SPECIAL ISSUE

PUBLISHING
OUT WITH THE OLD, IN WITH THE NEW
There's a Word for

Arbor Sales

Calculated Sales

Celestial Body

Competitive strategies

Tips for achieving

government goals

Calculations on

The Arbor

and how the com-

petition is doing in

earlier and later

market sectors.

Calculations on

The Arbor

and how the com-

petition is doing in

earlier and later

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

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

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

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

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

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

For something a tad more informative than this ad, call (800) 541-1261, Dept. J92, to receive a brochure or ask for the location of your nearest dealer for a demo. You'll find that no matter what type of word processing you're performing, you could be doing it better.
Just take our Word for it.
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Desktop publishing has changed dramatically since the first page-layout program appeared. Our special coverage begins on page 168. (Photo by John Vachon, Library of Congress, LC-USM 3-24786-E.)

Resizing screen resolution on the fly. (See News, beginning on page 139.)
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SMART WORD PROCESSING!

EASY-TO-USE
A great word processor is more than just a stockpile of features—it's the usability of those features when doing real work! WriteNow actually delivers usability—and our awards and ratings prove it.

FAST ON ANY MAC!
WriteNow is the undisputed performance champion. Editing, searching, spell checking, saving, and printing happen lightning fast. For big and small documents. On any Macintosh. With or without a hard drive.

SMART WORD PROCESSING
WriteNow now includes the new Grammatik 2.0 grammar checker, making WriteNow the smartest choice in Macintosh word processing!
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.

Call Shiva for the Power and the Glory
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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All product names are trademarks of their respective manufacturers.
ROSES ARE X=0.7344, Y=0.2656;
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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 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.

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".

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.
So—you've mastered TETRIS™ and WELLTRIS™ and thought you were head and shoulders above the rest...

Presenting the newest challenge from the Soviet Union: FACES™, the third of the Tris line of games.

You'll recognize the concept of FACES soon enough. Stack the falling blocks of face segments of the famous and not-so-famous in the proper order to make complete faces. Swap the pieces, flip them, and drop them into place. Rack up the score by making perfect or mixed faces.

Face up to the new Soviet craze. It's funny, it's obsessive, and you'll keep coming back for more!

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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.

You're a consultant with a Mac whose clients love your reports so much they keep making urgent demands that you send them via modem for use in their favorite PC packages. No problem with MacLinkPlus. In minutes, you can send each file over the modem directly into the PC package of choice.

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 programs 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 XWrite on DOS laptops. With MacLinkPlus, everyone uses what they've got, while you pull it all together in your favorite Macintosh applications.

Solve these and thousands of other file exchange problems with award-winning MacLinkPlus software.

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Find out more about why MacLinkPlus is standard equipment for the Macintosh. For more info or the name of your nearest DataViz dealer, call (203) 268-0030 today.

The MacLinkPlus User Knows No Boundaries.
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.

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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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CANADA: ECLECTIC PRODUCTS
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*Greater than 90% H field attenuation above 30 KHz
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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-EMR and better than half of magnetic EMR.*
ColorPage™ T16 all business display. Full page, full price: $2995!*

When you’ve got the world’s top rated Mac II display, all you can improve is the price! ColorPage T16 from E-Machines now offers Macintosh business professionals the best for even less — the ultimate combination of compact size and big-screen impact, just judged #1 again by MacUser LABS. You get a whopping 70% more working space than on a 13” Apple. Don’t settle for less when now you can afford the productivity of a full page color display. Call 1-800-34-GRAPHIC for your nearest dealer. Or write E-Machines, 9305 SW Gemini Drive, Beaverton, OR 97005.

Circle 101 on reader service card
Truevision provides the key to integrating video and the Macintosh*. Now it's easier than ever to videotape your presentations, training materials or animations, thanks to NuVista+. It provides a true broadcast-quality signal for video in and video out. Simply connect the NuVista+ to your VCR and record.

Plus, with new features like digital linear and chroma keying, it's simple to achieve professional results. Best of all, the NuVista+ has reduced the cost of professional quality video production while adding exciting new features.
NuVista+ Is Your Key To Video Production.

Your Key To Video Connections.

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.

New Keys For Creativity.

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.

Savings and Flexibility Are Key, Too.

Just by integrating the video encoding and decoding onto the NuVista+, we saved you the cost of a VID/IO™ Box. But we didn't stop there. We've incorporated the new keying features which previously required additional expensive peripherals. And we've added flexible memory upgrades.

The NuVista+ base model, packed with all these features, is priced at $2995. It contains 1MB of high-speed VRAM, making it ideal for 16 bit/pixel video. And you can upgrade to a 2MB or 4MB configuration for 32 bit/pixel NTSC or PAL production. See your local Truevision Reseller for more info, or call us at 800/858-TRUE.
Modems, wake up. Macintosh users take heart. MicroPhone II 3.0 is about to brighten your day.

Using Color Icons, Superior Text Editing and Custom Dialogs, MicroPhone II 3.0 lets you design your own custom front ends. Suddenly, hostile remotes are on speaking terms. And clumsy chains of commands are reduced to effortless clicks and keystrokes. You communicate more easily than ever before.

Whether for mail, teleconferencing, on-line research or bulletin boards, MicroPhone II 3.0 is helping everyone put on a happy face.
Supporting Computer Users' Civil Rights

Concerned that a national crackdown on computer crime is threatening the civil rights of computer users, Lorus 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 Leveco 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 Leveco 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 Encyclopedia (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 Super-Match 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 Sloley will follow Liaison to become a Farallon employee. Peachtree Software, of Atlanta, Georgia, has acquired Layered Software. For more information call 404/564-5700.
It's no accident that the high performance of Canvas** evokes images of a jet fighter in full flight.

Fact is, its technical drawing power renders Canvas remarkably adept at evoking almost any kind of image you could want.

Over time, this has served to render Canvas's competitors rather speechless. And its reviewers, just the opposite.

A quick tour of its amazing arsenal of weapons helps explain why all the commotion.

Advanced Bezier and spline curves with total editing control. 64,000 dpi accuracy. 16 million-plus colors. Custom rulers, dashed lines, and arrowhead styles. 1/100th-inch hairlines. Auto object distribution and dimensioning of lines & arcs. Auto tracing of scanned art.

Press-ready 4-color (CMYK) separations, with precision screen angle adjustments and independent color overrides. Flexible EPSF export formats. Importing of MacDraw® I or II files. Smooth text handling and a 100,000 word onboard spell checker.

The list just goes on. And on. And on.

Yet despite all this technical prowess, Canvas has earned consistent applause for its intuitive design & ease of use.

And, perhaps best of all, for its list price of under $300.

So, if you're looking for a lot more thrill and a lot less limitation, look into Canvas.

By any measure, it's the only way to fly.

For additional information or the name of your nearest dealer call 1 (800) 6-CANVAS or (305) 994-8985.

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For eleven days and 1,641 miles, Team Solarcat had
Looks like another beautiful day for Sony floppy disks.

For a certain solar-powered vehicle, they shine even when the sun doesn't.

After all, Sony floppies are made for critical missions.

Recently a team of engineering students from Villanova raced their "Solarcat" from Florida to Michigan in Sunrayce USA.

The competition: Physics. The elements. And thirty-one other solar-powered cars.

Moreover, the team had to analyze a steady stream of computer information: Energy absorption. Battery depletion. Even the elevation of hills.

Not one byte could be lost.

That's why, after sweating over their computer screens for this very critical event, Team Solarcat trusts their data only to Sony's critically acclaimed 3.5" disks.

The floppies that always earn their place in the sun.
"See workgroups differently with QuickMail 2.2."

"Connect with Paris as easily as Purchasing."

"QuickMail" users have redefined workgroups to include co-workers and clients, partners and prospects, folks down the hall or up and down the coast. It's collaborative computing with point and click simplicity. Send a message, a document, or a whole file to everyone you work with. Connect through commercial online services, remote QuickMail networks or with any fax in the world with one key-stroke. Add gateways to your mainframe, VAX™ or NetWare MHS™, TCP/IP, or X.400 networks just as easily. No other E-mail offers you this many connections.

"Get the features that really make E-mail deliver."

"Features that make your extended workgroup easy to manage: A mail log tells you the status of all your mail—who's read it, who hasn't. Sort mail and file it in personal mail folders so you can track conversations or projects. Retrieve messages or even 'unsend' them."

"And features that make it easy to work. The QuickMail Menu™ is always there so you can send a quick message, attach your open document or up to 90 seconds of voice mail, set up an impromptu online conference, post a notice to your whole directory or a pre-set group, or send mail for delayed delivery all without leaving your application."

"No wonder it's the world's most popular."

"QuickMail is working for over a quarter million users in 60 countries. It got the highest E-mail rating for PC or Mac from InfoWorld, who states, 'CE Software's QuickMail reigns supreme as far as features go.' MacWeek says, 'CE Software is far ahead... offering links to more than a million E-mail users.' From MacUser, 'QuickMail is the one you should pick.' Get the message?"

"Go to a dealer and try it."


QuickMail is working for over a quarter million users in 60 countries. It got the highest E-mail rating for PC or Mac from InfoWorld, who states, 'CE Software's QuickMail reigns supreme as far as features go.' MacWeek says, 'CE Software is far ahead... offering links to more than a million E-mail users.' From MacUser, 'QuickMail is the one you should pick.' Get the message?"
Commentary

Can America Compete in Asia?

A computing 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 over-

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

(continues)
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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 Baoying, 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-clones 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 Monitor 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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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 Mita. But in Taiwan Apple has a 10-year history of selling computers and a base of more than 500,000 Apple PCs, 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,
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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 Page-Maker 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 512KFs 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 (HanguTalk), 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 ensure 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.

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LETTERS

Monitoring Emissions

Your article "The Magnetic-Field Menace" [July 1990] was well researched, even-handed, 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

Television, 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 reasonably 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 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 (continued)

Corrections

In the sidebar "Speed Tests: IIFX at a Blur" ("Power at a Price," May 1990), SuperMac's Spectrumi24 with Graphics Accelerator should have read ColorCardi24 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.


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


Upright 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 ("Relodex Roll Call" table, Roll Over Rolodex, May 1990).
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PARACOMP 1725 Montgomery Street, 2nd Fl., San Francisco, CA 94111

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

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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 expose 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 Ottomad  
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
Before engineering the QMS-PS 410, we performed one very important task. We listened. Then we took everything we heard, added a few surprises, and built a revolutionary laser printer with a suggested retail price of just $2795!

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You said make it reliable. So we used the Canon® LX print engine manufactured by the undisputed world leader in high-quality, easy-maintenance print engines.

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You see, listening to you gave us the insight to develop a printer that offers real world solutions to real world problems. And the QMS-PS 410 delivers PostScript power to the people by giving you more solutions than any other printer on the market. Affordable. Reliable. Flexible. Solutions that set you free!
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. Toader, 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 emissions 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)
How The New Kid On The Block Made The Best Drive In The Business

The Protege 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 Protege hard drive features an outstanding 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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A drive that keeps its cool also keeps its reliability. The Protege is a really cool machine because it maximizes air flow across its drive assembly and its isolated power supply — efficiently cutting the danger of heat-related failure from the two most important parts of your drive.

Attention to Details
Even the back of the Protege is loaded with smart features. Like an extra power outlet for other drives or peripherals. A push-button SCSI ID setting. And an external terminator for convenience.

Loaded with Smart Software
Your Protege will arrive pre-formatted and ready for work, loaded with easy-to-use, custom-designed utilities. The Protege’s Disk Management Software allows you to partition for more efficient drive operation and password protect each partition. The software even allows for disk spanning and creation of ProDOS and UNIX partitions.

Drive Your Bargain
Like all MacAvenue products, the Protege is backed by superior documentation, a 30-day, no-questions-asked, money-back guarantee, a one-year warranty and a toll-free technical support line. So call now. And drive a bargain on the best drive in the business.

Protege Hard Drives

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Creating a page of text and graphics on your Macintosh once required the use of several different software programs. One for drawing and graphics. Another for text effects and font editing. And one more for page layout.

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Introducing Adobe Illustrator software Version 3.0, the only program that actually combines all those features in a single application.

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And because we weren't satisfied with that, it also includes an expanded toolbox, along with ease-of-use features like an instruction bar that guides you through the program.

Yet, what makes the new Adobe Illustrator program truly unique isn't what we've improved, it's what we've added. Most notably, the program's unprecedented type-handling and font editing features enable you to integrate text into your designs with virtually no limitations. And its sophisticated graph tool charts numbers automatically.

All of which means Adobe Illustrator can take any job from initial concept to final separation. In fact, that's exactly what we did with this ad.

So call 1-800-344-8335 for the name of your nearest Adobe Authorized Dealer (outside the U.S.A. and Canada, call your local distributor) and discover for yourself the power of Adobe Illustrator Version 3.0.

It just might leave you speechless.
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 ("Mediablitz: 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 chief 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.

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"1989 Best Word Processor" MacUser U.K.

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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 checkeredboard.

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 Fs, 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 76 percent. Finally, after specifying a perspective view for the checkerboard, he imported it into the window image.
You can't always choose the data you have to manage.
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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.

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As you use FileMaker Pro you will find more and more things to do with it. This "revealed power" is what makes FileMaker users FileMaker fanatics.

What's more, you will experience the seamless way that FileMaker Pro fits with other Claris® software. The graphic and text tools work the same as they do in our other products - so you spend more time on business and less time remembering commands. There's also XTND, a Claris invention that lets you easily exchange text and graphics with other software and computers without loss of formatting. All this raises Macintosh productivity to a new level.

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We make no apologies for the pricing of our monochrome monitors. Like all Ehman peripherals they're excellent products and superb values. But it's hard to explain the gap between Ehman monitors and the two leading brands. It's even harder to justify it.

You could buy three Ehman two page monitors for the suggested retail price of one Apple two page monitor. Or you could buy three Ehman full page monitors for the price of one Radius full page monitor.

If you think we've taken short cuts in quality, think again. Ehman monitors feature exceptional resolution, front mounted controls, U.S. made tubes, and our two-page monitor has true WYSIWYG resolution and a flicker-free refresh rate higher than Apple or Radius. Prices on the Ehman monochrome monitors include card, a tilt/swivel base, a full one year warranty, and, of course, our standard 30 day money-back guarantee.

For those who are in the market for monitors there are a couple of choices. If you don't mind spending money on expensive labels, buy your next monitor from Apple or Radius. But, if you prefer saving money, call Ehman.

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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.

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 juicer 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." (continues)
Dear Jasmine Technologies,

Occasionally we win one.

On 11/15/89, as I was driving home from work, a tornado formed just to the west of me. I had enough time to pull into a safe parking lot and duck down. The “safe parking lot” turned out to be right in the path of the tornado. I was knocked out as the 200 MPH winds struck, flying my car—and me—nearly 300 yards. I woke up in the hospital with a severe concussion and blood loss. As part of the $230 million storm damage, my car was totalled and my computer was lost.

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 damn 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,

Gene Lawson
For the last four years Jasmine has continuously been the leader in the Macintosh hard drive market. We're proud to announce that we are now a division of Chess, a dominant force in the European Macintosh market. With our new management we are producing the kinds of innovative products that we've become known for.

Look at the Service...

Jasmine's Platinum Flower Service is focused on our Customers. Over 25% of our staff is dedicated to Customer and Technical Support. Each Jasmine drive is thoroughly burned in and tested before shipping and we include informative manuals and detailed troubleshooting guides to help with any problems that may arise. If you're not satisfied with any aspect of your drive, you have 30 days* to return it for a full refund and, should your drive need help, the Platinum Flower line has a 2-year repair warranty.

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Jasmine Technologies has consistently finished first in the MacUser Labs' Buyers Guide and we've been praised in every major Macintosh publication for the quality of our drives and for the ease of use of DriveWare, our custom drive utility. Jasmine has earned more MacWorld and MacUser awards for Macintosh peripherals than all of our competitors combined.

Now, Consider the Alternatives...

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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 reeking 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 using 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, (continues)
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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 panes 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.

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 (continues)

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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. Were’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 art-­‐­­­fancy 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 Gopher, 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 (continue)
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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."

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THE ICONOCLAST

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...
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And because the typical business slide takes only two minutes, what you see on your Macintosh can be on the presentation screen almost instantly. Which means you can make those last minute decisions and changes without sacrificing the quality of your presentation. Or a major chunk of your budget.

Even with all it does, perhaps the most amazing thing about ColorFast is its price: just $5,999. This includes everything: film recorder, 35mm and Pack Film adapters, instant 35mm slide processor, overhead enlarger, software, sample films, slide mounts, and cables.

Two-Year Warranty.

Finally, ColorFast is the only digital film recorder with a two-year warranty.

To get ColorFast, all you have to do is call 800-422-7777. We’ll give you the name of your nearest GCC Technologies dealer, or you can order direct. When you buy direct from GCC, you get a 30-day money-back guarantee and $9 overnight delivery. Call today. And start creating more professional presentations, in your own office, tomorrow.

800-422-7777.
Why MacConnection's

From the more the merrier... Why are we making such a big deal about a little foam peanut? Well, ever since David Hall and I started MacConnection in 1984, we've been trying to give our customers more. More efficient delivery (we set the $3 overnight-shipping standard). More service (we were the first to offer toll-free tech support). More peace of mind (we also introduced 30/60-Day Money-Back Guarantees).

And more fun (only our customers can laugh, chew gum, and order Mac products at the same time—without even looking at the manual).

...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...
more is to give less. So we've developed a way to ship safely using less packaging. And we've eliminated styrofoam peanuts.

