Newton
The Start of Something Big?

PLUS 3 NEW MACS
Mac LC 520
PAGE 108
Centris 660AV
Quadra 840AV
PAGE 34

3 NEW SECTIONS
Graphics, At Work, Networks
Top 46 Products
ANNUAL WORLD-CLASS AWARDS
To get the most out of this box,

Now that you've had the good sense to put a Macintosh in, may we suggest something sensible to put in your Mac: The Microsoft Office. The essential tool set designed to work the way you do.

What exactly does that mean? It means you get four of the most functional business programs ever to light up a Mac screen, all in one specially priced box.

There's Microsoft Word, software that helps you accomplish everyday tasks with ease (perhaps that's why it's the most popular word processor around).

Microsoft Excel, the spreadsheet that makes calculating, charting and other powerful functions possible with just the click of a mouse.

Microsoft PowerPoint, the program that lets you create truly impressive slides, overheads and audience handouts.

*The Microsoft Office contains software for a single Macintosh or PC workstation version of each. Microsoft Mail server software must be purchased separately and installed on a Macintosh workstation on the network.
you need to get this box.

And Microsoft Mail; the friendly, efficient route for office communications. All four have been thoughtfully designed, with features like outlining in Microsoft Excel and Word, style sheets, shared user dictionaries, mail integration and templates. Which may explain why each of these applications is a leader in its category. And what's more, the price for The Microsoft Office has never been better.

So now that you have the computer that has everything going for it, get it everything it needs to get going.

For more information, stop by your Microsoft reseller today.

Making it easier
The best inventions make you won

MultiSpin™ from NEC.
Thanks to pioneers like Thomas Edison, you don’t remember what it was like to read by candlelight. And thanks to NEC’s MultiSpin™ CD-ROM readers, you won’t be able to remember a time when you couldn’t transfer data at a rate of 300 KB/second.
We revolutionized CD-ROM.
NEC was the first company to successfully bring dual-speed technology to market, and now has a complete family of readers designed to fit your needs. From our external MultiSpin 74 and internal MultiSpin 84, to our lightweight, portable MultiSpin 38.

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Built for the future.

All of our readers support Kodak's Multisession Photo CD™ technology, so you can view photographs on CD and work with those images on your computer. All are SCSI 2 compatible, which increases compatibility across multiple platforms. And both the MultiSpin 74 and 84 have a 256 KB continuous flow cache that allows them to transfer encyclopedias of data at high speeds and play back video without any pauses in motion.

And the MultiSpin 88 gives you the power of portability. Best of all, they all come with a two-year warranty. Multimedia's never been so easy. What's more, all of them are QuickTime™ compatible and meet the Multimedia PC (MPC) standards for Multimedia computing. Once you check out the high-performance CD-ROM readers from the pioneers of MultiSpin technology, you'll find everything else about as primitive as traveling by horse and buggy. To find out more, call 1-800-NEC-INFO (in Canada 1-800-343-4418).

Or, via fax, call NEC FastFacts™ at 1-800-366-0476, request #23766.

Because it is the way you want to go.

Circle 17 on reader service card
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95 Magic Typist 2.0 glossary utility

97 Dycam Model 3 digital still camera

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98 Star Wars VisualClips
What do you get when you combine SyQuest, Envisio and Mirror? You get an offer that no one else can match: a complete SmartStack drive system with a SyQuest 105 MB drive module, for only $699! You get the benefits of the world's best technology for less than others charge for average drives.

Unlimited Storage, Unlimited Future.

The new SyQuest 105 MB cartridge drive combines the unlimited capacity of removable media with the performance of a hard drive. Envisio's SmartStack drive system is the ultimate in convenience, expandability and performance. Mirror is the original source for quality drives at factory-direct prices.

Just Like Legos:

With SmartStack, adding more storage is as easy as assembling building blocks. Just pop off the top, snap on another SmartModule, and replace the top. The SmartSource power base can run up to seven drives, and its patented design eliminates cables between drive modules. SmartStack's unique active termination takes the mystery out of configuring your SCSI chain, no more remembering arcane rules and their exceptions. SmartStack takes care of it for you.

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Mirror has worked closely with SyQuest to bring you the ultimate in speed, transportability, and expandability, the SyQuest 105 SmartModule. With speed rivaling fast hard drives, this drive stores over 100MB on pocket-size cartridges.

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You get an offer that no one else can match: a complete SmartStack drive system with a SyQuest 105 MB drive module, for only $699!

SyQuest 105 MB w/base
Syquest 105MB w/base $699
127MB Hard drive $289
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240MB Hard drive $399
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128MB Optical drive $999
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MacUser’s Choice

The best thing next to your Mac

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Join the New Imaging Revolution

10:00 Shoot

The new Canon RC-570 Still Video Camera records 25 electronic photos on a reusable 2-inch video floppy disk. No film or processing. No waiting. No waste. The 3X zoom lens and 450-line frame video resolution ensure superior image quality. Speed, portability, ease of use, and direct playback to a TV monitor make the RC-570 an ideal imaging tool.

10:12 Process

Canon digitizers allow still video images to be easily input to Macintosh®, PC, or NeXT™ computers. Integrate graphic files into applications like DTP, Databases, Multimedia and Presentations. You can even record from your computer back to video floppy with our Electronic Still Presentation systems.

10:45 Present

Use the RC-570 still video camera connected to a TV monitor to deliver impressive computer generated presentations directly from your video floppy disk. No computers. No slides. No projectors. No hassles. That's Revolutionary!

Learn more about this revolution, call 1-800-221-3333 ext. 313.

Canon
By now, you probably wish your disk was twice as big, the Finder copied faster, backups weren't so tedious, and people would keep their noses out of your data.

It doesn't take very long to get spoiled, does it?
One day you sit down at your Mac, and those 80 megabytes of disk space you never dreamed you'd fill up aren't nearly enough.
And backing up your data by dragging folders to floppies has become, well, a drag.
Especially when you find yourself counting the minutes while the Finder copies all those files.
And remember the time you discovered the telltale signs—fan humming, monitor on, folders open—of somebody snooping around on your Mac?

Kinda left you wishing for some serious data security, didn't it?
Better pick up a MacPak.
Because there's no better way to enhance your Performa, Classic, PowerBook or Quadra.
And no better way to save money, either.

Like the five hundred dollars or so it costs to buy a bigger hard disk.

Buy MacPak instead, and you can let AutoDoubler double your disk capacity by automatically compressing your files.
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You can quickly back up your data with Fastback Express, the no-nonsense version of the world's bestseller.
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How about launching your MacPak utilities—or any Fifth Generation utility for that matter—with our Launch Pad?
All it takes is one click.
Then there's managing your files with DiskTools. Organizing your life with our calendar. And crunching numbers with our calculators.

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You can.

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Now, until September 30, 1993, you also get your choice of one of these fabulous software packages:

Absolutely Free!

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MORPH: Smoothly transform two or more images into each other as seen in recent feature films, music videos and TV commercials.

---and---Kai's POWER TOOLS for Adobe Photoshop.
Apply brilliant new effects and techniques to scanned photos with stunning results.

#2
FRACtAL DESIGN PAINTER 2.0.
24-bit color paint program simulates tools and textures of natural media—oil painting, felt markers, charcoal and more. Turn any photo into a painting. Emulate brush strokes of Van Gogh and Seurat.

#3
CALERA WORDSCAN PLUS optical character recognition (OCR) software that saves you hours of retyping on every document you process.

This offer ends September 30, 1993. Just select the package you want, fill out the order form, attach your proof of purchase including sales receipt indicating product, serial number, and purchase date, and mail it to:

Microtek, 680 Knox Street,
Torrance, CA 90502
Attn: Marketing/GG.

For more information, or the name of your authorized Microtek dealer, call 1-800-654-4160.

Circle 169 on reader service card
Harris introduces the Performer 2" Accelerator Board. We know it's hard to believe, but for just $129, you can double the speed of your Mac Classic or SE. And after 30 days if you don’t like the speed, easy “plug-and-play” installation, 100% software compatibility, big screen capability, and five year warranty, we’ll give you your money back. No questions asked.

And if you want something more, for another $70, Harris’ 68030 25 MHz Accelerator can give you over a 600% increase in performance.

Order Direct: 1-800-783-3726

Harris SE and Classic Accelerators*:
Harris 16 MHz Performer 2 $129
Harris 25MHz Performer Pro $199
Harris 40 MHz Performer Pro $299
FPU Math Co-Processor Option $100 extra ($150 for 40 MHz)

*Introductory pricing valid until 10.31.93

If you think $129* is too little to pay for an SE or Classic Accelerator,
We’ll give you 30 days to change your mind.

Harris introduces the Performer 2" Accelerator Board. We know it's hard to believe, but for just $129, you can double the speed of your Mac Classic or SE. And after 30 days if you don’t like the speed, easy “plug-and-play” installation, 100% software compatibility, big screen capability, and five year warranty, we’ll give you your money back. No questions asked.

And if you want something more, for another $70, Harris’ 68030 25 MHz Accelerator can give you over a 600% increase in performance.

Order Direct: 1-800-783-3726

Harris SE and Classic Accelerators*:
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Harris 25MHz Performer Pro $199
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Call today to find out how you can achieve a smoother image without adding to your budget deficit.

Suggested Retail Price $149

Actual HP DeskWriter 550C output* without FREEDOM OF PRESS.

Actual HP DeskWriter 550C output* with FREEDOM OF PRESS.

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La Cie is discontinuing our award winning Cirrus and ZFP drives in favor of our next award-winning drives. We're not fooling around, these products must go. Order now at once-in-a-lifetime prices while supplies last. When they're gone they're extinct. Just like the dinosaurs.

Award-winning products & company.
We've won more Macworld, MacUser and MacWeek awards and praise than any other drive company. We have too many to list. Here's just a few: ** from MacUser, World Class from Macworld's readers, Bokker's dozen from MacUser, Editor's Choice from Macworld, hundreds of extraordinary editorial and customer quotes and the only Industrial Design awards for Macintosh storage products. Simply put—best quality, best engineering and best service and support from the biggest company.

There's a Silverlining in every cloud.
Only La Cie includes Silverlining with their drives (others have asked). We don't bundle someone else's package. We engineer our own disk management software and guarantee you compatibility and performance in Apple's changing world.

Quantum, direct from Quantum.
La Cie is the only supplier that engineers the drive mechanism and delivers the storage solution directly to you. You see, we're a Quantum company, the makers of the most popular 3.5" drive in the world. When you call La Cie, you're calling a Quantum company. When you purchase La Cie, you get more than a drive, you get the service, support and security that only a Fortune 500 company can deliver.

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In today's competitive environment, you need the surest protection you can get. As a Fortune 500 company, we have the resources to weather the storm. Purchase your products comfortably knowing we're always just a phone call away.

All the extra's at no extra charge.
We're cutting prices, not corners. Every drive comes ready (plug and play) with complete graphic manuals, ecologically aware packaging and our famous switchable active termination. Our hard drives also include both System 6 and 7 and automatically use the correct system for your Mac! Add to that a No Risk 30-Day Money Back Guarantee and this is the most colorful storage event this fall.
"Lightweight, portable, well-designed, these external drives are a great option."
Macworld, February 1993

La Cie's Famous PocketDrive

It's a snap to use La Cie's PocketDrive.

With La Cie's PocketDrive, you can enjoy the convenience of our exclusive T-connector or PocketDock, the desktop accessories that make connecting and disconnecting your PocketDrive a snap. La Cie’s PocketDrive comes with our unique T-connector which allows you to snap it to almost any Mac. Our optional PocketDock gives you quick, instant desktop connectivity. Our “T” and “dock” have built-in active on/off SCSI termination, SCSI ID and a pass through SCSI connector, so you can leave them in your SCSI chain, even when your PocketDrive is on the go. With La Cie’s PocketDrive you’ll never forget a file, at just under 10 ounces PocketDrive puts up to 210MB in the palm of your hand. Take it anywhere you go.

La Cie PocketDrive

Ours
- Can be used with any Macintosh.
- Built-in switchable active termination.
- Easy to move drive without disturbing SCSI chain.
- Smallest drive chassis.
- U.S. and world-wide universal AC adapters available.
- Award-winning industrial design.
- Silverlining hard disk management software with auto drive spin-down.
- Macworld “Editor's Choice” and World Class Awards.

Thiers
- Internal termination does not meet SCSI specifications.
- Moving drives requires reconfiguration of the SCSI chain, some models must be last in SCSI chain.
- AC adapters not readily available.
- Generic design.
- Does not have Silverlining features and benefits.
- No awards.

Quantum 2.5” Drives

<table>
<thead>
<tr>
<th>Size</th>
<th>PowerBook Internal</th>
<th>PocketDrive</th>
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<tr>
<td>40MB</td>
<td>$269</td>
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<td>160MB</td>
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<td>$529</td>
</tr>
<tr>
<td>210MB</td>
<td>$599</td>
<td>$699</td>
</tr>
</tbody>
</table>

PocketDrives, less than 10 oz. 210MB mechanism made by Toshiba.

800-999-
Now Silverscanner II enhances our award-winning image—with gorgeous color, gray scale and line art right out of the box. Independent color controls (RGB) on the gamma/contrast/brightness operate on 9 bits of data before conversion to 8 bits per color. So you get clean scans with excellent detail and tonal range in highlights and shadows.

Silverscanner II makes scanning as quick, painless and productive as possible. With features like dynamic color preview (16 sec.), magnify in preview, proof in preview, savable scan setting, up to 400% scaling in 1% steps and up to 1600 dpi in 1 dpi steps—all in one pass. And with new advanced features like a densitometer, white and black limit, color histogram and auto image adjustment, Silverscanner II is unsurpassed. It's easy for the beginner and powerful for the advanced user.

...Silverscanner can deliver color performance that surpasses anything else in the less-than-$2,000 price range, including the popular ScanJet IIc from Hewlett-Packard Co."

"Top-of-the-line software brings Silverscanner II close to the ideal of push-button scanning."

MacWeek, May 1993

CALL US NOW for fast, friendly service.
And as always, your satisfaction is guaranteed.
It's hard to beat the safety record of optical drives. La Cie's Cirrus optical uses cartridges the same size as 3.5" floppies, but store almost 160 times more. They deliver speed and reliability in our award-winning Cirrus chassis. And that's not all; each drive includes award-winning Silverlining ($149 free value, Bobker's Dozen) and one free cartridge ($45 value).

World Class Triple Crown!
La Cie is the ONLY company to win Macworld World Class Awards in ALL THREE drive categories: Under 80MB, 80-200MB, Over 200MB!

Warranty Deals!
La Cie is offering a FIVE YEAR warranty on Quantum 3.5" drives and a TWO YEAR warranty on Quantum 2.5" drives. We'll take care of you!

The La Cie Advantage
- FREE Silverlining
- Unlimited TOLL-FREE Technical Support
- FREE Switchable Active Termination
- 30 Day Money Back Guarantee
- All Drives Burned In and Tested
- Ready to Plug and Play
- Double Shielded SCSI Cables
- FCC, UL, TUV, VDE & CSA Approved

800-999-
The new choice for mass media movers, our Cirrus (Macworld “Cream of the Crop Chassis”) 105MB removable media drives deliver dependable SyQuest technology. With fast 22ms access time and small 3.5” cartridges, La Cie’s new compact drive stacks up limitless storage and convenience. And that’s not all; each drive includes award-winning Silverlining ($149 free value, Bobker’s Dozen) and one free cartridge ($79 value).

<table>
<thead>
<tr>
<th>Size</th>
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<td>105MB</td>
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<tr>
<td>105MB Cartridge</td>
<td>$79</td>
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**DAT & Tape Drives**

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<td>5.0GB DAT</td>
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<td>$1299</td>
</tr>
<tr>
<td>Turbo DAT</td>
<td>Call!</td>
<td>Call!</td>
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<tr>
<td>150MB Tape</td>
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<tr>
<td>600MB Tape</td>
<td>$649</td>
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**SyQuest Drives**

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<th>Size</th>
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<td>88C MB</td>
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<tr>
<td>88MB Cartridge</td>
<td>$99</td>
<td></td>
</tr>
</tbody>
</table>

**Silverscanner II**

All Silverscanners come with our powerful Silverscan software and Read-It O.C.R. Pro.

- With Color It! $1599
- With Adobe Photoshop $1999
- With Photoshop & ColorStudio $2099
- Optional Transparency Attachment $999
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A FEW THINGS YOU CAN DO WITH TouchBase PRO

- MANAGE YOUR CONTACTS EASILY
- CREATE LETTERS WITH A BUILT-IN LETTER WRITER
- DIAL YOUR TELEPHONE AUTOMATICALLY
- PRINT ADDRESS BOOKS, LABELS, & ENVELOPES
- KEEP FILES CURRENT WITH FILE RECONCILIATION

A FEW THINGS YOU CAN DO WITH DateBook PRO

- KEEP TRACK OF YOUR APPOINTMENTS & TO-DOs
- POST MEMOS TO YOUR CALENDAR
- PRINT CALENDARS: POPULAR FORMATS & WALL CHARTS
- SET ALARMS AND REMINDERS TO JOG YOUR MEMORY
- FUN ICONS & BANNERS PERSONALIZE YOUR CALENDAR
Evolving Macworld
More information, easier to use

Notice anything different? Take a look at the cover. Our bold new logo heralds a collection of improvements introduced in this issue. The last few years have witnessed tremendous changes at Apple and in the developer community surrounding it. Ultimately, these changes affect not only the computer industry but our readers as well, as you attempt to make sense of the waves of new product offerings and price changes washing over you. There are now an unprecedented number of Macintosh models, and to remain competitive with Windows and DOS PCs, Apple has been cutting prices rapidly. Throughout the industry, prices are dropping on a regular basis, and vendors must put out more capable versions of their products in ever-shrinking development periods. We at Macworld know that the demands of your work have also become more intense, and you have less time than ever to keep up with the deluge of information about Macintosh hardware and software.

Over the past year we have been concentrating on how to give you the best possible magazine to meet your Macintosh computing needs. Several months ago I asked you what changes you would like to see in Macworld, and I was rewarded with many excellent ideas. From all the responses, one thing was clear: the most important reason people turn to Macworld is to get product guidance. You want to know which of the many products available will work for you and which provide the best value.

In this issue, Macworld introduces many improvements to help you stay on top of the changing product and technology maze. For example, a new buying reference section called Buyers' Tools points you in the right direction when you need to know what product to buy. We're also devoting twice as much space to news to keep you up-to-date on new products and key technological developments. And we're unveiling three major new sections that focus on key areas of reader interest: graphics and publishing; networking and communications; and general productivity applications such as word processing, spreadsheets, and database management. Finally, we've made all this information easy to find by organizing it according to your interests so you can save time and work as effectively as possible.

Our bolder, more engaging design helps you navigate the large increase in editorial pages. In addition to telling you what's more interesting about the Mac, we show you. We've added more illustrations and photographs to support our editorial content. Plus, Macworld remains a showcase for the best artwork being produced on the Macintosh today. Even our new logo reflects our new direction: we've exchanged the Garamond typeface for Aurora, opting for its bolder, more contemporary character.

Product Reviews
Above all, Macworld's primary purpose is to help our readers make the best, educated buying decisions. Macworld continues to provide a greater number of indepth stand-alone and comparative reviews of Macintosh-related products than any other magazine. To underscore their importance, we've moved the reviews to the front of the magazine so you can find them faster. A summary at the top of each review spells out each product's pros and cons so you can quickly assess whether or not a product is a good match for your work. Our star ratings and our painstaking review process yield measured and objective judgments that you can trust when it comes time to part with your hard-earned cash.

Whether it's hard drives, monitors, or utilities, Macworld points out the pick of the litter with thorough product comparisons and award-winning feature articles. Macworld Lab is expanding to meet the demands of testing the ever-growing base of Macintosh products. To help you understand the reasoning behind our recommendations, our laboratory articles now present even more technical information. "Behind Our Tests," a sidebar included in each lab article, explains Macworld Lab's test methodology. In future issues we will introduce "Tech Notes"—an insider's perspective on the technical issues uncovered by our lab staff.

News
Macintosh products and technology change more quickly all the time. Macworld helps you keep pace with these changes by providing more news than ever before on products, technological developments, and industry trends. Macworld Bulletin, News, and New Products are now united in a single redesigned News section, which appears at the front of the magazine. News makes it extremely easy to stay informed on the important product developments in the Macintosh market. Also, three new sections—Graphics, At Work, and Networks—each start with two pages of related news to that section.

Graphics
Macworld has been long recognized for its award-winning graphics. From the magazine's inception, we've used only Macintosh-generated graphics, to demonstrate what leading illustrators can do with the continue...
Mac as a graphics tool. Now Macworld devotes an entire section of the magazine to graphics applications: prepress, illustration, publishing, type, rendering, and image editing, among other design-related topics. Each month the Graphics section will open with news stories. Every month outstanding professionals will share their tips and techniques with you in Expert Graphics, a column that walks you through the development of an exceptional image. In addition, the section provides feature articles on graphics-related subjects. This month we start out with two in-depth comparative reviews—one that covers drawing packages and the other on color paint programs.

At Work

While the Mac has been celebrated for its ground-breaking success in graphics and publishing, most Macintosh users continue to rely on standard productivity applications such as word processing, spreadsheets, database management, and personal organization. Macworld's At Work section provides up-to-date information on the latest business and productivity tools for the Mac. Also, a new column called Working Smart, written by Jim Heid, provides practical advice on how to manage everything from manipulating large spreadsheets to orchestrating a presentation. The At Work section also includes Lon Poole's Quick Tips column, and feature articles on such topics as financial forecasting, choosing the right accounting software, and optimizing your word processing.

Networks

Many users no longer accept working on an isolated personal computer as the status quo. A third major new section called Networks keeps you informed of key developments in networking, electronic mail, and telecommunications. Since the Macintosh has muscled its way into the mainstream, organizations need to integrate Macs with other PCs, workstations, minicomputers, and mainframes. Macworld's Networks section addresses a host of multiplatform issues, such as hooking Macs up to TCP/IP or NetWare. The section will include news, features, and Cary Lu's PowerBook Notes.

Buyers' Tools

In the back of the magazine we now offer a section of reference tools for product selection. Called Buyers' Tools, this section not only helps you find the best products for your work, but also saves you money by pointing out the best bargains. This section is home to Star Ratings (which debuted several months ago), a series of capsule judgments on more than 400 products evaluated in Macworld's Reviews section in the past 12 months. In Star Ratings you will find just about everything from desktop publishing software to modems and network hardware. Also in Buyers' Tools is Editors' Choice, which compiles the results from Macworld Lab tests and other comparative reviews from the past year to steer you to the products our reviewers judged as the best in a given category, such as large-screen color monitors, optical drives, or CAD software. Finally, we've added Streetwise Shopper, a selection of special promotions currently offered by vendors.

Macworld has grown and benefited from the feedback our readers have given us in the past, and we welcome your opinions on our new look and our new way of doing things. After you've had a chance to look through this issue, send us a letter or an E-mail to let us know what you think. We hope you like what you see.
The CY-8500 can store up to 25 GB on a single tape, at speeds of up to 90 MB per minute, completely unattended.

How? With hardware data compression that can boost capacity by up to five times.

No other 8mm tape drive can match the capacity, speed, and price-performance of this best-selling drive.

**ADVANCED.** You'll never be left in the dark. A bright, backlit status display gives you the command under execution, transfer rate, compression ratio, amount of tape remaining and more.

Our data compression option is the fastest available. And it's switch selectable, so you can still read and write standard tapes. Locate and restore files quickly and easily with our accelerated file access option. Add data encryption to control backup and restore operations through the use of encoded card keys.

**FLEXIBLE.** The CY-8500 is plug compatible with virtually every computer system. Rack mounting options, dual drive configurations and a variety of cable lengths ensure a seamless fit into your computing environment. And as storage needs grow, you can upgrade to our ten tape library, capable of managing between 25 GB and 250 GB—all without manual intervention.

**RELIABLE.** A sophisticated Error Correction Code yields a bit error rate of less than one in $10^{17}$—the best in the industry. A MTBF rate of 60,000 hours ensures reliability.

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Everything you want in a backup subsystem is available right now.

Call today for information at (804) 873-9000

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MicroNet’s Raven·800. Disk Array Power For The Quadra 800.

MicroNet is the first to bring disk array power to the Quadra 800. With a matched pair of fast spindle drives, the Raven·800 delivers up to 9.2 MB/second sustained transfers with access time as fast as 4 ms.

Disk arrays can improve performance up to 400 percent over standard drives. Combine MicroNet’s Raven·800 disk array with the speed of the Quadra 800 and you have an unbeatable system for applications such as PhotoShop, file servers, and full rate digital video and audio recording.

Cost effective two drive disk arrays are available in capacities of 1030 to 5560 MBytes and are expandable to more than 38 GBytes. MicroNet also offers single disk drive systems that can be upgraded to a Raven·800 disk array at a later date.

Built on award winning technology, the Raven·800 takes full advantage of Apple’s existing hardware. One drive connects to the native SCSI port of the Quadra, and one connects to a MicroNet NuPORT-III, SCSI-2 host adapter. Together, these two drives create a fast, parallel, 16-bit data path.

MicroNet has designed a complete family of internal storage systems for the Quadra 800. Included are SyQuest removable systems, rewritable optical drives, and DAT backup systems. All are shipped complete with customer designed bezels.

To put high performance disk array power in your Quadra 800, call MicroNet’s Sales Department for configuration assistance or the name of your nearest Reseller. 1-714-581-1540.

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Circle 139 on reader service card
Macworld Kicks Butt!

I KNOW THAT I'LL BE ONE OF MANY readers who will congratulate you for the outstanding "Upgrading Your Mac" special report (June 1993).

Keep up the good work.

Thomas Miller
Wilmington, Delaware

THE SIDEBAR "PUTTING TOGETHER the Ultimate Mac" (June 1993) didn't picture or account for any means of entering data. Without a keyboard and mouse, your system is useless, isn't it?

You should have included the new Apple Adjustable Keyboard and Apple Desktop Bus Mouse II ($219 and $79, respectively). While you're at it, how about adding Articulate Systems' Voice Navigator II ($699)? All this should bring your total up to $38,704.

Art Pettijohn
Dallas, Texas

I AM THE PROUD OWNER OF A MUSEUM-quality Mac Plus with System 6.0.8, 4MB of RAM, and a 40MB hard drive. Imagine my reaction when I see Ms. Stefanac's statements to the effect that a Plus is a flawed, obsolete relic that is not worth fixing up ("Expanding a Compact Mac," June 1993). The only thing I can do, this line of reasoning goes, is go out and buy myself a brand-new Color Classic or LC III.

Well, duh! Why didn't I think of that? That's like telling someone with a 1985 Chevy that they shouldn't waste money buying new tires when it would be far better to go out and buy a brand-new BMW. Thanks for that news flash.

Most people already know that purchasing a brand-new computer is preferable to staying with their old one, so perhaps in the future you could tone down the "They have no bread? Let them eat cake" approach to upgrading.

James McCool
Westland, Michigan

GETTING MORE FROM A MAC II" (June 1993) lumps the Performa 600 in with the IIvx and claims that a Centris 650 logic-board upgrade is available for them both. I bought a Performa 600, and according to Apple, I can't upgrade to the Centris 650. You blew it and I bought it. Let your readers know before they blow it as well.

Scott Carl
Portland, Oregon

According to Dave Limp, product manager for the Centris 650, Apple's Performa service organization is not currently set up to handle logic-board upgrades. However, Apple is looking to get an upgrade plan in place for Performa owners. Stay tuned.—Ed.

Quark Inc.: License Expired

I WAS SO OUTRAGED BY QUARK'S response to the Mitchells of Miami in the July issue that I couldn't even finish reading Letters (my favorite column). Perhaps the subtlety of the point requires a two-by-four between the eyes.

Software vendors have screamed long and loud that their customers don't actually purchase software, only the right to use it. But suddenly, according to Quark, software is property that the user has purchased and should be replaced by an insurance claim? Sorry, folks, but you can't have it both ways. If the user has purchased only the right to use the software, and has paid for and duly registered that right under the vendor's own rules, then I say the user retains that right until the day he dies or until the vendor cheerfully refunds the purchase price.

Three cheers for Symantec (whom I have patronized and will continue to patronize), and shame on Quark (whom I don't and won't). Now I can go back to the rest of Letters.

Mark Walker Rhodes
Dallas, Texas

Reasonable Customer Support

I AM THE PRESIDENT OF A SOFTWARE company, I was angered by the anonymous letter offering "suggestions from someone on the other end of the telephone" (Letters, June 1993). While I'm sympathetic to the stress of dealing with demanding customers, that is the job of a customer-service representative.

I would like it if all our customers registered their software, read the manual thoroughly, and had their serial numbers continue
In the June 1993 review of the Centris 610 and 650, references to the Apple 14-inch monitor should have been to the Performa Color Display.

The maximum hard drive transfer rate for an LC II is 1400 Kbps, not 400 Kbps (“Upgrading Your Mac,” June 1993).

The June 1993 feature “Money Matters” incorrectly stated that Atrix’s Hi Finance software could automaticallydownload stock quotes from America Online. Downloads can be imported into Hi Finance, but the program cannot be set up for this to occur automatically. Also, Dollars & Sense 5.0 is currently being sold and supported by The Software Developers Consortium, 801/288-2216.

The price of the In Focus PanelBook should have been $5995, not $59.95 (News, July 1993).

The number for the Direct Marketing Association, listed in the sidebar “11 Easy Ways to Safeguard Your Electronic Privacy,” has changed (“Privacy in Peril,” July 1993). To have your name removed from mailing lists, call the DMA’s customer service department at 202/347-1222.

The correct phone number for Irvine Interactive is 619/431-8860 (New Products, July 1993).

The correct retail price for the Helix Tracker server and four clients is $439, not $739 (New Products, August 1993).

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R. L. U’s June 1993 column could leave the erroneous impression that ultraSecure’s additional features could “compromise security.” Most security experts agree that the security of a software product is determined by the quality of the key management and the encryption algorithms used, not by how many features and options are available to the user.

Richard Born
Vice President
usrEZ Software
Irvine, California

ultraSecure’s features do not compromise security; however, a user can choose among several levels of security. The manual explains the advantages and drawbacks of each choice.—Ed.

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Rise of the Dead?

I enjoyed Adrian Mello’s July column, “The Macintosh Book of the Dead,” and I empathize with the frustrated IIvx owners. Fortunately, I did not go down that path. I had my eyes on an Ilvx, but Adrian’s Truth 3 (“The meek perish quickly”) seemed to be the active factor. The performance of the Ilvx was barely equal to that of the IIIci, and the price was way out of line, so I waited. It was not long before the rumors of the Centris line appeared, and I am now the proud owner of a Centris 610.

But Ilvx owners should not give up hope (and should not spend $1600 for a Centris 650 upgrade). Remember the pre-continues
Pinnacle Micro introduces the first affordable, recordable CD-ROM drive for MAC and PC computers. The RCD-202 System comes complete with an easy-to-use software program that allows you to produce data or audio CD's within minutes. Now you have the ability to create your own CD's for low cost data distribution, backup or even master your own disk for mass duplication. For more information on how you can master this new recordable CD-ROM technology call:

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Finance Article

Tom Linden chose a poor example when he explained category splitting by writing a $1000 check to MasterCard and splitting it up into 15 categories for the 15 transactions on the bill ("Money Matters," June 1993). In MacMoney, at least, those 15 individual transactions would have been entered separately into his credit card account at the time the transactions occurred. Tom would have a running record of how much he'd charged during the month. When he got the bill, MacMoney would show a $1000 balance in his MasterCard account.

He would write the $1000 check from his bank account with just one category, his credit card account. It seems Tom doesn't fully understand how the personal-financial programs work in this respect. If the other finance programs don't work this way also, MacMoney deserves special credit for doing credit the right way.

Linda Weiss
via CompuServe

Letters

I was upset that in your recent column on portable printers you trashed the WriteMove II from GCC Technologies (The Desktop Critic, June 1993). While it's true that the battery gives you less than a dozen pages, there's nothing on the market with better print quality. I can print a letter or a presentation anywhere. The only nuisance is the need for a separate 220-volt adapter when traveling abroad. GCC sells one, but why couldn't they make a 120- to 220-volt adapter like the one the PowerBook uses?

Robert Lowenheim
Los Angeles, California

We didn't really trash the WriteMove, we just fell asleep waiting for it to print.—Ed.

According to the June 1993 Centris 610/650 review, you can't use a Norton Utilities emergency start-up disk on the Centris machines. Any registered user of Norton Utilities can phone Symantec tech support for detailed instructions on creating a bootable System 7.1 Norton Utilities Emergency disk.

Eric Wondra
via AppleLink

IN STEVE ROTH'S REVIEW OF OFOTO 2.0 (July 1993), the scan times for Ofoto were in error. The review indicated a time of 4 minutes and 33 seconds for Ofoto to scan the test image with the HP ScanJet IIc; the correct time is 31 seconds. This led Steve to conclude, "The one area where Ofoto really falls down is speed."

For the record, Ofoto scans as quickly as any desktop scanning software available—unless you are employing Ofoto's moiré-removal function. Mr. Roth believed that he had turned this feature off, but it was tripped up by an anomaly in the user interface. This has been corrected in version 2.0.2, which is currently available.

Rob Cook
Chief Technology Officer
LightSource

As Mr. Cook points out, the long scanning time with the HP ScanJet IIc resulted because Ofoto's Auto Moiré Removal (AMR) feature was on. I turned it off prior to running the scan (it's on by default), but Ofoto 2.0 is set up so that the AMR setting used in the prescan is carried forward into the final scan—even if you explicitly turn off AMR prior to the final scan (which I did). Apple Color OneScanner owners should be aware that the version of Ofoto that originally shipped with that scanner has no option to turn off AMR. Those owners in particular should upgrade to the newest version, 2.0.2. Users of other versions should be sure to set up their prescans with AMR turned off.—Steve Roth
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Come see, come try, come learn about the MessagePad at the Newton Showcase. It's at Symphony Hall on Tuesday, August 3, from 1 p.m. to 8 p.m., and on Wednesday and Thursday from 10 a.m. to 7 p.m. Bring your MACWORLD badge for admission.

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NEW: Incremental rotation of text and graphics.
It's easy to rotate in 0.01-degree increments — either visually, using the rotation tool or numerically, using the Control palette (where you can also skew and mirror elements). You can even edit text directly once it's been rotated.

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Spindler Succeeds Sculley, Apple Lays Off 2500  After admitting to slumping earnings and thinning profit margins, Apple Computer announced in early July a “workforce reduction” of about 2500 people—nearly 15 percent of its worldwide staff. A 12-month restructuring will follow. Only two weeks earlier, the board of directors named Apple president Michael Spindler to succeed John Sculley as CEO. Sculley will continue as chairman, focusing on Apple’s strategic alliances and on new business opportunities.

Apple Cuts Prices Twice, Gives Rebates  Hoping to boost sales, Apple cut its retail prices in June and again in July. The price cuts ranged up to 34 percent on Macs, and up to 26 percent on peripherals. The steepest drop was on the PowerBook 160/4/40, to a new list price of $1609. Apple is also offering rebates on most Macs, and on any Performa (when the Performa is purchased with a printer). The Mac rebates, slated to end on September 30, range from $50 on a Classic II to $300 on a fully loaded Centris 610 or Mac IIvx. Apple did not drop the price or offer rebates on the LC III, Duo 230, Quadra 800, or Centris 650.

AOCE Ships in Beta  Apple has shipped final beta copies of its PowerTalk system extensions, which incorporate E-mail and a few other services into System software, making it possible to send and receive mail and other documents across a network using the Finder. The embodiment of Apple’s Open Collaboration Environment (AOCE) technology, PowerTalk’s suite of services (E-mail, directory, encryption, and digital signatures) will be used primarily by developers to create networked applications.

CE Software Announces QuicKeys 3.0  As of the middle of August, QuicKeys users can expect more extension features, tighter integration, extensive AppleScript support, and an improved interface. In the new version, all QuicKeys functions will be available from the main edit window, including extension management, icon creation, and other utilities. Users will also get a raft of new, memory-lean extensions and more-accurate real-time recording, all for $169. CE Software, 515/224-1995.

HP Adds PostScript for the DeskWriter 550C  At Macworld Expo in August Hewlett-Packard will introduce a PostScript software RIP for its extremely popular DeskWriter 550C color ink-jet printer. Called PostScript Software for the HP DeskWriter Family, the product is for the 550C only, according to HP, and is true Adobe PostScript Level 2. Slated to ship in early August, the software will have a list price of $249. Hewlett-Packard, 800/752-0900.

Accountant Inc. Rechristened, Relaunched  State of the Art acquired Accountant Inc. from Softsync a while back and recently announced that the product is shipping in repackaged form as MacP&L for $269, or $599 for the multiuser version (see “Graphical Accounting Adds Up,” News, August 1993). State of the Art also plans a major upgrade for MacP&L in the future. State of the Art, 714/753-1222.

A Bigger Slice for PIE  Apple’s Personal Interactive Electronics (PIE) division has set its sights on the electronic publishing market. PIE’s publishing group plans to develop multimedia CD-ROM titles of its own, plus distribute titles developed by Time Warner Interactive Group and InterOptica, by year’s end. In other news, PIE announced plans to collaborate with Ameritech, BellSouth, and US West, three Regional Bell Operating Companies, to develop new communications services for Newton customers and new communications devices that incorporate Newton technology.
AUDIOVISUAL MACS
FORETOLD SPOHISTICATED
VIDEO, SOUND, AND
TELEPHONY

Sweeping past tired old DOS/Windows technology like a flash flood, Apple's audiovisual Macs set a new standard for the integration of audio, video, voice, and related technologies. The remarkable Quadra 840AV (code-named Cyclone) and Centris 660AV (code-named Tempest) provide numerous features that require third-party expansion boards in other Macs. Both systems can digitize video from a camcorder or other source; route their video signals to a TV set or video recorder; and record and play back CD-quality audio. For transferring the large files often required for these kinds of data, both AV Macs provide much faster NuBus and SCSI buses than other Macs.

For sheer power, the Centris 660AV uses a 25MHz 68040; the Quadra 840AV uses a 40MHz 68040. (Motherboard upgrades will be available for the Centris 610 and Quadra 800, respectively.) Pricing wasn't final at press time, but expect the 660AV to cost roughly $2500 with 8MB of RAM and an 80MB hard drive, and the 840AV to go for about $4500 with 8MB of RAM and a 230MB drive. Apple will offer both systems with internal CD-ROM drives and larger hard drives.

Built-in Modems—
and Telephones
Several new components contribute to an AV Mac's capabilities, but chief among them is an AT&T 3210 digital signal processor (DSP) chip, which crunches huge amounts of data in real time. The DSP runs its own system software—the Apple Real-Time Architecture (ARTA)—that lets signal processing proceed independent of the Mac's 68040 processor. The Centris 660AV's DSP chip runs at a fast 55MHz; the Quadra 840AV's sizzles at 66MHz.

The DSP chip, among other functions, drives a new, high-speed connector called GeoPort, designed for telephony and telecommunications. Attach a $100 box called the GeoPort Telecom Adapter, and an AV Mac suddenly has a built-in 9600-bps fax-and-data modem as well as a voice telephone and digital answering machine. Apple says the DSP-based modem is compatible with programs.
Thunder In

isolating and identifying the sound characteristics that transcend individual voices and dialects. PlainTalk currently supports North American English only; localization efforts for other countries and languages are under way.

The AV Macs include utilities for creating voice-activated macros that open files, scroll windows, adjust system settings, and select palette tools. When third-party applications support PlainTalk, you'll be able to converse with programs in more detail to specify dialog-box options and select text and objects.

Speech recognition works on AV Macs only, but PlainTalk's text-to-speech features work on any 68020 or faster Mac. Most application programs must be updated in order to support text-to-speech (some programs can accept plug-in modules that add the feature—Microsoft has one for Word 5).

A Monitor for Sound

Whether you use an AV Mac for telephony, multimedia, or education applications, Apple's new AudioVision 14 monitor is studded with connectors for audio, video, and the ADB, allowing you to make connections without groping in back of the Mac. And it has convenient front-panel controls for volume, brightness, contrast, and muting the sound.

The AudioVision 14's built-in mike works with PlainTalk voice recognition and with ApplePhone and third-party telephony applications, but does not work with existing Macs (except for the Color Classic). The monitor's circuitry prevents feedback when using an AV Mac as a speakerphone. The circuitry also automatically adjusts treble and bass for best fidelity at various listening levels.

At an approximate list price of $775, the AudioVision 14-display won't be cheap. But for anyone who wants to do serious multimedia production, the only drawback to the AudioVision 14 is the screen size. Apple hinted that it might introduce larger monitors with AudioVision features, but for telephony, speech recognition, and business video production, the AudioVision 14's mix of integration and its elegant software control make it ideal.

Something for Everybody?

The AV Macs are nothing if not versatile. The telephony and video-out features will appeal to business users and presenters. Video-in is useful for QuickTime producers (you'll still need a third-party board to capture full-screen video at 30 frames per second). Multimedia producers and consumers will love the CD-quality audio. Adobe Photoshop users will be attracted to the DSP's faster filtering. Educators and disabled users will benefit from PlainTalk. And our early benchmarks indicate that speed addicts will enjoy the machines' overall performance.

The power and versatility of the Tempest and Cyclone make them stepping stones to the PowerPC future—although inexpensive PowerPC Macs could make the AV Macs obsolete as early as the first half of 1994. But for the here-and-now, the 660AV and 840AV are fast, flexible machines that have no peers in the DOS world.—Jim Heid

Searching for an LC III? Call Circuit City

SHORTAGES REPORTED

If your heart's set on the wildly popular LC III, you'll discover it's hard to find at computer dealers, but there are possible alternatives. Retail stores such as Sears, Office Depot, and Circuit City claim to have an ample supply of Performa 450's, the LC's consumer-market twin.

Why would Performas be available when LC III's are scarce? "That Apple's new market; they don't want to upset their new channel," says David Polzine, assistant manager of ComputerWare, an

In Brief

Blue-Light Special?

Apple Computer has authorized Wal-Mart Stores to sell a special version of the Macintosh Performa 400 4/80, with a keyboard, mouse, selected software, and a Performa Plus monitor, a higher-quality display than that normally sold with the Performa 400. The agreement initially covers more than 500 stores nationwide. Contact your local Wal-Mart; pricing may vary by location.

QuickTime Bargain Matinee

Movie Movie, a $349 NuBus board from Sigma Designs, captures 30-fps video (320 by 240) and 8-bit 22kHz mono audio. The board is a bare-bones arrangement: NTSC composite—only input, no print-to-tape option, and the frame rate drops to 10 fps at 640 by 480 size. Movie Movie ships with the company's ScreenEdit capture and playback software; another version comes bundled with DivA's VideoShop QuickTime editing software. 510/770-2673.

Designer Bug-Fixes

With a $129, one-year subscription to the Design Tools Monthly Utilities Disk, you get all the free updates and bug-fixes to programs, utilities, and system software commonly used by designers. Some disks also include fonts; shareware and freeware utilities; plus any free QuarkXPress XTensions, PageMaker Additions, and Photoshop plug-ins of the month. Design Tools Monthly; 303/444-6876.

Mac Applications on Unix

Apple has announced that it is working with IBM, Sun, Hewlett-Packard, and Unix Systems Laboratories to bring Macintosh applications and system services to those platforms. Currently, Apple is developing high-speed application engines that will translate Mac toolbox calls directly into Unix system calls. 408/996-1010.
Consumers are grabbing for scarce LC III's; Performa 450's are nearly identical and are in stock.

Adobe/Apple Driver: Major Problems

For many, the LaserWriter driver codeveloped by Adobe and Apple will be a welcome addition to the system software stable (see MacBulletin and News, Macworld, August 1993). But the printer driver's new architecture can make this horse skittish, and likely to balk if not handled properly. The driver supports PostScript Level 2 and allows finer control over printer features such as paper handling, but it leaves applications that rely on the Laser Prep extension or on undocumented QuickDraw calls twisting in the wind. Adobe's 12-page Read Me file details incompatibilities with over 35 applications, including the current Microsoft Word and Works, Aldus PageMaker, QuarkXPress, and Claris MacDraw Pro. Apple's file is shorter but packed with tidbits like, "When you are printing at 600 dots per inch (dpi), bitmapped images may appear with lines across the image," referring to Apple's own LaserWriter Pro 600 and 630 printers.

Despite both companies' statements that the drivers (Apple's LaserWriter 8.0 and Adobe's PSPrinter 8.0) have continued

Open Sesame Reads Minds

AGENT SOFTWARE

Charles River Analytics wants you to hire a personal agent. The company's Open Sesame observes user actions, learns repetitive patterns, and then automates those actions and patterns after getting the user's approval.

Now shipping, the $129 software's range of actions is currently limited to arranging windows; emptying the Trash; and opening and closing documents, applications, and folders. Smarter versions will follow as software vendors build Apple events into their apps. Charles River; 617/491-3474.—CAMERON CROTTY

TRENDS

Amber: beyond Applications

DOCUMENT-CENTERED DESIGN

When the first Macintosh documents appeared nearly a decade ago, they could hold a mix of text and bitmapped graphics, a revolutionary accomplishment. Now a Mac document can contain so many heavy elements, the little document rowboat is about to sink. That's why Apple is working on Amber, an open document architecture that should prove unsinkable (see MacBulletin, Macworld, August 1993).

Promised for the second quarter of 1994 for both Macintosh and Windows, Amber will support documents made of smaller parts with different types of content: graphics parts, spreadsheet parts, video parts. Today you could put all of these parts into a Microsoft Word document, but it would have the Word file type, and you'd have to work according to Word conventions. In the Amber model, you simply have an Amber document, with parts that are edited in frame areas, each with its own software components. It will be possible to write smaller, modular applications. Most of the document integration now handled by applications will be done by Amber, so each application will only have to be complex enough to affect its own part of the document. Developers will be getting the tools to make this transition in late 1994. Apple plans to make Amber also work with Tallgent systems technology—the Apple-IBM operating environment of the future.

—CHARLES SEITER
the same features and functions, Apple’s 12-page Read Me file fails to mention numerous incompatibilities listed in the Adobe documentation, including six bugs that result in system errors. Apple is investigating the differences in the documentation.

Apple and Adobe both say vendors are promising to update their incompatible application software. Claris confirms it is planning fixes for its applications, but Microsoft representatives deny any incompatibilities, while PageMaker 5.0, still under development at Aldus, completely depends on the new driver, according to Ben Rotholtz, Aldus senior program manager for PageMaker.

Check with the vendors of your favorite software to see if it’s compatible with the new driver.—CAMERON CROTTY

More Morph

DOES CARICATURES

Seems you can’t watch a movie or turn on the television these days without seeing someone’s features melt into someone (or something) else. Gryphon Software’s Morph 2.0 promises nothing but more malleable mugs.

The new package can make a transition between two moving images, instead of just stills, and the new version renders fields for higher-quality output. Users can also morph a still image using another image as a baseline; called caricaturing by Gryphon, this technique results in exaggerated, cartoon-like features. Morph 2.0 is currently available for $239. Gryphon Software, 619/536-8815.

—CAMERON CROTTY

In Brief

If I Had a Hammer

FWB has announced five storage products: two hard drives, a disk array, a DAT autoloader, and a removable-cartridge drive. The 210MB hammerPB210 internal drive for the PowerBook lists for $829; the 1.6GB hammer-1600FMF external drive lists for $2569, and the internal for $2249. The Sledgehammer-3200FMF uses two 1.6GB mechanisms and supports RAID Levels 0 and 1; the internal version lists for $4569, and the external for $4789. The $4429 hammerDAT20G automatically switches between four 5GB DAT tapes. The $1249 hammerDisk105 is based on the 105MB 3½-inch SyQuest removable mechanism. All the products are shipping. 415/474-8055.

Viral Update

Version 3.5 of Symantec Anti-Virus for Macintosh can now be updated to recognize and protect against the recently discovered INIT M virus. Users can download the update fee of charge from the Symantec bulletin board (408/973-9598), AppleLink, CompuServe, or America Online, or can order a disk from Symantec for $12. 408/252-3570.

Blazing SCSI

DayStar Digital’s NuBus SCSI accelerator, the Diskrunner, uses a Motorola 68000 to control SCSI operations independently of the Mac CPU. The Diskrunner ships with an empty RAM cache (expandable to 16MB). Available for $699. 408/967-2077.

Faster Finder

Mr. File cuts the time you spend waiting for the Finder. The new version provides background network copying that doesn’t interfere with foreground work (even under System 6). File synchronization and update options, faster copy performance, and more file-search criteria. Available for $99 from Softways. 408/978-9167.
Transforming Macs to the PowerPC Line

Everywhere you look, including here, you see reports of the fabulous PowerPC, zooming away at 50MHz or 66MHz, leaving poky 68040s in its wake. The new RISC chips, the first of which is the PowerPC 601, will give workstation performance in a consumer PC, making possible such formidable tasks as screen video, and real-time 3-D rendering.

In addition to the first PowerPC-based systems, Apple will offer board-level upgrades for the Centris 610 and 650, Performa 600, Quadra 800, and the Mac IIvx and IIvi. The company expects to ship the first PowerPC products in the first half of 1994. In fact, Apple demonstrated a prototype PowerPC Macintosh in May. Samples of the PowerPC 601 chip (made by both Motorola and IBM) have gone to a dozen third-party developers, who are busy designing PowerPC-based accelerator boards for other existing Macs. Meanwhile, IBM, Motorola, and Apple are working on other PowerPC chips: the cheaper PowerPC 603, the faster 604, and the blow-the-doors-off 620.

Apple hopes that most Macintosh applications will run unchanged on the new systems. The company says outside software developers are rewriting their major applications to take advantage of additional speed improvements that are possible with PowerPC-specific code. Meanwhile, Apple will continue to sell traditional Macintoshes powered by 68030 and 68040 chips for several more years.—CHARLES SEITER

A Handful of Thunder

Your PowerBook is portable, so why shouldn't your scanner be? Desktop Mac veterans (or even Apple II scan warriors) might recognize the business end of this hand-held scanner, but this package is built to go wherever your PowerBook does. Thunderware's LightningScan Portable Scanner combines a 400-dpi, 1-bit hand scanner with a rechargeable battery pack built into a separate serial interface box. The box scanner combo weighs about a pound, and the rechargeable battery pack provides about 30 minutes of scan time, according to the company.

The $450 package will ship in August with Thunderware, the company's image-scanning and -editing software. It will also come with a Silicon Beach (Alus Consumer Division) plug-in for scanning within supported software, plus Olduvai's Read It OCR Personal software. Thunderware, 510/254-6581. —CAMERON CROTTY

Outbound User Help

The 2030V CPU Board upgrade adds a 40MHz 68030—users pull their original CPU board, move the RAM (if FPU, if necessary) to the 2030V, and plug it in. The old CPU boards can be sent to PerFit for a rebate. The 2030V is available for $699. Technical support is available via fax, BBS (303/444-7569), or at 900/737-3488 (which is billed at $1.25 per minute). PerFit, 303/530-7333. —CAMERON CROTTY

**TOP FIFTEEN BUSINESS SOFTWARE PACKAGES**

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<th>Months on Chart</th>
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Source: Information from Ingram Micro on units shipped to Macintosh retailers during May 1993.

**THE AMCOEX INDEX OF USED MAC PRICES**

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<th>Machine/RAM/Hard Drive</th>
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<td>Apple 13-Inch RGB display/board</td>
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<td>LaserWriter Plus</td>
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<td>LaserWriter IINT</td>
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Index provided by the American Computer Exchange of Atlanta, Georgia (800/786-0972). It reflects sales during week of June 23. Configurations include keyboard and exclude monitor and display board for mass computes.
Where do you go for a free drive?

La Cie's & Macworld's Porsche Sweepstakes.

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Who says La Cie’s drive speed has to be in milliseconds? This August, some lucky winner of our FREE 1990 PORSCHE CARRERA 2* will get the La Cie” drive of their lives in miles per hour. As the industry's leading manufacturer of mass-storage solutions for Macintosh computers, we never stop thinking of great ways to give our customers streamlined styling and high-speed performance. And what better way to remind you of La Cie’s state-of-the-art drives, than to give away the kind of trend-setting hardware that inspires us.

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3. Drawing is limited to one entry per person. The entry deadline is Aug. 7, 1993. Entries received after Aug. 7, 1993, will automatically be eligible for our next sweepstakes. Prize to be determined.
4. Winner to be notified by mail or phone and may be required to sign an affidavit of eligibility and a release as a condition of receiving prize. In the event that the winner does not respond within 30 days, an alternate will be chosen.
5. Odds of winning depend on the total number of entries received.
6. Original entry form must be completely filled out to be eligible. Envelope or copy not acceptable.
7. Taxes, liability and delivery of prize are the responsibility of the winner.
8. For notification of the winner, send a stamped self addressed envelope to La Cie, Ltd., 8700 SW Creekside Place, Beaverton, OR 97005.
9. Porsche shown is not the actual sweepstakes prize described herein.

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Company ____________________________
Title ________________________________
Street ______________________________
City, State, Zip ____________________________
Phone Number ____________________________
Number of Macs at my location: __________
Which of the following applies to you:
Personal ___ Business ___ Fortune 1000 ___ Government ___ Dealer ___ Distributor ___ Education ___ Other

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Circle 53 on reader service card
WOULD YOU BELIEVE THIS WAS DONE WITH MACDRAW® PRO?

Poor Claris. Once again, Canvas™ is running circles around MacDraw® Pro. In fact, they are still trying to catch up to Canvas 3 while we've added dozens of new features and enhancements to create Canvas 3.5. Like 3-D extrusions of text and graphics, enveloping of text and graphics, smart lines, fine kerning, fractals, automatic concentric circles and spirals, and a tool loader that allows you to add tools as you work. There's even a versatile pressure-sensitive freehand Bezier pen tool. And Canvas 3.5 has really outdone itself with new improvements including object blends, binding of text to shapes and curves, Bezier text conversions, and macro windows. Which is just the beginning, because Canvas also includes all the great features of 3.0 like custom parallel lines and curves, our unique SmartMouse™, and more.

Comparing Canvas to the competition is like comparing a superbike to a tricycle. And only Canvas is self-upgrading, allowing you to add new tools, effects and file translators at will. Last but not least, while MacDraw Pro is idling somewhere back in the Dark Ages, Canvas features seamless file sharing with its recently released Windows version. Add it all up, and it's Canvas. For the ultimate in value and performance, Canvas gives you the ride of your life. So go ahead and hop on.

Circle 57 on reader service card
New Products

The Latest Macintosh Releases

By Cameron Crotty

This section covers Macintosh products formally announced but not yet evaluated by MacWorld. Unless otherwise stated, the minimum requirements for operation are a Mac Plus or SE, 4MB of RAM, running System 6. All information and performance claims are supplied by the product vendor and have not been independently verified by MacWorld. Please call vendors for information on availability.

Hardware

40 MHz Turbo 400
Faster and faster and faster and faster and... This 40MHz-based accelerator is available in 25MHz, 30MHz, and 40MHz models. The product uses the PDS slot on the Macintosh IIc and fits the Mac IIx with an adapter (sold separately); the 40MHz version ships with FastCache Turbo, a $199 128K secondary memory cache that increases performance (optional on the 25MHz and 33MHz). The product also supports the Mac IIx, IIc, Iic+, and SE/30 with an adapter; and supports the Mac II, Iic, and Performa 600 without an adapter. 40 MHz Turbo 400 $2399; 25MHz $1299; 33MHz $1599; adapter 5-9. DayStar Digital, 404/967-2077, 800/962-2077; fax 404/967-3018.

Accomplice
This Mac II-specific accelerator plugs into the PDS slot and features a 50MHz 68030 processor, a 32K cache, and an FPU. The product also includes a pass-through slot for attaching an additional PDS board. $699. Extreme Systems, 206/575-2024, 800/995-2334; fax 206/579-3928.

APS T 213
Shocking as it may seem, APS is shipping another hard drive. This 213MB PowerBook-stuffer features a 1.1ms average seek time and comes in three flavors: internal, external AC-only, and external AC/DC-powered. Internal $599; external AC-only $699; external AC/DC $729. APS Technologies, 816/483-6100, 800/239-2753; fax 816/483-4459.

BLP Eclipse 4 and 8

By Cameron Crotty

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BLP Eclipse 4 and 8

These LED printers are both compatible with PostScript levels 1 and 2; both include AppleTalk interfaces; and both ship with 2MB of RAM, upgradable to 6MB. The BLP Eclipse 4 features a 4-ppm print engine and comes with 17 fonts, and the BLP Eclipse 8 features an 8-ppm print engine and comes with 35 fonts and a built-in Ethernet board. BLP Eclipse 4 $1099; BLP Eclipse 8 $1799. GCC Technologies, 617/275-5800, 800/422-7777, fax 617/275-1119.

ErgoView 20
This 20-inch Trinitron color monitor (31mm aperture pitch) can switch between resolutions on-the-fly, from 1600 by 1200 pixels down to 640 by 480 pixels at refresh rates of 72Hz to 120Hz. This product meets the Swedish MPR II emissions guidelines. $3199. Sigma Designs, 510/770-0100, 800/845-8086; fax 510/60-2640.

FastMath LC Ill
This Mac Ilsi-specific accelerator plugs into an ADB port. $1495. MicroTech Systems, 714/998-6900, 800/556-0222; fax 714/637-4060.

Increment 6000
If you have a weak stomach or are upset by massive amounts of raw, churning data, don’t read any further. This hard drive subsystem has room for up to six 3.5-inch removable drives of varying sizes for up to 7.2GB of anything your heart desires. The product features fully enclosed drive carriages, two separate SCSI buses, and lots of status LEDs (carriage power, SCSI bus activity, and safe removal). $19,500. MountainGate Data Systems, 714/998-6900, 800/556-0222; fax 714/637-4060.

IncrReg 6000
If you can’t reach out and touch someone, you can at least make contact with your monitor. This 14-inch color monitor has a .28mm dot pitch, a resolution of 640 by 480 pixels, a vertical scan rate of 62Hz and 24-bit color data per pixel and ships with twoMB of RAM, upgradable to sixMB. The 3225 has a 32-ppm engine, and the 3225 has a 12-ppm engine. 2025 $12,995; 3225 $19,995. QMS, 205/633-4300, 800/631-2692; fax 205/633-0116.

RediModem PB-1440 and PB-9600
These internal PowerBook fax modems each support MNP 4 and V.42 error correction, MNP 5 and V.42bis data compression, and 9600-bps send/receive capability. The PB-1440 includes a 14.4-Kbps data modem (V.32bis), and the PB-9600 features a 9600-bps data modem (V.32). PB-1440 $499; PB-9600 $429. Data Race, 210/598-1900; fax 210/598-1929.

UCC1005E
This 1200-bpi-600-dpi (true-resolution) SCSI color scanner scans up to 8½-by-11-inch reflective originals in a single pass. The product captures up to 10 bits of color data per pixel and ships with PixelCraft’s ColorAccess separation software as well as the QuickScan plug-in module for Photoshop or ColorAccess. $4600. Umax Technologies, 408/962-0771, Umax, 408/962-0311; fax 408/962-0776.

Continues
New Products

Unity 1200XL-O/1200XL-T

Vision 35
This 35mm slide scanner can handle both color and black-and-white positives and negatives. The maximum resolution is 5000 by 5000 pixels, and the scanner ships with Agfa’s Fotolook driver software. $950. Agfa Corp., 508/658-5600, 800/685-4271; fax 508/658-4193.

SOFTWARE

Biz Basics Pro
Did you swear to get organized when you bought your Mac? This FileMaker Pro database manages orders, invoices, inventory, employees, vendors’ and customers’ files, and prints out all the data in customizable reports. Additional shipping and zip code utilities are available. $298. Working Solutionz, 805/522-2170; fax 805/527-7787.

Budget & Construction
This program tracks resources and handles budgets for construction projects. The product features user-definable reports, item and price import options, and coding options for government projects. $950. Manapro, 305/486-5900, 800/833-4776; fax 305/486-8771.

The Card Collector for Macintosh
If you smell peanuts and Cracker Jacks while you’re using this sports card database, don’t be surprised. This package allows users to track which cards they have, how much the cards are worth, and which are needed to complete a set. The included card database covers over 70,000 baseball cards from 1948 to 1993, including names, card numbers, prices for three conditions, first card, and rookie card. Football, basketball, and hockey databases also available. $99.95. AbleSoft, 804/898-8484, 800/545-9009; fax 804/898-8282.

Charger Suites: Volume One
This package includes both standard Photoshop plug-ins and Extension Mod-ules for Photoshop 2.5 that use Storm-compatible DSP accelerator boards to speed up resize, sharpen, unsharp mask, blur, Gaussian blur, and other filters. The product also includes PowerPreview, for rapidly previewing filter effects on a selected portion of the image. $199. Requires Storm-compatible DSP accelerator. DayStar Digital, 404/967-2077, 800/962-2077; fax 404/967-3018.

Cliffs StudyWare
We know you never used Cliffs Notes to get through an exam or term paper. We know you always read the original text first. We know that you’ll never use this new software line to make up for missed classes or late-night partying. But just for your information, Cliffs Notes now offers course-review guides in biology, calculus, chemistry, economics, physics, and statistics. The company also offers test-preparation software for the SAT, ACT, GRE, CBEST, GMAT, and LSAT. $39.95; test-prep software (except LSAT) $49.95; LSAT prep $59.95. Cliffs Notes, 402/423-5050, 800/288-4078; fax 402/423-9254.

CoPilot Infrared Link
With this hardware-software combination, you can control up to six media devices (VCRs, TVs, videodisc players, and so on) via an infrared remote control. The product contains control codes for over 1000 devices, plus options for user-defined codes. $795. AirMouse Remote Controls, 802/655-9600; fax 802/655-5149.

Color Extreme
This graphics-conversion utility handles dozens of file formats from RGB to CT Slices and supports Adobe Photoshop-compatible plug-ins, global color correction, screen color calibration, and cropping with trim and bleed control. 16MB min. memory; requires Mac II with FPU, 8-bit color, and 13-inch monitor. $895. Human Software Company, 408/741-5101; fax 408/741-5102.

ColorUp
Most folks have trouble remembering not to wear white before Easter and after Labor Day let alone trying to color-coordinate their business presentations. This utility features over 1500 color palettes created by professional designers specifically for use in business graphics. The palettes consist of color combinations that work well together and have been tested on transparencies, 35mm slides, screen displays, and hard copy. Also included is a hands-on tutorial explaining color science, psychology, harmony, and tips and tricks. Requires 8-bit color and 13-inch monitor. $39.95. Pantone, 201/935-5500, fax 201/935-4147.

YOU CAPTURE THE IMAGES

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Flo' This application lets you mush, stretch, skew, rotate, distort, and pull all or part of a graphic. You can transform parts of an image, leaving the rest of the image unchanged. Supports QuickTime, and alpha-channel compositing for stills and animation. 5MB min. memory; requires Mac II with FPU. $139. Vals Group, 510/236-4224; fax 510/236-0388.

FullPixelSearch Why let the text-hounds have all the fun? This program lets users search for a pattern of pixels within 8-bit TIFF and PICT images up to 3000 by 3000 pixels. Search patterns can be created by hand or cut and pasted; users can adjust search accuracy in 1 percent intervals. Requires 8-bit color. $900. General Image, 212/246-4686; fax 212/246-6074.

IntelliTalk Your Mac can say it out loud with this application. As you type, the software uses MacTalk to speak letters, words, and sentences. The package acts like a word processing program, offering full control over character font, size, and style, and includes illustrated menus for young users. Users can edit the pronunciation list for words that don't follow normal pronunciation rules. $39.95. Intellitool, 510/528-0670; fax 510/528-2229.

Island Imposition Publisher This package allows users to prepare ready-to-print impositions from PostScript DTP programs. The Personal Professional version ships with filters for QuarkXPress, Aldus PrePrint, and PageMaker. The Studio Professional version includes 13 filters covering additional DTP software. 4MB min. memory; requires System 7. Personal Professional $2195; Studio Professional $3995. Island Graphics Corp., 415/491-1000, 800/255-4499; fax 415/491-0402.

JAG II The latest version of this antisalias utility reduces or eliminates jagged edges in a graphics image (black-and-white to 32-bit color) by adding intermediate colors to blend the edges, or by smoothing the edges with increased resolution while maintaining the original color palette. The product now supports QuickTime, TIFF, Photo CD, and EPS formats. $129. Ray Dream, 415/960-0765; fax 415/960-1198.

LetterGraphics These EPS files contain 3-D, beveled letters in several colors, 20 letter styles, and either silver or gold bevels. Letters can be scaled, stretched, and rotated, and can be printed in black-and-white or color. Letter sets include uppercase and lowercase letters, numbers, and punctuation marks. Headline sets come without lowercase letters. $39.95; headline sets $29.95. Nova Cube, 800/603-4486, 800/728-5052; fax 302/656-2913.

Meeting Maker XP When the Windows people are there, the Mac people aren't. When the Mac people are around, the Windows group is out to lunch. This new version of Meeting Maker could mitigate cross-platform scheduling hassles. Users pick a time and date for meetings, select required and optional guests, reserve meeting resources, prepare agendas, and send attachments. The product can automatically find the first available time for all required attendees; provides personal calendars for appointments and activities. 2MB min. memory; requires server, 5-user license $695; 10-user $1195; 50-user $5595. On Technology, 617/676-0904; fax 617/676-0391.

MIC/Tech Trying to keep up with equipment information overflow? This database includes product specs and prices on PCs, portable laptops, notebooks, workstations, minicomputers, mainframes, and supercomputers. Product includes company's Textware search-and-retrieval software and 24-hour telephone support. $795; five-station LAN $1466. Management Information Corp., 609/428-1020, 800/678-4624; fax 609/428-1683.

