Pro League Football	2.0	1MB/6.0		*
MultiClip	2.0	512K/6.02	8/90	*
MultiLedger ★	1.1	512K/3.2		Free
Multi-User Appointment Diaries	3.01	512K/3.2		*
MusicProse	1.01	1MB/6.0	4/90	Free
Music Publisher	2.0.3	1MB/6.0		Free
MyDiskLabeler III		1MB/6.0		$25
MyTimeManager	2.0	1MB/6.0	5/90	*
Navigate	2.0	1MB/6.0		Free
Nemesis Go Master	4.0	512K/4.1		*
NanoDisk	**2.0**	**4MB/6.04**		**Free**
Network DiskFit	1.5	512K/4.1	12/89	$30
The NightWatch ★	1.03	512KE/3.2		*
Nisus	2.0	1MB/6.02		Free
NuPaint ★	1.04	512K/3.2		Free
NuTools	**1.2**	**1MB/6.0**		*
Nutrition Stack	2.0	1MB/6.02		$20
OmniPage ★	2.1	1MB/6.02	2/90	Free
Omnis 3 Plus/Express	2.0	512KE/3.2		*
On Schedule	2.0	1MB/3.0		*
P51 Mustang Flight Simulator	2.04	512K/3.2		$10
PacerLink	5.0	512K/5.0		*
Panorama	1.5	1MB/4.2		Free
PEGASYS II	3.2	1MB/6.03		Free
Performer Sequencer ★	3.4	1MB/6.0		Free
Personal Golf Stats	2.0	512K/3.2	2/90	Free
Personal Reference Catalog	2.0	1MB/6.0	10/90	$10
Personal Phone ★	1.1	1MB/6.0		*
PhotoMac	1.5	2MB/6.03		$75
PhotoMacEdit	1.5	2MB/6.03		$30
The Phrase Thesaurus	2.0	1MB/6.0	12/89	Free
PICT Detective	2.0	512KE/6.0		$20
PixelPaint	2.0	2MB/4.1		$99
Plains & Simple ★	1.06	1MB/3.2		*
PostShow	1.1	1MB/6.0		$35
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 Interface III	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
The Programmer's Online Companion	2.0	1MB/6.02		$10
Property Management III		1MB/6.0.1		$100
PropsForms	2.0	1MB/6.03		Free
Prototyper ★	2.01	1MB/4.1		$79
Publish-It	1.2	512KE/5.0		*
Publish or Perish	5.0	512K/4.2		$10
Pyro	4.0	512K/4.1	7/90	$15
QuarkXPress	2.12	1MB/6.02		*
Quicken ★	1.5	512K/3.2	1/90	*
QuickLetter ★	1.03	512KE/3.2		Free
QuickLock	**2.0**	**512KE/3.2**	**10/90**	**Free**
QuickMail	2.2	512KE/3.2		$95
QuickShare	2.0	512KE/3.2		$75
QuickShot ★	2.1	1MB/4.2		$5
Q-Sheet A/V	2.0	1MB/6.0	10/90	$50
RagTime 3	3.04	2MB/6.0	8/90	$150
Read-It OCR Personal	2.1	1MB/6.03	12/89	$29
Read-It OCR Professional	3.0	2MB/6.03		*
ReadySetGo	4.5	1MB/6.0		*
Real Estate Edge	2.0	1MB/6.03		Free
Rendezvous	2.5	512KE/4.1		$15
Reports ★	1.2	1MB/6.0		Free
Retail Engine	3.0	1MB/6.0		*
Sales Associate	1.10	1MB/6.03		Free
Sales and Market Forecasting Toolkit	2.0	1MB/6.0		$49
SAM	2.0	1MB/6.0	1/90	$29.95
ScanMan Model 32		1MB/6.0	10/90	Free
ScheduleMaker ★	3.01	1MB/6.0		$25
ScreenSnap ★	2.2	1MB/4.2		*
ScriptEdit	1.1	1MB/6.04	3/90	*