We're going to start having fits. Packaging has always been a big issue with us. Early on we switched to a non-static foam peanut without hard CFCs. But as the environmental case against foam products grew, we decided to switch to recyclable newsprint.

Just as important, we're reducing our volume of packing materials by using a greater variety of box sizes. Now every order fits much more tightly and needs little (if any) extra packaging.

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.
Actually, we work in a dump. In New England’s early days, the few things that couldn’t be reused 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.

By analogy, one look in any dumpster tells a lot about how we live today. And it’s sure hard to imagine how a used piece of plastic could be a rewarding find for future generations.

So we’re cleaning up our act. 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.

Since we run ads in magazines and print several different catalogs a year we are

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

Our catalogs may be getting a little duller.

We are currently experimenting with using recycled papers for everything from company stationery, envelopes, and in-house forms to our four-color catalogs. Our latest catalog was printed on paper containing 50% to 70% recycled fiber of which an average of 8% to 10% is post-consumer waste. These percentages are, believe it or not, among the highest currently available for color magazine printing. Unfortunately, you just don't get the same sharp, crisp look as with new coated stock. But we felt it was important to give it a try and hope that as demand grows the quality will improve. We welcome your comments.

At G.E. Robertson, Inc. in Hinsdale, NH, George Dubois' crew recycles 100 tons of used magazines and catalogs every week.
THINGS YOU CAN DO WITH MORE MEMORY.

Do you use memory-intensive programs like Macro Mind Director, PageMaker or OmniPage? Would you like to use MultiFinder to multitask? Have you been moving INITs and CDEVs into deep storage because your System Folder keeps creeping over 1 Meg? Would you like to create HyperCard stacks with sound and/or graphics? Has that message "Not Enough Memory" been popping up with alarming regularity? Do you feel we're getting too personal? If you can answer yes to any of these questions, read on! Because the solution is adding SIMMs to your system board. Yeah, that's definitely the ticket. And the fastest and easiest way to add some SIMMs is by buying them from us.

The chips are down. Way down. A Meg of memory used to cost more than a spare screw from the Pentagon. But now SIMMs have become a commodity—the more we buy, the better price we can pass along to you.

These days we're bringing in SIMMs in serious quantities by camel across the Gobi desert, by boat through the treacherous Magellan Straits, and, finally, by special couriers into Marlow during the dead of night. Actually, we buy them by the load from the major manufacturer offering the best price. And send them out to you overnight via Airborne Express. So you can bring your Mac to full power tomorrow, for just $69 per Meg, plus $3 shipping.

Why is this SIMM different from any other SIMM? A SIMM is a Single In-line Memory Module—eight chips (comprising, in this case, 1 Meg) on a single plug-in strip. The chips on our SIMMs are made by companies like Toshiba, Micron, and Siemens, and we guarantee them for two years!
Big SIMM Sale
$69/Meg!

FREE Installation Video!
It's no good knowing the moves unless you've got the motion. That's why every order for MacConnection SIMMs comes with a free video (VHS or 8mm) that demonstrates how to get inside your Mac and put your SIMMs in their place.

You can add up to 4 Meg in an SE/30, Mac II, IIx, IIc, or IIfi (4 Meg at a time).
And we also carry the 64-pin 1-Meg and 4-Meg SIMMs for the IIx which let you upgrade from four to thirty-two Meg.

Can I really do it myself?
Installing SIMMs is like hooking up a stereo system or putting together a tricycle on Christmas morning. You have to relax, take your time, pay attention, and promise not to go at it with a sledge hammer if you get frustrated.

With our free instruction booklet, free technical support, and free installation video, thousands of customers have successfully installed SIMMs, saving hundreds of dollars in the process. If you get stuck, just call us toll-free and we'll talk you through it step by step.
All it takes is about half an hour on a Plus, SE, or SE/30—we'll sell you the special tools to get inside those Macs for just $8. To install SIMMs on the MAC II line takes even less time and no special tools.*
The result is a rewarding feeling of accomplishment, a well-balanced checkbook, and enough RAM to run roughshod over the most robust applications.

MacConnection SIMMs, 2 Yr. Warranty

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
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<tr>
<td>1107</td>
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<td>7600</td>
<td>4 Meg for SE/30</td>
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<td>7497</td>
<td>1 Meg for IIx (4-pack)</td>
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<td>7599</td>
<td>4 Meg for IIx (4-pack)</td>
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<tr>
<td>4748</td>
<td>Mac Toolkit (Plus, SE, SE/30)</td>
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</table>

* Most manufacturers (including Apple) get a little nervous about non-authorized personnel (that means you) working inside their machines. Be advised that opening your Mac may void the warranty, so check with your dealer if you're concerned.

Prices subject to change without notice.
It's one thing for a product to prove itself on a tech bench. But it's ever so much more impressive to be the best in the trenches. The fourth annual Macworld World Class Awards are chosen by users. And this month we're proud to feature some of the many winners that we carry.

The majority of products we carry are covered by 30-60 day Money Back Guarantees (as listed here in red). If you're not happy with one of these products, call us for an authorization and return it with all of the original packaging within the guarantee period for a refund check (or credit on your credit card). We reserve the right to limit quantities on such returns.

We only carry the very latest versions of products. The version numbers shown here are based on the best available information at press time. Also, all software is not copy-protected, unless indicated otherwise by (CP).

**DAILY BUSINESS**

<table>
<thead>
<tr>
<th>Name</th>
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<tr>
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<td>Cover Letters</td>
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<td>Planisoft 1.0 (1 user)</td>
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<td>Dow Jones ... 30 day MBG</td>
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<td>Managing Your Money 3.0</td>
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<td>MacConnection ... 2 year warranty</td>
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<tr>
<td>1 Meg SIMMs—Crank your system's memory to the max with our very own, very reliable 30ns SIMMs. Includes complete instruction booklet &amp; installation video (VHS or 8mm) $69. 4 Meg SIMMs (80ns) ... call</td>
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**Paracomp**

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<tr>
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<td>Swivel 3D Professional</td>
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<tr>
<td>7441 Swivel 3D Professional 1.0-A 3D modeling &amp; visualization tool. Features include smooth shading, 24 bit color, animation, linking, AutoCAD output and Renderman output for photo realistic graphics.</td>
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**Ashton-Tate**

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**Microsoft**

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<td>The Microsoft Office</td>
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<td>Microsoft Office (CD-ROM)</td>
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<td>Word on Apple Mac Book</td>
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<td></td>
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</tbody>
</table>
World Class status

ASD Software ... 30 day MBG
7619 Playslips 1.0—Coordinate agendas, find available time-slots for appointments, keep track of deadlines & priorities, distribute tasks evenly, optimize resources, share information between Macs & PCs over any LAN ... $145.

Paragon Concepts
5683 Niue 3.0 ... 245.
★ Portfolio Systems ... 30 day MBG
6916 Dynodex 1.2 ... 57.
7448 Dynodex Paper (100 sheets, 300 pgs.) 14.
★ PowerUp ... 30 day MBG
7656 Calendar Creator ... 35.
7657 Letter Writer Plus ... 52.
7654 Address Book Plus ... 52.
7655 Address Book Plus with Binder ... 75.
7658 Fast Forms 2.0 ... 105.
★ Preferred Publishers ... 30 day MBG
4781 Vantage 1.5 ... 52.
7650 Direct Mail 1.0.2 ... 52.
4780 Database 1.5 ... 68.
4582 Panorama 1.5 ... 249.

★Reference Software ... 30 day MBG
6268 Grammatik Mac 2.0 ... $50.
3320 BulkMailer 3.25 ... 75.
★Sensible Software ... 30 day MBG
Sensible Grammar or Bookends ea. 51.
★ Shana ... 30 day MBG
7653 Informed Mini-Manager ... 54.
7652 Informed Designer ... 159.
★ Softsym ... 30 day MBG
7129 Accountant, Inc. Professional 1.03 345.
★ Spinmaker ... 30 day MBG
6508 The Resume Kit ... 35.
★ Survivor Software ... 30 day MBG
6097 Invoic1 1.01 (reqs. MacMoney) ... 49.
3289 MacMoney 3.5 ... 59.
★ SystemTie ... 30 day MBG
3422 More 3.0 ... 285.
★ Symmetry ... 30 day MBG
4504 Acta Advantage 1.02 ... 63.
6069 KeyPlan 1.0 ... 243.
★ Synergy ... 30 day MBG
6617 KaleidaGraph 2.0 ... 145.
★ Systac, Inc. ... 30 day MBG
7409 FastPoint Coprocessor 1.1 ... 159.
7410 Systac 5.0 ... 599.
★ Teleware ... 30 day MBG
7616 M.Y.O.B. 2.0 ... 145.
★ TIMESLIPS ... 30 day MBG
2996 Timeslips III 2.0 ... 195.
★ T/Make ... 30 day MBG
3652 WriteNow 2.2 ... 117.
7360 WriteNow 2.2 Corporate 3-Pak ... 245.
★ WordPerfect ... 60 day MBG
3800 WordPerfect Mac 1.03 ... 229.
★ Zedcor ... 60 day MBG
6742 Desk 1.0 ... 229.

GRAPHICS & DESIGN
★ Aapps ... 30 day MBG
6509 MicroTV ... 265.
7117 DigiVideo 1.0 (black & white) ... 399.
7114 DigiVideo Color ... 685.
Adobe Systems
Adobe Type Library ... call.
6957 Adobe Type Reunion 1.0 ... 39.
5750 Adobe Type Manager 2.0 ... 55.
6053 Adobe Plus Pack ... 109.
6156 Adobe Plus Pack/ATM ... 159.
6098 TypeAlign for ATM 1.0, 4 ... 89.
6365 Adobe ATM/TypeAlign Pack ... 89.
6931 Adobe Type Set 1, 2, or 3 ... call.
1137 Adobe Illustrator 3.0 ... 349.
6644 Adobe Photoshop 1.0 ... 499.
5505 TrueForm 2.1 ... 225.
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3507 Super3D 2.1 ... 315.
Aldsys
1194 Fantastical Plus 2.0 ... 51.
5425 Art Importer 2.0 ... 89.
6495 Meta morphosis 1.5 ... 149.
1185 Fontographer 3.1 ... 249.
Bright Star Technology
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Toyogo ... 30 day MBG
7623 Nexus Go Master Deluxe 4.7—Chaos Manor Users' Choice Award 1990 (type 490), Unites the Go playing abilities of Go Master, the Corner-Opening Tutorial John R. Genius, and the life and death Consultant, Tactical Wizard $38.
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4815 smart form designer 1.01v ...... 299.
1117 macdraw ii 1.1 (w/atm) ........ 299.
4814 claris cad 1.0vs ................ 579.
computer associates/ cricket
1668 ca-cricket graph 1.3.2 .. .... 125.
1670 ca-cricket presents 2.0 ....... 319.
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6645 easy color paint 2.0 ............ 42.
★ custom applications ... 30 day MBG
6517 freedom of press 2.4 ........... 255.
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6095 delta graph 1.5 .................. 109.
★ deneba software ... 30 day MBG
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6302 designstudio 1.0 ............... 489.
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5908 Publish It! 1.2 ............... 222.

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7424 EPS Animals & Nature .......... 82.
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6576 Vietnam Remenbered (CD-ROM) .... 69.
6370 Quick Art (CD-ROM) .......... 175.
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6501 SpriteScraper 1.0 ........................................... 57.

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5681 HyperTMON 1.0 ............................................ 58.
4085 TMON 2.6.4 ................................................... 87.

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5457 QuickLock 2.0 ............................................... 34.
2591 The NightWatch 1.03 ..................................... 85.
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6267 KiwiEnvelopes 3.0 ........................................ 34.
7445 KiwiFinder Extender 1.0 ................................. 65.

Leister Productions ... 30 day MBG
7126 Reunion 1.8 ................................................... 99.

Loop Software ... 30 day MBG
5442 PictureBook 3.2 ............................................. 39.

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7267 AutoSave II 1.1 ............................................. 28.
7268 POWERIcons 1.0 ........................................... 39.
7270 Backmatic 1.1 ................................................ 50.

Microcom ... 30 day MBG
4803 Vortex 2.7 .................................................... 56.
5885 Vortex (10 Pack) .......................................... 329.
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7465 CarbonCopy Mac (Twin Pack) ...................... 169.

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2732 GOMix 1.0 ................................................... 45.

MOS Software ... 60 day MBG
7068 INITPicker 2.0 .............................................. 35.
2913 Redux 1.62 ................................................... 49.
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4471 QuickBrow 1.0 ................................................ 64.

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6656 Personality 1.0 ............................................. 49.

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7404 DiskDoubler 3.0 ........................................... 45.
7403 Partner 1.01 .................................................. 56.

Microcom ... 30 day MBG
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<td>Silicon Beach</td>
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<tr>
<td>SuperCard 1.5</td>
<td>$189</td>
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<td>BrightStart, Inc.</td>
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<td>HyperFt 2.2</td>
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<td>HyperFt Relational</td>
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<td>HandOff II</td>
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<td>Solutions, Inc.</td>
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<td>SmartScrip &amp; The Chipper 2.1</td>
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<td>ScriptEdit 2.0</td>
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<td>SharpenUp 1.0</td>
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<td>Carmen Sandiego Series</td>
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<td>Type! 1.0</td>
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<td>Ancient Art of War at Sea</td>
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<td>The Playroom</td>
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<td>Network DiskFit 1.5</td>
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<tr>
<td>Activation</td>
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<tr>
<td>Manhole</td>
<td>$28</td>
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<td>Manhole (CD-ROM)</td>
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<td>Cosmic Omen</td>
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<td>Ars Nova</td>
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<td>Gams of The Word 1.0 (KJ or NI)</td>
<td>$25</td>
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<td>HyperBible 1.0 (King James)</td>
<td>$145</td>
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<td>HyperBible 1.0 (New International)</td>
<td>$175</td>
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<td>Beoga Productions</td>
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<tr>
<td>Super Studio Session wMusic Library</td>
<td>$99</td>
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<td>Bright Star Technology</td>
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<td>Typel 1.0</td>
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<td>Star Wars (CP)</td>
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<td>Carmen Sandiego Series (CP)</td>
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<tr>
<td>SimCity 1.2 (CP)</td>
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4751 Persuasion 2.0—Macworld World-Class Award for Business Presentation Graphics. Imports text from word processors, and PICT and EPS graphic imports from MacDraw, FreeHand, etc. $329.

**First Byte**

5294 Puzzle Storybook 1.0 (ages 3-8) | $27 |
5293 Dinosaur Discovery Kit 1.0 (ages 3-8) | $27 |
5293 Great Wave—30 day MBG        | KidsTime 1.2, American Discovery 2.3 |
                                  | NumberMaze 1.1, KidsMath 1.1 | ea. 26 |
5294 ConcertWare+ 4.0             | $38   |
5294 ConcertWare+ MIDI 5.1        | $98   |

**HyperGlot**

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Verb Tutor - Intermediate (Spanish, French, German) ea. 42.
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KanjiMaster - Beg (Japanese)      | $105  |
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7425 Training for Microsoft Word 4.0 | $26 |
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2765 Fool’s Errand ....... 32.
4596 Deja Vu II
5253 The Puzzle Gallery . . . . . . . . . . . . . 26.
5453 Talking Math Rabbit 1.0
2670 Reader Rabbit 2.2 (CP) (ages 4-7) .. 30.
5453 Talking Math Rabbit 1.0 (ages 4-7) .. 30.
- Microsoft ... 30 day MBG
2868 Flight Simulator (CP)
3210 Miles Computing
5253 The Puzzle Gallery ... 26.
2765 Pool's Errand .... 32.
3985 Mindscape
4095 Balance of Power 1989 (CP) .... 29.
4596 Deja Vu II (CP) .... 29.
2743 Crossword Magic (CP) .... 29.

● Inline Design ... 30 day MBG
5870 Bomber 1.3 (includes headphones) .... 32.
7622 Darwin’s Dilemma .... 32.
6210 Knowledge Revolution ... 90 day MBG
7310 Interactive Physics .... 169.
- Learning Company ... 30 MBG
2670 Reader Rabbit 2.2 (CP) (ages 4-7) .... 30.
5453 Talking Math Rabbit 1.0 (ages 4-7) .... 30.
- Microsoft ... 30 day MBG
2868 Flight Simulator (CP)
3210 Miles Computing
5253 The Puzzle Gallery ... 26.
2765 Pool’s Errand .... 32.
3985 Mindscape
4095 Balance of Power 1989 (CP) .... 29.
4596 Deja Vu II (CP) .... 29.
2743 Crossword Magic (CP) .... 29.

● Silicon Beach ... 60 day MBG
3502 Beyond Dark Castle
3503 Dark Castle 1.1
3503 Dark Castle 1.1
3503 Dark Castle 1.1

● Network & Communications
2106 Flash 1.0—Start flashing your coworkers today! The friendliest way to transfer files over AppleTalk—without a File Server. Transfer files from the Finder or within any application $127.

● Penton Overseas ... 30 day MBG
Vebeurnd Dark Castle
(French, Italian, Spanish, German, Russian, Hebrew, & Japanese) ea. $35.