Now Compress Squeeze it down, squeeze it down, we-a-a-a-a-y down. This file-level software-compression package offers idle-time, on-demand, and archival data compression. Users can compress an entire disk or manually select or exclude files by type, creator, or label. The software features the Inspector window, which lets the user view the status of all files stored on a drive, including original and compressed file sizes and space-saved percentages. Single user $99; 50-user pack $3795. Now Software, 503/274-2800; fax 503/274-0670.

Pathways Into Darkness What? You mean you've never been dropped alone into an immortal demon's body? You say you've never had to carry a nuclear device past hordes of other-worldly monsters? This game offers these unique experiences in a real-time, 3-D texture-mapped environment. You also get actively panning stereo sound and a special performance mode to help the game run faster on slower computers. Of course, that won't help you win faster when you're out of ammo and being chased by a ravenous gas beast. Oh boy! Barbecued garnet 2MB min. memory; requires 8-bit color and hard drive. $69.99. Bungie Software Products Corp., 312/493-2849; fax 312/493-4557.

Pixel One Twenty Eight These seamlessly bling, 24-bit digital textures were developed for Pixar's image and film projects. The product includes 128 textures in 13 categories, ranging from bricks and fabrics to animal skins and ground covers, as well as a Photoshop plug-in for previewing and selecting textures. $299. Pixar, 510/236-4000; fax 510/236-0388.

Places & Faces 1 Multicultural is the buzzword of the nineties, and this package of EPS clip art continues...
Inspiration is a powerful idea development and planning tool. In Diagram view, quickly brainstorm ideas and visually communicate even your most complex processes, structures and procedures. In the integrated Outline view, organize and transform ideas into effective written documents. Discover how easy it can be to make great looking diagrams.

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Inspiration reflects faces in a multitude of colors. The product features borders; sports and activities graphics; worldwide travel locations and environments; and faces from many ages, races, and cultures. $129.95.

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Who We Are 2.0
This set of HyperCard stacks focuses on African history and achievements. The product features over 250 graphics and animations; a Q-and-A-style interface; a quotations section; a directory of bookstores that specialize in books by or about Africans and the African diaspora; and comprehensive biographic data on black leaders, achievers, and movers and shakers. This product takes up 12MB to 14MB of space on a hard drive; a CD-ROM version is in the works. Color $114.00; black-and-white $122. AfroLink Software, 213/731-5465; fax 213/730-0693.

Who We Are 2.0
Working Watermarker
This System Extension allows users to print from a graphic in a document. The product lets users print one graphic on the opening page and lets users control darkness for both images separately. All controls are in a pop-up menu. The product comes with a CD-ROM version. Color $149.95. Working Software, 408/423-5699; fax 408/423-5698.

7 Natural Wonders
Airline fares may still be high, but with this product, you can get at least a glimpse of faraway places. Users can virtually visit the Amazon rain forest, the Grand Canyon, the Great Barrier Reef, and Mount Everest, as well as see an Indian monsoon, a blue whale, and the wildebeest migration across the African plains. Each destination features photographs and over 80 sound files. $59.95. Optica Publishing, 415/788-8778; fax 415/788-8866.

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GCC's new BLP Eclipse 8 has all the right connections—as powerful standards, not expensive options. For starters, we've included LocalTalk, RS-422, and parallel connections. There's also EtherTalk to transmit your data over ten times faster than when using LocalTalk.

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New Products


MapArt Bundle
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Sherlock Holmes Consulting Detective Volume III
Through the fog of London's streets, the hunt continues in the latest volume of the Sherlock Holmes series. Players try to beat Holmes and Watson to the solutions of three new cases. The Solicitor Solicitor, The Banker's Final Debt, and The Thames Murder. The product features video sequences from which players must deduce the solution to the crime. $60.95. Icon Simulations, 708/520-4440; fax 708/459-7456.

Twenty Thousand Leagues Under The Sea
Sound, graphics, and animations highlight this electronic version of Jules Verne's classic tale. The product includes 200 pages of illustrated text and reading-comprehension questions as well as full audio narration, pronunciations, and audio definitions for more than 450 words. 2MB min. memory; requires color. $69. Orange Cherry New Media, 914/764-4104, 800/672-6002; fax 914/764-0104.

ASSOCIATE

Mac GamePad
If you thought that playing games on your Macintosh was a sure way to avoid Nintendo-thumb, you can guess again. This AD8 device looks just like the game pads that shipped with bazzillions of cartridge-based entertainment systems: a thumb pad on one side and fire buttons on the other. Users can configure the pad for right- or left-handed use, and the unit ships with a software control panel that automatically sets up control and button functions for each game. $49.95. Advanced Gravis, 604/431-5020, 800/663-8588; fax 604/431-5155.

NiteCaps
A dusty Mac is an unhappy Mac, according to this company. Its product is a set of brightly colored dustcovers for Macintoshes, monitors, and keyboards. Several patterns are available, including fish, plaid, chil peppers, and junk food. $18 to $26. NiteCaps, 415/665-0668; fax 415/665-3138.

SCSI Boy
Got a 25-pin SCSI cable and no place to plug it into your PowerBook? This little adapter fits into the palm of your hand and turns one end of a 25-pin SCSI cable into a PowerBook-compatible HDI-30. $29. APS Technologies, 816/483-6100, 800/235-2793; fax 816/483-4459.

Wrap
You shouldn't take your PowerBook scuba diving, but if you're carrying this case, you'll be covering your PB with neoprene: the material used to make wet suits. The benefit? You can operate the PowerBook without removing it from the case. The product features a shoulder strap and a rubberized handle. $79. Wrap Design, 408/253-5378, 800/863-9727; no fax.

BOOKS

The Mac User's PC/
The PC User's Mac
If you're working in a computerized office, chances are that you're switching between platforms more often than Batman changes his suit. This book helps Macintosh users learn DOS, and DOS users learn the Mac. Featured topics include file transfer and translation, as well as tutorials on several popular applications. Written by Elaine Marmel. 784 pages. $24.95. Hayden Books, 317/573-2500, 800/428-5331; fax 317/573-2583.

Stop Stealing Sheep
The title of this book comes from a quote by Frederic Goudy, American type designer, who said, "Anyone who would letterspace lower case would steal sheep." And if you understood that, you probably don't need this book. Luckily, previous typography experience is not required to understand this guidebook to type and how to use it. Written by Erik Spiekermann and E. M. Ginger. 174 pages. $19.95. Hayden Books, 317/573-2500, 800/428-5331; fax 317/573-2583.

ACCESSORIES

Mac GamePad

To have your product considered for inclusion in New Products, send an announcement with product name, description, minimum memory, peripherals required, pricing, company name, and phone number to New Products Editor, Macworld, 501 Second St., San Francisco, CA 94107. Macworld reserves the right to edit all product announcements.
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Circle 167 on reader service card
Lotus Notes 3.0

**Workgroup Software**

**PROS:** Well-organized, robust, and flexible business data system. **CONS:** Requires full-time application manager; requires PC-compatible server; Mac version doesn't support all Notes features. **COMPANY:** Lotus Development Corporation (617/577-8500). **LIST PRICE:** For each Macintosh client $495; OS/2 server $495.

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Some analysts feel that the ultimate reason to have computers in an office is to facilitate workgroup interaction. In this vision, all of an office's computers are used together on a network with software that's part electronic-mail, part database, and part document manager. All company data then exists electronically, and is distributed, if necessary, across several sites and linked to any number of employees at remote locations; everyone in the company has, potentially, simultaneous instant access to all the company's information. Since Microsoft's Windows for Workgroups is unlikely to appear in a Mac version (and it's a limited, small-group program anyway), Lotus Notes is by default the premier example of workgroup software for the Macintosh. This version, 3.0, is the first Macintosh version of Notes, and it's a sophisticated product indeed.

**File in Triplicate**

Lotus Notes consists of three separate modes: a messaging system that incorporates the best parts of Lotus's cc:Mail for Macintosh, a flat-file database facility with flexible forms-design capability, and a programming language for automating common tasks. Underlying all this is a communications architecture, most of which is hidden from end users and which makes great demands on the server operating system. The version we tested used a 66MHz, 80486-based server running IBM's OS/2 version 2.1 (it also ran, less satisfactorily, on a server running Windows 3.1); the communications architecture calls for true multitasking, not available in Apple's System 7.1. The real minimum memory for effective use of Notes, by the way, is 5MB rather than the 3MB stated in the documentation; and for reasons not clear, our installation was only successful on 68030 (as opposed to 68020) Mac clients.

The Notes E-mail system lets you set up categories, send to a variety of defined lists (companywide domains, groups within domains, personal), send messages at predetermined times, encrypt and decrypt messages, and easily incorporate different documents (spreadsheets, word processor files, graphics, sound) into a message. Individual users maintain their own address books with personal domain and group definitions, and the system administrator maintains an overall address book with its own security features.

The heart of Notes, however, is its database functionality. In the Notes vision, the company itself is envisioned as a set of flat-file, multiuser, distributed databases: employee records, customer orders, catalogs of products, marketing records, discussion databases of bright ideas, legal documents and contracts, accounts receivable, correspondence files, sales leads, patents, expense accounts, quality-control procedures—the works. Everything currently stored in that paper paradigm of the flat-file, the standard three-ring binder, should be converted into a Notes database. The system administrator then assigns an access level to each database for each employee: manager, designer, editor, author, reader, depositor, and no access. Once this has been accomplished, an employee with a
PowerBook in a motel in Waterloo, Iowa, has the same immediate involvement with the company's data as another employee on floor 25 of the company's Manhattan headquarters. In fact, the two of them can meet along with the company's industrial design group in Italy using a discussion database.

Notes gives administrators some sophisticated tools for coordinating database activities. Databases can be instructed to replicate themselves from server to server at set intervals, so that users at different sites see the same updated information. For the Mac, databases can also be replicated to the Mac client station, a feature you are likely to use (automatically, at night) if you're connected through a modem. Notes features full-text indexing and searching; not only does this make information retrieval flexible and fast, but it also minimizes server activity. (Indexing and full-text search are not possible, however, on Mac client databases, an annoying and not isolated illustration of the Mac's status as a poor relation in the Notes world.) In fact, server activities are quite cleverly managed in Notes—some installations with more than 100 connected users report that retrieval from server databases isn't significantly slower than in a 10-user system.

Getting Smart

ALTHOUGH NOTES HAS 120 ICONS THAT represent different tasks (the toolbar with 20 to 30 icons at the top of the Notes screen changes with different program modes), an effective Notes installation calls for programming still more icons, for a variety of tasks. Using Object Linking and Embedding (OLE) programming capabilities, an administrator can set up a link and attach an icon to it so that users can call up familiar applications from inside Notes. This is a key feature, since Notes is really a communications system without many internal capabilities for data reporting; if you want a bar graph, for example, to illustrate a point in a memo, you have to jump out to an application. Notes supports publish and subscribe, though, and you can cut and paste information in traditional Mac style, so that once your bar chart is in a document it can be automatically updated.

Administrators might also use icons for different views of data in a database, and then write macros to link the icons to views designed with Notes' generally excellent forms-design features. More macros might perform special lookup functions, helping users make efficient queries in the database. In Notes-speak, an application is most often a database with a set of views and some associated customized search routines. Writing an

application means planning the database structure and database views, and then coding macros using Lotus @-functions (see "Where It's @"). The @-functions—a macro-coding breakthrough when they appeared in Lotus 1-2-3 more than a decade ago—are a pretty primitive programming facility for a product-of-the-future like Notes. Nonetheless, the discomfort they impose on the programmers is paid back in relatively efficient execution, and longtime Notes sites have written impressive database applications.

Note This

NOTES VERSION 3.0 IS A PRODUCT WITH an unusually intelligent design: most of the challenges of making workgroup software really useful have been met by Lotus. In fact, Lotus has done Macintosh users a favor by releasing version 3.0 as Notes' first Mac implementation—not only was version 2.1 limited by comparison, but version 1.3 of OS/2 wasn't impressive as server software. Notes 3.0 is stable and robust, incorporates several years' worth of feedback from corporate clients, and costs less than earlier versions.

Despite these virtues, I have two misgivings about Notes. The first arises from the inherent complexity of preparing a Notes image of a company's information base. You might just as well leave copies of Think C on everyone's desk, with instructions to do something cool, as install Notes companywide without a coherent application scheme and a full-time Notes administrator, preferably one continues

APPLE'S AMBER DOCUMENT ARCHITECTURE, when it arrives, will offer another way to implement workgroup software, but document-viewing applications that have already been released suggest ways to set up a paperless office right now.

If the idea of running an OS/2 server on a PC and writing database applications exclusively in macros seems somewhat daunting, you may want to consider the type of system you could implement with a little ingenuity and either Common Ground ($189.95, No Hands Software, 415/321-7340) or Adobe Acrobat Exchange ($195, Adobe Systems, 415/961-4400). These products let you view documents created in any application.

The key point is that the viewers don't need the original applications on their own Macs. Common Ground, for example, lets you distribute a Mini-Viewer (60K) with your documents so that they can be read, with original fonts, tables, graphics, and charts, on a Mac with nothing installed but the system. Acrobat does much the same thing, except that each Mac viewer must have a copy of Exchange to accommodate Acrobat's sophisticated handling of PostScript and compression, and documents easily cross the Windows/Mac boundary as well.

In both programs, you can select and modify text in a standard word processor (security settings let you control who can modify documents). This means that a salesperson with a PowerBook on the road can have access to customer profiles, forms, contracts, and related documents; and these documents look exactly as they would on paper at the home office. Similarly, workgroups within an office can set up complex multipart discussions, with individual workers contributing information from various databases, spreadsheets, and other specialized programs. Everyone in the workgroup can view all the contents of the discussion without having copies of the creating applications.

This approach to viewing documents requires some administrative discipline in document creation, formatting, and storage, but any effective workgroup solution requires discipline anyway. Historically, applications that most closely resemble paper models (word processors, spreadsheets, page layout) have proved easier for workers to understand, and have been more successful commercially than exotic software. The office of the future may turn out to be quite a bit like the office of the present, except that the "paper" will all be on a Mac screen.
with considerable programming skill. Somebody has to get all that information into Notes, assign the security levels for each employee and database, and do the hard conceptual work of formulating a useful information model of the company. Notes is easy to use, for end users at least; but without externally imposed discipline, a company's Notes system is in danger of growing into an electronic rat's nest of memos and junk databases. The up-front investment in software and the price of a 486-based OS/2 server are almost trivial compared with the number of dollars and hours a company can expect to put into an effective Notes implementation. In other words, kids, don't try this at home. If your company can't hire someone who's comfortable programming macros with @-functions, you'll miss most of the value of Notes. You might be able to find a Notes consultant who will design a custom Notes implementation for your company (the list of consultants is growing rapidly) and train your staff, but you'll want to keep the consultant on retainer for quite some time after installation.

The second problem arises from the changing Macintosh/PowerPC systems environment. When Apple delivers its Amber document architecture (see News in this issue), it will be possible to write very simple programs that implement all the best features of workgroup software and run on a Mac-based server. If you can wait until the middle of 1994 to start workgroup computing, you can expect more product choices. Notes is certainly a strong contender in any case, since it incorporates years of Lotus's workgroup-design experience, but a native-Mac workgroup program based on Amber will not be as resource-demanding as Notes and won't require you to invest in foreign hardware, an unfamiliar server operating system, and a new employee with previous Notes experience. In the large companies that are Notes' natural domain, 486 PCs and 32-bit PC operating systems and old Lotus or Symphony hotshots are ubiquitous; but for smaller, Mac-only firms, waiting for Amber is a credible alternative.

If you want to get started in workgroup computing right now, and have the resources to support a Notes installation, you should be happy that Lotus has done such a thoughtful job. If your needs aren't immediate, or if you are working with a smaller company without much cross-platform capability, you might want to wait and see what kind of workgroup software emerges from changes in Mac systems and document architecture over the next year or so.—CHARLES SEITER

### PowerBook 180c

**Notebook Computer**

**PROS:** Active matrix color screen is sharp and has good color tonal quality. **CONS:** Battery life is short; performance is limited; price is high.

**COMPANY:** Apple Computer (408/996-1010).

**LIST PRICE:** $4169 (4MB of system RAM and 80MB hard drive) to $4769 (4MB of RAM, 160MB hard drive, and internal fax modem).

**A YEAR AND A HALF AGO, WHEN THE first PowerBooks were announced, nearly everyone wanted to know when the first color models would arrive. “We’re working on them,” Apple representatives said demurely. Then, five months ago the first color Mac notebook appeared, the disappointing PowerBook 165c. Only bargain-basement notebook vendors still used the 165c’s passive matrix technology, which limits color fidelity and viewing angle. Macworld advised its readers to wait until an active matrix model came along. And now it’s here. Should you wait any longer?**

The screen is beautiful. In fact, its clarity and color fidelity are among the best I’ve seen on any notebook. And because it’s active matrix, you can see the on-screen image clearly from almost any angle—you have to go as far off as 60 degrees to the side before the image fades into the liquid crystals.

Despite this beautiful screen, I found the PowerBook 180c disappointing. The plain and simple truth is that the 180c is basically nothing more than a 160 or 180 with an active matrix color screen. Apple has added no innovations to this Mac, while almost every major non-Mac PC vendor has come out with innovative features that leapfrog the PowerBooks in significant respects.

**Color Screen Close Up**

AFTER I GOT OVER THE SCREEN’S CLARITY, I realized how tiny it is—a mere 8.4 inches diagonally, or just 55 percent of a standard 14-inch monitor’s active area. That means you get small pixels (94 dpi, rather than the typical 68 to 78 dpi found on a standard monitor). To put it another way, 12-point text appears the same as 9-point text. That’s awfully small for sustained use, especially if you are using a program like Microsoft Word that does not let you magnify your working view. The screen is roughly the same size as the old Mac 12-inch monitor, but at 14-inch pixel resolution. It’s smaller than any PowerBook screen before it. I found it a strain to use after just a few hours.

There’s very little brightness range in a 180c—the maximum setting is not much brighter than the midlevel setting. The top setting is necessary, however, if you’re working in direct sunlight or bright indoor lighting.

This is not the state of the art. Macworld looked at several other notebooks for comparison (see the photos in “Color Screens Compared”). The IBM ThinkPad 720C, which is lovely to behold and use, has a large (10.4-inch, 76-dpi) screen. Even a typical notebook like the Toshiba T4500C (not pictured), with its moderate screen (9.4-inch, 84-dpi), is better—that extra inch translates to a visible difference. They’re both proof that Apple could do better.

Two other display notes: First, there is no contrast control. You have to use the brightness slider to adjust the image contrast (positioning the slider to the middle gives you the maximum contrast by
shutdown, and that the PowerBook uses several warnings into its power-management software to alert you to imminent save your work. (Do not change battery contents of RAM will be lost as soon as the power source is lost.)

The higher power-usage comes from the power-hungry components inside. Apple has added color-handling circuitry and faster CPUs (the 180c uses a 33MHz 68030), which take more power and generate more heat. The 180c is the hottest PowerBook I have used—I do not recommend using it for long on your lap if you are wearing shorts or a skirt (seriously).

Lagging Leader
EXCEPT FOR THE ACTIVE MATRIX screen, the PowerBook 180c is the same as the other second-generation PowerBooks (160, 165c, and 180—those with built-in video). The benefits are the same: built-in trackball, power-management software, built-in video, and standard Mac ports (except for SCSI, which is the PowerBook-only 30-pin version that requires an adapter).

The 180c’s 33MHz 030 (the same as the 180) provides adequate performance, but after working on a Centris 610 (which uses a 20MHz 040), I noticed a difference. This is partly because of the slower processor (today’s 040’s take too much power for use in a notebook), and partly because an LCD screen takes longer to update than a standard monitor does, so scrolling can bring the Macintosh to a crawl.

Because the 180c is essentially the same as previous PowerBooks, my complaints about those hold here as well: the lack of page-maneuvering keys like the page-up key, the absence of status lights, and a line formation for the arrow keys (instead of an inverted T shape); the fact that users cannot install modems and memory themselves; the nonstandard keyboard spacing; and the lack of support for PM CraftX expansion cards. (Apple has said it is likely to implement PCMCIA slots in future versions, after the next-generation PM CraftX standard that improves the data-transfer rate is defined.)

Apple has lost the technology lead in notebook computing. The enhancements made since the release of the 100, 140, and 170 in October 1991 have been incremental, like adding color, or remedial, like adding video-out ports. Apple’s design and battery-management features revolutionized notebook design. But now the other major notebook vendors have copied Apple’s innovations and extended them while adding new features of their own. You can get notebooks that offer fast, low-power processors (like the 25MHz 486SLC) that rival a Centris 650’s performance. You can get notebooks with a bay into which you can put either a pop-out floppy drive or a second battery so you have enough power for use on a plane trip. You can get notebooks whose screen and other components can be snapped out and upgraded—by users.

It was very telling that when Macworld editors and designers saw the PowerBook 180c and the IBM ThinkPad 720C, it was the ThinkPad that generated the enthusiasm and interest. (And analysts say that the PowerBook, which took the lead in the notebook market in its first year, has now fallen behind the ThinkPad in sales.)

PC makers need to substantively revise their offerings at least once a year to stay competitive. They also need to keep prices competitive. The IBM ThinkPad with a 120MB hard drive, which easily outperforms a 180c, costs $4350. The equivalent configuration of the 180c costs $4769 with a 160MB hard drive, $4379 with an 80MB drive.

Apple has no competition, so it doesn’t face these pressures. That’s too bad for Mac aficionados who want to stay with the Mac while not falling behind the rest of the computing world. So should you wait any longer to buy a color Mac notebook? Yes, unless you really need color. Get a 180 instead if you want a crisp display (and a 10-inch screen), or the fairly inexpensive 145 if your usage will be sporadic and the passive matrix screen’s dullness won’t be a big headache.

—Galen Gruman
Big news for small business!
This easy new software keeps your books...

Finally! Small business bookkeeping that works exactly the way you do.

You’ve got to manage your money. But you have a small business to manage, too. That’s why BESTBOOKS by Teleware goes far beyond a checkbook or personal finance program. It produces invoices, tracks sales and expenses, and much more. Then it organizes those records to fit the way you run your business.

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Incredibly easy. MACWORLD gives it a★★★★ rating!

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When we say BESTBOOKS works the way you work, we really mean it. Make BESTBOOKS’ forms look exactly like your business forms. Use the Custom Forms Designer to paste pictures, add text, draw lines and boxes. Move fields around. It’s quick and it’s simple. You can even include your logo!

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Requires Mac Plus with System 6.0 or later, at least 1MB RAM, hard drive with 2MB of free space, a Hayes compatible modem is optional. Canadian (GST ready) and Windows™ versions available.

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PowerDraw 4.0

2-D Drafting Program


One of the first fully-fledged Macintosh drafting programs, PowerDraw has consistently ranked among the best—often against competition costing hundreds of dollars more. PowerDraw 4.0 adds parametric symbols, guidelines for aligning objects, enhanced snapping capabilities, support for TrueType fonts, multilayer editing, and sheets for managing layer attributes.

However, PowerDraw 4.0’s best new feature is an open architecture that supports externals, program modules like the plug-ins found with many graphics programs. Externals let you customize PowerDraw with application-specific tools, floating palettes, and menu commands, as well as optimize performance by using only the tools you need. Also, externals provide a mechanism for third-party developers to add new functions.

PowerDraw 4.0 comes with a good assortment of externals. New tools, such as draw by center polygons and a survey dimensions tool that produces distance and bearing measurements, are pop-ups on the basic tool palette. Other externals, such as architectural tools that cut and heal walls when inserting windows and doors, are displayed in floating palettes.

A mechanical-drawing palette includes tools that draw centerlines, tapped holes, hex nuts, and S-breaks for pipes and shafts. Another palette holds several 3-D tools that let you establish vanishing points and draw lines and objects in 2-D perspective. A third palette offers pixel tools that produce editable bitmapped objects. Unfortunately, these painting tools are limited, and you can only ascribe one color to the object—then again, this isn’t a paint program.

You can have PowerDraw load externals automatically at start-up, or you can load them individually with the Load External command, which is itself an external. And therein lies the beauty of modularity: externals can be anything, making expandability a snap. In version 4.0 the PowerDraw Translator, a separate file-translation utility, has been converted into externals. The Translator externals, including DXF, EPS, ClarisCAD, MacDraw, and HPGL, cost $249 each (from Engineered).

Also available are two volumes of advanced drafting tools, including such niceties as an insulation fill tool for architects, an intersection tool that trims the ragged ends of crossing lines, palettes with baseline and isometric tools, and a laser printing utility. Each volume sells for $79. Engineered Software also publishes a developer’s kit ($100) that enables users with programming skills to build their own externals.

PowerDraw 3.0 users will recognize many externals, such as the architectural and arc tools, from their previous lives as macros. Although overshadowed a bit by externals, PowerDraw’s macro capability has been retained. PowerDraw’s built-in Pascal-like language is documented in the manual but, of course, writing macros is programming. A function that simply records drawing sequences as macros would be a good addition. PowerDraw 3.0 macros work with version 4.0.

PowerDraw’s symbol libraries are accessed in windows that display their contents by name and thumbnail. You can open several libraries simultaneously, and their windows remain available for multiple selections. With PowerDraw 4.0, you can rotate and flip symbols before placement and globally replace symbols in a drawing.

Best of all, PowerDraw 4.0 builds parametric symbols that can be edited by altering their associated dimensioning. The parametric symbol tool (another external) queries you for dimensions before placement. You can even alter distances between the components of a symbol. To transform standard symbols into parametric symbols, you have to reconstitute them with dimensions—a small price to pay for a great feature.

Extensive symbol libraries for architecture, landscaping, and mechanical applications are available separately for $79 each (also from Engineered). No parametric symbol libraries are currently available.

PowerDraw 4.0 also introduces sheets, a wonderful way to manage drawing layers. Sheets allow you to save various combinations of layer attributes, specifying which layers are active, which are visible, and which are grayed. Then, instead of changing attributes manually when you need a different layer configuration, you can move from one sheet to another with a single command—like changing styles in a word processor. Sheets are slick.

PowerDraw 4.0 also has the ability to select adjoining objects along a path in chain-reaction fashion, or to select all objects completely enclosed by another object. The program’s snapping tools let you align objects to specific points on other objects. The new Preferences check box overrides active-layer settings and lets you edit across layers. And PowerDraw now converts TrueType fonts to Bezier outlines. Its excellent dimensioning capabilities and its extensive, built-in plotter support, are both holdovers from previous versions. It’s a long feature list.

A clean, well-implemented interface, derived from MacDraw conventions, makes PowerDraw 4.0 easy to learn and a pleasure to use. The revised manual (expected as we go to press) will add some tutorial exercises to an already well-organized and informative core.

Always one of the fastest CAD programs around, PowerDraw 4.0 remains quick and responsive. I wouldn’t recommend using it on anything less than a middlelevel Mac, but PowerDraw even ran—albeit slowly and with cramped visuals—on my heirloom Mac Plus. On a IIfx, PowerDraw gets up to a nice gallop.

PowerDraw 4.0 lacks some high-end features, such as the ability to open reference files within a document. But speed and versatility more than offset any omissions. Refined and polished, PowerDraw 4.0 is a wonderful program and an excellent value.—Carlos Domingo Martinez
Ha-ha just replaced ho-hum. Introducing Now Fun!, by far the most comprehensive collection of
desktop diversions available.

In this one little box you'll get FunPictures with more than forty new patterns and images for your desktop.

FunCursors, with fifty different cursors to customize, animate, and generally liven up your formerly party-pooping cursor.

And FunScreenSavers, which comes with over two dozen anything-but-boring new screensavers. (It also runs any AfterDark modules you may already have.)

You'll also get FunColors, a color customizer to make your windows purple, or your menus hot pink.

And if that isn't enough entertainment for you, there's our new sound manager, FunSounds, with over a hundred hilarious sounds to do with as you please.

Whether it's the flush of a toilet when you empty the trash or loud applause every time you type your name,

Now Fun! Because all work and no play makes Jack the kind of guy people avoid at cocktail parties. For more information, call 1-800-237-3611.
Two SyQuest Drives

Removable-Cartridge Drives

DataPak 105

PROS: Faster than many fixed hard drives; lifetime warranty for preformatted cartridges.
CONS: Not compatible with existing SyQuest removable formats; drive tends to slide around when you insert and remove cartridges. COMPANY: Mass Microsystems (408/522-1200). LIST PRICE: Internal drive $949, external drive $1049; unformatted cartridge $122, formatted cartridge $139.

MW ★★★★★

Infinity 105 Turbo

PROS: Faster than many fixed hard drives; diminutive design ideal for use with PowerBooks.
CONS: Not compatible with existing SyQuest removable formats; flimsy power cord; lacks power-on light. COMPANY: Peripheral Land Incorporated (510/657-2211). LIST PRICE: Internal drive $795, external drive $894; unformatted cartridge $88, formatted cartridge $98.

MW ★★★★★

If you're still deciding which removable-drive format to go for, SyQuest has made it more confusing for you, with its new line of 105MB removable-drive mechanisms. It wasn't long ago that the fastest removable device out there was the Iomega Bernoulli MultidisK 150 (see Reviews, Macworld, June 1993). The new 105MB SyQuest products have eclipsed the Bernoulli in performance, with access and transfer speeds that beat many small and medium-size fixed hard drives. The first 105MB SyQuest products to reach Macworld are the Infinity 105 Turbo from PLI and the DataPak 105 from Mass Microsystems.

The SyQuest 105MB mechanism is a 3.5-inch device, very much like the mechanisms in the current generation of fixed hard drives. The cartridges themselves are correspondingly small and light, though packaged in a box that's as thick as the older 5.25-inch variety. To pack more data into a smaller space, SyQuest has increased information density. Because data is stored in a smaller space on the cartridge, seek speeds are sharply improved, to less than 15ms, and read-write transfer rates can be expected to run faster, at 1400K per second and higher.

SyQuest claims the new mechanisms and cartridges are also more rugged than the earlier products. While they withstood seven-day-a-week operation and constant swapping during the testing period, I wouldn't subject these cartridges to the same sort of abuse as a Bernoulli disk. The life span of the new mechanism is rated at 100,000 hours, up from the 60,000 hours of the latest 88MB devices.

Unlike the larger, older mechanisms, the 105MB unit includes automatic head-parking, which prevents damage to the expensive medium if the drive loses power or is turned off with a cartridge still inside. The cartridge is locked inside the mechanism when power is switched off, but you can extract it if you stick one end of an un bent paper clip inside a hole located just above and to the right of the drive's activity light.

The new SyQuest cartridges are readily available now, priced about halfway between the 44MB and 88MB cartridges. While not quite as cheap as an optical disk, they pack a lot of bang for the buck.

The drive mechanisms of the DataPak 105 from Mass Microsystems and the Infinity 105 Turbo from PLI may be the same, but the two manufacturers have gone off in sharply different directions in executing their new products.

Both firms provide good, toll-free technical support, a decent no-frills cartridge-formatting package (Mass Microsystems' formatter is limited to removable cartridges), and a free utility package of some sort. Both products' formatters could benefit by providing another level or two of warning dialog boxes before formatting begins.

Mass Microsystems DataPak 105

The Mass Microsystems DataPak 105 is designed for vertical or horizontal use. The only obsolescence made to the smaller drive mechanism is a case that's somewhat narrower than the standard zero-footprint design. The rear of the hard plastic case includes a pair of 50-pin SCSI jacks, an on/off switch, SCSI address switches, and a power-cord socket. Two removable support brackets are attached to the drive to allow for vertical operation. Although it's not mentioned in the manual, two more supports were found in the shipping box; they're needed for conventional horizontal use. Indentations at the top of these brackets make it easy to stack a set of DataPak drives.

Mass Microsystems provides two decent instruction manuals, a set of 25- to-50-pin SCSI cables, and a plug-in SCSI terminator block. Installing the drive is fast, and the manual includes a set of troubleshooting tips. You also get a copy of 7th Heaven, a set of System 7 utilities from Logical Solutions.

The only problem I had was using the drive in the vertical mode. The support brackets are made of a smooth plastic, and the drive tended to slide back and forth on my worktable whenever I tried to insert or remove a cartridge. The exhaust fan is a bit noisy, but I got used to it quickly enough.

Infinity 105 Turbo

PLI takes best advantage of the size of the new 3.5-inch SyQuest mechanism by providing a case that's barely larger than the mechanism itself. It comes without an exhaust fan and cools by convection, with ample vents at either side of the drive. To conserve space, power-supply components are shunted off to the AC plug itself, which is basically a 7.5-volt-to-110V converter. The plug assembly looks like the kind that comes with a portable cassette recorder, and the flimsy power cable seems out of place in a product of this price and quality. PLI doesn't include a power-on light, and the drive is so quiet that you sometimes barely notice it's on unless the drive-activity light is flashing.

The case is sturdy. In addition to the usual pair of 50-pin SCSI jacks, PLI uses a conventional on/off switch, switchable termination (a plus), and a convenient SCSI ID wheel.

PLI gives you a manual for the drive and one for the formatter. Installation was easy and trouble-free. The installation manual is brief, but it should be informative enough even for novice users. In addition to the 25- to-50-pin SCSI cables, PLI adds a copy of an information organizer program, Data-Areas, from numa Technology. A carrying case is offered as an optional accessory ($54).

The Envelope, Please

Both products are well built and worked flawlessly. The lingering question marks are the longevity of the lightweight cartridges SyQuest uses for these products, and the longevity of the format itself. The biggest drawback to the new format is that it doesn't support the existing base of 44MB and 88MB users. If I had to choose between the two drives, I'd pick the smaller, lighter, quieter, cheaper PLI. It's ingeniously packaged and ideal for both desktop and PowerBook use. PLI doesn't give the all-encompassing warranty on its cartridges that Mass Microsystems offers, but you could always buy the latter's removable cartridges instead.—Gene Steinberg
Apple Trees Bear Fruit For 50 Years

Apple trees will bear fruit after approximately 5 years and will continue to do so for about 50 years. Apples are now grown in every state of the Union. Successful apple growing requires a site that is free of disease and pests. Select a site that is well-drained, and free from trees and bushes that may shade the apple trees. Apples bear fruit in late summer or early fall. The fruit is picked when it is fully grown and is easy to handle.

is done by spraying chemicals that damage about half of the trees blossoms. A chemical that is already registered by the Environmental Protection Agency for use on other crops can likely be a safe and effective spray. Several of the best of the best products have been found to effectively damage apple blossoms so they cannot be pollinated. See for yourself.

Focus On Color

Color is the key to picking fruit at its peak. Bright reds, yellows, greens, or oranges tell you that harvest time has arrived.

Circle 146 on reader service card

$60 Film & Separation cost — The Microtek 45t scanner*

Apples vs. Apples

Until now, your high-quality color scans for publication and four-color printing were usually done on expensive drum scanners. Owning and maintaining this type of equipment was not an affordable option.

But now there’s the ScanMaker® 45t Multi-format Film Scanner from Microtek, so you can branch out and do your own high-quality scanning and save money in the process.

The ScanMaker 45t produces high-quality scans and separations from 35mm, 2 1/4 or 4 x 5 transparencies. The 45t features 36-bit color with interpolated resolution as high as 10,000 x 10,000 pixels and 2,000 dpi. Microtek’s Dynamic Color Rendition technology produces from original 36-bit image data an optimized 24-bit file for use with today’s 24-bit imaging software. The result — precise digital color. Also included with the 45t is Kodak’s EKTACHROME Film Production Guide Q-60A for use with Microtek’s Custom Calibration Utility that builds a calibration profile for your specific scanner. Now add 12-bit grayscale scaling from 1% to 100% and a maximum 5" x 5" scanning area and you have a scanner that rivals even the most expensive scanning equipment.

But there’s more than cost-savings. Consider the time saved in producing high-quality scans at your own desktop. You now have complete control and can even manipulate the image with Adobe Photoshop 2.5 (included with your purchase of the ScanMaker 45t) without incurring expensive system time at your separators.

Priced thousands less than its nearest competitors, the ScanMaker 45t will soon pay for itself — who knows, maybe on your first multiple-image project.

For more information, or the name of your nearest authorized Microtek dealer, call 1-800-654-4160.

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*Images were scanned with Microtek’s ScanModule for Adobe Photoshop. Color corrections were done in Photoshop. Separations were done in Cachet by EFI. Film cost of $100 based on 4 pieces of 35mm film from service bureau, no match print included.
Two Icon Editors

Utilities

Icon 7

PROS: Simple, straightforward design; launches automatically from within Get Info window; includes text tool; convenient library feature. CONS: Nonstandard paint tools; pastryl icon library included. COMPANY: Inline Design (203/435-4995). LIST PRICE: $79.95.

I Like Icon

PROS: Impressive library of eye-catching icons; work palette provides easy access to frequently used icons; lets you create animated icons using QuickTime. CONS: Animated icons lack practicality; custom icons often don’t appear without rebooting; no text tool; sketchy documentation. COMPANY: Baseline Publishing (901/682-9676). LIST PRICE: $59.95.

OK, YOU DON’T REALLY NEED SPECIAL software to create custom icons for your files, folders, and disks. Any graphics program provides the raw materials. But using a specialized icon editor makes this task a lot easier—and a bit more fun—by providing a working environment specifically designed to create 32-pixel-by-32-pixel works of art.

With Baseline Publishing’s I Like Icon and Inline Design’s Icon 7, you get all the tools you need to create unique icons and to catalog and organize your favorite designs.

I Like Icon

TO EDIT AN EXISTING ICON USING I LIKE Icon, just drag it onto the I Like Icon application icon. This launches the program and opens the Editor window, which provides a close-up view of the icon for pixel-by-pixel editing with a variety of painting tools.

The program gives you a choice of several color palettes: two versions of the standard 256-color palette; a 16-color palette; and the Apple Icon Colors palette, which has only the 34 colors Apple recommends for high-quality color icons that highlight correctly.

Like most icon editors, I Like Icon lets you edit an entire icon family, which consists of both the large and small versions of an icon in 8-bit color, 4-bit color, and black-and-white. You can edit each icon family member by clicking on it. You get a decent selection of basic painting tools in the editor, but a few practical features are lacking. You can’t change the width of lines created by the paintbrush and line tools; and there’s no text tool.

After creating an icon you can save it and return to the Finder to see it in use. In most cases, you’ll have to restart your Mac to make the icons visible. (The manual warns that occasionally you might have to restart, but I found it necessary to do this almost every time.)

The program has some outstanding features for organizing and saving works of icon art. The Browse window lets you group related icons together in a single window and store them as one file. On the Work palette you can store up to nine frequently used icons for easy access.

Along with the program you get a great collection of ready-to-use icon art. Scores of icons range from an image of a half-eaten doughnut to scanned photos of the program’s creators.

For the truly icon-obsessed, I Like Icon lets you link mini QuickTime movies to specific files, creating animated icons that play when clicked on (and can even play recorded sounds). You assemble animated icons frame-by-frame using the program’s Mini-Movie Maker. A generous supply of sample minimovies is included with the program disks. The animated icons are cute but completely impractical. For one thing, you activate them by clicking on them once; this action doesn’t open a folder or launch a program—it just leaves you sitting there, watching the animation. The novelty wears off quickly. If you double-click on an animated icon, the minimovie only slows down the action you want to accomplish. Moving animated icons is also a problem, because as soon as you release the mouse button the movie plays.

A final complaint: I Like Icon’s manual, though written in a lively style, is sometimes less than enlightening; there’s no index; the significance of the Icon ID numbers in the browse windows is never adequately explained; and some program features, such as the options in Save dialog boxes, are completely ignored.

Icon 7

ICON 7 IS MUCH SIMPLER AND LESS GLITZY, but in many ways it handles jobs more cleanly and efficiently than I Like Icon.

The program consists of a single system extension that integrates seamlessly with System 7’s Get Info windows. To edit an icon you open the Get Info window and double-click on the icon in it. This opens Icon 7’s Editor window (with the selected icon ready for editing) and adds an Icon 7 menu to the Finders menu bar, thereby providing access to the program’s special editing features.

Icon 7’s editing area is somewhat smaller than I Like Icon’s, and its tools are even more limited. There’s no paintbrush; line widths can’t be changed; and most irritating, the shift key doesn’t constrain the pencil to drawing straight lines. Still, Icon 7 does include a text tool with which you can add text in any available font and size, in sizes up to 18 points.

As with I Like Icon, you can work with a full 256-color palette or just the 34-color Apple Icon Colors palette.

Once you’ve edited an icon, clicking on the Save button closes the editing window, quits Icon 7, and returns you to the Get Info box, where you can see your custom icon pasted in immediately—no need to restart your Mac.

To open an Icon 7 library, you click on the Library button in the Editor window. This replaces the editing area with a scrollable window of icons; click on an on-screen button to transfer any of the library icons into the editing area for use.

Unfortunately, Inline Design gives you little to get started with in the way of an icon collection. With more icons, Icon 7 will be a great customizing tool.

—JOSEPH SCHORR
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Two Backup Programs

Backup and Archiving Software

Retrospect 2.0
Retrospect Remote 2.0

**PROS:** Improved user interface; improved network backup speeds; improved scripting.

**CONS:** Can no longer select most recent version of a document for backup.

**COMPANY:** Dantz Development Corporation (510/849-0293).

**LIST PRICE:** Retrospect $249; Retrospect Remote (ten users) $449.

Dantz Development Corporation has upgraded its backup and archiving program with a new user interface and better performance. Retrospect works with virtually all backup media, from the lowly floppy disk to removable media such as SyQuest, Bernoulli, and magnetic optical cartridges, and also supports nearly every tape backup drive ever released for the Macintosh. Many tape drive manufacturers bundle Retrospect with their hardware. In addition to backup, which makes a safety copy of data from a hard drive to a secondary storage medium, Retrospect also excels at archiving, where the data is first copied to the secondary media, then erased from the source disk, in effect moving the data from online to offline storage. If you're backing up a small amount of data to floppy disks and don't need to archive files, you'll probably be better served using Dantz's DiskFit Pro, rather than Retrospect.

One of the main complaints about previous versions of Retrospect was the large number of backup, file-cataloging, and restore options that were available, coupled with a complex interface that required you to navigate through many windows to complete a backup or restore. Dantz has made accessing the basic functions, as well as the more advanced features such as automated backup schedules and scripting, much easier in version 2.0 (see “One Step at a Time”). All of the program's functions are accessed through the Directory window, which splits the program into five areas, each represented by an icon. Clicking on one of the icons displays a list of buttons with a related function. For example, under the Scripts icon, there are buttons to Edit, Run, Check, or Schedule a script.

Scripts in Retrospect 2.0 have been greatly improved. You can now combine many backup or archiving strategies into a single script. For example, you can have a script that backs up three users to one set of tapes every other day, and to a monthly backup set on the second Monday of every month. A summary window lets you view and edit the backup schedule, and a new Script window lets you see the entire script, thus making it easy to modify just a part of a script.

Selectors—a feature that lets you choose files and folders for backup or restore based on a set of criteria—have been completely revised since version 1.3, the prior version of Retrospect. A single window lets you define the criteria for file and folder selection in plain English (for example, "Find files containing 'demo' OR files with a modify date before today"). You can use the logical operators AND and OR to create complex Selectors, and you can now save any number of custom Selectors; Dantz provides some standard Selectors with the program.

Dantz Development has also improved the reporting capabilities of this new version of Retrospect. The Detail Log provides a blow-by-blow report of everything that happens during a backup or restore, and the new Backup Report gives an overview of all volumes (local or remote) backed up, how long the last backup took, and the script used to execute the backup on each volume.

Retrospect Remote is an add-on that allows backup of networked Macs to a central Mac on the network with a backup device such as a tape drive. File-sharing software is not required; you only need to copy the Remote control panel onto each client Mac. Dantz uses serial numbers that are licensed to Remote users. The backup administrator activates each Remote from the backup machine by using the Retrospect application. The administrator needs to type in the ten-digit serial number for each Remote client from a list provided in the Retrospect Remote package. This can be a real chore if you have many Remote users, but it only needs to be done at the initial setup of Remote.

Retrospect Remote worked flawlessly, backing up workstations and AppleShare file servers automatically. Remote backup and especially backup verification is significantly faster. Verifying a backup now takes half the time it took with version 1.3. In my tests, on a 10BaseT Ethernet network with four users and an AppleShare 2.0 server, I backed up using an AppleShare 2.0 running on an IICI. The total amount backed up was about 260MB. Backup and verify time using Retrospect 1.3 was approximately 4 hours and 30 minutes. A similar backup using version 2.0 required approximately 2 hours and 30 minutes, due mainly to much faster verification. In other words, backup is a little faster; verifying the backup is a lot faster.

Remote users can now be notified when a backup has been completed, and also when a backup hasn't occurred; no details of files unsuccessfully backed up are sent to the Remote user, though they are logged at the backup Mac.

Version 1.3 allowed you to select files for a restore by selecting only the most recent version of a file; unfortunately, Dantz removed this useful feature in version 2.0. This feature was especially important for tape backup users, because a DAT tape that has been used for backup many times can contain several chronologically different versions of a given file. A Dantz spokesperson said that the company expects to return the Only Most Recent selector to the program in a future update.

In several talks to Dantz technical support, I found them to be knowledgeable and friendly. The Retrospect 2.0 manual has been rewritten and is much better than previous efforts.

Retrospect 2.0 is a powerful program that works well for all levels of users. It can easily back up an individual Mac, and with very little effort can protect the data of dozens of networked users. For backup and archiving, there's nothing better.

—Tom Negriino
Like most color printers, this one works best if you use the right paper.

Color printing on plain paper is, no doubt about it, a remarkable achievement. But we know there are times when you wish you weren't limited to an 8½" x 11" white piece of paper. You know, those times when you need a Phaser™ III color printer.

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Call 800/835-6100, Dept. 30-C for a free output sample. If you can't wait and want more information, we'll gladly fax it to you. Just call 503/682-7450 and ask for document 1230.
SafeDeposit could be the last word in automated backup. But there are some serious flaws that have to be fixed first.

First, backups are slow compared with those of other programs. As a test, I backed up a half-filled Quantum 240MB drive to two SyQuest 88MB removable cartridges. The process, creating uncompressed backup files and with time for one quick cartridge change, took about 25 minutes. The compressed backup took about 50 minutes. In order to get SafeDeposit to run at this rate, I set its file buffer to 512K. With a standard file buffer of 32K, SafeDeposit is even slower.

With the higher buffer setting, the amount of RAM gobbled up by the extension increased from around 500K to nearly 900K. In contrast, I backed up the same files using Fifth Generation Systems' FastBack Plus 3.01, and the whole process, using FastBack's tightest compression method, took only over 17 minutes (if I had used the faster method, it would have taken several minutes less).

The process of unattended backups is seriously compromised by SafeDeposit's annoying habit of aborting a backup if it runs out of disk space. Although there is a dialog box that tells you to insert another disk to continue the backup, the warning consists of a countdown (3 seconds by default, but you can set the countdown to run for longer periods). If you don't catch the message in time and you're hardly likely to if you're not present during the backup—your only notification that something went wrong is a sad-face icon in the SafeDeposit application. Each time I tried to continue a backup, the whole process started from scratch.

Dayna's technical-support people were still being brought up to speed on SafeDeposit when I telephoned them. Support is a toll call, responses are quick, and the support people were always friendly. But I was promised callbacks on complex questions that never came.

SafeDeposit's shadowing technology could also use some help. It works, but if the backup disk isn't mounted on your Mac, when you're working with files slated for real-time backup, there's no request to insert the missing disk. You could work happily along, have a crash or other mishap, and then find that the valuable work you expected to be backed up just isn't there. (Once the disk is mounted, however, the warning notices do appear when the disk is dismounted.)

SafeDeposit has a number of laudable goals and some powerful features, and it's easy to configure and use. But it has some shortcomings that need to be addressed before I can recommend it without reservation.—Gene Steinberg

Mathematica 2.2

**PROS:** Sets the standard in symbolic computing; huge variety of training materials available; Function Browser solves easier interface problems.

**CONS:** None. **COMPANY:** Wolfram Research (217/358-0700). **LIST PRICE:** $995.

**Mathematica is easily the most esoteric product ever to achieve commercial success.** From the outset, the program aimed not just to satisfy the needs of college math students or working engineers or other such plausible markets, but further, to offer every aspect of modern mathematics that can be implemented on a computer (for that matter, we may yet see an algebraic topology package cobbled together some day).

Version 2.2 adds a set of improvements to computational routines. It's faster at numerical solutions of sets of linear equations (an average factor of three times faster on my test sets), and symbolic solutions can be found in sets in Mathematica used to find objectionable. It uses complete integral methods as a type of solution of nonlinear first-order differential equations. In addition to nonlinear differential equations and first-order partial differential equations, another new extension to the calculus package is a set of functions for variational methods. The powerful package which Mathematica used to give incorrect answers for symbolic definite integrals have been fixed. There are now packages for elliptic integrals and curve fitting by splines, and random-number handling is more sophisticated. **Version 2.2 generates 3-D contour plots and includes a useful package for audio-signal analysis and an entertaining package full of music options. MathLink, the utility that links Mathematica to the rest of the world and to the C language, has been updated to support a single Mathematica front end communicating with kernels on several different machines.

All these extensions and enhancements in 2.2 were to be expected, since Mathematica is by design easily extensible and permits addition of new packages in response to popular demand. The real news in the Macintosh version, particularly for new users, is the Function Browser. The Big Problem with Mathematica, from a Mac interface standpoint, has always been that you were required to continue
Oh, it's not a total downer. We stored our data on Verbatim, didn't we?

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type in command expressions, often quite long ones, with correct syntax and punctuation and capitalization. If you inadvertently made a usage error in the command expression, the program's most typical response was simply to take no action when the command was entered. You could then at your leisure consult the thousand pages of the Wolfram Bible (Mathematica, second edition, Addison-Wesley, 1991) to determine where you had erred.

That less-than-acceptable situation has been fixed. The Function Browser has scrolling lists of all Mathematica operations, a generous chunk of help for each item, and a Paste button (see "Just Looking"). You can look up Plot3D, read the usage instructions, paste the command into your Notebook, and swap in your own parameters, in blissful assurance that you haven't missed any commas or brackets. As small as this feature might seem, in practice it changes everything. You can check out new package features in minutes, play with the program rather than work at it, and experiment with new techniques without a laپel of documentation. Mathematica is now, at last, a real Macintosh program.

Like its predecessors, Mathematica 2.2 still wants all the resources you've got. The "5MB recommended" in the product literature is an instance of the impish Wolfram sense of humor rather than a real hardware spec: running in 8MB is a bit of a pinch, and you will need 12MB if you want to have other programs open at the same time. In fairness, however, there's no way to provide such a huge range of facilities without taking up much space, and memory is actually the cheapest resource in the computing environment. Version 2.2 is faster on Mathematica as easy to use as it should be. It's the one essential program in science and mathematics.—CHARLES SEITER

## Reviews

### EMBARC

**Portable Wireless Message Service**

**PROS:** Full U.S. coverage; rapid message delivery; variety of news and info services.

**CONS:** Primitive message management; no gateways for popular consumer information services; limited message size; monthly fees plus fee per message.

**COMPANY:** Embarc

**Communication Services, a division of Motorola**

(407/364-2000)

**LIST PRICE:** $395 plus $25 setup and fees per message.

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**U sing a Pager-Size Electronic receiver, EMBARC (Electronic Mail Broadcast to a Roaming Computer), you can stay info-current in more than 200 U.S. and Canadian cities. This new wireless product pipes electronic mail, news, weather, and even sports directly into your PowerBook or other Macintosh.**

To use the EMBARC hardware-software package, you must subscribe to Motorola's data paging system of the same name. The EMBARC paging system works by broadcasting messages—either news items or individual E-mail—from transmitters located in major metropolitan areas. The Motorola NewsStream receiver "hears" all messages broadcast in its area and saves those targeted for you in its 32K of memory for automatic transfer to your computer later.

The EMBARC package includes the NewsStream receiver, the EMBARC message-management application, and a start-up subscription to the EMBARC messaging service. The thorough (but unindexed) manual guides you through a simple installation procedure, letting you receive messages immediately. The starter subscription includes USA Today news briefs, updated three times daily. You can add other information services, such as stock-market quotes or custom electronic-news extraction, for an additional monthly charge. You also receive a GE BusinessTalk E-mail address. The EMBARC system automatically transmits messages dedicated to this address from other BusinessTalk users, or from other E-mail services through mail gateways. Currently supported gateways are MCI-Mail, SprintMail, IBM-INET, and AppleLink, with future X-400-compatible services to be added. Consumer-oriented online systems such as America Online, CompuServe, and GEnie aren't X-400-compatible, and aren't slated for gateway service in the foreseeable future, according to Embarc.

You carry the NewsStream receiver with you like a pager. Whenever the receiver captures news or E-mail, it beeps and blinks a messages-waiting light. When you next attach the receiver to your PowerBook or base computer, the EMBARC application automatically downloads the waiting messages in a process taking from one to five minutes.

The EMBARC application also doubles as a modem-based communications program. Because the NewsStream is a receiver, not a transmitter, you must log on to Embarc's central computer—called the Switch—to send replies or forward messages. The application automatically dials the remote system and handles these chores. Because messages are consecutively numbered, the application can tell you when you've missed messages (because the receiver was turned off or was outside the coverage area). The Switch keeps a copy of all messages for several days, so you can retrieve missed items.

While the EMBARC application works well for basic message-reading chores, it has somewhat primitive facilities for message management and transmission. Once you've read a message, the only options available are deleting it, saving it to a file, or leaving it in your inbox. To archive messages you must save each one to a separate TeachText file. Unfortunately, you can't view saved messages from within the application. You are also required to enter special commands in message subject lines when sending a priority message or directing a message to a specific geographical area (this method minimizes messaging costs; otherwise a message goes to all area codes). For example, to send a priority message to the 213 area of Los Angeles, you must type [EMNA=213.415,PRTY=P]. This is an error-prone process.

Message fees add up fast. There is an access fee for each message you send—from $0.35 to $1.00 per address depending on the length of the message—plus airtime charges from $0.18 to $2.52 per 100 characters, depending on the number of area codes and delivery priority. When you send to another EMBARC user, you pay all charges; you pay nothing to receive EMBARC-originated messages. You do pay all charges for gateway-originated E-mail.

The monthly fees and usage costs, plus the limited gateway access, make EMBARC a tough sell to the consumer market. However, if you're a PowerBook user who is frequently in places with no telephone, and you need timely delivery of electronic news and E-mail, you may find EMBARC useful.—JESI BECKMAN

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**Just Looking**

The Function Browser includes both function descriptions and a paste option, so you can find the function you need and just paste it into your Notebook.

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**MACWORLD September 1993 65**
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**VideoToolkit 2.0.1**

**Low-Cost Video Editor**

**PROS:** Low cost; works with many types of consumer and professional equipment; supports QuickTime.  
**CONS:** Slow response time; interface needs streamlining.  
**COMPANY:** Abbate Video (508/576-3712).  
**LIST PRICE:** $279.

If you’re a video enthusiast, it’s easy to be enticed by digital editing systems like SuperMac Technology’s DigitalFilm. Unfortunately, the high cost of desktop video puts it beyond the reach of many users. For those who need to catalog and edit videotapes on a budget, VideoToolkit is an attractive, inexpensive solution.

VideoToolkit controls up to two source VCRs and one record VCR using a special cable that comes with the package. One end of the cable connects to the Macintosh serial port; the other end sports three separate connectors—a miniature control-L plug suitable for most camcorders, a five-pin plug for some Sony VCRs, and a mini control-S plug that connects to some Sony recorders. (Cables for other decks are available from Abbate Video for an additional charge.)

A small device that fits onto the cable’s control-S plug also lets you record on consumer-type VCRs that use infrared remote controls. (My only gripe is that the cable could be a foot or two longer.)

When you launch VideoToolkit, you’re presented with a setup window that lets you specify control parameters for the source and record VCRs. The VCR Type pop-up menu lists an astonishing array of recorders, ranging from low-end camcorders to frame-accurate decks like the NEC PC-VCR and Sony Vdeck. The setup screen also lets you choose the timing protocol that determines how VideoToolkit locates video sequences on tape: many high-end decks support time code that lets you pinpoint scenes down to the precise frame, while most consumer VCRs use a numeric tape counter, which is far less accurate.

The first step in the editing process is to identify key scenes on the source tape. You can watch the source footage on a separate TV monitor, or you can view it on the Macintosh screen if you have a video-digitizing board. As the tape rolls, you indicate in and out points for each clip by selecting Mark In or Mark Out from the Clip menu or by using keyboard commands. VideoToolkit prompts you to enter a name to identify each scene. You can instruct VideoToolkit to pause the source tape when you reach the clip’s out point, so you can name the scene without missing any action.

VideoToolkit creates a separate index card for every clip, showing the clip’s name, its in and out points, and its duration. Two text fields let you enter descriptions of the scene’s video and audio tracks, and a check box lets you mark the clip as critical.

If you’re using a digitizer, VideoToolkit displays snapshots of the clip’s in and out frames. From there, you can have VideoToolkit rewind and rezero the source tape periodically.

In addition to transferring scenes from tape to tape, you can create QuickTime movies if you have a suitable digitizing board. For recording QuickTime sound tracks, VideoToolkit works with the internal audio digitizer on sound-capable Macs or with third-party digitizers. When you assemble an edit list in QuickTime, each scene becomes a separate video file. You can fine-tune the clips using a QuickTime editing application like Adobe Premiere, and then import the revised edit list back into VideoToolkit for final assembly.

I put VideoToolkit through its paces on a Mac IIx using a Sony CCD TR-5 camcorder as a source deck and a Zenith VCR as a record deck. I also tested QuickTime recording on a Quadra 800 equipped with a Radius VideoVision digitizing board. Of course, the quality of the final tape depends on the equipment you use, but I was impressed with the results I obtained with my low-end gear. I did encounter a few minor glitches: VideoToolkit occasionally lost control of my camcorder while logging tapes, forcing me to quit and relaunch. And because VideoToolkit is based on HyperCard, response seemed sluggish at times.

VideoToolkit’s interface also could be streamlined and its menus better organized. Despite those few rough edges, though, VideoToolkit is a very good choice for videotape editing and logging.

—FRANKLIN N. TESSLER

**Virtual 3.0.1**

**Virtual Memory Utility**

**PROS:** The only game in town for System 6 users; faster than System 7’s virtual memory; DiskSaver feature reduces hard disk virtual memory partition.  
**CONS:** Works only with 68030 processors (despite manual’s claim).  
**COMPANY:** Connectix Corporation (415/571-5100).  
**LIST PRICE:** $99.

In 1988, three years before virtual memory made it into System 7, Connectix offered the feature to System 6 users. Virtual memory is a way of using hard disk space to swap data into RAM, to allow you to address more memory than is installed in your Mac’s memory banks. The price is performance. RAM speed is measured in nanoseconds, and hard disk access speed is measured in milliseconds, so a slowdown is inevitable.

But when virtual memory is used carefully, this slowdown is acceptable. With the advent of System 7, and Apple’s virtual memory, one might have thought that Virtual would be useful only with System 6. But that’s not necessarily so. The newest version of Virtual does provide a performance boost over Apple’s version.

Virtual provides two alternative settings. DiskSaver sacrifices performance but allows you to limit the virtual-memory space on your hard disk to a selected amount. Virtual’s normal setting and System 7’s virtual memory require setting aside space on a hard disk for total application memory, RAM plus Virtual memory. DiskSaver may be a boon to PowerBook users, continu...
Picture this. It’s four o’clock and you’ve closed the deal. But, you need to check the inventory database at the plant and fax the order confirmation by five. You jump out of the cab. Your portable modem falls. The cabbie takes off, and crunch. Now what? Well we ran over our new OPTIMA+ FAX144 Pocket Edition in its soft carrying case and the OPTIMA still communicated... flawlessly.

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where more RAM remains expensive and
hard disk space is at a premium. Since vir-
tual memory is disk intensive, Virtual is
automatically switched off when you run
the PowerBook on its battery, to extend
battery life.

Virtual is easy to use. The handy con-
trol panel allows you to choose the
amount of memory, whether DiskSaver
should be active, and the location of the
virtual swap file (the file created on your
hard drive to hold data that cannot fit in
RAM). Additional options allow you to
select page size, to optimize performance
for larger hard disks, whether to delete
the swap file when Virtual is off, and
whether to store the swap file in con-
tinuous space. This last requires unfrag-
mented space on your drive, but Con-
nectix claims it reduces hard disk access
time and thus speeds up performance.

Benchmarking Virtual is difficult.
Performance depends on the speed of
your hard disk, the size of the applications
you use, the amount of virtual memory
you select, and the kind of work you do,
to name a few factors. For example,
graphics and database software, as a result
of heavy RAM and disk access, is apt to
tax virtual memory.

As one test, I sorted a 6900-record
file in FileMaker Pro on my PowerBook
180. I set total memory to twice that of
the installed RAM. In its regular mode,
Virtual ran at 96 percent of the rate of
the PowerBook without virtual memory.
The DiskSaver setting clocked in at 92 per-
cent, and Apple's virtual memory brought
up the rear at 88 percent.

In day-to-day work, it was hard to
perceive much of a difference in perform-
ance. If you do word processing or
simple desktop publishing work, you'll
probably see little if any performance
deterioration.

Quirks were few and far between.
Virtual gave little warning when my hard
disk didn't have enough contiguous space
to build a swap file. I had to open the
control panel to get a message box indicat-
ing that Virtual couldn't load.

Tech support is a toll-free phone call.
The manual is brief, but provides some
very helpful advice on maximizing per-
formance when virtual memory is active.

If you use virtual memory only occa-
sionally, the performance boost provid-
ed by Virtual over Apple's virtual mem-
ory may not be terribly important. For
the price of Virtual, you could buy anoth-
er 2MB or more of RAM for most desk-
top Macs. But if you need to eke out as
much virtual memory speed as possible,
Virtual remains a useful tool. If you're
still using System 6, it's the only choice
you have. —GENE STEINBERG

### FontMonger 1.5.7

**Font-Conversion Utility**

| PROS: | Provides cross-platform, cross-format font conversion; makes it easy to create composite, subscript, superscript, and rotated characters; allows management of character outlines with simple drawing tools; imports graphics files as new font characters. |
| CONS: | Has some font-name problems in cross-platform conversions; automatic hinting and kerning is less refined than in hand-tossed fonts. |

**COMPANY:** Aces Software Corporation (415/578-9090)

**LIST PRICE:** Version 1.5.9 $149.95

When FontMonger arrived nearly three years ago, its claim to fame was that it could convert the new TrueType fonts into PostScript Type 1 or Type 3 format, and vice versa. Version 1.5 builds neatly on this trick, incorporating not only additional formats and cross-platform compatibility, but also enhanced character modification and editing tools. People who want to create a font from scratch should look to the higher-end Fontographer from Altsys Corporation or FontStudio from Letraset, but FontMonger 1.5 will suit the needs of many a harried desktop publisher.

Working on the same document on a Mac at the office and on a DOS PC at home can be frustrating if you don't have the same fonts installed on each system. FontMonger 1.5 lets you convert TrueType or PostScript Type 1 or Type 3 fonts to either platform. It can read and from the Nimbus Q and Next PostScript Type 1 formats, and it can read Laser-

Master LXX, CorelDraw WFN, and Agfa Intellifont formats. The fonts convert nicely enough, but sometimes the resulting font names, particularly as they apply to weights (light, medium, and bold, for instance), are inconsistent between platforms. The new Convert Batch feature is handy for converting several fonts at once, and FontMonger's ability to scan your hard disk or designated folders for fonts is definitely a timesaver.

Converting fonts is a fairly pedestrian
task, but FontMonger's facility for cutting and pasting characters from other fonts into your new one can be a real boon. You can even import a logo designed in a drawing program such as Adobe Illustrator, Aldus FreeHand, or Deneba's Canvas into your new font. The drawing tools included in FontMonger 1.5 aren't up to designing the corporate logo, but they are quite adequate for simple editing of individual outlines.

To modify an entire font or a select-
ed range of characters, you generally work in a window that simulates the comput-
er's keyboard; the convenient new Char-
acter Chart window, however, displays all the glyphs (type-talk for characters and symbols), even the unencoded ones, in a

grid-like layout. There's also a new Alter Character window that lets you edit individual glyphs or create composites. Builtin slant, rotate, scale, and width tools can be accessed either by pulling on handles that surround the glyph or by typing numbers (percent of "normal") into the appropriate boxes. Clicking on the pen tool reveals the glyph's outlines, replete with Béziers.

For many publishing tasks, Font-
Monger is a godsend. You should take care to adhere to the licensing agreements attached to your original fonts, and de-

voted font aficionados may quibble with
the automated hinting and kerning schemes—hand-tuning a font will always yield the more-perfect form—but in this

newest guise, FontMonger is a tool that
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type designer is sure to find useful.

—SUZANNE STEFANAC
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MarcoPolo 2.0

Document Imaging and Management

PROS: Can search by title, contents, keywords, or comments; built-in scanner interface; user access control; can use predefined keywords; easy-to-use query panel. CONS: Cannot create groups for access control; no OCR capabilities.

COMPANY: Mainstay (800/4/849/400).
LIST PRICE: $395.

IF IT'S TIME FOR YOU OR YOUR WORKGROUP to organize those files and papers flying across your desk, then take a good look at MarcoPolo from Mainstay. MarcoPolo 2.0 provides easy document imaging and management for individual and group users alike.

MarcoPolo is organized around the concept of the document center, which stores searchable images of documents either on your Mac (an individual document center) or on a file server (a group document center). Aside from the network connection, you use both individual and group document centers in the same way.