Second Sight	2.0	1MB/6.02		$33.75
Sentinel	2.2	1MB/6.0		$30
Shanghai	2.0	1MB/6.02	2/90	$13
SimMac	**3.0**	**1MB/6.02**		**Free**
SimpleSpan	2.5	512K/3.2		*
Smart Alarms	2.9.1	512K/3.2		$12
SmartForm Assistant	1.1	1MB/6.0		Free
SmartForm Designer	1.1	1MB/6.0		Free
SmartScrap & The Clipper	2.0	1MB/6.03		$20
Snap ★	3.1	1MB/3.0		*
SoftPC ★	1.3	2MB/6.0		*
Sound Designer Universal ★	1.5	512K/6.03		$45
Spelling Coach Professional	3.1	512KE/4.2		*
Spellswell ★	2.2	512K/3.2	5/90	$20
Spinnaker Plus	2.0	2MB/6.0		$45
Springboard Publisher	2.0	1MB/6.0		*
Stepping Out II	2.0	1MB/4.1		Free
StickyBusiness	1.06	512KE/6.03		Free
Still Light	3.0	1MB/6.0		Free
StrataVision 3d ★	1.4	2MB/6.03	4/90	$50
Suitcase II	1.2.6	512KE/4.1		$25
Super 3D	2.1	512KE/6.02		Free
SuperGlue II with GlueNotes	2.1	1MB/6.0	1/90	*
SuperLaserSpool	2.0.2	1MB/6.0		$30
SuperPaint	2.0	1MB/6.02		$50
SuperSpool	5.0	512K/4.1		$30
Sybil	2.0	1MB/6.0		*
Synchronicity	2.0	512KE/3.2	12/89	$5
Systat	5.0	4MB/6.0		$190
Teacher's Rollbook ★	2.2	512K/3.2		$17.95
Tempo II	1.02	1MB/4.2	12/89	*
Tempo+ Tools ★	1.1			*
Ternary Plot	3.0	512K/3.2		*
TextPert ★	3.01	1MB/6.0		Free
TextScan	**3.04**	**1MB/6.0**		**$69.95**
TGRAF-07/Mac	2.0	2MB/6.0		*
Think C	4.0	1MB/5.0	2/90	*
Think Pascal	**3.0**	**1MB/5.0**		**$69**
ThunderWorks	1.0.3	1MB/6.0.2		$69
Timbuktu	3.1	1MB/4.1	10/90	*
TimeMinder	2.0	1MB/4.2		$50
Timeslips III	2.0	1MB/6.02	2/90	*
TML Pascal II	3.0	1MB/5.0		$79.95
TMON ★	2.8.4	512K/4.0		*
TOPS/Mac	3.0	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
TurboCASE	**2.0**	**1MB/6.0**		**$25**
Turbosynth	2.0	1MB/6.03		$35
Typeface Library	1.5	1MB/6.03		*
TypeStyler	1.01	1MB/4.1	7/90	*
UNITize ★	1.3	512KE/3.2		$20
UpBeat	2.01	1MB/6.0	8/90	$75
VersaCAD/ Macintosh Edition ★	2.11	1MB/6.0		Free
Vietnam War	2.0	1MB/6.0		*
Virex	2.7	1MB/4.2	1/90	$15
Virtual 2.0 for 030	2.03	1MB/4.2		Free
Virtual 2.0 for Mac II	2.03	1MB/4.2		Free
Virtual 2.0 for Mac Plus	2.02	1MB/4.2		Free
Vision	1.1	1MB/6.03		Free
Voyager	1.2	1MB/6.0	4/90	*
VMacS	2.0	1MB/6.0		$25
Wall Street Investor	3.0	1MB/5.0		$150
White Knight II	11.6	1MB/6.02	7/90	$35
WillMaker	4.0	512KE/4.2		$18.50
Wild Things ★	1.1	1MB/6.0		Free
Wingz ★	1.1	1MB/6.0		Free
Word Finder	2.0	512K/3.2		*
WordPerfect for the Macintosh ★	1.0.3	1MB/4.2		Free
WorksPlus Spell	2.0	1MB/6.03	1/90	*
WriteNow	2.2	512K/4.2	9/90	$49