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6466 Citadelle
5773 Strategic Conquest Plus 2.0
5774 Net-Trek—The Real Version 2.3
- Shogan ... 30 day MBG
7689 Leoprechaun
Sierra On-Line
3397 Leisure Suit Larry (CP)
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3396 King’s Quest III (CP)
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- Connect, Inc.
5834 Connect 1.5 for the Macintosh ..... 63.
- DataViz ... 60 day MBG
1823 MacLink Plus/PC 4.5
4842 MacLink Plus/Translator 4.5
- Dove Computer ... 60 day MBG
6788 DoveFax Desktop
- Dow Jones ... 30 day MBG
5295 News/Retrieval Membership Package
1765 DeskTop Express 1.03
- Farallon Computing ... 30 day MBG
5707 Timbuktu 3.1
4867 Timbuktu 3.1 30-Pack
3620 Timbuktu/Remote Access Pack
2202 PhoneNET to LocalTalk Adapter

-Custom Applications ... 30 day MBG
6517 Freedom of Press 2.4-1993 MacUser
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- Aldus/Silicon Beach ... 30 day MBG
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- Eldorado Software
2106 Flash 1.0—Start flashing your coworkers today! The friendliest way to transfer files over AppleTalk—without a File Server. Transfer files from the Finder or within any application $127.
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**Aldus** ... 30 day MBG
7083 PagesMaker 4.0—1990 Macworld World-Class Award for Page Layout. Write, design, and produce professional-quality printed communication quickly and easily. **$499.**

**Farallon Computing** ... 30 day MBG
PhoneNET Connectors—1990 Macworld World-Class Award for Networking. Patended connectors run LocalTalk over ordinary telephone wiring.

**Farallon** 2400EX Modem (DIN-9) ... 179.
6275 2400EX Modem with QuickLink II ... 195.
6240 2400EX MNP Modem ... 223.
6550 2400EX MNP Modem with QuickLink II ... 249.

**Apple** ... 30 day MBG
Aldus for Mac II

**Microsoft** ... 30 day MBG
Microsoft Mail 2.0 Workstation ... 83.
Microsoft Mail 2.0 Server ... 245.

**NuvoTech** ... 60 day MBG
3000 TurboNet ST (DIN-9) ... 30.
6751 TurboNet ST (12-Pack) ... 279.
5277 TurboBridge ... 319.
6750 NuVoLink I ... 275.
6275 NuVoLink SC ... 309.
6261 TurboStar ... 1095.

**Orchard Technology**
6849 OrchardFAX Modem ... 459.
**Practical Peripherals** ... 30 day MBG
3102 2400 Baud External Modem ... 179.
5285 2400/600 MNP Modem ... 209.
3069 Mac Communications Pack 1.5 ... 225.

**Shiva** ... 30 day MBG
3444 NetSerial X232 ... 275.
4347 NetBridge ... 339.

**SoftPC**
6750 SoftPC·AT/EGA Module ... 125.
3089 SoftPC for the Mac Portable ... 245.

**TurboBridge** ... 30 day MBG
5277 TurboBridge ... 1095.

**Screen Lock®**
6917 ScreenLock ... 109.
6975 ScreenLock for SE/30 (640 x 480) ... special 849.

**Software Ventures** ... 30 day MBG
3455 MicroPhone II 3.0 ... 215.

**Solutions, Inc.** ... 60 day MBG
6712 MailMaker 5 User Pack 1.1 ... 117.
4308 BackFAX (reqs. Apple FAX modem) ... 139.
6720 FaxGate Plus 1.1 ... 239.

**Synergy** ... 30 day MBG
6618 VersaTerm 4.1.1 ... 89.
6619 VersaTerm-PRO 3.1.1 ... 174.

**TOPS** ... 30 day MBG
4188 TOPS Teletalk (DIN8) ... 23.
4598 TOPS FlashBox ... 118.
3723 TOPS Mac 2.1 (limited supply) ... 137.
3720 TOPS American Power ... 165.
7057 MacPrint TOPS Network Version 1.0 ... 165.
6264 TOPS Networking Bundle 3.0 ... 187.

**Traveling Software** ... 60 day MBG
3729 LapLink Mac III Connectivity Pac ... 119.
6741 LapLink Mac III Network Pac ... 165.

**Forte Communications** ... 30 day MBG
7317 Remote Keyboard/Mouse ... 289.

**GDT Softworks**
7687 Mac Daisy Link ... 59.
6258 PrintLink Collection 3.0 ... 59.
6151 JetLink Express 1.2 ... 89.

**Hewlett-Packard**
6514 HP DeskWriter Printer ... 859.

**Kensington** ... 30 day MBG
7518 KM300 ADB Joystick ... 49.
6099 ADB Trackball (with foot pedal) ... 79.

**Logitech** ... 30 day MBG
5082 ScanMan Mac Model 32 ... 319.

**Magnavox**
6693 9CM080 14" Color Monitor ... 529.
6690 14" Color Monitor with Micron Xceed for SE/30 (640 x 480) ... special 849.
6691 14" Color Monitor with Micron Xceed for Mac II (640 x 480) ... special 849.

**OmniPage**
4476 OmniPage 2.1 ... 539.

**Orchard Technology**
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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 Conspicuous 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.

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.

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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. Ateas 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.

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


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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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.

When I call Sandra Pedelle 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, Pedelle 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."
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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 Twigg 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 IIIi. Or—most surprisingly—even its speed demon, the IIXe. 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 (continues)
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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 buffer 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 computer 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 IIx, Apple touted the addition of DMA capabilities to the IIx's SCSI port, while giving a sotto voce disclaimer that current system software (that is, (continues)
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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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AN INTERVIEW WITH GORDON EUBANKS, PRESIDENT OF SYMANTEC CORPORATION

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 G&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 Guanar 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 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 G&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
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&F 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 re-think 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.

In 1986 we developed the strategy of the multiproduct 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 Ashton-Tate went to Randy Wigington, 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 boiler plate. What's it mean?

EUBANKS You get nowhere in life hating people like Steven Jobs. We don't
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 reflection 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 bash 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

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 (continues)
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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.
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 317/841-0532. — T.M.

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 Halcen like voice control so much that they use it not only to compose but also to perform. In April, at Verbena Magazine's "Digital Be-in," the two artists announced that they would control a collaborative piece entirely by the words they spoke into their headphones. Yavelow's verbal commands would trigger and transform MIDI fragments, while Halcen'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 (continues)
Hi Jon -

As I'm typing this, I'm watching your video on my Mac. It's great. I especially liked the San Francisco background. Did you get all those background shots into your presentation? I have a few that may make it easier. I'll highlight below with a few screen shots captured from your video and pasted into this.

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.

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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.

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Composer Christopher Vavelow (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. Vavelow 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 Vavelow 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 doc-
Have you ever noticed the way your colleagues use graphics? How they seem to make their reports and presentations come alive? Chances are, they are using MacDraw® II software, the most popular drawing tool for the Macintosh.

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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 (honestly), 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.

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.

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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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 into 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 (continues)
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5
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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.

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 a 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 stand-alone 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

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

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!

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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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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.

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.—O.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)
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Circle 152 on reader service card
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, RoboCup 2 marks the first time Mac animation has been juxtaposed with live-action shots. Los Angeles animators Lynda Weinman and Ann Morn employed Studio8, Adobe Photoshop, Macromind Director, and ElectricImage 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 Morn 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.—Erford Fenton

Help with AIDS Education

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. 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 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

(continues)
"There Was Pantone 485 Everywhere. She Wiped A Tear.

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 PrecisionColor 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.
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.
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 upgradeable to 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 Linotype. No more hoping the Linotype 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.

I35 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, IICL, IIX, and beyond).

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. #130.
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.

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 (78.5 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, 29.5 percent say they go often, and 14.1 percent say they always attend meetings.—T.M.
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 statistics 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.

Best in the final analysis.

444 North Michigan Avenue, Chicago, Illinois 60611
SPSS International BV; Avelingen West 80, P.O. Box 115, 4200 AC Gorinchem, The Netherlands

Circle 210 on reader service card
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 Sale Prices:**

- Power User 20MB Hard Drive **only** $309!
- Power User 45MB Hard Drive **only** $399!

© 1990 MicWare Warehouse Inc.
Tomorrow's Upgrade For Your Mac Is Only $69*

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 spreadsheet. 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@$69 each).

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

<table>
<thead>
<tr>
<th>Amount</th>
<th>Do this: (Install in multiples of two only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 MB</td>
<td>Remove all four existing 256K SIMMs, install two 1M SIMMs, leave two sockets for future expansion.</td>
</tr>
<tr>
<td>2 1/2 MB</td>
<td>Remove only two 256K SIMMs, install two 1M SIMMs.</td>
</tr>
<tr>
<td>4 MB</td>
<td>Replace all four 256K SIMMs with four 1M SIMMs.</td>
</tr>
</tbody>
</table>

To upgrade a 6-socket Mac II, IIx, IIsi, or SE/G3 to this amount of memory

<table>
<thead>
<tr>
<th>Amount</th>
<th>Do this: (Install in multiples of four only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 MB</td>
<td>Remove all four existing 256K SIMMs, install four 1M SIMMs.</td>
</tr>
<tr>
<td>5 MB</td>
<td>Keep existing 256K SIMMs, install four 1M SIMMs and remaining sockets.</td>
</tr>
<tr>
<td>8 MB</td>
<td>Remove all four 256K SIMMs, install eight 1M SIMMs.</td>
</tr>
</tbody>
</table>

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 Inline 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 billions 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 models.

OVERNIGHT DELIVERY

Place your order by 12:00 a.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.

1-800-255-6227

Call toll-free Twenty-four hours a day, seven days a week.
Inquiries 1-908-367-0-410 Fax 1-908-903-9279

MacWAREHOUSE™

1-800-255-6227

Call toll-free Twenty-four hours a day, seven days a week.
Inquiries 1-908-367-0-410 Fax 1-908-903-9279

MACWAREHOUSE 3D 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.

MWKOP

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

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.

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.

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!

**Quality Guarantees**

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.

**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.

**Call 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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**OVERNIGHT DELIVERY**

**ONLY $3.00**
(See details below)

---

**ACCESSORIES**

- 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 tools direct on-screen entering and manipulation of text. Use it to choose any number 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) $59.

- Macintosh SE/Flies w/Extended Keyboard Carrying Case (Targus)
  - Targus, Ltd.
  - Deluxe Plus SE-XX6 Case (black) $55
  - Image Writer II Case (black) $45
  - Mac Plus/SE Case (black) $55
  - I/O Case $75
  - Premier Leather Case $175

**MOBITUS PRODUCTS**

- Fanny Mac OT
  - SE Silencier $55
  - Targus, Ltd.
  - Deluxe Plus SE-XX6 Case (black) $55
  - Image Writer II Case (black) $45
  - Mac Plus/SE Case (black) $55
  - I/O Case $75
  - Premier Leather Case $175

- 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 Redwood. $12. After the game win/lose statistics and strategies over thousands of decisions managed with professional gamblers. $13. (accessories)

**ACCOUNTING & PERSONAL FINANCES**

- Calculator
  - Checkwriter II 1.2
  - Payroll 3.5
  - Absolute Solution
    - Computerized Classic Accounting $215

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- Casino Master
  - Let It Ride! You can bet on having hours of fun with Casino Master's five exciting casino games. Includes Blackjack, Craps, Roulette, Poker, and Baccarat. Board table simulation, mouse controlled betting, selectable bankroll, stored win/lose statistics and complete manual included. Mac II version available in full color! $13. (accessories)

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

The POWER USER'S TOOL KIT 4.0 is FREE from MacWAREHOUSE when you order from us. If you want the disk, you pay only $1.50 for shipping and handling. The programs are shareware, so you can try them free of charge. If you wish to continue using them, some authors ask that you pay a fee ($10-$35). Many are absolutely free. All of the details are explained on the disk, which is yours to keep.

FREE CATALOG!
We carry more than 1200 Macintosh products, including all the latest releases and new versions. We pride ourselves on getting new products first. If you can't find what you need, just fill in the information requested below and we'll start your free, one-year subscription to the MacWAREHOUSE catalog.

Freedom of Press 3.0
(Custom Applications, Inc.)
Feel free to take new PostScript printing libraries with updated Freedom of Press. Freedom of Press lifts the costly restriction of requiring a PostScript printer to print PostScript-language files. Now, in addition to the 40 non-PostScript printers currently supported, Freedom of Press can print PostScript of the Apple line of QuickDraw printers. It includes 30 scalable fonts and supports any additional PostScript font including Type 1 fonts from Adobe. Now compatible with all Mac systems. (utilities) $255.

PixelPaint Professional 1.0
(SuperMac)
The first "true color" advanced graphics program that is designed to grow with you from 8-bit to 24-bit systems and from general painting to advanced design. PixelPaint Pro gives you the intuitive tools to do your work easily. Use powerful features like advanced masking, fill effects, blending, anti-aliasing and transparency control for advanced graphics effects and photographic-quality images. New 2.0 version coming soon! Buy 1.0, register and receive a free upgrade. (graphics) $399.

Timbuktu/Remote 2.0
(Farallon)
Timbuktu/Remote 2.0 enables you to remotely connect your Mac to another Mac to control, observe, send or exchange files over telephone lines or ISDN links. Observe the remote Mac's screen in a window on your desktop. Additional security features include a unique privilege password protection scheme and security call-back. Timbuktu/Remote 2.0 now supports CCL modem control language for users with non-Hayes compatible modems. (networking) $123.

I'm Kerry, call me at:
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1-800-255-6227
(1-800-ALL-MACS)

Inquiries: 908-367-0440
FAX: 908-905-9279

Call anytime - day or night
24 hours a day, seven days a week
* Midnight Express service available weekdays.
FREE matching wallet with every

FontShare 2.0
FontShare allows up to 32 network users to access downloadable PostScript printer fonts without having to store them locally. It works with AppleShare and TOPS, includes Net Counter utility and is ATM compatible. $149.

Mac LC/ei Monitor Stand
Mac LC/e Monitor Stand, from Basic Needs, saves desktop space while protecting the LC from the weight of a heavy monitor. Your LC or a disk right underneath the stand and the 16 gauge steel frame provides solid support for any size monitor. Platinum. $40.

MacPrint 1.2
MacPrint displays your printer's fonts for true WYSIWYG performance and prints text and graphics at maximum resolution. Completely transparent in operation. $95. MacPrint 4.0 with each purchase of MacPrint. Limited Supply. $95.

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Data Translation (609) 898-8200

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Read-Me- Personal 2.0 .............. $195
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QuarkXPress 3.0 ...................... $175
Silicon Beach
Personal Press ...................... $195
Sppinaker
Springboard Publisher II .............. $109
TimeWorks
Print-Until- Easy ...................... $113

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MacStack 20 Meg .................... $420
MacStack 30 Meg .................... $459
MacStack 45 Meg .................... $599
MacStack 60 Meg .................... $649
MacStack 80 Meg .................... $769
MacStack 100 Meg ................... $899
Cutting Edge
800K External Floppy Drive ............. $149
SyQuest Removable 44 Meg ............ $699
Under the Mac 20 Meg ................ $309
Under the Mac 30+ Meg ............... $379
Under the Mac 45+ Meg ............... $435
Under the Mac 80+ Meg ............... $499
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DaynaFile Single 360K (5 1/4) ........ $585
DaynaFile Dual 720K & 1.44M .......... $795
Fujitsu
800K Floppy Drive ................... $149
Konnekt Technology
Drive 2.1 .......................... $329
Drive 560 ......................... $692
Drive 1200 ......................... $922
Rappor
Rappor ................................ $199
Orange Micro
Grapples, Call Mac 286 Co-Processor $1079

Peripheral Land, Inc.
Infinity Dual 40 Meg Turbo ........... $1875
Infinity Turbo 40 Meg ............... $985
Turbo Floppy 1.4 ..................... $350
Power User
20 Meg Drive ........................ $309
30 Meg Drive ........................ $359
45 Meg Drive ........................ $399
60 Meg Drive ........................ $459
80 Meg Drive ........................ $569
44 Meg Removable Drive ............. $679
Quantum
Quantum 40 MB Raw Drive .......... $399
Quantum 80 MB Raw Drive .......... $649
RasterOps
RasterOps ColorBoard 264 .......... $699

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AlphaBot Blocks 1.0 .................. $30
Talking Tiles ......................... $26
Davidson
Math Blaster Speed Reader ............ $29
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Clip Art CD-ROM .................... $29
Linguistica .......................... $279
Fair Tide Technologies
Navigable monogram ................. $199
Learning Company
Math Rabbit or Caddy Rabbit 2.0 .......... ea 30
Nordic Software
(full line available)
MacKids Preschool Pack ............... $35
Penton Overseas
Vocabularian French, Spanish, German, Italian, Russian, or Hebrew ...... ea 35
Vocabularian Japanese ................ $35
Voice & Video Instruction Videos
HyperCard or Pagemaker 3.0 .......... ea 35
Word 4.0 Video Tape ................. $35

ENTERTAINMENT

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Bridge 6.0 .............................. $22
Broderbund
Shuttlepuck Cafe .................... $23
Where in Time is Carmen Sandiego? $29
Buff eye
Ferrari Grand Prix or PS1 ............. ea 31
Centron Software, Inc.
BlackJack or GrapMaster ............. ea 27

NFL Challenge
NFL Challenge is the "Superbowl" of football simulations! It's the most realistic NFL football simulation in any arena. It's also one of the only officially recognized and licensed by the NFL. The game uses actual stats from the latest NFL season and offers over 60 offensive and defensive plays. Test your strategy against the computer or battle it out in head to head competition with a friend. (entertainment) $55.

Personal Press (Silicon Beach)
Personal Press creates professional layouts for you. Forget the long, steep learning curve, because Personal Press has AutoCreate to assemble stories and graphics into templates. It includes a full featured word processor with spelling checker and thesaurus, controls for scanned images, spot color separations, posted notes, link navigator, extensive page previewing, and on-line help. (desktop publishing) $199.