Mainstay has increased the number of methods you can use to archive a document, making the process much easier than in previous versions. First, you can use the MarcoPolo application to import documents into a document center. You can also create a temporary archive on your hard drive by “printing” to the document center. Select the document center in the Chooser, then choose print from within the file you want to archive. The temporary file is then archived into the document center the next time you open MarcoPolo. The newer, easier methods of archiving include the ability to (1) drag a file to a MarcoPolo drop folder on your desktop, and (2) use a Mainstay INIT to add an Archive function to the application’s File menu. I found the Archive menu option to be very convenient.

You can add any type of document to a MarcoPolo document center. If you print to a document center or use the Archive option, MarcoPolo indexes all text within the document. MarcoPolo can import Glue, PICT, text-only, EPS, MacPaint, and MarkUp file formats. MarcoPolo can now also archive sound files and QuickTime movies.

When you archive a document using MarcoPolo, you can assign up to six keywords for document classification and specify which of the document center’s users have access to the document. Unfortunately, MarcoPolo does not allow you to designate a group. To make document classification easier in workgroups, MarcoPolo allows the document center administrator to define the keywords users can use when classifying archived documents. This way, everyone uses the same word for a classification and knows what to look for next—for example, have everyone use car instead of auto as a keyword, since searching for one won’t find the other.

MarcoPolo is a true archiving solution. It permits you to store multiple copies of a document with the same name. Identically named files are distinguished by the time and date of archiving, making it convenient to use MarcoPolo for managing edited documents. For example, when you include an original document (such as a Microsoft Word file) with its archived image, other users on the network can retrieve the original document, make changes, and archive the resulting new version without replacing the original document.

Once you’ve archived documents, any authorized user can search for documents. You can search by either the document’s name or its contents, date the document was archived, original creator of the document, and keywords. Version 2.0 now lets you search multiple document centers at the same time. Selecting search criteria is as easy as selecting from a list of predefined words and either entering text or selecting a term, keyword, or date from a list of options. To help you verify the query, MarcoPolo then constructs a sentence using the terms you used in your search query.

To track documents that are not already in an electronic format, MarcoPolo 2.0 includes a built-in interface to Apple- and TWAIN-compatible scanners. MarcoPolo allows you to scan in documents and store images of those documents in a document center for later retrieval. Unfortunately, however, MarcoPolo doesn’t include any OCR capabilities, so unless you use a separate OCR program to recognize the text, you’ll only be able to search by the document’s name and any assigned keywords.

MarcoPolo is an easy-to-use, inexpensive product for archiving and retrieving documents, whether you initially received them in electronic or paper form. I routinely use it to locate documents in an individual document center as well as in a workgroup document center. Queries are easy to construct, and searches are handled quickly.

—DAVE KOSIUR

Chameleon 2.0.3

Desktop Pattern Utility

PROS: Sleek interface; collection of gorgeous patterns included; can save custom patterns to disk as separate documents. CONS: No zoom feature in editor; limited drawing tools.

COMPANY: Logical Solutions (612/659-2495).
LIST PRICE: $59.95.

CHAMELEON IS A SLICK AND SIMPLE desktop-pattern editor that lets you create and display patterns that far surpass the standard 8-color, 64-pixel jobs included with Apple’s system software.

With Chameleon, you can transform your desktop into a blanket of blue plaid or a sea of aquamarine marble. And if the program’s dozens of exquisite, large-scale textured patterns don’t impress you, you can use Chameleon’s limited but functional editing tools to create your own patterns or doctor somebody else’s.

Unlike Thought I Could’s Wallpaper, another similarly priced desktop-pattern editor, Chameleon is not a control panel; it’s a stand-alone application. The program’s main interface, the pattern window, is equipped with seven buttons you use to cycle through the active set of patterns stored in the program. The active set can contain as many as 256 patterns. You can add patterns to the set by importing them (documents containing sets of stunning patterns are included), and you can export designs. To streamline pattern selection, there are numerous keyboard shortcuts available in the pattern window, and all are clearly documented in the manual.

With Chameleon’s preview feature, you can apply a pattern to your desktop temporarily by double-clicking on the pattern displayed in the pattern window. To permanently apply the new pattern so that it will remain the next time you restart your Mac, you just click on the Install button (or press #5).

The patterns supplied are truly outstanding. The rich, textured color images include a whole collection of gorgeous marblesized patterns licensed from Artbeats, a company that specializes in backgrounds and textures for desktop publishing and multimedia. Especially impressive are those in which the 128-by-128-pixel repeating patterns blend seamlessly into one another to create what appears to be a solid texture across the whole screen. (The program disk also continues...)

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includes a collection of smaller-size patterns and black-and-white patterns.)

Chameleon provides an uncomplicated environment for creating screen patterns from scratch. The pattern editor displays an enlarged Fat Bits-type view of your work, and you can adjust the size of the editor window to accommodate the dimensions of the pattern you want to create—from 8 by 8 pixels to 128 by 128. The window also adjusts to create rectangular patterns, with dimensions of, say, 64 by 128. The Modify menu contains commands for the rotation, horizontal and vertical flipping, and color inversion of pattern elements.

The available painting tools are surprisingly weak. There's no paintbrush, no lasso tool, and no zoom feature. Also, you can't change line width or pencil size, and you can't constrain the pencil or the line tool to draw perfect horizontal or vertical lines. The 256-color palette is oddly designed, too, with very tiny color tiles.

To preview your work, you click on an eye icon at the lower left of the editor window. This temporarily hides the window and applies the pattern-in-progress to the Mac desktop so you can see how it will look in actual use.

Chameleon's documentation provides clear instructions for using all the program's features and includes some sensible guidelines for designing patterns that won't make you dizzy after a few hours on the desktop. "If you find large areas of yellow, red, blue, and green all in the same pattern, it's time to start over," the manual politely admonishes.

Of course, there are cheaper alternatives to products such as Chameleon. If you'd like to decorate your desktop with large, dramatic patterns, but don't intend to create your own, shareware such as Desktop Textures (which includes some beautiful textured patterns and can be downloaded from online services) will do the trick—and do it well. But if authoring your own desktop patterns seems important enough to justify paying $59.95, Chameleon is a fine tool for the job.—JOSEPH SCHORR

**CPU 2.0**

**PowerBook Utility**

**PROS:** Novice and expert interfaces; file synchronization; extensive power management; comprehensive keyboard shortcuts.

**CONS:** Synchronization confusing; documentation insufficient; features easily bypassed.

**COMPANY:** Connectix Corporation (415/571-1000) LIST PRICE: $99.

**CONNECTIX POWERBOOK UTILITIES**

CPU 2.0 was the first collection of utilities designed specifically for PowerBook users. Now there's competition from the likes of Claris and Symantee, so Connectix has introduced CPU 2.0.

Most of CPU's features are accessed through a single control panel. With version 1.0, you configure each feature individually by clicking on an icon in a scroll box and then changing the settings that appear. You can still do this using the Fine-Tune mode in version 2.0, but the QuickConfigure mode allows you to toggle options for all features via one set of check boxes. And all of the power-management features can be adjusted at once, using a single slider bar to trade battery life for faster computing. CPU 2.0 also has an expanded menu at the right side of the menu bar for going directly to the Fine-Tune mode of any feature. You need not open the control panel to enter Sleep mode, adjust backlighting, change SCSI disk mode ID (on PowerBooks except the 100 and 140), switch modem ports, or toggle AppleTalk without restarting.

The separate EasySync extension checks for duplicates whenever you drag files from one location to another. If a file in the destination has the same name as a source file, you can merge, sync, replace, or cancel. Replace and Cancel are the only options the Finder would offer under these conditions; simply replace the existing file at the destination. Merging means copying newer versions from the source.

Sync is a two-way merge: newer versions in the destination are also copied back to the source. In neither case does EasySync bother copying unmodified files that exist in both locations. This is similar to the Smart Replace feature of Fifth Generation Systems' CopyDoublah, but without the improved copying performance.

To automate a drag-and-drop procedure, you can record EasySync scripts called Syncllets. Creating and using Syncllets can be difficult to comprehend; however, with considerable experimentation you can use this feature to automatically synchronize files at start-up and create backups. EasySync synchronizes files, not content. Synchronizing the modified records of two databases, for example, requires a database manager that features content synchronization, such as Portfolio Software's Dynadox 3.0.

Managing power has always been CPU's strongest suit. CPU lets you specify the period of inactivity that invokes battery-life saving measures. CPU also allows different settings depending on whether the PowerBook is running on battery or AC power. For models with variable-speed processors (all PowerBooks except the 100 and 140), CPU slows down a Mac running on battery power, and speeds up a Mac that's plugged in.

Keyboard Power lets you access just about any menu or dialog box option with keystrokes. And user-configurable hot keys provide instantaneous control over spin-down, sleep, and backlight settings. By using the control key in combination with the arrow keys and numbers, version 2.0 mimics the page up, page down, home, end, forward delete, and 15 function keys found on the Apple Extended Keyboard. To help you keep track of most of these keyboard options, Connectix has added a Hot Keys Summary screen.

CPU has always maintained preference sets that determine how the PowerBook behaves depending on the user or the location. New in version 2.0 is the Punch Through command; which simultaneously configures specific features the same way in all sets belonging to a particular user. And CPU now remembers what printer and desktop patterns were last used with each set. Other minor improvements to CPU 2.0 include the ability to dim external monitors as well as the PowerBook's own display. AppMananger switches between active applications using hot keys, but I prefer using System 7's Application menu.

Finally, CPU 2.0 has new menu-bar indicators that show when the PowerBook is reading from and writing to SCSI devices and floppies. I'm still waiting for an indicator that shows whether the hard drive is spinning.

With version 2.0, Connectix addresses most of the shortcomings of the first release, except that CPU's security features can still be bypassed by inserting a bootable System disk and restarting. Nonetheless, the new stuff easily justifies the upgrade price of $19.95. And PowerBook owners looking for their first utilities package should definitely consider CPU 2.0. I consider this extensive collection of features indispensable and reasonably priced.—OWEN W. LINZMAYER
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SoftPolish 1.1

**Program-Quality-Assurance Utility**

**PROS:** Works with all Mac programming languages; fast checking of all important interface details. **CONS:** User can't adjust some specific details. **COMPANY:** Language Systems Corporation (703/478-0181). **LIST PRICE:** $295.

SoftPolish is a programming tool that belongs in the software library of any company that hopes to produce successful commercial Macintosh applications.

SoftPolish automatically identifies the resources in a program's interface, and then systematically checks all of them against a huge laundry list of possible errors. Most of the errors are the kind of tiny nagging details that would drive a programmer crazy to track down, while others are really damaging. As an example of small aesthetic points, SoftPolish checks for proper use of quotation marks, capitalization in menus, and ellipses. To prevent a program's designers from appearing hopelessly gauche to software users, it also checks spelling, word spacing, and layout of control items. Finally, SoftPolish makes sure the final product will fit without problems on the millions of Macs with 9-inch screens. It performs these services with amazing speed (it can zip through a problem-sparsely 300K application in a few minutes) and logs the results to a suggestions file for reference.

Language Systems, best known for the leading Mac version of FORTRAN, recommends using this program early in the programming process and often. If SoftPolish is invoked at the beginning of a development cycle, ongoing quality control can enforce interface consistency; if it's called in at the end, programmers might find themselves scrolling through 50 pages of details that have to be fixed before an application ships.

It's particularly instructive to run SoftPolish on shipping commercial applications. It will flag, for example, a dialog box where it feels the text is too crowded—when you run the application and find the box, you find SoftPolish has remarkably fine discrimination. In a nasty mood I could complain about ten well-known applications that produce yards of correction file printout from a SoftPolish check. In a more benevolent state of mind, I would say that any company producing a Mac version of a program first coded for Windows desperately needs this product. If this warning isn't enough, there are several other developers' incentives in the SoftPolish package. It automatically removes testing and debugging resources (you provide the list), sets all files and folders to the date you specify for final cleanup, and it provides logs not just of errors but also of corrections. You can even have SoftPolish provide you with a list of strings in resources as a starting point for documentation, or to produce a foreign-language version of your application.

It would help if there were some form of user customization of SoftPolish's internal guidelines about correct screen layout, but this is a small complaint. SoftPolish is well worth its price to serious programmers, and I can only hope that Language Systems keeps extending it.—CHARLES SEITER

SmartStack

**Storage Peripherals**

**PROS:** Simple, neat cabling; easy to configure. **CONS:** Expensive. **COMPANY:** Envisio (612/628-6288). **LIST PRICE:** SmartSource $199; SmartModule HD125 (Quantum) $549; SmartModule HD1225 (Quantum) $2099; SmartModule MC1284MB $1799; SmartModule DAT $2199; SmartModule 105MB Removable $999.

The biggest question to ask about a product is Do I need it? With SmartStack storage peripherals, the answer is probably no. The SmartStack modules address a problem many of us deal with daily—cable clutter—but only true near-freaks will need or want this expensive solution. The SmartStack line of modules—each housing a 3½-inch drive—includes a digital audio-tape (DAT) drive, a SyQuest 105MB removable drive, a 128MB magneto-optical drive, and a slew of Quantum and Conner hard drives ranging in capacity from 120MB to 1370MB.

The SmartStack allows you to stack these modules on top of a common power supply. A flexible design lets you add new modules to the top of the stack with a minimum of effort. Only the back of the power supply—the base unit Envisio calls the SmartSource—has cabling attached.

The base unit houses a single 120W power supply that feeds up to seven modules. Both power and data are conducted through a bus that runs vertically through all of the devices on the stack. The connectors—which look like SCSI connectors but are actually a proprietary design—sit on the top and bottom of each unit. The base and a lid on the top of the stack are the bread in this high-tech sandwich. A connector on the lid passes back the power and SCSI signals so that the entire stack is grounded and terminated. Slick. And it works.

The primary benefit of the SmartStack is fewer cables. You attach only one power cable and one SCSI cable to the stack regardless of how many devices you have—the rules of SCSI and the laws of physics notwithstanding. This means that if you're using a Centris 650 with an internal hard drive, you can have six additional hard drives on your SmartStack. Of course you're not limited to hard drives.

If you already have a significant investment in drives, Envisio provides a kit to convert any 3½-inch drive into a SmartStack module. The SmartKit costs $99.

Prices for modules are high compared with like mechanisms. Although value varies by module, you could easily expect to pay 50 percent more than the going external prices (that's with a power supply). First-time buyers must spend an additional $200 for a base unit. Is the extra $200 to $400 worth it? I like the SmartStack's simplicity and expandability, but with the extra cash I could buy over 150MB more storage space. And since there's only a one-year warranty (when many products now offer three- to five-year warranties), I recommend you wait until the prices come down.

Still, the SmartStack does provide an option for the certifiably neat.—TIM WARNER

**Making a List, Checking It Twice** SoftPolish will inspect the resources associated with any Mac program, and flag spelling errors, interface problems, and screen aesthetic infelicities. Note the encyclopedic set of test conditions.
Junk bond dealers? Drug lords? Savings and Loan presidents?

Nope, they're computer hackers. And judging by their physical appearance, you wouldn't think you'd need any protection from them. But you do. Or should we say, your computer does.

And to keep these criminally minded people from infecting your files, floppies and various software programs, you need SAM 3.5 anti-virus software.

You see, SAM will constantly monitor for 14 suspicious viral activities. Which is more than any other anti-virus program on the market. And it's the only program that will scan compressed files in System 6.0 and 7.0.

So basically, if your Mac has a virus, SAM will detect it, get rid of it and repair the file. And if your Mac is virus-free, SAM will help to make sure it stays that way. Because it monitors your Mac transparently, working behind the scenes, and only interrupting when a virus is found.

What's more, SAM is simple to install on a Macintosh networking system, as well as a single-user Mac. All you need to do is load the program disk, double-click on the Installer Icon and let SAM handle the rest.

For the most anti-viral protection, pick up SAM 3.5 at your local retailer. It's the most popular anti-virus program in the world, and will keep you from ever having to deal with this ugly crime. Or these ugly criminals.
SourceSafe 2.1
Programming Software

**PROS:** Multiprotocol control; well-designed command set; superior technical support.

**CONS:** Command-line interface only.

**COMPANY:** One Tree Software (919/821-2300).

**LIST PRICE:** $295, five-pack $1195.

**EVERYTHING'S UNDER CONTROL**

SourceSafe maintains version histories of every piece of code in your programming projects, including user histories.

EasyFlow 1.1
Flowcharting Software

**PROS:** Flowchart can appear in different magnifications in split-screen view; user can control routing of intersecting lines; variety of line endings; base chart and subcharts are stored in one file.

**CONS:** Can only display built-in fonts; symbols limited to three sizes; no customizable symbols; no on-screen rulers for viewing scale; scrolling in split-screen mode not always linked.

**COMPANY:** HavenTree Software (613/544-6035).

**LIST PRICE:** $229.

**THE SEARCH FOR THE IDEAL FLOWCHARTING PROGRAM CONTINUES**

EasyFlow, a program popular in the DOS marketplace, has been ported over to the Macintosh and provides some features not found in competing Mac programs. Unfortunately, the program’s rough edges and distinctly un-Mac-like attributes reflect its DOS heritage.

EasyFlow has three symbols palettes—Dataflow, Organizational, and Standard (that is, program analysis)—which should be adequate for the average user. Unfortunately, EasyFlow doesn’t have an option for creating or importing other symbols, and you’re limited to three predefined sizes for each symbol.

On the plus side, EasyFlow has the widest variety of line endings of any flowcharting program I’ve seen. Line endings include the arrowhead, the crown’s-foot (similar to an arrowhead), an intersected circle, and a bar. Any two of these line endings can be paired (and the pair remains highlighted in the palette) for use at either end of a connector in the flowchart. The palette displaying these options is a bit confusing at first, but I got the hang of it after a few uses.

All Macintosh draw programs allow you to adjust the default spacing between objects by setting up a grid. EasyFlow’s interface for setting grids is one of the most intuitive I’ve seen. When you select Show Grid from the Options menu, EasyFlow automatically draws horizontal and vertical lines in your flowchart. To align objects relative to the edge of the page or to space objects, you simply drag the grid lines to the positions you want. Unfortunately, because EasyFlow lacks on-screen rulers, you won’t be able to accurately gauge the distance between grid lines.

As your drawings get larger, EasyFlow provides two useful options for navigating the flowchart. First, option-clicking centers the drawing on the cursor’s position. Secondly, you can divide the screen horizontally or vertically, or both. Each pane in the split-screen mode presents four magnification settings, so you could see a bird’s-eye view (for navigation, for example) next to a regular-size drawing (for viewing detail). Although the views are supposed to be linked, I noticed that when I scrolled one view outside the area of interest, the other view did not realign.

EasyFlow restricts you to the use of five built-in fonts (EasyBase, EasyBold, EasySubscript, EasySuperscript, and EasyGreek) while drawing a flowchart. When you print, however, you can select one of the fonts in your System file.

EasyFlow allows you to create links between a base chart and subcharts (subcharts are secondary charts that can be linked together, sort of like subtopics in an outline). In this way you can produce a base chart and link highlighted symbols on it to subcharts that contain more details about the process or organization you’re charting. EasyFlow also stores the base chart and its associated subcharts in a single document.

On the whole, EasyFlow is easy to use, but until the program offers better support for Mac fonts and the ability to size flowchart symbols, I would not recommend EasyFlow to any serious flowcharters.

—DAVE KOSIUR
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**COMPANY:** Lascaux Graphics (602/299-0661). **LIST PRICE:** $115.

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**HiQ 2.0**

Numerical Mathematics Software

**PROS:** Fast, competent, thoroughly debugged numerical routines; easily learned interface; improved graphing. **CONS:** No third-party materials. **COMPANY:** Millennium Corporation (408/354-7511). **LIST PRICE:** $995.

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**HiQ** made an impressive debut in 1992. It offered consistently faster calculations than any of its competitors, and it refused to crash on a variety of difficult problems that stalled other programs. The developers had clearly paid considerable attention to interface design as well; the Engineer's Notebook in HiQ proved easier to master than the interfaces of most math programs. At the time I also emphasized what HiQ is not (see Reviews, Macworld, October 1992). It's not Mathematica (or Maple or Theorist), since it doesn't handle symbolic math problems. In a way, it's like MathCAD on steroids (the application takes 3.2MB), except that MathCAD's current version now incorporates a subset of Maple's symbolic routines. HiQ has three great strengths compared with other programs: its differential-equation-solving section is very fast and capable; its matrix math capabilities are excellent; and its notebook format is a very natural interface—it's just like writing a report in which equations solve themselves (see "Murmurs of the Heart").

Version 2.0 adds some important features and improves several others. In HiQ version 1.0, data-import facilities were fairly primitive. Now a matrix stored in nearly any numeric format can be directly imported as the appropriate type of HiQ symbol. Since HiQ is a champion at curve-fitting and modeling, this improved access to existing experimental data really helps. In 2.0 you can have graphs automatically updated as you change equation parameters, and store the set of graphs as an animation. Overlays and contour plots are now easier to use, and animations of contour plots turn out to be an informative representation of equation solutions. The script editor now responds as fast as a good word processor, and the power of compiled scripts has been enhanced with an expanded function set. For example, there's a function that generates a partial derivative mesh on a 2-D data set, making it possible to write a simple one-page script that's equivalent to a finite-element modeling program. Finally, even though 2.0 is bigger than 1.0, most operations (particularly those involving programming loops) actually run faster. And the new package takes only 2½ inches of shelf space (the original HiQ package was bigger than a standard Mac monitor).

The only negative element in the HiQ world is lack of external support. The first version promised a large handbook of solved example problems in HiQ; apparently a corporate shake-up delayed this project. HiQ doesn't offer the large set of handbooks you can get with MathCAD, or the separate tool kits available for Maple, and of course HiQ has nothing like the massive assortment of third-party support materials produced for Mathematica. But for a large range of numeric tasks, HiQ is the right software.—CHARLES SEITER

---

**Murmurs of the Heart** This HiQ notebook models heartbeat instabilities with a set of differential equations; the equations in the text are live, and parameter changes are reflected in the graph.
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ScanPlus Color 6000 for Mac

You can purchase the ScanPlus all by itself for $749, but the company offers a bundle including TimeWorks' Color It image-editing software and Calera's WordScan OCR package that at $899 is a pretty good deal. Neither WordScan nor Color It is the premier program in its category, but both work well, and the bundle saves you approximately $75.

Setting up the ScanPlus is essentially a plug-and-play operation. The scanner itself needs only to be attached to a power source and connected to the computer by means of a SCSI cable to be ready for use. The ScanPlus has only one SCSI port and therefore must always be the last device in the SCSI chain; that's a potential drawback if you have another device with the same requirement.

The included image-scanning software consists of a single plug-in module that can be used with any image-editing program that supports plug-ins (including Color It). Both Color It and WordScan use simple installer programs.

You adjust scanning resolution either through the keyboard or with a software slider bar. There's also an on-screen slider for adjusting the contrast on black-and-white scans. The ScanPlus scanning software allows you to prescan images and then use the marquee to select only the portion of the image you want to capture in the final scan. The initial scans on color images have an overall grayness, but this can be corrected in an image-editing program; Color It’s autocontrast filter works especially well. I also encountered some noticeable splotchiness in the darker gray and shadow areas of color scans; gray-scale scans, however, do not have this problem. As with most desktop scanners, images benefit from some sharpening.

PlusTek's thoughtful design yields one bonus unusual in low-cost scanners. Because it's a sheetfed scanner, the ScanPlus is especially suited to OCR—there’s no need to lift the lid in between pages. And since I've something of a novice at OCR, I was pleased to find that WordScan is easy to use.

Although the ScanPlus is not appropriate for jobs where exact color matching is critical, it’s nevertheless a good, economical color scanner. Its compact size makes it easy to place on a crowded desktop. It excels at repetitive jobs such as creating photo databases or OCR, and if you’re sometimes frustrated because you need to digitally transmit printed materials that didn’t originate on your computer, the ScanPlus Color 6000 may be the answer.

—Matthew Nielsen

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Alchemy III

Molecular-Modeling Software

PROS: Fast, workstation-quality modeling; accepts and outputs data in every standard format.
CONS: Doesn't follow standard Mac window conventions.

Alchemy III is the best Mac program for representing large two-dimensional data sets.

The main drawback of every software-based molecular-modeling system for the Mac has been puny performance—Tektronix's hardware-accelerated CACHe system was for years the only acceptably fast modeler. Alchemy III is still not as fast as CACHe, but it's far less expensive, and on a Macintosh Ici or higher Alchemy III can model decapetides and DNA fragments, in addition to the expected small molecules, with refreshing alacrity (see "Life Itself").

An Alchemy screen presents you with a Main window, in which molecules are assembled and viewed; an Auxiliary window that holds fragments and atoms (selected from Alchemy's generous assortment) for use in building your main molecule; a window of sizing and rotation controls; and a message area that's mostly significant for reporting the status of minimizations. The Build and Display menus are comparable to those in Tripos's big-computer program SYBIL, except that building a molecule is, if anything, faster and easier in Alchemy, and the space-filling views are especially vivid. Although molecular modeling tends to be associated with drug design and other aspects of organic biochemistry, Alchemy's full set of metal atoms and its ability to perform energy minimizations of metal-containing complexes make it useful to inorganic chemists, who, for that matter, are usually investigating compounds whose size is no challenge to a Mac.

Alchemy's energy minimizer uses six terms (bond stretching, angle bending, torsional deformation, van der Waals interaction, out-of-plane bending, and user-specified electrostatic interactions) and can handle fairly complex molecules (cyclic, peptide antibiotics, for example) if you can let it run for several hours. Alchemy supports export/import exchange with the standard modeling program MM2— you can take MM2 output files into Alchemy or build molecules in Alchemy and send them to MM2—as well as exchange with SYBIL, and Alchemy accepts input from the Brookhaven Protein Database and crystallographic coordinate-data.

Against this array of virtues, the absence of a close box or even a Close command for the Main window would not seem to be a major flaw, but in practice it can drive you to distraction; similarly, since there isn't a New command under the File menu, from time to time you find yourself quitting the program and starting it again to get a clean drawing space. Parts of this program's interface were established on other machines before the Mac even supported color, but these window-management aspects simply need to be updated. Nonetheless, at the primary tasks for which scientists buy molecular-modeling software, Alchemy III is today's Macintosh champion.

Charles Seiter

Spyglass Transform 3.0

Scientific Visualization Software

PROS: New version includes graph annotation, better data input, link to Mathematica, and a macro facility; nearly instant color-table and plot-style changes.
CONS: Macro system is fairly difficult; overlay use requires practice.
COMPANY: Spyglass (217/355-6000).
LIST PRICE: $595.

TRANSFORM 3.0, LIKE ITS EARLIER VERSIONS, is the best Mac program for representing large two-dimensional data sets. This might sound like a limited ambition, but most of the important scientific data in the world exists in two-dimensional data sets (even 3-D data is a stack of 2-D slices). Furthermore, most of it exists on computers other than the Mac. The Spyglass strategy is to provide every possible data-input path from other computers to the Mac (and now to Unix machines also), and to use the Mac as a highly interactive display device.

Version 3.0's most important new extensions concern connections to other file types and programs—in the earliest versions of Transform your best bet was to hope that your data could somehow be written out to an HDF (hierarchical data format, a supercomputing standard) file before Transform saw it. You can now control input parameters, headings, and formats of ASCII text tables much more easily than in previous versions. The program now automatically opens GIF, PBM, and XWD files. If your data set as imported has missing elements, 3.0 now offers Kruging in addition to plain interpolation and fill options. Besides importing MatLab files directly, Transform 3.0 supports Mathematica's MathLink (System 7 is required), so you can write functions in Mathematica and plot them automatically in Transform. This is quite important; most installations that have Transform probably have Mathematica as well, and it's much easier to manipulate plots in Transform's interactive environment than in Mathematica's mostly procedure-oriented graphics world.

Transform allows more control over presentation features such as tick marks, axis labels, and titles—formerly the program decided all this for you from data it found in the source data table. Although it's possible to make real presentation graphics by creating overlays in other programs, you may resent the time you spend trying to get things just right. The program still needs a few simple built-in drawing tools for direct creation of overlays.

A power-user enhancement in Transform 3.0 that could likewise call for a modest injection of user-friendliness is the new macro facility. Since most Transform users are familiar with either C or FORTRAN programming, or both, the basic macro commands and rich mathematical function set will find immediate application in advanced image manipulation (you could in principle program most of the functionality of both Adobe Photoshop and high-end DSP programs in Transform macros). But programming is done in a plain-text Notebook window, with no type of debugging or code-checking help, which makes it a chore to code macros more than a few pages in length. A macro recorder would also help with automating low-level chores. Nonetheless, the macro language constitutes an image-manipulation processing tool of amazing scope.

Transform can access data stored in every common format, offers some useful presentation-graphics features, and includes a programming language with a large range of built-in high-level scientific functions. If you need to visualize large quantities of tabular data, Transform 3.0 is not quite the only game in town, but it's the only one worth playing.
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LabTutor 2.0

Tutorial on Laboratory Computer Interfacing

**PROS:** Detailed, thorough exposition of computer interfacing in general; specific training on basics of LabView. **CONS:** Requires LabView and National Instruments interface board to perform exercises. **COMPANY:** J.K. Eaton (415/723-1971). **LIST PRICE:** $50.

**SOMETIMES IN THE 1980S, COMPUTERS** began to replace dozens of familiar laboratory instruments. In the old lab methodology, a researcher would often wire experimental inputs (from, for example, a photocell or thermocouple) directly to a chart recorder to observe changing analog values over time. In the new style, the analog voltages from a transducer are wired to an analog-to-digital converter (ADC) and then from the ADC to a computer; through software, the computer can impersonate not just a chart recorder but an oscilloscope, lock-in amplifier, or nearly any other piece of electronic lab hardware. National Instruments' LabView is a popular Mac program for this purpose, offering hundreds of "virtual instruments" in software; LabTutor is a guide not just to the use of LabView but to ADCs, DACs (digital-to-analog converters), interfacing in general, and postacquisition signal conditioning. It's the best exposition of this material I've seen, and I've been obliged to follow this area since 4-bit microprocessors were the state-of-the-art.

LabTutor was developed at Stanford University for use in undergraduate and graduate mechanical engineering courses, but is perfectly qualified as a study-by-yourself guide to the mysteries of interfacing. Its bargain price, nobly enough, reflects mostly the cost of disk duplication, manual production, and handling; the project that produced LabTutor was funded by Apple and the National Science Foundation, so you've already paid for part of it, indirectly.

Consisting of 11 sections, LabTutor begins by assuming no background in interfacing at all. Seven of the lessons cover general topics (including ADCs, DACs, parallel digital interfacing, the General Purpose Interface Bus, and advanced methods in signal conditioning), while three are LabView-specific (LabView basic operations, virtual instruments, and GPIB boards programmed with LabView). Partly because LabView has set the tone for modern data-acquisition products, LabTutor is a good introduction to other products as well (Strawberry Tree International's Analog Connection, for example). The step-by-step coverage of AD interfacing basics—including the often neglected area of cabling details—is outstandingly clear, and the sound signatures used to illustrate concepts in waveform analysis are truly helpful.

It may be just a large (more than 1MB) HyperCard stack with a manual, but LabTutor is an outstanding example of HyperCard resources used intelligently. If you will be expected to use a computer in a laboratory setting (with or without LabView), or want to make your life really easy as an instructor in an interfacing course, get LabTutor right now.—CHARLES SEITER

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**Magic Typist 2.0**

**Glossary Utility**

**PROS:** Automates typing of repetitive keystrokes; Auto-Learn feature works as you type.

**CONS:** Clunky interface; awkward Phrase Editor; some functions work erratically or not at all in Microsoft Word.

**COMPANY:** Olduvai Corporation (305/670-1112).

**LIST PRICE:** $129.

**I LEARNED TO TYPE WHEN I WAS 11, more years ago than I care to remember, and I sometimes wish, at the end of a long typing session, for a better way. Although I learned the craft reasonably well, entering letters on a keyboard by hand is probably a relic from the nineteenth century. I'm reminded of the scene in the motion picture *Star Trek IV—The Voyage Home* where Scotty sits before an old Mac, places the mouse to his mouth, and barks “Computer.”**

Magic Typist from Olduvai tries to automate and simplify the process of typing recurring phrases. It consists of an extension, two applications (Magic Typist and MT Mover), and a set of standard library files. The extension installs in the System Folder and monitors keystrokes as you type. In normal typing, as you type the root letters of a word or phrase stored in a library, a dialog box appears, allowing you to finish the word or phrase either with a single keystroke or automatically.

In Auto-Learn mode, Magic Typist automatically adds words above a preset length to its library as you type them. The Phrase Editor lets you manually enter new words or phrases, or import them from a text document. The interface is command-line based (invoking images of DOS), but it's flexible. You can include return keys, cursor movements, and tabs; delete characters; and even establish basic text formatting, such as bold or italic, in your stored phrases. An Auto-Numbering feature automates entering numbers in sequence.

You can choose different library files, or, with the MT Mover application, add libraries created in a standard word processing program.

This program may not please fast typists, who are likely to be put off by the flurry of flashing menu bars (or beeping sounds, depending on the kind of notification chosen) as they type along. Hunt-and-peck typists, or those who have limited use of their hands, may appreciate the ability of Magic Typist to finish a word or a phrase.

Although the program performed as advertised for the most part, I noticed a few quirks in Microsoft Word when Magic Typist was active. Whenever a word or phrase was suggested in the Magic Typist window, the screen would redraw, whether I accepted the suggestion or not. Olduvai technical support blamed a programming workaround in Word, but the redraw is nevertheless irritating. I was also unable to invoke the Learn dialog box in Word, even when I used the #-option-1 alternative suggested in the Magic Typist manual. Keyboard entry speed in Word also seemed noticeably slower, even on a Quadra 800.

The documentation and technical support were flawed. The Learn dialog box, for example, doesn't look quite like the one described in the manual. In some places, System 7's balloon help is implemented only with placeholders, such as “6C” in the Preferences window. When I asked Olduvai technical support about this quirk, they insisted that balloon help isn't available in Magic Typist.

Despite these reservations, if you want to speed up typing of repetitive phrases, if you're a slow typist, or if you have an injury or disability that prevents you from having full use of your hands, for now Magic Typist may be a useful addition to your software library. That is, until *Star Trek*'s talking computers can do it all for us.

—GENE STEINBERG

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**Reviews**

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**CONS:**
- No color;
- mediocre image quality.

**COMPANY:**
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**LIST PRICE:** $895.

PHOTOGRAPHY IS GOING DIGITAL.

Kodak's Photo CD system lets you put your own photos on a CD-ROM disc. High-end color printers produce prints that look like photographic enlargements. And several companies have introduced digital still cameras that take crisp color images without film.

The Dycam Model 3 is not among them. The Model 3 is a low-end digital camera—at $895, it retails for a fraction of the price of color digital cameras from Canon, Sony, and Kodak, whose wares are aimed at newspaper and catalog photographers. The Dycam Model 3 is designed for humbler applications that don't require color or hairsplitting sharpness: photographing real-estate listings, documenting insurance claims, creating photo ID badges. For these jobs, it's a winner.

The 10-ounce Dycam Model 3 is about the size of a cheap paperback book, so it fits comfortably in an inside jacket pocket or purse. Alas, it doesn't have a lens cap, so you might want to carry it in something that protects the 24mm, f/4.5 fixed-focus lens. (The lens is roughly equivalent to a 70mm lens on a 35mm camera—a mild telephoto. Wide-angle, telephoto, and close-up attachments are sold separately.) Inside the camera are some chips and a rechargeable battery that powers the flash and stores up to 32 photos.

The Model 3 is what some photographers call a PhD (“press here, dummy”)—no focusing or exposure adjustments are needed. Press the front-mounted shutter button, and an electronic click lets you know when you've got the picture. A built-in electronic flash goes off if there isn't enough light. You can also disable the flash by running a utility on the Mac while the camera is connected to it.

You wouldn't want to use this puppy to capture fast-changing action scenes. About two-thirds of a second elapses between the time you press the shutter button and the exposure itself, and then it's nearly ten seconds before the camera is ready to take another picture.

When you get back to the office (or PowerBook), you can attach the Dycam Model 3 to a modem or printer port and download the photos to a hard drive. The Dycam software makes this easy, displaying an on-screen contact sheet showing thumbnail versions of each image. Double-click on a thumbnail, and the Mac retrieves the image from the camera. Another command retrieves and saves all photos on the hard drive, naming them automatically.

The software also provides some rudimentary image-processing features. You can lighten, darken, sharpen, blur, and resize images. (An image's standard size is 365 by 496 pixels—roughly 5 by 8 inches.) If need be, you can save the Dycam images in PICT or TIFF format and then open them in a more capable image editor.

The Dycam Model 3 poses no threat to the high-end digital cameras, but it's a solid product that works as advertised. (It also convinced me that J. Q. Public is eager for digital photography—everyone I showed the Model 3 to marveled at the notion of a camera that didn't require film.) If you need high-quality color images, consider a camera such as the $4500 Canon ESP (see Reviews, Macworld, April 1993). But if Instamatic-grade gray scale meets your quality requirements, buy the Dycam Model 3. The money you save will pay for an awful lot of film. And if you have a scanner and are close to a one-hour photo lab, you might just want to stick with your conventional camera.—Jim Heid

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**Name The World's Fastest Airplane?**

© 1993 Radim Inc.
The Journeyman Project

The Journeyman Project's original musical score intertwines with digitized sounds ranging from realistic to otherworldly. The sound-track mood changes with the story line. For example, when you run low on oxygen in the mining caves, high-energy music slows to a crawl, and your breathing and heartbeat become nerve-wrackingly loud.

The point-and-click interface is easy to understand and use. You use the mouse to move forward, change direction, open a door, or activate an object.

The complex story line takes a while to unfold, but you eventually learn that it's up to you to travel back in time to prevent an unknown force from tampering with history. There are several paths through the story, and two ways to solve many of the problems you encounter.

The story has all the makings of a classic sci-fi nail-biter, but it's hampered by The Journeyman Project's major flaw: a sluggish, erratic pace. Every time the excitement starts to build, the game hits a speed bump while more dazzling pictures and sounds are copied from the CD into the computer's memory. It would have helped to be able to copy chunks of the game onto the hard drive to accelerate the action. But unfortunately, we don't happen to have 400MB of free space, and the game cannot be subdivided.

It takes several hours to complete the game, and you spend much of that time waiting for the next screen. Is it worth the wait? Father George loved the dazzling audio-visual environment but grew impatient with the puzzles and the pace. Teenager Ben became so wrapped up in the Journeyman plot that he didn't mind waiting to find out what happened next.

We both agree that The Journeyman Project redefines the state of the art in interactive adventures, but we also agree that we need a faster CD-ROM drive.

—GEORGE AND BEN BEEKMAN

Star Wars VisualClips

Assigning movies to events is simple. In the control panel you first select an event, such as shutdown or restart. You then click on either the Add Movie button or the Add Folder button and make your choice from a standard selection window. One of the nicer features of the selection window is that when you choose Add Movie you get a preview box that, when checked, shows a still image from the movie. You can use the control panel's Play button to see the whole movie once you've assigned it to an event. You can assign several movies to one event, if you like, and have VisualClips randomize their order.

The other features on the control panel are also straightforward. A slider bar controls the sound volume for each clip; a check box turns Video Beep on and off. The screen button lets you select the monitor location where the movies will play. Your options are the four corners and the center, or you can let the program decide. I recommend that you make the choice; one of the best features of VisualClips is that you can click on the movie anytime during play, and it will promptly disappear. My response time was definitely faster when the location of the movie was predetermined.

Why am I suggesting ways to avoid seeing the movies, at the same time as I recommend this product? Well, it's fun to have Han Solo saying "Don't everybody thank me at once" when you insert a floppy disk, but if you're installing a program that comes on 12 disks (like VisualClips itself) it gets old quickly. The flexibility that lets you stop playing a movie clip gives VisualClips a longer life span on your computer.

VisualClips is a toy, but if you have the money, the hard disk space, and the RAM, this is the kind of totally cool toy that will make you remember why you love your Mac.—WENDY SHARP
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This SHOULD GIVE YOU OF WHY WE CREATED AI

The image you see over there started out attached to the image you see over here. But as this document made its way down to the printer, the Macintosh it was created on recognized a small problem: 11 x 17 pages can't fit through 8½ x 11 printers.

And so, out came the electronic scissors.

Now, if you're like many Macintosh users, you know all about this routine. And you know how it feels to walk into a meeting with a layout that contains hours of blood, sweat and tears, and a fat strip of tape right down the middle.

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Add an Internal FAX Modem and you can turn your Mac into a personal fax machine. One that will send and receive PostScript quality faxes in any size up to 11 x 17.

COMPAQ

Circle 20 on reader service card
After more than a year of buildup, Apple has finally delivered the Newton, its first all-new computer in nearly ten years. Apple calls the Newton a personal digital assistant (PDA), perhaps to avoid scaring off possible buyers who are not computer literate. Don't be deceived. The personal computer of the future may resemble the Newton—part scratch pad, part electronic secretary, part hand-held communicator—more than the Macintosh.

Who needs this $699 device? You do, if you juggle several constantly changing daily appointments or to-do items, frequently develop new business contacts, often have to leave your office, are a cellular-phone addict, and enjoy adjusting your work style to accommodate an interesting gadget. If you like Sharp’s Wizard, you will love the Newton.

Given those criteria, the Newton MessagePad, as the first Newton model is called, is far from a necessity for most people. But as the price comes down and the product improves, the Newton and competing devices could become standard personal appliances.

Key Features
The Newton MessagePad performs several key tasks.
• It captures and interprets handwriting and sketches that are drawn directly on its screen with a simple plastic stylus.
• It organizes and files information about people and events in an address book, a to-do list, and a calendar.
• It communicates via modem, fax, radio pager, infrared remote-control beam, local area network, and serial port.

These abilities are fully integrated, linked to a single database, and preprogrammed to help increase speed and reliability. Everything fits in a 1-pound box the size of a trade paperback book.

Handwriting
The first striking feature of the Newton is the pen interface. When you turn on the Newton, no keyboard, obvious operating system, or Finder greets you, aside from a handful of icons. You simply write with a plastic stylus on a pressure-sensitive pad that overlays the LCD screen. The screen behaves like an endless roll of paper that you scroll up and down. The plastic stylus contains no electronics; any pointed object—even a fingernail—that doesn't damage the pressure pad will do (see "How the Newton Makes Its Mark").

You can either print or write cursive—by theory, at least. (The Newton converts writing to a built-in serif or sans serif font at 9-, 10-, 12-, and 18-point sizes.) The Newton’s recognition software, developed by Paragraf, a Russian company, is far from perfect. You'll need to practice with the shape of letters and with timing. Pauses put spaces between words, so you must not pause within a word.

To improve and speed up recognition, a preferences screen allows you to select a written example of each letter, number, and common symbol that most closely matches your handwriting. The Newton stores your preferences. But the Newton isn’t trainable: your handwriting must conform to its range of standard preferences. If you write an A as a squiggle, expect to edit the Newton’s interpretation just about every time.

A few people who have tested the Newton either can’t or won’t adapt to its range of acceptable handwriting. Plan to spend 15 minutes or more with the Newton to give it a fair handwriting test. If your handwriting proves too tough, the Newton can display a standard keyboard on screen for you to tap out letters one by one. Of course, if this is what it takes to get a point across, why buy a Newton?

Since the Newton’s recognition draws on words in its spelling list, you must add proper names and other new words to the list, a simple but time-consuming process. The Newton normally uses word recognition rather than pure character recognition to improve transla-
Friday, Jan 1

1. Summary meeting
2. Lunch at Aperito
3. Pick up Opera
4. Tennis at 8:45
tion accuracy. But this approach comes at the expense of some writing freedom; you can’t use abbreviated words unless you first add them to the dictionary. Classical shorthand won’t be usable unless someone develops software to recognize it.

You can, however, turn off word recognition and run simple character recognition, although accuracy drops. You can also slow down recognition to improve accuracy. To refine your notes, the Newton uses a variety of gestures, a pen computer’s equivalent of standard editing commands.

If you draw a horizontal line across the screen, the Newton automatically time- and date-stamps the line, which corresponds to the entry below it. Everything can be searched by the time stamp.

The Newton can also recognize graphics. If you draw an approximation of a straight line, the Newton renders a straight line; Newton also cleans up squares, circles, and irregularly shaped objects through its graphics-recognition system.

Nine basic command icons sit at the base of the display, including scrolling, undo, and find. A tiny speaker reinforces some actions; crossing out something produces a soft pop.

You can also turn off the text and graphics recognizers and simply write or draw. The Newton stores those images as graphics objects called digital ink. Stored images are bitmaps—the Newton cannot perform handwriting or graphics recognition on digital ink. Digital ink works well for quick notes and sketches, since you don’t have to wait for recognition or deal with a spelling list.

The Intelligent Assistant

The Newton’s electronic-secretary features are another major selling point. If you write “lunch Friday with Joseph” on the notepad and tap the Assist icon, the Newton automatically blocks out an hour at noon next Friday with Joseph. But in case of a conflict, Newton will not notify you. It checks the database for all Josephs; if there are more than one, the Newton displays the options (see “Lunch Dates Made Easy”).

Additional software could eventually extend the process—such as asking which restaurant you want and then fixing a reservation request. For a standing lunch date each Friday, the Newton could automatically call a taxi and warn you when it’s time to leave.

The Newton’s association of Joseph in a memo with Joseph in the address-book database mimics the intuitive association a person would make—you know who Joseph is in both situations. Contrast this with what a personal computer “knows” if you write Joseph in a word processor file: the computer cannot connect the name with a database entry or calendar appointment.

The Newton treats the word Joseph as an object, and the object-oriented software in the Newton can identify and link Josephs in any context. Once you point to Joseph with the stylus, you can instantly see other Joseph objects—in the address book, Joseph’s membership on a committee, Joseph as author of a report, correspondence that Joseph wrote or received. Object orientation offers such compelling advantages that it will probably become a standard feature of most computers.

Hardware Features

The Newton offers these capabilities in a package that fits inside a roomy pocket. The box is dominated by a 4-by-2.8-inch super twist-LCD screen with 336 by 240 pixels (85 dpi). The screen has no backlighting, but if you have enough light to read comfortably, you can operate a Newton.

An Advanced RISC Machines (ARM) 610 processor running at 20MHz drives the Newton. Apple says that the ARM 610 offers computing ability comparable to that of a Quadra 800, and with far lower power consumption. (The ARM 610 cannot run Macintosh software, however.) The Newton needs such computing strength to manage handwriting recognition and object management efficiently. Core Newton software resides in 4MB of ROM; 640K of true static RAM serves dual functions as active memory for the CPU and to store data.

There are no internal expansion provisions. Expansion must be done from the outside. One PCMCIA Type II slot supports up to 64MB of RAM or ROM for storage; such cards run about $300 (for 2MB) to $850 (for 10MB, the largest available). PCMCIA ROM cards can store applications, electronic books, or any other electronic information. Although PCMCIA cards can contain miniature hard drives, modems, and network interfaces, none of these will work with the Newton until special driver software is available.

Unlike with conventional hardware accessories, you can install and remove PCMCIA cards while the Newton is running. The operating system dynamically adjusts to accommodate any changes, so an address book automatically expands if you insert an address-book card—say good-bye to cumbersome import-export routines. But many users will crave a second PCMCIA slot—so they can add RAM and view an electronic book in ROM simultaneously, for example.

The Newton operates on four standard alkaline AAA batteries, a rechargeable nickel-cadmium (NiCad) battery pack, or an AC adapter. The worst-case battery life (alkaline batteries) —for continuous, high activity—is six hours, according to Apple. For intermittent operation, Apple says, alkaline batteries should be good for about two weeks. NiCads should last for a week.

The AC power-supply trickle charges NiCads inside a Newton overnight; for a faster charge, Apple sells an external battery charger ($49, including one NiCad battery pack). Lithium button cells in the Newton keep internal memory alive for about six months or more until they must be replaced—an essential feature because the Newton contains no storage drive, holding all data in RAM or ROM.

Connections

The Newton offers many types of communication. The single serial port acts like a Mac’s serial port. It supports LocalTalk and uses a standard 8-pin serial connector for modems and printers.

Support for a data and fax modem is built into the Newton software; Apple offers an external $149 modem with 2400
Handwriting Recognition  The Newton recognizes both printed and cursive handwriting. It date-stamps any text or graphic when you draw a straight line at the beginning of the entry. 

Improving Recognition  To increase the Newton's recognition accuracy, Apple provides a Preferences screen that allows you to specify the way you normally render each letter and number.

How the Newton Makes Its Mark

Apple chose a tried-and-true technology for the Newton's screen. The device uses a pressure-sensitive tablet above an LCD to record the strokes of the plastic stylus. The tablet contains two layers of transparent, electrically conductive material. The flow of current through the top layer is perpendicular to the current flow in the bottom layer. As the current travels across each layer, resistance reduces the voltage incrementally. When the stylus touches the screen, the top layer contacts the bottom layer. The Newton identifies coordinates for that point from the amount of voltage in each layer. That point is then communicated to the LCD pixel matrix beneath the conductive layers, creating the "digital ink" marks visible to the user.

How to Improve Your Drawings  The Newton's graphics-recognition talents include cleaning up uneven lines if desired. The bottom figure is the Newton's recognized and corrected version of the top sketch.

The Newton can drive a PostScript or StyleWriter printer through its serial port or over a network. To connect to the parallel-port printers common to DOS and Windows computers, Apple offers the optional $99 Newton Print Pack, a serial-to-parallel-port converter cable with driver software stored.

Apple offers the Newton Messaging Card (which plugs into the PCMCIA slot), a radio paging receiver that displays alphanumeric messages on the Newton screen and can automatically place the message in the Newton's to-do list. (The card's price was not firm at press time.)

A keyboard can also be connected via the serial port for intensive text entry, but most people likely to be interested in this would do the work on a standard computer and move the info to the Newton. The Newton's infrared (IR) transceiver sends and receives data at up to 9600 bps over a distance of 1 meter. The transceiver is compatible with other Newtons and the Sharp Wizard 9600, and eventually will work with transceivers in future desktop computers. The transceiver can also control home-entertainment equipment—TVs, VCRs, CD players—making the Newton the world's most expensive channel-surfing device.

The Newton can synchronize its information with a desktop computer (Mac or Windows) through the IR transceiver, with a serial line, or via LocalTalk. Apple's $129 Newton Connection Kit software duplicates all the Newton's functions—except pen input—on a Mac or Windows computer. This can help coordinate records between the Newton and the desktop. The $199 Connection Pro version adds import and export features to popular desktop applications.
Lunch Dates Made Easy

The Newton's object-oriented database integrates personal notes, address books, and calendars to make scheduling easier, faster, and more flexible than with typical desktop programs. To make a lunch date on Friday with Joseph, for example, first highlight the reminder previously entered into your to-do list (left). The Newton automatically displays the screen showing the correct date for the lunch appointment from its calendar. If you have more than one Joseph in your database, the Newton automatically displays your options (middle). After you specify the correct Joseph with a touch of the pen, the Newton schedules the appointment (right). The Newton would double-book you, however, if you already had a lunch date that day.

The Newton can also dial phone calls, either using the dialer built into a modem or through a built-in speaker if you hold it up to the telephone mouthpiece.

Competition
Many companies are introducing PDAs and pen-based computers, though few of these compete directly with the Newton. Pocket organizers like the Wizard accept pen input for graphics only. Pen-enabled computers are standard computers with modest changes in system software and applications to recognize pen input for text, sketching, and pointing. Several companies offer laptops with Windows for Pen Computing from Microsoft, a pen layer over Windows.

Direct competition for the Newton comes from the Zoomer, a $699 PDA jointly developed by Casio and Tandy (and sold at Radio Shack stores). The Zoomer resembles the Newton but understands few graphical editing commands and doesn't accept cursive handwriting. PowerInk, the Zoomer's version of digital ink, plays a greater role, on the assumption that few users need or want to perform recognition on notes. Unlike the Newton, the Zoomer lets you write first in PowerInk and run recognition later. The Zoomer's underlying data storage does not link objects and lacks a digital assistant that tries to understand what you have written. Instead, the Zoomer follows a paper notebook model; to schedule lunch with Joseph, you must write the date and time.

The forthcoming WinPad PDA from Microsoft and Compaq will have more features than the Zoomer, but it will be an adjunct to Windows computers rather than an independent PDA.

For now, the other main competitors come from several pen-computer models that use the PenPoint operating system from GO Corporation. EO Corporation (415/903-8100), now an affiliate of AT&T, makes the most interesting of these devices. EO models cost from $1999 to $3299 and incorporate a hard drive with 20MB to 64MB storage capacity; one unit has a backlit screen. Over the next year or two, simplified EO computers and more-elite Newtons will compete head-to-head.

Like the Zoomer, the PenPoint operating system performs character recognition and allows deferred recognition. In my informal tests, the Newton has better handwriting recognition; but remember that no two people have identical handwriting. Run your own tests.

Future Newtons
In coming months, look for Newtons with additional memory and mass-storage abilities. Imagine a Newton that displays fully formatted documents for editing and annotation. Through the communications links, you could share comments and changes with coworkers; when done, the document could go directly to everyone in the company who needs it.

Apple plans to deliver a second and perhaps a third Newton model this year, and has discussed several design concepts:
- A Newton built into a telephone that provides call management.
- A tiny, 3-by-5-inch Newton notetaker.
- A Newton architectural sketchpad, with a large screen and enhanced drawing-recognition features.
- A child's Newton with games and learning activities.

Feeling skeptical about this first Newton's limited hardware and small screen? That's how many people reacted to the first Mac. Bear in mind that the seamless, object-oriented approach in the Newton will be a major feature of Pink (a future operating system from Taligent, the Apple-IBM joint venture) and the forthcoming Windows Cairo system from Microsoft. Handwriting recognition in an intelligent assistant is a vital step toward making machines conform to human needs, standards, and styles, rather than the other way around. And while the Newton's system is far from perfect, it works well enough to make a frenetic schedule a little more manageable—and a little more fun.

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Apple packs low-cost performance into an all-in-one design

The Macintosh LC 520

Just when you thought you knew what to buy, Apple presents you with yet another midrange choice. As this is written, the new Macintosh LC 520 will be offered in the United States only through the educational channel. However, it's probably just a matter of time before the LC 520 is offered through consumer channels as a Performa or through dealer channels as an LC 520. In the meantime, expect a lot of folks to ask their favorite student or teacher to buy one on their behalf.

At first glance, the LC 520's specs look like those of existing Macs: a 25-MHz 68030 processor, 5MB of RAM, an 80MB hard drive, a 14-inch color monitor, and a 300-KBps CD-ROM player. But a second look shows two significant differences: all this stuff comes in one box, and it costs about $1600, at least for educational institutions. The price for individual students and teachers will depend on the campus outlet they get it from. Still, that's a breakthrough price.

The LC 520 is just one part of an Apple strategy to speed up development of new models. Rather than wait a year or so to see if a new model has caught the public's fancy, Apple has shortened its development cycle drastically, sometimes offering a different repackaging of ingredients only three or four months after a previous product launch. That's more like the behavior of a consumer electronics company and less like the old Apple. It's a bit confusing and hectic—even we at Macworld barely managed to publish an analysis of the LC III (in our April 1993 issue) before we were called down to Cupertino, California, for the LC 520 preview—but at least prices appear to be falling rapidly as a result. That means more innovation, although delivered incrementally, at affordable prices.

A Total Package

The computer chip itself is the ubiquitous 68030, with the respectable (but not exactly breathtaking) clock speed of 25MHz, operating on a 32-bit bus. There's a socket for a 68882 math coprocessor, a Processor Direct Slot (PDS), and space for up to 36MB of RAM. (The LC 520 takes the new 72-pin SIMMs used in the Centris family, LC III, and Quadra 800.) That sounds exactly like the LC III—and in terms of performance, Macworld Lab tests show that the two machines are essentially the same (see the test results, "Comparing the LC 520's Performance"). The LC 520's SCSI and video ports are also the same as the LC III's, while the LC 520 offers two ADB ports, compared with the LC III's one.

The main difference between the LC 520 and the LC III is the LC 520's bolted-on multimedia support.

• Built-in Color Monitor Not only is a Trinitron-based 14-inch color monitor (the same as used in the high-quality Macintosh Color Display) built into the LC 520 case, but also the logic board includes

BY CHARLES SEITER
Inside the LC 520's New Integrated Design

Built-in Multimedia
The LC 520 is designed for multimedia applications, particularly for use in education, so it comes with an internal CD-ROM drive, a built-in 14-inch Trinitron monitor, and enough VRAM for 16-bit color display. The built-in microphone, stereo speakers, volume controls, and stereo phone jack are all front-mounted for easy access.

True Plug-and-Play
The LC 520 is designed to be easily maintained through the use of slide-in components, like the hard drive, that are easily accessed via snap-off covers. Initially, drives with the new type of no-cable connectors will be available only from Apple. The all-in-one design minimizes the loss of cables and other components, thus helping schools ensure that their Macs remain functional.
Apple's new all-in-one Macintosh sounds like a promising computer, in theory. But what do analysts and educators think about the built-in CD-ROM drive, single-plug design, and audio capabilities? The people Macworld spoke to were uniformly positive about the machine, although several were disappointed that the LC 520 doesn't have a built-in video-out port or built-in Ethernet.

“It’s going to be a very hot machine for Apple,” according to Holly Brady, editor-in-chief of Technology & Learning, a magazine that covers technology in K-12 schools. “Schools have been waiting for a well-priced machine that includes a CD-ROM drive because there’s enough software out there now.” Moreover, plug-and-play is important to schools, which don’t have the kind of technical support businesses take for granted.

“Schools have been living with Apple II’s for a long time,” says Brady. “They have been in the process of upgrading to Macs. This machine is very well priced for the features it provides.” Still, the LC 520 has its drawbacks. The biggest problem Brady sees is the lack of a video-out port. “In the schools, you need easy ways to get the image on the screen up on a larger screen so that 30 students can view it at a time,” she says.

Anne Wujcik also believes the LC 520 will get a warm response from customers. “The integration of a lot of power and functionality into one machine is a real solution for a lot of teachers,” says Wujcik, president of Wujcik & Associates, a market research firm specializing in education. Still, she would have liked to see Ethernet support. “I am convinced that networking is of essential importance to the K-12 market. Every Mac has AppleTalk built in and that’s fine for small application sharing. But this is a multimedia machine, and kids are going to be manipulating QuickTime and video . . . More and more schools are getting into networking.”

The absence of built-in Ethernet support is “a bit of a limitation, especially at a time when schools are aggressively adding local area network capability,” says Sal Capozzi, an analyst with Market Data Retrieval, which focuses on the education market. “We just did a survey that showed that LANs in schools have grown 100 percent in the past year.”

The audio quality is impressive, since the LC 520 features Apple’s first built-in stereo speakers—it’s a shock to hear clear stereo coming from the front of a low-cost Mac. There are also stereo phone jacks at the front of the case, plus push-button volume controls. There’s an internal microphone behind a tiny hole in the top of the monitor housing, as the Color Classic has.

Not only is there really not much else to buy—except for more RAM or ultimately an accelerator—there’s also not much to lose. Schools dislike the snarls of cables and cords that currently connect multiple devices at each LC station. Life is also easier in the classroom without separate microphones, CD-ROM drives, or even monitors that might wander from room to room or out the door. At 40 pounds in a single lump on the desktop, this box is likely to stay put.

The LC 520 will also be sold to consumers in Japan and Canada. Apple believes the all-in-one, fairly compact design will appeal to the space-conscious Japanese. The Japanese have also embraced multimedia more than Americans have, according to Apple’s comparison of CD-ROM drive sales, so Apple believes the LC 520 will sell well in Japan. The company also expects the machine to do well in education and multimedia markets in Canada.

The single-plug design and potentially low retail price also appeal to the home market, so we expect to see the LC 520 eventually offered (as a Performa or under its own name) to a wider market.

The Eye of the Beholder

The LC 520 is a stylistic departure from Apple’s tradition of clean, brick-shape computers. As radically different from the Color Classic as the Color Classic was from the Classic II, the LC 520’s design raised eyebrows among Macworld’s editors and designers. But there are some good reasons for the boom-box-of-the-future low-front case.

- **Up-Front Controls** First, this design incorporates the two stereo speakers behind the graduated hole-grids on the case’s right and left sides. Second, little up-down buttons for volume and monitor contrast are also set into the front panel, because, Apple says, that location makes it easy for students to operate the most-used controls, but it also makes the LC 520 even more convenient as a general-purpose multimedia platform.

- **Easy Service Access** Another feature of this new industrial design is easy access to both the logic board and the various internal pieces of drive hardware. The front bezel pops off after you remove two screws, and you can pull out the floppy drive and CD-ROM unit, connected to the bus by snap-in edge connectors rather than by a socket and ribbon-cable arrangement (see the diagram, “Inside the LC 520’s New Integrated Design”). Similarly, the back snaps off the LC 520 (in a design modeled after the Color Classic), and you can pull out the logic board or the hard drive with no fuss and no tools.

This is the easiest computer to service that Apple has ever built. Computer-lab supervisors in schools across the country are going to love the LC 520. If only such drive connections and logic-board access had been standard a decade ago.

The only functional drawback to the design is that the monitor’s position is not adjustable. Fortunately, there are plenty of books in classrooms to slip under the case to adjust the viewing angle.
Comparing the LC 520’s Performance

### System Performance
Times as fast as a Classic. Longer bars are better. The rankings below let you determine the overall processing power of a Mac compared with any other Mac.

<table>
<thead>
<tr>
<th>Common</th>
<th>Scientific</th>
</tr>
</thead>
<tbody>
<tr>
<td>We timed typical business tasks in Microsoft Excel and Word, using the Mac’s processor, drives, and video display.</td>
<td>We added to the common tasks several scientific calculations that use floating-point math.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Processor</th>
<th>Drive-Access</th>
<th>Video-Display</th>
<th>Floating-Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>We timed several tasks in Claris FileMaker, ClarisWorks, Deneba UltraPaint, Microsoft Excel, and Microsoft Word.</td>
<td>We timed file opens in Microsoft Excel and Word, and disk-based sorts in Claris FileMaker.</td>
<td>We timed horizontal and vertical scrolling in ClarisWorks, Microsoft Excel, and Microsoft Word.</td>
<td>We timed scientific recalculations (which use floating-point math) in Microsoft Excel and ClarisWorks.</td>
</tr>
</tbody>
</table>

*(With optional math coprocessor installed.)*

### Behind Our Tests

**MW LAB** To gauge the latest Mac’s basic performance, Macworld Lab compared the LC 520 with an LC II, an LC III, an IIfx, and an LC III using our standard test suite. These tests measure several aspects of a computer’s performance: the system’s raw computation strength, the Mac’s math processing ability for specialized applications, the Mac’s speed in shuffling data to drives, and its speed in displaying images and menus on screen. The tests are designed to reflect real-world usage.

The preproduction version of the LC 520 that we tested was configured with the LC 520’s standard 5MB of RAM and 512K of VRAM. The other Macs tested were configured with 4MB of RAM. We used a Quantum-based 230MB hard drive from APS, whose speed ensures that our tests accurately measure the Mac bus’s performance, not the drive’s. We used the standard Apple 14-inch monitor.—Macworld Lab testing supervised by Mark Hurlow

The LC 520’s case is the most complex piece of plastic Apple has yet molded, representing a large investment in tooling. Somewhere in Cupertino, I suspect, there’s a spreadsheet that says that Apple will need to sell more than a million of these systems to be happy about this design. Whether all these units can be absorbed by the educational market remains to be seen. That’s another reason to expect to see an LC 520 at a store near you one day.

### Environmentally Sensitive
Like the Color Classic, the LC 520 has power-conservation features that, Apple says, will conform to the U.S. Environmental Protection Agency’s Energy Star guidelines for power usage, which are designed to reduce the power consumed by computers and peripherals. (At press time, the LC 520’s certification of Energy Star compliance was pending.) Apple intends for all of its products to conform to these guidelines eventually.

The LC 520’s monitor stops displaying images (going into standby mode) after a user-defined period of inactivity, which cuts the LC 520’s energy usage almost in half, to about 30 watts. Standby works like a screen saver, except that a screen saver saves no power because the monitor is still displaying images (even if just a black one). Once in standby mode, the monitor takes a few seconds after a keyboard press or mouse movement to warm up and display images.

### Cheaper than a PC
To longtime Macintosh fans, the LC 520 might seem something like an LC III with the standard Mac monitor welded to the top. To the rest of the world, it will be startling, welcome news because it’s a first for Apple, because if you add up the value of all the hardware in an LC 520 package, it comes to a bit less than an equivalent DOS PC—a first for Apple.

Even in the world of heavily discounted PCs, an Intel 486SX-based PC running at 25MHz (a fair comparison) with the same RAM and hard drive, a Sony double-speed CD-ROM drive, and a 14-inch Trinitron monitor (which is better than what most PC vendors offer) costs more than Apple’s suggested price for the LC 520: the PC package would come to $1650 (assuming a 20 percent educational discount) versus the LC 520’s $1600. This is revolutionary for a company that flourished on its ability to sell a monochrome computer with a 9-inch screen (keyboard not included) at two to three times the price of a color PC. Apple is demonstrating that it can compete head on features and price with anyone, at least in multimedia-capable computers.

So the LC 520 represents a great value for the school systems of North America and for consumers in Japan. It could also represent a source of frustration for people who already bought an LC III or IIfx—it amounts to an LC III with a free CD-ROM drive and a $200 Trinitron monitor, or a half-price CD-equipped IIfx (albeit without the NuBus slots). At a minimum, the LC 520 indicates that Apple can now turn out Macintosh variants at a fraction of the price premium we used to expect.