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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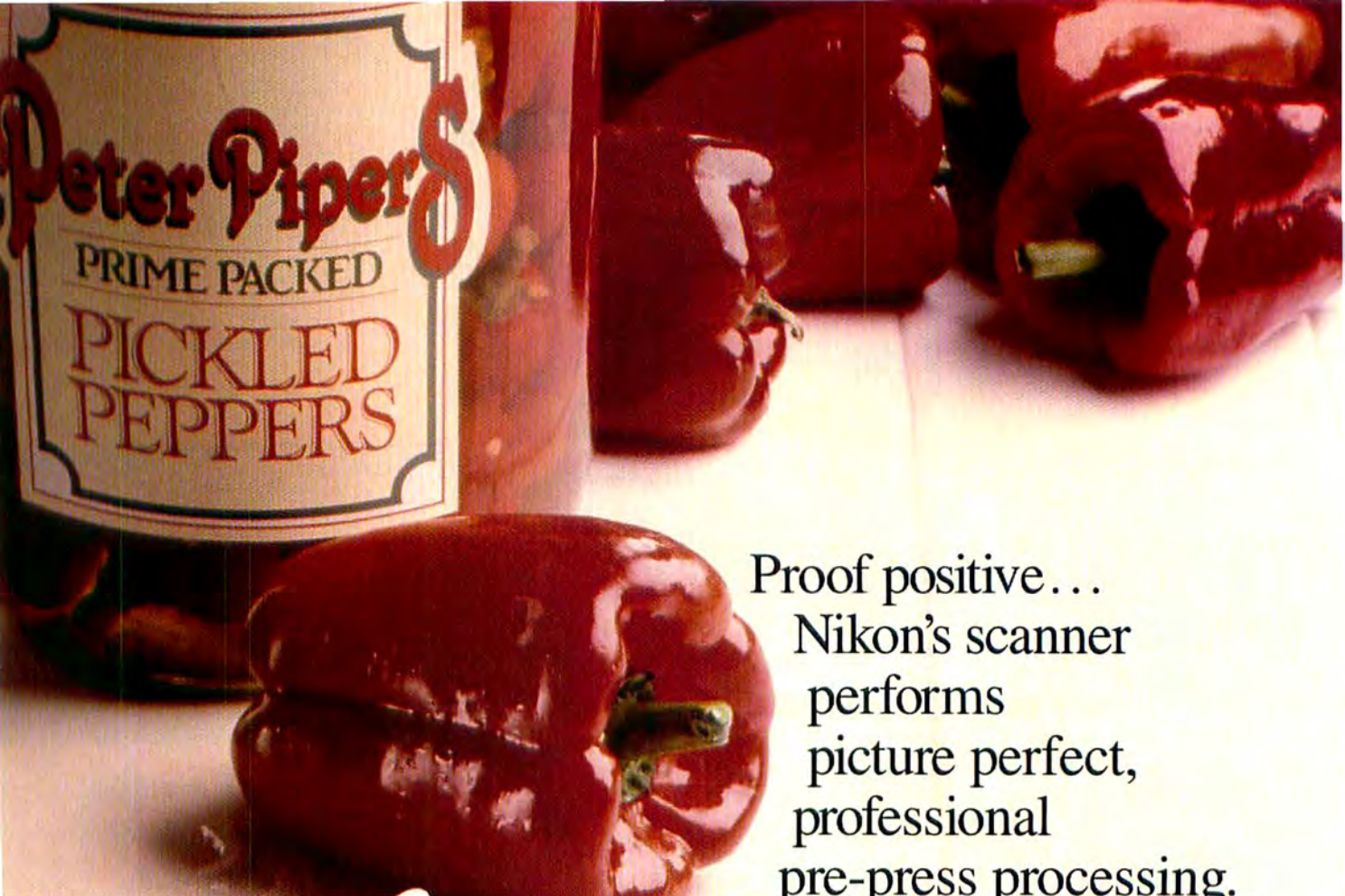