The Neon Ultimate
Carrying Case (IJ Design)
Here's the latest in fashionable outerwear for the active Macintosh user. The NEW Neon Ultimate SE in fluorescent green, hot pink and brilliant yellow neon accents! Protect and protect your Plus or SE with its high density foam padding & durable Da Ponte Coated nylon exterior. Secure all your peripherals in its roomy padded inner compartments & two exterior pockets. FREE matching disk wallet with every purchase while supplies last. (accessories) $99.
## MORE FOR YOUR MONEY...

<table>
<thead>
<tr>
<th>Product/Service</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacFlow 3.1</td>
<td>$125.00</td>
</tr>
<tr>
<td>Virex (Microcom)</td>
<td>$265.00</td>
</tr>
<tr>
<td>MacLabelPro ( Avery)</td>
<td>$150.00</td>
</tr>
<tr>
<td>MailMaker (5-Pack)</td>
<td>$117.00</td>
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<td>TOPS FlashCard</td>
<td>$155.00</td>
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<tr>
<td>TOPS 3.0 Network Bundle</td>
<td>$107.00</td>
</tr>
<tr>
<td>MACWAREHOUSE™</td>
<td>$907.00</td>
</tr>
</tbody>
</table>

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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,” but by that one means that it’s become mainstream 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 & World Report, where the Macintosh is used primarily to make maps and other illustrations. “Cutting Amberith, 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 when 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’ turn-around-time requirements off the production schedule. As Robert Goodman, publisher of Waxed Song, the first coffee-table book to feature Mac scans, puts it, “No longer
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 an example a recent job in which he successfully produced 1200 four-color pages in three weeks. John Selit 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 AddisonWesley 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."

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 Autex 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 bitmaped illustrations. San Francisco computer artist Nick Fair 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-paced 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 Agfa's Forte and Management Graphics' Solitaire Image Recorder can produce 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 rip, 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.
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 suntan: 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.

- **Imagettesetting** A new generation of PostScript imagetsetters 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 imagetsetters include the Varityper 5330 Photonmedia Imagetsetter, 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 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 SmaarTwo, which handles 35mm to 2 1/4-inch transparencies. In its initial release, however, the SmaarTwo 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 imagetsetters. 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 Vari-typer have all announced imagetsetters based on the Emerald Controller.

Optronics claims that by early next year its imagetsetters 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 imagetsetters 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.
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.

**Mapping It Out**  Understanding Company artists mimicked maps in the *complex* Illustrator 68 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.

ances 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-3000 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.

- 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”).

**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 what 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.

**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 Gutzeit of Goodside 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.
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 IIc 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, Read-Star 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
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 unfilled 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 hard 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 best 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 *rn*. OmniDraft recognizes documents printed by dot matrix printers. Finally, OmniProof compares two text files and points out any differences between them.
How OCR Works

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

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.

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.

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.
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.

Some packages require training...

Measured in minutes

<table>
<thead>
<tr>
<th>Package</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read-It</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>ReadStar II Plus</td>
<td>3</td>
<td>9</td>
<td>11.5</td>
<td>11.6</td>
<td>11.5</td>
<td>11.6</td>
</tr>
<tr>
<td>TextPert</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>TextScan</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

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

Measured in seconds

| Package      | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
|--------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| AccuText     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| OmniPage     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| Read-Star II Plus | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| TextPert     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| TextScan     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |

and all of them generate errors.

Measured in number of errors (substitution errors / recognition errors)

| Package      | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
|--------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| AccuText     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| OmniPage     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| Read-Star II Plus | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| TextPert     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |
| TextScan     | 0 | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 | 3200 | 3400 | 3600 | 3800 | 4000 |

*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 unrecognized 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.

**TextPort**

TextPort combines features of both trainable and automatic OCR programs. It comes with an already-built general library for fonts—TextPort’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. TextPort is an all-around good OCR program, recognizing every document consistently.

Training in TextPort 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, TextPort 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.

**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.

**TextPort**

Formatting tables is a TextPort 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, TextPort lacks the capability for landscape scans, which limits its use in recognizing spreadsheets.

**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.
Setting Up for OCR

<table>
<thead>
<tr>
<th>Product</th>
<th>AccuText 1.1</th>
<th>OmniPage 2.1</th>
<th>ReadIt 2.1</th>
<th>ReadStar II Plus 1.0/6</th>
<th>TextPert 3.05</th>
<th>TextScan 3.08</th>
<th>TopScan 1.02</th>
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<tr>
<td>Company</td>
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<td>Canon</td>
<td>Okidata</td>
<td>Xerox</td>
<td>Iosonic</td>
<td>CTA</td>
<td>Prism</td>
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<td>Mac II 1</td>
<td>Mac Plus</td>
<td>Mac SE</td>
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<td>2MB</td>
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<td>1MB</td>
<td>2MB</td>
<td>1MB</td>
</tr>
</tbody>
</table>

**SCANNERS SUPPORTED**

- Xerox Imaging Systems
- Canon
- Okidata
- Xerox
- Iosonic
- CTA
- Prism
- Calera

- Hewlett-Packard
- Apple
- Datacopy
- Dell
- Microtek
- Other

**TEXT PERKS**

TextPerk 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 "TextPerr"). You can even change the way TextPerk 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.

**TEXT SCAN**

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, resizeable windows. The order in which you create the windows is the order in which TextScan reads.

TextScan can be fussy. 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 page—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
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.

### OCR SOFTWARE COMPARED

<table>
<thead>
<tr>
<th>Type</th>
<th>AccuText 1.1</th>
<th>OmniPage 2.1</th>
<th>Read-It 2.1</th>
<th>ReadStar II Plus 1.06d</th>
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</tbody>
</table>

● = yes, ○ = no.
PAGE PRINTERS 
REVISITED

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

BY JIM HEID

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 

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 
average 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 Laser­ 
Writer. You just couldn't make either 
statement a year ago.

Faster Today's controllers—the 
circuit boards 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 Sys­ 
tems' 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 tech­ 
nical tricks to produce sharper text 
and finer half-tones 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 Per­ 
fomers, 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 con­ 
tained 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 docu­ 
ment was the Aldus sample file named 
Motorcycle. And the Newsletter docu­ 
m ent was a 4-page PageMaker file 
containing several fonts, three gray­ 
scale scanned images, and one Mac­ 
Paint 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 to­ 
day's standards, but they all out-per­ 
form the original LaserWriter. All pro­ 
duce 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 fam­ 
ily, see "LaserWriters for Less," Mac­ 
world, August 1990.)

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

And its appeal goes beyond the 
price tag. The Personal LaserWriter 
uses Canon's compact P-110 print 
gainer, 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
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 controller speed than on 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 mathematical descriptions of a font’s characteristics. 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 spottily 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-460. 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 italics 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,
builds the 250-sheet tray—and everything else you need to use the Mac into the printer. The IIP's print quality is excellent, but its controller's performance is disappointing; the printer finished last or close to it in all but the Courier test.

**NEC SilentWriter 2 290**

One way to do better is with the SilentWriter 2 290, 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 SilentWriter 2 lists for just $3995.

Within the SilentWriter 2'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 SilentWriter 2 took a good deal longer than Apple's Personal LaserWriter NT, but in every other test, the SilentWriter 2 finished first among the PostScript printers in this class.

The SilentWriter 2 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 SilentWriter 2 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 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 SilentWriter 2, 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 SilentWriter 2 290, and TI's microLaser are first-rate prod-
users whose performance belies their relative affordability. If you need an 8-ppm engine, the SilentWriter 2 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 PCL 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 IIXT

The aging, Canon SX-based LaserWriter IIXT 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 IIISc or IIXT, by all means consider the IIXT 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 IIXT 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 IIXT’s manual has also been expanded to cover printing from PCs.

An upgrade for existing IIXT models is available for $119. The printer’s speed remains the same, so there’s no reason to upgrade an existing IIXT unless you need the new features. If you’re buying a new IIXT, check its part number: the revised IIXT 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 $4995 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 IIXT 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 IIXT. 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 IIXT 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 IIXT, 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.
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 straightforward 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 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 II/NTX remains a strong contender, but it's slower than QMS's turbo series. Qume's CrystalPrint Publisher II and Brother's HL-880 are also-rans.

**The Sharper Imagers**

Two of the three printers in this category—NewGen Systems' TurboPS/300 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/300 and TurboPS/480**

The $3595 TurboPS/300 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 600 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 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 IIIP 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

---

**Sharper Imagers**

<table>
<thead>
<tr>
<th>Font</th>
<th>Courier</th>
<th>MacDraw</th>
<th>FreeHand</th>
<th>Newsletter</th>
</tr>
</thead>
<tbody>
<tr>
<td>NewGen Systems TurboPS/300</td>
<td>150</td>
<td>175</td>
<td>150</td>
<td>130</td>
</tr>
<tr>
<td>NewGen Systems TurboPS/480</td>
<td>133</td>
<td>186</td>
<td>111</td>
<td>353</td>
</tr>
</tbody>
</table>
| Hewlett-Packard LaserJet III| 883     | 174     | 472      | 1728       | 339
### LaserWriter Roundup

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imaging language, version</strong></td>
<td>PostScript, 47</td>
<td>PostScript, 47</td>
<td>QuickDraw</td>
<td>PostScript, 51.8</td>
<td>PostScript, 47-compatible</td>
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<tr>
<td><strong>Uses Adobe PostScript interpreter</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Processor</strong></td>
<td>68000, 12MHz</td>
<td>68208, 16MHz</td>
<td>68000, 7.45MHz</td>
<td>68000, 12MHz</td>
<td>TMS 34010, 40MHz</td>
</tr>
<tr>
<td><strong>Number of built-in fonts</strong></td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td><strong>Accepts font expansion boards/cartridges</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>LCD screen for status messages</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Front-panel configuration switches</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Hard disk for font storage</strong></td>
<td>No</td>
<td>Optional</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td><strong>RAM in base model</strong></td>
<td>2MB</td>
<td>2MB</td>
<td>1MB</td>
<td>2MB</td>
<td>2MB</td>
</tr>
<tr>
<td><strong>RAM in model tested</strong></td>
<td>2MB</td>
<td>2MB</td>
<td>1MB</td>
<td>2MB</td>
<td>2MB</td>
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<tr>
<td><strong>RAM expansion upgrades</strong></td>
<td>None to 12MB</td>
<td>None to 12MB</td>
<td>None to 8MB</td>
<td>None to 8MB</td>
<td>None to 64MB</td>
</tr>
<tr>
<td><strong>Other controller upgrades</strong></td>
<td>to NTX ($2999)</td>
<td>to NTX ($2999)</td>
<td>to NT ($160)</td>
<td>to NT ($160)</td>
<td>none</td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td>A, ADB, R</td>
<td>A, ADB, R, SCSI</td>
<td>ADB, SCSI</td>
<td>A, R, P, R</td>
<td></td>
</tr>
<tr>
<td><strong>Emulation modes</strong></td>
<td>Doble 630</td>
<td>Doble 630, HP</td>
<td>Doble 630, HP LaserJet Plus</td>
<td>Doble 630, HP LaserJet Plus</td>
<td>Doble 630, HP LaserJet Plus</td>
</tr>
<tr>
<td><strong>Print engine</strong></td>
<td>Canon SX</td>
<td>Canon SX</td>
<td>Canon P-110</td>
<td>Canon P-110</td>
<td>Canon SX</td>
</tr>
<tr>
<td><strong>Resolution (in dpi, h x v)</strong></td>
<td>300 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
</tr>
<tr>
<td><strong>Rated engine life (in pages)</strong></td>
<td>300,000</td>
<td>300,000</td>
<td>150,000</td>
<td>150,000</td>
<td>300,000</td>
</tr>
<tr>
<td><strong>Maximum speed (in ppm)</strong></td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Imaging technology</strong></td>
<td>semiconductor laser</td>
<td>semiconductor laser</td>
<td>semiconductor laser</td>
<td>semiconductor laser</td>
<td>semiconductor laser</td>
</tr>
<tr>
<td><strong>Number of paper trays</strong></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Multiple-tray support software</strong></td>
<td>NA</td>
<td>NA</td>
<td>No</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Paper tray capacity (in sheets)</strong></td>
<td>200</td>
<td>200</td>
<td>250</td>
<td>250</td>
<td>50</td>
</tr>
<tr>
<td><strong>Optional paper accessories</strong></td>
<td>A4, envelope, legal</td>
<td>A4, envelope, legal</td>
<td>envelope cassette</td>
<td>envelope cassette</td>
<td>A4, envelope, legal</td>
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<tr>
<td><strong>List price of model tested</strong></td>
<td>$4999</td>
<td>$5999</td>
<td>approximately $3000</td>
<td>approximately $3300</td>
<td>$4790</td>
</tr>
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</table>

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

1 Most specifications also apply to NovGen's TurboPS/300 and TurboPS/400, which produce 300-dpi and 400-dpi output, respectively.

2 Most specifications also apply to QMS's single-tray PS turbo.

3 LaserWriter IIXXs produced after May 1990 contain PostScript version 5.1.8. Other features are unchanged.

4 WP/II includes Courier, Helvetica, Times, Palatino, and Helvetica Narrow. GCC's $330 Fonts Plus package adds seven additional families.

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

Most specifications also apply to 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 INTT) 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
paper-handling features aren’t available in any similarly priced printer. The 4MB RX7100PS+ sells for $3790; a 2MB version, the RX7100PS, is $5999.

**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-volume 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

<table>
<thead>
<tr>
<th>Paper Chasers</th>
<th>Font</th>
<th>Courier</th>
<th>MacDraw</th>
<th>FreeHand</th>
<th>Newsletter</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEC SilentWriter LC 890XL</td>
<td>351</td>
<td>163</td>
<td>143</td>
<td>474</td>
<td>117</td>
</tr>
<tr>
<td>Hewlett-Packard LaserJet IID</td>
<td>697</td>
<td>174</td>
<td>486</td>
<td>1773</td>
<td>373</td>
</tr>
<tr>
<td>Fujitsu RX7100PS+</td>
<td>1003</td>
<td>237</td>
<td>346</td>
<td>1275</td>
<td>161</td>
</tr>
<tr>
<td>QMS-PS 820 turbo</td>
<td>349</td>
<td>163</td>
<td>134</td>
<td>452</td>
<td>126</td>
</tr>
</tbody>
</table>

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### LaserWriter Roundup (continued)

<table>
<thead>
<tr>
<th>Feature</th>
<th>NewGen Systems TurboPS/480*</th>
<th>NewGen Systems TurboPS/260*</th>
<th>Qume CrystalPrint Publisher II</th>
<th>Texas Instruments microLaser PS35</th>
<th>QMS-PS 820 turbo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imaging language, version</td>
<td>PostScript, 2.7</td>
<td>PostScript, 2.7</td>
<td>HyperScript</td>
<td>PostScript, 5.2.1</td>
<td>PostScript, 5.1/78</td>
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<tr>
<td>Uses Adobe PostScript interpreter</td>
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<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Processor</td>
<td>Intel 80800K (RISC)</td>
<td>Intel 80860K (RISC)</td>
<td>RISC (Worksp)</td>
<td>68000, 12MHz</td>
<td>68020, 20MHz</td>
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<tr>
<td>Number of built-in fonts</td>
<td>25</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Accepts font-expansion boards/cartridges</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>LCD screen for status messages</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Front-panel configuration switches</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Hard disk for font storage</td>
<td>requires</td>
<td>requires</td>
<td>requires</td>
<td>no</td>
<td>optional</td>
</tr>
<tr>
<td>RAM in base model</td>
<td>3MB</td>
<td>2MB</td>
<td>3MB</td>
<td>1.5MB</td>
<td>2MB</td>
</tr>
<tr>
<td>RAM in model tested</td>
<td>5MB</td>
<td>3MB</td>
<td>3MB</td>
<td>1.5MB</td>
<td>2MB</td>
</tr>
<tr>
<td>RAM expansion upgrades</td>
<td>to 5MB</td>
<td>to 5MB</td>
<td>none</td>
<td>to 4.5MB</td>
<td>to 8MB</td>
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<tr>
<td>Other controller upgrades</td>
<td>SCSi interface</td>
<td>SCSi interface</td>
<td>none</td>
<td>Diablo 630, Epson FX</td>
<td></td>
</tr>
<tr>
<td>Print engine</td>
<td>Canon SX</td>
<td>Canon SX</td>
<td>Casio LCS-130</td>
<td>250,000</td>
<td></td>
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<tr>
<td>Resolution (in dpi, h x v)</td>
<td>800 x 400</td>
<td>600 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
<td></td>
</tr>
<tr>
<td>Rated engine life (in pages)</td>
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<td>300,000</td>
<td>300,000</td>
<td>250,000</td>
<td>NA</td>
</tr>
<tr>
<td>Maximum speed (in ppm)</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>8</td>
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<tr>
<td>Imaging technology</td>
<td>semiconductor laser</td>
<td>semiconductor laser</td>
<td>LCD shutter</td>
<td>semiconductor laser</td>
<td>semiconductor laser</td>
</tr>
<tr>
<td>Number of paper trays</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Multiple-tray support software</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>yes</td>
</tr>
<tr>
<td>Paper tray capacity (in sheets)</td>
<td>200</td>
<td>200</td>
<td>100</td>
<td>250</td>
<td>200 (each tray)</td>
</tr>
<tr>
<td>Optional paper accessories</td>
<td>A4, envelope, legal</td>
<td>A4, envelope, legal</td>
<td>none</td>
<td>second tray 500 sheet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cassettes</td>
<td>cassettes</td>
<td>n/a</td>
<td>A4, envelope, legal</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>cassettes</td>
<td></td>
</tr>
<tr>
<td>List price of model tested</td>
<td>$2993</td>
<td>$4995</td>
<td>$3995</td>
<td>$2995</td>
<td>$4995</td>
</tr>
</tbody>
</table>

* Specifications listed for the Hewlett-Packard printers reflect their Macintosh configuration. Basic-model printers are considerably less expensive and have fewer features.