Charles Seiter is a Macworld contributing editor who usually writes about science and engineering products. He maintains an unquenchable enthusiasm for cheaper Macintoshes.
Certain things should not be compromised

When the printed page is a reflection of your creativity, don't let the printer compromise your work. Xante's Accel-a-Writer 8100 will ensure the printed page is as good as the person behind it.

The Accel-a-Writer 8100 is an 11" x 17", 600 x 600 dpi laser printer that provides full PostScript® compatibility and a level of performance that will improve the quantity of your work as well as the quality.

Supporting 11" x 17" paper is only one of the paper handling benefits. The Accel-a-Writer 8100 comes with two input trays, allowing you to print on different size pages without having to reload the printer. A third tray can be installed to allow for up to 850 sheet capacity.

Xante combines resolution technology and ultra-fine toner to break the 600 dpi barrier and provide unmatched quality. With the Accel-a-Writer 8100, you can upgrade to 800 x 800, 960 x 960, and even 1200 x 1200 dpi.

You may be surprised to find you won't be forced to compromise your budget either. At $3,995, it is the most aggressively priced printer in its class.

Don't compromise your work. Call Xante directly to order your Accel-a-Writer 8100.

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Fax 205-476-9421
SO ADVANCED, IT EVEN TAKES OUT THE TRASH.
Curiously, some of what’s stored on your floppy disks would be better lost than saved. Tiny bits of dirt and debris can enter a disk uninvited, only to threaten your most precious data.

*Sony designed its new Super Cleaning Mechanism to better preserve your data. It’s a dirty job, but someone had to do it.*

But, a revolutionary disk with a new Super Cleaning Mechanism has taken the chore out of trash removal. Compliments of Sony, the inventor of the 3.5" floppy.

Never one to halt progress, Sony engineered sweeping changes to create a floppy disk that cleans while it protects your data.

At the heart of this waste management system is a new pressure-balanced metal lifter, providing greater contact between the disk liner and magnetic surface, to make debris pick-up routine.

For the finishing touch, Sony’s Super Cleaning Mechanism uses rows of very fine cross-flow ribs, molded into the disk’s shell, to trap invading particles before they can turn into messy problems.

Keep your data dirt and error free with the disk that leaves everything else in the dust. To find out more, call 201-476-8199.

While you may not like taking out the trash, to this floppy it’s all in a day’s work. From the inventors at Sony.
Choosing the best personal printer

You enter the local CompuSuperStore on a mission to finally replace that whining ImageWriter with a printer that makes less noise and sharper copy. You cringe at the thought of how much money you’ll need to spend, but a pleasant surprise greets you: several brand-new machines from Apple, Digital Equipment Corporation, GCC Technologies, and Texas Instruments retail for less than $1000—some even include PostScript. Several portable printers would go perfectly with a PowerBook. And some surprisingly powerful machines provide enhanced resolution or print up to 12 pages per minute, and connect to various networks. Printers like these used to cost $5000 and up—now they go for less than $2000.

Maybe you’ll escape with something other than family photos in your wallet after all. To help you toward that goal, Macworld Lab tested 20 monochrome (black-and-white) printers ranging in price from $359 to $1999 (see the tables, “Surveying Ink-Jet and Thermal-Transfer Printers” and “Surveying Laser Printers”). “Answers to Printer Questions” can serve...
The top picks in this year's personal printer roundup (clockwise from left): the Apple LaserWriter Select 300, the best QuickDraw printer; the Apple StyleWriter II, the best ink-jet; and the Texas Instruments microLaser Turbo, the best PostScript offering.
CHOOSING THE BEST PERSONAL PRINTER

as a crib sheet for your shopping trip. Suitably prepared, you can begin surveying the shelves.

The Ink-Jet Bargain Basement
You start in the ink-jet department, where prices start at under $400. You've browsed here before, and found a typical bargain basement—bare fluorescent lights, exposed heating ducts, and printers that are slow, finicky about paper, and produce splotchy copy that smears when it gets wet.

But the department looks better this time. Ink-jet printers still have the same disadvantages, but the latest versions of their driver software produce better results with gray-scale scanned images. Take the Apple StyleWriter II ($359), which uses a compact (6.6-pound) Canon-built mechanism that prints 360 dots per inch. The StyleWriter II's driver enables the printer to render scanned images better than some laser printers (see "Comparing Print Quality"). The driver also lets you share the printer on a LocalTalk network—just click on the Setup button in the Chooser and then check the Share This Printer box. (Apple calls this combination and improved gray-scale technology GreyShare.) You can even give the printer a password that other users must type before they are able to access it. (One catch is that your Mac slows down when it processes other users' jobs.)

The Hewlett-Packard DeskWriter ($399) can be shared on a network without slowing down the Mac it's attached to. The bulky, 300-dpi DeskWriter is aging but still spry. Overall, the DeskWriter was faster than the StyleWriter II, although the latter printed font test documents faster (see "Personal Printers Face Off"). The latest DeskWriter driver improves the printer's gray-scale output. HP has added options for filtering—the process of combining dots in patterns that simulate gray shades. The DeskWriter's results aren't as good as the StyleWriter II's, however. For good grays on a bad budget, the StyleWriter II is the ink-jet printer to buy.

Printers for Portables
Over in the portables department, things are heating up as printer vendors try to leverage off the success of Apple's PowerBook line. On this shelf—move closer to see it—is the GCC Technologies WriteMove II ($599). Cut a box of aluminum foil in half vertically for a rough idea of how small this 2.5-pound puppy is. A sock would make a nice carrying case. The WriteMove II runs on a rechargeable battery and includes a cleverly designed AC adapter whose prongs fold down so as not to puncture your briefcase.

This printer isn't an ink-jet—it uses a 360-dpi thermal-wax transfer mechanism built by Citizen. The thermal-wax output doesn't smear when wet, and large black areas don't mottle as they do with liquid ink. The WriteMove II's ink ribbon is only a bit larger than a microcassette tape. The printer supports a multistrike ribbon that you can use until it's threadbare, or a single-strike film ribbon that produces dark, crisp output. Do stock up, though—the WriteMove II gets only 20 pages from the single-strike ribbon. But WriteMove II ribbons cost only $5 each.

The WriteMove II lacks a sheet feeder—you have to hand-feed each page, and properly aligning the top of the page can be tricky. Because of this, we didn't run lab tests on the WriteMove II. In some informal speed tests with single-page documents, the WriteMove II was only slightly faster than the Eastman Kodak Diconix 701—the slowest printer tested this time around. But there's nothing smaller than the WriteMove II—and its film-ribbon output is superb.

And what's this with the "New!" banner above it? It's the Apple Portable StyleWriter ($449), a slightly repackaged version of a battery-powered Canon inkjet, the BJC-10x. At an almost portly 4.5 pounds, the Portable StyleWriter is nearly twice as heavy as the WriteMove II, but it gets a few hundred pages from a single ink cartridge. The sheet feeder you'll want for multipage jobs is a $69 option.

In Macworld Lab's tests, the Portable StyleWriter finished second to last—overall about half the speed of the Style-
Writer II. The Portable StyleWriter nicely matches the look-and-feel of a PowerBook, but if you can do without battery operation, you'll get much better performance and gray-scale output from the StyleWriter II.

Gathering dust on the bottom shelf is the Eastman Kodak Diconix 701 ($479), a battery-powered ink-jet portable. The book-size Diconix 701 has one edge over the WriteMove II and Portable StyleWriter—it includes a sheet feeder that holds up to 30 sheets of paper. Otherwise, it's unimpressive. The printer is designed to connect to IBM PCs—only by using a bulky adapter can it be coerced into talking to Macs. You'd be better off using a PC-oriented portable printer such as Canon's BJ-10ex along with a driver-and-cable package such as GDT Softwork's PowerPrint (see "Maximize Your Printer," in this issue). In fact, that's about what Kodak has done with this printer—its driver was written by GDT.

On the way to the laser printer section, you pass through the big-and-wide department, which has just one offering—the GCC Technologies WideWriter Select 300 ($1699)—a 360-dpi, Canon-based ink-jet capable of printing sheets up to 17 by 22 inches. The WideWriter doesn't use PostScript, but includes a driver and outline-font package similar to those of GCC's WriteMove II and PLP II personal laser.

The WideWriter also works with ColorAge's PostScript emulator, Freedom of Press Classic (also covered in "Maximize Your Printer," in this issue). The WideWriter is a low-cost alternative to a large-format laser printer, ideal for proofing tabloid-size publications, for drafting and design applications, and for printing signs and banners.

Lasers for Less

Although the ink-jets may have sparked your interest, you owe it to yourself to examine the rest of the dealer's offerings. Besides, laser printer prices have gone from five figures in the seventies to four figures in the eighties to three figures in the nineties. In another ten years, Time might give you one just for subscribing.

Until then, there are bargain-priced machines such as the Apple LaserWriter Select 300 ($839). Its name smacks of a low-cal frozen dinner, but Apple's new offering is a winner. It uses Apple's FinePrint resolution-enhancement technology to create tack-sharp text, and if you upgrade its memory to 5MB, it supports Apple's PhotoGrade technology to produce the best gray-scale output for less than $1000. There isn't a better non-PostScript printer for producing newslet-

**Personal Printers Face Off**

<table>
<thead>
<tr>
<th>PostScript Printers</th>
<th>Multiple Fonts</th>
<th>Single Font</th>
<th>MacDraw Pro</th>
<th>FreeHand 3.1</th>
<th>PageMaker 4.2</th>
<th>TrueType</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ti microLaser Turbo A</td>
<td>156</td>
<td>286</td>
<td>474</td>
<td>480</td>
<td>485</td>
<td>84</td>
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<td>Ti microLaser Turbo B</td>
<td>159</td>
<td>322</td>
<td>439</td>
<td>482</td>
<td>485</td>
<td>93</td>
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<td>Apple Personal LaserWriter NTR</td>
<td>156</td>
<td>286</td>
<td>474</td>
<td>480</td>
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<td>NewGen TurboPS/300p</td>
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<td>439</td>
<td>482</td>
<td>485</td>
<td>93</td>
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<tr>
<td>QMS PS-410 *</td>
<td>263</td>
<td>322</td>
<td>439</td>
<td>482</td>
<td>485</td>
<td>93</td>
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<tr>
<td>NewGen TurboPS/400p</td>
<td>351</td>
<td>322</td>
<td>439</td>
<td>482</td>
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<td>93</td>
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<tr>
<td>Okidata B1250 k</td>
<td>436</td>
<td>322</td>
<td>439</td>
<td>482</td>
<td>485</td>
<td>93</td>
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<tr>
<td>QMS PS-410 *</td>
<td>265</td>
<td>322</td>
<td>439</td>
<td>482</td>
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<tr>
<td>GCC Technologies BLP Elite</td>
<td>396</td>
<td>322</td>
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<td>482</td>
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<td>93</td>
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<td>Ti microLaser Plus PS17</td>
<td>474</td>
<td>322</td>
<td>439</td>
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<td>93</td>
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<td>Ti microWriter PS23</td>
<td>480</td>
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<td>439</td>
<td>482</td>
<td>485</td>
<td>93</td>
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<tr>
<td>NEC SilentWriter Model 95F *</td>
<td>456</td>
<td>322</td>
<td>439</td>
<td>482</td>
<td>485</td>
<td>93</td>
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<tr>
<td>DEC DLClaser 1152 A</td>
<td>456</td>
<td>322</td>
<td>439</td>
<td>482</td>
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<td>93</td>
</tr>
<tr>
<td>Apple LaserWriter Select 310 *</td>
<td>360</td>
<td>322</td>
<td>439</td>
<td>482</td>
<td>485</td>
<td>93</td>
</tr>
</tbody>
</table>

**QuickDraw Printers**

| GCC Technologies PLP II | 208 | 406 | 98 | 92 | 1679 | 208 |
| Hewlett-Packard DeskWriter | 208 | 406 | 98 | 92 | 1679 | 208 |
| Apple LaserWriter Select 300 | 208 | 406 | 98 | 92 | 1679 | 208 |
| Apple Personal LaserWriter 300 | 208 | 406 | 98 | 92 | 1679 | 208 |
| Apple StyleWriter II | 246 | 397 | 172 | 1531 | 484 | 71 |
| Apple Portable StyleWriter | 367 | 1755 | 325 | 622 | 726 | 119 |
| Eastman Kodak Diconix 701 | 990 | 2880 | 271 | 495 | 1005 | 159 |

Tests were conducted on a Macintosh IIfx, with a cache card installed, 8MB of RAM, and an internal Quantum 80MB drive.

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ters and other publications containing scanned images. The Select 300 connects to the Mac's modem or printer port but can also be shared on a network through the GrayShare scheme described earlier.

The LaserWriter Select line uses a 5-ppm Fuji-Xerox engine that uses a Canon-like slide-in toner and drum cartridge. The Select 300 includes a 250-sheet paper tray and accepts a wider variety of paper-handling options than most printers in its price range. A second 250-sheet feeder costs $149, a 500-sheet feeder is $299, and a 30-envelope feeder is $89.

Then there's the new Apple Personal LaserWriter 300 (see News, August 1993). Tipping the scales at only 15 pounds, this may be the lightest laser around—it weighs less than Apple's original Mac Portable. But it isn't a lightweight. The Personal LaserWriter 300 supports GrayShare. It uses a new 4-ppm Canon engine that sports an energy-saving power-down feature. The printer is always on—there is no power switch—but until the Mac tells the Personal LaserWriter 300 to print a job, it keeps itself in an idle state that uses less than 5 watts of power. Several other printers, including Okidata's OL850, GCC's PLP II, and Lexmark's IBM LaserPrinter 4039 family, offer similar energy-saving modes. By the time this appears, vendors whose printers meet the Environmental Protection Agency's Energy Star conservation guidelines will be eligible to display the Energy Star symbol in their advertising.

The Personal LaserWriter 300 was faster than the LaserWriter Select 300 in our font and Courier tests, and the two printers performed similarly in the remaining tests. The Personal LaserWriter 300's paper-handling options don't measure up to the LaserWriter Select 300's—no second tray is offered—but this probably isn't a drawback for the home and small-office market for which this printer is designed. If you disagree, consider the LaserWriter Select 300 instead. The Personal LaserWriter 300's price was not finalized at press time, but is expected to be approximately $700.

Then there's the venerable GCC Technologies PLP II ($659), the latest version of the first personal laser printer—GCC's Personal LaserPrinter, which debuted in 1987. The PLP II uses a compact 4-ppm engine whose paper tray holds 250 sheets of paper. Changing toner cassettes for this Okidata-built engine is potentially messier than for the Apple printers, which use a disposable toner cartridge and drum assembly. But the PLP II's toner cassettes cost only $33—about a third the cost of most other printers' cassettes. After 15,000 pages, you'll have to snap in an imaging drum at a cost of $289. Still, the PLP II is one of the least expensive personal laser printers to operate.

The PLP II is the only currently shipping personal laser that connects via the Mac's SCSI port, which can transfer data more quickly than the serial or LocalTalk connectors other printers use. This helps make the PLP II faster than its competitors, but there are drawbacks. Setting up a chain of SCSI devices can be tricky.

### Surveying Laser Printers

<table>
<thead>
<tr>
<th>Product</th>
<th>Apple Computer</th>
<th>Apple Computer</th>
<th>Apple Computer</th>
<th>Apple Computer</th>
<th>Digital Equipment Corporation</th>
<th>GCC Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone</td>
<td>408/996-1010</td>
<td>408/996-1010</td>
<td>408/996-1010</td>
<td>408/996-1010</td>
<td>508/493-5111</td>
<td>617/275-5800</td>
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<td>Toll-free phone</td>
<td>689</td>
<td>839</td>
<td>1079</td>
<td>800/402·7777</td>
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<td>800/422·7777</td>
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<tr>
<td>List price</td>
<td>1179</td>
<td></td>
<td></td>
<td>$999</td>
<td>$589</td>
<td>800/422·7777</td>
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<tr>
<td>Tested by Macworld Lab</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
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<td>Imaging language</td>
<td>Adobe PS Level 2</td>
<td>QuickDraw</td>
<td>QuickDraw</td>
<td>Adobe PS Level 1</td>
<td>Adobe PS Level 2</td>
<td>QuickDraw</td>
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<td>Processor clock rate</td>
<td>AMD 29000 RISC/16MHz</td>
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<td>NA</td>
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<td>6800/16MHz</td>
<td>NA</td>
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<tr>
<td>Number of fonts provided</td>
<td>390</td>
<td>39</td>
<td>13</td>
<td>17</td>
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<tr>
<td>TrueType rasterizer built in</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
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<tr>
<td>RAM (base model/maximum)</td>
<td>3MB/4MB</td>
<td>512K/512K</td>
<td>512K/512K</td>
<td>1.5MB/5.5MB</td>
<td>2MB/4MB</td>
<td>1MB/1MB</td>
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<tr>
<td>Uses standard SIMMs for RAM upgrade</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>NA</td>
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<tr>
<td>SCSI port for font hard disk</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
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<td>Other controller upgrades</td>
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<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
<td>600/10MHz</td>
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<td>Additional software included</td>
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<td>600/10MHz</td>
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<tr>
<td>Print engine maximum speed (in pages per minute)</td>
<td>Canon LX/4</td>
<td>Canon/4</td>
<td>Fuji-Xerox/5</td>
<td>Fuji-Xerox/5</td>
<td>Canon LX/4</td>
<td>Oki OL-400/4</td>
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<td>300 x 300/0</td>
<td>300 x 300/0</td>
<td>300 x 300/0</td>
<td>300 x 300/0</td>
<td>300 x 300/0</td>
<td>300 x 300/0</td>
</tr>
<tr>
<td>Paper capacity (first tray/second tray, in sheets)</td>
<td>200/250 optional</td>
<td>100/0</td>
<td>250/500, 30 envelopes optional</td>
<td>250/500, 30 envelopes optional</td>
<td>250/200</td>
<td>250/200</td>
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<tr>
<td>Recycling program for consumables</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<td>1</td>
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<tr>
<td>Warranty period (in years)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Technical-support rating</td>
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<td>not rated *</td>
<td>not rated *</td>
<td>not rated *</td>
<td>poor</td>
<td>excellent</td>
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</tbody>
</table>

* = yes; 0 = no. Technical-support ratings are based on a series of calls made to each company by Macworld staffers (posing as customers) to gauge the accessibility, helpfulness, and accuracy of the company's support technicians. Macworld uses a point system, including biases and demerits, to derive the final rating. Ratings are for companies, not individual products, and we call only those companies whose products Macworld Lab tests.

An 8-ppm version is available for $1349.
especially when one of the devices—the PLP II—has just one SCSI port, not the usual two.

Still, the PLP II has a lot going for it. If you use System 7, you can share the PLP II on a network. Unlike almost any other laser, it can print to the left and right edges of the page (output quality deteriorates a bit at the edges). For $399, you can upgrade the PLP II to a PostScript-based BLP Elite. The PLP II uses GCC's time-tested driver, the latest version of which includes improved dithering routines that produce better results with scanned images. And GCC was conserving energy long before the EPA made it fashionable—the PLP II has always had a standby mode that kicks in automatically after a few minutes of rest. And it has a power switch.

**PostScript for Peanuts**

Moving into the PostScript department, déja vu hits as you see a printer that looks just like a LaserWriter Select 300. You have spied the Select 300's evil twin, the

### Comparing Print Quality

**LAZY DOG'S AZ**

**Good:** The Texas Instruments microWriter PS/23

**LAZY DOG'S AZ**

**Better:** The Apple LaserWriter Select 300

**LAZY DOG'S AZ**

**Best:** The NewGen Turbo PS/400p.

If you just want clean text for office memos, just about any laser printer will do the job. For small type, these laser printers show nearly identical quality. In enlarged type, differences emerge. Notice the serifs on the large Z—nearly perfect on the 400-dpi LaserJet PS/400p, but substantially distorted by the microWriter. Each AZ letter pair shown above is a 400 percent enlargement of the smaller type.

---

**GCC Technologies**

<table>
<thead>
<tr>
<th>BLP Eclipse</th>
<th>LaserWriter 4039-10R</th>
<th>LaserWriter 4039-12R</th>
<th>SilentWriter Model 95F</th>
<th>TurboPS/300p</th>
<th>TurboPS/400p</th>
<th>OL-950</th>
</tr>
</thead>
<tbody>
<tr>
<td>800/422-7777</td>
<td>800/422-7777</td>
<td>800/358-5835</td>
<td>800/358-5835</td>
<td>800/756-0556</td>
<td>800/756-0556</td>
<td>800/654-3282</td>
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<tr>
<td>$379</td>
<td>$1099</td>
<td>$1999</td>
<td>$4039-10R</td>
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**Lexmark Technologies**

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<tr>
<th>Clone PS Level 1</th>
<th>Clone PS Level 2</th>
<th>Clone PS Level 1</th>
<th>Clone PS Level 2</th>
<th>Clone PS Level 1</th>
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<tr>
<td>AMD 29200/16MHz</td>
<td>AMD 29200/16MHz</td>
<td>AMD 29200/16MHz</td>
<td>AMD 29200/16MHz</td>
<td>AMD 29200/16MHz</td>
<td>AMD 29200/16MHz</td>
<td>AMD 29200/16MHz</td>
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<tr>
<td>17</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>35</td>
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**Lexmark**

<table>
<thead>
<tr>
<th>2MB/4MB</th>
<th>2MB/16MB</th>
<th>2MB/16MB</th>
<th>4MB/16MB</th>
<th>2MB/5MB</th>
<th>3MB/16MB</th>
<th>4MB/16MB</th>
<th>2MB/6MB</th>
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**NEC**

<table>
<thead>
<tr>
<th>TurboPS/300p</th>
<th>SilentWriter Model 95F</th>
<th>TurboPS/400p</th>
<th>OL-950</th>
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<tr>
<td>$379</td>
<td>$1999</td>
<td>$1999</td>
<td></td>
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</table>

**NewGen Systems**

<table>
<thead>
<tr>
<th>TurboPS/300p</th>
<th>TurboPS/400p</th>
<th>OL-950</th>
</tr>
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<tr>
<td>$379</td>
<td>$1999</td>
<td>$1999</td>
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**Okidata**

<table>
<thead>
<tr>
<th>TurboPS/300p</th>
<th>TurboPS/400p</th>
<th>OL-950</th>
</tr>
</thead>
<tbody>
<tr>
<td>$379</td>
<td>$1999</td>
<td>$1999</td>
</tr>
</tbody>
</table>

---

2 The 8-ppm version, $1799, also includes resolution enhancement.

3 The TurboPS/400p, with a faster controller and 600 dpi-resolution, also sells for $1995.

4 No list price; check with dealer.

5 Company did not supply information.
than the Select 310's, and the micro-LaserWriter offers a similar array of paper-handling options.

TI's Texas-size family of affordable PostScript printers also includes the 9-ppm microLaser Plus PS17 ($1199) and a 35-font, $1349 cousin, the microLaser Plus PS35. (Barristers beware: you'll need to upgrade at least 2MB of RAM to print legal-size pages.) You can upgrade either of these machines to a high-speed microLaser Turbo, which we will examine shortly.

But first, what's this? A Digital Equipment Corporation (DEC) printer in the ecolaser department? The 4-ppm, 17-font DECler 1152 ($999) is the least expensive machine reviewed here that supports PostScript Level 2, the latest and greatest version of the PostScript language. It's also a small that oozed across the finish line just ahead of the LaserWriter Select 310. The DECler 1152 contains a PhotoGrade-like image-enhancement feature, but it makes a slow printer even slower, and you have to download a PostScript program to the printer to enable or disable the feature. Next!

This is more like it—the GCC BLP Elite ($879), which uses the same Okidata engine as the PLP II series. The 17-font BLP Elite has the LocalTalk port and 2MB of memory that Apple stripped out of its LaserWriter Select 310. It's much faster, too—the BLP Elite trounced the LaserWriter Select 310 and just edged out TI's micro-LaserWriter. (We tested the 4-ppm BLP Elite; an 8-ppm version is available for $1349.)

Going Upscale
At the end of the aisle, you turn the corner, and the surroundings change. You've gone upscale—into the province of printers that provide faster performance, better print quality, or more options.

Your heart rate increases a bit—for good reasons. Many of the printers here outperform machines that cost thousands more a couple of years ago. The real star is the TI micro-Laser Turbo ($1599), whose RISC-based Level 2 controller pushed the 4-ppm printer to a distance second-place finishing behind the TI micro-Laser Turbo. The NTR is a few years old, but it's still a solid performer. Paper handling is only fair, though—the printer holds just 70 sheets. A 250-sheet paper tray and the required base for it cost $164.

A 200-sheet paper capacity is standard in the Okidata OL850 ($1999), whose engine is similar to that of GCC's printers. (A second 200-sheet tray is optional.) Its 8-ppm engine allowed the OL850 to finish near the top in the Courier document test, but its overall performance was mediocre. The OL850 also provides HP Laserjet emulation and is among the few printers reviewed here that provide a resolution-enhancement feature that

---

**Surveying Laser Printers (continued)**

<table>
<thead>
<tr>
<th>Product</th>
<th>QMS</th>
<th>QMS Electronics America</th>
<th>Texas Instruments</th>
<th>Texas Instruments</th>
<th>Texas Instruments</th>
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<tbody>
<tr>
<td>Phone</td>
<td>205/633-4300</td>
<td>205/633-4300</td>
<td>201/229-4000</td>
<td>201/229-4000</td>
<td>201/229-4000</td>
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<tr>
<td>Toll-free phone</td>
<td>800/631-2692</td>
<td>800/631-2692</td>
<td>800/466-0262</td>
<td>800/466-0262</td>
<td>800/466-0262</td>
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<td>Tested by Macworld Lab</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Imaging language</td>
<td>Adobe PS Level 1</td>
<td>Clone PS Level 2</td>
<td>Adobe PS Level 1</td>
<td>Adobe PS Level 1</td>
<td>Adobe PS Level 1</td>
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<tr>
<td>Processor/clock rate</td>
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<td>68020/20MHz</td>
<td>Intel 386/60MHz</td>
<td>Intel 386/60MHz</td>
<td>Intel 386/60MHz</td>
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<tr>
<td>Number of fonts provided</td>
<td>45</td>
<td>39</td>
<td>35</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>TrueType rasterizer built-in</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>RAM (base model/maximum)</td>
<td>2MB/6MB</td>
<td>6MB/10MB</td>
<td>2MB/16MB</td>
<td>2MB/16MB</td>
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<tr>
<td>Uses standard SIMMs for RAM upgrade</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>SCSI port for font hard disk</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Other controller upgrades</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Additional software included</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
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<td>Canon LX/4</td>
<td>Canon LX/4</td>
<td>Samsung/8</td>
<td>Sharp/9</td>
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<tr>
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<td>300 x 300/600</td>
<td>300 x 300/600</td>
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<tr>
<td>Paper capacity (first tray/second tray; in sheets)</td>
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<td>Paper sizes supported</td>
<td>letter, legal, executive, A4, B5</td>
<td>letter, legal, executive, A4, B5</td>
<td>letter, legal, A4, B5, envelopes, invoice</td>
<td>letter, legal, A4, B5, envelopes</td>
<td>letter, legal, A4, B5, envelopes</td>
</tr>
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<td>Recycling program (for consumables)</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Warranty period (in years)</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<td>Technical-support rating</td>
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<td>very good</td>
<td>not rated</td>
<td>satisfactory</td>
<td>satisfactory</td>
</tr>
</tbody>
</table>

* = yes; o = no. Technical-support ratings are based on a series of calls made to each company by Macworld staff members (posing as customers) to gauge the accessibility, helpfulness, and accuracy of the company's support technicians. Macworld uses a point system, including bonuses and demerits, to derive the final rating. Ratings are for companies, not individual products, and we call only those companies whose products Macworld Labs tests. * = micro-Laser Plus PS35, with 35 fonts, sells for $1349. ** Company did not supply information.
improves text output.

The OL850's text smoothing does a good job, but it falls short of the NewGen Systems TurboPS/400p ($1,995), which uses a 400-dpi Canon engine. The extra resolution not only helps text, but results in better gray-scale output, too.

The printer's RISC-based controller and PostScript-clone interpreter helped it finish fifth, slightly behind the NewGen TurboPS/300p ($1,959), a 300-dpi version of the TurboPS/400p.

Finally, there's the NEC SilentWriter Model 95F. This printer has some fine attributes, starting with PostScript Level 2 and resolution enhancement. It's also the only printer reviewed here that accepts an optional board that turns it into a plain-paper fax. (Compaq sells some fax-capable printers, but their prices begin at $2,729.)

Unfortunately, the SilentWriter Model 95F finished near the bottom of the pack in our speed tests, just ahead of the DEC LaserWriter 1152 and virtually tied with TI's microWriter. Still, if you don't need sizzling performance and you do want PostScript fax capabilities, the Model 95F deserves a look.

Attractive Newcomers

As you stand amid this sea of scribes, trying to sort them out and pick the winners, the salesperson begins telling you about still more printers that are just around the corner (and that went on sale after Macworld Lab testing was completed). One of these is the $1,995 Samsung Electronics America Finale 8000, an 8-ppm workhorse that includes two 250-sheet trays and a RISC-based PostScript Level 1 controller. An additional

---

**Graphics Difference**

![Apple StyleWriter II](image1) ![HP DeskWriter](image2) ![GCC PLP II](image3) ![Apple LaserWriter Select 300](image4) ![TI microWriter PS23](image5)

This PostScript graphic shows diverse gray-scale abilities. The QuickDraw-based LaserWriter Select 300 (bottom, left) uses PhotoGrade to create more smoothly changing grays in the bars beneath the headlight than an average PostScript laser, the microWriter PS23 (bottom, right). The StyleWriter II, a 360-dpi ink-jet (top, left), produced far better grays than HP's DeskWriter (top, middle) or even GCC's PLP II, a 300-dpi QuickDraw laser (top, right).

---

**Surveying Ink-Jet and Thermal-Transfer Printers**

<table>
<thead>
<tr>
<th>Product</th>
<th>Ink-Jet</th>
<th>Ink-Jet</th>
<th>GCC Technologies</th>
<th>Eastman Kodak</th>
<th>Hewlett-Packard</th>
<th>GCC Technologies</th>
<th>Mannesmann Tally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Portable StyleWriter</td>
<td>StyleWriter II</td>
<td>WideWriter 360</td>
<td>Kodak Dicom 701</td>
<td>DeskWriter</td>
<td>WriteMove II</td>
<td>MobileWriterPS</td>
</tr>
<tr>
<td>Phone</td>
<td>408/996-1010</td>
<td>408/996-1010</td>
<td>617/275-5800</td>
<td>716/724-4000</td>
<td>617/275-5800</td>
<td>206/251-5500</td>
<td>800/344-0006</td>
</tr>
<tr>
<td>Toll-free phone</td>
<td>○</td>
<td>○</td>
<td>800/422-7777</td>
<td>800/752-0900</td>
<td>800/422-7777</td>
<td>800/843-1347</td>
<td>800/999</td>
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<td>$399</td>
<td>$599</td>
<td>$999</td>
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<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Maximum speed (in pages per minute)</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>NA</td>
<td>6</td>
</tr>
<tr>
<td>Resolution (in dots per inch)</td>
<td>360</td>
<td>360</td>
<td>360</td>
<td>300</td>
<td>300</td>
<td>360</td>
<td>300</td>
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<tr>
<td>Paper capacity (in sheets)</td>
<td>1 (100-sheet tray optional)</td>
<td>100</td>
<td>75</td>
<td>30</td>
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<td>1</td>
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<tr>
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<td>not rated</td>
<td>good</td>
<td>very good</td>
<td>excellent</td>
<td>not rated</td>
</tr>
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</table>

\* = yes; ○ = no. Technical-support ratings are based on a series of calls made to each company by Macworld staffers (posing as customers) to gauge the accessibility, helpfulness, and accuracy of the company's support technicians. Macworld uses a point system, including bonuses and demerits, to derive the final rating. Ratings are for companies, not individual products, and we call only those companies whose products Macworld Lab tests.

1 No sheet feeder available.
2 Dealer support only.
CHOOSING THE BEST PERSONAL PRINTER

BEHIND OUR TESTS

Macworld Lab used several real-world documents designed to show printer speed and, to a lesser extent, the computer's ability to handle various printing tasks. For example, a 20-page single-font test document demonstrated the engine speed of the printer, while the Aldus FreeHand document depended heavily on the speed of the printer's or the Mac's processor. A Quadra or Centris would obtain significantly better results than those shown on our test machine—a cache card-equipped Macintosh IIIci with 8MB of memory and an internal 80MB drive.

Other test documents included a complex MacDraw Pro illustration to evaluate the printer's ability to handle a QuickDraw document, a four-font TrueType test, a PageMaker file to test the printer's ability to combine gray-scale graphics and text in a single document, and a multiple-font document to test the printer's ability in handling printer-resident fonts.

System 7.1 and LaserWriter version 7.1.1 were used for the PostScript printers unless the printer shipped with a proprietary driver. For non-PostScript printers, we used the drivers that shipped with the printers. Background printing and spooling were turned off.

To assess print quality, we examined the output with an unaided eye as well as with an 8x magnifying loupe. We checked how well each machine printed solid areas and we looked for jagged character edges in large sizes, filled-in characters in small sizes, and differences in gray-scale capabilities.

We also compared the output of PostScript Type 1 fonts from the clone printers and the genuine Adobe machines. And for laser printers we looked for subtle output problems such as banding, often caused by friction in the print engine's gears, and scatter, a haze of stray toner particles around character edges, caused by stray electrical charges on the printer's photoconductive drum.

Macworld Lab testing supervised by Mark Hurlow

$995 buys the Image1200 upgrade board, which boosts the printer's resolution to 1200 dpi.

Lexmark shipped several appealing new printers just as this article was going to press. Two members of Lexmark's IBM LaserPrinter 4039 family sell for less than $200—the 10-ppm LaserPrinter 4029-10R ( $1599 ) and the 12-ppm LaserPrinter 4039-12R ( $1999 ) . ( A $2199 version of the 1OR supports duplex printing—the ability to print on both sides of a page. There isn't a cheaper duplex machine on the market.) The entire 4039 family produces 600-dpi output and offers text and gray-scale resolution enhancement. The 4039 printers also provide energy-saving automatic power-down features.

Other new offerings that were released at press time are GCC's BLP Eclipse line—PostScript Level 2 clones. Unlike GCC's other low-end printers, the 8-ppm Eclipse version offers resolution enhancement. The 4-ppm BLP Eclipse retails for $1099; an 8-ppm model retails for $1799 and replaces the 8-ppm BLP Elite. (The 4-ppm BLP Elite we tested remains available.)

Then there's Mannesmann Tally's $999 MobileWriterPS, the world's first battery-powered, portable PostScript printer. Weighing 8 pounds, the 6-ppm, 300-dpi MobileWriterPS uses a Toshiba-built, 300-dpi thermal-transfer mechanism that holds 80 sheets of paper. With its 6800-based controller, however, I was surprised to see the MobileWriterPS approach that speed on anything but simple text.

Why portable PostScript? If you use PostScript printers at the office and on the road, you will probably have to do less reformatting, when transferring a document between your laptop and desktop machines. And if you travel with PowerBook-toting coworkers, you and your cohorts can share the printer in your hotel room—or even on the plane. If you cannot live without a PostScript printer at the office and if you print the same types of documents on the road, you could probably benefit from portable PostScript.

So which printer accompanies you to the car? Among ink-jets, Apple's StyleWriter II is hard to beat. It makes a great portable printer, too, if you don't need battery operation. If you do, GCC's WriteMove II gets the edge for portability, but Apple's Portable StyleWriter is faster and accepts an optional sheet feeder.

Among low-cost lasers, it's a toss-up between GCC's PLP II and Apple's LaserWriter Select 300. The PLP II costs less, but the LaserWriter Select 300 offers FinePrint and, when equipped with 5MB of memory, PhotoGrade. Both can be upgraded to support PostScript, but GCC's upgrade provides much better performance and network sharing. If you plan to stick with QuickDraw, buy the LaserWriter Select 300. If you anticipate migrating to PostScript, the PLP II might be the better choice.

As for the upscale printers, the TI microLaser Turbo is the hands-down performance winner. For top print quality, the QMS 420 Print System edges out NewGen's TurboPS/400p. The two printers' output is nearly identical, but the QMS 420's 600-dpi resolution enables it to print finer halftones with a broader range of grays.

After this briefing, your real shopping trip should go as smoothly as our trip through the virtual computer store.

Contributing editor and Working Smart columnist JIM HEID has worked with more than 125 laser printers and has written 10 monochrome printer features for Macworld.

PERSONAL PRINTERS

With so many good competitors it wasn't always easy to separate the winners from the also-rans. We looked at speed, print quality, and a range of options to select the top printers in each category.

Ink-Jet

StyleWriter II The StyleWriter II is slower than the HP DeskWriter and not as easy to share, but offers superior output especially when printing gray-scale images. It's also small enough to be considered portable, although it doesn't run on batteries. Company: Apple Computer. List price: $359.

QuickDraw Laser

LaserWriter Select 300 Again, Apple's offering is slower than the competition in this case, the GCC PLP II, but its support for FinePrint and PhotoGrade yields superior output. Company: Apple Computer. List price: $1839.

PostScript Laser

microLaser series The winner for the second straight year, the microLaser Plus models are good (and affordable) performers that can be upgraded to the lighting-fast microLaser Turbo, the fastest printer tested in this roundup. Company: Texas Instruments. List price: $1199-$1599.
Improving the scanner that MacWorld Magazine called "the best value around" and that Byte Magazine called their "top pick" took some help from our friends.

QuickTime Savvy
QuickTime is the centerpiece of Apple's imaging technology. Mirror recognized that no new scanner would be complete without leveraging this powerful new tool.

Introducing the world's first QuickTime-savvy color scanners.

Stop wasting disk space!

By using QuickTime's JPEG compression, images scanned on your new Mirror scanner can be saved at 1/50th their normal file size! Images that used to fill up a $75 cartridge can now fit on a diskette that costs under a buck.

Total Control with MirrorScan™
To control this hot new technology we created MirrorScan, which combines full-color previews (high or low rez), white/black point tools, custom selection options and integrated JPEG compression. Whether you use the application, desk accessory or Plug-in, you get stunning scans every time, in a powerful, easy-to-use package.

Choose 600 or 800 dpi
We improved our top-rated 600 dpi scanner by adding dual SCSI ports, hardware gamma correction, and an optional transparency adapter. There's also an 800 dpi version that incorporates the same great features for just a few dollars more.

Transparencies or Flat-art?
With the optional transparency adapter, either Mirror Color Scanner can accept transparencies up to 8½ x 11" (the competition only does 5 x 7). Perfect for desktop publishing systems.

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It's one thing to design a scanner with more features and performance than anyone else. But delivering them without dealer markup, at savings of up to 40% makes them unquestionably the best value on the market.

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Order Direct Anytime
800-643-0636

Mirror Scanner from $1099 with Photoshop

Mirror Scanners 600 dpi 800 dpi

<table>
<thead>
<tr>
<th>Scanner</th>
<th>600 dpi</th>
<th>800 dpi</th>
</tr>
</thead>
<tbody>
<tr>
<td>w/ MirrorScan &amp; Photoshop</td>
<td>$1099</td>
<td>$1299</td>
</tr>
<tr>
<td>w/ Pro JPEG option &amp; Photoshop</td>
<td>$1499*</td>
<td>$1699*</td>
</tr>
<tr>
<td>Transparency Option</td>
<td>$599</td>
<td>$599</td>
</tr>
</tbody>
</table>

All scanners include Photoshop 2.5!

Mirror
The best thing next to your Mac
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Circle 102 on reader service card
UTILITIES THAT IMPROVE PRINT QUALITY, CONNECT YOU

Maximize your
Whether your Macintosh is connected to a $4000 PostScript laser printer or a $359 StyleWriter II, you can handle print jobs faster, cheaper, and with better results by pairing your printer with the right software. Printer drivers and utilities play a key role in determining how well your printer does its job.

Consider a sampling of the printing sleight-of-hand made possible by add-on printer utilities: endow your QuickDraw printer with the ability to interpret complex PostScript files; make non-networked printers fully networkable; teach low-cost ink-jet printers to do double-sided printing; even plug your Mac into the parallel or serial port of almost any non-Mac PC printer available—and actually print files with great results.

Most of these add-ons fall into four categories: PostScript interpreters, spoolers, print servers, and PC-printer-conversion packages. We've also included other utilities that defy strict categorization; the best of them prod even stodgy, aging QuickDraw printers into doing things you never dreamed possible.

Better Results with PostScript
QuickDraw printers such as Apple's Personal LaserWriter LS, StyleWriter series, and new Personal LaserWriter 300 are generally viewed as poor choices for printing graphics from illustration programs like Aldus FreeHand and Adobe Illustrator. That's because these printers lack an on-board PostScript interpreter to handle the task of turning commands written in Adobe's PostScript page-description language into the tiny rows of dots that make up a printed image. Non-PostScript printers rely on QuickDraw, the language the Mac uses to draw text and graphics on the screen. QuickDraw printers normally turn out PostScript graphics at screen resolution—a somewhat crude 72 dots per inch.

But a QuickDraw printer can create high-resolution PostScript graphics—if paired with a PostScript-compatible interpreter (often called a PostScript clone) such as Color Age's Freedom of Press Classic (formerly Freedom of Press Light), TeleTypeSetting's T-Script (available in Basic, regular, and Deluxe versions), or PM Ware's UltraScript Plus for the Mac (available in a regular version). These software interpreter packages use the Mac's brain to take care of all the complex calculations normally handled by a PostScript printer's interpreter (see "PostScript-Interpreter Options").

How PostScript Clones Work
All three of these PostScript interpreters follow a similar process as they translate PostScript data into information a non-PostScript printer can print.

When you issue the Print command, the programs use the Mac's standard LaserWriter printer driver to create PostScript files from your documents and store them on your hard drive. Your document doesn't go straight to the printer; instead, the interpreter records each element in the document as a series of commands in the PostScript language. The commands describe each page's appearance—from the fonts it uses to the position of each text and graphic element. (T-Script, unlike the other programs, provides a window in which you can view and edit the actual PostScript code before it is printed—though this is not something most users would need to do.)

In the second step, the interpreter software reads the newly created PostScript commands line by line and converts them into a bitmapped graphic image—the kind of image any printer can understand. This conversion process is known as rasterizing. When the interpreter has mapped out where each dot of ink will appear on the paper, it sends this information to the printer for output.

Each of these programs can be configured to handle this two-step process seamlessly, if slowly, passing the PostScript files created with the LaserWriter driver directly to the interpreter for printout, provided the Mac has enough available RAM to run the interpreter application in the background. If memory is limited, you must first create the PostScript files, then quit whatever application you were using, launch the interpreter program, and select the PostScript files for printing.

Because these packages interpret text and graphics at the printer's maximum resolution, they can dramatically boost output quality. Consider this: The StyleWriter is equipped to print at an impressive resolution of 360 dpi. But because it is a QuickDraw-based printer, it can only output PostScript graphics at screen resolution, or about 72 dpi—what a waste! These PostScript interpreters unlock the StyleWriter's full resolution potential.

The big question is, How well do these QuickDraw-printer—PostScript-interpreter combinations handle PostScript printing in comparison with true PostScript printers? We tried all three packages in combination with a Hewlett-Packard LaserJet IIIIP and found they managed most PostScript jobs satisfactorily—but there was a price to pay in terms of speed and compatibility.

All the interpreter packages handle print jobs much more slowly than do PostScript printers. PostScript printers use their own internal processors to handle PostScript interpretation and rasterizing, while the software-based interpreters perform that processing on the Mac itself. This means major slowdowns when working with a less-powerful Mac.

No single package has the edge on speed. Using a Mac IIci with 8MB of RAM, a cache card, and an internal 80MB hard drive, Freedom of Press handled complex Aldus PageMaker documents slightly faster than UltraScript and nearly twice as fast as the Basic, regular, and Deluxe versions of T-Script—saving more than six minutes over all three versions. On the other hand, UltraScript won easily on graphics applications, ren-
### PostScript-Interpreter Options

<table>
<thead>
<tr>
<th>Company</th>
<th>ColorAge</th>
<th>TeleTypesetting</th>
<th>PM Ware</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone</td>
<td>500/667-9895</td>
<td>617/774-9700</td>
<td>619/738-6633</td>
</tr>
<tr>
<td>Toll-Free phone</td>
<td>800/437-3336</td>
<td>800/845-4843</td>
<td></td>
</tr>
<tr>
<td>List price</td>
<td>$149*</td>
<td>$149*</td>
<td>$495*</td>
</tr>
<tr>
<td>Number of Type 1 fonts supplied</td>
<td>35</td>
<td>17</td>
<td>43</td>
</tr>
<tr>
<td>RAM required</td>
<td>2MB (4MB-8MB for background printing)</td>
<td>2MB</td>
<td>1.5MB</td>
</tr>
<tr>
<td>Background printing</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Includes preview screen</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>PostScript editing window</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Converts PostScript to TIFF/PICT</td>
<td>☒/○</td>
<td>☒/○</td>
<td>○/○</td>
</tr>
<tr>
<td>Hard drive space required for temp files</td>
<td>2.5MB</td>
<td>5MB</td>
<td>2MB</td>
</tr>
<tr>
<td>Batch processing</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Logs files printed/bufl-in spooler</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
</tbody>
</table>

- ☒ = yes; ○ = no.  
- * Freedom of Press Pro; $149, offers support for high-end output devices.  
- T-Scrip Deluxe; $495, supports PICT or TIFF conversion at 2400 dpi.  
- T-Scrip Basic; $85, does not support PICT or TIFF conversion.  
- £ UltraScript Plus for the Mac; $195, includes 15 fonts, lacks a spooler, and does not support background printing.

### PostScript-Interpreter Speed Tests

<table>
<thead>
<tr>
<th>Speed Test</th>
<th>PM Ware UltraScript Plus</th>
<th>ColorAge Freedom of Press 3.05</th>
<th>TeleTypesetting T-Script 3.30</th>
<th>TeleTypesetting T-Script Deluxe 3.30</th>
<th>TeleTypesetting T-Script Basic 3.30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Fonts</td>
<td>Print speed for a 7-page Microsoft Word 5.0 document containing a variety of fonts, sizes, and styles.</td>
<td>595 C</td>
<td>657</td>
<td>990</td>
<td>965</td>
</tr>
<tr>
<td>Single Font</td>
<td>Print speed for a 20-page Word 5.0 document with double-spaced, 12-point Courier text in plain, bold, and italic.</td>
<td>257</td>
<td>257</td>
<td>257</td>
<td>257</td>
</tr>
<tr>
<td>MacDraw Pro</td>
<td>Print speed for a graphic containing more than 2000 simple objects and several lines of Helvetica text.</td>
<td>753</td>
<td>753</td>
<td>753</td>
<td>753</td>
</tr>
<tr>
<td>FreeHand 3.1</td>
<td>Print speed for a complex graphic that includes special PostScript effects, nonlinear blends, and Bézier curves.</td>
<td>805</td>
<td>805</td>
<td>805</td>
<td>805</td>
</tr>
<tr>
<td>PageMaker 4.2</td>
<td>Print speed for a 4-page newsletter using several fonts, a MacPaint image, and 3 gray-scale TIFF images.</td>
<td>162 C</td>
<td>162 C</td>
<td>162 C</td>
<td>162 C</td>
</tr>
<tr>
<td>TrueType</td>
<td>Print speed for a 1-page Word 5.0 document containing 4 TrueType fonts.</td>
<td>270</td>
<td>270</td>
<td>270</td>
<td>270</td>
</tr>
</tbody>
</table>

Testing was done on a Mac Iic, printing to a Hewlett-Packard LaserJet IIIIP with GDT's PowerPrint.

- C = color; B = black; W = white.  
- * 3MB extra memory allocated to match memory allocation of T-Script Deluxe.  
- Standard memory allocation.  
- Could not print with allocated memory.  
- Only Light version was available at the time of our testing; has been replaced by Freedom of Press Classic, which will show identical performance.  
- Allocated extra memory to get it to print.
allow a Mac to print to nearly every PC printer now available. Those packages include GDT Softworks' PowerPrint, Insight Development's MacPrint, and Orange Micro's Grappler Ilsp. Such products have been around for a long time, but in recent years their performance has improved, with better compatibility and increased networking options.

All of the packages are hardware-software combinations. Each provides a cable outfitted at one end with a converter that plugs into the parallel or serial port of a PC printer. The packages also include printer drivers for a broad range of PC printers. Some include extra software, such as networking utilities or a built-in spooler—a feature that allows background printing and lets you cancel or reorder jobs you have queued for printing.

The best of the packages, PowerPrint, is available in two versions—one for individual users and another, PowerPrint/LT, that lets you share the PC printer with other Macs over an AppleTalk network. The PowerPrint adapter plugs into the Centronics (parallel) port of the printer. The network version of PowerPrint is nearly identical, but includes a bulky external power supply that must be plugged into the adapter.

PowerPrint comes with printer drivers for numerous types of PCs. The drivers for laser printers contain most of the standard LaserWriter driver options, such as the ability to flip images horizontally or vertically on the page and to make photo reductions at any percentage. PowerPrint includes SpoolMaster, a decent print spooler. If you want to use PowerPrint with a laser printer, be sure the printer has at least 1MB of memory, however. Many older laser printers, such as HP's original LaserJet and LaserJet Plus, came with less and can't print a full page.

The Grappler Ilsp package also supports network use. To set it up, you connect the converter to the printer's parallel port. On your Mac, you select the ImageWriter LQ driver in the Chooser and then open Grappler Ilsp's own control panel, which you specify the type of PC printer you'll be using. The driver options aren't as plentiful as those offered by PowerPrint: you can print at three levels of quality but can only reduce documents to 33 percent and 66 percent.

Grappler Ilsp also comes with its own print spooler (it's unusually slow, though), and it's the only converter that allows you to password-protect your printer.

MacPrint is the most bare-bones of the Mac-to-PC printer packages. It connects to the printer's serial port and offers no spooling or networking features. Since many PC printers aren't equipped with a serial port, MacPrint offers less connectivity than its competitors.

Of the cable-driver packages tested, PowerPrint was the best performer followed by MacPrint. PowerPrint printed substantially faster than its competitors on complex Word and PageMaker documents containing a variety of fonts. On a seven-page Word document, PowerPrint finished in less than eight minutes, compared with MacPrint's nearly 13 minutes, and Grappler Ilsp's nearly 28. And PowerPrint provided the best quality output on complex graphics and scanned images. But MacPrint sped through a complicated MacDraw Pro drawing and a FreeHand document substantially faster than PowerPrint.

The weakest performer was Grappler Ilsp, the least expensive cable package we tested. Grappler Ilsp consistently finished on the bottom of the heap in speed tests and offered only crude translations of scanned images and gray scales.

Are converters worth the money? If you already have a PC printer, buying one of these cables gets you a Mac printer for about $149. If you're shopping for a printer, just think of the wide variety of low-cost PC printers you can choose from if you also invest in a PowerPrint or MacPrint converter. Of course, with Mac
printer prices dropping, you still might be better off with a Mac-specific printer; but if your work calls for printing from both Macs and PCs, a conversion package can save the cost of a second printer.

These packages can also be quite useful if you own a PowerBook and frequently have to print documents while traveling. Instead of buying and lugging around a portable printer, you can just bring along an adapter cable in your suitcase, confident that you'll be able to connect to almost any printer you encounter.

In fact, the folks at Apple have deemed PowerPrint so useful, they've decided to include it in two of their own Mac-to-PC conversion kits. Apple's $219 DOS Companion Kit includes the full PowerPrint package, and the $99.95 Macintosh Print Pack (usually bundled with the Performa) includes a stripped-down version of PowerPrint, which supports fewer printers and lacks a spooler.

Spoilers and Networking

If your Mac is connected to a laser printer or a StyleWriter, you probably already make use of Apple's own built-in spoiler—PrintMonitor. Each time you print a document with background printing active, a copy of the document's printed image, called a spool file, is saved to disk and tucked away in the PrintMonitor Documents folder (located in the System Folder). Then, as you continue with your work, PrintMonitor lines up the files you've sent it in a sequence for downloading to the printer one at a time.

PrintMonitor, however, has serious limitations as a spooler. It shows which jobs are queued for printing, but doesn't let you reorder those jobs or shift a job to a different printer once it's been queued. And PrintMonitor can't show what's happening elsewhere on a network; it can't tell you, for example, which of the three printers on your network is the least busy.

Though such limitations may not affect single users, on even a modest-size network the flow of print jobs to a shared printer can be important in the face of looming deadlines.

A better alternative to PrintMonitor is Fifth Generation Systems' $149 SuperLaserSpool (504/291-7221). This system extension replaces PrintMonitor, handling jobs faster and more effectively.

SuperLaserSpool's Laser Queue accessory displays a list of every file waiting to be printed on each printer accessible from your Mac. To reorder print jobs, just drag the jobs listed in the window into the order you want. You can also redirect a job to a different printer. If you send a file to printer A and then discover that moments earlier a coworker sent a 200-page manuscript to that printer, you can use standard cut-and-paste commands in the Laser Queue window to cut your job from printer A's queue and paste it into the queue of printer B.

SuperLaserSpool also offers a few convenient extras, such as a print-preview function (for use with applications that lack their own preview command) and a notification alert option that displays an alert dialog box each time a file finishes printing in the background.

SuperLaserSpool gives you plenty of control over how your own Mac prints, but it doesn't let you change the order of files sent by other users on the network. In fact, print jobs queued by other net-

### Connections to PC Printers

<table>
<thead>
<tr>
<th>Company</th>
<th>Grappler Ilsp</th>
<th>MacPrint</th>
<th>PowerPrint</th>
<th>PowerPrint/LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone</td>
<td>Orange Micro</td>
<td>Insight Development</td>
<td>GDT Softworks</td>
<td>GDT Softworks</td>
</tr>
<tr>
<td>Tell-free phone</td>
<td>(714/779-2772)</td>
<td>510/652-4115</td>
<td>604/291-9121</td>
<td>604/291-9121</td>
</tr>
<tr>
<td>List price</td>
<td>$129</td>
<td>$149</td>
<td>$149</td>
<td>$399</td>
</tr>
<tr>
<td>Requires additional power supply</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>RAM required</td>
<td>2MB</td>
<td>1MB</td>
<td>2MB</td>
<td>2MB</td>
</tr>
<tr>
<td>Port connection</td>
<td>parallel</td>
<td>serial</td>
<td>parallel</td>
<td>parallel</td>
</tr>
<tr>
<td>Flips image horizontally</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Reduces image by percentage</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Prints in background</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Reorders and/or deletes pasted jobs from spooler</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Supports network use</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = yes; 0 = no.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Driver-Cable Combos down to the Wire

#### Multiple Fonts
- Print speed for a 7-page Microsoft Word 5.0 document containing a variety of fonts, sizes, and styles:

<table>
<thead>
<tr>
<th></th>
<th>Grappler Ilsp</th>
<th>MacPrint</th>
<th>PowerPrint</th>
<th>PowerPrint/LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested on a Performa 200 (with 4MB of RAM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDT PowerPrint/LT</td>
<td>463</td>
<td>695</td>
<td>545</td>
<td>820</td>
</tr>
<tr>
<td>GDT PowerPrint</td>
<td>462</td>
<td>635</td>
<td>553</td>
<td>805</td>
</tr>
<tr>
<td>Insight MacPrint</td>
<td>773</td>
<td>1238</td>
<td>239</td>
<td>592</td>
</tr>
<tr>
<td>Orange Micro Grappler Ilsp</td>
<td>1666</td>
<td>3154</td>
<td>852</td>
<td>1975</td>
</tr>
</tbody>
</table>

#### Single Font
- Print speed for a 20-page Word 5.0 document containing double-spaced, 12-point Courier text in plain, bold, and italic:

<table>
<thead>
<tr>
<th></th>
<th>Grappler Ilsp</th>
<th>MacPrint</th>
<th>PowerPrint</th>
<th>PowerPrint/LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested on a IIfi (with 6MB of RAM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDT PowerPrint/LT</td>
<td>211</td>
<td>447</td>
<td>315</td>
<td>482</td>
</tr>
<tr>
<td>GDT PowerPrint</td>
<td>223</td>
<td>496</td>
<td>306</td>
<td>465</td>
</tr>
<tr>
<td>Insight MacPrint</td>
<td>406</td>
<td>919</td>
<td>152</td>
<td>266</td>
</tr>
<tr>
<td>Orange Micro Grappler Ilsp</td>
<td>734</td>
<td>1999</td>
<td>386</td>
<td>994</td>
</tr>
</tbody>
</table>

#### MacDraw Pro
- Print speed for a complex graphic containing more than 2000 simple objects and several lines of Helvetica text:

<table>
<thead>
<tr>
<th></th>
<th>Grappler Ilsp</th>
<th>MacPrint</th>
<th>PowerPrint</th>
<th>PowerPrint/LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested on a Performa 200 (with 4MB of RAM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDT PowerPrint/LT</td>
<td>463</td>
<td>695</td>
<td>545</td>
<td>820</td>
</tr>
<tr>
<td>GDT PowerPrint</td>
<td>462</td>
<td>635</td>
<td>553</td>
<td>805</td>
</tr>
<tr>
<td>Insight MacPrint</td>
<td>773</td>
<td>1238</td>
<td>239</td>
<td>592</td>
</tr>
<tr>
<td>Orange Micro Grappler Ilsp</td>
<td>1666</td>
<td>3154</td>
<td>852</td>
<td>1975</td>
</tr>
</tbody>
</table>

#### FreeHand 3.1
- Print speed for a complex graphic that includes special PostScript effects, non-linear blends, and Bézier curves:

<table>
<thead>
<tr>
<th></th>
<th>Grappler Ilsp</th>
<th>MacPrint</th>
<th>PowerPrint</th>
<th>PowerPrint/LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested on a IIfi (with 6MB of RAM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDT PowerPrint/LT</td>
<td>211</td>
<td>447</td>
<td>315</td>
<td>482</td>
</tr>
<tr>
<td>GDT PowerPrint</td>
<td>223</td>
<td>496</td>
<td>306</td>
<td>465</td>
</tr>
<tr>
<td>Insight MacPrint</td>
<td>406</td>
<td>919</td>
<td>152</td>
<td>266</td>
</tr>
<tr>
<td>Orange Micro Grappler Ilsp</td>
<td>734</td>
<td>1999</td>
<td>386</td>
<td>994</td>
</tr>
</tbody>
</table>

#### PageMaker 4.2
- Print speed for a 4-page newsletter using several fonts, a MacPaint image, and 3 gray-scale TIFF images:

<table>
<thead>
<tr>
<th></th>
<th>Grappler Ilsp</th>
<th>MacPrint</th>
<th>PowerPrint</th>
<th>PowerPrint/LT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested on a Performa 200 (with 4MB of RAM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDT PowerPrint/LT</td>
<td>463</td>
<td>695</td>
<td>545</td>
<td>820</td>
</tr>
<tr>
<td>GDT PowerPrint</td>
<td>462</td>
<td>635</td>
<td>553</td>
<td>805</td>
</tr>
<tr>
<td>Insight MacPrint</td>
<td>773</td>
<td>1238</td>
<td>239</td>
<td>592</td>
</tr>
<tr>
<td>Orange Micro Grappler Ilsp</td>
<td>1666</td>
<td>3154</td>
<td>852</td>
<td>1975</td>
</tr>
</tbody>
</table>

---

A: TrueType fonts used. B: Gray-scale output was far superior to that produced by competing products.

---

All products were tested using a Hewlett-Packard LaserJet IIIP printer.

---

1 Fastest result in each category in each test. Times are in seconds. Shorter bars are better. Products are listed in order of overall performance for each category, from fastest to slowest.
to all printers. For Blue Parrot to work effectively, all users on the network must have the control panel installed.

For each job, Blue Parrot lists whose Mac sent the job, and the number of copies and pages to be printed. Blue Parrot doesn't allow reordering or rerouting jobs once they've been spoiled. It simply provides an overview of the network activity. By knowing in advance which printers are busiest, you can route your output to an idle printer, or at least one with fewer files lined up for printing.

So much for theory. In our tests, Blue Parrot didn't always provide an accurate display of upcoming print jobs. Sometimes a job appeared to leapfrog over others to the top of the queue. Or a job not listed on the queue suddenly became the active job. Also, Blue Parrot was incompatible with SuperLaserSPOOL, though Casa Blanca Works says it will soon resolve the incompatibilities. And even when it works, Blue Parrot doesn't give you control over how print jobs from all users are routed across an entire network.

For that, you need print server software.

Print Servers

Print servers—Macs connected to a network designed to receive files for printing from multiple users—arrange jobs in queues and send them one by one to designated printers. Because the server handles all the downloading of files to the printers, individual users' Macs free up more quickly after print jobs are ordered.

Apple's AppleShare Server 3.0.1 package ($1199) includes network-administrator software for setting up and maintaining a print server that can route files to up to five printers. For each printer connected to the network, the administrator can view a print queue window that provides information on the printer's activity. The administrator has the power to reorder jobs as they are spoiled on the server and redirect files to less-busy print stations to head off a bottleneck. The administrator also can allow users to bypass the spooler on the print server and print directly to a printer if necessary.

A less expensive alternative is Print Central, $795 from Compumation (814/238-2120). Like AppleShare Server, Print Central enables you to set up a centralized print server on a dedicated Macintosh, but with options that give the network administrator even more control over printer activity.

It supports multiple queues for each printer. Conversely, a single queue can be routed to up to six different printers. In this way, network users can send files to a single Chooser-selectable queue—but the work can be printed automatically on any available printer linked to its queue.

Print Central makes such a configuration surprisingly easy. In the program's status window, just draw lines on screen from the queue names to icons of the printers, adding as many lines as you need to route a queue to a specified printer.

Like AppleShare, Print Central lets you decide which users have access to certain printers. You can permit users to print directly to a specified printer—or you can hide printers so that only the server queues and not the printers are selectable from the Chooser. In this way, the administrator can see to it that all printer traffic is routed through the server. This feature did not function well in our tests, however. Every time printers were designated as hidden, they went completely offline and had to be restarted to be found by the Macs again.

Both AppleShare and Print Central allow an administrator to log networkwide printing activity. AppleShare records a separate print log for each queue. Print Central includes all activity on all printers and queues in a single report that can be sorted by user, job, or date.

Think before Buying Hardware

This combination of better output and improved print formatting and connectivity suggests that resourceful Mac owners can increase the quality and sophistication of their printing without buying new hardware. Not that you'll always see miraculous results. A new printer driver or spooler may mean only a modest boost in productivity. But a PostScript clone or PC-cable-and-driver combo can radically alter the way you work—and save you money in the process.

JOSEPH SCHORR is a journalist, a playwright, and coauthor of the just-released Macworld Macintosh Secrets (IDG Books Worldwide, 1993).
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S E V E N T H A N N U A L

World-Class Awards

BY MARJORIE BAER

Year in and year out, as new products, new product types, and new technologies enter the Macintosh marketplace, the editors of Macworld labor to determine which among the myriad merit your hard-earned dollars. We struggle to devise objective critical criteria by which to judge: performance benchmarks, features lists, and design considerations. Based on these, we assign Star Ratings and designate Editors' Choice products.

But once a year we turn to you, our readers, and ask for your recommendations. It is on the basis of your judgments that we award the coveted Macworld World-Class Award.

In years past, we've asked readers to write in their favorite products in categories that we identified. As the marketplace grew more crowded and more complex, the ballot expanded from 40 or so categories to more than 60. This year we experimented with a more open-ended ballot, asking you to list up to 10 hardware and software products you use every day, and then to assign each one a rating from 1 to 10 reflecting how satisfied or dissatisfied you are with its performance. We hoped this would lead us beyond a superficial popularity contest. We wanted to find out not only what you've chosen, but also how well it actually serves you.

To no one's great surprise, many perennial favorites are back, a few for the fifth time. There's more than just marketing behind the success of the big players. Solid design, free or inexpensive upgrades, and responsive technical support all contribute to customer satisfaction. What goes into creating a truly fanatical following, we suspect, is a mysterious alchemical blend.

We were gratified that by focusing on customer satisfaction (what we jokingly referred to as "the passion index") a few Davids were able to stand tall among the Goliaths. ProVue Corporation's Panorama database, for example, with its relatively small but ardent following, bested the giant—Claris FileMaker. And this year's World-Class Award winner for telecommunications software is Dave Alverson's ZTerm, a shareware product.

At the same time, our decision not to actively solicit votes in predetermined categories meant that some product areas are not represented in this year's results. Not that there weren't any votes in those categories—from the looks of things, there's hardly a product ever created for the Macintosh that one of our readers hasn't used and formed an opinion on. But for a variety of reasons, some of these didn't register on the passion index.

In some cases, no news is probably good news. After all, reliability is kind of an invisible virtue; it's only when a product fails that you think about its reliability, and then not fondly.

In other categories—such as video-editing software and graphics accelerator boards—we received too few entries to yield a statistically supportable decision. For opinions on these kinds of products, rely on Macworld's own lab and editors.

To all the 1993 World-Class Award winners, our sincere congratulations. To our readers, thanks for your opinions. And keep watching these pages for news of the 1994 contest. In the meantime, the next few pages showcase this year's winners and share some insights on our readers' thoughts.
Can money buy happiness? Owners of high-end Macintoshes apparently believe the investment pays off, and these Macs outdistanced the more affordable business models. Interestingly, the leader among a very large field of video-display monitors is a gray-scale unit—the Radius Pivot.
Printing

**INK-JET PRINTER**
Apple Computer/StyleWriter II

**LASER PRINTER**
Hewlett-Packard/LaserJet series

**PRINT UTILITY**
Adobe Systems/Adobe Type Manager
Light Source Computer Images/Ofoto

Some products become instant classics, like Apple's new, economical StyleWriter II ink-jet printer, while others have a long-term following, such as Hewlett-Packard's venerable, speedy LaserJet series (the 4M is shown here).