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701 **256G** Asuka Technologies; 714/757-1212.

702 **5330 Photomedia Imagesetter** Varityper; 201/887-8000, 800/631-8134.

A

703 **AccuText** Xerox Imaging Systems, Datacopy Division; 408/496-6511.

704 **Adobe Photoshop** Adobe Systems; 415/961-4400, 800/833-6687.

705 **Alchemy II** Tripos Associates; 314/647-1099, 800/323-2960.

706 **Aldus PrePrint** Aldus Corporation; 206/628-2320.

707 **Apple Scanner** Apple Computer; 408/996-1010.

B

708 **Business LaserPrinter II (BLP II)** GCC Technologies; 617/890-0880, 800/422-7777.

C

* **Carbon Copy Mac** Microcom Software Division; 617/551-1999.

709 **CIS 3515, CIS 4520 Multi-Format Scanner** Barneyscan Corp.; 415/521-3388.

710 **ClearScan Color Hand Scanner** NCL America; 408/734-1006, 800/521-0121.

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CLIP ART

711 3G Graphics; 206/367-9321, 800/456-0234.

712 Adobe Systems; 415/961-4400, 800/833-6687.

713 Archive Arts; 213/861-7562.

714 Artbeats; 714/881-1200.

715 ArtFactory; 714/793-7346, 800/331-3145.

716 C.A.R.; 314/721-6305, 800/288-7585.

717 Casady & Greene; 408/624-8716, 800/359-4920.

718 Cathay Europa Trading Company; 603/522-6000.

719 The Church Art Works; 503/370-9377.

720 Collector Software; 714/620-9014.

721 Davka Corp.; 312/465-4070, 800/621-8227.

722 Devonian International Software; 714/621-0973.

723 Discimagery; 212/675-8500.

724 DiskArt; 415/820-3734.

725 Dream Maker Software; 818/353-2297, 800/876-5665.

726 Dubl-Click Software; 818/700-9525, 800/359-9034.

727 D.V. Franks; 919/872-5379.

728 Dynamic Graphics; 309/688-8800, 800/255-8800.

729 Electric Banana; 213/370-4557.

730 Electronic Pen; 404/296-8623.

731 Enabling Technologies; 312/427-0386.

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733 Foundation Publishing; 612/445-8860.

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D

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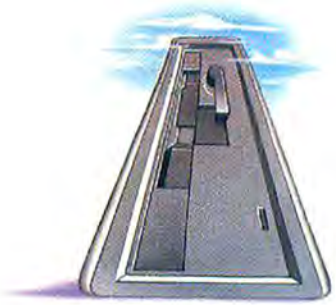

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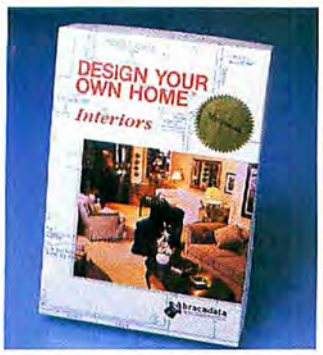

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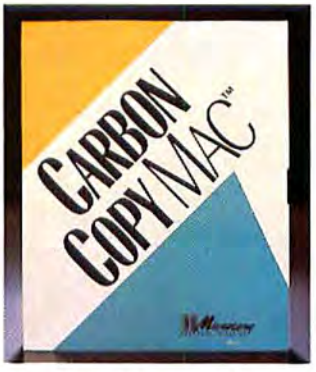

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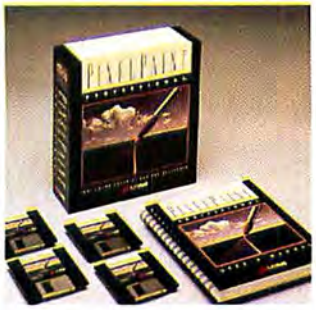

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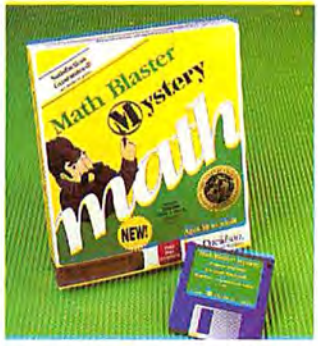

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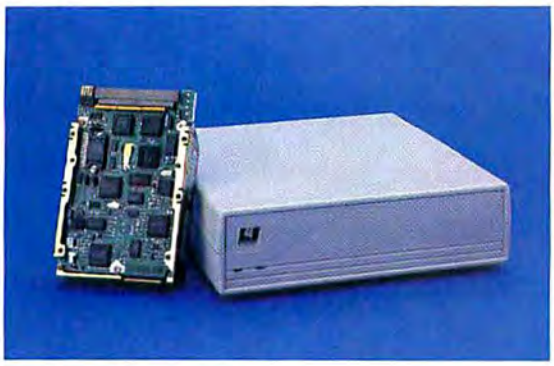

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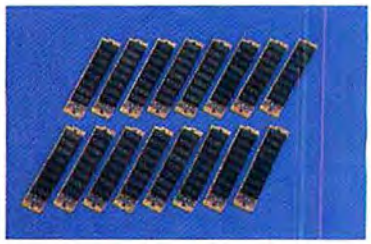