* Most specifications also apply to NewGen’s TurboPS/30 and TurboPS/400, which produce 200- and 400-ppm output, respectively.

* Most specifications also apply to QMS’s single-tray PS 810 turbo.

* LaserWriter LXTs produced after May 1990 contain PostScript version 5.1.8. Other features are unchanged.

* PnP II includes Courier, Helvetica, Times, Palatino, and Helvetica Narrow. GCC’s $239 Fonts Plus package adds seven additional families.

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

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Houses discount the printer to as low as $435. It’s the best-priced heavy-duty, high-performance PostScript printer available.

The 68-pound SilentWriter LC uses an NEC 800 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 (415/693-2226) is shipping its $2995 LaserScript PostScript clone. LaserScript provides HP LaserJet Series II emulation; 3MB of memory (upgradable to 6MB); 36 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.

• Dataproduts (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, Dataprodacts 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 interfacex will cost $50-$100. An 8-ppm version, the BLP IlS, will cost $2796. Both printers, scheduled to ship in August, sound hot.

• LaserMax Systems (612/944-9996) 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 Dataprodacts printer mentioned in "Coming Attrations" 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 working 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).
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 grayscale 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.)
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.

HYPERPERFORMANCE

Shown here: State-Smart
Format: Bittmapped, HyperCard (floppy)
Subjects: world, U.S. states: facts, political, topological

MICROMAPS SOFTWARE

Shown here: MacAtlas EPSF Version
Format: Bittmapped, PICT, Illustrator 88 (floppy)
Subjects: world, U.S. states, U.S. states by county, political boundaries

ARTBEATS

Shown here: Natural Images, Vol.1; Dimensions 2
Format: EPS (floppy)
Subjects: Dec, Flo

ARTFACTORY

Shown here: Textured Backgrounds, Vol. 1
Format: EPS (floppy)
Subjects: Dec

C.A.R.

Shown here: Clipables
Format: EPS (floppy)
Subjects: Ani, Bor, Chi, Com, Dec, Edu, Flo, Hol, Pro, Spo, Sym, Tra

CATHAY EUROPA TRADING COMPANY

Shown here: GlobalArt Oriental Images
Format: Bittmapped (floppy)
Subjects: Ani, Dec, Flo

THE CHURCH ART WORKS

Shown here: Youth Art 1.0
Format: TIFF (floppy)
Subjects: Chi, Edu, Flo, Hol, Rel, Spo

ADobe SYSTEMS

Shown here: Adobe Collector's Ed. series: Ed. 1; Patterns and Textures
Format: Illustrator (floppy)
Subjects: Bor, Dec, Flo, Map, Sym

ARCHIVE ARTS

Shown here: Ed. 7—Music Masters and Instruments; Ed. 9—Sports and Recreation
Format: TIFF (floppy)
Subjects: Ani, Bor, Chi, Dec, Flo, Flo, Gov, Hol, Pro, Rel, Spo, Tra

CASADY & GREENE

Shown here: Vivid Impressions series: Vol. 1 Special Events
Format: EPS (floppy)
Subjects: Ani, Gov, Hol
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, Spec, 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, Fio, Flo, Fco, 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, Flo, 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

DYNAMIC GRAPHICS

** * **
Shown here: DeskTop Art series: Athletics 1; Design Elements 1
Format: Bitmapped, EPS, TIFF (floppy)
Subjects: Ani, Bor, Chi, Com, Dec, Edu, Fio, Hol, Pro, Spo, Sym, Tra

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: Fio, Mil, Sym

ELECTRONIC PEN

** * **
Shown here: The Visual Arts
Format: EPS (floppy)
Subjects: Bor, Com, Dec, Fio, Pro, Spo, Sym, Tra

SUBJECT KEY

Ani = Animals
Bor = Borders
Chi = Children
Com = Computers
Dec = Decorative
Edu = Education
Fio = Flags
Flo = Flowers
Fco = Food
Gov = Government
Hol = Holidays
Map = Maps
Mil = Military
Pro = Professions
Rel = Religion
Spo = Sports
Sym = Symbols
Tra = Transportation

CALIFORNIA REPUBLIC

MACWORLD • OCTOBER 1990
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, bittmapped, or EPS format.
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: Bmapped, 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

DISCIMAGERY
Shown here: Professional Photography Collection
Format: 24-bit color TIFF, 8-bit b&w TIFF (prints and slides also available)
Subjects: 100 images in categories including business, fitness, food, scenes, 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)

MACWORLD OCTOBER 1990

IMAGE CLUB GRAPHICS
Shown here: DarkRoom
Format: 8-bit b&w TIFF (color slides available from Focus Stock Photo)
Subjects: people, industry, nature, scenes, sports, travel, wildlife

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, scenes, and sports

TSUNAMI PRESS
Format: 8-bit and 24-bit color, 8-bit b&w PICT2
Subjects: stars, planets, space vehicles

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.
SPINNAKER SOFTWARE
* * (Bittapped) * * * * (EPS)
Shown here: Works of Art series; Education Series; Holiday Series
Format: Bittapped, HyperCard, EPS (floppy)
Subjects: Ani, Chi, Com, Edu, Flo, Foo, Gov, Hol, Map, Pro, Rel, Spo, Sym, Tra

T/MAKER
* * * (Bittapped) ***** (EPS)
Shown here: ClickArt series; EPS Animals & Nature; Business Cartoons
Format: Bittapped, HyperCard, EPS (floppy)
Subjects: Ani, Bor, Com, Dec, Flo, Foo, Gov, Hol, Map, Pro, Rel, Spo, Sym, Tra

STORM KING TECHNOLOGY
****
Shown here: NavyArt, Naval & Marine Clip Art
Format: Bittapped, PICT (floppy)
Subjects: Mil, Sym

TACTIC SOFTWARE
****
Shown here: Art Clips series: Vol. 2, Business Images
Format: EPS (floppy)
Subjects: Ani, Com, Flo, 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
*** *
Format: Illustrator, FreeHand, EPS (floppy)
Subjects: Ani, Flo, Foo, Hol, Pro, Spo, Sym, Tra

VISATEX
****
Shown here: Hollywood Greats
Format: Bittapped (floppy)
Subjects: Edu, Gov, Pro

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: Bittapped (floppy)
Subjects: Ani, Bor, Dec, Flo, Hol, Rel

SUBJECT KEY
Ani = Animals
Bor = Border
Chi = Children
Com = Computers
Dec = Decorative
Edu = Education
Flo = Flowers
Foo = Food
Gov = Government
Hol = Holidays
Map = Maps
Mil = Military
Pro = Professions
Rel = Religion
Spo = Sports
Sym = Symbols
Tra = Transportation

SPINNAKER SOFTWARE

T/MAKER

STORM KING TECHNOLOGY

TACTIC SOFTWARE

STUDIO ADVERTISING ART

TOTEM GRAPHICS

VISATEX

THE UNDERGROUND GRAMMARIAN

WEST STONE SOFTWARE

MACWORLD • OCTOBER 1990
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.

Getting premium gray-scale halftones requires a premium scanner—as well as the know-how to use it to its fullest.

For this article I've chosen to evaluate the one overhead and five flatted 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 to 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.
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 littlehourglass, 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 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 Diagram](https://example.com/correct-correction.png)
Scanners Compared

<table>
<thead>
<tr>
<th>Company</th>
<th>Model</th>
<th>Price</th>
<th>Type</th>
<th>Internal SCSI Interface</th>
<th>Resolution Settings/Increments (dpi)</th>
<th>Maximum Optical Resolution</th>
<th>Gray-level Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abaton</td>
<td>Scan 300/S</td>
<td>$1985</td>
<td>FB</td>
<td>•</td>
<td>75, 100, 150, 200</td>
<td>300</td>
<td>2, 16</td>
</tr>
<tr>
<td></td>
<td>Scan 300/GS</td>
<td>$1985</td>
<td>FB</td>
<td>•</td>
<td>72-300/1</td>
<td>300</td>
<td>2, 18, 256</td>
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<tr>
<td>Agfa Compugraphic</td>
<td>Focus S1000/GS</td>
<td>$4345</td>
<td>FB</td>
<td>•</td>
<td>100-200/25, 200-400/50, 400-800/100</td>
<td>400</td>
<td>2, 64</td>
</tr>
<tr>
<td></td>
<td>Focus II S1000/GS</td>
<td>$6345</td>
<td>FB</td>
<td>•</td>
<td>100-200/25, 200-400/50, 400-800/100</td>
<td>400</td>
<td>2, 64, 216</td>
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<tr>
<td>Apple Computer</td>
<td>Apple Scanner</td>
<td>$1799</td>
<td>FB</td>
<td>•</td>
<td>300</td>
<td>300</td>
<td>2, 10</td>
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<tr>
<td>Asuka Technologies</td>
<td>2560 GS</td>
<td>SCSI $599, NuBus $499</td>
<td>HHI</td>
<td>•</td>
<td>100-200, 300, 400</td>
<td>400</td>
<td>2, 16, 256</td>
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<tr>
<td>Canon USA</td>
<td>IX-30F</td>
<td>$1545</td>
<td>FB</td>
<td>•</td>
<td>75, 150, 200, 300</td>
<td>300</td>
<td>2, 256</td>
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<tr>
<td>DEST Corporation</td>
<td>PC Scan 2000</td>
<td>$1955</td>
<td>SF</td>
<td>•</td>
<td>38-300/1</td>
<td>300</td>
<td>2, 256</td>
</tr>
<tr>
<td></td>
<td>PC Scan 3000</td>
<td>$1955</td>
<td>FB</td>
<td>•</td>
<td>38-300/300/1</td>
<td>300</td>
<td>2, 256</td>
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<tr>
<td>Hewlett-Packard</td>
<td>ScanJet Plus</td>
<td>$1955</td>
<td>FB</td>
<td>•</td>
<td>12-150/300/1</td>
<td>300</td>
<td>2, 16, 256</td>
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<tr>
<td>Microtek</td>
<td>MSF-300G/GS</td>
<td>$2195</td>
<td>FB</td>
<td>(IG)</td>
<td>75-300/3</td>
<td>300</td>
<td>2, 256</td>
</tr>
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<td>Mouse Systems Corporation</td>
<td>MSF-400G/GS</td>
<td>$3995</td>
<td>FB</td>
<td>(IGS)</td>
<td>100-400/4</td>
<td>400</td>
<td>2, 4, 16, 64</td>
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<tr>
<td>Thunderware</td>
<td>PageBrush</td>
<td>$795</td>
<td>HHI</td>
<td>NuBus</td>
<td>75-300/3</td>
<td>300</td>
<td>2, 4, 16, 64</td>
</tr>
<tr>
<td>Truelove Corporation</td>
<td>TZ-3</td>
<td>$795*</td>
<td>OH</td>
<td>•</td>
<td>18-576/1</td>
<td>288</td>
<td>2, 16</td>
</tr>
<tr>
<td>Truelove Technologies</td>
<td>UG80</td>
<td>$1995</td>
<td>FB</td>
<td>•</td>
<td>3-200/3</td>
<td>300</td>
<td>2, 16, 256</td>
</tr>
<tr>
<td>Xerox Datacopy</td>
<td>Datacopy GS Plus</td>
<td>$1995</td>
<td>FB</td>
<td>•</td>
<td>75-300/1</td>
<td>300</td>
<td>2, 16, 64</td>
</tr>
<tr>
<td></td>
<td>7300S</td>
<td>$1995</td>
<td>FB</td>
<td>•</td>
<td>60-450</td>
<td>300</td>
<td>2, 16, 64</td>
</tr>
<tr>
<td></td>
<td>D30</td>
<td>$3495</td>
<td>FB</td>
<td>•</td>
<td>100, 200, 240, 300</td>
<td>300</td>
<td>2, 16, 64</td>
</tr>
</tbody>
</table>

* = yes, ○ = no  
FB = flatbed, HII = hand-held, OH = overhead, PH = print head, SF = sheetfed.  
* Can increase to 256GS for $595.  
* Digital Darkroom or ImageStudio available for $100.  
* Except when scanning with Digital Darkroom.  
* Price includes $595 interface.  
* Digital Darkroom or ImageStudio available for $100.  
* Except when scanning with Digital Darkroom.  

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 Truelove 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 there is 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 reassigned image values without chopping off the ends of the spectrum. The concept is simple, the results sophisticated. By reassigned
the relationship between input and output 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 output 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 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,

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<table>
<thead>
<tr>
<th>Bundled Software</th>
<th>Scanning Modules</th>
<th>Memory or Disk Limited?</th>
<th>Gamma Control During/After Scanning</th>
<th>Sharpening During/After Scanning</th>
<th>Maximum Image Size (in inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abaton Scan (DAI)³</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>Abaton Scan (DAI)³</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>McView Plus (application)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 13</td>
</tr>
<tr>
<td>McView Plus (application)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 13</td>
</tr>
<tr>
<td>AppleScan (application)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>HyperScan (application)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>MyScan (application)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>ThundorWorks (application)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>MacImage (application), ImageCopy (DAI)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>MacImage (application), ImageCopy (DAI)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
<tr>
<td>MacImage (application), ImageCopy (DAI)</td>
<td>Digital Darkroom, Photoshop</td>
<td>disk</td>
<td>0/0</td>
<td>0/0</td>
<td>8.5 x 14</td>
</tr>
</tbody>
</table>
**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. 

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).
Anthony Boruso, vice president and associate director of computer systems for BBDO New York, one of the largest advertising firms in the country, relies on SPSS to keep track of market and media research.
The Macintosh finally emerges as a major league statistics platform. 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 statistical methods.
analyses and offering radically different interface approaches. The Authori­
cies—Systat and SPSS for the Macintosh—at tempt 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 selec­
tion 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
from statistical graphing with business
presentation features down to pain­
fully austere character-based plots.

Two Explorers
• JMP, from the SAS Institute, is the
most surprising Mac product in years.
The SAS Institute has long been a ma­
jor vendor of minicomputer and main­
frame 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 pro­
gram from scratch, with the most help­
ful Mac interface of all the statistics
programs and one of the best inter­
faces ever produced for scientific soft­
ware. It’s nothing less than dazzling.

JMP assumes that
what you really want in
a statistics program is a
convenient way to per­
form regression, correla­
tion, and ANOVA stud­
ies. You import existing
data, or type it into a
spreadsheet-like struc­
ture, and use pull-down
selector boxes to assign
and classify variables.
(JMP provides special
import and export for­
mats 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 sta­
tistical 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 proce­
dure in other programs calls for you
to make four or five separate menu
selections to collect the same informa­
tion. 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 oth­
erwise 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 inter­
pretation of calculations, plots, and
menu choices.

• DataDesk 3.0 from Odessa is now
the oldest widely marketed Macintosh
statistical software. Fortunately, be­
because the product reflects the ener­
getic approach to statistics of its de­
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
calculation capabilities have been
added—most recently a particularly
easy-to-use general linear-modeling
feature—and the package now ap­
proaches the general-purpose range of
StatView.

In comparison to a spreadsheet, the
basic data structure of DataDesk
is a somewhat more-cumbersome col­
collection of data elements (its style at
least makes for easy links to Odessa’s
database Double Helix). As you select
elements for analysis, previously
grazed-in items under the Cale and
Plot menus become available. Data­
Desk emphasizes the use of evocative
displays rather than tables of results
as a way of finding connections among
the data elements. To this end, Data­
Desk has the most responsive 3-D dis­
play of any of the six packages re­
viewed: unique sliding axes for easy
expansion of plot regions of interest,
and nearly automatic facilities for col­
oring plot points by group identity.
This last feature makes it possible to
inspect multidimensional correlations
in a standard 3-D plot and is a nontriv­
ial advance in the Macintosh statistical
state of the art.

Although DataDesk offers a re­
spectable selection of tests, including
clustering and nonparametrics, this
program actually addresses a special

Robert P. Aenechianico, 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.
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 loss 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.

- **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 Maitrey 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-

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**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 60 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.
face, Minitab also enables user groups to contribute macros that work across all platforms; a selection of macros is provided. On a Mac Ilex, 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.
(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...
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 tessellations, 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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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.


**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.


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 $1995 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 half-tone 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 half-tone 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 half-tone 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 image-setter 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 works well (because of its control over dither patterns), and its ImageCopy DA lets you copy a scan to the Clipboard 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; 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 protrusions at the front, is connected to a SCSI controller box—with internal termination—that plugs in to the Mac. Plug the AC transformer into 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-holds. 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)
Joint Strips

Using ClearScan’s Gather command, you can assemble several 2 1/2-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 (2 1/2 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 skyscraper tool like the one in Thunderware’s LightningScan software—which allows you to join scans easily—to eliminate this problem.

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 grayscale 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

Facial-Animation Programming Kit

INTERFACE 1.0

Pros: Synchronizes animation to Macintosh 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
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 register 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 A V E 9 3 2 1 2” in the RAVE-command window. The letters represent spoken sounds, and the numbers are timing values in 1/8 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 A 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 free-hand 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

(continue)
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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 fickle 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 tediousness 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 Macintosh).

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.
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 gray; 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 885 (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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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.