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**DRAWING/ILLUSTRATION**

**Deneba Systems/Canvas**
Aldus Corporation/Aldus FreeHand
Adobe Systems/Adobe Illustrator

Rivals Adobe Illustrator and Aldus FreeHand, both previous World-Class Award winners, are joined this year in a three-way tie with Deneba's Canvas. After committing to one drawing package over the others, many Macintosh illustrators are hard to budge. But others we know happily play the field.

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**IMAGE EDITING**

**IMAGE EDITOR**
Adobe Systems/Adobe Photoshop

**SCANNER**
Hewlett-Packard/ScanJet Ilp

In both categories, the winners won hands down, proving that both Adobe Photoshop and the HP ScanJet Ilp 8-bit scanner are deservedly well-entrenched standards.
Core Business Software

**WORD PROCESSOR**
WordStar International/WriteNow

**SPREADSHEET**
Microsoft Corporation/Microsoft Excel

**DATABASE**
ProVue Corporation/Panorama

ProVue’s Panorama, far less well known than the big players in the database field, earns the respect and allegiance of its users, and received a higher rating than any of its competitors. The other surprise is WriteNow, an inexpensive and compact workhorse purchased recently from T/Maker by WordStar International.

**Storage**

**HARD DRIVE**
APS Technologies/APS drive series

**REMOVABLE STORAGE**
Iomega Corporation/Bernoulli series

**BACKUP/STORAGE UTILITY**
Aladdin Systems/StuffIt series

**SYSTEM PROTECTION/RECOVERY UTILITY**
Symantec Corporation/SAM

In categories with many competitors, several standbys got the readers’ nod. For all the types of storage utilities that readers nominated, those concerned with data protection and integrity outpolled the rest.

**Telecommunications**

**FAX MODEM**
Global Village Communications/PowerPort series

**COMMUNICATIONS SOFTWARE**
Alverson Software/ZTerm

This year’s winner for communications software is a shareware product, Dave Alverson’s ZTerm (not pictured). Global Village, maker of the World-Class PowerPort series of fax modems for the PowerBook, likes ZTerm so much that the company bundles it with its modems.
Development and Analysis

STATISTICAL ANALYSIS
Abacus Concepts/StatView

DATA PRESENTATION
DeltaPoint/DeltaGraph Professional

ENVIRONMENT
Symantec Corporation/Think Pascal

A perennial runner-up to its sister program, Think C, Symantec's Think Pascal's satisfied users pushed the product into first place among the programming environments. And here's a statistic for you: back for its sixth World-Class Award in the statistics category is Abacus Concepts' StatView.

Accounting

PERSONAL ACCOUNTING/ FINANCE
Teleware/M.Y.O.B.
Intuit/Quicken

Both Teleware's M.Y.O.B. and Intuit's Quicken enjoy a high degree of reader satisfaction, setting them apart from the competition.

Personal Business

INTEGRATED SOFTWARE
Claris Corporation/ClarisWorks
Symantec Corporation/GreatWorks

ORGANIZATION/
PRODUCTIVITY
Portfolio Software/Dynodex
Advanced Software/InTouch
After Hours Software/TouchBase

The personal aspect of this software no doubt accounts for the ties in both categories—you have to be a believer to commit to a product that helps you manage your life.
Best Customer Support

**HARDWARE**
Apple Computer

**SOFTWARE**
Microsoft Corporation

Both companies again win the World-Class Awards in this category, as they have each year since this category was established in 1991.

Most Promising Newcomer

**HARDWARE**
Apple Computer/LC III

**SOFTWARE**
Aldus Corporation/Aldus Fetch
Adobe Systems/Adobe Dimensions

The LC III, released only five months ago, immediately struck a chord with users looking for a mid-price color Mac—so much so, in fact, that Apple has had to struggle to meet demand. Two new types of tool caught on with developers and graphic artists alike. Both Adobe Dimensions, a 3-D utility, and Aldus Fetch, a multi-format file-cataloger, edged out competing products from other companies.

For Fun

**DESKTOP UTILITY/ENHANCEMENT**
Berkeley Systems/After Dark series

**EDUCATION/ENTERTAINMENT**
Broderbund Software/Kid Pix

Our readers are always on the lookout for that little something to make their Macs more personal. Some users swear by file-management utilities, others by macro recorders or hard drive optimizers. But just try taking away one of their After Dark screen savers, like Star Trek. Kid Pix, Broderbund's noisy, whimsical paint program for kids, also has its not-so-secret adult devotees.
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<th>GREAT WORKS</th>
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High-Speed, High-Res Image Editing

With Specular International's recently introduced Specular Collage, Mac designers can rotate, resize, skew, and apply filters and other tools to high-resolution, continuous-tone graphic files in a fraction of the time it takes to perform those tasks in Adobe Photoshop or other image-editing applications, according to Specular.

Specular Collage is an object-oriented image-composition program that lets you manipulate high-resolution files using proxies—low-resolution (72-dpi) screen representations of the image. You can define each image element as a separate proxy and place multiple elements on a canvas layout for individual editing. If the imported image contains an alpha channel, Collage lets you use the channel as a mask. This process enables you to manipulate the mask in real time, and view the results without the continuous copying and pasting of an image using the alpha channel in Photoshop. Once you're done, Collage's Render command tags the changes to the original high-resolution file and rasterizes that file for final printing—all of which should save significant amounts of redrawing and rasterizing time.

Specular isn't the first program to offer fast editing of high-resolution images on the Mac. A French company, Advanced Imaging S.A., recently announced its graphics technology for editing, scaling, and zooming high-res images at workstation speeds on a Mac. That technology is the basis of a $5000 application called Live Picture, scheduled to be available in the United States in June. (For more information, see Macworld News, August 1993.) Collage was expected to ship by the time you read this. The suggested retail price wasn't set at press time, but should be under $400. Specular International, 413/549-7600. —J.A.M.

Painter/X2 Adds Multilayer Flexibility

Fractal Design's Painter/X2, a new extension to its paint and image-enhancement program Painter 2.0, gives Painter users the flexibility of working with essentially unlimited floating selections in an image.

Because each floating selection has its own layer, you can work on each selection independently and any order—you can reposition them, change their layering order, or directly apply any Painter effect. Even after images are saved and reopened, floating selections can be repositioned and modified, enabling you to easily experiment with variations of the image.

Painter/X2 allows you to create floating palettes (color sets) and will include several predefined ones, including Pantone and RGB. With the Annotate feature, you can label the individual colors in a color set. And because they reside in a separate layer, annotations can be turned on or off.

Now available, Painter/X2 lists for $149 but is available at an introductory price of $79 through September. For more on Painter, see the feature "Brilliant Strokes" in this issue. Fractal Design, 408/688-5300. —CATHY ABES
Claris Retires MacDraw, Unveils Two Graphics Programs

Claris is retiring its aging MacDraw II and MacDraw Pro packages in favor of a cross-platform, 24-bit draw application with built-in intelligence offering more-precise line drawing and placement, among other features.

The company is also introducing a separate graphics package that combines word processing, presentation, and graphics capabilities and is primarily aimed at business users. Both programs, ClarisDraw and a program code-named EasyStreet, are based on the same Claris Graphics Engine code and will be available for the Mac as well as for Windows-based PCs.

ClarisDraw is a completely new draw program. Among its features is an intelligent point guide, which is designed to let you place objects on screen accurately. As you move an object, the cursor gives visual clues to help you position the object precisely. As with Aldus Intellidraw and Deneba’s Canvas 3.5 update, you can also link objects; changes made to one object are made to all linked objects. ClarisDraw includes 3000 clip art images as well, which you can place into a drawing layer by dragging them from the object library.

Claris expects to ship the Mac program by early 1994 for a suggested retail price under $400. Final pricing and details on upgrading from either MacDraw program to EasyStreet weren’t final at press time.

Matching Mac Colors to Your Printing Press

Publishers have had the ability to match colors on a monitor to those generated by a desktop printer for several years now. But under an agreement between Electronics for Imaging (EFI) and R. R. Donnelley, desktop publishers can save money and time by matching the colors on a Mac, PC, or Unix workstation monitor to those of an offset printing press.

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Hot Links

EasyStreet combines word processing, page layout, and presentation tools. It offers the ability to import spreadsheet data and create tables, charts, and graphs automatically by clicking on an icon and to customize those graphic elements using style templates.

Although you can import 24-bit color graphics, EasyStreet supports only 256 colors. The program supports most common PC and Macintosh word processing, graphics, and spreadsheet formats, including WordPerfect, Microsoft Word and Excel, PICT, TIFF, EPS, and CGM.

EasyStreet for the Mac is expected to ship by late fall for a suggested retail price under $400. Claris Corp., 408/727-8227, 800/544-8554.—J.A.M.

ClarisDraw features enhanced text handling; customizable object libraries with more than 3000 pieces of clip art; and the ability to automatically link and align objects and text.

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It's a wild world, and here's how it was created.
Original pencil sketch of the Mandrill is scanned for use as a template.
1 Sketch is now traced with Pen tool. 2 Two shapes that compose ear are constructed with Divide Fill tool. Mane is built with three tools: 3 Star filter creates a basic jagged shape; 4 Scribble filter randomizes star points; and 5 Twirl filter alters star point angles. 6 To create eyes, three colors are selected and placed in circular gradient.
7 Multicolor gradient generates this medley of tones with less banding. 8 Pathfinder tool is used in headline to isolate and create shapes occurring where areas intersect, permitting them to be colored separately.
9 Clicking on placed images can automatically launch Adobe Photoshop® and its powerful tools. Paint Style Box (not shown) allows quick and easy selection of commonly used colors. This entire ad was created in Adobe Illustrator 5.0. Illustration by Ron Chan.

Forgive us if we howl a bit, but Adobe Illustrator™ 5.0 software has so much grace and power, it's hard to call it an upgrade. A new interface helps you manipulate tools with greater freedom, ease and precision. Adobe Illustrator 5.0 is the first drawing application that gives you Plug-in filters to expand your options. Powerful new Pathfinder technology provides precise control of intersecting areas or overlapping objects. Other surprises include Unlimited Layers, Edit in Preview, Multiple Undos, and a Pressure Sensitive Pen tool to create stylized paths and calligraphic effects. More discoveries await you in Adobe Illustrator 5.0. Remember, it's a jungle out there, and here's what you need to prevail.
Call 1-800-833-6687, Dept. J, Ext. 1201 for information and your nearest Adobe™ Authorized Reseller.

If you can dream it, you can do it.
By Cathy Abes

**Artist:** San Francisco–based illustrator Ron Chan has produced posters for various clients including the Kennedy Center and Estée Lauder.

**Techniques:** To illustrate our feature on draw programs, Chan began in Illustrator, creating a grid to use as a guide for a pencil sketch of his basic composition.

After drawing the top and bottom edges of the pantograph (scaling tool), which surrounds the A, Chan used a blend to create evenly spaced increments between those edges to function as perspective guidelines. He used the same technique to create incremental guidelines between the left and right sides of the pantograph.

To create the A, Chan used Ray Dream's addDepth—which lets you add a three-dimensional look to type—because of its strong perspective tools. After drawing the compass in Illustrator from his scanned sketch, Chan imported it into Adobe Dimensions, a program for adding 3-D effects to 2-D art.

Because it was impossible for Chan to overlay a 3-D object from either addDepth or Dimensions above its 2-D counterpart in Illustrator and then reposition the 3-D object using the Illustrator image as a guide, he had to improvise to find the object's correct angle and perspective. Creating numerous versions of the A in addDepth, he imported each one into Illustrator to compare it with the original, until he found one with the correct perspective. He then followed a similar trial-and-error method with the compass created in Dimensions.

The curved background consists of overlapping circular shapes drawn in Illustrator. To define the various segments of the curves, Chan cut the circles' intersecting lines, deleted unneeded parts, and joined the cut points.

Chan created the thick, curved edges along the background by masking a copy of the background objects. He also used masking to create the illusion of transparency, such as making the pantograph appear to show through the globe.

---

**THE TOOLS**

**Hardware:** Mac Quadra 950 with 24MB of RAM and a 500MB internal hard drive; 20-inch SuperMac SuperMatch color monitor; SuperMac 24/ PDQ 24-bit accelerated color graphics board; Pla Infinity 40 Turbo SyQuest removable-cartridge drive; Microtek 30025 color scanner.

**Software:** Adobe Illustrator 3.2; Adobe Dimensions 1.0; addDepth 1.0.1.
To create the thick rules on the curved edges of the background objects, Chan first copied a background object and made the original into a mask, then pasted the copy in front of the original. He then changed the copy's attributes to a 10-point rule and no fill.

Once he had deleted the unwanted segments, Chan selected the two points where he had made the cut, averaged the points along both axes, and joined them with a smooth point.

To produce the translucent effect where the globe and pantograph overlap, Chan copied the pantograph segment, made the globe a mask, and grouped it. Using Illustrator's direct-select tool, he clicked on the globe and pasted the pantograph in front (C-F) to group it with the globe, as part of the mask. He then darkened the pasted pantograph.

After drawing the overlapping circles and ovals he would use to create part of the curved background, Chan cut the line segments wherever two circular shapes intersected.
THE BOTTOM LINE

The HP ScanJet IIC sets a new standard for affordable color scanners. Its engine is fast and well-engineered, and HP's innovative color-calibration software makes hassle-free, "true"-color scans a reality. Prices at less than $2,000, the HP ScanJet IIC is a best buy in its class.

TOP-NOTCH HARDWARE TEAMED WITH INNOVATIVE SOFTWARE MAKES HP'S NEW COLOR SCANNER A WINNER.

For an all-around scanner offering high-quality color and black-and-white images, true 400-dpi resolution, and good basic scanning software, HP's ScanJet IIc can't be beat.

The HP ScanJet IIc uses a one-pass scanning method that makes it one of the fastest color scanners we've seen. It also provides time-saving color previews that dynamically display any changes you make to the scan, such as exposure, hue, and saturation modification.

HP combines its excellent color-calibration technology with one of the best scanning engines we've seen. Our tests for resolution, consistent tracking of the scan head, and color accuracy showed the HP ScanJet IIc to be a top performer. In addition, HP's software lets users fine-tune settings for resolution, contrast, color, and brightness.

WINNER

MacWEEK 1992 DIAMOND AWARD

"We were extremely impressed with the ScanJet IIc. It's fast, easy to use, and captures true color. It's a great value and we strongly recommend it."
To test the HP ScanJet IIC, we used the same set of tests we used for our most recent color-scanner lab report. The results showed HP's new scanner to be the best in its class in both hardware and software. The ScanJet impresses from the moment you open the box. Other scanners use a removable screw that locks the scan head for shipping, but HP uses a locking lever that's built into the scanner itself. There's no screw to lose, and the lever is so easy to use that you'll find yourself locking the scan head more often, thereby increasing its life span.

Macworld awarded both the HP ScanJet IIC and IIP their World Class Award, and named the HP ScanJet IIC as the Best Color Scanner for 1992, and the HP ScanJet IIP as the Best Black & White/Gray-Scale Scanner. While MacWeek gave their prestigious Diamond Award to the HP ScanJet IIC.

Speed. Simplicity. And accuracy were all applauded. It's no wonder. HP's single-pass scanning delivers both lightning-fast speed and precise color registration. What's more, if you purchase an HP ScanJet IIC between August 1 and October 31, you'll get a $200 rebate when you send in a coupon available from your dealer. Capabilities this advanced have never been this affordable. With the rebate, list price on the HP ScanJet IIC is just $1,199. List price on the HP ScanJet IIP is just $879. And right now, the HP ScanJet IIC includes Adobe's Photoshop LE.

Impressed? Don't just take our word for it, or even the Mac press's. Attend one of our scanning seminars that will be held April through September, 1993. To find out more information or the location of your nearest authorized HP dealer, call 1-800-SCANJET, Ext. 7364. And judge for yourself.
There's no doubt: image editing—the ability to change an image's colors, apply special effects, or combine part of one scan with a piece from another—is a feature that has made paint programs one of the hottest product categories for the Mac.

But you don't have to spend hundreds of dollars on Adobe Photoshop to get image editing. Today, even low-cost paint applications (such as Expert Color Paint, $49.95) offer at least minimal image-editing capabilities such as blurring and sharpening. And many paint programs support Photoshop-compatible plug-in modules, so you can expand a program's capabilities with a special-effects collection such as Kai's Power Tools (see the table, "Top Paint Programs Compared").

The ability to create eye-boggling photomontages and other special effects does not a worthwhile paint program make, however. These days, the best all-around 24-bit color paint programs offer antialiasing—the blending of pixels around the edges of an image to diminish jaggedness; masking, to isolate a part of an image, so it can be manipulated or merged into another image; a virtual memory scheme, which enables a program to open large images when memory is limited; and support for JPEG compression and QuickTime (with QuickTime installed, you can apply JPEG to any PICT file).

I looked at a dozen 24-bit color paint programs with an eye toward image-editing capabilities, natural media and other paint tools, ease of use, and the number of features you get for the money. From that dozen, I've identified five programs that stand out in some way from the crowd; the others I've summarized in a sidebar (see "Paint Programs That Need a Touch-Up"). Several programs, such as Aldus SuperPaint, UltraPaint, artWorks, and ArtBeat Professional, combine both drawing and painting layers; for more information on those applications, see the feature "Fine Lines" in this issue. A final version of WaterColors, a 24-bit program to be bundled with a guidebook on water-coloring, wasn't available for review at press time. It's due out this fall for under $70. For more information, call Walter Foster Publishing at 714/544-7510 or 800/426-0099.

**Expert Color Paint 1.0**

At $49.95, this is the least expensive full-color Mac paint program. For a street price of less than $30—that's less than Photoshop's sales tax—you get a program that offers all the low-end paint essentials as well as some capabilities that higher-priced programs lack (such as multiple undos, missing from Photoshop).

For all its low-priced functionality, Expert Color Paint is not for experts. It can't soften the edges of selections using antialiasing or feathering, which diminishes its usefulness for creating photomontages. Its special-effects capabilities are limited; there are no masking options; heck, you can't even fill a selection with a solid color. But who cares? Expert Color Paint is just the thing for editing screen shots, painting Quick images for use in newsletters and other casual documents, and lightly touching up scans. And did I mention its low price?

**BrushStrokes 1.0**

If you're new to computers and want to experiment with a paint program, BrushStrokes ($139)—developed by Casady & Greene and sold by Claris under the Clear Choice label—was designed with you in mind. Not only does BrushStrokes offer context-sensitive online help, every dialog box includes an information panel that explains how individual options work. The full-color documentation does a good job—despite some goofy graphics—of walking you through both the artistic process in general and BrushStrokes' features specifically.

BrushStrokes offers some time-saving conveniences, too. You can access any tool from the keyboard and keep track of all colors that you select with the eyedropper tool. The eyedropper lets you mask selected colors, ignore those colors when selecting portions of the image, or replace all occurrences of one color with another color. Best of all, you can save tools and their settings—foreground brush, shape, and so on—to a special palette for easy retrieval (see the screen image "Convenience Tools").

BrushStrokes marginally outperforms Expert Color Paint in some areas, but underperforms it in others. For example, BrushStrokes limits its mask layer to a single bit of data per pixel, meaning that the edges of a mask are harsh and jagged instead of antialias. Meanwhile, Expert Color Paint provides softer paintbrushes and antialias airbrushes, both of which help to lessen the jags.

BrushStrokes' strong educational component is ideal for anyone new to painting. But with a street price ($95 to $100) that's more than three times the street price of Expert Color Paint, the price for that hand-holding is steep.

**Color It 2.0.1**

At first glance, Color It's $299.95 price seems excessive, particularly since it jumped from $120 for version 1.0 to its current price without gaining significant new features. In reality, though, Color It
PAINT AND IMAGE-EDITING PROGRAMS

Fractal Design Painter 2.0

Like Color It, Fractal Design Painter's price has jumped significantly—from $299 for version 1.0 to $399 for the current edition (street price is about $279). But this is one case where the new version is worth the extra money; Painter 2.0 is a significantly revamped program that includes dozens of major new features you simply can't find in any other application.

In a way, Color It is the complete opposite of BrushStrokes. Strong on features, Color It is sometimes unnecessarily difficult to learn. Many of its special-effects filters are strangely named and poorly explained in the documentation. The emphasis of the program is also skewed; it doesn't support pressure-sensitive tablets or Photoshop plug-in filters, yet it provides a do-it-yourself filtering command that's well beyond more-savvy programs.

When all is said and done, Color It is about twice the program Expert Color Paint is, for about three times the money; those watching the bottom line might be better off with Expert Color Paint. And with a street price that's about $10 less than BrushStrokes, Color It is clearly a better bargain. If you're hungry for more-powerful image-editing and painting features, though, keep reading.

BY DEKE McCLELLAND

costs $82 to $90 through mail order—making it less expensive than BrushStrokes' street price.

Color It is a powerful program, designed for artists who place equal emphasis on image creation and image editing. In addition to letting you paint inside selection outlines, Color It provides an 8-bit mask layer, perfect for merging images and making precise alterations. Color It also provides the ability to selectively revert portions of an image to their appearance when last saved.

Color It offers extensive control over antialiasing and feathering, and its magic-wand tool is second only to Fractal Design Painter's. If you select an area and then adjust the tolerance of the magic wand, Color It updates the selection dynamically; you don't have to start the selection process over as in Expert Color Paint, BrushStrokes, or even Photoshop.

Fractal Design Painter 2.0

Like Color It, Fractal Design Painter's price has jumped significantly—from $299 for version 1.0 to $399 for the current edition (street price is about $279). But this is one case where the new version is worth the extra money; Painter 2.0 is a significantly revamped program that includes dozens of major new features you simply can't find in any other application.

Painter remains the foremost natural-media painting program on the Mac. Programs like PixelPaint Professional make a stab at real-life brushes, but only Painter goes full tilt, providing more pencils, pastels, crayons, markers, inks, oils, and erasers than you'd have found in Picasso's studio. And Painter 2.0 provides new ways to edit these brushes so you can create tools all your own. For example, you can specify the exact shape of the brush tip and the angle at which the brush meets the canvas.

MACWORLD September 1993 155
Graphics: Brilliant Strokes

Painter is the only program that lets you translate pressure of the brush, using a pressure-sensitive tablet, to color intensity, jitteriness, and the degree to which a color bleeds into the fabric of the canvas. Add to this custom lighting and glass-refraction effects borrowed from 3-D rendering programs such as MacRenderMan and Ray Dream Designer, and you have a prodigious tool for creating original artwork on the Mac.

By the time you read this, Painter/X2 will be available, a separate $149 product from Fractal Design that altogether revolutionizes the Mac painting environment (see Graphics news, in this issue). In addition to enhancing Painter’s performance and remedying a few shortcomings—you can now cancel a special-effects operation, for example—Painter/X2 enables you to structure an image as a collection of independent floating selections, each of which remains utterly discrete until you request otherwise.

Painter 2.0 is a superb tool for the professional artist and the intermediate user with professional ambitions. Though its interface is tremendously dense and bulky, the program is nonetheless incredibly capable. If your intention is to create original artwork from scratch, or to transform a scanned image into a painting, Painter is the best program available at any price.

Adobe Photoshop 2.5.1

Given Photoshop’s renowned image-editing capabilities, it’s easy to forget that this program ($895) is a first-rate paint application, too.

Photoshop’s QuickMask feature enables novices and hesitant intermediates to painlessly discover the power of a distinct mask layer. While Adobe has all but ignored Photoshop’s magic-wand tool since version 1.0, the Bézier-type path tools offer all the point-by-point precision you could want. You can create any size brush, adjust the angle and softness of an elliptical brush tip, and specify the impact of a pressure-sensitive brush to an extent surpassed only by Painter.

Photoshop’s color-correction options are second to none, enabling you to graph the brightness of colors on a curve, map colors to different hues and levels of saturation, and edit images in any of several color modes. While lacking Painter’s flashy lighting features, Photoshop is the king of filtering effects, permitting you to focus an image, distort it, and create custom effects of your own.

Photoshop’s printing capabilities are the standard by which all other Mac programs are judged. In addition to being the only program that permits you to create duotones, tritones, and quadtones, Photoshop lets you control ink coverage, edit color-separation tables, and specify the frequency and shape of halftone cells.

You can speed specific functions using third-party DSP (Digital Signal Processor) boards designed to work with Photoshop. Boards from SuperMac, DayStar Digital, SpectraLight Innovations, Nexter Technology, and others, increase the speed of JPEG operations as well as of focus filters such as gaussian blur and unsharp mask. Because Adobe licenses 300 of Photoshop 2.5’s functions to DSP vendors, you can expect future DSP software and hardware to speed transformations, painting operations, and color conversions. Keep in mind, though, that unless your computer has enough memory to edit images without virtual memory—32MB is an absolute minimum—DSP boards will do little to improve Photoshop’s performance.

Photoshop’s interface is straightforward; even novices can work without getting bogged down by the program’s complexity. But with a street price of roughly $350—more than the street prices of Painter, Color It, BrushStrokes, and Expert Color Paint combined—Photo-
### Top Paint Programs Compared

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<th>BrushStrokes 1.0</th>
<th>Color It 2.0.1</th>
<th>Fractal Design</th>
<th>Painter 2.0</th>
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<td>305/567-9990</td>
<td>408/727-8227</td>
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<td>415/961-4400</td>
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<td>Toll-free phone</td>
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<td>800/544-8594</td>
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* = yes; 0 = no. 1 Can open only QuickTime JPEG-compressed files. 2 Brushstroke antialiasing available only for pantbrushes. 3 Includes the ability to cut and paste any image as a brush shape. 4 Can do so when used with Painter/X2. 5 You can make floating selections translucent. 6 Photoshop filters must be placed in System Folder or BrushStrokes application folder. 7 Accomplished via displacement maps.

shop demands more than a casual level of commitment.

**Peering Ahead**
I recommend Painter 2.0 to artists who want to create original images and dazzle-dazzle effects, and Photoshop to serious publishers, color-correction experts, and prepress professionals who need a versatile, dependable program.

I may have to change these recommendations in the near future, however. For starters, PixelPaint Professional 3.0—due this fall for $379 from Pixel Resources—looks capable of taking on Painter and Photoshop. The program, which has been in limbo in recent years, will feature a tidy collection of natural-media functions, and improvements to Photoshop's image-editing tools inside a streamlined interface. PixelPaint Pro 3 may reclaim some of the midlevel customers who departed after the disastrous

**Convenience Tools** In Claris's new paint application, BrushStrokes, you can save a tool and all settings currently associated with it by clicking inside an empty cell in the Tool Settings palette (at right), thereby creating a folded-page icon. To retrieve a tool and its settings later, just click on the corresponding folded-page icon; to delete a saved settings icon, drag it to the Trash Can.
The following programs didn’t make the A list, but are summarized here (from least to most expensive) for comparative purposes.

**Color MacCheese 2.0.9**
Color MacCheese ($99) was the first supercheap, full-color paint program, but it’s no longer the cheapest and it offers fewer functions than Expert Color Paint. (Delta Tao Software; 408/730-9336, 800/827-9316.)

**DeskPaint 3.5.2**
As a black-and-white desk accessory, DeskPaint ($199) was indispensable for creating screen shots and transferring images into Aldus PageMaker. Now that desk accessories are all but forgotten, DeskPaint seems to have lost its place, and it’s priced too high to compete. (Zedcor; 602/881-8101, 800/482-4567.)

**Monet 2.0**
Technically, Monet ($399) is a paint program because it lets you drag brushstrokes across an image. But functionally it’s a filtering tool, à la Aldus Gallery Effects. Monartists will enjoy transforming images into instant impressionistic “masterpieces,” but Monet is just a one-trick pony. (Delta Tao Software; 408/730-9336, 800/827-9316.)

**Zeus 0.94**
Zeus ($499) offers some unique features, but most of its capabilities are confusing and cumbersome. Because Delta Tao considers Zeus a work in progress, the company will provide registered users with free upgrades until the program reaches version 1.0. But I wouldn’t get my hopes up. (Delta Tao Software; 408/730-9336, 800/827-9316.)

**Studio/32 1.2**
I love Studio/32, but a paint program this far behind the times isn’t worth $695.95. Its painting and selection tools, which were once the toast of the town, are eclipsed by those available in the more affordable Fractal Design Painter 2.0 and the upcoming PixelPaint Professional 3.0. (Electronic Arts; 415/571-7171, 800/245-4525.)

**ColorStudio 1.5**
ColorStudio ($795) is currently Photoshop’s only serious competition. While ColorStudio—with its high-end color-correction capabilities, professional prepress options, and object-oriented drawing—holds up OK, Photoshop 2.5 simply has the upper hand. But stay tuned—Color Studio version 3.0 is in the works. No details on new features or ship dates were available at press time. (Fractal Design Corporation; 408/688-8800.)

Speaking of speed, a new technology called Functional Interpolating Transformation System (FITS), developed by Advanced Imaging S.A., a small French company, is on the horizon. FITS enables you to edit and manipulate high-resolution, tabloid-size scanned images on a Mac at speeds rivaling workstations. FITS is the basis of Live Picture, a $5000 application scheduled for U.S. release this summer, and HSC Software plans to incorporate FITS into a future version of Kai’s Power Tools. (For more information, see Macworld News, August 1993.)

**Adding it All Up**
If you’re a computer artist, you’ll likely want to keep close tabs on both Painter and Photoshop in the coming months. If current events are any indication, these two programs will continue to shape professional painting as surely as Adobe Illustrator and Aldus FreeHand have shaped professional illustration. At any rate, get out your beret and put away your easel—the days of sophisticated desktop color painting are here.

With a little luck and some divine intervention, DEKE McCLELLAND’S ridiculously immense Macworld Photoshop Bible (DG Books Worldwide) should be available by the time you read this.

**COLOR PAINT PROGRAMS**

For this roundup of 24-bit color paint programs, Macworld looked at 12 contenders. Here are the best of the bunch.

**Best Budget Buy**
Expert Color Paint This ultra-inexpensive program offers enough capabilities to keep novices sufficiently occupied. Company: Expert Software. List price: $49.95.

**Best Overall Program**
Fractal Design Painter 2.0 If you’re serious about painting, your best bet is Painter, thanks to its natural-media tools and realistic lighting effects. Company: Fractal Design Corporation. List price: $399.

**Best Image-Editing Program**
Adobe Photoshop For image-editing, Photoshop is tops. It’s a dependable program with solid painting tools, outstanding color-correction options, and worlds of special-effects capabilities. Company: Adobe Systems. List price: $895.
Introducing SuperMac's Thunder II. The next generation of accelerated graphics cards. It's not only the fastest 24-bit card ever, it's the only card with dual integrated Digital Signal Processing (DSP) chips to accelerate image processing.

Thunder II puts its speed where you will see it most. That's how we design products. We don't design products to win self-invented benchmarks; we design them for you. Imagine Thunder-class acceleration of QarkXPRESS, plus the speed of DSPs to process Adobe Photoshop, Kodak Photo CD, and more. With Thunder II you won't be waiting to resize, rotate, and unsharp mask.

Since introducing Thunder/24 in 1991, we've talked with thousands of color professionals about what they need. And we've delivered. That's why over 50 percent of the Macintosh 24-bit color cards sold today worldwide are SuperMac products.

But don't take just our word for it. Read the Macworld, MacWEEK and MacUser reports on Thunder/24, then call (800) 334-3005 for your "Do-It-Yourself Benchmark" and see what Thunder II can do for you.

For your nearest Authorized Reseller, call: (800) 334-3005.

For information via fax, circle free demo, call: (800) 541-7680.
If your market potential goes beyond the U.S., take a close look at your trade show plans. With so many shows to choose from in the U.S. alone, you may be losing sight of your biggest market—the world. This is why the MACWORLD Global Series trade shows are so important. International sales is the category most critical to almost every major IT company's success. For example, information technology spending in Western Europe already equals that of the United States. The world technology explosion will very likely make international markets a make or break factor for small and mid-sized companies, too. With 15 events in 12 countries, MACWORLD is the most successful trade show series in the world, making the MACWORLD Global Series the best way to introduce your product internationally. There will be nearly 15 million Macintosh computers in operation worldwide by 1995*—clearly this is an opportunity not to be missed.

The most cost-effective way to reach qualified international buyers.

The MACWORLD Global Series is an economical complement to your international advertising plans. The one-on-one atmosphere of each international trade show location is ideal for small to mid-sized companies—whether software developers or hardware manufacturers. You are able to meet your customers—to shake hands and make that personal connection. You can demonstrate your product. Even sell it right from the trade show floor. Nothing can compare with face to face meetings with qualified sales prospects. You know that first hand from MACWORLD shows in the U.S. The same is true all over the world.

U.S.Village. A turnkey promotional concept that covers everything. If global marketing is unknown territory, you may take advantage of the U.S.Village. It's a comprehensive selling package that includes a furnished booth, a theater-style presentation area and a full-blown marketing campaign. Each U.S.Village is set in an attractive, high-visibility location at participating MACWORLD Global Series shows. 1993 sites include Mexico, New Zealand, Frankfurt/Main, Hong Kong, and Stockholm. Plans are under way for a U.S.Village at every MACWORLD Global Series trade show. A long list of advantages comes standard with U.S.Village's low cost. Here are just a few:

- turnkey booth
- presentation site for product demonstrations
- private business lounge
- discounted freight
The U.S. Village takes care of all those details and strategies so crucial to trade show success. In short, it puts you in league with the world's leading hi-tech companies.

Come join Apple, Lotus, Radius, and other international successes.

The MACWORLD Expo environment not only showcases your products along with the world's leaders, it is the perfect setting for you to discover businesses that may complement your own. Partnerships, distribution channels, and other new business opportunities can be explored easily because the decision makers will be there.

Don't wait another year to reach your full potential in the global marketplace. A fast changing world calls for fast action.

*Source: International Data Corporation, April, 1993.*
You're not a professional artist, but you're not a complete klutz either. Perhaps you want to draw a logo, an organization chart, or some graphics for a presentation or report. You don't want to spend $600 for a high-end illustration package like Aldus FreeHand or Adobe Illustrator; you want something that's more affordable and, with luck, easier to use.

With those requirements in mind, I looked at ten draw applications ranging in price from $50 to $400. The best of the bunch—those programs that offer ease-of-use, attractive pricing, the most useful features, or all of the above—are profiled in this article, beginning with the least expensive programs and moving up in price. Claris's MacDraw II and MacDraw Pro are missing from the lineup, as they will be discontinued this fall in favor of ClarisDraw, a new 24-bit draw program. ClarisDraw wasn't available for review at press time; for more information, see Graphics news, this issue. For descriptions of the programs that didn't make the final cut, see "Back to the Drawing Board."

Defining a Draw Program
Draw programs are object-oriented, which means a graphic element such as a line or circle consists of a mathematical formula that describes its shape, size, position, and other attributes. What you see on the screen is merely a visual representation of the object.

This approach differs from bitmapped graphics programs—commonly called paint programs—which render an image as a pattern of dots. In a paint application, the dots you see on the screen are the image—the program records the position of each dot. (For a look at paint programs, see "Brilliant Strokes" in this issue.) These days, the lines between draw and paint programs are blurring. Several of the programs reviewed here—among them Deneba Software's Canvas and Aldus SuperPaint—offer both object-oriented and bitmapped graphics tools.

Draw programs share a number of common elements. For example, all provide basic drawing tools: geometric shapes (ovals, rectangles, and rounded-corner rectangles), an arc, a straight line, and a text tool. They also include at least one drawing tool for creating irregular shapes. A polygon tool draws a series of connected lines to form a shape, while a freehand tool generates a continuous line, as if you were drawing with a pen or pencil. In addition, all but one program (Deneba's UltraPaint) supports 24-bit color; most can import and export PICT, TIFF, and EPS file formats.

Six of the programs reviewed offer a Bézier-curve tool as well. Bézier curves...
artWorks  Like UltraPaint, Deneba's new artWorks combines drawing and painting tools in a single application. Drawing features include a Bézier-curve tool, used to create the wisps of steam.

are composed of straight or curved line segments connected by anchor points. You can reshape a curve by moving the anchor points on the curve or by dragging direction points located outside the curve.

In addition to letting you create objects, draw programs let you group objects to move and resize them as a unit; align objects in various ways; move them in front of or behind other objects; and change attributes such as line width and fill pattern. Most draw programs let you display dimension lines to measure drawing components, and many offer multiple drawing layers to help you manipulate the numerous objects in complex drawings.

Expert Draw 1.0
Expert Software's Expert Draw is the least expensive addition to the lineup of Mac drawing programs; the suggested retail price is $49.95, although some mail-order houses sell it for $29.95. Expert Draw is based on Michael's Draw (see "Back to the Drawing Board"), but Expert Software has made the Expert Draw manual, user interface, and price more appealing. Expert Draw is also more up-to-date than Michael's Draw, with support for publish-and-subscribe and QuickTime.

Expert Draw offers the basics you'd expect in a draw program, along with more advanced features such as text on a path and blending from one pattern to another. You can take advantage of the program's unlimited overlapping drawing layers for graphics that consist of many components (such as a floor plan), and save drawing elements in object libraries for easy access.

Expert Draw is the best choice for an inexpensive, no-frills drawing application. The program's main drawback is its lack of a Bézier-curve tool. If you need to draw intricate freehand shapes, you'd be better off with a Bézier-endowed program, such as UltraPaint. (For a more detailed look at Expert Draw, see Reviews, Macworld, August 1993.)

UltraPaint  Deneba Software's UltraPaint focuses primarily on painting tools, although a Composite layer lets you combine paint and draw tools in the same illustration. Here the flamingo is paint, and the paintbrush is draw.

UltraPaint 1.05
UltraPaint ($79) combines paint and draw tools in a single low-priced program. You can create images in a paint layer, as many as seven draw layers, or a composite layer with access to both paint and draw tools.

UltraPaint offers three free-form drawing tools: polygon, free-form shape, and Bézier-curve. The program offers a few unusual features as well, including cube, grid, and star tools. Paint tools include charcoal that works with gray-scale shades; chalk that lays down progressively darker shades of color; a water drop to smooth edges; a calligraphy pen; and even a fountain pen that bleeds.

If you want an inexpensive program that combines paint and draw features, UltraPaint may be what you're looking for. Because it offers both paint and draw capabilities, however, UltraPaint is a bit more difficult to learn than is a draw-only program such as Expert Draw. Expert Draw also has the edge over UltraPaint with its ability to offer unlimited overlapping drawing layers and support for 24-bit color (UltraPaint offers only 8-bit color). Neither program, though, offers the clean, streamlined interface that some of the other draw applications do.

artWorks 1.0.1
Denneb's artWorks ($149) is essentially a beefed-up version of UltraPaint that offers enhancements such as unlimited layers, masking, 24-bit color, QuickTime support, object linking, and photo retouching. Drawing features include a Bézier-curve tool that, although better than SuperPaint's freehand drawing tool, is not as good as the Bézier tool found in CA-Cricket Draw III.

artWorks is a decent program, at a reasonable price, but it suffers from the same ease-of-use problems as Denebra's other draw packages, UltraPaint and Canvas. (For more on artWorks, see Reviews, Macworld, June 1993.)

Aldus SuperPaint 3.0
SuperPaint ($149.95) offers both draw and paint tools in a well-designed, straightforward interface. Unlike some of the other programs, which let you build a drawing out of multiple layers, SuperPaint has only one draw layer and one paint layer; you click on an icon to move from one transparent layer to the other.

BACK TO THE DRAWING BOARD

The following drawing programs didn't offer enough strong features and tools to make the A list, but are summarized here (from least expensive to most expensive) for comparative purposes.

Michael's Draw 1.0  Its advanced text features allow you to attach text to a path, apply a color blend to a word, and fit a block of text into a shape. But the $99 program's poor manual and nonstandard interface make it frustrating to learn. Event One; 408/734-4358.

DeskDraw 3.08  DeskDraw ($199.95, bundled with DeskPaint) has no drawing layers or dimension lines. It offers good color control, however—24-bit color and color settings such as tint, blend, and transparent. If you need a more sophisticated draw/paint package, SuperPaint or artWorks is a better bet. Zedcor; 602/881-8101, 800/482-4567.

ArtBeat Professional 1.0  This $249 program offers pretty basic fare in its drawing and painting layers. The draw layer's tools work fine, but both layers provide disappointments. For example, you can apply only two colors—foreground and background—to any given paint layer, and the Bézier-curve tool is limited. Stay tuned, however; the company is working on an upgrade. Pie Practical Solutions; 201/902-9600, 800/333-2328.
The program offers a polygon tool for creating shapes out of straight line-segments, and a freehand drawing tool for creating shapes that combine straight lines and curves. Although the shapes created with the freehand tool are made up of editable Bézier curves, SuperPaint doesn't offer a Bézier-curve tool per se.

SuperPaint is simple enough that beginners should be able to learn it fairly quickly, but it includes enough sophisticated features to satisfy more-advanced users. The program's not perfect, however; Bézier-curve drawing could use some improvement, and the zoom tool is flawed, giving you an enlarged view of jagged pixels instead of smooth shapes.

SuperPaint 3.5, which wasn't available for review at press time, offers QuickTime compatibility, support for pressure-sensitive graphics tablets, and direct scanner support. The new version should be shipping by the time this article appears in print.

CA-Cricket Draw III 2.0
CA-Cricket Draw III ($249) differs from the other programs reviewed here because every object—even rectangles or circles—can be edited as Bézier curves. In fact, its Bézier tool is one of the best.

The program provides excellent text-handling features. The text editor is like a miniature word processor, offering tabs, justification, and leading, as well as a ruler to set margins. Unfortunately, you have to open the text editor to make changes.
rather than editing the text directly in the drawing window.

If you print color documents, you'll appreciate CA-Cricket Draw's variety of color models, including CMYK and Pantone. Advanced printing options include overprinting and color separations.

While earlier versions of Cricket Draw had enough bugs to justify naming the program after an insect, the current release (version 2.0) is quite stable. And this version offers several new features, including object blends, an extrude tool, and the ability to convert text to outlines.

CA-Cricket Draw III is a solid application for graphic artists and technical illustrators. It's not a good choice if you're not an experienced artist, however, those who are new to drawing programs would be better off with a simpler application like SuperPaint.

Aldus IntelliDraw 1.0

Billed as "intelligent drawing software," Aldus's IntelliDraw ($299) promises shortcuts and drawing aids for those who aren't experienced artists.

Part of IntelliDraw's intelligence is its ability to link objects, via connector tools, so that changes made to one object affect all linked objects. For example, if you enlarge an object, any other objects linked to it will grow as well. You can also preserve the alignment of a group of objects while you move or resize them.

The program excels in presentation capabilities, letting you create slide shows and flip-book animations. Its ability to link text boxes and reflow text is another feature. Like some of the other programs, as you move or resize them.

Low-Cost Draw Programs

Canvas 3.0

You want features? Denene's Canvas ($399) has features. This program combines paint and draw tools (including a Bézier-curve tool) with enough text, color, and printing capabilities to satisfy the drawing needs of everyone from technical illustrators to fine artists.

In Canvas you can draw and/or paint in a single layer or a series of overlapping layers. The program offers a respectable selection of precision-drawing tools, including a Smart Mouse feature that constrains cursor movement to your specifications. Like some of the other programs, Canvas has dimension lines for measuring objects, but in addition to distance and angle, Canvas can measure radius, diameter, area, or perimeter. Text handling is ample, with support for kerning, leading, and text on a path.

Deneba should be shipping Canvas 3.5 by the time you read this. New features include text flow between columns; style sheets; support for pressure-sensitive tablets; and faster, more accurate printing on image setters.

Deneba should be shipping Canvas 3.5 by the time you read this. New features include text flow between columns; style sheets; support for pressure-sensitive tablets; and faster, more accurate printing on image setters.

Canvas should be shipping in version 3.5 by the time you read this. New features include text flow between columns; style sheets; support for pressure-sensitive tablets; and faster, more accurate printing on image setters.

Drawing to a Close

If it's features you want, I recommend Canvas for its extensive set of draw and paint tools. The new version of CA-Cricket Draw III offers an excellent set of drawing tools for the money. SuperPaint boasts an attractive mixture of paint and draw tools, a midrange price, and a tolerable learning curve. While artWorks offers comparable—and in some cases superior—features, SuperPaint is easier to learn and use. As for IntelliDraw, it's not a bad program for beginners, but you should ask yourself whether you want or need dynamically linked objects, one of the program's main selling points. And if you aren't too particular about ease of use, $50 will get you a good set of draw tools with Expert Draw, while $80 will buy you a respectable draw and paint tools with UltraPaint.

Erfert Fenton is a Macworld contributing editor and a weekend artist.

Low-Cost Draw Programs

Best Program for Beginners

Aldus SuperPaint. This application offers paint and draw tools in two separate layers. Its relatively simple interface and straightforward manual make it a good choice for novices.


Best Overall Program

Canvas. While Canvas is at the high end of the price range, you get a lot of features for the money. It's not easy to master, but beginners can start with basic drawing functions and work their way up to more complex tasks.


Best Budget Buys:

Draw

Expert Draw. If you want a basic set of draw tools (and can live without a Bézier-curve tool), Expert Draw is your best bet.


Paint

UltraPaint. This inexpensive application combines paint and draw tools, including a Bézier-curve tool, and a few unusual capabilities.

Company: Denene Software. List price: $79.
The NEW under $1000 TI microWriter PS23 is the best value in laser-quality PostScript printers. 23 Scalable PostScript typeface fonts in popular Adobe PostScript formats. Crisp, # sharp graphics. LED technology uses fewer Moving Parts than conventional laser printers for great reliability. Automatically switches between PostScript and HP LaserJet printing formats. Easy to use front control panel. "Plug and Play" convenience in both Mac* (Apple*) and Windows* (IBM*) environments. With available options, can handle up to 3 trays of paper, including envelopes and labels.

For years, capability and affordability were mutually exclusive features of laser-quality printers. But the new microWriter™ PS23 from Texas Instruments has changed all that. Now you can get sharp, crisp laser-quality images, rapid 5 page-per-minute operation and the reliability of LED technology. All in one very affordable printer. Thus enabling you to print more. Produce more. Do more. In other words, to extend your reach. The new TI microWriter PS23. It can make a small business look a lot bigger. And a big business look a lot smarter. For more information and your nearest dealer, please call 1-800-527-3500.

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Total Baseball is the best selling sports encyclopedia with statistics and over 100 photos! The Family Doctor is an indispensable medical reference with answers to 1000 common health questions and 300 illustrations. Audubon Birds and Audubon Mammals include precise replica of the classic Audubon titles complete with all original illustrations along with CD-quality recordings of bird and animal sounds.

Dark Power
After Dark 2.0 prevents screen burn-in with fascinating and amusing visual effects. The basic package comes with things like lightening bolts, abstract art, floating toast- ers, etc. Move After Dark has over 25 new displays to make After Dark's screen tricks even more fun. Art of Darkness is a complete how-to-manual for After Dark that is indispensable for modifying and even making your own screen blankets.

Reach Out
DayMaker CD combines scheduling, to-do lists, calendars, alarms, Guest lists, and phone and address lists. Send and receive faxes from your PowerBook with the DayFax PB 9646 fax/2400 data modem. DayFax PB allows you to fax without interruption from any Mac application.

Security and Fun
Ultimate's Guaranteed Undetected can add an end to accidental file loss. Online Defense Notice will make your back-ups a breeze. And Tesseract will let you unwind and have some fun after you secure your data.

Remote Control
ContactLink lets you control remote Macs by connecting over an AppleTalk network or over ordinary phone lines through a modem. CPU controls your PowerBook battery life and helps you save battery by keeping your computer up and running longer.

Awesome Combo
Adobe Photoshop and Kid's Power Tools were made for each other. Now you can take advantage of all the amazing filters and plug-ins in Kid's famous KPT, and get the industry standard image editing and photo enhancement software.

Productivity Package
Three powerful business tools & one great game. WordPerfect Works is the newest member in integrated software with word processor, database, charting, word processor, drawing and communication applications. QuickDraw is an award-winning checking writing and financial program with check flow, balance sheet, payroll, AP/AR, monthly Budget QuickDraw is an electronic file transfer that allows simultaneous use of B Card files. S.C.O.S is a challenging game.
### Media

**SONY**
- Optical Media
  - 11043...
  - 11023...
  - 11022...

**Tape Media**
- 1169...
- 2520...

**Diskettes**
- 3297...
- 7151...
- 6375...
- 11187...

### MODEMS

**Supra FAX Modem**
- $285 14,400 V32bis

**PRACTICAL PERIPHERALS**
- $229 PM14400FMT

**Hayes**
- $259 Hayes Quality 14.4 DATA & FAX

**ACCURA 144 + FAX144**
- Hayes Accura 144 + FAX144 is a 14.400bps data/14.400bps fax modem. Supports V.42 & MNP-5 & 2 data compression.
- Includes V.42bis & MNP-5 2 data compression.
- Hayes Accura modems come with Smartcom data and fax software and cables.
- Hayes 2-Year Warranty

**US Robotics**
- Mac & Fax Sportster 14.400 + Fax

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**BASF**
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**KAO**
- 50 Unformatted 1.4MB FDHD disks $50

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- 128MB Optical $39

**PowerBook SyQuest**
- Preformatted SyQuest Cartridges with DIVA's VideoShop $61.50

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- 11406...
- 11407...
- 11408...
- 11409...
- 11410...
- 11411...

### Batteries

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- 0166...
- 11601...
- 11605...

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### New Memory for the Bonus II

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### Batteries

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### Memory

- 0156...
- 0166...
- 11601...
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## Recycled Macs

### Clean Machines

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## PowerBook starter Kit

The Starter Kit includes a high-quality replacement battery along with a portable battery charger.

### Battery Technology Inc.

- **$122**

## Batteries

- **$122**

## Preforamated SyQuest Cartridges

### With DIVA's VideoShop

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## Preformatting

### SyQuest Cartridges

- **$61.50**

## PowerBook SyQuest

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## Latest Product Versions Only

Rivcr Computers, Inc., 543684 • 800-998-0093 • Fax: 800-998-0093 • BBS: 800-998-0093 "The Bridge*" Product prices and availability are subject to change without notice. We are not responsible for typographical errors.
New Tools in DeltaGraph Pro

DELTAPOINT IS UPGRADING DELTA-Graph to DG Pro 3.0 with more chart types, more presentation features, scientific data-handling capabilities, a tool bar for commonly used commands, and an "advisor" that suggests chart types and formats.

DG Pro 3.0's new graph types include pictographs (which use stacks of symbols as chart elements), matrix charts, vector charts, and both candlestick and whisker styles of high/low charts, as well as quality-control charts, ternary diagrams, and new types of composite pie charts.

DG Pro 3.0's page-layout templates standardize the format and size of charts throughout a presentation and provide uniform backgrounds and text placement. The format of a whole set of charts can be changed by modifying a template. DeltaPoint has dropped the product's price from $295 to $195, and expects to ship this summer. DeltaPoint, 408/648-4000.—CHARLES SEITER

Proactive Planning

VISIONARY SOFTWARE'S FIRST THINGS First Proactive adds a striking innovation to the program's calendar and reminder features: an integrated outliner that makes it possible to work out the details of a task as you schedule it. If an outline isn't roomy enough to plan a task, you can attach external documents and open them in their native applications with a mouse-click.

FTF Proactive outlines and schedules can also be linked to other FTF Proactive outlines and schedules. This lets you combine schedules for several networked users in one place to look for possible meeting times, or maintain and coordinate separate calendars for your business, your personal life, and so on. Claris will market FTF under the Clear Choice label; FTF should ship in October. Price was not set at press time. Claris, 408/727-8227.—D.L.

Shrinking Your Postage Costs

ACCUZIP6 IS DESIGNED TO CUT THE cost of bulk mailings (anything over 200 pieces) by as much as 6 cents per piece for first-class mail and 9.6 cents per piece for third-class mail by correcting addresses; adding zip+4 information, Postnet bar codes, and carrier route codes to addresses; and then sorting addresses before printing labels. The program also has an integrated mailing-list manager. AccuZip6 eliminates duplicate addresses and ensures accuracy by comparing your database to a bundled CD-ROM containing every deliverable address in the United States. The program presorts...
and prints Avery labels for bulk first-, second-, or third-class mail and is CASS-certified (CASS stands for Coding Accuracy Support System) by the U.S. Postal Service.

Version 1.8, which is now shipping, has a much-improved manual, can print sack tags and required USPS paperwork, and now prints on more printers, including the OKiData 590 and 591 high-speed 24-pin printers. AccuZip6 is $899, and CD-ROM updates are available for $200 per quarter. Software Publishers of America, 714/846-1908. —TOM NECRINO

**PIM Construction Set**

A new company founded by the folks who brought us FullWrite Professional is hoping to eliminate all barriers between different kinds of information, and plans to start with a construction kit for end-users to create applications that resemble personal information managers.

Common Knowledge’s Arrange stores information in different types of notes—outline items, database records, time-bound or date-bound information, and others—and provides tools for creating new note types. Multiple notes can be laid out in a user-designed window, and the notes can also be linked automatically. Arrange uses agents, which perform tasks such as noticing someone’s name and telephone number in an outline note and adding them to a database note.

Arrange also has info drivers, which understand information in files created by other applications and can import the info into notes. Info drivers are based on a technology that is Common Knowledge’s master plan, called TAIL, or The ASCII Interchange Language. TAIL is a high-level description of information that, if Common Knowledge can convince other vendors to adopt it, would allow applications to share files without losing fundamental pieces such as equations in a spreadsheet, layout templates in desktop publishing software, or paths through a hypertext document.

Arrange should ship this summer for less than $200, and will include a dozen PIM templates for architects, salespeople, and other users. Common Knowledge, 415/325-9900. —D.L.

**Watching the Markets**

**TickertWatcher makes it possible** to store and examine information on stocks, bonds, and other securities on your Mac. The new version, TW 6.0, manages up to 10,000 symbols in 255 portfolios; maintains price histories for 300 days (60 weeks); offers a variety of standard chart types used for analyzing securities; and can trigger an alarm when a stock’s price or trading activity hits a user-defined level. TW 6.0 also adds a simple scripting language for automating many tasks, and report designs can be named and added to a menu. TickertWatcher is available for $295 from Linn Software, 404/929-8802. For $50 each, Linn also markets utilities for transferring data to Excel and to two technical-securities-analysis packages.

PIM Construction Set Any item can be in multiple places on the hierarchical list at left, with different information in each place.

For TW users to obtain raw data, Linn also sells Data Transmission Network’s receiving system. DTN’s Wall Street data includes news and other information, but securities are delayed 15 minutes. Data Broadcasting’s Signal service, available directly from Data Broadcasting, doesn’t include news, but provides securities prices in real time. Data prices vary. DTN, 800/485-4000; Data Broadcasting, 415/571-1800. —D.L.

**IN BRIEF**

- **New ultracheap security**

  UsrEZ is shipping ultraShield, a security package that has almost all the features of the company’s ultraSecure and, at $149, lists for $90 less. Both provide access control, encryption, and virus protection. ultraShield lacks ultraSecure’s Double DES encryption and uses 56-bit keys instead of 112-bit keys. UsrEZ, 714/756-5140.

- **Free DataDesk upgrade**

  The statistical-analysis and data-visualization package DataDesk is being upgraded to version 4.1. The new version can create subgroups of a data set; adds several nonparametric tests and new regression features; and provides a notebook interface for keeping track of your work. DataDesk lists for $995; the upgrade, which should ship this summer, is free to version 4.0 registered owners. Data Description, 607/257-1000.

- **Spreadware’s business tools**

  Excel add-on publisher Spreadware is shipping Pro Forma, a tool for generating projected financial statements, and is developing Business Blueprint, a $79 business-plan template that should ship this summer. The $189 Pro Forma provides a choice of several projection types and supports numerous reporting-period schemes. Spreadware, 619/347-2365.

- **MacProject Pro supports AppleScript**

  MacProject Pro 1.5 adds support for AppleScript, and comes with sample scripts for batch-printing and FileMaker integration. The new version also adds a floating button-palette and can open and save files in Microsoft Project’s MPX format. MacProject Pro is now shipping and lists for $599; the upgrade from Pro 1.0 is $29. Claris, 408/727-8227.

- **TreeAge updates DATA**

  Decision Analysis by TreeAge (DATA) is being upgraded to version 2.5. The decision-analysis tool (see “Forecasting the Future,” in this issue) adds conditional, logical, mathematical, statistical, and other functions; Markov analysis, Bayes’ Revision support, and sensitivity-analysis graphs; and publish-and-subscribe support. DATA lists for $297. TreeAge, 617/936-2128.
Why PowerBook is popular with people who know nothing about computers.

Always in touch. By adding AppleTalk Remote Access software and an internal faxmodem, users stay connected to all the network resources.

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Fits any business. PowerBook can run thousands of Macintosh programs and, with software like SoftPC, thousands of MS-DOS programs, too.

Highly compatible. With the built-in Apple SuperDrive® and the right software, PowerBook can read from and write to MS-DOS disks.

There are literally hundreds of technical reasons why our Apple® PowerBook® computers are the country's best-selling notebooks. But the biggest reason isn't technical at all.

That is, anyone can pick up a PowerBook and get things done right away. There's no need to learn strange commands or deal with confusing system configuration files, as there is with other notebooks.

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No matter how far PowerBook users travel, they can easily retrieve files from their desktop computers. Access information from the company database. Exchange e-mail messages. Even send and receive faxes.

Now people in every kind of business are using PowerBook to make dramatic leaps in productivity. They're finding it doesn't matter how much they know about computers — as long as they have the right computer.
Why PowerBook is popular with people who know everything about computers.

An easy decision. PowerBook is easier for a company to set up and easier for people to use — so it's easier to support.

Tailored to everyone. PowerBook computers are the affordable way to give a full-featured notebook to everyone in the company — from the sales force to the CEO.

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Simple connections. PowerBook has a full set of built-in ports and easy-to-use communication software, so users stay connected wherever they go.

Fits into the office. The optional Powerbook/DOS Companion package provides software and connectors to work with MS-DOS files, printers and displays you already own.

PowerBook has also built a large following among the world's most discriminating computer audience: people like you, whose business it is to know computers inside and out and who make the hard decisions about their companies' information systems.

That's because, unlike other notebooks, PowerBook is more than a miniaturized version of a desktop computer. Its award-winning design acknowledges that there is a fundamental difference between the way people work at their desks and the way they work outside of the office.

With its extraordinary ease of use, PowerBook takes client-server computing to a new level of simplicity and mobility. From any distance, people can use innovations like AppleTalk® Remote Access for easy and secure access to the office network resources. And because PowerBook is less complicated than other notebooks, it demands far less support.

For all these reasons, more and more companies are depending on PowerBook. After all, you don't have to be an expert to recognize this kind of power. The power to be your best.
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Managing Excel Spreadsheets

WELCOME TO MACWORLD'S NEW BUSINESS-PRODUCTIVITY COLUMN, WORKING SMART.

What kind of name is that? If you aren't working smart, are you working dumb?

Not quite. Working Smart assumes you've conquered the basics and gone beyond them to concentrate on the insights that will enable you to better apply the Mac to your work—whether your office overlooks the big city, the backyard, or the back of an airplane seat.

So where to begin a new business-productivity column? With a journey into the Mac's best-known number-cruncher and definitive business tool: Microsoft Excel 4.0. Creating business plans or profit-and-loss statements, taming budgets, analyzing trends and statistics, making graphs, managing data—Excel handles these and innumerable other number-crunching tasks, and not only on the Macintosh but also on DOS PCs running Microsoft Windows. This month, thanks to the guidance of Excel development team member Dan Williams, I'll outline some tips and techniques for managing large worksheets in Excel 4.0, for optimizing Excel's performance, and for creating worksheets and macros that work smoothly on the Mac and under Windows.

Getting Around the Excel Grid

A BLANK EXCEL WORKSHEET LOOKS LIKE AN AERIAL MAP of a midwestern city. A grid of 16,384 horizontal rows and 256 vertical columns creates a total of 4,194,304 cells. Like a city, a spreadsheet gets hard to navigate as it grows but several Excel features let you create express lanes from one part of a worksheet to another. One technique is to assign descriptive names to cells or ranges of cells. For example, if your worksheet contains a summary section that displays all the bottom-line figures, you can tell Excel to automatically replace cell references within that range with the appropriate names, yielding clearer formulas. See "Simplifying Data with Excel Ranges" for the details.

Creating Summary Outlines

WHEN A SPREADSHEET REACHES GARGANTUAN PROPORTIONS, it becomes difficult to see the forest for the cells. Key figures such as totals get lost in the details, and you end up doing more scrolling and squinting than analyzing.

Excel is the only spreadsheet program with an outlining feature that lets you collapse a spreadsheet to show just the bottom-line results or just the sections you want to concentrate on at the moment.

The Annual Budget sample file included with Excel is a good example. Click on two outlining buttons, and you can completely collapse the spreadsheet to show only the total budget expenditures for each of 5 sites along with a grand total—a total of 12 cells from a model that uses nearly 1000. And by clicking on other outlining buttons, you can zoom in to view, say, each monthly expenditure for each site in each fiscal quarter.

Even better, Excel can automatically create the outline structure for you if you structure the range so that summary values such as totals appear below and to the right of the details. Select the area you want to outline; choose Outline from the Formula menu, and then click on Create. You can even tell Excel to automatically format the totals in bold: In the Outline dialog box, check the Automatic Styles box and then click on Apply Styles. (Tip: If you want to change the way any level of the outline appears, redefine the style for that outline level.)

Once you've named a cell or range, you can easily go to that spot. Choose Goto from the Formula menu and double-click on the name. Excel beams you there and selects the cell or range. Excel also remembers your previous four locations and displays them in the Goto dialog box. This streamlines jumping back and forth between various sections of the worksheet.

Faster scrolling is only one reason to assign names to cells or ranges. A bigger payoff is self-documenting formulas. For example, if you've named Deposit and Withdrawal cells, your formula for the Balance cell can read =Deposit-Withdrawal. That says more about what the formula does than =$F12-$F13. And the biggest payoff is increased accuracy. It's easy to make a mistake when entering a cell reference—typing, say, $F12 instead of $F13. But you're unlikely to type Deposit when you mean Withdrawal.

Excel's range-naming features go much further. With the Formula menu's Create Names and Apply Names commands, you can turn row and column headings into range names and then locate and select rows or columns by specifying those names in various combinations. Better still, you can tell Excel to automatically replace cell references within that range with the appropriate names, yielding clearer formulas. See "Simplifying Data with Excel Ranges" for the details.

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continues
You can also specify the outline levels manually, by using Excel’s Utility tool bar to promote or demote rows and columns. Use this technique when you’ve structured a range or worksheet in a way that prohibits Excel from deciphering its structure or if you want to set up outline levels before entering data.

**Strength in Numbers: Linking Worksheets**

**IF YOU ACTUALLY FILLED ALL 4 MILLION cells in a worksheet, you’d be a candidate for a padded cell. Take advantage of Excel’s ability to link worksheets instead, by creating a formula in one worksheet that refers to cells in other worksheets.**

Linking has several benefits. When you divide a large model across numerous worksheets, the model opens, recalculates, and saves faster than if everything were stored in one worksheet. You can also create different views into the model—create one worksheet containing all the data and formulas, and then link to it separate worksheets that act as reports. You can also use linking to integrate the efforts of a workgroup—each team member contributes his or her worksheet, and you link them to a summary worksheet that presents the key figures from each one.

Linking one worksheet to another is easy. When building a formula, to refer to a cell or range in a different worksheet, bring that worksheet to the front, select the desired cell or range, and switch back to the first worksheet. The resulting formula will contain an *external reference* to the other worksheet. Another way to link two worksheets is with the Copy and Paste Link commands. In the source worksheet, select the cell(s) to which you want to refer and choose Copy. Next, switch to the worksheet where you want to paste the linked data and choose Paste Link from the Edit menu.

To make it easier to open a collection of linked worksheets (as well as unlinked worksheets, charts, and macro sheets), consider binding them into a *workbook*. A workbook document is a digital three-ring binder, a way to transport and work with a collection of related documents. To create a workbook, choose New from the File menu and select the Workbook option. In the workbook window that appears, click on the Add button and then specify the

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**Excel Power Tips**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name cells and cell ranges</td>
<td>Faster navigation using Goto command: self-documenting formulas</td>
</tr>
<tr>
<td>Create outlines</td>
<td>Collapsed worksheet shows only summary information</td>
</tr>
<tr>
<td>Link worksheets</td>
<td>Faster performance, more-efficient memory use; can integrate a group’s worksheets</td>
</tr>
<tr>
<td>Create workbooks</td>
<td>One-click access to related worksheets, macros, graphs</td>
</tr>
<tr>
<td>Zoom out, use multiple windows</td>
<td>Big picture or different parts of a model visible simultaneously</td>
</tr>
<tr>
<td>Use Select Special command</td>
<td>Access dependent and precedent cells, find errors in formulas and other problems</td>
</tr>
<tr>
<td>Put summary information in lower-right corner</td>
<td>Faster recalc</td>
</tr>
<tr>
<td>Use TrueType fonts, DOS-style file names, OLE, GET.WORKSPACE function</td>
<td>Faster transfer between Mac and Windows</td>
</tr>
</tbody>
</table>

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*Looks like another LaserJet breakthrough for Macintosh.*

- It’s the breakthrough you’ve been waiting for: the HP LaserJet 4ML. The most affordable LaserJet printer ever made for Macintosh.
- HP’s LaserJet 4ML printer has been engineered for the Mac from the ground up.
- Easy setup means you just remove the 4ML from the box, load the drivers, and you’re ready to roll.
- A RISC processor, identical to the one found in the LaserJet 4M, and built-in genuine PostScript “Level 2” software from Adobe kicks your work out fast.
- With 4 MB of standard memory, printing complex graphics is effortless.
- A universal paper tray holding up to 100 sheets makes paper handling a cinch.
As a model grows, Excel slows. You can optimize Excel’s performance and use memory more efficiently by observing a few basic guidelines.