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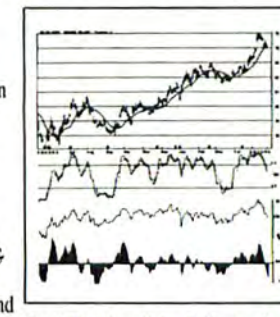

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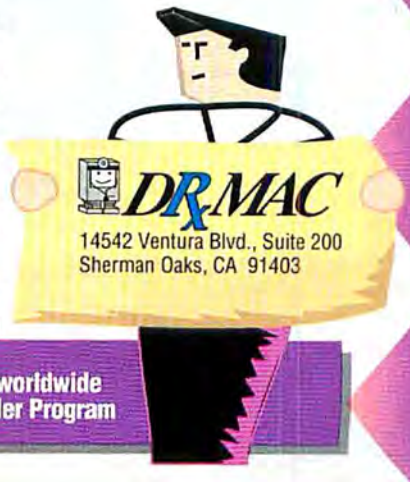

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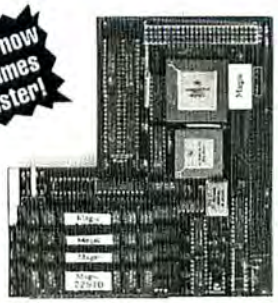

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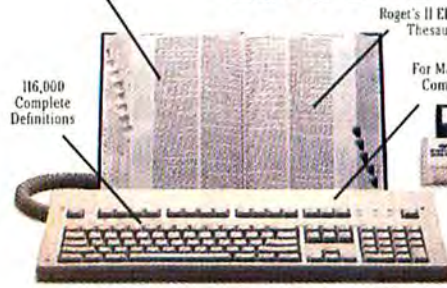

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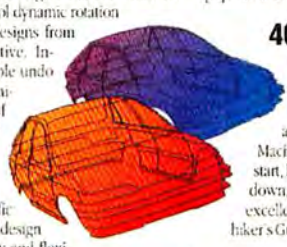

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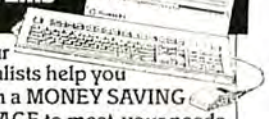

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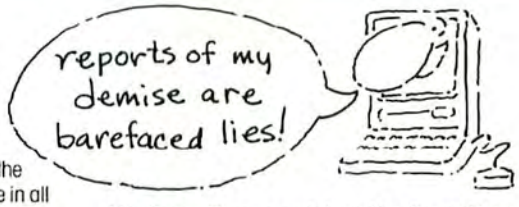

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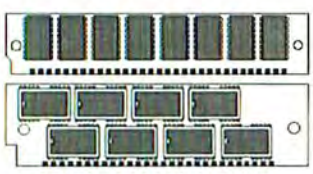
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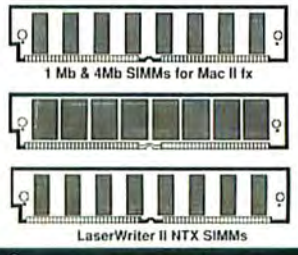
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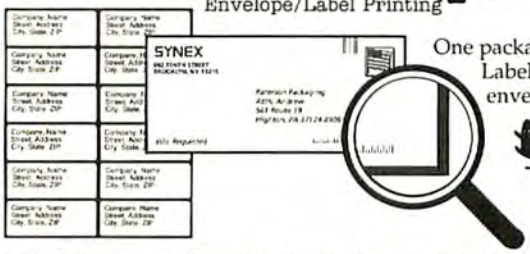

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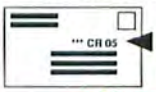

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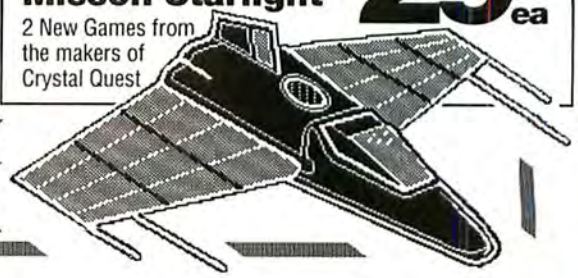