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 geographical 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 Snoop 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)
It's like owning a disk drive with a bulletproof vest.

Introducing the Metro with SCSI Sentry

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.

And only EMAC Metro drives have it. Metros are zero-footprint disk drives - so they fit perfectly under a Mac Plus or SE. You can also stand Metro on its side next to any Mac II, keeping your desk free for papers, phones, or photographs.

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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


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.

Dought 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, lets you use the software’s motion capabilities to generate a model of a molecule in six minutes—not Cray speed but better than one gets on most overpriced 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.

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 modeller 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

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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.


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.


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 Host

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.

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, 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 (continues)
The original MacDraft™ is a classic precision drawing program in its own right. And now, we've upgraded it. Introducing MacDraft 2.0. As you can see, it gives you even more powerful precision drawing tools. Plus many enhanced features like object and text rotation in less than 1° increments, up to 32X zoom, and PostScript®-quality printing. But we didn't change the easy-to-use interface that made the original MacDraft a favorite for over 70,000 users. If you'd like to experience MacDraft 2.0 for yourself, visit your nearest dealer. And see the classic drawing program that's way ahead of its time.
Once you're a guest, you can run any application, open any folder, and so on. Everything appears in a separate resizable, movable window on the guest Mac's double-click on the name of a host. In screen (see "Timbuktu in Action").

Monitor is smaller than the host's. If, on the other hand, the guest Mac is larger 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
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 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 function (I wish 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 roughening them out. And FontStudio’s bitmap-editing tools really shine.

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 (continues).
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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 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.

As the World Kerns
FontStudio lets you adjust character positioning visually, by clicking and dragging, or numerically, by typing numbers in a table.

EZ VISION 1.0

**MIDI Sequencer**

**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-

(continued)
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They Do Windows, but Not Many

EZ Vision’s incredibly sophisticated editing system 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.

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.
A lot of manufacturers say they have the best trackball, but only the Kensington Turbo Mouse® has the awards to prove it.

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The next time you read another claim for a trackball, remember the one that has earned all the acclaims. Turbo Mouse.

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, hierarchical (fitting categorical log-linear models to multidimensional contingency tables), logistic regression, log-linear (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
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 Maccssories® 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.

The result is a 96% reduction in glare. And an improvement in contrast and clarity of up to 20 times.

In short, the most advanced eye-protection system you can find today—it even filters out VLF and ELF radiation and dissipates static.

Kensington has custom designed screens for the Mac, Mac Plus, Mac SE, Apple IIgs, as well as for the entire Mac II family of large screen monitors.

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Combine the raw power of your Macintosh with the utility of a modem and the indispensable convenience of a fax machine — and you've got a DataLink Send-Fax™ modem from Applied Engineering.

Send faxes directly from your Mac's screen without ever printing a “hard copy” of the information. The exclusive AE Send-Fax™ software installs itself in your Mac's Chooser DA. Faxes can then be sent as simply as printing. Imagine not having to waste time waiting around the fax machine to see if your faxes got through. Go right back to what you were doing, while AE Send-Fax™ operates in the background. You'll automatically receive a report when the fax is completed.

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You can even preset the number of retries for individual numbers, for distribution lists or for the entire phonebook.

Best of all, AE Send-Fax™ comes with the best modems you can buy — the DataLink™ series 2400 bps modems that deliver unparalleled reliability, futuristic capabilities and unmatched technical excellence. Modems designed exclusively for the Macintosh, not “ported over” from another platform.

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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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Circle 50 on reader service card
MACROMIND DIRECTOR 2.0


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)
Now Utilities

12 ways to get more from your Macintosh.

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In short, Now Utilities has everything you need to make your Macintosh even more powerful, accessible and fun!

To order Now Utilities, or for the name of a dealer near you, call us toll-free at 1-800-237-3611.
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 allows 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 Whose to Buy or circle 809 on reader service card.

**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.


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-holds 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 aim the 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 (F6-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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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 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 nonpresentation 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 QuickKeys 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.


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)
The only thing stopping you now is your imagination.

Just imagine a hard drive for the Macintosh line of computers that lets you spend less time waiting and more time creating. A drive that maximizes your computer capabilities and makes fast work of database management, desktop publishing and computer-aided design. A drive that can connect your network in a flash, and be very reliable. It's not a dream. Rodime Systems' Cobra Series offers access times as low as 14.5 milliseconds and storage as high as 650MB. And up to 48K of look-ahead caching to take advantage of the high performance of these drives. Cobra internal drives range from 45MB to 210MB while our external Cobra drives go from 45MB to 650MB. So, you can work with a long list of advanced software applications.

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Circle 149 on reader service card

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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-

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.

multiple 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.

FLEXIGRAPHS 1.1

GRAPH WIZ 1.0

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.

(continues)
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ALL BY INTRODUCING THE
The PageMaker toolbox and pasteboard, along with 30 pre-designed layout templates, are some of the reasons why learning and using PageMaker is still so quick and easy.

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For a brochure or the location of your nearest PageMaker dealer, call 800-333-2538, Department 2L. Because the best thing about the new PageMaker is not what it can do now; it’s what you can do now.
FlexiGraphs has limitations when compared with the charting capabilities of spreadsheets. First, FlexiGraphs has only three chart types: pie, line, and bar. Excel has 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.

**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 gives 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 175 (FlexiGraphs), 192 (Graph Wiz) on reader service card.
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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.

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 file: 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 safe 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 (continues)
The freedom to write and think is for all of us. Now, there is a new word processor that's just right for us, too. It's called MacWrite® II, and it's made by Claris. MacWrite II makes it possible to share your ideas and thoughts with other computers and word processors. You'll be free to open documents from over 50 word processors, on all kinds of computers, with all kinds of speech, and work on them without reformatting.

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.)

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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), 819 (QuickLock) on reader service card.

HyperCard and CD Audio Program

WARNER NEW MEDIA AUDIO NOTES SERIES: THE MAGIC FLUTE


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 Harmoncourt, with a cast that features Marti Salminen, Hans-Peter Blochwitz, Edita Gruberova, Barbara Bonney, Anton Schrading, 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 crescendo, 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 Superfetities

With the Magic Flute Audio Notes CD, you can enjoy synchronized superfetities 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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Circle 8 on reader service card
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.

LAZER 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 preview mode.

Company: Baudville Computer Products.


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.

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 Lukes

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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. Achten, 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 update 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.

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 mechanics. 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 represents...
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.

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. See Where to Buy or circle 634 (Letter Writer Plus), 408 (MacChat), 611 (MacSurvey), 834 (Personal Reference Catalog), 683 (StudyMate), 670 (Time&Money) on reader service card.
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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.

Concord 1050 Hard Drive

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.

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)
$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, 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 Porta 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.

**Power II VGA Monitor**
14-inch VGA monitor. Operates with 0.28mm dot 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 exchange-

---

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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.

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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.

Ultra 14
14-inch color monitor that supports VGA, Super VGA, and IBM's 8514/A graphics standards at 1024 x 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.

Xceed

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

(continues)
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, 703/528-1955.

Crypagrammar
Shareware electronic note pad that can be used to solve crypograms, 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.

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.

DocuKey
Electronic keynoting system assists design professionals in organizing and integrating written specifications and working draw-
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 AppleTalk 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.

There is a better way.
With the HP ScanJet Plus, you've

The HP ScanJet Plus scanner provides 8-bit photographic-quality scanning.

That means 256 shades of gray for the hottest-looking output from your Mac. And it's so easy, too. At the click of a mouse, you can get negative or mirror images, as well as scaling in 1% increments from 4-200%. All for $2,190, about what you would expect to pay for a 4-bit scanner.

So if you want the richest, most detailed images from your Mac, you've got it made with Hewlett-Packard. Call 1-800-752-0900, Ext. 1005 for your authorized HP dealer.

There is a better way.

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**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. $12K min. memory. $49.95 (introductory price $39.95). Koy Software, 314/878-9125.

**Ishida: The Way of the Stone**
Game in which one or more players must accurately place 72 stones from a pouch onto a 96-square 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, pre-calculus, and calculus. $12K 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.

**Stratego**
Computer version of Milton Bradley's Stratego in which

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HEWLETT PACKARD
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.

Wedding Set
Color collection of still images and backdrops designed 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 assigned 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. Broderbund 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 (continues)

got it made in the shades.
in various writing disciplines such as autobiography, persuasive writing, evaluative writing, and reports. LMB 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 note-books. 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 II Minder
Stand that lifts a Mac IIc 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, 800/446-7825.

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.
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**
Surg-e-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.

**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.

**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 IIx, 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**

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To have your product considered for inclusion in New Products, send an announcement with product name, description, minimum memory, peripherals required, pricing, company name, phone number (and two copies of the software) to New Products Editor, *Macworld*, 501 Second St., San Francisco, CA 94107. We reserve the right to edit submissions.
Five lessons other companies have yet to learn about PostScript® printing.

1. Genuine Adobe® PostScript®
   You need a true Adobe PostScript printer. The Silentwriter2 290 printer from NEC. Some companies emulate PostScript with clone interpreters or add-on cartridges. Others have limited font capabilities. But that's not the way to produce eye-popping newsletters, or 3D charts. We've known this since we introduced our first Silentwriter LC 890 printer back in 1987.

2. MS-DOS® and Macintosh® Connectivity. That's right, the 290 works with both Macintosh and PC-compatibles. And with its standard Centronics parallel, RS-232C, RS-422 and AppleTalk™ interfaces, the 290 is ideal for standalone or network environments.

3. WYSIWYG Screen Fonts. As in What-You-See-Is-What-You-Get. Our printer support kit included with every 290 we sell includes software that lets you see all of the printer's 35 scalable typefaces before you print them out. Also included are diskettes that allow you to install the fonts on any Macintosh or under Microsoft® Windows™ in the MS-DOS environment.

4. Memory. With a full 2 MB of standard memory, there's simply no more worry. Since now you have more than enough memory to print a full page of text and graphics (letter or legal size) without losing valuable data. Plus the optional user-installable 2 MB of additional memory satisfies your need to store downloadable fonts and overlays.

5. Software. The Silentwriter2 290 is the printer of choice for MS-DOS or Macintosh users working with hundreds of the most popular software packages. With an installed base of over 100,000 Silentwriters, our experience with printer software is hard to beat. Meaning you get more than just a printer, you get answers.

Since NEC began making PostScript® printers, we've learned how to stay ahead of the competition. Sure, other PostScript printers can do some of these things, but only NEC puts them all together in the Silentwriter® 2 290, the printer that goes to the head of the class. To find out more about the Silentwriter2 290, call us at 1-800-NEC-INFO. In Canada, 1-800-343-4418.
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 Icon 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

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

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

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

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 make 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

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

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 flopp 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)
In fact, you can have the sharpest image around for a lot less than you'd expect to pay. With the Magnavox Analog Color (MAC) display, specifically designed to complement your Macintosh II system.

And the 14" MAC display is superior to others for a very good reason: it works better.

For superb on-screen resolution, the MAC display is equipped with our fine pitch 0.29mm CRT. We polished the CRT face for crystal clear images, in graphics or text. And added a tilt/swivel base for the ultimate in user comfort.

Not to mention protecting your purchase with a solid, two-year limited warranty instead of the usual 90 days. All of which adds up to quite a value.

Improving your image is smart. Improving it while saving money, that's very smart.
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.

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.—LP.

**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

**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.
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 cm 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

Long Poole answers readers' questions and selects their tips for this monthly column. He has written many personal computer books, including the quick reference Hyptalk (Microsoft Press, 1988), and a new book of Mac tips (to be published soon by Microsoft Press), Amazing Mac Facts.
It's 9:01. And it's do-or-die. All 5 offices of Venture Vessels have just 10 minutes to finish a presentation. Together.

It's 9:05. For a moment, things run aground. Philadelphia points out a need for another sail. And, thanks to Aspects, they’re able to alter the graphic right there for everyone to see.

It's 9:10. The conference breezes right along with text contributions made together by San Francisco, Los Angeles and Newport. And everybody agrees—the presentation is ready to set sail.

Introducing Aspects, the first simultaneous conference software for the Macintosh.

No matter what your group project, Aspects™ gives you a visual dimension to communication. Whether you’re across a continent or merely across the hall, you now have the power to develop ideas through the exchange of words and images, without leaving your desk. Imagine. Now hold interactive meetings with up to 16 Macintosh® users, in real-time. And save thousands of dollars in time and travel expenses.

Create a meeting of the minds.

Everyone can actively participate in an Aspects conference—at the same time. They can write text, create graphics, insert material from their own files. While everyone else in the conference watches. And the exchange of ideas is a fast-flowing, natural process. Giving on-line work new levels of vision and cooperation. You might say that Aspects lets one Macintosh user dot the i’s, while the other crosses the t’s. Literally.

Seeing is believing.

Call 1-800-476-8781 now for an Aspects demonstration video (just $9.95 for shipping and handling), and see how your group can work better—together.
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.

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 IIIc or the IIx.

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 passes 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 copier.

**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...
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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 Innovate'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.

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, bows, 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 scripts, 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 IleX. 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.

Sheeted 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. Flatted 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. Flatted 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 flatted 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 52 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 n, and s can become 5. In one of my test documents, OmniPage turned PS/2 (a model of IBM personal computer) into PS12. 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 PS12 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.
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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 Sturdvant 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)
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 tool: 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—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”).

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, re-coloring 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.
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)
FileMaker Pro
(Claris Corporation)
More powerful and user friendly than FileMaker III. Choose from 100 new features including improved design capabilities, custom tools from Claris CAD and MacDraw II, a size dialog, revised data files and support for 64 colors. Multi-user capabilities have also been enhanced through improved password protection and selected views. $219. Upgrades from FileMaker II are FREE.

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. The new graphics tool lets you automatically create, manipulate and customize presentation quality charts and other graphics. Includes FREE copy of Adobe Type Manager. $349.

TypeStyler 1.01
(Broderbund)
With TypeStyler you'll create dramatic graphics without expensive typefaces. TypeIt then StyloIt using an array of unique paint features. Import and PGX, IFT and EPS files, create original typefaces, export Adobe Illustrator outlines and more. TypeStyler comes with 10 AGFA, CompuServe typefaces and works with thousands of fonts including Type 1 from Adobe. $114.

WriteNow 2.2
(T/ Maker)
Incorporates many new user-requested features, such as mail merge, a larger dictionary, cursor key support, a Windows Menu, dedicated decimal tabs, a Hide Pictures option, ability to save files directly in text only, MacWrite, or RTF (word option) formats. Power features include hyphenation, horizontal scrolling, automatic foot-notch and guttering. Can display up to four columns simultaneously. $117.

SIMMs
Get more mac brainpower with 1 Meg/120ns SIMMs! Adding more memory means the ability to boost productivity. You'll finally be able to edit large graphic files and run many applications simultaneously. After installing SIMMs you can refer to a sales letter while juggling a monthly spreadsheets, edit complex scanner graphics or develop your own HyperCard stacks. $69.

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Desk Cover - Mac SE & Ext. Keyboard...$11
Keyboard Flip...$6
Large Screen Monitor Stand...$38
Laser Printer Stand...$26
Computer Artware
Mickey Mouse/Dick Tracy Mouse Pads...$13
Curts
Command Center...$9
EID Center Co.
Teak Disk Holder - 50...$14
Teak Disk Holder - 100...$21
Teak Disk Holder - 150...$26
Teak Double Drawer Disk Holder - 140...$25
Ergotron
Mac SE/II - Platinum...$88
Mac Design
Macintosh Mac SE Carrying Case...$58
Macintosh Plus Carrying Case...$54
Macintosh SE Ext. Carrying Case...$57
The Ultimate SE Carrying Case (black)...$78
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Anti-Glare Filter...$32
Apple Hi-Res RGB Anti-Glare Filter...$53
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Mac II Monitor Stand...$24
Mac II Stand w/Extension Cables...$45
Master Key...$29
Power Tree 50 Surge Protector...$19
Power Bailer 360 UPS...$26
System Saver Mac - Platinum...$63
Sanyo
Dics - 1.44MB High Density...$22
Disk - 0.45MB (box of 10)...$12
Targus, Ltd.
Mac Plus/SE Carry Case (black)...$54
Mac Plus/SE - Ext. Keyboard Carry Case...$69
COMMUNICATIONS AND NETWORKS
CE Software
QuickMail 2.2 (11-10 users)...$315
QuickMail 2.1 (5-4 users)...$178
CompuServe
CompuServe Subscription Kit...$22
CompuServe Navigator...$59
DataViz
MacLink Plus w/Calendar...$118
Earntone
PhoneNEX EXT SE & III...$133
Tickle 3.1...$35
Tickle Remote...$41
FreeSoft
White Knight 11.0...$85
Software Ventures
MicroPhone II 3.0...$215
Solutions
FastFile Plus...$29
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TOPS 3.0 Network Bundle Mac...$180
TOPS 3.0 Network Bundle DOS...$180
Traveling Software
FaxLink...$113
FaxLink - Network Pac...$185
DATABASES
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4th Dimension 2.0...$464
File Force...$464
Claris
FileMaker Pro...$219
Fox Software
Fox database 3.0...$291
Odesta
Double Helix III...$38
DRIVES
CMS
MacStack 20 Meg...$429
MacStack 30 Meg...$458
MacStack 45 Meg...$598
MacStack 60 Meg...$649
MacStack 80 Meg...$789
MacStack 44 Removable Drive...$639
Cutting Edge
600K Floppy Disk Drive...$149
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5M Reconfigurable Hard Drive...$699
Fujitsu
600K Floppy Disk Drive...$149
Peripheral Land, Inc.
Cartridge Tape Reader 40 MB...$190
Infinity Turbo 40 Meg...$998
Infinity Turbo 80 Meg...$1,798
Turbo Floppy...$416
Power User
20 Meg Drive...$350
3M Drive...$321
4M Drive...$350
6M Drive...$425
8M Drive...$450
10M Removable Drive...$679
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Beauty Shop 2.0 (1 user)...$38
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Computer Science & Engineering...$38
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The Playroom...$78
Where is Carmen Sandiego?...$78
Bullseye
Fernald Grand Prix 1.6...$31
PSI MacTrack 2.0...$31
Penton Overseas
Vocalcouture L. T. 1.0- German, French, Italian, Spanish...$35
Vocalcouture L. T. 2.0- German, French, Italian, Spanish...$35
Vocalcouture L. T. 3.0- German, Spanish...$35
Silicon Beach
Dark Castle or Beyond Dark Castle...$31
Spectrum Holobyte
Spectrum...$19
Wells...$19
XSN Corporation
Macscore Classic...$51
NFL Challenge...$53
Road Racer...$37
TaskMaker...$56
GRAPHICS AND DESIGN SOFTWARE
Adobe Systems, Inc.
Adobe Systems Type Manager 2.0...$55
Adobe Type 3.0...$107
Adobe Type Set 1 or 2...$58
Adobe Type Remover...$38
Illustrator...$39
Photoshop...$49
Small I, II, III or IV...$38
SmartDraw...$55
TypeAlign...$50
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Freehand 2.0...$30
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Persuasion 2.0...$239
Adobe
Art Institutes...$18
Fantastic Font 2.0...$50
Fontographer 3.0...$48
Metamorphosis...$14
Bright Star Technology
Integrated Systems...$49
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Broderbund
TypePaint...$114
The Whole Earth Catalog - CD-ROM...$69
Claris
MacDraw II...$89
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The Organizer

MORE 3.0

software

MegaScreen Rival-Macworld Magazine's "First Choice" in black-and-white big screens. Combines our excellent price, we rate it WSWTY two-page system your BEST BUY 1024 x 826 resolution; flicker-free 7Hz refresh. Interface cards and cables included. Compatible with Mac Plus, Mac SE, Mac SE/30, and all Mac II models. $1,275.