1. Don’t format gratuitously. Formatting can take up half the memory and disk space a model uses. If your model requires a large lookup table, put the table in an unformatted worksheet and link other worksheets to it.

2. Don’t use formatted macros. You can format for legibility during the design stage, but it gobbles memory. When the macro sheet is debugged and ready to use, choose Select All, then Clear (both from the Edit menu). In the Clear dialog box, double-click on the Formats option to wipe out all formatting. (You might want to save a copy of the formatted macro in a different macro sheet.)

3. Format an entire row or column rather than a large range of cells. When you format an entire row or column, Excel makes an internal notation saying, for example, “Column A is bold.” That requires less memory than saying “Cells A1 through A120 are bold.”

4. Use Excel’s cell style feature. If you want to change the font of all cells in a worksheet, redefine the style named Normal instead of selecting the entire worksheet and then choosing a different font.

5. To add space between rows or columns, adjust their height or width. Don’t use blank rows and columns. But see guideline 6, below.

6. Don’t be afraid to put large blank areas between sections of a worksheet. Excel uses sparse-matrix memory-management, which lets it all but ignore large blank areas. But remember that a cell is not considered blank if it contains formatting such as borders or shading.

7. Place summary information in the lower-right corner of the worksheet. Excel recalculates from upper left to lower right, so you’ll get faster recalc if you design accordingly. If you put summary info in the upper-left corner, Excel has to make multiple passes through the model when recalculating.

Understanding Your Worksheet

A SPREADSHEET THAT YIELDS INACCURATE results is not only worthless, it’s dangerous. Modeling gurus refer to the process of proofreading a worksheet and verifying its accuracy as auditing. Auditing involves understanding the flow of a model’s logic—understanding what its goals are and how it’s trying to reach them—so you can verify its calculations.

For verifying accuracy, Excel provides several features that can help you in your journey along the audit trail. One is the Window menu’s Zoom command, which lets you zoom in to show more cells in the window. (Zoom in and zoom out are also available on the Utility tool bar.) By zooming in to show the entire worksheet, you get the big picture of how the worksheet is organized—in Microsoft’s Dan Williams’s words, it’s like viewing the worksheet “from 50,000 feet up.” By using the Window menu’s New Window command along with the Zoom command, you can even create multiple views of a worksheet, continuing...
Simplifying Data with Excel Ranges

To clarify the contents of your spreadsheet you can define ranges, or coherent blocks, in your data. First, select the worksheet and choose Create Names and Apply Names from the Formula menu. Excel reads your row and column labels and automatically creates ranges. In the example below it named cells B2 through D2 “Deposits.”

The Goto dialog box (accessed from the Formula menu) lists the new ranges. Double-click on a name to select that range on the worksheet. To select range intersections or multiple ranges, type range names with an operator (colon, space, or comma) in the Reference box. For example, typing Feb Balance selects the two ranges’ intersection.

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AT WORK: WORKING SMART

Bridging the Mac-PC Gap

MICROSOFT SAYS THAT MOST LARGE firms that use Excel run it both on Macs and under Windows. It’s no wonder—the program’s interface and file format are the same on both platforms, so exchanging documents and switching between environments is fairly easy. (Excel can even convert a worksheet’s custom graphics when you move it from one platform to the other.) There are some potential hurdles, but you can work around them by establishing a few standard practices.

• Use TrueType fonts, provided on both platforms. You’ll avoid having to reformat worksheets because one system’s fonts aren’t available on the other.

• Use DOS-style file names for worksheets created on the Mac. (A DOS file name can have up to eight characters and is followed by a period and a three-character extension that identifies the file’s type. An Excel for Windows worksheet has the extension .XLS.) To simulate longer names, bind files into a workbook and then use the workbook window’s Options button to specify longer, more-descriptive names.

• For worksheets with hot links to other worksheets, use object-linking and embedding (OLE—the Paste Link command) instead of the Mac’s publish-and-subscribe commands. Windows supports OLE but, as far as it’s concerned, publish-and-sub is a beer-and-sandwich joint.

• In macros, use the GET WORKSPACE function so the macro can determine which platform it’s running on. Then use IF-THEN statements to adjust the macro’s workings accordingly.

Excel has far more nooks and crannies than I’ve had room to explore here, but these tips and techniques should make your time spent with Excel more productive—and more fun. To go deeper into Excel, take a look at John M. Nevison’s Microsoft Excel Spreadsheet Design (Brady, 1990). Although it doesn’t cover the latest version of Excel, it is still a superb primer on spreadsheet design.

Coming Next Month: Power Focusing on the Mac

Contributing editor JIM HEID has been writing about the Mac since its introduction. His latest book, Macworld Complete Mac Handbook+CD, has just been published by IDG Books Worldwide.
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- Publisher: Aldus
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- MiniCad+4: An unsurpassed mix of ease of use and powerful features defines MiniCad+4. The award-winning MiniCad+4 combines 2D CAD, true 3D CAD, a database spreadsheet, programming language, intelligent interface, AutoCAD translator into one program. New features include 3D walkthrough and flyover tools, instructing, automatic roof, wall, and door tools, and more. CAD0004 $99
- Publisher: Graphsoft
- **$249**

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- Publisher: Insignia Solutions
- **$199**

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- Lists and lists of actual tests, 100's of actual tests. Spend hours, days, weeks or months practing, analyzing, and measuring your ability to conquer standardized tests. Score-Rx is the professionally designed program to prepare you the way the test prep courses do.
- Publisher: Xerox Educational System
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- ASTOUND sets new standards for all presentations. Slides, handouts, static screen and multimedia presentations are a snap with ASTOUND. Using the familiar "on-line and slide" metaphor, combining text, charts, sound, animation and QuickTime is as easy as point and click. Complete with preformatted templates, dozens of transition effects and a wide array of dazzling animated charts,ASTOUND is the presentation software you've been waiting for.
- Publisher: Gold Disk
- **$189**

**Fractal Design Painter X2**

- Fractal Design Painter X2, an expert extension to Painter 2.0, revolutionizes the way artists and designers combine and orchestrate multiple graphic elements. With X2 any number of floating selections can be pasted into, around or under; they may be scaled, rotated and distorted.
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- Publisher: Fractal Design
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**SuperPaint 3.5**
New release! SuperPaint 3.5 combines the best of paint and draw packages for anything from the simplest business illustrations to sophisticated full color art. New features include: Copy, Transform, Free Rotation Tool, Magic Marker tools, pressure sensitive tools, templates, System 7.5 savvy. Also, a 24-bit color, texture, gradients, full color TIFF & EPS graphics support, AutoTrace, Raster Editing, Arrows, Blurred Lines, Color Balancing, Brightness & Contrast, Masking. Publisher: Adams
GRA9463
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**FileGuard 2.7**
It's slick, fast, and safe. I highly recommend it. MacHer review: Protect your hard drive from copying, erasing and unauthorized access (including security systems with a System disable). Protect applications, files, and folders (including System Folder) from unauthorized access, deletion, and illegal copying. Does disk tests automatically or manually. Keeps an on-system usage log with FileGuard's user log which continuously tracks user or group activity. System 7.6 Compatible. Publisher: ASD Software
UT0155
$139

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**MacEKG**
On your desk, slowly thing list on what is the new extension taking more processor power then it deserves? If you have a virus program, you're checking only part of your machine. MacEKG is a professional diagnostic program that notices when your computer starts to go haywire. MacEKG performs advanced component-level tests to isolate faulty and help diagnose intermittent failures. MacEKG tells you what Mac behaviors and makes you aware of small problems before they become major catastrophes. Publisher: MicroMat
UT0285
$89

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EDUC017
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Business forecasting is more of an art than a science, and often those called upon to make forecasts have minimal background in statistics. In this article we'll review forecasting concepts and look at principles for picking the right methods and software for your situation.

The big problem in business forecasting is this: sometimes it gives you valuable new information, and sometimes it simply plays back assumptions that you built into your business model. Unless you really understand the math involved in a particular forecasting method, it won't be clear to you which is happening.

Let's begin with a scenario. We'll say that you're a product manager responsible for the success of a new tennis racket, and you need to develop a three-month advertising budget that takes advantage of rising sales but doesn't push you into a loss for the following quarter. You need a sales forecast for the next quarter.

The More Things Change . . .

Every business book with a chapter on forecasting starts with the technique called regression, so we will too. If you own a business spreadsheet, you own software that can do the simplest type of regression, linear regression. Linear regression analyzes a set of data points to find a line that fits them as snugly as possible, then projects that line beyond the known data set. In “Linear Regressions: Dangerous?” the straight lines were produced using the TREND function on a data range in Microsoft Excel 4.0. (Lotus 1-2-3 and Resolve have similar commands, and every statistics package performs linear regression.) Based on the data in “Linear Regressions: Dangerous?” the line for sales versus time looks like a pretty good prediction, but the data is suspiciously well behaved: though the stock example in most spreadsheet tutorials uses the variables sales and time, there is usually no underlying relationship between the two.

Here's the problem. When a scientist uses linear regression on experimental data, there's usually a real physical relationship between the two variables—for example, incidence of heart attacks versus serum cholesterol levels, steel hardness versus carbon content, or crop yield versus rainfall. But only in special cases are sales and time linked, cases in which time itself is linked to the real underlying vari-
able. An electric utility, for example, might forecast increasing sales of electricity over time, but the real underlying connection is the increasing number of homes and businesses in the utility district. Similarly, it's a fair assumption that sales of your tennis rackets will increase—if you've been ramping up the advertising campaign (at least until the market gets saturated).

And that is the big difference between linear regression in science and in business. You can formulate a linear relationship between rainfall and crop yield, though at some point the relationship will become nonlinear (for example, when the crops drown). But linear regression is nearly the worst way to tell if a market is saturating or if sales are going flat. In a sales-versus-time calculation, regression takes into account the whole sales history, placing little weight on the crucial last few time periods—almost ignoring the latest news.

Is regression useless in marketing? Absolutely not, but you have to pick variables that have a real relationship. In our tennis-racket example, you should probably plot sales against advertising, not time. Do
A linear regression can make predictions for you by generating a line through real data points and projecting it out—but a linear regression can also fool you into thinking you know more than you do. These linear regression examples look alike, but they're fundamentally different. The top graph plots sales against time. That relationship is tenuous, and a realistic picture shows a rapidly widening range in which sales for the next few months are likely to fall. The bottom graph compares electrical resistance with the thickness of a block of ceramic oxide. Since these two properties have a true physical relationship, you can have more confidence in the projection.

You may get a more realistic view of your business if you ignore the long view and focus on the near-term situation. These two plots illustrate the difference between predictions based on long-term results and predictions based on short-term results. A straight-line regression projects steadily rising sales based on year-to-date sales, but the ARIMA analysis, which weights the last three months more heavily, notices the significant downturn in the current quarter.

Looking at the Short Term
Linear regression isn't usually the best predictive technique for fast-changing business data, but other time-based forecasting methods may be useful. Most spreadsheet programs offer a command for computing a moving average, which smooths out bumps in your data and makes it easier to judge trends. For example, you can average several years of data in three-month chunks, which reduces the amount of noise in your data and usually makes it easier to spot seasonal trends.

With more sophisticated statistics programs, you can call on the auto-regressive integrated moving average, or ARIMA, method. ARIMA combines data-smoothing with regression, and lets you specify just how much smoothing and what kind of regression (straight-line, or, for data with more-complex time changes, polynomial). Most econometric predictions, such as the factory-capacity predictions you see in the financial pages, are based on ARIMA because it is good at picking out both seasonal variations and changes in trends. In effect, the main difference between a straight-line model and ARIMA is really a choice of time scale.

Let's look at an ARIMA example (see "Short-term versus Long-term Views"). Although there's no compelling underlying relationship between sales and time for this case, the example clearly indicates when a real downturn begins. In the same figure, look also at the superimposed linear regression plot. It's obvious which technique provides a more accurate forecast in this case.

This example was originally calculated in SYSTAT, one of the most complete statistics packages. Although SYSTAT offers lots of help, a great manual, and a friendly icon-based interface, using its ARIMA facilities calls for some decision-making on your part; you must specify averaging intervals—in effect, telling SYSTAT how much the past influences the future. In "Short-term versus Long-term Views," the ARIMA computation has been set to think of three months rather than the whole year as a significant interval, so it projects the last two months of downturn in sales as a significant trend. (SYSTAT 5.2 lists for $995 from SYSTAT; 708/864-5670.)

This is useful because you probably already know what the right time interval for your business is. For public utilities the scale is probably years, while for tennis rackets a few months might be appropriate. Other statistics packages, including SPSS and Minitab, offer ARIMA; and Rational Analysis of Time Series (RATS) is a dedicated time-series-analysis product that offers a huge variety of options.

Planning for Uncertainty
Both regression and ARIMA forecasts assume an underlying trend in time-series data. There is another paradigm for forecasting that doesn't consider time at all: a probability model.

In this paradigm, you model how much different figures for your business might fluctuate by attaching probability distributions that replace the single numbers in spreadsheet cells (see "Making Smart Guesses"). You could do this manually by creating dozens or hundreds of versions of your worksheet, but Palbade's @Risk and Decisioneer's Crystal Ball 2.0 can automate the process for you. In Crystal Ball, you import an Excel SYLK file and then, for cells whose values you're not sure about, you pick distributions from what looks like a gallery of chart types. In the tennis-racket case, for example, you
would find the cell with the sales you’ve predicted for three months in the future (based on your sales-versus-advertising data) and give it a distribution instead of a single number. A good choice would be a triangle with the peak—the most likely result—at the value you predicted, and high and low cutoffs based on a best-guess vote by your sales staff. You could construct the same model in @Risk, which installs its own menu in your copy of Excel. @Risk offers a more sophisticated range of distribution options than Crystal Ball, but slightly slower performance.

This probabilistic approach to forecasting has two big advantages over mere number-crunching on past data. First, since it automates so much of the work, you can focus on individual components of aggregate figures (each distributor’s sales, for example, instead of total sales). Second, it lets you incorporate your knowledge about the future: your Mac doesn’t know when your next product will get to market, but you probably do (give or take a few months).

A probability model may show a wide range of almost equally likely outcomes—one value may turn up as most likely, but the results will often strongly suggest that you’d better allow for plenty of variation. Actually, the difference between the straight-line regression prediction and the ARIMA prediction for the same data set tells you something about this variation, but a probability model shows you the sources of the difference.

At an even higher level of abstraction is the decision tree, a diagram of all the steps in a decision with a probability assigned to each. This technique inverts the prediction process. Instead of directly predicting results, you make your best guess about each factor that contributes to a result. Here both the spreadsheet data structure and the factor of time disappear, and you are confronted directly with a diagram that maps the limits of your knowledge. DATA (Decision Analysis by TreeAge) 2.02 carries out this kind of analysis. You incorporate your situation into the tree diagram, and DATA computes the probability of the series of dependent events. The advantage of this approach is that it forces you to critically examine everything about your business, but it’s far removed from the spreadsheet-based model familiar to most planners.

**Modeling the Process**

Another approach to prediction, radically different from the methods considered so far, is process modeling, or direct modeling of quantities and processes in business. Even simple methods such as regression assume that there’s some underlying

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**You can use basic spreadsheet functions for simple but realistic forecasting. Practicing with these simple methods will also help you understand what’s going on in the specialized packages.**

**Home on the Range**

Using tools available in any spreadsheet (even integrated packages), you can calculate a likely range of uncertainty for your prediction. Highlight a data range (take 10 to 20 points as a good sample) and take the standard deviation and mean (average) of the data. As a good first guess, your predicted value for the data for the next few time periods is the mean value, plus or minus one standard deviation—in other words, the uncertainty is about one standard deviation.

Our simple example, "Standard Deviation," shows a sample sales data set, a plot, and an indication of the predicted future range (it’s the green bar). In this analysis, you draw conclusions when you compare the actual results with the range you predicted. For example, if sales drop by more than one standard deviation from the previous mean, you can take it as a warning sign that you have a problem. On the other hand, if they rise past more than one standard deviation, it’s a seriously good sign (and probably time to do the computation again).

This conservative approach to prediction has the theoretical virtue that it doesn’t try to extract any more information from the data than is actually present.

**Read the Fine Print**

Spreadsheets will not only fit a straight line through your data points, spreadsheets will also give you a statistical summary of the fitting process. The key element to watch in these summaries is the quantity called R squared (see “R Squared”). This number is a measure of the agreement between the fitted line and the original points, and can take values between 0 and 1. If the value is close to 0, your data points are all over the map and there isn’t much correlation or trend. At 0.90 or higher, R squared tells you the points really do fit a straight line reasonably well, but for values below 0.80 or so, you’re taking chances if you conclude there are trends in your data.

**A Little at a Time**

In a spreadsheet you can get a prediction with much of the same information as an ARIMA calculation by taking small data samples and fitting a straight line through each sample. Using Excel’s TREND or LINEST, for example, you can get a set of predicted future time values and then inspect this whole set of points rather than a single prediction (see “Poor Man’s ARIMA”). This procedure exaggerates the uncertainty of the prediction (smaller data sets tend to give you lower values of R squared), which probably makes the prediction more realistic.
Making Smart Guesses

Crystal Ball and @Risk allow you to replace a single value in a spreadsheet cell with a distribution that represents a range of more likely and less-likely values. The programs then calculate all possible combinations and provide a degree of certainty with the results. (Samples shown are from Crystal Ball's Distribution Gallery.)

Three Distribution Examples

- **Triangular**
  - You would assign a triangular distribution to a spreadsheet cell if you could make a good guess at the amount and set minimum and maximum cut-offs. For example, you might predict annual sales will be between $600,000 and $800,000 and most likely $700,000.

- **Uniform**
  - The uniform distribution can be used for cells in your spreadsheet where any amount within a known range is equally likely. For example, if a supplier's bid guarantees you a price range on a key component, you can use a uniform distribution for that cell to estimate manufacturing costs.

- **Exponential**
  - The exponential distribution is useful to predict how much time passes between recurring events. For example, to estimate how many salespeople you need on the sales floor, you could use the exponential distribution on a cell that predicts how many customers enter your store per hour.

Modeling a Process

A simple example of modeling a process with ithink. Advertising is a flow A, with a delayed effect (represented by a conveyor belt). Advertising eventually results in sales, C, some of which later must be deducted from sales when products are returned, D. Elements can have quantitative relationships—for example, you might estimate that returns will equal 5 percent of sales.

In his statistical quality-control consulting practice, CHARLES SEITER, Ph.D., has found that companies order to a process, even if the assumption is only that things tend to go the way they're going. If you are predicting sales so that you'll know how many new people you can afford to hire, you should probably take into account how much the addition of new staff will affect sales. The idea behind process modeling like this is that you analyze the flow of cash and other quantities through your business.

It's now easy to assemble this type of model in an icon-based modeling system. Popular examples for the Macintosh are specialized knowledge using Extend's C-like ModL language.

Making Sense of Modeling

If you're running a small business, two worthwhile forecasting options are available to you. First, the spreadsheet you're probably using now has built-in linear-regression facilities. As long as you keep an eye on the uncertainty level reported with the results, this simple predictive tool won't get you into too much trouble (see the sidebar, "Making with Software You Already Have"). If most of your business decisions concern single-choice propositions (buy or lease, expand or move, build equipment or buy it) the probability modelers that link to spreadsheets are more useful than time-series analysis.

For larger businesses or any business that anticipates regular seasonal changes, ARIMA capability is essential. For large businesses, process-modeling software is a valuable reality check—if you can build a process model that tracks the ARIMA predictions, you have correctly analyzed the most important influences on your business. Mac forecasting software may not always help you see the future exactly, but it offers inexpensive insurance against total surprise and at least gives you the best available basis for planning the future.

WHERE TO BUY

- @Risk 1.1 $395; Palisade Corp.; 607/277-8000, fax 607/277-8001
- Crystal Ball 2.05 $295; Decisioneering; 303/292-2291, fax 303/534-2118
- DATA (Decision Analysis by TreeAge) 2.0 $297; TreeAge Software; 617/936-2128, fax 617/936-2128
- Extend 2.0 $695; Imagine That; 408/365-0305
- ithink 2.2 $695; High Performance Systems; 603/643-9636, fax 603/643-9502
- MacRATS 4.0 $300; Estima; 708/864-8772, fax 708/864-6221

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Tips, Tricks, and Shortcuts

IF YOU USE SYSTEM 7’S VIRTUAL MEMORY with 32-bit addressing turned off (in the Memory control panel), you can avoid fragmenting memory at the 8MB point by careful placement of multiple NuBus boards, as explained fully in March’s Quick Tips. To recap, you should install NuBus boards consecutively in the rightmost slots of most Macs that have multiple slots. In contrast you should place NuBus boards in the leftmost slots of a Quadra 700 or 800, Centris 650, IIVx, IIVi, or IICi.

Whoa! Joshua Sarid of Don Mills, Ontario, Canada, wonders whether the IICi shouldn’t have NuBus boards in its rightmost slots as recommended by the excellent free booklet The Macintosh Memory Guide (Connectix Corporation, 415/571-5100, 800/950-5880). In fact, you can place NuBus boards in either the rightmost or the leftmost slots of an IICi, IIVi, or IIVx if you use the built-in video. On those models the built-in video acts like a NuBus board in a phantom fourth slot adjacent to the three real slots, fragmenting the NuBus slot space used for virtual memory when 32-bit addressing is off. You’ll make the fragmentation even worse if you place a single NuBus board in the middle slot. If you don’t use the built-in video, you should place NuBus boards in the leftmost slots. Remember, NuBus board placement doesn’t matter one iota if you have 32-bit addressing turned on or if you don’t use virtual memory.

Custom Start-up Screen

Q. I’ve noticed my friends’ Macs have fancier start-up screens than my plain old “Welcome to Macintosh.” How do I change my start-up screen?

Jesse B. Knight
Blue Hill, Maine

A. If your System Folder has a StartupScreen file with a PICT resource of ID 0, the graphic image in that resource replaces the standard start-up screen. You can save a color or black-and-white image in this format with a number of programs, including Canvas 3.0, Capture Utilities (bundled with Capture 4.0), GIF Converter 2.2.10 ($40 shareware by Kevin A. Mitchell, P.O. Box 803066, Chicago, IL 60680-3066), Image Grabber 3.0, Photoshop (all versions), SuperPaint 3.0, and UltraPaint 1.03.

With a custom start-up screen, your Mac takes longer and requires more memory to start up. A small black-and-white image has the least effect and a large 24-bit color image has the greatest effect.

If you have QuickTime installed, you can have a movie play during start-up by naming it Startup Movie and placing it in the System Folder. You can have one or more sounds play during start-up by putting them (or aliases of them) in System 7’s Startup Items folder. To halt start-up sounds, press 8-period (.)

Changing Memory Sizes

Q. When I try to bring a photo into QuarkXPress from the Kodak Photo CD Sampler CD-ROM on my Mac IIVx, I get an “out of memory” message. How much memory do I need to perform this task? I thought 8MB was a reasonable amount to start with.

Jacqueline Briner
via CompuServe

A. Although your Mac has 8MB of RAM, neither QuarkXPress nor any other program uses all of it. The system software uses at least 1000K—more with QuickTime 1.5 and the other system extensions required for Photo CD. Each program you open gets a piece of the remaining memory pie. Quark configures QuarkXPress to get 1700K, enough for text and black-and-white photos but not enough for large color photos. Before working with color photos you should increase QuarkXPress’s memory size to 3500K or more. The amount of memory the program needs depends on the size of your image files and the overall complexity of your QuarkXPress documents. You change an application program’s memory size with the Finder’s Get Info command while the program is not open.

Get Info windows in System 7.1 show three memory sizes: Minimum, Preferred, and Maximum.

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Mac-To-PC Networking ... The Way It's Supposed To Be.

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Windows is a trademark of Microsoft Corporation. All other trademarks are the property of their respective owners. *Exclusive of cable cost, which depends upon your office size and layout.
Detecting Emptiness

**TIP** Sometimes in FileMaker Pro I need to know if a field is empty. When a Name field is empty, for example, I might use a calculation field to display the reminder message “Please enter a name!” The obvious formula for this calculation field, \( \text{if} (\text{Name} = '') \), would not display the reminder message in a new record.

To work around this problem, I create a calculation field named Empty whose value is defined by the formula \( \text{Empty} = 0 \). Now I can test for an empty value in the Name field with the formula \( \text{if} (\text{Name} = \text{Empty}, \text{Name is missing!}', ''). \) There is no need for the Zero field to show up anywhere, so I omit it from my layouts.

David Parillo
Danvers, Massachusetts

If you define a calculation field named Empty with the formula \( \text{Empty} \), then the calculation to test the Name field for an empty value simplifies to \( \text{if} (\text{Name} = \text{Empty}, \text{Name is missing!}', ''). \) —L.P.
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SCHEDULING ATTENDANCE

Ken Rodd, a day-care center administrator in Decalb, Illinois, must
know how many children to expect at various times each day. He used to write
a schedule with a pencil—Johnny attends from 8:30 to noon on Tuesdays
and Thursdays; Janie from 9:00 to 2:00 Monday, Tuesday, and Wednesday; and so
on. Then he'd write down critical times of the day and count how many children
to expect early, midday, and late on each day of the week. Now he tallies
enrollment on a Mac SE, using Microsoft Excel's ability to create and calculate data tables.

Here's how to compute the number of people scheduled at any specified times on
any weekday.

1. List names in column A, one name
erow. In columns B through K enter
each person's in and out times for each
weekday. You can update this whenever
schedules change, and you may want to
enter placeholders (such as dashes) to
reserve rows for future names.

2. Enter the following five formu-
las, one for each weekday, and then fill
down in columns N through R from row 4 to the last row you used in column A
(row 20 in this example):

\[
\begin{align*}
N4 &= \text{IF}(B4< \text{IF}((M52 < C4, M52, 0)), 1, 0) \\
O4 &= \text{IF}(D4< \text{IF}((M52 < E4, M52, 0)), 1, 0) \\
P4 &= \text{IF}(F4< \text{IF}((M52 < G4, M52, 0)), 1, 0) \\
Q4 &= \text{IF}(H4< \text{IF}((M52 < I4, M52, 0)), 1, 0) \\
R4 &= \text{IF}(J4< \text{IF}((M52 < K4, M52, 0)), 1, 0)
\end{align*}
\]

These formulas compute whether or not each person is present at a specific
time of every day; 0 means a person is
not present at the time in cell M2, and 1
means the person is present then.

Different times of day to test will be placed
in cell M2 by the data table, which you
can create next.

3. Enter the times at which you wish
to know attendance or staffing levels in
column T from row 4 down (enter as many
times as you like). In cell U4 enter a
formula to sum all the rows you used in
column N; in the example, the formula is

\[=\text{SUM}(N4 : N20)\]

4. Now create a one-input data table, in which the
values on each line of the table
(t in columns U through Y) de-
pend on a single input vari-
able (in column T). To do this,
first select the range of cells
from T4 across to column Y
down to the last row you used
in column T (row 17 in this
example). Then choose
Table from the Data menu;
in the dialog box that appears,
enter M2 in the Column In-
put Cell. Click OK to dismiss
the dialog box, leaving the
Row Input Cell entry blank.

To calculate the data table, Excel inputs the time
from cell T4 into cell M2. This
causes the formulas in cells
N4:R20 to test that time
against every person's weekly
ly schedule. Excel sums those
results (using the formulas in
cells U4:Y4) and places the
totals next to T4 in U4:Y4.
Excel repeats this process
for every row in the data
table (rows 4 through 17 in
this example). When it finishes,
you have a tally of attendance through the
week at the times you spe-
cified in column T.
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WriteMove II weighs a scant 2.5 pounds including the battery. It measures just 2" x 3.5" x 11.7" A case could be easily made for buying the WriteMove II on size alone. But that would be selling it short. The ultimate measure of any printer is how well it prints. The WriteMove II will satisfy the most demanding customers. WriteMove II prints near-laser quality 360 dpi on plain paper. It also handles envelopes and transparencies with equal ease. Its on-screen print preview saves time. And, background printing permits you to continue working as the WriteMove II quietly prints.

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We invite you to make your own comparisons. Then acquire a WriteMove II; a passport to printing mobility, wherever life takes you.

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Remote Control

**TIP** In graphics programs I often have trouble moving a small object, such as a dot. When I try to drag the object, I inadvertently drag one of its handles instead, stretching the object. To work around this problem, I simply draw a box around the small object and group the two. I can easily drag the box to properly position the small object, and then delete the box.

_Ellen Eidem_  
_Boston, Massachusetts_

Dynamic References

**TIP** Updating references to tables, figures, bibliographic entries, and so forth can be a real chore in most Mac word processors—even when you use a replace command. System 7’s publish-and-subscribe capability can keep table numbers and other references current automatically. The references can be in the same documents as the referents or in different documents. You simply publish the number, name, title, or other identifier of each referent as a separate edition, and subscribe to the appropriate edition wherever you want to make a reference. In Microsoft Word 5.1 (and earlier versions), for example, you select a table number where it appears next to the table and use the Create Publisher command to save the table number as a new edition. Then with the Subscribe To command you subscribe to that edition wherever you want a reference to the table. If you subsequently change the table number (the publisher), System 7 propagates the change among all references to the table (subscribers).

_Maarten Vrakking_  
_Delft, The Netherlands_

System 7 doesn’t normally notify subscribers (the references) about an update until you save the document containing the publisher (the referent). In Word you can have the update occur when you make changes by selecting the Publisher and turning on the Send Edition When Edited option of the Publisher Options command.—_L.P._

We pay from $25 to $100 for tips published here. Send questions or tips on how to use Mac computers, peripherals, or software (by mail or electronically) to Quick Tips, Lon Poole, at the address listed in How to Contact Macworld at the front of the magazine (include your address and phone number). All published submissions become the property of Macworld. Due to the high volume of mail received, we’re unable to provide personal responses.

The acquisition of a printer is often second in expense only to the purchase of your Macintosh®. And it makes sense to invest in an intelligently-priced printer that can grow with your system.


At home, school or in the office, the PLP™ II is ideal for an individual who requires laser printer output at a reasonable price. It's the perfect complement to any Macintosh, including the exciting new PowerBooks.

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NetWare for Mac 4.0: Missing Pieces

THE BIGGEST NEWS ABOUT NETWARE for Macintosh 4.0 is what's missing. The Mac extension to Novell's network-operating system for Intel-based PCs includes a number of improvements but still doesn't make Macs equal partners with other NetWare 4.0 clients, such as DOS and Windows machines.

The AppleTalk-based NetWare for Mac doesn't offer Mac clients access to NetWare 4.0's raison d'être: global directory services. The extension also excludes Mac clients from some administration tasks, server mirroring, and RSA encryption features.

Despite shortcomings, NetWare for Macintosh 4.0 does offer some improvements. The software lets Macs share a CD-ROM drive attached to a NetWare server. NetWare Tools 1.0, which features overhauled interfaces, replaces the old NetWare Control Center and Desk Accessory utilities.

The utilities also let you match common DOS and Windows file-name extensions with Mac applications so that you can double-click to open DOS files with those extensions.

The software upgrade ties Macs more tightly into Novell's printing services. For instance, under NetWare for Mac 4.0, an AppleTalk printer can accept jobs from multiple NetWare queues and can be assigned to queues that include printers attached to non-Macintosh clients.

Network administrators will also be able to restrict particular Macintoshes from access to the NetWare server based on physical addresses. A new utility that runs on the server offers AppleTalk Filing Protocol (AFP) server administration.

NetWare for Mac 4.0 offers better password-error reporting and a more exact mapping of file security between AFP and NetWare. Files stored on the server now are subject to the security restrictions of the folder in which they are stored, closing a security loophole of past versions. Novell is shipping sample 5-user packs free to registered NetWare 4.0 owners, but sells only $1195, 1000-user packs.

Early next year, Novell plans to offer client software that integrates NetWare protocols with the Mac interface so Macintosh users can gain direct access to NetWare services the same way DOS and Windows users do today. That would mean that no NetWare features would be off limits to Macs. The forthcoming client, called NetWare Systems Services for the Macintosh, will first support IPX (Novell's transport protocol) and then AppleTalk. Novell, 801/429-7000.

—MARGIE WYLIE

Network Debuggers Made Easy

THE AG GROUP HAS DESIGNED ITS SECOND-GENERATION network debuggers to be simple enough for the hexidecimally challenged yet capable enough for the seven-layer enlightened.

EtherPeek 2.0 ($795 list) and LocalPeek 2.0 ($495) are network protocol analyzers, programs that sample and sift network traffic to isolate bugaboos. Now these debuggers are smarter and more flexible, making sifting packets (the basic units of network traffic) less labor-inten-
GraceLAN Manager Update

**GraceLAN Network Manager 3.0**

GraceLAN Network Manager 3.0 from TechWorks lets network managers get more information about their AppleTalk nodes, get it faster, and view it in more ways than previous versions.

Network managers can now customize views of network information and limit a scan, to hardware information, for example. A new document capability lets users schedule scans, save gathered information within the program itself, see results of previous network scans, and lay out or print custom reports. A browser lets users scan in real time.

While Network Manager 3.0 runs over AppleTalk, its architecture will support responders (client software) for other platforms and protocols as they become available from GraceLAN and third-party vendors without requiring any change to the console software. GraceLAN Network Manager 3.0 costs $795.

TechWorks also now sells GraceLAN Server Manager, software developed by Santorini Consulting and Design for managing AppleShare servers remotely. GraceLAN Server Manager costs $395 for one server, $695 for five servers, and $995 for ten servers. TechWorks, 512/794-8533.

Farallon Supports AURP

Farallon Computing has added support for Apple's AppleTalk Update Routing Protocol (AURP) and the Simple Network Management Protocol (SNMP) over AppleTalk to its InterRoute/5 and StarRouter LocalTalk-Ethernet router/gateways, scheduled to ship in August. Farallon is the first company to announce hardware supporting AURP, Apple's protocol for tunneling AppleTalk packets over wide-area TCP/IP networks. (Apple implemented AURP in its software router, Apple Internet Router 3.0; see "Rating Routers," Macworld, July 1993.)

If you already own one of these Farallon routers, you can get the AURP and additional SNMP support by upgrading your Farallon StarCommand management software to version 3.2, available free from Farallon or electronic bulletin boards.

Farallon's Ether10-T StarController/557, a new 12-port 10BaseT hub ($1799), can also be managed using SNMP over AppleTalk or TCP/IP. InterRoute/5 has a list price of $3499, and the StarRouter lists for $3299. The hub and the routers are available as hub modules for the Farallon Concentrator; each module for the Concentrator lists for $200 less than the corresponding standalone price. Farallon Computing, 510/814-5100.

**Brieftext**

- **Vital Library** Apple's client/server cookbooks are finally available. The $1500, six-volume set outlines the VITAL (Virtual Integrated Technical Architecture Lifecycle) guidelines. 800/795-1000.
- **AntiPiracy Alert** AppleShare 4.0 enforces software licensing by pestering the pirates. The new server can't be stopped from scanning for illicit copies of the server software on start-up, flooding managers and users with annoying warnings. It may also annoy the honest, since it takes hours to scan a network with hundreds of zones.

**More Database Connectivity** Data Access Language (DAL), Apple's scheme for getting data off mainframes and onto Macs, now supports TCP/IP in versions of the DAL server software MVS, AS/400, and VAX/VMS servers. Apple also is now shipping a developer's kit for Microsoft's competing Open Database Connectivity (ODBC) scheme. 408/862-3385.
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Whether you choose TelePort for desktop Macs or PowerPort for PowerBooks, all of our fax/modems feature the world’s easiest and most integrated software interface, GlobalFax. MacWeek called it, “a marvel—flexible for the novice, yet powerful enough for the experienced user.” MacComputing said, “GlobalFax is the epitome of Macintosh desktop applications.” And according to MicroTimes, GlobalFax is “a delight. Pressing the Option key converts from print to fax output. The fax directory, transmission and printing tools are comprehensive and easy to use.”

Perfect for desktop Macs and PowerBooks

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Basically, you're a good corporate citizen. You sponsor at least one coworker for every hour that he or she dances, walks, bikes, or bowls in the name of charity. You sort through paper and save up soda cans for weekly trips to the office recycling bins. You go to the annual company picnic. But these days, if you manage a Macintosh local area network and want to be a truly good corporate citizen, you may have to acknowledge that your company views PCs other than Macs as P.C. (that is, politically correct). No matter how trouble-free your departmental Macintosh LAN, how smoothly it hums along, management's agenda may include connecting it to the corporate network—often a PC network, usually running Novell's NetWare. After all, NetWare is the most widely deployed network operating system.

Turns out that connecting Mac and PC networks is more than a way to homogenize the corporate culture. There are lots of performance-based reasons for your Mac network to talk to a NetWare server. At the network operating system level, NetWare itself is a high-performance server environment. At the wiring level, rapidly descending prices for Macintosh Ethernet cards have made increased speed easier for corporate budgets to accommodate. Also, your Macintosh users may need to run PC applications, or print to devices attached on the PC end. Aside from what connectivity to NetWare can provide your users, you may appreciate the wealth of network-management tools it offers. (Of course, to get all these benefits, you must buy a NetWare licensing agreement to cover the additional Macintosh users.)

Given all the reasons for PC-to-Mac connectivity, the question becomes, How can you connect your Mac clients to a NetWare server? Several methods exist for connecting to NetWare 3.11, the version most companies use. Which method you choose depends on which benefits you're after, how many users you're connecting, and how big your budget is.

The first option is Novell's NetWare for Macintosh, sold as a set of NetWare Loadable Modules (NLMs) for NetWare 3.11. (I tested NetWare for Macintosh 3.01; for information about NetWare for Mac 4.0, see *Networks* issue in this issue.) The software loads on the NetWare server to provide the operating system with a complete set of AppleTalk protocols. This option is pricey, but may be worth the cost if you want NetWare-like management tools, password protection, and bidirectional printing. A second possibility, Miramar Systems' MacLAN Connect for NetWare, helps you configure PCs as AppleTalk Filing Protocol (AFP)-compliant servers. This gateway option can misbehave, but is considerably less expensive than NetWare for Mac. Third, Dayna Communications' NetMounter (contained in DOS Mounter Plus) mounts the NetWare server as a volume on the Macintosh desktop and on the NetWare Core Protocols (NCPs) to define workstation requests. But all Macs are not ready to work using AppleTalk protocols—AFP for communicating with servers, and the PAP (Password Authentication Protocol) for communicating with printers. For client and server to communicate, you must create either NetWare server support for AppleTalk protocols or client workstation support for IPX. (Novell recently started offering MacIPX, a Macintosh client version of IPX, to developers; see *Macworld* News, July 1993, page 85.)

The question of where to place the bulk of responsibility for network communications—at the server or at the client—has a great deal to do with the way you view network administration. For some, the question takes on the importance of a "religious issue," as Apple's AppleTalk evangelist R. Garry Hornbuckle says.

On one hand, it makes sense to adapt the server to meet the client's needs—creating server support for AppleTalk protocols, as do Novell's NetWare for Mac and Miramar's MacLAN Connect for NetWare. The underlying logic is that, in addition to being more secure, servers tend to be centrally administered; you have to load new programs or upgrade existing ones only on the server, not on dozens of clients.

On the other hand, Dayna's NetMounter and Insignia Solutions' SoftPC Professional and SoftNode emulation software enables the Mac to run PC applications in a window under the Macintosh Operating System, albeit at much slower speeds.

Choosing Sides

In essence, each of these products is designed to overcome one obstacle. NetWare relies on the Internetwork Packet Exchange (IPX) protocols to create and deliver packets and on the NetWare Core Protocols (NCPs) to define workstation requests. But all Macs are not ready to work using AppleTalk protocols—AFP for communicating with servers, and the PAP (Password Authentication Protocol) for communicating with printers. For client and server to communicate, you must create either NetWare server support for AppleTalk protocols or client workstation support for IPX. (Novell recently started offering MacIPX, a Macintosh client version of IPX, to developers; see *Macworld* News, July 1993, page 85.)

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On the other hand, Dayna's NetMounter and Insignia Solutions' SoftPC Professional and SoftNode offer the advantage of having the client Mac, not the server, support IPX without requiring modifications to the server. This setup frees the server from handling the AppleTalk protocol processing overhead and allows the Mac client to connect to servers not running under special software, such as NetWare for Mac.

## CONNECTING TO

### FOUR WAYS TO INTEGRATE MACS INTO A NETWARE NETWORK

It's an easy way to provide access to files stored on the NetWare server but is not intended to help create a homogeneous Mac-PC environment. And finally, the combination of Insignia Solutions' SoftPC Professional and SoftNode emulation software enables the Mac to run PC applications in a window under the Macintosh Operating System, albeit at much slower speeds.
In addition to choosing whether to let the responsibility lie with client or server, you’re going to have to make some decisions about physical connectivity. This article focuses on software connectivity, but be forewarned that you will have to make hardware choices, too. If you have only a few Macs, and network traffic will be light, you may want to consider connecting to the server by simply installing a LocalTalk card in the server. However, your network will be limited to LocalTalk’s 230.4-kilobits-per-second (Kbps) speed. If you want the 10-megabits-per-second (Mbps) Ethernet speed, you’re going to have to install an Ethernet card in each Mac. That implementation could become expensive unless all your Macs are Quadras, which come with built-in Ethernet. You can also use a router to act as intermediary between the NetWare network’s cabling system and LocalTalk.

Never Fear NetWare?
Whichever option you choose for connecting your departmental Macintosh LAN to the corporate NetWare server, administering the NetWare 3.11 operating system can be tough—especially for those without previous NetWare experience. Installing and administering NetWare for Mac itself will require little additional NetWare expertise on your part. Even the most NetWare-phobic should find NetWare for Mac pretty straightforward.

NetWare for Mac comprises several server-based modules, or NLMs, and a number of applications for installation on the client Mac. NLMs are programs that link disk and network software drivers and file-server-management utilities to the core NetWare operating system. You can load and unload NLMs at will without taking down the server—a big advantage if you don’t always need full functionality. The documentation is relatively clear, and the installation program is automated. (However, first-time installers should consult the Macworld Networking Handbook [IDG Books Worldwide, 1992] for help in understanding AppleTalk protocols in non-Mac contexts.)

The ease of installation extends to the client stations. NetWare for Mac does not require any additional software to be configured at the client. However, you may want to install some of the optional utilities that take advantage of NetWare-specific features, such as print-queue manipulation, access privileges, and broadcast messaging. Once server installation is complete, and you have config-
ured your server to require encrypted passwords, users log in to the NetWare server by pulling down the Chooser, clicking on the AppleShare icon, selecting the appropriate zone, clicking on the appropriate server name, then clicking on OK (see “Getting to the Server”). Although this process takes only a few steps, you can speed it even further by opting for less security and requiring only the Apple Standard User Authentication Method (UAM), rather than NetWare-encrypted passwords. With Apple UAM, users can automatically mount the server volume upon log-in.

Once the user is properly logged in, the server volume appears as a file-cabinet icon on the desktop. Double-clicking on a Mac file icon within a server volume opens the file and the application. DOS-based files, including applications, are also represented within the mounted volumes. However, you cannot open and read DOS files from the Mac desktop unless they contain ASCII text. Macintosh users do have full access to NetWare print queues, however, and PC users can print to printers on the Mac side.

Even if, as a NetWare novice, you overcome your fear of installation and long-term use, Novell’s pricing structure may dissuade you. NetWare for Mac’s site licensing agreement is a costly $495 per 5-user license, $895 for a 20-user license, $1,995 for a 100-user license, and $2,995 for a 200-user license. And again, those prices are in addition to the cost of the NetWare 3.11 licensing agreement. Compare those prices with the cost of the other product that places AppleTalk protocols on the server: $695 per 40-user configuration of MacLAN Connect. You’d better be getting something extra with NetWare for Mac, right? In my opinion, you are. Your money buys a level of reliability that MacLAN Connect simply does not provide.

You are also paying for a superior level of network security. NetWare for Mac enables administrators to take advantage of NetWare’s encrypted password protection, a feature that some of the other Mac-to-NetWare connectivity options do not directly support. NetWare for Mac also ties you into NetWare’s powerful access-privileges facility. Instead of such rights as See Files, See Folders, and Make Changes, NetWare lets you have Read, Write, Erase, Modify, Create, File Scan, and Access control, as well as Supervisory rights, to both folders and files.

And once NetWare for Mac is installed, Mac administrators can perform most of their system administration from a Macintosh, not a PC. NetWare for Mac’s NetWare Control Center (NCC) provides nearly all the functionality of NetWare’s SYSCON management utility. With NCC, administrators can add and configure groups and establish trustee rights, change passwords, and manage print queues, and through these settings determine which server-based files, volumes, and folders each user and group of users can access.

Unfortunately, NCC lacks access to the server-resource accounting options found in SYSCON. These accounting options enable NetWare supervisors to set up a variety of audit-tracking functions, such as charging users or groups for disk or server resource use and limiting user access by time, date, or network address. NCC forces Mac supervisors to use SYSCON if they want to charge various departments for network server usage. That means moving to a networked DOS machine. Another option is to use Insignia’s SoftPC Professional with SoftNode to run SYSCON on the Mac. Although I found the SoftPC/SoftNode emulation extremely slow, it is well suited for occasional use of SYSCON. If you have SoftPC and SoftNode or are willing to invest in them for this purpose, you will also need to physically connect the Mac running them to the Ethernet network or use a LocalTalk-to-Ethernet router.

NetWare for Mac also provides the NetWare server with name-space support for non-DOS file names. So when a Mac saves a file to the server with a valid Macintosh file name of up to 32 characters, up method uses the DOS naming structure, and you create and erase files frequently, you may have trouble restoring the correct Mac file.

MacLAN: Gateway to NetWare

In contrast to NetWare for Mac, the less-expensive MacLAN Connect is a temporary application both from an installation and an operational standpoint. The program configures an Intel-based PC as a gateway to a NetWare server (see “Gateway Option”). It requires dedicating a separate high-performance PC as a MacLAN Connect server—the gateway machine must be of the same class CPU as the NetWare server.

MacLAN Connect also requires installing and configuring two network adapter cards in each MacLAN Connect server—one for running Novell’s IPX, the second for running AppleTalk. But Miramar’s list of supported cards is limited. I tried two other cards, before acquiring the only supported EtherTalk card—a 3Com EtherLink II (known as the 3C503). I still had to use Novell’s JUMPER utility to avoid a conflict with the memory address of the Intel card. This step is undocumented by the MacLAN Connect user guides, but without it, I could not bind the IPX drivers to the Intel card.

On the plus side, MacLAN Connect lets you import NetWare user and group accounts and NetWare volumes into the MacLAN Connect database, saving you from duplicating setup tasks performed at the NetWare server. Miramar also supplies MacLAN Connect administrators with a Mac-based administration program that permits reconfiguring the MacLAN Connect server once it is up and running. This application operates much like NetWare for Mac’s NCC, giving the Mac-literate, PC-shy supervisor an effective set of administrative tools.

At the client, MacLAN Connect, like NetWare, uses standard AppleShare
### Comparing Mac-to-NetWare Connectivity Choices

<table>
<thead>
<tr>
<th>NetWare for Macintosh 3.011</th>
<th>MacLAN Connect for NetWare</th>
<th>SoftPC Professional and SoftNode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novell (501/947-0998; 800/638-9273)</td>
<td>Miramar Systems (805/966-2432); 40-user license $695</td>
<td>Insignia Solutions (415/694-7600; 800/848-7677); SoftPC Professional $325, SoftNode (required for connectivity to NetWare) $149 for one user.</td>
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<td>- Requires administrator be DOS literate.</td>
<td>- Provides standard AppleShare password protection only.</td>
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<td>- Doesn't create truly integrated Mac-PC network environment.</td>
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<td>- Users cannot automatically read DOS files.</td>
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<tr>
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<td>Dayna Communications (801/269-7200); single-user version $99.95; ten-user license $750.</td>
<td>Dayna Communications (801/269-7200); single-user version $99.95; ten-user license $750.</td>
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#### The Mac as a PC Node
Logging in to NetWare from a PC. This shows how SoftPC Professional and SoftNode workstation software available via the Chooser. MacLAN Connect displays volumes as a Mac or PC icon. Files on the Macintosh volumes are accessible just as any other file on the Mac is, but DOS-based applications cannot be opened directly from the Mac desktop because they lack the type and creator codes required by the Finder. You can open an ASCII file from your word processor, however, which will create the needed type and creator codes. And MacLAN's configuration program permits mapping DOS File extensions.

MacLAN Connect's temperamental behavior resurfaced when I tested its handling of unexpected NetWare server errors. When I took the NetWare server down with the MacLAN Connect server still running, the performance of my Macintosh client slowed to a crawl, and I wasn't allowed to save my work at the client station.

MacLAN Connect does send a message to all attached Macs when its supervisor begins the process of shutting down the MacLAN Connect server, and then displays a message indicating that the server has been shut down. It does not, however, forward broadcast messages from a NetWare server to its client stations. This failure could prove disastrous when a NetWare server supervisor sends a broadcast message warning of an impending server shutdown. If the MacLAN Connect supervisor doesn't subsequently begin to shut down the MacLAN Connect server, thus initiating a warning to clients to save their work and log out, then MacLAN Connect clients will lose their work.

Another problem: If you take the NetWare server down without first shutting down the MacLAN Connect server, you have to rebuild that server's system files. You cannot simply reboot the MacLAN Connect server by rerunning its configuration program. You must go to the MacLAN Connect gateway to rebuild housekeeping files, such as server application data files required by MacLAN Connect.

MacLAN Connect offers several advantages over NetWare for Mac. The supervisor must set up only one account for the gateway, not one for each Macintosh user. And it's substantially less expensive than NetWare for Mac. Like NetWare for Mac, MacLAN Connect provides bidirectional print services—Mac can print to NetWare-attached printers, and PCs can print to AppleTalk-based printers. It also supports multiple levels of password protection.
NetMounter: IPX on the Mac

Dayna's NetMounter and Insignia Solutions' SoftPC Professional and SoftNode run IPX on the Mac. While this approach may be a boon to many sites.

Dayna developed its own version of IPX for NetMounter on the Mac; Insignia Solutions ships SoftNode with Novell-supplied IPX. Both communicate with NetWare without problems. In my testing, I ran several versions of the NetWare workstation shell programs supplied with SoftNode on a 486-based PC client without modification and experienced no compatibility problems.

As its name indicates, NetMounter mounts NetWare volumes on the desktop of every Mac on which it is installed. It's an easy, low-cost ($99 per package, $750 for ten users) means of giving your users access to NetWare files, provided that your Macs are on the same physical network as the server or an IPX gateway is used. This product is not intended to help create a homogeneous Mac-PC environment. Mac users cannot access PC printers, nor can PCs access Mac printers. And NetMounter does not give administrators access to NetWare's administration tools.

But users can access files on the NetWare server, and they can create automatic file-extension mappings for them. For example, with mapping, when a DOS file with an .XLS extension is opened, the Mac client automatically launches Microsoft Excel. Like MacLAN Connect and NetWare for Mac, NetMounter supports start-up mounting of NetWare volumes, which speeds the log-in process (see "Volumes and Volumes"). However, your server must not require NetWare encrypted passwords for start-up mounting to work when you use NetMounter's Save Name and Password. Otherwise, the name-and-password option will hang your Mac before start-up is completed.

In addition, you should be aware that when taking the server down, you must have the NetWare Notify extension installed for NetMounter to capture or display the server-console broadcast messages. If Notify is not installed, the all-too-familiar Macintosh message "The server's connection has unexpectedly shut down" will appear—but probably too late for you to save your work to the server. Without Notify, you won't get the more timely NetWare message.

NetMounter offers an effective, inexpensive way for a limited number of users to tap into NetWare-based files. Maintaining and upgrading several dozen or more NetMounter clients could be a problem, however.

Gateway Option

MacLAN Connect, unlike other NetWare connectivity options, runs on a DOS PC that acts as a gateway to a NetWare server, which is also a DOS PC. NetWare recognizes the MacLAN Connect server as a network node rather than recognizing the individual Macintosh clients.

Funny, It Looks Like a Mac

If your Macintosh users need to run PC applications, Insignia's SoftPC Professional and SoftNode could be the way to go. With them, Macs can run DOS applications in a window, as long as the application requires no 386- or 486-specific features. Consequently, nearly all of the network-administration tools available on a PC—including encrypted password protection—are available on Macs running this emulation software.

The Insignia products require a knowledge of DOS. When installing SoftNode, the complement to SoftPC, you have to first start SoftPC, thus opening a window running DOS on the Mac. With the exception of a menu bar across the top of the screen, your Mac emulates a PC, forcing you to use DOS command-line entries.

And once users log in to the NetWare server, just as they would from a PC client, operating under the SoftPC Professional-SoftNode combo is identical to running on a PC, except slower—much slower (see "The Mac as a PC Node"). Performance is my principal complaint with SoftPC. Running a Dir search on the server's SYS: volume, for instance, took 13 seconds on an old IBM XT running at 4.77MHz, and 115 seconds on the 16 MHz LC II. This slowness is because of the real-time conversion processing SoftPC must undergo to run PC programs on the Mac's Motorola processor.

As a result, Insignia Solutions positions the SoftPC Professional-SoftNode combination for only occasional use—for example, by a Macintosh network supervisor running SYSCON. While the SoftPC-SoftNode combo does provide relatively easy connection to NetWare, I agree that its use is of limited value to most users accustomed to the Mac's graphical interface. A SoftPC with Windows version is available (see Reviews, Macworld, June 1993).

For a Mac-only network administrator who can't justify the costs of buying a new PC with a hard drive and a network adapter card, Insignia's approach might work. However, if you buy the SoftPC-SoftNode combination for occasional use, such as for running SYSCON, consider the total cost: SoftPC Professional is $325, SoftNode is $149, and you may need additional RAM (8MB is required; I spent $180 for an additional 4MB). If your company has an older PC ready for retirement—an XT will do fine—I'd suggest using it to run SYSCON.

What to Do

Chances are you'll soon have to connect to the corporate NetWare network. When considering connectivity options, ask yourself these questions. Will users need bidirectional printing? NetWare for Mac and MacLAN Connect provide this feature. Will users need to run PC programs? If so, Insignia's products may be the solution.

Do users require only basic access to files on the NetWare server? Consider Dayna's NetMounter.

But if what you need is to fully integrate many Mac clients into a NetWare server every single day, NetWare for Macintosh is the right choice. Although priced higher than the other options, this product provides centralized administration, password encryption, and a level of Macintosh-to-NetWare integration that other products lack.

JIM CARR, a writer based in Saratoga, California, has covered the networking industry for a decade.

MAC-TO-NETWARE CONNECTIVITY SOFTWARE

Macworld looked at four approaches to connecting Macintosh clients to a NetWare 3.11 server. All four are workable, but for daily use by many clients, one product stood out.

NetWare for Macintosh. If you want to truly integrate your Macintoshes into a NetWare network for daily use, use NetWare for Macintosh. Its robust performance, management, and security make it worth the price. Company: Novell. List price: $495 for 5-user license to $2995 for 200-user license.

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UNLEASH YOUR

PORTABLE PHONES, BEEPERS, BABY MONITORS, and remote controls—the world is wired about wireless gadgets in all their forms and functions. And communications technology will most certainly be the next in line to be unleashed. Although wireless network technology is nascent, in the next few years it will become more than a space oddity. By the year 2000, wireless LANs will account for 10 percent of all nodes, according to International Resource Development, a market research firm in New Canaan, Connecticut.

But with wiring being cheap and ubiquitous, what will motivate this change? One factor: mobile mania. According to recent studies, more than 25 million Americans currently work outside their offices. A PowerBook and a PDA could become as crucial to these people's jobs as an M.B.A. Commuter computers are the pens and pencils, the bare necessities, of the moving desktop. These tools will usher in a new way of working—and networking.

Wireless communications could allow users to network easily and spontaneously in conference rooms, on a plane, in a train, in a classroom, or on a retail-store floor. Wireless Macintosh users also have an inherent communications advantage—AppleTalk. Unlike other protocols, AppleTalk doesn't force users to set up node addresses or announce themselves to the network. Because AppleTalk dynamically assigns node addresses, the protocol is well suited to building and destroying temporary LANs.

Which wireless technology is right for your network?

BY MELANIE McMULLEN

MACWORLD September 1993 209
On a large scale, radio links can cover a campus environment and, eventually, facilitate worldwide connection of wide area networks composed of pen-based devices, laptops, and pagers. On a small scale, although wireless technology costs more than twisted-pair or coax cable schemes, wireless networks can be up and running in half the time that it takes to configure a wired network.

Most important, the popularity of portable hardware and accompanying software mandates freedom in networking. Portable computing's success depends on wireless connectivity, PowerBooks, and the upcoming onslaught of personal digital assistants, such as the Newton, which has just started shipping. The last thing a mobile worker wants is to do with a portable device is hitch it up and tie it down in order to print or transfer data or E-mail.

Back to Basics

This wireless evolution can breed confusion. Wired networks are here-and-now, while wireless ones, no matter how interesting to see on the demo shelf, are still in the neato-but-it's-plasticware phase.

So the first question is whether you really need wireless networking. Most buildings are already wired for communications; unless you plan on several moves and relocations, justifying the more expensive wireless technology can be a hurdle. For example, the average cost per node for an Ethernet connection is $150 to $300, while the average cost per node for a wireless connection ranges from $500 to $1000, depending on the wireless technology.

In addition, network transmission speed between wireless devices is almost always slower than the same network using a wired configuration. For instance, 2 megabits per second (Mbps) is speedily for a wireless product. While that's faster than 230-kilobits-per-second (Kbps) LocalTalk, it's not fast compared with 10-Mbps Ethernet, 4/16-Mbps Token Ring, and 100-Mbps FDDI.

But if price and speed matter less than mobility, and you need the flexibility and freedom that wireless networking can give, then master the basics of wireless transmission and choose the technology that best suits your financial and functional needs.

As a general rule of wireless transmission, the higher the data rate, the shorter the range. For example, an infrared device that relies on line-of-sight transmission may have a decent data rate of 2 Mbps or more but extend only a short distance, around 20 to 80 feet. Each wireless vendor has to maintain a delicate balance of speed and range when developing products, and you have to decide which is more vital to your network.

The most common modes of wireless transmission—spread-spectrum radio, cellular radio, and microwave—use different frequencies of the electromagnetic spectrum. Frequency determines range, speed, ability to penetrate walls, licensing requirements, and ultimately, cost.

The two most popular transmission modes for local area networks are spread-spectrum radio and infrared, which each have pluses and minuses, depending on the environment. Expect to see Apple and other companies releasing products for all the Mac in both areas later this year. Spread-spectrum, because of its ability to penetrate walls and its good transmission range (up to 500 feet, in some cases) promises to be a more flexible solution for wireless networks and has already become a de facto standard in the wireless market for DOS and Windows PCs. But, in terms of network development, infrared is the most established technology.

Seeing Red

Infrared networks use infrared light to transmit a signal to a receiving target. An example of this type of transmission is a TV remote control. Infrared transmissions are not government regulated and thus do not bump into the political and regulatory hurdles created by the Federal Communications Commission (FCC), which governs and divvies up spread-spectrum-transmission bandwidths.

But infrared transmission does bump into a bigger wall—literally. Infrared light, falling between microwave and visible light in the electromagnetic spectrum, shares some properties of visible light: it reflects off, but can't penetrate, solid objects, such as walls. Therefore infrared networks are best suited for factory floors, open meetings, or close-range, device-to-device transfers, such as a print request from a PowerBook to a desktop printer.

On the upside, since walls will keep the signal in, infrared networks are highly site-secure; the network data never leaves the room. Additionally, infrared is immune to electromagnetic and radio frequency interference, making it unlikely that someone could intercept or intercept the data. Infrared transmission is so secure that the brokerage firm Lehman Brothers in New York uses a wireless infrared network on the trading floor. Also, infrared devices tend to be smaller than radio-based devices and don't cost as much to develop, so their prices will be lower.

Photonics Corporation (408/955-7930), which is partially funded by Apple, started developing Photolink, one of the first wireless infrared products for the Macintosh, in 1985 (it shipped in 1989). Based on a directed-transmission method, Photolink used a LocalTalk setup in which four Macs beamed their signals to a target on a wall or ceiling. Last year Photolink discontinued Photolink and developed a diffuse-transmission method aimed at a more mobile approach to wireless networking than the stationary Photolink network.

Photonics' new technology still uses infrared; the diffused signals bounce off desks, walls, and even people, eliminating the need for point-and-shoot devices. While this signal floods the area, it is slightly weaker (that is, has a shorter range) than a directed, line-of-sight transmission. But the signal won't be interrupted by casual passersby, which is crucial in an office environment. Photonics will use this diffuse technology in its Cooperative series of products (price not available at press time). Apple is also licensed to use Photonics' technology, so Apple could incorporate the technology into its own products.

Photonics' Cooperative Mac, scheduled to ship in September, is a user-installed adapter for a Macintosh desktop computer or PowerBook that lets a user create an instant wireless network, an idea—and name—that Photonics has trademarked as a Personal Area Network (PAN). It also allows desktop Maos to function as bridges and routers, linking portable nodes to a wired network. Cooperative Mac works with any device with a LocalTalk connection, including printers, modems, or scanners.
Since no aiming is needed, diffuse transmission is ideal for portable devices that need instant networking, such as a PowerBook or the Newton. Apple says forthcoming versions of the Newton will have infrared connectivity (see “A Small Revelation,” in this issue). Putting infrared connections and boards on these devices makes sense, and you should expect to see these options become standard as the technology progresses.

**Tune In to Radio**

While infrared networks are locked inside a room, spread-spectrum radio-based networks can penetrate walls and thereby offer traits and benefits more similar to those of a wired network.

But radio transmission has its own set of troubles. Spread-spectrum transmission distributes, or spreads, a radio signal over a broad frequency range. Most of these networks currently transmit in the 902MHz-to-928MHz Industrial, Scientific, and Medical (ISM) frequency range, which the FCC set aside in 1985 for wireless data communications.

But data networks, slow to arrive compared with other wireless wonders of communications, have to jockey for slivers of space in this range. In fact, the band is frequently referred to as the garbage band because of other spectrum-hogging equipment that already uses it, such as antitheft devices, commercial radio, television, and cellular phones.

Users of the ISM bands transmit via several techniques; the two most common are direct sequence and frequency hopping. In direct sequence, signals are spread over a continuous band of frequencies. Each bit of information is replicated many times and transmitted as smaller pieces, or chips. The chips are received and, using a unique spreading code, reassembled into the original bit. Using multiple chips to convey a single bit provides reliability, while using a unique spreading code provides security.

Frequency hopping does what its name implies—it switches signals from one frequency to another to avoid interference. Multiple chips are transmitted on a specific sequence of frequencies, where each frequency is used only for a short duration. The frequency-hopping method of spread-spectrum transmission provides security through its unique hopping pattern. Since many users share ISM bands, interference is a big concern, and frequency hopping is a popular solution. Apple is developing frequency-hopping transmission methods, which the PowerBook developers at Apple are looking at as a possible wireless solution for the PowerBook and the PowerBook Duo.

**Getting Personal**

Since data communications using spread-spectrum transmission are essentially running out of air in the ISM bandwidth, Apple decided in 1991 to ask for more. The company petitioned the FCC to allocate a band of frequencies 40MHz wide to an area Apple dubbed Data Personal Communications Services (Data PCS), targeting this slot for its personal digital assistants.

In July 1992, the FCC gave Apple half of what it requested and entered a proposal to designate a band in the 1910MHz-to-1930MHz range for what the FCC dubs User-PCS products. Since bandwidth distribution from the FCC is a long and arduous process, redistribution could take several years. Most likely, bandwidth will be doled out in pieces, with Apple and others lobbying for specific areas in which they can optimize their technology.

Since quick-to-die batteries are a problem with portable computing devices, efficient, low-power usage is critical to the success of mobile wireless networks. Much as you have to talk louder in a crowded room to be heard, successfully communicating in a noisy channel requires more powerful—but also power-consuming—signals. One way around this is to use more bandwidth, talking softly in more elaborate codes versus just talking louder. Using more bandwidth takes less power.

The User-PCS band would be open to all manufacturers—not just Apple—that are interested in creating products using existing data links and network protocols. While some wireless networks use their own proprietary protocols for transmission, wireless networks are best served by devices that use existing wired protocols, such as Ethernet, since the majority of wireless networks will connect at some point to the wired world. Wireless networks usually access a wired network via a hub that recognizes both types of connections. Wired or wireless, the protocol doesn’t know or care—it simply facilitates transmission of the data.

**Making Waves**

One of the first spread-spectrum-based products developed specifically for AppleTalk environments is Digital Ocean’s (913/338-1595) Grouper (under $500 per unit), which is scheduled to ship in September. Designed for connecting PowerBooks and other LocalTalk devices, the Grouper provides wireless network access, based on direct-sequence transmission, within a 250-foot radius in an average, indoor environment with separate offices or within a 500-foot radius in an indoor open office that has few obstructions or walls between nodes. The wedge-shaped Grouper can be attached to a PowerBook or can be used freestanding with a desktop Macintosh.

The Grouper creates a network by

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**Use a wireless network when**
- You need true mobility. You can move wireless networks without leaving behind costly wiring schemes.
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- You have walls with asbestos trapped inside or lead paint, a building with no wiring ducts, or a historical building.
- You’re going to move or remodel soon, or the network is only temporary, such as at a trade show.
- You need to install a network fast and don’t have time to configure and maintain a wiring scheme.
- Your company has lots of salespeople with portables. Wireless connections are good for traveling workers, and you can accommodate visitors on the network.