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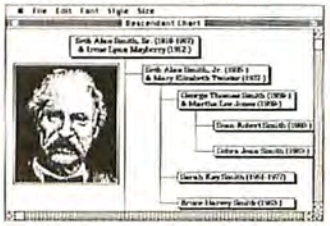

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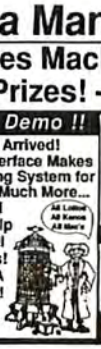

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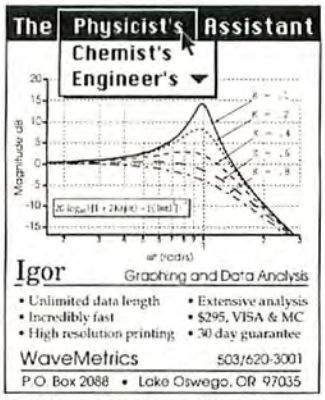

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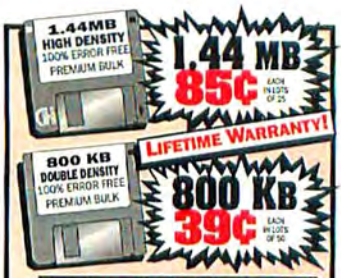

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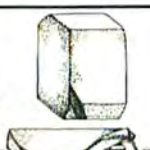

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Months on chart	Last month	This month		
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44	2	2	**Microsoft Works**	Microsoft
56	3	3	**Microsoft Excel**	Microsoft
52	4	4	**Aldus PageMaker**	Aldus
5	—	5	**Quicken**	Intuit
41	7	6	**MacWrite II**	Claris
17	5	7	**FileMaker II**	Claris
9	9	8	**Wingz**	Informix
18	6	9	**QuarkXPress**	Quark
50	8	10	**MacDraw**	Claris

EDUCATION SOFTWARE

19	1	1	**Where in the World Is Carmen Sandiego?**	Brøderbund
32	2	2	**Reader Rabbit**	The Learning Company
47	5	3	**Math Blaster**	Davidson & Associates
10	4	4	**Math Rabbit**	The Learning Company
6	3	5	**Where in the USA Is Carmen Sandiego?**	Brøderbund

ENTERTAINMENT SOFTWARE

8	1	1	**Tetris**	Spectrum HoloByte
10	2	2	**SimCity**	Maxis Software
44	3	3	**MacGolf**	XOR/PCAI
2	5	4	**Welltris**	Spectrum HoloByte
10	—	5	**Crystal Quest**	Casady & Greene

NETWORK/DATA COMMUNICATIONS

44	1	1	**TOPS**	Sitka Corporation
39	2	2	**AppleShare**	Apple Computer
5	5	3	**MicroPhone II**	Software Ventures
1	—	4	**Timbuktu**	Farallon Computing
1	—	5	**White Knight**	The FreeSoft Company

HARD DISKS*

Months on chart	Last month	This month		
8	2	1	**MacStack SD40**	CMS Enhancements
23	1	2	**MacStack SD20**	CMS Enhancements
10	—	3	**MacStack SD30**	CMS Enhancements
2	—	4	**MacStack SD80**	CMS Enhancements
2	—	5	**MacStack SD60**	CMS Enhancements

ADD-IN BOARDS/MEMORY

1	—	1	**Radius Accelerator 16/SE**	Radius
2	—	2	**Radius DirectColor 24**	Radius
1	—	3	**Radius TPD Interface**	Radius
4	—	4	**ColorBoard 264**	RasterOps
1	—	5	**Radius Accelerator 16+**	Radius

UTILITY SOFTWARE

6	1	1	**SAM II**	Symantec
6	2	2	**SUM II**	Symantec
6	4	3	**Adobe Type Manager**	Adobe
4	3	4	**Virex**	Microcom Software Division
2	5	5	**Pyro**	Fifth Generation Systems

PRODUCT WATCH

Recent or forthcoming products of particular interest.