(Co-Star)

Spruce up the appearance of your office's laser printer area with the clean design of the CoStar Organizer. It's a handy place for your printer and supplies. Its cable management systems keeps wiring neat and out of sight while its ample storage can accommodate a hard disk drive, extra paper tray, and toner cartridges. Casters make the whole system mobile. $199.

Pamper your Mac with a Targus case made of Zili-cone treated nylon for waterproof durability and impact absorbing high-density foam for complete protection. Cushioned shoulder pad and handles provide comfort and convenience. Plus there's room for everything from your Mac, hard disk drive, and extended keyboard. Full Mac line available in black. $89.

The Organizer (Co-Star)

Pamper your Mac with a Targus case made of Zilicone treated nylon for waterproof durability and impact absorbing high-density foam for complete protection. Cushioned shoulder pad and handles provide comfort and convenience. Plus there's room for everything from your Mac, hard drive, and extended keyboard. Full Mac line available in black. $89.

The Microsoft Office

Provides everything you'll need to increase productivity through word processing (Microsoft Word), desktop presentations and financial charting so concepts zoom from your "doodle" pad to the board room in no time. A single step converts ideas into bullet or tree charts. Over 100 templates and layouts simply document formatting. MORE's Chart Tutor provides step-by-step instructions on preparing everything from overhead transparencies to 35mm slides. $265.

Virtual 2.0

Virtual gives you the advantages of virtual memory with system 6.0. Virtual memory uses your hard disk to expand your RAM without adding memory chips to your Mac. With Virtual, you can have up to 14 megabytes of memory at your fingertips. And it's fast too, offering performance comparable to the usual hardware memory chips. $187.
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 integrates 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.

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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Circle 10 on reader service card
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 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.

**UPDATES**

**Bold** = first time the product is being listed

= minor update

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**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-determined 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, 800/525-3587. Free upgrade to registered owners; $59.95 new.
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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.

If you forget 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.

Encrypt financial data, employee records, and other sensitive information in a format nobody can crack. Except you.

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.

Make exact copies of floppy disk fast. MacTools takes full advantage of your computer's memory to reduce disk swapping and lets you make as many copies as you like.

You wouldn't drive without a seat belt—don't operate your Mac without one either. MacTools copies criticalanime information daily (or more often!) to protect against hard disk crashes and accidental initialization.

Central Point Software, Inc.
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### How the left brain sees MacTools

**How the left brain sees MacTools:**

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## Product Updates

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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, 561 Second St., San Francisco, CA 94107.
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Oh, yes—where’s the proof positive? This complete page is peppered with it. (Scanned and separated by the Nikon LS-3500 from a photo shot by Michael Pruzan with a Nikon camera.) Impressed? Phone or write for complete details: Nikon Electronic Imaging, Dept. EB-1, 101 Cleveland Ave., Bayshore, NY 11706, (516) 222-0200 Ext. 324. Or call 1-800-NIKON-US for the dealer nearest you.
WHERE TO BUY
A Guide to Products Featured in This Issue

This listing provides companies and phone numbers for products mentioned in this issue. Allow several weeks for responses to reader service card inquiries. Asterisks indicate vendors who prefer to be contacted by phone.

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775 DataDesk Osolenta Corp.; 708/496-5615,
800/323-5423.
776 Desktop To Press Peter
Fink Communications; 617/527-1899.
777 Digital Darkroom Silicon
Beach Software; 619/695-0956.
778 Digivideo Color Appar
Corporation; 408/735-8550.
779 Doele PS Science America
Corporation; 617/275-5100,
800/886-0489.

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800/430-2700.
820 MMS-PS Microtek; 713/752-0900,
800/654-1460.
813 ImageStudio Leraset
Graphic Design Software; 201/845-6100,
800/343-8973.
826 InterFace Bright Star
Technology; 206/451-9977.

Reader Service
800/421-2009.
876 Focus II SBOOGSE Agfa
Compugraphic Division; 508/658-5600,
800/822-5524.
877 FocusColor Scanner Agfa
Compugraphic Division; 508/658-5600,
800/822-5524.
878 FontStudio Leraset
Graphic Design Software; 212/845-6100,
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879 Forte Agfa
Matrix Division; 914/565-0100,
800/876-7543.
880 GeoQuery Osolenta Corp.;
708/498-5615, 800/523-5423.
881 Graph Wis William K.
Bradford Publishing; 508/263-6996,
800/421-2009.
882 The Magic Flute Warner
Now Media; 818/955-9999.
883 microLaser PS35
Texas Instruments; 214/995-6611,
800/527-3500.
884 Microsoft PowerPoint
Microsoft Corporation; 206/682-8080,
800/246-9400.
885 Mintab Statistical
Software; 814/238-3280,
800/440-3555.
886 MPS-300Q Microtek;
213/232-2121,
800/654-1460.
887 JMP SAS Institute;
919/677-8000.
888 Laser Award Maker
Baudville Computer; 800/654-4160.
889 LaserJet IID Hewlett-Packard; 800/752-0900.
890 LaserJet III Hewlett-Packard; 800/752-0900.
891 LaserJet III Hewlett-Packard; 800/752-0900.
892 LaserWriter INT Apple
Computer; 408/996-1010.
893 LaserWriter INTX Apple
Computer; 408/996-1010.
894 Letter Writer Plus Power
Up Software Corporation; 415/445-5900,
800/851-2917.
895 LightningScan 400
Thunderever; 415/251-6581.
896 Linotronic 320 Linotype
Company; 516/434-2000, 800/635-1900.
897 LS-3500 Nikon,
Electronic Imaging Department;
516/222-0200.
898 MacLit: The Guide To
Macintosh Literature
Black Gryphon; 914/206-3527.
899 MacroMed Director
MacroMind; 415/442-0200.
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<table>
<thead>
<tr>
<th>Software</th>
<th>Price</th>
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<tr>
<td>Acinus 5th Dimension v2.0</td>
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<td>Dv8 Software Unines v5</td>
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<td>Cheng Laboratories L.A.T. v1.0</td>
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**SPEAKING & GRAMMAR CHECKERS**

- Donbea Software
- Big Trainer Deluxe
- Spelling Coach Professional v3.1

**Founding Publisher**

- HySpeller

**DATABASE MANAGEMENT**

- Database
- Network Bundle v3.0
- Tops Repeater or Flashbox

**UTILITIES**

- Abbott Systems CanOpener v1.1
- Affinity Microsystems
- Aladdin Systems Shortcut
- ALSoft Disk Express II
- American Power Conversion
- Berkeley System Design
- Stopping Out

**CE Software**

- CE Software
- Calendar Maker
- Dv8 Software Unines v5

**Central Point Software**

- Central Point Software
- Copy II Mac v7.2

**Dantz Software Development**

- Dantz Software Development
- FastBack II v7.2

**Fifth Generation Systems**

- Fifth Generation Systems
- FastBack II v7.2

**INFORMIX**

- Informix Wings v1.1

**KLA-TENCOR**

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**Microsoft**

- Microsoft Excel v2.2
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- Tongue
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- Voice Symptom
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- Wingz
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Seagate

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Imprimis

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<td>Imprimis 1.2 Gigabyte 16ms</td>
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<tr>
<th>Model</th>
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<td>40 Quantum</td>
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<tr>
<td>Carrying Case</td>
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<tr>
<th>1 MB Surface Mount, Low Profile</th>
<th>$52</th>
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<tr>
<td><strong>• 80ns/70ns SIMMs • Gold contacts and traces • Lifetime warranty</strong></td>
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<tr>
<td>4Mb Surface Mount/Low Profile (80ns)</td>
<td><strong>$279</strong></td>
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<tr>
<td>Macintosh FX &amp; LaserWriter NTX SIMMS</td>
<td><strong>$62</strong></td>
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<td>INDEX Macintosh Portable RAM</td>
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### Index Hard Drives

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<td>Quantum 3.5&quot; ProDrive HD - 12ms</td>
<td><strong>Absolutely FREE!</strong></td>
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<td>40Mb 12ms</td>
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### Hardware

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<td>MacTel Extended Keyboard</td>
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<td>MacTel-Ext (100% Phone-Net)</td>
<td><strong>$19</strong></td>
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<tr>
<td>Index Modem 2400 baud external (100% Hayes compatible)</td>
<td><strong>$99</strong></td>
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<td>Kensington Turbo Track Ball Mouse ADB</td>
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### Printers

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<td>TI micro laser printers AppleTalk Connector Included! PS6e &amp; 35 fonts</td>
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<td>PS17 w7 fonts</td>
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<td>Irk Jet 300 dpi Printer</td>
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### Micronet Scanners

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<th>Scanner Type</th>
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<td>MSF 300 GS, including cables and software</td>
<td><strong>$195</strong></td>
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<tr>
<td>MSF 3022 ColorScan, including cables and software</td>
<td><strong>$2195</strong></td>
</tr>
<tr>
<td>MSF 400 GS</td>
<td><strong>$2495</strong></td>
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<th>Capacity</th>
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**CDC IMPRIMIS WREN**

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<td>60mb</td>
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<th>STORAGE &amp; BACK-UP</th>
<th>DISPLAY SOLUTIONS</th>
<th>SYSTEMS &amp; DISPLAYS</th>
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<td>Microtek MSF300GS</td>
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<td>1MB SIMMs 70/100 ns</td>
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<td>MagicScan 256 w/ColorSet</td>
<td>MagicScan 256 w/ColorSet</td>
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<td>$289</td>
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<td>IIIx</td>
<td>6099</td>
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Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 5.9
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.0
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.1
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.2
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.3
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.4
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.5
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.6
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EDUCORP CD-ROM 6.7
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.8
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 6.9
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 7.0
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 7.1
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 7.2
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EDUCORP CD-ROM 7.3
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 7.4
Includes extensive multimedia help with pronunciation.

EDUCORP CD-ROM 7.5
Includes extensive multimedia help with pronunciation.
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For your ad to appear on The Macworld Catalog screen, call 800/888-8622.

---

**The Macworld Catalog**

### Advertising Rates & Information

The Macworld Catalog section is a monthly link-up for advertisers and volume purchasers of Macintosh-related products and services. The Catalog offers advertisers a low-cost marketing opportunity and provides readers with a timely, easy-to-use menu for product buying.

Display ads are sold by column inches (2" minimum). Standard red is available as a second color. Text-only listings are available for a minimum of three issues at $450 per issue.

For more information on The Macworld Catalog, call 800/888-8622.

---

**The Macworld Catalog**

### Advertising Sales Staff

Beverly Schneider, Telemarketing Sales Manager

Niki Stranz, Western Account Manager, 415/978-3105

Carol Felde, Eastern Account Manager, 415/978-3152

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San Francisco, California 94107
800/888-8622

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Mail order can save you time—and money!

**CD Rom**

**HOLIDAY SPECIAL**

**MEDIA CLIP-ART OFFERS THE #1 CD-ROM**

With Color And Black & White EPS Images
Also Hundreds of 24-bit Royalty Free
Color Photographs.
All EPS Images Can Be Altered
In Adobe Illustrator.
Each CD Comes With an
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Disk, Tutorial and Manuals!
Over 650 Megabytes of Images on 1 CD-ROM
IMAGES ARE ROYALTY FREE!
Were Celebrating a Successful Year
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**To Order Call - 609-795-5993**

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Cherry Hill • N.J. 08003 Fax 609-795-0462

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For All Macintosh Models
• No software changes
• Attaches as 2nd keyboard
• Installs in seconds
• Reads UPC/EAN, Int 2 of 5,
  Codabar, Code 128,
  MSI, and Code 39
• Outstanding read rate

Complete with Steel Wand—$399
Magstripe Option—add $100
64K Portable Reader—$349

Bar Code Software
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• UPC/EAN fonts—$99
For Laser, Linotronic. Dot Matrix

1 YEAR WARRANTY
30 DAY $5 BACK GUARANTEE
800-345-4220
417 Ingalls Street
Santa Cruz, CA 95060
408-458-9938

“**I saw it in Macworld!”**

For your ad to appear on The Macworld Catalog screen, call 800/888-8622.
## Computer Systems

### INTERNATIONAL COMPUTER CENTER

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC II FX 4MB 80 MB</td>
<td>$6969</td>
</tr>
<tr>
<td>MAC II FX 4MB</td>
<td>$6389</td>
</tr>
<tr>
<td>MAC Portable 40MB</td>
<td>$3785</td>
</tr>
<tr>
<td>MAC IIIC 1MB</td>
<td>$1195</td>
</tr>
<tr>
<td>MAC IIIC 4MG 80MB</td>
<td>$5285</td>
</tr>
<tr>
<td>MAC IIICX 1MB</td>
<td>$3195</td>
</tr>
<tr>
<td>MAC IIICX 4MG 80MB</td>
<td>$4095</td>
</tr>
<tr>
<td>MAC IIIX All Models</td>
<td>CALL</td>
</tr>
<tr>
<td>MAC SE/30 1MG 40MB</td>
<td>$3975</td>
</tr>
<tr>
<td>MAC SE/30 4MG 80MB</td>
<td>$3569</td>
</tr>
<tr>
<td>Laser NT/NTX</td>
<td>$3075/4075</td>
</tr>
<tr>
<td>8 Bit Video Card</td>
<td>$409</td>
</tr>
<tr>
<td>13&quot; RGB Color Monitor</td>
<td>$599</td>
</tr>
<tr>
<td>Full Page Monitor &amp; Card</td>
<td>$1149</td>
</tr>
<tr>
<td>Image Writer II</td>
<td>$425</td>
</tr>
<tr>
<td>H.P. Deskwriter</td>
<td>$819</td>
</tr>
<tr>
<td>H.P. Scanjet &amp; Int.</td>
<td>$1444</td>
</tr>
<tr>
<td>Radius 2 Ps. Mono/Card</td>
<td>$1295</td>
</tr>
<tr>
<td>Reg. Keybd./Extended</td>
<td>$95/170</td>
</tr>
</tbody>
</table>

All Items New/VISA & MC Add 2%

(800) 767-7706
FAX (818) 891-3285
16175 Roscoe Blvd.
Sepulveda, CA 91343
U.S.A.

CIRCLE 694 ON READER SERVICE CARD

---

### EXSEL DIRECT

**1-800-624-2001**

**In NY:** 716-272-8770

**Refurbished Macs!**

- Mac 512K
- Mac Plus
- Mac Plus w/20MB Ext.
- Mac SE Dual Floppy
- Mac SE/20
- Mac SE w/40 MB Int.
- Mac II
- Imagewriter LG
- Imagewriter II
- Laser Writer
- Laser Writer Plus
- 800K External Drive

**2260 Brighton-Henrietta Townline Rd.**

**Rochester, NY 14623**

All units refurbished with 30-Day Warranty, VISA, MasterCard, payment. C.O.D. subject to credit.

Prices subject to change.

CIRCLE 665 ON READER SERVICE CARD

---

### The Bottom Line:

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**Call 800/888-8622 to reserve your space today!**

For your ad to appear on *The Macworld Catalog* screen, call 800/888-8622.
The Macworld Catalog

Tremendous Changes in Pricing on Apple Equipment!
To make sure you are getting the best possible price on your Macintosh system, call M•l•S now at 800/633-1538.

We only sell brand new computers.