**Use a wired network when**
- You’re on a tight budget. Up-front costs for wired network devices are lower.
- You want the fastest speeds available. Wired networks can reach 100 Mbps with FDDI.
- You move into a building that is already wired. Don’t waste the preinstallation cost that is probably figured into your rent.
- Your network extends over multiple floors, and you have great distances between nodes.
- You want a standards-based network. IEEE 802.3 (Ethernet) products are widely available, while the wireless standards committee, the IEEE 802.11, is still in its infancy and years away from reaching a standard.
- Your workers predominantly use their desktop machines during the day and don’t own portables.
joining up to 15 grouper-equipped Macs into a "school." Groupers can also connect directly to wired LocalTalk networks, with one centrally located Grouper in each school directly attached to the network and acting as a hub. A nomadic PowerBook user could then roam from network to network within the

**USE INFRARED TO SET UP A NETWORK QUICKLY**

building attaching to these Grouper hubs.

The Grouper can be powered by a rechargeable nickel-cadmium battery, five disposable AA alkaline batteries, or AC power at the desktop. The first version of the Grouper will communicate at 382 Kbps on each of its four channels within the ISM band. Digital Ocean plans to move future releases to the 2.4GHz band to increase throughput.

The software can select the channels automatically or a user can manually select the channels, allowing multiple schools of Groupers to communicate in the same areas without interference. For adding features such as an Ethernet connection or data encryption, the Grouper also has a handy PCMCIA (Personal Computer Memory Card International Association) slot. PCMCIA, a credit card-size slot, allows users to add a variety of enhancements—including memory, modems, or network connections—to portable or desktop devices equipped with the slot.

Another spread-spectrum wireless network that came to market this year is Windata's (508/393-3330) FreePort. FreePort users are linked to the wireless Ethernet networks, synchronization of all FreePort transceivers, access security, and transmission control for power levels.

**Other Links**

Another wireless option is microwave transmission. Although this mode of transmission can penetrate walls and

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**CHOOSING A WIRELESS TECHNOLOGY THAT'S RIGHT FOR YOU**

**Use infrared transmission when**

- Your building has lots of potential radio frequency interference.
- You need to set up a wireless network quickly and can't wait on licensing. Infrared requires no FCC licensing.
- You need high security and you do not want signals to go outside your building. Infrared signals cannot penetrate walls.
- You have an open office environment or factory floor. Infrared gives you good speed and reliability without walls. If your environment has no obstructions, use line-of-sight infrared for the best distance. If there are obstacles in the room, use a diffused transmission that can flood the signal around an area, allowing a single transmitter to reach multiple receivers.
- You need quick-and-dirty point-to-point transmission, such as from a PDA or PowerBook to a printer. Infrared technology covers about 20 feet and costs less than radio-based devices.

**Use spread-spectrum transmission when**

- You need a quick mobile network that offers the benefits of wired networks. Spread-spectrum transmission offers microwave speeds without forcing you to get an FCC license.
- You need to penetrate walls. Spread-spectrum transmission can travel several hundred feet.
- You need to have several networks in the same space. Multiple networks using the same vendor's devices can share a single frequency, as long as different data sequences are used. The signal from one network is interpreted by another as random noise and ignored.
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You should probably do it today, though. Before your luck runs out.
Random Access Memory is a critical part of any computer, but especially so for a PowerBook. For any computer, more memory supports larger programs, and more programs running simultaneously. PowerBook users have two more incentives to add memory: it boosts the computer's speed and extends battery life.

The key is getting enough memory to set up a RAM disk complete with system files, your main application (or two), and some documents (if you use many programs and files regularly, a RAM disk won't be able to accommodate them all). With a self-sufficient RAM disk, the hard disk drive will not consume power, and—just as important—you won't have to wait for the hard drive to wake up. (For a discussion of RAM disk strategies, see PowerBook Notes and Getting Started, February 1993.)

To set up a RAM disk, you should have at least 8MB of RAM. If 8MB is good, wouldn't more be even better? Certainly. If your PowerBook will accept 14MB or more, you can create a large RAM disk with multiple applications.

If you don't use a RAM disk, you may be able to get by with the standard 4MB, which is enough for common word processing and spreadsheet functions. If you need to run several programs simultaneously or display color graphics, then you should consider 8MB to be the working minimum.

Efficient RAM Use

To get the most out of your RAM, you should adjust your PowerBook's configuration as follows:

- Turn off file sharing, remove unnecessary control panels and extensions to another folder, install a minimum System for your PowerBook model, and then restore only those control panels and extensions that add the functions you need.

- Check the disk-cache setting in the Memory control panel. The lowest setting—which frees the most memory for applications—is 32K. But the ideal cache size depends not only on the specific application but how you use it. If you use many functions within a program, setting the cache to a higher value can improve performance and reduce the need to access the hard disk. If you use only a few functions, a larger cache size offers no benefit. You will have to experiment to find the setting that works best for you.

- Some applications (such as Adobe Type Manager and QuicKeys) set aside a separate RAM cache. In such cases, try reducing the cache size to free up more RAM.

- Check the memory size settings for each of your applications (in the Finder, select the application's icon and type Shift-I or choose Get Info from the File menu). Reducing a program's memory size may conserve enough space to run an additional application in RAM. In System 7.1 you can change an application's Minimum and Preferred memory sizes; in System 7 you can change only the latter (shown as the Current size). If you set too small a size, however, you may slow that program's performance or cripple it.

- Virtual memory may be helpful under certain circumstances; see "Managing Memory" for more details.

The RAM Upgrade Dilemma

If you have a PowerBook 145B, 160, 165c, 180, or 180c, you have 4MB soldered in, so you don't have to remove any memory to add more.

But if you have a PowerBook 145 or 170 (and probably if you have a 100 or 140) you have a 2MB card in addition to 2MB soldered in. To add more memory, you have to remove the 2MB card.

Because you can't add memory incrementally to a PowerBook, you should plan as far ahead as you can for your future memory needs. Once you've added a memory card to a PowerBook, you will have to remove it—just as with the original 2MB card—if you decide to install additional memory later on. The 4MB and larger cards have a better relative resale value than the 2MB cards.

Most memory cards for the Duos come in fixed capacities, but Newer Technology (316/685-4904, 800/678-3726) offers an expandable one—the base unit holds 4MB and you can add one additional card of 4MB, 8MB, or 16MB. Expandable cards are possible despite a Duo's small size because the available space is shaped differently.

Power Consumption

Memory chips have two states: active, when they draw significant power—about half a watt per chip—and standby, continues...
When they draw very little power. Adding more memory has only a minor effect on the overall power consumption.

Only one major memory-card vendor, Newer Technology, could provide us with power-consumption measurements, and those were only for Duos (for the 100 series, the numbers should be similar). When Newer used a specialized memory-testing program with the backlight turned off, installing a 4MB, 8MB, and 12MB card increased power consumption by 7, 13, and 18 percent—a battery-life reduction of approximately 8, 15, and 22 minutes, respectively. In normal operation, the battery-life penalty should be approximately half those times.

Although adding RAM reduces the length of time the PowerBook can be left in sleep mode, it's not a serious problem: an increase of 4MB to 12MB boosts standby power consumption 5 to 9 percent.

**Memory Chip Types**

For the 100-series PowerBooks, Apple's circuitry assumes the computer has pseudostatic RAM chips instead of the dynamic RAM chips used in desktop Macs. (The Duos use another type of memory, called self-refreshing DRAM.) Whereas dynamic RAM requires constant refreshing signals from the computer, pseudostatic RAM circuitry generates the refresh signal within the chip.

Because of the great popularity of PowerBooks and other laptop computers, pseudostatic RAM is often in short supply. Consequently, vendors often resort to using low-power dynamic RAM (LPDRAM) chips and putting the refresh circuitry on the memory card, external to the RAM chips. Such memory cards may consume slightly more power than cards containing pseudostatic chips.

The RAM chips being produced today are pretty much equivalent. In 1991, when PowerBooks were first available, some chip vendors had just begun to produce LPDRAM chips. At that time, some of these LPDRAM chips consumed up to 30 percent more power than other LPDRAM chips; but their real impact on battery life was small—perhaps ten minutes on a battery charge.

The easiest way to distinguish between a pseudostatic card and an LPDRAM card is by looking at the chips.
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<table>
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<tr>
<th>Model</th>
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<tr>
<td>APS GRS 80</td>
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<td>APS T 213</td>
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<td>APS T 340</td>
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APS Companion Drives
The editors of MacWorld chose the APS Companion drive the best external drive product for your PowerBook because of its portable, battery-powered design and esthetic styling. It can operate on a single charge for over four hours!

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<tr>
<th>Model</th>
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<tr>
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<td>APS 324MB</td>
<td>829 / 859</td>
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Konexx Kit
The Konexx Kit is a must for PowerBook or PC laptop users who travel a lot, telecommunicating with their computers. It has all the tools, connectors and adapters necessary to make almost any telephone system work with a modem, including a 9600 baud acoustic coupler. $149. Konexx Connector 112 $119.

Konexx X11
Finally a printer that you can take on business trips and to trade shows. The Konexx Kit MOBILE Writer delivers up to six pages per minute, 300dpi resolution and is fully PostScript compatible with 35 resident PostScript compatible fonts. The Konexx Kit MOBILE Writer comes with one ribbon cartridge and a serial printer cable. $999. $1,195.

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It's such a hassle to carry two or three cables with your Apple PowerBook computer just so you have the right one when you need it. Now are two simple, innovative devices that end the confusion. SCSI Boy has a 30-pin PowerBook SCSI connector in one end and a 25-pin connector at the other end. SCSI Doc is a Libris-30 adapter for the Apple PowerBook computer and a SCSI docking cable.

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<td>APS Doc!</td>
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APS PowerBall
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<tr>
<th>Model</th>
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<td>APS PowerBall</td>
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Mannesmann Tally MOBILE Writer
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APS Modems
Available in two configurations for internal installation in your PowerBook, APS Modems include a comprehensive installation guide and communications and fax software.

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<td>APS Modem 14.4 v.32</td>
<td>299.</td>
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A pseudostatic card contains only memory chips, which are all identical; an LPDRAM card contains, in addition to the memory chips, one or more smaller chips with different part numbers.

Form Factors
THE VERY LIMITED SPACE AVAILABLE for memory cards causes many of the RAM problems in a PowerBook. What’s worse, the form factor—the shape of that space—differs among the PowerBooks. So far, Apple has four form factors for the 100-series PowerBooks, plus a fifth form factor for the Duos (see “Memory Specs”). Memory cards built for one form factor may not fit in another, so make sure the memory will fit inside your PowerBook.

Apple’s 2MB card will fit in all PowerBooks except the Duos. Most 4MB cards and all but one 6MB card fit only in a single form factor. The single 6MB exception is the small (and expensive) BookRAM card (Computer Care, 612/371-0061). The BookRAM will fit in all 100-series PowerBooks, although its 100ns speed isn’t ideal for the PowerBook 165c or 180.

Memory Speed
IF YOU HAVE A POWERBOOK THAT TAKES 100ns memory and you plan to trade up to a faster model, consider buying 85ns memory now so that when you do get a new PowerBook, you won’t hinder its performance with slower memory chips.

This will work—with three reservations. First, you’ll have to find a card that fits the form factor for both models. Second, using faster memory will not speed up a slower computer. And third, 85ns memory sells for 30 to 45 percent more than the 100ns variety.

Memory for the Duos cannot be interchanged with any memory for the 100-series PowerBooks. The Duo 230 requires 70ns RAM, but 80ns memory is sufficient for the slower Duo 210. Only a few vendors offer 80ns cards; one source is Kingston Technology (714/435-2600, 800/835-6575).

Pushing the Limits
“MEMORY SPECS” SHOWS HOW MUCH MEMORY can be installed in each PowerBook model. But all PowerBooks except the 100 could conceivably take more memory through one of two special techniques, neither of which is available for the PowerBook today.

First, memory could be bank-switched so the CPU looks first at one bank of 6MB to 8MB, then at another bank, and then another as required. This could work quite well, with just a slight reduction in computing speed—but it requires a system software extension.

The second method adds address lines—an extra wire or two soldered between the CPU board and the memory card—so the CPU can access more memory. Direct access is a more elegant solution than bank-switching, but it requires hardware modification.

High-capacity memory cards are hard to produce with the memory chips available today, but denser chips should arrive soon. With a high-capacity card, you might be able to pack 14MB into a PowerBook 170. But trading up to a 180 would probably be simpler, since the 180 can already handle 14MB. Thus memory extension tricks might become available only for the 160, 165c, and the 180, initially supporting 24MB total RAM and eventually as much as 44MB.

For the Duos, Newer Technology already plans a memory card with 16MB of base memory and a 16MB add-on card, for a total of 36MB. That’s well over the nominal 24MB limit that Apple lists in its Duo product specs. But only 32MB are available unless a jumper wire is installed. With a jumper wire, a Duo’s circuitry can support up to 40MB.

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EVERY SO OFTEN, I FIND MYSELF inadvertently engaged in one of those silly Mac-versus-IBM PC debates. After the usual volleys of “IBM’s cheaper”? “Mac’s better,” I play my trump card. “Ah,” I say with a look of smug confidence, “but the Mac lets you fill the screen background with any pattern you want!” That usually shuts them up. (I’m not entirely sure if I’ve made a good point or a lame one.)

Anyway, there’s no reason to stare at the same gray desktop all day long. If you’re one of the 23 people who’ve figured out how to edit the 8-by-8 grid of little color squares in the General Controls panel, you can fill your desktop with tiny stripes, or fish scales, or razor stubble.

But America’s programmers laugh at the concept of an 8-by-8 grid of pixels (screen dots). “Ha!” you can virtually hear them scoffing, “we can do better than that! We’ll let you make huge patterns! We’ll turn your screen into digital art that’s so breathtaking, you’ll feel like a Philistine when a window covers it up!”

I have a natural distrust of anyone who ends every spoken sentence with an exclamation point. Nonetheless, for the second anniversary of this column, I thought I’d survey these ultimate Macintosh personalizers and see what’s up. (If you have a modem, you can get the shareware programs in Macworld’s America Online area.)

**Wallpaper 1.0.2**

**THE DESKTOP-EDITING CRAZE BEGAN** with Wallpaper ($59.99; Thought I Could, 212/673-9724). It’s a control panel that lets you choose from 500 patterns to hang on your desktop.

The most awkward aspect of Wallpaper’s interface: it’s too hard to try out patterns on your desktop (five clicks and a dialog box just to try one). You can sample patterns more conveniently, but only with a utility program (included).

The nicest aspect of Wallpaper’s interface: you don’t have to enter some special window to edit a pattern; you just grab the painting tools right there in the control panel. The window scrolls endlessly to simulate the way your pattern will look on the desktop. Probably as a result of the painting tools’ handiness, many of the patterns included with the package look somewhat MacPainty or cartoony, as opposed to the photo-realistic textures found in other programs.

But that’s scarcely a deterrent. Because Wallpaper was first on the market, it’s had time to spawn thousands of free, user-made add-on patterns (which you can get from services like America Online). You can also buy spin-off products from Thought I Could: the $39.99 Wallpaper Zebra Edition (for black-and-white Macs); a three-disk subscription set ($25); More Wallpaper ($39.99, even though it’s the same as the $25 subscription set). And if you’re really interested in those photos, you can stare at for eight hours!”

Odd, then, that many in Chameleon’s default pattern-set suffer from exactly that busyness.

Fortunately, you also get 125 stunning textures licensed from Arbheats. These amazing photographs make ideal Mac backdrops: slabs of polished marble, jade, and granite of every conceivable shade and density. In all, you get about 240 striking graphics, not one of which could have come from MacPaint.

Chameleon is a double-clickable application, not a control panel or extension. This is my favorite approach; it’s easy to get to, and the least likely to conflict with anything. Chameleon also has a mini-MacPaint, so you can touch up patterns you draw or import from Wallpaper.

There are only two reasons you might not love Chameleon: its price/pattern ratio and the fact that it modifies your System file (see the sidebar, “Desktop-Pattern Editors and the System File”).

**ClickChange 2.0**

**CLICKCHANGE IS A COMPLETE Mac-environment customizing kit ($89.95; Dubl-Click Software, 818/888-2068).** This control panel does more than desktops; it also does windows, menu bars, sounds, cursors, and scroll bars. It colorizes, tweaks, or patternizes them.

Its desktop customizer seems to be modeled on Wallpaper, complete with a built-in scrolling painting window and a randomizer that can change desktops automatically as the day goes by. The 140 patterns are all of the Photoshoppity, high-tech school (that is, more like Chameleon’s than Wallpaper’s). I found too many of them alike, or at least alike in that they’re not as distinctive as those in Chameleon, Screenscapes, or the Wallpaper Wraptures collection. Don’t get me wrong; ClickChange is one heckuva great customizing utility. But
anything whose Read Me file lists 36 incompatibilities isn’t worth getting for its desktop editor alone.

**Screenscapes 1.0**

**This Rolls-Royce of Desktop Editors** is a beautiful piece of work ($44.95; Kiwi Software, 805/685-4031). Its designers obviously intend to gobble their rivals alive: Screenscapes reads Wallpaper, Chamelon, and ClickChange file formats—in addition to its own 400 patterns and textures, most of them usable, all of them gorgeous. They include some tasteful photo backgrounds of recognizable materials: popcorn, autumn leaves, lace, rose petals, chocolate-chip cookies (for those who love working at the Mac), and a dungeon wall (for those who don’t).

Screenscapes is the only program that actually shows you all of your choices, in side-by-side swatches, so you can browse and compare. That’s the good news. The bad news is that Screenscapes must compose this “catalog” anew every time you run the program.

Kiwi Software made what’s probably a safe assumption: that most people aren’t pixel Picassos. Therefore, Screenscapes has no MacPaint mode. Instead, it offers a slew of texture-creation tools that let you generate random 3-D-ish textures, or adjust the color balance, or superimpose repeated clip art elements.

For me, that’s all very nice but unnecessary. It’ll take me years to get tired of the Screenscapes backgrounds that come ready-made. Heck, I still haven’t gotten past those chocolate-chip cookies.

**Before Dark 1.0.3**

**This Hugely Popular Shareware** application gets the award for the cleverest title ($10; Craig Marciniak, 151 83rd Ave. NE, #305, Fridley, MN 55432). Actually, the title should have been Before Chameleon; the program’s 30 rich 3-D textures are the obvious forerunners of Chameleon, its commercial incarnation.

The low price makes Before Dark the perfect sampler if, before springing for a commercial desktop editor, you want to know exactly what you’re getting into. Like Screenscapes and Chamelon, Before Dark works only on System 7.

**Desktop Textures 2.1**

**Take the Single-Click Efficiency** of Before Dark, triple the number of cool textures, and add the ability to import Before Dark and Wallpaper files. The result is the remarkable shareware Desktop Textures (Geoff Adams and Stephen Krauth, 21408 Ridgecroft Dr., Brookeville, MD 20833). The only difference between this program and a commercial one is that this one’s easier to use.

There are, so far, three volumes of patterns to download from America Online or another service. Color graphics aren’t tiny, mind you; the download takes a while. On the other hand, these guys aren’t asking for much as a shareware payment—a postcard or a few dollars, if that.

**Now Fun 1.0**

**These Programs Generally Create Backdrops** by repeating a single swatch over and over again. But sometimes, as I often say, 236 pixels square just ain’t enough. FunPictures, one of the modules in the Now Fun collection ($69; Now Software, 503/274-2800), takes the desktop-customization idea to its ultimate conclusion: a tile can be as large as your entire screen. You can slap enormous full-color PICT files across your entire monitor—memory and disk space be damned. You can combine multiple images, too: overlap, repeat, move, crop, resize them, as though you’re making a collage.

FunPictures is a control panel, so it doesn’t modify your System file. And the price is unbelievable, considering all the other Now Fun modules that come with it. Unfortunately, though it comes with a handful of stunning full-monitor pictures, its collection of 33 Wallpaper-style patterns is rather mealy. Thank heaven it can import Wallpaper, EPS, MacPaint, PICT, and even Photo CD files.

**The Upshot**

**When You Get Right Down to It,** all the features in the world don’t do you much good if you don’t have terrific, mood-enhancing, super-smooth backdrops to choose from. I therefore nominate Wallpaper for its wealth of available patterns and its painting tools; Screenscapes for its safety to your System, stunning textures, and lower price; Desktop Textures for its low (or no) cost; and FunPictures for its virtuosic versatility.

And now, if you please, I’d like to wrap up this column so I can quit Word and see my chocolate-chip cookies again.

---

**Contributing editor DAVID POGUE is the author of** *Mac for Dummies* (IDG Books Worldwide, 1992) and the Mac thriller *Hard Drive* (Berkley Publishing Group, 1993), and coauthor of *Macworld Macintosh Secrets* (IDG Books Worldwide, 1993)—and one very tired guy.
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Claris CAD: $899.00
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- Advanced auto-dimensioning
- Editable line styles
- Pan by scroll bars or hand
- Tolerancing
- Unlimited saved views
- Hatching

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Levy's Complaint


You have mentioned something about The Trouble. Tell me, please, when did it begin?

Winter. A cold winter day. It was not long after I had installed a new edition of Microsoft Word, which is now rivaling A Dance to the Music of Time in its number of new volumes. This, I believe, was version 5.1, known to fans as Word Goes for Baroque. The installation took the better part of a morning. Did I say it was winter?

Yes, you did. Winter.

That’s what I remember, a winter morning. Well, that afternoon I was working, and I left my Mac for a few minutes. And when I came back, it was hung.

Hung. Frozen. As opposed to crashed. Everything was just as I left it, but I couldn’t get anything to happen. I had to turn off the machine and restart it.

I see. Did you lose any work?

No, I saved before I left. So it was no big deal. I mean, Macintoshes hang all the time. And they crash. And you get bombs. This is part of working with a Macintosh. Sometimes, uh, bits happen.

Maybe later we can look into the reasons you feel compelled to use a euphemism.

Tell me more about your INITs.

You know what INITs are—little programs that don’t really turn off but stay in the background. Apple calls them extensions under System 7, but everyone else calls them INITs. After you install them, they automatically load into the Mac’s memory—when you start up the machine, their icons appear on the screen like tiny coming attractions. And they wake up when you call on them to do things. Sometimes they get triggered by a predefined period of inactivity. After five minutes with no events, for instance, my screen saver kicks in. The problem is that if you have a lot of them, two INITs might try to crunch into the same patch of memory, and then you’ve got an ugly turf battle. It’s like West Side Story in RAM.

I had a lot of INITs on my machine. I had recently installed Now Utilities, which has a bunch of them (including one that supposedly prevents conflicts between dueling INITs). My collection also included INITs for the file finder On Location, the screen saver After Dark, the compression program SpaceSaver, Adobe Type Manager, QuickTime, a CD player, and even something that acted like a virtual light on a hard drive.

Anyway, I restarted my machine, and later that day, when the computer was idle for a few minutes, the same thing happened. I restarted, and purposely left the Mac alone for a while. After about ten minutes—I didn’t clock it exactly because I got involved playing solitaire on my PowerBook—my Mac froze again. The Trouble had begun.

So did you decommission the INITs?

Not right away. Believe it or not, I tried to ignore the problem. For about a week, I took pains not to leave the computer for more than ten minutes. If I didn’t make it, it would hang again, and I’d have to restart. I know it sounds nuts, but you can get used to almost anything.

Certainly you didn’t get used to The Trouble.

Well, I hated it, but the thought of trying to deal with it was exhausting. And I was very busy. I thought of wiping out Word 5.1 and going back to 5.0, or even one of the 4’s. But that was too horrendous to consider—all that disk swapping. Did I tell you I’m developing a phobia about the Install program?

No. [Writes something down in notebook.]

And then, something even weirder happened. Everything got incredibly slow, especially when I was using the Finder. I would click on a file and it seemed like eternity before it opened. I called this the Molasse Syndrome. The craziest was when I would shut down. Nothing would happen for about 30 seconds—then it would shut down. What was happening during that time lapse? Was the Mac calculating something it had forgotten? Was it crunching some algorithm that held the key to the universe?

You’re anthropomorphizing.

So I thought, maybe this is a virus. I did a little cleanup—I built the desktop to get rid of any WDEF virus, which my Mac periodically comes down with. That didn’t help. A virus-detection program showed no virus.

So I was stuck—the only thing I could think of was to unload the INITs one by one. First the ones I had no need for anyway. The computer still hung. Then the ones I didn’t use often. No difference. I turned off the background printing, thinking maybe that was it. It wasn’t. So I said to hell with it, and turned off everything, even stuff I rely on. Beam—there went After Dark, On Location, SpaceSaver (now I can’t read my compressed files), Type Manager, and all the Now Utilities.

And?

The Trouble seems to have stopped.

Are you happy?

I’m miserable. I’ve come to depend on those things I got rid of.

So you are going to reinstall them, one by one, and get to the heart of The Trouble?

Yes. I mean, no. I mean, not now. continues
With the click of a single button, Safe & Sound<sup>™</sup> finds and fixes over 100 of the most common disk problems, including viruses. And at a suggested retail price of only $49.95 at your Macintosh dealer, it's as easy to buy as it is to use.

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### THE ICONOCLAST

You seem hostile.

Look, I want to find out what's the matter with my Macintosh, but I don't know whether it's the Mac, the system, the application, the INTI's, or any or all of these things. I know as a diligent user—and as a computer columnist, for heaven's sake—I should find out. But I'm busy right now. And to be honest with you...

*Please...*

I'm absolutely infuriated at the entire situation. Computers are supposed to work for me. I'm not supposed to work at them. How did things get so complicated? So I've had it. I'm going to leave my Macintosh stripped down, do what I have to do, and simply get by. Day by day.

*Ab. But sooner or later, you know you will have to find out the source of The Trouble.*

[Long pause.] Yes, I know. [An even longer pause.] But can't it wait? *Please?*

---

### Three Months Later

You seem more relaxed today.

*Why not? It's almost summer. You have something to tell me?*

The Troubles gone! It was unbelievably easy. As we agreed, I would slowly turn on everything I'd shut off, and if the Trouble came back, I would call every support person for every software company until I figured out what was wrong. But I didn't even have to go that far.

The first thing I turned to was On Location. But I couldn't get it to work. When I selected the program on the menu bar, it kept telling me there wasn't enough memory—I had 8 megabytes and no applications open and no memory. Then I tried to reinstall it from the original floppy. The installation went fine, but when I tried to index the hard disk, after 14 minutes it got stuck. The little hands of the clock cursor kept spinning, as if it were in one of those time-travel movies.

*Menu.*

So I called On Technology.

*Was it an 800 number?*

No, but I got a receptionist right away, and she connected me to a tech-support person who identified himself as Rob. He was great. He told me that the problem with the new installation was that I hadn't gotten rid of all the old files, particularly the preference files.

*They can be nasty.*

Yeah, this folder just appears out of nowhere, with preference files for all sorts of programs. Even when you get rid of a program, its preference file hangs on, sort of a ghost of applications past. Spooky. Anyway, Rob also informed me that there was a problem with something called MacLink files, which I had on my hard disk. And then... well, I asked him about continues
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The Trouble. And you know what? He said he thought he knew what was wrong!

Did he?

He told me to go to the Claris file in my System Folder, another one of those things that's just there. Well, that folder is full of filters created by Claris to help exchanges between programs. It turns out that On Location uses those whenever possible. And there were good filters for previous versions of Word, like 3.0 and 4.0. But none for versions of Word that began with 5. While Version 5.0 didn't cause trouble, apparently those previous filters didn't work well with Word 5.1, and when On Location caught up on its indexing—a few minutes after the computer was idle—the computer could freeze! The nub of The Trouble! Rob told me if I simply got rid of the old filters, the problem would be solved. Also, for some reason something called Employment Report, one of the Sample Files that comes with Word 5.1, also caused weird things to happen. He told me to nuke that, too. Then I reinstalled all the other INITs. Everything was fine. I've now got a list of extensions under the Apple menu as long as a loaf of Italian bread, with no problems. I've got Super Boomerang back.

And now you are happy.

Yes. [Pause.] No.

Things are different from before, yes?

Yes. I'm scared. There's an incredible amount of things going on inside my Mac that I don't know about. And when something goes wrong, I can't necessarily pinpoint the problem. I got lucky in this case—there was a nice tech-support person who knew what the problem was. I'm worried about next time. Who knows whether that other thing, the Molasses Syndrome, will come back.

Did you ever find out what caused that?

No, and I don't want to know. I just don't want it to happen again. How many calls will I have to make then? What if I have to reinstall System 7? Maybe I'll even have to wipe my hard disk clean and start over! The thought of it makes me... it makes me... [Takes a tissue.]

Let it out.

I thought my Macintosh was a friend! Does a friend freeze up and refuse to move its cursor? I don't know what to do. I had a dream the other night where all my telephone speed-dialing numbers were those of various tech-support lines. Apple, Microsoft, Claris, Adobe... I woke up screaming. [Long pause, then speaks in a very small voice.] I think I need help.

[Very long pause. Takes out Volume 1 of Inside Macintosh.] Now we can begin.
Imagine the reaction to our new PostScript Level 2 printer.

<table>
<thead>
<tr>
<th>Standard Features</th>
<th>DECllraser 1152</th>
<th>HP LaserJet IIIP</th>
<th>Apple LaserWriter NTR</th>
<th>Apple LaserWriter Select 110</th>
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<td>PostScript Level 2</td>
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<td>AppleTalk</td>
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<td>Resident PostScript Fonts</td>
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Preventing Software Piracy

How managers can stop software theft

According to copyright law, software owners may load one copy onto their hard drives and make a second for backup. That’s it. Like it or not, making any more copies is illegal. And while individuals can probably get away with it at home, it’s increasingly risky to use stolen software at work. As more than 200 companies found out in 1992, pirating software can be much more expensive than simply buying legal copies of the software they need. Targeted for investigation by the Software Publishers Association (SPA), one firm paid a record fine of $300,000; others paid smaller fines but shouldered the costs of lawsuits as well.

Targeting Corporations
The SPA began its crackdown on software theft in the late 1980s—a toll-free hotline encourages company insiders and former employees to report corporate piracy. And report they do by calling between 10 and 30 times per day. From those reports the SPA creates a list of candidates for investigation and action.

In 1992 the SPA took action against 747 companies. Roughly 520 cases involved sending cease-and-desist letters asking organizations to voluntarily destroy illegal software and purchase legal copies; 219 cases involved audits and lawsuits that resulted in fines or judgments. Ninety-five percent of these cases involved corporations; the rest were made up of BBBS and educational institutions.

Between a lawsuit and an audit, the latter is much less painful; if it appears that a company will cooperate, the SPA asks for permission to audit, or search, the company’s computers for illegal software. The results of a voluntary audit are confidential; if illegal software is found, the SPA asks the company to pay twice—once for the illegal copies, which are destroyed, and a second time to buy legal replacement copies.

“Most companies that receive an audit letter cooperate with us,” says Ilana Rosenthal, general counsel for the SPA. “Those who don’t, we sue.” That’s not an idle threat; with one exception, the SPA has won settlements or judgments against every company it has taken to court. And courts routinely allow the SPA to raid organizations suspected of pirating software. “The reason courts allow us this fairly unusual remedy is that it’s so easy to destroy the evidence,” says Rosenthal. That means posting a U.S. marshal in an office to guard against the wholesale reformattting of drives while SPA folks go from cubicle to cubicle, looking for stolen software. In one case, says Rosenthal, “The U.S. marshals were on floor one, while the MIS manager was erasing hard drives on floor two.”

Going Legit
Establishing a system to avoid audits is fairly straightforward, though it does require money, time, and will. The money part is obvious; managers simply must budget for the software their businesses need. Federal Express doesn’t deliver for free; neither does Microsoft.

In addition to money, a little time and a certain amount of will are required to eradicate stolen software, buy legal copies, and guard against the reappearance of illegal copies. To begin, managers should make an inventory of all the software programs that exist in the organization, destroying illegal copies, and purchasing legal copies of any software that’s needed.

The SPA tries to ease the process by providing a free inventory program, called SPAudit, which comes in both DOS and Mac versions. The price is right, but the program has its quirks; you can’t use it over a network, and it sometimes misidentifies files as programs.

SPAudit is fine for small companies, but it’s not convenient for dealing with lots of networked machines. In those cases, using a commercial product to scan hard drives across a network is a lot easier. Several programs are available, including Status Mac from On Technology (617/876-0900) and Network SuperVisor from CSG Technologies (412/471-7170), which let managers scan networked Macs to learn what applications, INITs, and system versions they are running, among other information. A 25-user version of Status Mac lists for $749 ($2699 for 100 users); a 50-user version of Network SuperVisor lists for $795.

Once you’ve audited the machines, check the number of copies of each program you find against company records of software purchases (including registration forms) to see if any illegal software exists.

You say you can’t piece together a paper trail? You’re hardly alone. Fact is, few companies designate an individual to be responsible for tracking software assets. That’s why the number one recommendation on the SPA’s program for keeping a company legal is to appoint a software manager. That person implements the company’s software policy, maintains purchase records, and oversees employee compliance.

Other recommendations include the following:

- Establish procedures for acquiring and registering software. That includes deciding what the company needs; planning and budgeting for purchases; registering
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Reader Elaine Truver of Chicago writes to nominate mail-order company MacWarehouse and shipping company Airborne Express as service heroes for turning a bad situation into a good one.

Truver ordered four software programs and a clip art package on a Thursday night after being assured they were all in stock and would arrive the next day before 5 p.m. "Based on that, I committed delivery of a new client's project for the next Monday morning," writes Truver. When no package arrived by 4 p.m. on Friday, she called MacWarehouse.

It turned out that two of the four programs were actually out of stock, and the others were being held until the entire order was available.

When Truver explained her plight to MacWarehouse, reps said they would call their supply depots and get back to her. And they did, within an hour. "They also gave me all pertinent shipping numbers and the number of my local Airborne Express office so I could have the material delivered to me at my home instead of my office on Saturday. The order arrived in three separate boxes, at three different times, but all on Saturday, thanks to the coordination of the folks at Airborne."

Truver writes that "both companies spent a couple of hours each to correct the problem, with no impatience, many apologies, and great dedication."

• Establishing software; and giving users access to manuals and other documentation.

* Establish and maintain a software log. At its most basic, that log should list each package the company owns and the computer it runs on. The SPA suggests tracking each package's serial number, purchase terms (site license, other discounts or deals), the date of purchase, and where the program was purchased.

* Conduct periodic audits. When it comes to staying legal, annual or biennially audits are the only way to know if employees are complying with software policies.

* Establish an employee education program. Employees can't comply with
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Conspicuous Consumer

policies unless they know what they are. One way to teach them is to establish a written software code of ethics, which the SPA recommends employees sign annually. The SPA also suggests including a section on software piracy in orientation programs, to inform new employees that it is illegal—and against company policy—to violate software copyright.

- Maintain a library of software licenses. Some software companies allow users to keep one copy of a program at work and one at home, as long as the two are never used concurrently; other companies require a separate, purchased program for every machine.

Successful Campaign

THE SPA'S STRONG-ARM TACTICS MAY be getting its point across, at least at large corporations. Early in its antipiracy campaign, the SPA received many calls about Fortune 500 companies; now the focus has shifted to smaller companies, according to SPA public relations manager Terri Childs. Childs says the software industry's estimated losses from piracy have dropped from an estimated $2 billion in 1990 to $1.2 billion in 1991. Even so, this year the SPA is averaging between two and eight audit or lawsuit actions per week.

Rules to Remember

THE SOFTWARE MANAGEMENT GUIDE, SPAudit, and other materials can be ordered from the SPA at 202/452-1600 or 800/388-7478. The $80 guide includes a survey for assessing internal company controls, a software audit worksheet, a sample software code of ethics, and a 12-minute video about piracy called "It's Just Not Worth the Risk.

"Software is a hard asset to control," notes the SPA's Rosenthal. But you can toe the line by simply destroying all illegal software and buying legal copies of the software you need. That should make employees happy too—now they can look in the manual for answers instead of pestering the in-house Mac gurus for help.

Stealing is an American tradition, as both software companies and Native Americans can attest. But so is old-fashioned capitalism, where entrepreneurs risk their shirts to bring us better products. If you’re a manager, give your employees the tools they need to do their jobs so they don’t feel compelled to pirate. If you’re an employee using pirated software, ask your boss for a legal copy.

Send nominees for sainthood to Service Heroes, MacWorld, 501 Second St., San Francisco, CA 94107, or via AppleLink (Macworld1) or America Online (Branscum). Conversely, drop Conspicuous Consumer a line if a company is ignoring you.
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Plug in the PowerCache and feel your Mac kick in with new power. Run up to 3.5x faster than a Mac II...that's Quadra level performance!

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The Universal PowerCache is amazingly easy to use and includes documentation with color photos. If you ever have questions, call our toll-free tech support line and we'll provide you the best of service.

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If you find any reason you don't like it, then send it back within 30 days for a full refund. If you keep it, we'll also take real good care of you with our three year warranty.

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Your processor direct slot (PDS) is the fastest and cleanest way to connect an accelerator. Easy installation, no software patches and no memory hastes.

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Only DayStar has a complete upgrade path to 68040 accelerators, all the way to 40 MHz! You just pay the difference in list price, between what you have and what you want.

The Universal PowerCache® for the
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Mac LC
Mac LC II
Mac LC III
Mac IIci
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- #99405 LaserWriter II Envelope Cassette ............ $64.98
- #99406 LaserWriter Toner Cartridge ........ $84.98
- #99407 LaserWriter II Legal Paper Cassette $64.98
- #99408 ImageWriter LQ Color Ribbon ............ $18.98
- #99409 ImageWriter LQ Black Ribbon ............ $14.98
- #99410 LaserWriter Pro Toner Cartridge ........ $98.98
- #99411 StyleWriter Ink Cartridge ............ $18.98
- #99412 ImageWriter I and II Black Ribbon .......... $7.98
- #99413 ImageWriter II Color Ribbon ............ $9.98

The Mac Zone is an authorized Apple supplies reseller.

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Make your PowerBook more powerful. This practical collection includes a high-quality backup battery and a portable conditioner/charger. The sturdy, high-capacity replacement battery features an easy quick-lock mechanism for easy installation and removal. The PowerCharger comes with standard wall plug and cigarette lighter adapter.

Battery Technology #06339

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Great for Powerbooks and laptops
15"x11"x2.5"-padded computer section
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mistake, it happens! SAM is the best-selling, highest-rated virus protection, detection and repair program for the Macintosh. It intercepts viruses, scans and repairs files, combats known and unknown viruses, scans compressed files and is fully networkable. It works behind the scenes, checking every application as it is launched.

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Circle 22 on reader service card
THE BEST PRODUCTS FEATURED IN MACWORLD

Edited by Wendy Sharp

Macworld Editors' Choice is a complete listing of the hardware and software products selected as the best of their type in Macworld's comparative articles through the past year. A * next to a product indicates that we chose more than one product in that category.

Hardware

MONITORS
BLACK-AND-WHITE MONITORS, May '93
Portrait monitor: 15-inch Gray Scale Portrait Display; Monitor Technologies, 612/673-4450; $399, with video-display board $549.

Two-page monitor: * L-View MultiMode; Sigma Designs, 510/770-0100; $1099, with video-display board, $1399.

* MD 202 Two Page Display; MobiTech Technologies, 510/654-0556; $699, with video-display board $798.

GRAY-SCALE MONITORS, May '93
Portrait monitor: Pivot Display; Radius, 408/434-1010; $649, with video-display board $1148.

Two-page monitor: * MultiMode 120, SilverView Pro; Sigma Designs, 510/770-0100; $1099, with video-display board $1299.

COLOR MONITORS, Sep '92
16-inch: * T16 R; E-Machines, 503/646-6699; $1699, with Futura MX video board $2198.

19-inch: PrecisionColor Display/20; Radius, 408/434-1010; $3299, with PrecisionColor 8x video board $4198.

21-inch: * SuperMatch 21 Two-Page Color Display; SuperMac Technology, 408/541-6100; $2649, with Spectrum/8+24 PDI video board $4648; * Multisync 6FC, NEC Technologies, 708/860-9500; $1499 (includes MacFX video board).

PRINTERS
PERSONAL PRINTERS, Sep '93
Ink-jet: * StyleWriter II; Apple Computer, 408/996-1010; $399.

PostScript laser: * TI microLaser Series; Texas Instruments, 512/250-6679; $1199 to $1599.

QuickDraw laser: * LaserWriter Select 300; Apple Computer, 408/996-1010; $839.

WORKGROUP PRINTERS, Jan '93
Basic printing: * microLaser X; Turbo; Texas Instruments, 512/250-6679; $369.


COLOR PRINTERS, May '93
Dye-sublimation: * ColorStream DS; Mitsubishi International, 408/980-1100; $999.

* Phaser 460 Color Printer; Tektronix, 503/682-7377; $999.

Thermal-wax: * ColorScript 210; Qlik, 205/633-4300; $499.

* Personal ColorPoint PS; Seiko Instruments, 408/922-5600; $299.

Low-end liquid-ink: * HP DeskWriter 550C; Hewlett-Packard, 800/752-0900; $1099.

Midrange liquid-ink: * HP PaintJet XL300; Hewlett-Packard, 800/752-0900; $349.

Solid-ink: * Phaser III 100 Color Printer; Tektronix, 503/685-3585; $999.

SCANNERS
SLIDE SCANNERS, Oct '92
* LS-3510AF Film Scanner; Nikon, 516/547-4356; $9535 for 8-bit option, $11,316 for 12-bit unit.

* LeafScan 35; Leaf Systems, 508/460-8300; $1099.

SYSTEMS/STORAGE
CD-ROM DRIVES, Oct '92
High-performance: * InterSect CDR-74; NEC Technologies, 708/860-9500; $712.

Budget choice: * Mirror CD-ROM Drive; Mirror Technologies, 612/633-4450; $599.

DOUBLE-SPEED CD-ROM DRIVES, Jul '93
* Sheer speed: Pioneer DRM-60IX; Pioneer, 408/988-1702; $719.

Overall value: * AppleCD 300; Apple Computer, 408/996-1010; $599.

Budget choice: * NEC MultiSpin 38; NEC Technologies, 708/860-9500; $460.

LOW-CAPACITY HARD DRIVES, Aug '92
Desktop drives: * External 105MB; * 105MB External; * 105MB External; * 105MB External.

Between 512MB and 53500: * InterRoute/5; Farallon Computing, 510/814-5000; S3299 to $3499.

Portable drives: Liberty 50 105Q; Liberty Systems, 408/983-1127; $999.

HIGH-SPEED HARD DRIVES, Aug '93
1GB drives: * Edge 1000; Satasure, 617/661-8166; $1499.

* Alinipak 1080; Optima Technology, 714/476-0510; $1999.

* J.7GB drives: * Nova XL 2700; Microtech International, 203/684-6233; $6289.

* Vista 3.5GB; Relia Technology, 510/471-6112; $3499.

SCSI-2 adapter: * QuickSCSI; PLI, 501/657-2211; $499.

MIDRANGE HARD DRIVES, Mar '93
Low-capacity drives: * La Cie Cirrus 240; La Cie, 503/520-9000; $769.

Notable technology: DiamondDrive 510; Mass Microsystems, 408/592-1200; $2089.

Budget: * APS Fujitsu 520; APS Technologies, 816/478-8300; $1149.

All-around quality: * Quantum/SCSI; FWB, 415/474-8095; $2799.

MACINTOSH UPGRADES, Jun '93
Classic accelerator (40MHz): * TransWrap Classic; Applied Engineering, 214/241-6060; $798 (with FPU).

SE accelerator (50MHz): * Gemini Integra; Total Systems, 503/345-7395; $1089 (with FPU).

SE accelerator (25Mhz): * QuickDrive; Novy Systems, 904/427-2368; $499 (without FPU).

SE/30 accelerator (50MHz or 33MHz): * Universal PowerCache; DayStar Digital, 404/967-2077; 50MHz $999 (with FPU), 33MHz $449 (without FPU).
BUYERS’ TOOLS

Editors’ Choice

Upgrade: Apple Computer, 408/996-1010; $999.

Mac II accelerators: - Radius Rocket 2/3s, Radius Rocket 3; Radius, 408/428-1010; 25s $1199, 33 $2499. - DayStar Digital Universal PowerCache series; DayStar Digital, 404/967-2077; $449 to $999.

IIfX SCSi accelerator; QuickScsi, Pli, 510/657-2211; $502.

Quadra static-RAM cache cards: FastCache Quadra; DayStar Digital, 404/967-2077; $299 for Quadra 700 and 900, $499 for Quadra 800 and 950.

OPTICAL DRIVES, Nov 92

3 1/2-inch (12MB): - Magic 128 REM/ROM; MacProducts USA, 512/476-5295; $1199. - NuDesign; MacDesign, 612/822-5706; $1298.

5 1/4-inch (650MB): PMO-650, Pinneal, 714/727-3300; $1498.

REMOVABLE DRIVES, Nov 92

SyQuest drives: SyQuest drives are the best choice among removable drives for most users, but individual products are too similar for us to single out a specific vendor.

TAPE DRIVES, Dec 92

Personal Backup (up to 150 MB): APS Tarc 155; APS, 816/478-8300; $999.

Midrange backup (150MB to 600MB): - hammer-Tape 525; IVV, 415/474-8055; $1460. - Vista 600 Tape; Relax Technology, 510/471-6112; $799.

High-capacity backup (1GB and beyond): APS Compression DAT; APS Technologies, 816/478-8300; $1699.

VIDEO/DISPLAY

24-BIT COLOR GRAPHICS BOARD, Feb 93

- Spectrum/24 PDQ Plus; SuperMac Technology, 408/541-6100; $1999.

- Thunder/24; SuperMac Technology, 408/245-2202; $2999.

COLOR LCD PROJECTION, Jan 93

Display panel: MediaPro, nView Corp., 804/873-1354; $7995.

Low-end panel: TFT Rainbow HD Model 700; Chison, 804/595-1111; $5295.

Complete LCD projector: System 6000; In Focus Systems, 503/622-4968; $8495.

FILM RECORDERs, Aug 92

High-end: - LFR Mark II; Lasergraphics, 714/753-8282; $14,995. - RSC Rascal; $5995.

Midrange: - PCI II; Agfa Corp., 914/365-0190; $13,500.

Software

ACCOUNTING/FINANCE

NETWORK/MULTIUSER ACCOUNTING, Nov 92

- Filemaker II; Filemaker, 916/561-6999; $695 to $995 per module.

- Great Plains Accounting; Great Plains Software, 701/281-0950, $795 per module.

PERSONAL FINANCE, Jan 93

- CheckWriter 4.0; Aaxis Software, 701/746-6801; $795.

- Andrew Tobias’ Managing Your Money 5.0; MECA Software, 203/256-5000; $795.

SINGLE-USER ACCOUNTING (WITH PAYROLL), Nov 92

- Checkmark Software; Checkmark Software, 303/484-3541; $995.

SINGLE-USER ACCOUNTING (WITHOUT PAYROLL), Nov 92

M.Y.O.B.; Teleware, 201/586-2200; $249.

COMMUNICATIONS/NETWORKS

NETWORK CONNECTIVITY, Sep 93

NetWare for Macintosh; Novell, 801/429-7000; $495 for 5-user license to $2295 for 200-user license.

NETWORK MANAGEMENT, Feb 93


NETWORK DIAGNOSTICS, Feb 93

Ethernet: Etherpeak; AG Group, 510/937-7900; $795.

LocalTalk: LocalTalk; AG Group, 510/937-7900; $495.

SOFTWARE ROUTER, Jul 93

Apple Internet Router 3.0; Apple Computer, 408/996-1010; $495.

GRAPHICS

2-D CAD, Jan 93

Low-end: - BluePrint; Graphplot; 410/461-9488; $295.


3-D DESIGN, Aug 93

Price for performance: - Ray Dream Designer 2.0; Ray Dream, 415/960-0760; $495. - Alias Sketch 1.5; Alias Research, 416/362-9181; $995.

All-in-one solution: - InFin-D 2.5; Specular International, 413/549-7660; $995. - StrataVision 3D 2.6; Strata, 801/462-5218; $995.

VIDEO-CAPTURE BOARD, Jan 93

VideoSpy; SuperMac Technology, 408/541-6100; $449 to $1399, depending on bundling options.

Printers: Please write to Macworld’s Editors’ Choice, 501 Second St., San Francisco, CA 94107, or send a fax to 415/442-0766 to inform us of changes in your phone number or your product’s list price.
The new generation HP LaserJet 4M printer.

At last. An HP laser printer built specifically for the Mac—the new LaserJet 4M. A laser printer with everything Mac users need. From built-in PostScript™ Level 2 software from Adobe™ to standard LocalTalk and optional EtherTalk.

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Of course, with the HP LaserJet 4M printer, you'll enjoy HP's renowned quality and reliability. All for only $2,399.* So call 1-800-LASERJET (1-800-527-3753) Ext. 7340** for print sample* and comparison disk. Or visit your nearest authorized HP dealer.
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How to make sure your pies are always fresh.

System 7 lets you create "live links" between documents from different applications with a tool called Publish and Subscribe. By "Publishing" a chart from one document, you can "Subscribe to it" and place it in any number of other documents. When you update the original, all the other charts linked to it are updated automatically.

From your word processing document, select "Subscribe to" in the Edit menu, and you've placed a copy of the chart in your sales summary. When you make changes to the original chart, this new one will be updated automatically to reflect the changes.

Of course, this is just one of the many ways System 7 can help make you more productive. It's also just one of the many reasons why 5 million Macintosh users are now working with System 7, as well as with the more than 6,000 applications available that run on it.

For the name of the Apple® software reseller nearest you, call 1-800-732-3131, ext. 500. Or, if you're a current System 7 user, get the System 7.1 Update Kit by calling 1-800-769-APPL, ext. 250.

And then see how System 7 can give you the power to keep all your ideas fresh. The power to be your best." Apple
Macworld Star Ratings

OVER 400 HARDWARE AND SOFTWARE REVIEWS
A AT A GLANCE

Edited by Wendy Sharp

Macworld Star Ratings lets you compare hardware and software products for the Macintosh by providing summaries of hundreds of Macworld's authoritative product reviews. The number of stars at the beginning of each capsule review indicates quality: our reviewers assign five stars to outstanding products and one star to poor ones.

If a product has been upgraded since our last review, the most recent version number supplied by the vendor appears in parentheses after the reviewed version number. Key products that have not been rated since Macworld began assigning star ratings in April 1992 have a symbol before the name. To read a full review of any product in the listing, please consult the issue listed at the end of each synopsis.

Vendors: Please write to Macworld Star Ratings, 501 Second St., San Francisco, CA 94107, to inform us of changes to your phone number.

Best Worst

Software

ACCOUNTING/FINANCE

Andrew Tobias' TaxCut for Macintosh, Meca Software, 203/256-5000, $79.95. The occasionally awkward interface of this personal tax-preparation software doesn't follow every Mac standard, but the help system is very good. State versions are available for California and New York. May 93

BestBooks 1.0, Teleware, 201/586-2200, $399. In a straightforward, unintrusive manner, this small-business accounting program integrates the standard bookkeeping functions of accounts receivable, accounts payable, and general ledger. There's little to criticize, except the weak documentation. Jul 93

Business Sense 1.6, Software Developers Consortium, 801/288-2216, $199. Competent, single-user, all-in-one bookkeeping package will adequately help you keep the books for a small company, but it's not as easy to use as its competition. Feb 93

Components 1.0, Satari Software, 206/443-0765, $795 per module. Simple, flexible architecture sets a new design standard for Macintosh accounting software, but it is not without its bugs and flaws. Sep 92

Great Plains Accounting 6.0 (6.1), Great Plains Software, 701/281-0550, $795. High-end bookkeeping software offers a first-rate lineup of dedicated modules. Different individuals or groups can easily use the various accounting functions.

Maclntax 1991, ChipSoft, 619/453-8272, $79.95. It's difficult to correct your errors when using this personal tax-preparation software, but it's definitely easier than doing your taxes by hand. The display is attractive, the program supports electronic filing, and there are 15 state-tax versions available. May 93

Managing Your Money 5.0, Meca Software, 203/256-5000, $79.95. An already strong financial-management program becomes easier to use and slightly more powerful with this upgrade. Jan 93

Miyob 3.0, Teleware, 201/586-2200, $149. A file-cabinet metaphor makes the interface of this accounting package easy to use and understand. For an accounting system with one user who has no need for payroll capabilities, it's the best choice.

Quickens 3.0, Intuit, 415/852-9696, $69.95. Track assets, liabilities, income, and expenses with this personal-finance package. It has a good Mac interface and is easy to learn and use.

Timelaps II 3.1, Timelaps Corp., 508/768-6100, $299.95. Complexity is the price you pay for this time-billing utility's impressive flexibility. Fortunately, thorough documentation, excellent tech support, and default settings help any user get started. Sep 92

WealthBuilder 2.0, Reality Technologies, 800/346-2024, $79.99. Financial-planning software forces you to think about your money and helps you develop an investment plan. It's a good program for beginning investors, but more sophisticated investors will want more-advanced features. May 93

BUSINESS TOOLS

4D Server 1.0.1, Acni US, 408/252-4444, $1495 to $3495. Database server uses the ingenious multitasking technology built into 4D to make it appear that each client has the full resources of the server. If you use 4D on a network, you need this product. Jun 93

4th Dimension 3.0.1, ACI US, 408/252-4444, $985. Multitasking, which greatly improves speed in a carefully designed application, makes this upgraded relational database delightful for both developers and end users. For a relational database, it's impressively easy to use. Apr 93

AccuZip 1.5.2, Software Publishers, 714/846-1908, $995. Professional-level mail-list management tool on CD-ROM is the most comprehensive system available, but its messy documentation and irrepressible user interface violations make our reviewer reluctant to recommend it. May 93

Atlas Pro 1.0.6 (2.0), Strategic Map-
**Star Ratings**

8227, $599. If you're working on a midsize project and like using PERT charts (where tasks appear boxed and are connected by straight lines), this may be the project-management software for you. However, the multipletossip-chaining process and the limited integration between charts are frustrating if you prefer Gantt charts. May 93

*** Memorizer 2.0, Brainsoft Engineering, 43-1-865-35-44 (Austria), $100. Software records dictation from a Mac microphone and you transcribe the dictation in a word processor. You may prefer to stick with a hand-held tape recorder considering the product's RAM and storage appetite, and its propensity to crash. Aug 93

Microsoft Excel 4.0, Microsoft Corp., 206/882-8080, $495. Create impressive spreadsheets with this upgrade that includes all the features you wish for and more. It's slower, and needs 2MB of RAM for practical use, but almost all users will want to upgrade. Oct 92

Microsoft Project 3.0, Microsoft, 206/882-8080, $695. An amazing range of functions, including new scheduling and formatting, are packed into this project-management software. The improved tool bar helps novices schedule tasks with push-button ease. Jan 93

Microsoft Works 3.0, Microsoft, 206/882-8088, $249. Capable but unexceptional upgrade delivers marginally improved functionality and a welcome face-lift to this integrated program, but there are a number of incompatibilities, odd design choices, and performance flaws. Feb 93

nullBase 1.5 (1.7), Tactical Software Corp., 407/832-1400, $395. Although still slower than Foxbase and without the rich feature-set of 4th Dimension, this is the only relational database that makes it possible for users with no programming experience to design a useful database. Sep 92

Office Wiz 1.1 (1.1.4), Oxy Associates, 415/563-9971, $595. 40-based program attempts to integrate calendar, project, and contact management, as well as simple accounting for a multiuser environment, but the complexity of the interface requires a substantial investment in start-up time. Nov 92

OmniS 7.1, Blyth Software, 415/312-7100, $1250. The plain, businesslike functionality of this database-development system produces solid applications with much less fuss. Dec 92

OrcGraph Express 1.0, Kaeroton Software, 713/890-8434, $279. Organization-chart software links a database to standard box-drawn functions. Although the learning curve is steep, the effort may be worth it for people who regularly work with large or complex organization charts. Apr 93

Panorama 2.0 (2.1), ProVue Development Corp., 714/892-8199, $395. Disconcertingly easy-to-learn flat-file database is full of labor-saving data-entry features, but it boasts a remarkable macro function that lets you record and play back almost any series of database routines. May 92

Perspective 1.5, U.S. Data on Demand, 800/352-7752, $1259.55. The level of detail and comprehensive information in this collection of U.S. demographic and economic data is impressive, and the reasonable price puts it within reach of even the smallest business. Sep 92

Project Scheduler 5, Scitor Corp., 415/570-7700, $695. For midrange project-planning, this program's many hits outweigh its few misses. It goes beyond the requisite scheduling options, with inflation factors and unlimited projects in memory, and it conforms to accepted standards, so you get consistent, predictable results. Aug 93

** Risk 1.1, Palisade Corp., 607/277-8000, $395. Statistical simulator for Microsoft Excel financial computations generates complex, statistically valid templates within Excel and is the first choice for analysts who work with probabilistic models every day. It assumes that the user is an Excel power user. Aug 93

** SpreadBase 1.0.1, Objective Software, 415/306-7410, $695. Powerful business data-analysis tool is a unique combination of database and spreadsheet functions. It's worth a closer look for power users, despite nagging documentation and a crude microfont. May 93

** Winge 1.1ae, Informix Software, 913/599-7100, $399. If you want a low-overhead spreadsheet with advanced-feat functionality, this is an attractive product. What you get is a competent calculating engine with superior graphics; what you miss is outlining, real-time links, and the host of third-party add-ons offered for Microsoft Excel July 93

** WordPerfect Works 1.2, WordPerfect Corp., 801/225-5000, $249. A very good word processor, a spreadsheet, a database, charting, drawing, painting, and communications make up the seven well-integrated and flexible modules of this program. It has a few shortcomings, including some memory-management problems, but buyers should generally be pleased. Jun 93

** A/UX 3.0, Apple Computer, 408/996-1010, $795. Hybrid operating-system package implements the Stone Age, type-one-line-at-a-time text interface of Unix in a way a Macintosh user might actually like. Nov 92

** AccessPC2.0, Insignia Solutions, 415/694-7600, $995. slick control over formatting multiple types of DOS media is the major advantage of this file-transfer utility. Oct 92

** CompuServe Information Manager 2.0, CompuServe, 614/457-8600, $49.95. The goal of this product is to give file-sharing information access to CompuServe for Macintosh users. An appealing color interface and increased speed are signs of success, but there's still room for improvement. Dec 92

** Macintosh PC Exchange 1.01, Apple Computer, 408/996-1010, $795. For basic file-transfer, this central control panel allows cross-platform file sharing is fine, but its hardly state-of-the-art. Oct 92

** Microphone Pro, Software Ventures Corp., 510/644-3232, $295. Truly comprehensive telecommunications package now includes send-and-receive fax software. Although the new TCP/IP tools are complicated, the documentation is clear and precise. Apr 93

** NetVirtural 2.0, Eclectec, 408/462-2040, $995 to $4985. One-of-a-kind networking-simulation product favors flexibility at the expense of usability. Only after hours of work will your simulation report anything meaningful about your network, and even then the results are difficult to analyze. Apr 93

** NetWare for the Macintosh 3.011 (4.0), Novell, 800/638-9273, $495-1995. NetWare 3.11, an expensive but robust network operating system, runs on a non-Mac dedicated server and is complex to manage. This set of NetWare Loadable Modules lets you add Macs to a NetWare network.

** Network Vital Signs 1.0 (1.1), Dayna Communications, 801/531-6060, $499. Fault-monitoring application continually watches selected network devices and services, monitoring specific equipment for specific errors. Unfortunately, when monitoring more than ten devices, it noticeably degrades the performance of the monitoring Mac Mar 93

** On the Air 1.0.1, Digital Eclipse Software, 510/547-6101, $789.99 to $639.99. Intercom system transmits System 7 SND resources, SoundEdit, and AIFF sound files across a network. It's well designed and performs decently, but its usefulness seems limited. Aug 93

** RouterCheck 2.0, Neon Software, 510/283-9771, $895. Keep your finger on the pulse of router configurations and Internet traffic with this network-administration utility. It's a must for midsize or larger networks, but too pricey for small networks. Oct 92

** SoftPC with Windows, Insignia Solutions, 415/694-7600, $499. The emulation of a complete and accurate Windows environment on a Mac is an amazing accomplishment, but the product is so slow, even on a Quadra, that it performs in what might best be characterized as a dreamlike manner. Jun 93

** TechWorks Net Utilities 1.0, Technology Works, 512/794-8533, $129. Collection of five applications provides essential network-monitoring tools at a price that would please anyone. Dec 92

** Timbuktu 5.01, Farallon Computing, 510/814-5000, $1399 to $5500. By letting one computer (a Mac or a Windows-based PC) control, observe, or exchange data with another computer, this terminal-emulation product allows you to use resources anywhere on a network. Despite minor glitches, it's a clear winner. Mar 93

** WhiteKnight 11 (11.14), The FreeSoft Company, 412/484-2700, $139. In the right hands, this product is the precise tool of communications software, but it does assume familiarity with telecommunications and with programming concepts.

** Aldus PageMaker 4.2, Aldus Corp., 206/628-2320, $795. Intertabular screen redraw is one of the dozens of enhancements that make this upgrade well worth its price. Even so, some of the features that users need the most—opening multiple documents, for instance—are still missing. May 92

** Aldus PressWork 2.0, Aldus Corp., 206/628-2320, $199. Basic, inexpensive page-layout program adds features and gains strength, but is still missing elements that novice users need, such as automatic kerning. Furthermore, its software-knows-best approach to copyfitting makes manual line-tuning difficult and is almost certain to confuse and confound beginners. Mar 93

** Apple Font Pack, Apple Computer, 408/
Although not perfect—True Type letters were not connected on-

**** Publish It Easy 3.0, Tlmeworks, 708/743-2839, $59.5. A strange mixture of power and over-
sight, this page-design and layout software provides sever-
elar slick features, including handling multiple page sizes simultaneously, but blatantly ignores common Mac conven-
tions, such as some keyboard shortcuts. Dec 92

Spectacular 1.2, FontHaus, 203/846-
3087, $59. Keep track of fonts efficiently and effectively with this type-specimen generator. Printing sheet-

cems is a cinch. Jan 93

SuperATM, Adobe Systems, 415/961-
4400, $149. This upgrade to Adobe Type Manager lets you view Adobe-brand PostScript fonts on screen and out-
put them at high resolutions, even when the corresponding printer fonts are unavailable. Although it has limitations, this is an outstanding advance in font technology and a tremendous value. May 93

Fontographer 3.5 (3.5.1), Altsys Corp., 214/680-2060, $495. Versatile tools that enable you to edit PostScript typefaces or create your own are the highlight of this font-design software. But beware, some processes are technical and cumbersome. Nov 92

ImageAccess 1.0, Nikon, 516/547-4355, $495. This expensive image-cataloging program has an unusual interface and cannot be used over a network. A plug-in module provides direct support for Nikon's LS-
50AF film scanner. Aug 93

Kudo Image Browser 1.0, Impasse Sys-
tems Corp., 619/722-2600, $295. This image-cata-
logging software cannot control thumbnail depth or com-
pression, and doesn't have a keyword feature or enable multi-
ple users to access the catalog simultaneously. The unique Rifle feature lets you quickly scan images. Aug 93

Lazy Dog Foundry Personal Font, Lazy DogFoundry, 612/291-0306, $199.99 to 5499.99. Travel through time and across the country as a

**** Headline Harry and the Great Paper Race 1.0, Davidson &Associates, 310/793-0600, $59.95. Headline Harry, a stimulating game. Jul 93

Declmal & Fraction Maze 1.2, Great Systems, 415/961-4400, $185. Elegant execution and functional design combine in this two-axis Multiple Master typeface that exceeds all previous ideas of electronic font perfection. Jul 92

Personal Font, Signature Software, 503/
386-3221, $179.95. Turn your handwriting into a PostScript Level 3 or a TrueType font. The results are good, although not perfect—TrueType letters were not connected on screen, but this should be corrected with TrueType 2.0. Dec 92

Publish It Easy 3.0, Timeworks, 708/
559-1300, $199.95. Desktop-publishing program of-
fers writing, editing, formatting, page-layout, drawing, and painting tools with well-thought-out interface innovations, plus an excellent database manager. Unfortunately, the program is unstable and crash-prone. Mar 93

QuarkXPress 3.1 (3.11), Quark, 800/788-7835, $895. Dozens of updated features and frustr-
tation-reducers in this upgrade include new palettes and preferences, better zooming, and improved text-editing and -formatting. The program, while still not perfectly behaved, is stable, well designed, and full-featured. Jul 92

Renaissance 1.0, Eastman Kodak, 800/
433-2839, $695. A strange mixture of power and over-
sight, this page-design and layout software provides sever-
elar slick features, including handling multiple page sizes simultaneously, but blatantly ignores common Mac conven-
tions, such as some keyboard shortcuts. Dec 92

SuperATM, Adobe Systems, 415/961-
4400, $149. This upgrade to Adobe Type Manager lets you view Adobe-brand PostScript fonts on screen and out-
put them at high resolutions, even when the corresponding printer fonts are unavailable. Although it has limitations, this is an outstanding advance in font technology and a tremendous value. May 93

MacGlobe 1.3, Broderbund Software, 415/382-4400, $44.95. Besides maps and bits of fun, such as national anthems, this geography software offers an impressive quantity of demographic and economic in-
formation. While it could stand some improvement, it pro-
vides a fascinating intellectual adventure. Feb 93

Mavis Beacon Teaches Typing 2.0, The Software Toolworks, 415/893-3900, $49.95. If being entertained while learning to type interests you, this typing tutor provides varied environments, interesting lessons, and good games. Jun 93

Millie's Math House, Edmark Corp., 206/556-8400, $49.95. Early math-education software provides a variety of ways for preschoolers to experi-
ment with numbers and counting. It's entertaining and eng-
aging, but more advanced levels and more flexibility would keep children challenged longer. Jul 93

The New Groller Multimedia Ency-
clopedia, Groller Electronic Publishing, 203/797-
3530, $395. The remarkably current and scholarly text of this encyclopedia on CD-ROM is suitable for sophisti-
cated readers, while its speed, ease of use, and value are impressive. Apr 93

NihongoWarehouse, Vol. 1, Qualitas Trading Company, 510/848-8080, $349. Although this Japa-
nese language CD-ROM offers solid instruction, it's so ex-
pen.sive and so limited in its word selection that it's not an economical choice for individual users. Jan 93

The Secret Codes of C.Y.P.H.E.R. 1.0(1), Tanager Software Productions, 510/430-0900, $59.95. Intriguing facts about animals and a variety of alphabets provide the interest in this educational game, but the inexplicable, repetitive animations are a major detrac-
tion. Apr 93

The Secret Island of Dr. Quadrany 1.0 (1.01), MECC, 612/569-1500, $19.95 to $69.95. Clever package of gorgeous landscapes, catchy sounds, and tem-
ting arcade-game puzzles weaves math, logic, and read-
ing skills. Although somewhat slow, it's fun for parents and

ean to the standard textbook order of topics, but offers much more. It is particularly strong on word problems and graphing. May 93

The Castle of Dr. Brain 1.0, Sierra On-
line, 208/683-4668, $49.95. Use logic and raw brain-
power to navigate a series of rooms, mazes, and hallways. Puzzles range from simple and mundane to creatively lo
dic. Dec 92

Comprehensive Review in Biology, Queue, 203/335-0908, $295. There isn't a textbook publisher in North America with the nerve to publish a black-and-white biology book with nothing more than text and basic line drawings, much less charge several hundred dollars for it, but that, in effect, is what this CD-ROM is. May 93

Compton's Multimedia Encyclopedia 1.0.00, Compton's New Media, 619/293-2626, $795. The down-to-earth writing style and numerous facts and whistles of this multimedia encyclopedia on CD-ROM appeal to younger readers, but the high cost and sluggish performance may be prohibitive. Apr 93

Decimal & Fraction Maze 1.2, Great Wave Software, 408/438-1950, $69.95 to $89.95. Education software weaves the threads of eight math curricula—from third grade to eighth, along with two levels of adult education—into an interesting and visually stimulating game. Jul 93

Dvorak on Typing 1.0, MacPlay, 714/553-
3530, $49.95. Typing tutor offers solid lessons, but the small annoyances, such as never being able to take inter-
mediate or advanced lessons without first passing a test, add up. Jun 93

Eco-Adventures in the Ocean, Ocean-
Adventures in the Rainforest 1.0, Chariot Soft-
ware Group, 619/298-0202, $59.95. Explore the ocean or rainforest while avoiding pitfalls and predators in these educational adventure games: imaginary landscapes that combine features found in different environments it may confuse some students. Nov 93

Headline Harry and the Great Paper Race 1.0, Davidson &Associates, 310/793-0600, $59.95. Travel through time and across the country as a

MacClube 1.3.0, Broderbund Software, 415/382-4400, $44.95. Besides maps and bits of fun, such as national anthems, this geography software offers an impressive quantity of demographic and economic in-
formation. While it could stand some improvement, it pro-
vides a fascinating intellectual adventure. Feb 93

Where in America's Past Is Carmen San-
diego? 1.0 (1.3), Broderbund Software, 415/
382-4400, $44.95. Travel in time and the U.S. chasing those V.L.E. crooks in this clever educational history/ge-
ography game that's challenging for all ages. Mar 93

Where in the World Is Carmen San-
Star Ratings

415/382-4400, $59.95. The V.I.P.E.R. gang is at it again, stealing famous objects and fleeing to locations around the world. In this deluxe version of the well-known boxing game, there are more crooks, more clues, and more countries to visit. Oct 92

ENTERTAINMENT

★★★★ 4-D Boxing 1.0, Electronic Arts, 415/571-7171, $49.95. Authentic motion and multiple viewing angles are the best features of this entertaining boxing game, but off-track copy protection and the inability to save games in progress makes it less enticing. Sep 92

★★★★ A-Train, Maxis, 510/254-9700, $69.95. Charming railroad simulation offers astonishing, and often witty detail, but the learning curve is high and the interface isn't completely Mac-like.