Adobe Illustrator 2.0 *Adobe*
Color graphics program

The Typist *Caere*
300-dpi hand-held OCR scanner

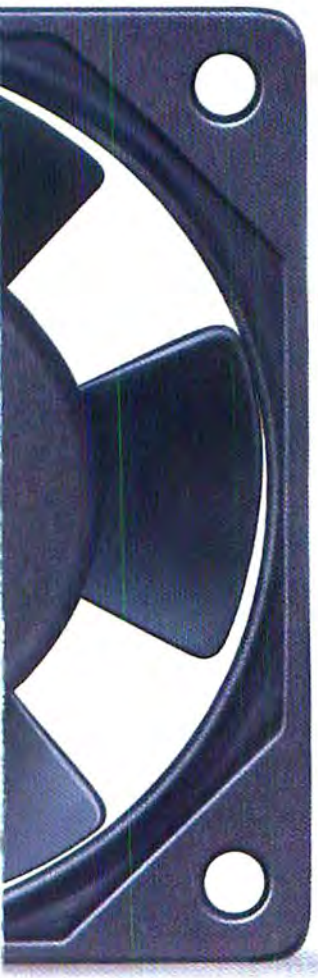
Virtus WalkThrough *Virtus Corporation*
Computer-aided "visualization" for spatial design

Source: Exclusive InfoCorp survey of more than 125 Macintosh retailers and selected mail-order vendors. Covers sales during June 1990.

*Does not include hard disks installed at the factory.

Affordability Has Always Been The Best Reason For Buying Ehman Hard Drives.

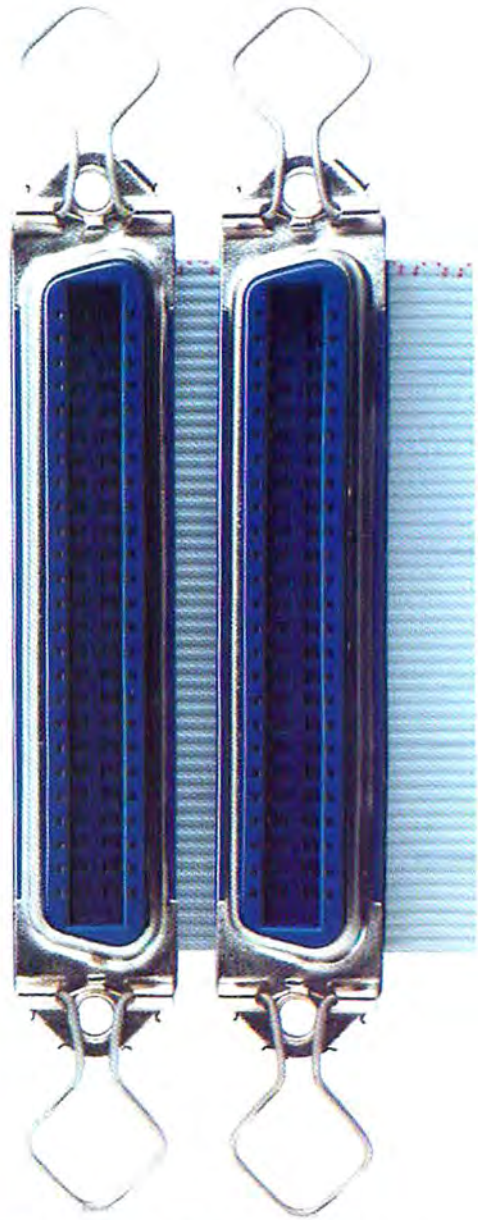
Now.



An improved manual reduces learning time.

24-hour burn-in testing and improved quality control.

New formatting software for clarity, ease of installation and optimum performance.



50-pin connectors to link peripherals.

e New E-Series.

manual makes learning to use your drive a snap. And all of the new E-Series drives will be tested twice, including a final 24-hour, system burn-in check. And if something does go wrong, Ehman is still backing all of its products with a 30-day, no questions asked money-back guarantee.

Now, if you think all these new extras will cost you extra, think again. The price is the only feature we haven't changed. Our external drives still start below $300 and our popular SyQuest removable is just $649 including a cartridge.

Whatever your reason for buying our hard drives, price or quality, call your Ehman sales representative and order yours today.