For your ad to appear on The Macworld Catalog screen, call 800/388-8622.
The Macworld Catalog

1-800-334-KIWI

Mac Plus ...........$1250
Mac SE 40mb ...$2150
Mac SE/30 40mb ....$2995
Mac Portable 40mb...$3995
Mac SE/30 40mb ...$3150
Mac SE/30 100/5mb...$3795
Mac IICx 40/2mb ....$3695
Mac IICx 100/5mb...$4295
Mac IICx 100/5mb ...$5295
Mac IIIFx 100/4mb...$6995
Apple color monitor...$695
Apple 8 bit video card...$375
Apple keyboard ..........$100
Apple ext keyboard...$175
Imagewriter LQ ........$495
Imagewriter NTX......$495
H.P. Deskwriter .........$845

All items new. 1 year warranty. Most items in stock today.
Visa & Mastercard add 2% C.O.D. orders accepted.

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International (213)553-4507
Fax (213)286-9667
Mon-Fri 8:30am-4:30pm PST

CIRCLE 608 ON READER SERVICE CARD

Emulators

Data Acquisition

\[ \text{In a Mac} \]

An Apple //e computer...all in software!

Run Apple II software on your Macintosh.

Convert Apple II files to Macintosh files.

$149.95 Add $5 for 72 MSCs

COMPUTER ApPlications, Inc.
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(919) 846-1411

CIRCLE 588 ON READER SERVICE CARD

Disk Drives

Extraterrestrial Prices
Beat all prices, lots of freebies! Call for $ lowest prices. COD.

MacPlus $1045
SE $1790
SE/32mb, SE/30/40mb $low
IICx $3149
IICx 40mb $3675
IICx 4/105mb $1439
Imagewriter INT $3099
INTx w/cable/toner $1499
IICx-fx Portable $low

Jupiter Computers,
624 Knox Ave.
Fontana, CA 92336.
714/829-2953 Fax: 356-1178

1 Year Warranty, 100,000 Hours MTBF

330MB FAT $1299 $1349
357MB Romer $1649 $1799
404MB/25 H $2245 $2445
676MB FAT $1949 $2099
1.2Gb $999 $997

2 Year Warranty, 80,000 Hours MTBF

330MB FAT $1249 $1349
357MB Romer $1649 $1799
404MB/25 H $2245 $2445
676MB FAT $1949 $2099
1.2Gb $999 $997

2 Year Warranty, 100,000 Hours MTBF

90MB 3.5" $500 $600
135MB 3.5" $649 $749
185MB 3.5" $819 $919
357MB 5.25" $1399 $1549
660MB 5.25" $1899 $2049

Mac!Direct! 800-621-8461

For your ad to appear on The Macworld Catalog screen, call 800/888-8622.
Hard Drives

**Quantum 12ms Access**

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mb</td>
<td>$339</td>
<td>$439</td>
</tr>
<tr>
<td>80</td>
<td>519</td>
<td>619</td>
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<tr>
<td>105</td>
<td>599</td>
<td>699</td>
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<tr>
<td>120</td>
<td>699</td>
<td>799</td>
</tr>
<tr>
<td>170</td>
<td>899</td>
<td>999</td>
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</table>

**Imprimus WREN Drives**

<table>
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<tr>
<th>Capacity</th>
<th>Half</th>
<th>Height</th>
<th>Internal</th>
<th>External</th>
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<tr>
<td>173 mb</td>
<td>2195</td>
<td>1159</td>
<td>1259</td>
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<tr>
<td>300</td>
<td>1649</td>
<td>2095</td>
<td>2195</td>
<td></td>
</tr>
<tr>
<td>330</td>
<td>2149</td>
<td>1499</td>
<td>1649</td>
<td></td>
</tr>
<tr>
<td>404</td>
<td>2149</td>
<td>1999</td>
<td>2149</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>2295</td>
<td>2295</td>
<td>2395</td>
<td></td>
</tr>
<tr>
<td>630</td>
<td>2749</td>
<td>2595</td>
<td>2749</td>
<td></td>
</tr>
<tr>
<td>1 Gig</td>
<td>4595</td>
<td>4349</td>
<td>4595</td>
<td></td>
</tr>
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</table>

**Maxtor 200**

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>999</td>
<td>1099</td>
<td></td>
</tr>
</tbody>
</table>

**Syquest 45 meg Removable**

- All Include one cartridge • $76 per cartridge for additional cartridges

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Internal</th>
<th>External</th>
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</thead>
<tbody>
<tr>
<td>Teac 60mb</td>
<td>599</td>
<td></td>
</tr>
<tr>
<td>Tape With Retrospect!</td>
<td>699</td>
<td></td>
</tr>
<tr>
<td>Teac 155mb</td>
<td>999</td>
<td></td>
</tr>
<tr>
<td>Tape With Retrospect!</td>
<td>699</td>
<td></td>
</tr>
<tr>
<td>WangDAT</td>
<td>2395</td>
<td></td>
</tr>
</tbody>
</table>

**All Drive Combo's**

- All Include one cassette

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 gig WREN/WangDAT</td>
<td>6995</td>
<td></td>
</tr>
<tr>
<td>600 mb/WangDAT</td>
<td>4495</td>
<td></td>
</tr>
<tr>
<td>600/Teac 155</td>
<td>2895</td>
<td></td>
</tr>
<tr>
<td>600/Syquest</td>
<td>2895</td>
<td></td>
</tr>
<tr>
<td>300/Teac 155</td>
<td>2295</td>
<td></td>
</tr>
<tr>
<td>300/Syquest</td>
<td>2295</td>
<td></td>
</tr>
</tbody>
</table>

**ASK ABOUT OUR OTHER COMBO's**

- All Tape Combo's Include one cassette and Retrospect!
- All SyQuest Combo's Include one Cassette

For your ad to appear on The Macworld Catalog screen, call 800/888-8622.
**Mac Rescue to the Rescue**

6 megs of RAM for Classic Macs. Burial at sea for the Classic Macs? Never! There’s years of productive life in all enhanced 128K and 512K Macs. Mac Rescue gives them the functionality of a Mac Plus, up to 4 megs of RAM plus a 2 meg RAM Disk and a SCSI Port. The obedient daugh-terboard snaps on the motherboard in minutes. One year warranty. RAM Disk software available.

A RAM Disk instead of a hard disk. In many situations, the RAM Disk eliminates the need for a hard disk, you just load the application(s) into RAM and use the floppy drive for data transfer.

We design, make and market 256K, 1 meg and 4 meg SIMMs, Softstep memory expansion modules and Mac Rescue, an upgrade board for Classic Macs. All have a one year warranty. Call today.

**Computer Care**

Dealer Inquiries Welcome. Visa/MC Accepted.

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**When you get serious about your Macintosh, give PSI a call.**

No more kidding around. PSI manufactures all the upgrades you need for your oldest Mac Plus to your newest Mac Portable. We make 1 meg SIMMs, 4meg SIMMs, LaserWriter INTX SIMMs, Portable Memory upgrades, an internal FAX/Modem for the Portable, a Cache Card for the IIci, and a removable SCSI Hard Drive for all your Macs. We can satisfy your every Mac need under one roof!

800-622-1722 · 408-559-8544 in CA

PSI 2005 Hamilton Avenue, Suite 220 San Jose, CA 95125

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**UPGRADES!**

512K - Plus $295
512K - Plus $625
128K - Plus $695

**MEMORY**

WE ARE LOWEST!!!

Peripheral Outlet
314 S. Edwy • Ada, OK 74820
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405-332-6581 Fax 405-436-2245
Visa & MC okay (add 3%)

**THE SIMMER**

Adds SIMM sockets and SCSI port to your 128/512 Macintosh
$199 (0 Meg)
1M $239.2M $329.2.5M $339.4M $459
Dealers Wanted!

1 Meg SIMMS $59 w/Trade
Low Profile Life Gear. Immed. Del.
128 to 512 $99
Wanted: 128K Macs, 256K simms

Digi-Graphies
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Kaysville, Ut 84037
(801) 544-2009

---

**SOUTH COAST ELECTRONICS**

- Made in USA
- Government, University & Fortune 500 PCs
- Lifetime Warranty
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- MC, VISA, AMEX

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(213) 208-3290 (213) 208-3282 FAX

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The Macworld Catalog

BEST PRICES IN MEMORY!

- 1 Meg Module
- 4 Meg Module
- IIfx Module
- NTX Module
- Laptop Module
- Lifetime Warranty
- 30-Day Money Back Guarantee
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FREE Installation Kits

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PO FAX# (512)794-8520

Technology Works

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(512)794 8533

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YOU'RE JUST A PHONE CALL AWAY FROM ALL YOUR MAC EXPANSION NEEDS

1 meg x 8 SIMMs $60

- Call us anytime,
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- Lifetime overnight replace-
  ment warrantee. We'll
  replace any NECs memory
  upgrade for any reason within
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- Every order shipped directly
  from stock—no backorders.
- We accept verbal purchase
  orders.
- Discount for Universities.
- Marathon 030 for MAC Plus, SE,
  SE/30 and IIfx
- 512 Memory Upgrades • Ethernet
  Controllers and Adapters
- FastNet O20 Multifunction Board
- 4 Meg Module
- IIfx Module • NTX Module
- Laptop Modules

Call and ask for our Memory
Division at 1-800-233-1312

292 Cabot Street, Beverly MA 01915
Tel/fax: 508-922-1341

CIRCLE 692 ON READER SERVICE CARD

Peripherals

MEMORY/HARD DRIVES
SYQUEST REMOVABLE

SEAGATE 20MB $239 $399
SEAGATE 30MB 289 369
QUANTUM 40MB 333 430
QUANTUM 80MB 515 669
TP 150MB 545 639
QUANTUM 170MB 838 935
QUANTUM 2yr. SEAGATE 1 yr. Warranty

SHIMES

1 meg x 8 SIMMs for MAC/SE, ex. $86
1 meg x 8 SIMMs for MAC IIfx $89
1 meg x 8 SIMMs for Laser Writer
Life Time Warranty

SYQUEST REMOVABLE
45MB widecarridge $599

AXONE Computer Systems, Inc.
60 Chestnut Ave., Suite 207
Devon, PA. 19333
Tel: (215) 341-6601
Fax: (215) 971-6598

ORDER CALL: 1-800-655-0388

University & Corporate Welcome
Ship in 24 hours. Match any H.S.Lower price

CIRCLE 691 ON READER SERVICE CARD

Continued...

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- Anchor Automation 2400 MNP........... $245
- Farallon Timbuka Remote Access Pack..... $884
- Hayes 2400 SmartModem.................. $278
- Hayes 2400 SmartModem V.42............... $478
- Hayes Ultra SmartModem 9600 w/cable..... $699
- Prometheus 2400 bps MNP................. $520
- Shiva NetModem V.32 9600 bps.......... $1105
- Telebit T 2500 19.200 bps V.32........... $1149
- US Robotics Courier IVS V.32 9600 bps.... $1119

Tel: 800-541-2318
Fax: 650-862-8711
CIRCLE 602 ON READER SERVICE CARD

Fax Modems

- Abatron InteFax 24-96.................. $359
- Dodge Fax 24-96......................... $269
- Orchid MacFax 9600..................... $419

Strictly Macintosh
Simply the Best

MACOUTLET
SUPER DEMO* SALE!!
UPGRADE YOUR MAC
WITH COLORBOARDS

- RasterOps CB108.................. $599
  Mac II Large Screen 8-bit Color
- RasterOps CB208.................. $379
  Mac II Small Screen 8-bit Color
- RasterOps CB264.................. $549
  Mac II Small Screen 24-bit Color
- RasterOps ClearVue/GS........ $1599
  Mac II Large Screen Greyscale
- 19" Color Monitors.............. Call

All RasterOps Products Available

48860 Milmont Blvd.
Suite 103C
Fremont, Calif. 94538

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CIRCLE 602 ON READER SERVICE CARD

SUPER DEMO* SALE!!
UPGRADE YOUR MAC
WITH COLORBOARDS

- RasterOps CB108.................. $599
  Mac II Large Screen 8-bit Color
- RasterOps CB208.................. $379
  Mac II Small Screen 8-bit Color
- RasterOps CB264.................. $549
  Mac II Small Screen 24-bit Color
- RasterOps ClearVue/GS........ $1599
  Mac II Large Screen Greyscale
- 19" Color Monitors.............. Call

All RasterOps Products Available

48860 Milmont Blvd.
Suite 103C
Fremont, Calif. 94538

MACOUTLET 1-800-MacOutlet
CIRCLE 602 ON READER SERVICE CARD

Apple Daisywheel Printer
TRUE letter quality on all Mac’s & Apple II’s.
Fast 40 char/sec. on 1-page/6-part forms, 198 column, bold face,
fixed/proport fonts. NEW $449.
RECOND $349 incl. easy mac point-&-click printer resource, LF cable, print
wheel, & ribbon. incl. foreign, legal &
math symbols. New sheet feeder $49.
Tractor $149. Commercial quality w/ 90-day guarantee.
Quality Discount Computers Inc.
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Wellington, NV 89444
702/465-2473, 415/487-8148

"I saw it in Macworld!"

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The Macworld Catalog

Software

Astrology

**MCHOROSCOPE**

Be your own astrologer, for fun or profit.

Produce amazing astrological reports for friends and family: $199.50

"MCHoroscope" (chart interpreter) produces beautiful natals charts plus 10- to 17-page interpretations. Professional astrologers charge $50.00 and more for similar reports. Excellent study guide for students and great fun for parties and get-togethers.

- *Astrology for the Macintosh* from Time Cycles Research

Write or call for free brochure

W. H. Willard

27 Dimmick St., Waterford, CT 06385

(203) 444-8841

**CIRCLE 675 ON READER SERVICE CARD**

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Postal Fonts For LESS

Save on postage with POSTNET/FIM fonts:

- Work via the font menu
- Print on ImageWriter, LaserWriter, ImageSetters
- Meet USPS requirements
- Saves $18 per Zip+4 envelope
- Cost: $99.95, includes shipping
- Demo: $20, apply to purchase
- Developer Inquiries Welcome

Send check or money order (MO. res. add 6.925% tax) to:

BarPost SymboLogics

P.O. Box 9914

O'Fallon, MO 63366-0314

314/625-3450

**CIRCLE 558 ON READER SERVICE CARD**

---

**BUSINESS**

**ExacTax®**

ExacWare, Inc.

5801 Christie Ave., Suite 520

Encinville, CA 90408

Dealers or out-of-state: 415/847-3435

ExacTax is a trademark of ExacWare, Inc.

**CIRCLE 688 ON READER SERVICE CARD**

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**CALIFORNIA SALES TAX PREPARATION SOFTWARE**

Complicated returns in minutes on your Mac

$149.95

Visa

MasterCard

Toll Free in California

1-800-339-9273

- Context-sensitive help includes all state instructions
- On-screen forms exactly match state forms
- Print all state forms and schedules onto plain paper
- Automatic calculation
- Link to built-in worksheet & detail windows for itemization
- Estimate proforma payments - don't pay more than you have to

**CIRCLE 699 ON READER SERVICE CARD**

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**MACENVELOPE**

Envelope/Label Printing

One package does it all!

Labels, bar coding, envelope printing:

Check/Visa/MC/AMEX 888/55 + 50 s/h (NY. ex tax)

SYNEX 692 10th St., Bklyn, NY 11215-4502

**CIRCLE 659 ON READER SERVICE CARD**

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**EMULATE!**

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<td>$0.71</td>
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<th>This month</th>
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<tr>
<td>65</td>
<td>5</td>
<td>1</td>
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- **Microsoft Word** Microsoft
- **Microsoft Works** Microsoft
- **Microsoft Excel** Microsoft
- **Aldus PageMaker** Aldus
- **Quicken** Intuit
- **MacWrite II** Claris
- **FileMaker II** Claris
- **Wingz** Informix
- **QuarkXPress** Quark
- **MacDraw** Claris

## HARD DISKS*

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- **MacStack SD40** CMS Enhancements
- **MacStack SD20** CMS Enhancements
- **MacStack SD30** CMS Enhancements
- **MacStack SD60** CMS Enhancements

## ADD-IN BOARDS/MEMORY

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- **Radius Accelerator 16/SE** Radius
- **Radius DirectColor 24** Radius
- **Radius TPD Interface** Radius
- **ColorBoard 264** RasterOps
- **Radius Accelerator 16+** Radius

## EDUCATION SOFTWARE

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- **Where in the World Is Carmen Sandiego?** Broderbund
- **Reader Rabbit** The Learning Company
- **Math Blaster** Davidson & Associates
- **Math Rabbit** The Learning Company
- **Where in the USA Is Carmen Sandiego?** Broderbund

## ENTERTAINMENT SOFTWARE

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- **Tetris** Spectrum Holobyte
- **SimCity** Maxis Software
- **MacGolf** XOR/PCAI
- **Weltiris** Spectrum Holobyte
- **Crystal Quest** Casady & Greene

## UTILITY SOFTWARE

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- **SAM II** Symantec
- **SUM II** Symantec
- **Adobe Type Manager** Adobe
- **Virex** Microcom Software Division
- **Pyro** Fifth Generation Systems

## NETWORK/DATA COMMUNICATIONS

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- **TOPS** Sitka Corporation
- **AppleShare** Apple Computer
- **MicroPhone II** Software Ventures
- **Timbuktu** Parallon Computing
- **White Knight** The FreeSoft Company

## 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.
The New E-Series.

An improved manual reduces learning time.

New formatting software for clarity, ease of installation and optimum performance.

24-hour burn-in testing and improved quality control.

A new 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.

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<td>45 Removable</td>
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Ehman
The Apple Alternative

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
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.

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
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.