Hard Drives (MB)	*Internal*	*External*
20	*$249*	*$299*
30+	*$299*	*$349*
40Q	*$379*	*$459*
45	*$329*	*$399*
60+	*$399*	*$449*
80+	*$449*	*$499*
80Q	*$599*	*$649*
105Q	*$649*	*$699*
135	*$749*	*$799*
180	*$849*	*$899*
45 Removable		*$649*

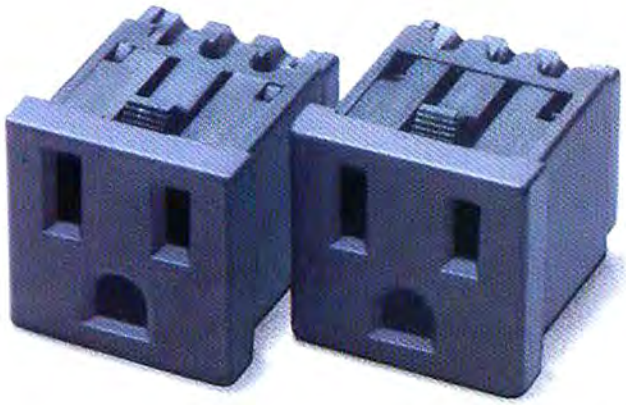
Ehman
The Apple Alternative

Seagate

Call 1-800-257-1666
or 1-307-789-3830
Fax 1-307-789-4656
Tech Support 1-307-789-1901

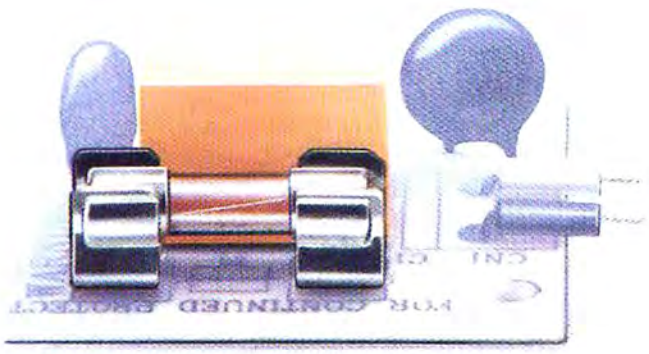
Circle 154 on reader service card

Until



Two power outlets enable users to turn on an entire system from the drive.

A fuse access latch for quick and easy repair of a faulty fuse.



Dual-fuse circuitry for protection against power surges.

A new, whisper-quiet fan for an improved work environment.

Since 1985, several hundred thousand Macintosh users have been interested in Ehman drives because of their attractive pricing. "Good product, great price and 30 days to change my mind," pretty much summed it up.

Until now.

Introducing the new Ehman E-Series of hard drives and removables. An enhanced line of products, loaded with features that bring you unsurpassed quality and reliability. The new enhancements include two power outlets that enable you to turn on your entire Mac system from your hard drive, and 50-pin cables that make daisy chaining a cinch. There's also a new, quieter fan that makes your Ehman drive *invisible* to the ear.

Introducing Th

Our new formatting software is simple, yet sophisticated. It's essentially the same software used by companies that charge twice as much for their hard drives. You'll notice this difference right away.

But other extras may not be so obvious. Our dual-fuse circuitry, for instance, provides a second buffer in the event of an electrical surge, while our new smart voltage switch means Ehman drives automatically operate on both international and domestic currents.

The new E-Series also offers enhanced ease of use and reliability. A completely redesigned user

RESTRICTED AREA

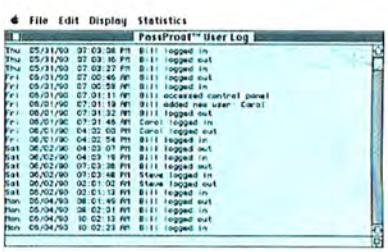
Your data is *your* data. And to keep it that way Kensington introduces PassProof™ — the first complete data protection system for the Macintosh®.

First, the hardware.

A rugged cylindrical lock keeps your disk drive safe from intruders. Two sturdy metal plates with tamper-proof screws block both rear-floppy and SCSI ports.

Next, the software.

As the master user you assign yourself a master password. From then on, you use the password as your key to unlock the system. You can add or delete additional users whenever you want. And PassProof's User Log keeps track of every attempt to use your Mac.



Want to "lock up" in a hurry? Quick Cover™ is PassProof's screen-locking program that lets you secure your Mac on command.

Best of all PassProof is user friendly.

Unless, of course, the user is unauthorized.

Ask your dealer about other Kensington accessories including cable and lock systems for all Apple and Macintosh computers, including the Mac Portable and the LaserWriter® II. Or call for a free brochure at 800-535-4242. Outside the U.S., call 212-475-5200.

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Circle 140 on reader service card