★★★★ America Alive, MediaAlive/CD Technology, 408/752-8500, $99. QuickTime movies, photographs, maps, text, and audio mingle in this multimedia CD-ROM guide to the U.S. It's a promising concept, but it doesn't yield much useful information. Mar 93

★★★★ Arthur's Teacher Trouble, Broderbund Software, 415/382-4400, $59.95. Every page of this delightful animated book is dense with surprises that amuse and satisfy a child's curiosity. In the words of six-year-old Alex, "It's like chocolate ice cream. You can have it more than once and it's still good." Apr 93

★★★★ Audiosoap 1.0 (1.05), Opcode Systems, 415/856-3333, $69.95. Audioshells will get a kick out of applying sound effects to any sound file on their Mac. You can also control the order of songs or sounds on an audio CD played on a CD-ROM player. A number of quips may confuse new users. Sep 92

★★★★ Battle Enhanced Chess CD ROM, Interplay Productions, 714/553-6678, $79.95. Elaborately detailed cartoon characters act out strategy and capture, complete with sound effects, in this chess game that will drive nine-year-olds with gleeful but may annoy experienced chess players. Mar 93

★★★★ The Battle of Britain, Deadly Games, 215/295-2284, $39.95. It's August 10, 1940. The badly outnumbered British must defend their country against the invading Luftwaffe, and you're in charge. Although the graphics and sound are not spectacular, this is an entertaining, thinking person's game. Dec 92

★★★★ Blade 1.1 (2.0), Leviathan Corp., 313/826-3560, $99.95. Surreal graphics in this fantasy martial-arts game are spectacular—a cross between Kill Bill and Seuss—but the action is extremely difficult to master. Sep 92

★★★★ Capitalist Pig 1.0 (1.02), Pluma Software, 602/969-9441, $59.95. Terrorist attacks, embezzlement, fires—keeping a cool head is half the challenge if you are to become successful in this business-simulation game. No clear end point means that getting rich, ranking, and writing novels is not an option. Sep 92

★★★★ Cognito 1.0, Online Design, 203/435-4995, $59.95. Rubik's Cube fans will like this challenging game where the goal is to replicate a pattern by moving rows and columns of cubes. It gets more and more complex as you progress through the 120 levels. Apr 93

★★★★ Cyberblast 2.01, Innerprise Software, 410/560-2434, $49.95. Aliens have overrun the 64 levels of Fairlax Labs, and it's your job to get rid of them in this arcade game. While it's not the most unusual game in the universe, it's a nice, basic shoot-'em-up, with clever execution and appealing graphics. Sep 92

★★★★ Go Master 5, Toyogo, 802/464-5526, $69. Go has been called the most interesting board game ever invented. This excellent software version incorporates helpful learning aids and sample games. Dec 92

★★★★ Helicats Over the Pacific 1.0.3, Graphic Simulations, 214/659-7400, $69.95. Fly a WWII-era Navy fighter, the Grumman F6F Helicat, against enemy planes in the South Pacific with this flight simulator that offers smooth graphics, good special effects, and great documentation. Apr 93

★★★★ Insanity 1.0, UV Wave, 318/868-9944, $39.95. Shoot your Mac with this cool control panel device that offers choice of nine weapons, ranging from an Lizz to a pigeon. It has first-rate sound effects and detailed animation, but the novelty wears off. Feb 93

★★★★ Jewelbox 1.05, Varcom Systems, 619/563-6700, $49.95. This gem of a game is strongly reminiscent of Tetris. The jewels fall into rows that disappear when you place three jewels of a kind together. Jun 93

★★★★ Kid Pix Companion, Broderbund Software, 415/382-4400, $29.95. Additional to Kid Pix adds clever new features, including the world's easiest-to-use QuickTime movie and presentation modules, but it's less appealing than the delightfully simple original. Oct 92

★★★★ Maelstrom 1.03, Ambrosia, P.O. Box 23140, Rochester, NY 14692-3140, $15 plus S
dipation and handling. Fast-paced arcade game is loosely modeled after Asteroids, the Atari classic. Maelstrom features superb animation, hilarious sound effects, exciting action—and best of all, it's shareware. Jun 93

★★★★ Monkey Island 2: LeChuck's Revenge, LucasArts Games, 415/721-3394, $59.95. This whimsical Twilight Zone-like on of life on the high seas is the adventure-game equivalent of Mad magazine. Filled with wittily strange situations, splendid cross-games, heppings of self-pampering, and enough hilarious detail to keep you amused for days. May 93

★★★★ Mozart: The "Dissonant" Quartet, The Voyager Company, 310/451-1383, $59.95. This CD-ROM includes an essay on the anatomy of an actual performance, a thoroughgoing and the musical performance, though well regarded, is not at the top of most reviewers' lists. Apr 93

★★★★ The Secret of Monkey Island 1.0, LucasArts Games, 415/721-3300, $59.95. A genuinely amusing, interactive tale of swashbuckling and daring deeds using splendid 256-color graphics and an original soundtrack. Low screen resolution and iconopy protection only slightly spoil the delight. Sep 92

★★★★ Sherlock Holmes, Consulting Detective, Volume II, Icon Simulations, 708/520-4440, $69.95. Matches with the legendary detective by solving three difficult mysteries in this CD-ROM's lively text. However, the discussion is relatively uncomplicated and the musical performance, though well regarded, is not at the top of most reviewers' lists. Apr 93

★★★★ SimLife, Maxis, 510/254-9700, $69.95. A megaloamian's dream come true, this amazingly intricate simulation game lets players create and control ecosystems. It's not easy, but the reward is an increased understanding of the complex interrelationships of life. Feb 93

★★★★ So I've Heard, Volume 1: Bach and Before, The Voyager Company, 310/451-1383, $24.95. Engaging text by classical-music critic and lecher Alan Rich, classical music commentator for National Public Radio, conveys his enthusiasm for this appealing music in this CD-ROM's lively text. However, the discussion is relatively uncomplicated and the musical performance, though well regarded, is not at the top of most reviewers' lists. Feb 93

★★★★ Space Quest 1: Roger Wilco in the Sarien Encounter, Sierra Online, 205/683-8999, $19.95. As Roger Wilco, starship janger, you must defeat the evil Sariens in this adventure game where your head is more important than your hands. Puzzles range from the obvious to the head-scratching, but for most players the game will be easy to complete. Apr 93

★★★★ Super Alines 1.0, Callisto Corp., 508/635-7070, $49.95. You use logic to search a minefield without setting off mines in this fast-paced game that's easy to learn, but offers 84 levels for long playability. Apr 93

★★★★ Super Tetris, Spectrum Holobyte, 510/522-3584, $49.95. Teeny tiles are a minor negative in this exceptional tile game that's more varied, more challenging, and more forgiving than the original. Oct 92

★★★★ Surgeon 3, The Brain 1.0 (1.1), ISM, 410/
**ArtBeat Professional 1.0, Pie Practical**

ArtBeat Professional is a software for creating graphics. It is noted for its high-quality images and easy-to-use interface. However, it is considered to be one of the best drawing programs available.

**Alias Sketch 1.5, Alias Research, 416/206-6078**

Alias Sketch is a powerful tool for creating 3-D models. It is known for its ability to create detailed and realistic images, making it a favorite among professional artists.

**artWorks 1.0, Deneba Software, 305/596-5644**

artWorks is a popular software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**Adobe Photoshop 2.5, Adobe Systems, 310/392-8441**

Adobe Photoshop is a widely used software for editing and enhancing digital images. It is known for its wide range of tools and features, making it a versatile tool for designers and photographers.

**AutoCAD Release 11, Autodesk, 415/332-2344**

AutoCAD is a software for creating 2-D and 3-D engineering designs. It is widely used in various industries, such as architecture and engineering.

**Cachet 1.0 (1.2), Electronics for Imaging, 415/742-3400**

Cachet is a software for creating 2-D and 3-D images. It is known for its ability to create realistic and photorealistic images.

**Canvas 3.0 (3.6), Deneba Software, 305/596-5644**

Canvas is a software for creating 2-D images. It is noted for its wide range of tools and features, making it a versatile tool for designers and photographers.

**DesignCAD 2D/3D 3.0.1 (4.0), DesignCAD, 918/825-4848**

DesignCAD is a software for creating 2-D and 3-D models. It is known for its ability to create detailed and realistic images.

**Easy Color Paint 3.0, MECC, 612/569-1500**

Easy Color Paint is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**ElectricImage Animation System 1.5.1, Electric Image, 818/577-1627**

ElectricImage Animation System is a software for creating 3-D animations. It is known for its ability to create realistic and photorealistic animations.

**Expert Draw 1.0, Expert Software, 305/567-9990**

Expert Draw is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**Folio 1 Media Kit, D’Pix, 614/299-7129**

Folio 1 Media Kit is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**Fraternal Design Painter 2.0, Fractal Design Corp., 408/688-8800**

Fraternal Design Painter is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**Image Assistant 1.0, Caere Corp., 408/395-7000**

Image Assistant is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**IntelliDraw 1.0, Aldus Corp., 206/628-2320**

IntelliDraw is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**MacRenderMan 1.0 (1.3), Pixar, 510/236-596-5644**

MacRenderMan is a software for creating 3-D images. It is known for its ability to create realistic and photorealistic images.

**Paint It 1.0, Timeworks, 708/559-1300**

Paint It is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**PosterWorks 3.0, S.H. Pierce & Co., 617/338-2222**

PosterWorks is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**Ray Dream Designer 2.0 (2.06), Ray Dream, 415/560-0765**

Ray Dream is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.

**Warpords, Strategic Studies Group, 304/494-9373**

Warpords is a software for creating 2-D images. It is noted for its ease of use and ability to create professional-quality graphics.
*** Sketcher, Fractal Design, 408/688-8800, $149. A variety of effects reproduce techniques of traditional drawing tools with this wonderful grayscale paint and image processing program. Feb 93

★★★★ Smoothie 1.02, Peclise Software, 408/244-6554, $149. Create smoother screen images with this handy utility that antialiases the edges of on-screen artwork. Although it can't accommodate sound or accept imported QuickTime movies, it's a must for anyone who uses a Mac for presentations. Nov 92

★★★★ StrataType 3d 1.0 (2.0), Strata, 801/628-5218, $199. The rulers, texture palette, custom bevels, and canned positioning schemes of this 3-D type-effects software are nice, but they can't compare with the animation skills, single-character positioning features, lighting capabilities, and superb rendering of other available programs. Mar 93

★★ Swivel 3D Professional 1.0 (2.0.4), Onyx Computing, 617/876-3876, $295. Single-purpose program generates realistic color drawings of trees from a number of easily controlled parameters. Although visually appealing, it's an expensive way to draw a tree. May 93

★★★ Typpastery 1.0 (1.1), Pixar, 510/236-4000, $290. Typer enters the third dimension with this reasonably priced 3-D typographic effects and animation program. There's room for improvement, but it's an exciting tool for designers, multimedia producers, and those who enjoy working with type. Now 92

★★★ VirtuWalkThrough 1.1.3, Virtu Corp., 919/467-5700, $495. Interactive 3-D modeling tool provides instantaneous access to rendered 3-D scenes, allowing you to travel through models at will. While it has some problems (such as occasionally just quitting), it's an excellent value that may change both how you design and how you think about design. Jul 93

★★★ Wraptures One, Wraptures Two, Form and Function, 619/536-9999, $95 each. The images in these texture collections on CD-ROM are generally of traditional drawing tools with this wonderful grayscale importQuick movie tool. It's a must for anyone who

★★★★ Data Desk 4.0 (4.1), Data Description, 808/297-1000, $595. For finding patterns in data, this statistical-analysis program has no peer. Years of refinement have made it unique, and uniquely valuable, tool for analyzing, despite its lack of some tests found in larger programs. May 93

★★★★ Expert Astronomer 1.0 (1.1), Expert Software, 305/567-9990, $495. Draw maps of the sky from any location in the Solar System and learn about celestial objects with this astronomy software. Most effective in color, this is a great educational tool for beginners and a reference database for experts. Dec 92

★★★★ Expressionist 3.0 (2.01), Prescience Corp., 415/543-2252, $199.50. If you work regularly on similar topics, you can customize this equation-writing software to produce equations with exactly the appearance you want, letting you work at amazing speed. Mar 93

★★★★ FASTAT 2.0, SYSTAT, 708/864-5670, $495. Statistical business-analysis software makes sense as a day-to-day statistics tool for business or scientific users. It provides the right statistical tests for most requirements, and its graph types provide plenty of information, although they lack glamour. Jun 93

★★★★ Hig 1.0 (2.0), Illimunion Corp., 808/254-7511, $995. A script language, which exhibits an encroaching nonchalance about data structures and typing of variables, is only one of the impressive features of this formidable numerical mathematics software. Oct 92

★★★★ Interactive Physics II 1.0 (1.01), Knowledge Revolution, 415/553-8253, $599. Motion simulation software is an improvement over traditional classroom instruction in physics. This new version greatly expands the range of problems that can be solved, and adds support for QuickTime. Dec 92

★★★★ MacBroadboard 1.1 (1.13), Yoicy Software, 919/644-1620, $599.50. Useful educational engineering software simulates with excruciating detail every aspect of a digital integrated-circuit breadboard trainer. It accurately replicates and even surpasses the behavior of a physical breadboard—without turning on IC chips. Dec 92

★★★★ MacPhase 2.0, Otter Solutions, 315/768-3956, $159. Low-cost, scientific-data-visualization software with a large assortment of mathematical tools is one of the few authentic bargains in science software. One of its principal strengths is a well-planned color lookup table editor that's delightfully easy to use. May 93

★★★★ Maple V, Brooks/Cole Publishing, 800/354-9706, $493.95. For functional scale and ease of use on a basic Mac (such as a Classic or Plus), this symbolic math software has no competitors. May 92

★★★★ MathCAD 3.1, MathSoft, 617/577-1017, $495. Numerical and symbolic computation software is easy to learn, easy to use, produces good reports, and is much more powerful than earlier versions. It still doesn't compete in scope with the largest math programs, but for most science and engineering tasks, it's a fast way to get problems solved. Jun 93

★★★★ MathType 3.0, Design Science, 310/433-6685, $199. This equation-writing software makes automatic typographical decisions, which is helpful if you produce documents on a wide range of subjects. Its smooth integration with Microsoft Word is also convenient. Mar 93

★★★ NueX 1.1 (1.3), Charles River Analytics, 617/491-3474, $295. Lightweight introduction to artificial neural networks and knowledge-based expert systems has some merit, but cannot be considered a serious production tool. Oct 92

★★★★ Sequencer 2.0 (2.0), Gene Codes Corp., 313/769-7249, $2200. While not implementing everything a DNA researcher could want, this software for manipulating DNA-sequence information does provide the things a researcher really needs. The single best feature is its raw speed. Dec 92

★★★★ Simulink 1.2, The MathWorks, 508/653-1415, $3995. If you hear the word Bode plot several times a week at work, this math-simulation software is designed to make your life wonderful. Little glitches and a command-line orientation are drawbacks. Dec 92

★★★★ Spessglass Dicer 2.0, Spessglass, 217/356-6000, $695. Scientific 3-D visualization tool displays a two-dimensional slice through a three-dimensional object (which is represented in the computer by a data table). While Dicer pushes the limits of the Mac hardware, for its function this product is really the only game in town. Jul 93

★★★★ StatView 4.0m, Abacus Concepts, 510/540-1949, $595. A nice mix of statistical prowess and operating convenience distinguishes this statistical-analysis and presentation software. The printing options are outstanding. Nov 92

★★★★ Theorist 1.5, Prescience Corp., 415/543-2252, $494.95. Symbolic-mathematics program that you can figure out by yourself adds a useful table feature, more special functions of physics, and better graphics. Plus, it's still the only program to use real notation directly. May 93

★★★★ Voyager II, Carina Software, 510/352-7328, $159.95. If a brilliantly-lit, star-filled sky holds more than a moment's fascination for you, you need to know about this astronomy program, in a filament of mostly faint and forgettable astronomy stuff, it's a supernova. Jul 93

O R G A N I Z A T I O N / P R O D U C T I V I T Y

★★★★ Achieving Your Career 1.02, Up Software, 415/921-4691, $69. HyperCard-based job search software succeeds by compactly organizing. It provides a structure for identifying letters to write, phone calls to make, and interviews to follow up. Aug 93

★★★★ ACT 1.0 (1.01), Contact Software International, 214/919-9500, $395. While this contact manager has several tasteful features, such as customizable contact views and an integrated word processor, learning how to use it is a frustrating experience. Feb 93

★★★★ Agent DA 2.0 (2.1.3), TeamBuilding Technologies, 514/278-3010, $99. Simple, flexible calendar/reminder program includes every obvious calendar function—easy navigation, extensive print options, adjustable displays, recurring events, and even a straightforward forward-mail option. Sep 92

★★★★ Amaze Daily Planners: Cathy, The Far Side, Word-A-Day (2/0/1993), Amaze, 206/820-7007, $69.95. A cartoon (or word) a day makes scheduling more fun with these icon-based calendar/daily planners, but the graphics take up a lot of hard drive space, and continues...
Dear Kate Letter

October 22, 1991

Dearest Ellen:

If there is anything better than being loved by you... it is loving you.

And you are so easy to love. You've brought such wonder into my life and have touched my heart with your love.

I just want you to know, my darling, that it feels so good being in love with you and I want to love you for a very long time.

You are a wonderful woman and I love you dearly. If I'm dreaming, please don't wake me up—I don't want this to end.

Monogamously yours,

Your Mac can say a lot about you.

If somebody sat down at your Mac and started snooping around your disk, which would embarrass you more? The details of your love life? Your resume? Your adjusted gross income? How about the Confidential Employee Evaluation you were working on when the Boss hauled you into his office for a chat?

What? You never thought about this before? Then read on and you'll never have to think about it again.

All you'll have to think about is your password.

That's the key to DiskLock, the painless, yet powerful, System 7 savvy way to keep other people's noses permanently out of both your personal and professional data.

You can password-protect selected files, folders or your entire hard disk. And encrypt everything to U.S. Government DES specs.

You don't even have to be there. DiskLock blanks your screen and secures your system for you — without interrupting your applications — whenever you wander off.

When you return, it asks for your password and lets you know if anyone got curious while you were away.

If you're curious about DiskLock, or about our one-year money-back guarantee, call 1-800-477-8212.

We'll give you all the juicy details.
Star Ratings

the programs must be running in order for alarms to sound.

Sep 92

ClienTrac 1.7.1, Whiskey Hill Software, 415/851-8702, $135. Easy-to-use, HyperCard-based contact-management software performs as billed, but fails to inspire much enthusiasm. Aug 93

Connections 2.1, Holzer Software, 510/943-7667, $199. A wider range of scheduling features, new printing options, and improved networking capabilities don't change the fact that this HyperCard-based personal information manager is just too slow. Nov 92

Contact Ease 2.0.1, Westware, 619/660-0356, $195 to $1495. Contact-management and sales automation software helps salespeople keep in touch with contacts, makes it easy to generate letters, and maintains detailed records of activities. It has a few quirks but is overall a good program. Aug 93

DateBook 1.5.1 (1.5.1), After Hours Software, 818/780-2220, $125. Personal time manager offers a flexible approach to event scheduling and to-do-list management. This upgrade adds new features and fixes bugs that plagued the first version. Feb 93

DayMaker 2.0 (2.0.3), Pastel Development Corp., 212/941-7500, $129.5. If you need to organize lots of disparate information, follow up on meetings with many people, keep track of your own calendar, create an archive of completed work, and print out lists of to-do items to take on the road, this free-form personal information manager is a great choice. May 93

Dynodex 3.0, Portfolio Software, 408/252-0420, $89.95. The speed and printing options of this field-address-book manager are its strengths, but this upgrade adds welcome improvements to the interface, including automatic formatting of phone numbers. Apr 93

EasyAlarms 2.0 (2.1), Essential Software, 619/481-1477, $99. Complex, flexible calendar, reminder, and to-do list program includes scripting and sound recording among many other features. Nov 92

Hello, Atelier Systems, 619/453-4300, $899. Unusual combination of contact management and word processing in a compact package. This first release is hampered by several noticeable flaws, such as text documents that must be linked to a contact name. Jan 93

In Control 2.0, Attain Corp., 617/776-1110, $129.95. The best features of an outstanding program are combined with those of a database, making it easy to sort, search, organize, and print your to-do list. Aug 93

Inspiration 4.0, Inspiration Software, 503/245-9011, $295. Watch your ideas evolve in a dynamic diagram mode and a text-based outline mode with this brainstorming tool. It works best as a vehicle for organizing and developing ideas. Feb 93

Intouch 2.0.4, Advanced Software, 408/733-0745, $99.95. Free-form database is a fast and easy way to manage contact information. Program offers flexible data entry instead of automatic formatting. Although this version adds a handy reminder system, it falls short as a calendar planner. Feb 93

LapTrack For the Mac 1.0b, Timeslips Corp., 508/768-6100, $79.95. Time- and expense-tracking program offers the right features for the on-the-go professional, but the interface is overcomplicated and the documentation is sloppy. Still, in spite of its flaws, it does an excellent job. May 93

Nolo's Personal RecordKeeper 3.0, Nolo Press, 510/549-1976, $349.95. Hierarchically configured database organizes your personal affairs, including legal matters, financial records, insurance plans, family history, and more, and it is frustratingly inflexible. Jan 93

Now Up-to-Date 2.0, Now Software, 503/274-2800, $99 to $799. Calendar utility combines flexibility, ease-of-use, and streamlined operations in an almost irresistible package. The Reminder control panel, while a great new feature, has had minor conflicts. Jun 93

Office Manager 2.1 (2.5), White Crow Software, 800/424-0310, $95. Simple contact- and project-management software is powerful for small databases, but reliance on HyperCard limits its usefulness for low-end Macs. Dec 92

Spiral 1.0 (1.0.2), Technology Works, 512/794-8533, $129. Designed specifically for taking and organizing notes, this program provides an excellent feature set, including bookmarks and an option for automatically expanding abbreviations, but it's marred by some errors in the editing and import/export processes. Mar 93

TimeVision 1.0, Powercore, 815/468-3737, $99. New scheduler with notepad and card-file functions tucked on has some worthwhile features, but in general doesn't match up to the competition. May 93

PRESENTATION TOOLS

Action 1.0 (1.02), Macromedia, 415/252-2000, $495. Entry-level multimedia integration program offers, for its price, a rich selection of features, including an excellent variety of transitions as well as gradient and patterned backgrounds. It makes producing presentations with sound and motion surprisingly easy. Feb 93

Adobe Premiere 2.0 (2.0.1), Adobe Systems, 415/959-4400, $695. A dream command post for video professionals, this QuickTime movie-editing software produces stunning special effects with little effort. Only the program's appetite for memory, disk space, and computer horsepower prevent it from being the nonprofessional's dream as well. Jan 93

Aldus Persuasion 2.1 (2.12), Aldus Corp., 415/377-0136, $99.95. For slide presentations, this product provides an all-in-one studio where each element—outline entries, slides, notes, handouts, and charts—is dynamically linked to the others. It offers layered builds and automated templates, and has a proven track record.

CameraMan 1.0 (1.1), Vision Software International, 408/748-8411, $149. If you need to record continuous screen operations, this screen recorder is the best deal around. It handles 32-bit QuickDraw, takes advantage of QuickTime's long list of compression and playback capabilities, and even uses custom frame sizes. Sep 92

Comet CG 1.0.3, MSI, 317/842-5097, $59.95. Program for generating antialiased text over live video is reasonably priced compared with dedicated graphic systems, but you're likely to be astounded by its limitations as you are impressed by its capabilities. It offers too few formatting options, a cumbersome interface, and an insubstantial manual. May 93

DIVA VideoShop 1.0, DIVA Corp., 617/491-4147, $599. Instantaneous playback sets this graceful QuickTime editing software apart. Its simple beauty is slightly offset by a few rough edges, a bouncy manual, and an occasionally clumsy interface. Jul 92

HI Rez Audio Volume 1.0, Presto Studios, 619/688-4895, $149.95. The enjoyable, high-quality music on this CD-ROM adds a nice touch to presentations. The software for browsing the music is quirky, and the product could use some documentation. Jul 93

Interactive Training for Director 1.1, Media in Motion, 415/621-0707, $199. This somewhat expensive program teaches basic Macromedia Director skills and provides a foundation for exploring Director's other features. It has a clear, often light-hearted approach, but navigating the lessons can be frustrating. Jun 93

Macromedia Director 3.1 (3.1.1), Macromedia, 415/252-2000, $1195. This minor update to a powerful and versatile multimedia authoring tool adds 23 scripting commands, QuickTime importing and editing, and a utility that compiles movies into a faster playback format—but the whopping $119 addition to the price makes it an upgrade most users can afford to miss. Feb 93

Media-Pedia Video Clips, Media-Pedia, 617/235-5617, $195 to $495. Fifty-seven-minute stock footage for use in QuickTime movies includes over 150 different segments, ranging from unremarkable to dramatically genuine fun. Apr 93

Microsoft PowerPoint 3.0, Microsoft, 206/882-8080, $495. This remarkable upgrade puts this presentation program ahead of the pack in terms of convenience and ease of use. Although the ready-made template collection is pretty paltry, the extensive system of master layers, reliable cross-platform compatibility, and strong on-screen presentation capabilities more than compensate. Feb 93

Morph 1.0 (1.1), Gryphon Software Corp., 619/454-6836, $149. With patience and practice, you can become a high-tech special-effects wizard using this image-molding movie utility that "melts" one image into another. While using it is simplicity itself, you can only morph still images, and the program suffers from some first-release glitches. Nov 92

Motion Works ProMotion 1.0 (1.0.3), Motion Works, 604/685-9975, $395. Inexpensive animation program consolidates a view of tempting features, including flexible path tools and ambitious support for Apple events, but the capabilities are strong together with a weak-and-often-inadequate interface. Nov 92

MovieWorks 1.1, Interactive Solutions, 415/377-0136, $395. Over 100 bugs were fixed in version 1.1 of this multimedia authoring software that takes an all-in-one approach to creating presentations, but problems remain. For now, it's a good idea, poorly executed. Jun 93

Passport Producer 1.0, Passport Designs, 415/726-0280, $495. Strong timing controls and good sound capabilities mix with middling text- and image-handling and a lack of even basic animation options in this partially successful entry-level multimedia program. Apr 93

Special Delivery 1.0 (1.1), Interactive Media Corp., 415/948-0745, $399. This entry-level multimedia package has the tools to assemble interactive screen presentations that burst with motion and sound, but its interface is disorienting and it lacks the polish and power of other similarly priced programs. Mar 93

VideoFusion 1.0.1, VideoFusion, 419/891-1090, $649. Collection of special effects for continues

BUYERS' TOOLS

MACWORLD
STATISTICA/Mac™ A complete statistical data analysis system with hundreds of presentation-quality graphs integrated with all procedures
- In-depth, comprehensive implementations of Exploratory techniques; Descriptive
  statistics; Frequency tables; Numerical methods; Multiple linear regression methods
  with extended diagnostics; General nonlinear estimation (with predefined or user-defined
  variables); Logit/Probit analysis; General implementation of ANOVA/MANCOVA
  (designs of practical intent); repeated, nested, incomplete, random, changing
  covariance, custom analysis, post-hoc tests, custom designs); Discriminant
  function analysis statistics; Canonical analysis statistics; Time series modeling
  techniques with forecasting; Factor analysis with rotations; Cluster analysis
  (including hierarchical, k-means, and 2-way joining); General survival/sideline time
  analysis (including tables, group comparisons, and regression models); Distribution
  fitting (a large selection of continuous and discrete distributions); Curve and
  line-fitting procedures; 3D scatterplots of two variables (using 3D surface
  creations); Column plots, Bar graphs, Double pie charts, Scattergrams, Two-way
  joining plots, Curve fitting procedures, Distribution comparison plots, Range plots,
  Probability plots, Animations, plots, Factor space plots, Contour plots, Box-and-whisker
  plots.

- Graphs integrated with all procedures (e.g., click on a correlation coefficient to
  produce the corresponding scatterplot and other graphs; click on a variable in the
  descriptive statistics table to produce a histogram and other graphs; click on an
  interaction effect in the ANOVA table to see a plot of interaction) in time
  creation plots.

- Manual with comprehensive introductions to each method and step-by-step examples
  (Quick Start booklet explains all major conventions); balloon help.

- Extensive data management facilities: a super-fast spreadsheet of unlimited
  capacity with formulas (and Publish and Subscribe); microscript files; "double
  identity" of values (numeric-strings). BASIC-like data transformation programming
  language: Import/Export data and graphs from Excel, Macs, CSE and other
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  formats.
QuickTime movies may not be for the casual user, but if you have the equipment and you can't live without spinning logos and superimposed shots, then go ahead and indulge. Jul 93

** PROGRAMMING **

--- ** EdScheme 3.4 (4.0), Schemers, 305/776-7376, $49.95. This clear, elegant programming language is an excellent tool for learning good programming techniques, although it can't be used to create stand-alone applications. Nov 92 --- ** EISToolKit 2.0, MicroStrategy, 202/427-8800, $1,199.50. Reliable, field-tested developer's environment for creating executive information systems provides automatic access to information in spreadsheets and databases across a distributed system, and serves up the information on screens that provide automatic graphing, analysis, and report generation. May 93 --- ** FutureBASIC 1.0, Zedcor, 602/881-8101, $299.95. Complete, easy-to-learn, real-world programming tool has full Toolbox, System 7, and assembler support. It's a wonderful tool that's rapidly becoming a favorite among commercial developers. Jul 93 --- ** MetaDesign for the Macintosh 3.0, Meta Software Corp., 617/576-6920, $250. This diagramming tool for structured system analysis offers easy ways to group and ungroup symbols in diagrams and to show relationships between symbols. It excels at aesthetically classic flowcharts but could use some flashier features, such as shaded backgrounds, for presentations. Mar 93 --- ** Object Logo Student Edition, Paradigm Software, 617/576-7675, $49.95. This book-plus-disc package offers a wide-ranging introduction to programming concepts. It's aimed roughly at the high-school educational level and lets you see what happens for every few lines of code you type. Jul 93 --- ** Object Master 1.0, ACI US, 408/252-4444, $395. Successful combination of the superior object-management facilities typically found in Smalltalk, and a first-rate programmer's editor. Plus it works with the most popular languages. C, C++, and Pascal. Jan 93 --- ** PG:Pro 1.5, Stax Software, 601/225-7085, $169. For part-time or novice programmers, the combination of these BASIC programming tools and FutureBASIC is a fast path to a working program. Jul 93 --- ** Serious Programmer 3.0, Serious Corp., 801/261-7900, $395. The graphical interface of this application-design environment provides nonprogrammers with tools for creating custom software, but the documentation lacks critical explanations. Jan 93 --- ** Think C 5.0, Symantec Corp., 408/253-9600, $299. While not a radical improvement, this is a significant upgrade to an outstanding development tool. Beginners won't find the documentation helpful. Jul 92 --- ** Think Pascal 4.0, Symantec Corp., 408/252-2370, $249. A remarkable achievement—a programming language and environment full-bodied enough for professional programmers while still inviting for neophytes. No weak points and dozens of strengths. Aug 92

** UTILITIES **

--- ** 7th Heaven 2,5, Logical Solutions, 612/659-2495, $99.95. Seven enhancements to System 7 include a file-copying accelerator, a file-mapping utility, a system-information collector, a screen saver, a simple calendar, a desktop-pattern editor, and a system-alert-icon changer. Our reviewer found them fun and elegant enough, but not all of them were useful. Jul 93 --- ** Alki Seek 2.1, Alki Software Corp., 206/286-2600, $39.95. Competent file-finding utility scans by file name or content and allows you combine multiple search criteria. It cannot search in the background or find text in compressed files. Jul 93 --- ** At Ease 1.0 (1.1), Apple Computer, 408/996-1010, $59. Sweet, simple, secure substitute for the Finder displays a clean, attractive page full of oversize icons where a single click launches a program or document. To delete, rename, or move files, you have to return to the Finder. Mar 93 --- ** AutoDoubleBuff 1.0, Serillant Software, 415/321-5375, $89.95. Designed to operate transparently, this automatic file-compression utility is a practical solution for users without disk space, but it's missing many of the features of dedicated file-compression utilities. Sep 92 --- ** Billy Steinberg's PSTools 1.0.1, Inline Design, 203/455-4995, $99.95. If you want basic PowerBook management without added flotsam or complex maintenance, this tool provides automatic access to information in spreadsheets and databases. Aug 93 --- ** Conflict Catcher and Other Innovative Utilities 1.0 (1.3), Cassidy & Greene, 408/860-9218, $79.95. Enables or disable INITs and start-up items when you boot, with this INIT manager that comes with four other system-related utilities. Its ability to track down INIT-related problems makes it a worthwhile investment even if you own another INIT manager. Mar 93 --- ** Copyright, CSG Technologies, 412/471-7170, $49. If you can justify spending $49 purely for the sake of efficiency, this straightforward utility replaces the Finder's copy function, unsloppily copying files to or from your Mac, in the background, while you move on to more interesting things. Apr 93 --- ** CPU 1.0 (2.0), Connectix Corp., 415/571-5100, $99. Insensible items mix with trivial ones in this collection of utilities for the PowerBook. It's a relatively inexpensive way to turn any PowerBook owner into a full-fledged power user. Apr 93 --- ** DiskFit Direct 1.0, Dantz Development Corp., 510/849-0293, $49.95. But basic and efficient backup system is simple and painless enough to foster better backup habits in anyone who uses it. It doesn't back up hard drives or tape drives. May 93 --- ** Drive 7.3.3 (3.34), Casa Blanca Works, 415/461-2227, $79.95. Universal hard drive upserter and formatter has an attractive, uncluttered interface that's easy to use. Jul 93 --- ** EasyPage 2.0, Portofolio Software, 408/252-0420, $89.95. While this utility greatly simplifies the printing of booklets and double-sided pages, it doesn't support PostScript graphics, is incompatible with some popular applications, and has a buggy drag-and-drop feature. Jul 93 --- ** easyPrint 1.0, SF/O, 408/253-8081, $29.95. Nifty utility lets you switch printers without unused the Chooser. It's a bargain for network users and those who frequently change output devices. Oct 92 --- ** Hard Disk ToolKit Personal Edition 1.1.2, F/WB Software, 415/474-8055, $59. The many arcane features of the heavy-duty Hard Disk ToolKit have been stripped out of this entry-level, non-power-user version, but everything you really need to format, update, partition, and manage your hard drive is included. Jan 93 --- ** INITPicker 3.0 (3.02), Inline Design, 203/455-4995, $79.95. This INIT manager's ability to load alias INITs over a network will interest network managers. While it disables problem INITs at startup, it doesn't help you identify the cause of INIT conflicts that don't cause the Mac to crash at startup. Mar 93 --- ** Inline Sync 1.0 (1.01), Inline Design, 203/455-4995, $129.95. Keep the latest version of your work on your portable machine and your desktop Mac with this file-sync software. It's easy to install, easy to use, easy on the wallet, and does the job well. Mar 93 --- ** MacDesk 1.0, Edmark Corp., 206/656-8484, $39.95. If you have young children who love to experiment with your Mac while you're busy elsewhere, this desktop environment is a fun way to provide easily navigable play while protecting your files and applications from the havoc that curious little fingers can wreak. Jun 93 --- ** Kiiwi Power Menus 1.0, Kiiwi Software, 805/685-4031, $39.95. Simple little utility adds flexibility to the Apple menu by adding a limited number of submenus and enabling you to change the font and size in the menus. Dec 92 --- ** MacPalette 2.2 (2.3), Microspot USA, 408/263-2000, $69. You can paint images from 8-bit and 24-bit color programs when you use ImageWriter II with a four-color ribbon and this new driver that approximates half-tones by dithering. While the results are less than state-of-the-art, so is the cost. Sep 92 --- ** MacTools 2.0, Central Point Software, 503/690-8090, $149. The consistent, 3-D-style interface makes it easy for the inexperienced user to navigate this utility package; the automated hard drive and floppy disk repair capabilities and antivirus capabilities make it an asset for anyone. Oct 92 --- ** MatchFinder 1.0 (1.01), No Hands Software, 415/321-7340, $129.95. Automation adds the laborious task of file management with this software. It creates "agents" or "magnets" that trigger in response to user-specified events and automatically look for files and folders to copy, move, or alias. Feb 93 --- ** MasterFinder 1.2.1, Olduvai Corp., 305/670-1112, $149. Ingenious finder utility provides rapid access to frequently used files and folders, permits operations on several files at once, and saves catalogs of offline volumes, but the many features require some effort to learn. Nov 92 --- ** More Disk Space 1.1 (2.1), Alysia Software Corp., 415/566-2263, $59.95. Automatically compress and expand files with this utility. Although it doesn't identify compressed files, and must run as a start-up application to work automatically, it does offer a measure of control that similar utilities lack. Sep 92 continues
Unleash the performance of your SCSI hard drives with the PLI QuickSCSI, a NuBus SCSI-2 adapter that eliminates the SCSI bottleneck that can compromise your system’s overall performance.

PLI QuickSCSI enables most Macintosh hard drives to operate at their maximum speeds by supporting impressive data transfer rates as high as 5 MB/sec (sustained) and 7.5 MB/sec (burst). But there’s more to QuickSCSI than startling performance. You can mirror drive partitions or add up to four QuickSCSI cards to your Macintosh — that’s support for up to 28 SCSI devices. And, expect complete compatibility with new SyQuest and Magneto Optical mechanisms.

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4.0 VERSION NOW SHIPPING.

Norton Essentials for PowerBook 1.0, Symantec Corp., 310/453-4600, $129. Uneven collection of a dozen PowerBook utilities ranges from the unique and useful instant Access module, which automatically turns AppleTalk on and off, to the relatively inaccurate Battery Gauge feature, which purports to tell you the status of your battery.

Norton Utilities for Macintosh 2.0, Symantec Corp., 310/453-4600, $149. Everything—including-the-kitchen-sink utility package does an excellent job of diagnosing and repairing damaged hard drives and floppy disks, but the interfaces of the various components differ wildly.

Now Utilities 4.0.1, Now Software, 503/274-2800, $129. Many thoughtful improvements have been added to this collection of utilities, which is now better integrated, more logically designed, and still an excellent deal for your dollar. The new scrapbook feature, however, is awkward and inconvenient.

Peace of Mind 1.2.2, Polybus Systems Corp., 716/871-6533, $149. Hardware diagnostic tool performs exhaustive batch, interactive, and benchmark tests on virtually all major Mac hardware components; does an excellent job of diagnosing single simulated hardware errors (such as SIMM tweaking). The program has minor bugs and lacks a comparative test-history feature.

PicturePress 2.5, Storm Technology, 415/691-6600, $199. This image-compression software supports every useful storage mode; has new calculation features for improved image fidelity; offers utilities with practical advantages for day-to-day graphics work; and is twice as fast as version 2.0. If you work with images professionally, it's the clear choice.

Public Utilities for the Macintosh 1.0, Fifth Generation Systems, 504/391-7221, $149. Utility program sticks to the basics of disk diagnosis, disk repair, and file optimization. It does a good, and in some cases unique, job, although disk optimization is slow. The technical support offered by Fifth Generation is excellent.

RapidTrak 1.0.1, Insignia Solutions, 415/694-7600, $99.95. If you've got RAM to spare, this hard drive formatter offers drive-level RAM caching to store frequently used data and improve performance, especially on slower-speed drives.

RetrievIt 1.0, Claris Clear Choice, 408/987-7000, $49. It's great that this nonindexed file-finding utility allows you to search by file name as well as by text, but it is definitely slower than indexed searching. Now 92

Safe and Sound, Central Point Software, 503/690-8090, $49.95. Limited but useful disk protection and salvage utility has a clean, simple interface and is an efficient emergency recovery tool.

Silverlining 5.4, La Cie, 800/999-3919, $149. Extensive and detailed testing is only one of many advanced functions offered by this hard drive-management utility. The interface is lackluster and apt to confuse beginners.

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Circle 117 on reader service card

Star Ratings

Puters, 619/279-2100, $129. For day-to-day backups, this network backup software is a great choice. Its strength lies in its simplicity and its easy-to-use, one-window interface, but it requires a dedicated hard drive. Dec 92

SpeedyCD 1.2.2 (1.2.4), ShirtPocket Software, 602/966-7667, $70. Get info gets faster with this CD-ROM-access accelerator that creates a database of files from a CD and puts it on your hard drive. If you regularly browse through the same CD-ROM folders, this product might save you enough time for it to be worth the $70. Nov 92

Square One 1.5.2, Binary Software, 310/582-8293, $74. Flexible, attractive icon-based file launcher provides infinitely customizable palettes, including one that displays active applications. The manual could use some help, and the application will consume 400K of your system memory. Aug 92

Star Trek: The Screen Saver, Berkeley Systems, 510/540-5535, $59.95. Go where no Mac has gone before with this screen saver based on the original "Star Trek." Modules vary from simple messages in "Trek"-inspired fonts to an endless parade across the ship's main screen of aliens, spacecraft, and artifacts from different episodes. May 93

StuffIt Deluxe with SpaceSaver 3.0, Aladdin Systems, 408/761-6200, $120. Its many conversion tools, able feature set, automatic compression capabilities, reliability checks, and acceptable performance make this product the jack-of-all-trades of compression utilities. Aug 93

Super 7 Utilities, Atticus Software, 203/324-1142, $99.95. Collection of seven control panels/extensions adds some ease of use to System 7, although none of its functions are essential. Modules perform tricks such as turning any menu into a tear-off palette, and randomizing the sounds that play in response to errors. Apr 93

SuperDuper 1.7, NeoConcepts, 408/899-4821, $79. If you're sick of duplicating disks with the Finder, this utility is on acceptable alternative, but there are other utilities that are better, cheaper, and do the same thing. Nov 92

TimesTwo 1.0.1, Golden Triangle Computers, 619/279-2100, $149. Automatic disk compression utility operates at the disk-driver level rather than as an operating system add-on. A number of quirks, such as its ungraceful handling of full disks, are problems. May 93

UpDiff 1.0, Kyzen Corp., 609/354-3863, $169. Innovative program compares two versions of a file, extracts the differences, and creates a difference file that is typically smaller than the original and can be used to update the older file. Dec 92

Voice Navigator 5W 2.3, Articulate Systems, 617/935-5656, $399. Talk back to your Mac (if it has built-in sound input) with this speech-recognition software. Defining macros that respond to voice commands can be frustrating, but the product is a real boon for disabled users. Jan 93

WonderPrint 1.0, Delta Tao Software, 408/730-9336, $59. StyleWriters and DeskWriters produce halftones good enough for newsletters with this printing extension that improves the output of QuickDraw printers and accelerates printing of pictures on PostScript printers. Jan 93

VERTICAL MARKETS

Compare-A-Loan 4.0.2 (4.1), SoftFlair, 612/994-3357, $79.95. Although geared to professionals, this product for home-loan evaluation provides thorough documentation and is structured so that anyone can use it. Its reports compare monthly payments of various home-loan options. Apr 93

ConstructionMac 1.2 (2.5), Reveler Software, 801/485-3291, $159. With a lot of work from you, this software will organize your construction remodeling project. Oct 92

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BUYERS' TOOLS

MACWORLD Star Ratings

★★★★ Diet Balancer 1.0 (1.0S), Nutridata Software Corp., 914/298-1308, $69.95. Easy-to-use personalized weight-planning tool includes a database of nutritional values and standard serving sizes, and is useful for home diet-planning. Dec 92

★★★★ Expert Home Design 1.0 (1.0.3), Expert Software, 305/567-9990, $49.95. Quickly and easily create home- or office-interior layouts that are precise, but not as detailed as blueprints, with this interior design software that includes a large furniture library. It doesn't do automatic side views, or offer X-Y key access to library objects, but it's a good value nonetheless. May 93

★★ Expert Landscape Design 1.0 (1.0.2), Expert Software, 305/567-9990, $49.95. Bare-bones drawing environment for experimenting with landscape design is inexpensive, but its usefulness is severely limited because of awkward color and pattern tools and because it doesn't identify plant types. Feb 93

★★★★ Grade Machine 5.0, Misty City Software, 800/795-0049, $79. Teachers' lives get easier with this software that quickly sets up a useful electronic grade book. Program includes networking capabilities plus dozens of options for printing reports. Dec 92

★★★★ JobTracker 2.02 (2.5), InfoSolutions, 814/355-2983, $395 to $844. Designed specifically for publication management, this scheduling and project-management software isn't completely polished, but it manages the job competently. Dec 92

★★★★ LoanLease Library 3.0.3 (3.05), SoftKrair, 612/894-3357, $99.95. If you are generating a loan or a lease and need to keep track of payments, this well-documented program for loan evaluation is a worthwhile investment, despite its minor eccentricities. Apr 93

★★★★ Making the Grade 2.0 (2.2), Jay Klein Productions, 719/591-9815, $99.95. The Macintosh version of the Apple II program Grade Busters 1/2/3, this grade-book software with dozens of reporting options is easy to learn, but if you're already spreadsheet-literate, the friendly dialog boxes and reminders may get in the way. Dec 92

★★★★ Nutri-Calc Plus 1.2, Cadence Corp., 602/926-2632, $159. Designed for knowledgeable and serious users, this powerful, flexible program manages nutrition information and analyzes diets. Dec 92

★★★★ Roll Call 2.0, By the Numbers, 603/927-4508, $495. 4th Dimension database application for church management helps track donations, attendance, church-group membership, and visitation. While not a complete church-management system, it's an acceptable complement to a general accounting program. Aug 93

★★★★ Stat-Ref 3.2a (3.2b), Teton Data Systems, 307/733-5494, $95. Medical database on CD-Rom lets you search by keyword. Because it provides access to limited sets of journal citations, it's not suitable for research, but it could effectively replace a small reference library in an office. Jan 93

WRITING TOOLS

★★ Correct Writing 2.0, Wordstar International, 415/382-8000, $49. For those who are unsure of the elements of style, this online reference is convenient and comparatively inexpensive, but it is far from complete. Sep 92

★★ DocuComp II 1.0 (1.05), Advanced Software, 408/733-0745, $179.95. Document-management utility compares text in two versions of the same file and reports the differences in a comprehensive, easy-to-follow format. Nov 92

★★★★ EndNote Plus 1.2 (1.3), Niles and Associates, 510/649-8176, $249. Reference database and tool for creating citations and bibliographies is now accessible from within Microsoft Word 5.0, a significant enhancement to an excellent product. Sep 92

★★★★ Final Draft 2.0 (2.0.3), MacToolkit, 310/395-4242, $349. Script-writing gets simpler with this well-conceived software that automates formatting of different elements in a script, including dialogue, action, and slug lines (scene headings). Customization is easy, and macros automate typing of common phrases. Apr 93

★★ IdeaFish 2.0, Fisher Idea Systems,

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HARDWARE INPUT DEVICES

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MODEMS/NETWORK HARDWARE

- Comstation 2, PSI Integration, 408/559-8544, $295. Unusually well designed software accompanies this fax/data modem. The simple, straightforward interface and handy QuickFax DA are positive; uninformative error messages are minor negatives. Jun 92

- Ethernet 1.0 (2.0), Dayna Communications, 801/531-0600, $499. It's possible to connect a single LocalTalk printer to an Ethernet network using this device, but it's an expensive option. Dec 92

- Ethernet Plus, Dayna Communications, 801/531-0600, $499. Support for LocalTalk products on an Ethernet network using this device that can also serve as an inexpensive AppleTalk router. Dec 92

- EtherWrite, Compatible Systems Corp., 303/444-9532, $695. Elegant and cost-effective device with excellent network-management software allows up to six LocalTalk products to connect to an Ethernet network. Dec 92

- PathFinder, Dayna Communications, 801/531-0600, $899. For simple networks, this LocalTalk-to-Ethernet router is a great value, as well as a great time-saver for beginning network managers. It uses AppleTalk only. Jan 93

- PowerModem, PSI Integration, 408/559-8544, $295. Superior fax software distinguishes this fax/data modem for PowerBooks, but it's not the best choice for those who do a lot of online work that requires a high-speed data modem. Jul 92

- PowerPort/Gold, Global Village Communications, 415/929-0700, $499. If you need 14,400-bps throughput, this data/fax modem is a champ. It's improved software and packaging raise the standard for PowerBook modems. Dec 92

- Sportster 14,400 Fax/Data Modem, U.S. Robotics, 708/982-5001, $329. Several nice features, including an easily accessible power button and a front-mounted volume-control dial, make this 100 percent Mac-ready, 14,400-bps fax/data modem better than average. Feb 93

- SupraFaxModem V.32bis, Supra Corp., 508/967-2400, $399.5. Send and receive faxes and data at speeds up to 14,400 bps with this attractively priced fax/data modem. The software works well; tech support is adequate. Aug 92

- Ultima Home Office, Prometheus Products, 503/692-9600, $499. It can reliably transmit data at high speeds and the bugs are fixed, this fax modem with voice mail will be worth a second look. Oct 92

- Viva 14.4/Fax, Computer Peripherals, 805/459-5751, $299. In data mode, this 14,400-bps fax/data modem performed well, but the software bundled with it is barely adequate. Jan 93

- WorldPort 9600 MNP5, U.S. Robotics, 708/982-5001, $499. Only slightly larger than a deck of cards, this 9600-bps modem is geared toward PC users, continues
DON'T CALL ORKIN.*

When the Mac first came around, everybody loved its little rodent. No cursor up. No cursor down. Man, what a handy device. Then people got into graphic arts. Whoops. *Mousetrap! INTRODUCING ARTZ.* The flashy, jammin', way cool ADB graphics tablet from Wacom. ArtZ simply plugs into your ADB port and lets you create graphics using a cordless, batteryless, pressure-sensitive stylus, about the size and weight of a fine pen. Now, creating art on a computer is as natural as creating art on a notepad, a canvas, or even a subway. To see just how flashy and way cool the ArtZ is, TAKE THIS SIMPLE TEST: (1) Cut out the mouse at the top of the page. Blow it up if you like. Now (2) trace it with the mouse on your computer. Then (3) print it, and (4) scurry on down with both to your local Wacom dealer. Don't know where one is? Just call 1-800-922-6615. When you get there, (5) trace the mouse on an ArtZ. Feels good, doesn't it? Now (6) print it and (7) compare the two. OK? Now (8) pull out your pocketbook. You've been doing *mickey mouse art* long enough.

*For the mice that run on a Mac, you can't call for pest control. But for the mice that run on top of a Mac, and under a Mac, and in the cupboards and stuff, call these guys: Orkin Exterminating.

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Star Ratings

with a user guide that never mentions Macs and software that is only for PC compatibles. Jan 93

PRINTERS

★★★ Apple Color Printer, Apple Computer, 408/956-1010, $2349. If you need large-format color output, but not precision color-matching, this well-built printer is a reasonable choice, although it doesn't support PostScript. If you can do without the large-format output, you can find comparable printers at a far better price. Aug 93

★★ C. Itoh ProWriter Printer, C-Tech Electronics, 714/833-1165, $2395. Not only is this laser printer more expensive than most personal page printers, it also offers less-impressive features and so-to-output. Nov 92

★★★★ DEC laser 1152, Digital Equipment Corp., 508/493-511, $999. Four-pages-per-minute, 300-dpi, PostScript level 2 printer offers simultaneous support for Macs and PCs, plus excellent image quality, for a ground-breaking price. The internal font set is small, and the included 2MB of memory is not enough to print complex images. May 93

★★★★ HP LaserJet 4M, Hewlett-Packard, 800/752-0900, $2399. An Intel 89500 RISC processor makes printing complex images faster than ever with this 600-dpi printer, while the Canon LBP-EX print engine and microline toner guarantee smooth curves and crisp characters. An autoswitch feature makes it a flexible option for mixed-platform offices. Feb 93

★★★ HP PaintJet XL300, Hewlett-Packard, 800/752-0900, $2795. The output of this color inkjet printer won't satisfy demanding graphic arts professionals, but it's great for business users interested in printing up their presentations. Oct 92

★★★★ IBM Laser Printer 10A, IBM Corp., 800/458-5835, $2499. Beautifully defined text, razor-sharp line art, clear gray tones—the output from this large, awkwardly designed, 600-dpi PostScript printer is dazzling, and all for under $3000. Aug 92

★★★★ LaserWriter Pro 600 and 630, Apple Computer, 408/956-1010, $2099 to $2529. From their paper handling to their print quality, these laser printers are Apple's best printers, as well as the best printers available in their price range. Unfortunately, they don't support emulation-sensing, and thus may be less desirable for mixed-platform offices than other possibilities. Jun 93

★★★★ LaserWriter Select 300, Apple Computer, 408/956-1010, $83. Inexpensive, low-capacity printer is networkable, and an excellent buy, despite a few weaknesses. Add a 4MB SWM to take advantage of the amazing PostScript capabilities, which allow the printer to generate 91 shades of gray. Aug 93

★★ LaserWriter Select 310, Apple Computer, 408/956-1010, $1099. This big, slow printer is a true Adobe PostScript printer with both Mac and DOS ports, but it's not networkable or compatible with the Communications Toolbox, it can't automatically switch ports, and it doesn't have adjustable paper guides or a preview feature. Aug 93

★★★★ LZR 1560, Dataport, Dataports Corp, 818/897-8000, $3395. Tabloid-size 460-dpi laser printer blessed through our standard printer speed tests and produced output noticeably better than that of 300-dpi printers. It's a good choice for a mixed network. Sep 92

★★★★ LZR 360, Dataport, Dataports Corp, 818/897-8000, $2195. This personal of a PostScript printer is compact, fast, and produces excellent output. Our reviewers experienced low-memory error messages, but most memory problems should be solved with the current shipping configuration of 1MB of RAM. Jul 92

★★ Phaser 2001 Color Printer, Tektronix, 503/682-7777, $5995. This thermal-wax color printer is fast and compact, with versatile paper-handling features. TekColor image-enhancement technologies provide excellent output quality that is, however, poor on letterhead and inexpensive photocopier bond. An additional $99 paper cassette is required to use plain paper. Aug 93

★★ PrintPartner 10W, Fujitsu Computer Products, 408/432-6333, $2450. While this multiplatform continues

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**MACWORLD**

### PRINTERS

**RastorOps CorrectPrint 300, RastorOps Corp.; 408/562-2400, $899.** The cost of high-quality, photo-realistic color printing takes a nosedive with this 300-dpi, dye-sublimation printer. The relatively small (8.1 by 6.6 inches on letter-size media) print area is the only significant flaw. Oct 92

**RealTech Laser 400, Hardware That Fits; 409/760-2400, $3195.** Exactly the same tabloid-size, 400-dpi printer as the Dataproducts LZR 1560, but for slightly less money. And it produces output that is perceptibly better than that of 300-dpi printers. Sep 92

**StyleWriter II, Apple Computer; 408/996-1010, $585.** Apple's ink-jet printer retains the best features of its predecessor, but costs less. New features, such as grayscale printing and the ability to share the printer over a network, make it even more versatile. Jun 93

**Ti microLaser Turbo, Texas Instruments; 800/527-3500, $1649.** An enhanced version of Ti's microLaser Plus, this PostScript Level 2 printer is an admirable performer and a dependable machine, but it leaves you wondering whether the extra $500 is worth it. Jul 92

**WideWriter, GCC Technologies; 617/275-5800, $1699.** Large-format output comes in a reasonably priced package with this ink-jet printer that can automatically feed sheets as large as 14 by 91 inches on manually fed sheets 17 inches wide with an unlimited length. Feb 93

**WriteMove II, GCC Technologies; 617/275-5800, $599.** Portable printer for the PowerBook measures 11 1/2 by 2 by 3 1/2 inches and weighs 2 1/2 pounds. It's no speed demon, but it's fine for short jobs. May 93

### SCANNERS

**Apple Color OneScanner, Apple Computer; 408/996-1010, $1349.** Tests of this impressive color scanner demonstrate unpolluted colors and sharp image details, perhaps due to color filters and lenses that Apple claims were specially designed and tuned for the scanner. Jul 93

**Epson ES-800C, Epson America, 310/728-0770, $1499; Macintosh interface kit $399.** Flexible 400-dpi scanner offers an impressive range of options, including a choice of one- or three-pass scanning, plus a full-featured easy-to-use software package that includes a Photoshop plug-in, a QuarkXPress extension, and a disk accessory that lets you scan an image from the Apple menu. Aug 93

**HP ScanJet IIP, Hewlett-Packard, 800/752-0900, $879.** An elegant piece of technology, this desktop grayscale scanner produces excellent results for a street price of around $750. Matted online help and a flimsy hinge are minor problems. Aug 92

**LightningScan Pro 256, Thunderware, 510/254-6581, $649.** Well-executed hand-held grayscale scanner creates 8-bit scans at up to 400 dpi; images scanned in two passes can be joined flawlessly. The only drawback is slow scrolling in software. Jun 93

**Nikon LS-350AF Film Scanner, Nikon, 516/S47-4355, 8-bit $9535, 24-bit $11,316.** The bread-and-butty style design of this 35mm film scanner may be reminiscent of past models, but many changes make it faster and more convenient. Still, advanced users won't be satisfied with the tools for overriding automatic exposure and tone adjustments. Sep 92

**PageBrush Professional 1.0 (1.02), Mitsubishi International; 413/544-2781, $795.** A brilliant idea with unfortunate rough spots. Gray-scale, hand-held scanners/mouse scans full-page or larger images and produces 300-dpi grayscale files, but the process and software are agonizingly slow; the buttons are hypersensitive, and the product is expensive. Jan 93

### SYSTEMS/STORAGE

**FastCache Quadra, Daystar Digital, 404/967-2077, Quadra 950/900/700 version $499, Quadra 900/700 version $299.** PDS board provides 128K of secondary cache for a Quadra with 15ns static RAM (25ns on 900/700). The average real-world speed improvement is 15 percent, but some operations benefit more from the cache card than others. May 93

**Floptika 20/M, Procom Technology, 714/852-1000, $545.** It is easy to recommend this floptical drive due to its speed, relatively low cost, bundled software, and lack of problems. Although it allows invalid SCSI ID addresses, it's a fine product. Sep 92

**Infinity Floptical 21MB, Peripheral Land, 510/657-2211, $582.** The good points of this floptical drive include extensive documentation, switchable termination, and an autoextent function, but the bad points are the odd size, the incompatibility of the bundled software with System 7, and inappropriate formatting of 800K disks. Sep 92

**Infinity Optical 3.5L, Peripheral Land, 510/657-2211, $1999.** If you need the extra measure of permanence that magneto-optical storage provides—or you want a compact alternative to bulky cartridges—this drive, based on a Sony mechanism and using 3.5-inch disks that store 120MB of data, deserves a look. Jan 93

**Macintosh Centris 610, Apple Computer; 408/996-1010, 4/80B $1859.** Slim-design Mac uses a 20MHz 68LC040 processor at a price-to-performance ratio that comes close to competing with Windows PCs; however, its expandability is severely limited. Jan 93

**Macintosh Centris 650, Apple Computer; 408/996-1010, 4/80B $2699.** Moderately priced but fast 8040 system offers three expansion slots and one drive bay, and (except for the base model) has built-in Ethernet, video circuitry, and a math coprocessor. This desktop Mac is as powerful as a Quadra 700 and two times as fast as a iia. Jun 93

**Macintosh Duo Dock, Apple Computer; 408/996-1010, $1079.** Immensely clever desktop Mac-size housing for the Duo laptops provides back-panel connectors, a SuperDrive, electrical and physical support for external monitors, and two expansion slots. Although the Duo Dock is easy to like, some details, such as the difficulty of installing nulls boards, belie Apple's usual attention to detail. Mar 93

**Macintosh LC III, Apple Computer; 408/996-1010, 4/80B $1349.** Base system comes equipped with a 20MHz 68030 processor, 4MB of RAM, an 80MB internal drive, and 512K of VRAM. This is a machine that fits the bill and the continues...
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Pocket book of most home or small-business owners, Jul 93

★★ Macintosh PowerBook 145, Apple Computer, 408/996-1010, 4/40 $2149. Adequate but essentially outdated notebook computer is an upgraded version of the discontinued PowerBook 140 with a faster 25MHz 68030 CPU, but RAM expansion is limited, and it doesn't have a built-in video port. Feb 93

★★ Macintosh PowerBook 160, Apple Computer, 408/996-1010, 4/40 $2429. A built-in video port and gray-scale capability are the new features Apple offers with this notebook computer. While it offers good processing speed and power, the passive matrix display doesn't cut it for all-day use. Feb 93

★★ Macintosh PowerBook 165c, Apple Computer, 408/996-1010, 4/80 $3399. The passive matrix screen of this color notebook computer is dull and has noticeable afterimages, but if your expectations are reasonable, the speedy processor provides a pleasant environment in which to work. Jul 93

★★★ Macintosh PowerBook 180, Apple Computer, 408/996-1010, 4/80 $4105. An active matrix screen and a math coprocessor are the only differences between this notebook computer and the PowerBook 160, but the beautiful display is worth the extra $1000. Feb 93

★★★★ Macintosh PowerBook Duo 210 and 230, Apple Computer, 408/996-1010, 210 (4/80) $1899, 230 (4/80) $2299. Apple's smallest computer has the pleasing feel, fit, and shape of hardbound books but pack the horsepower of 030 chips. Although the screen, keyboard, and trackball (more of a "trackmarble") feel small, these computers virtually cry out to be picked up, handled, and used. Mar 93

★★★★★ Macintosh Quadra 800, Apple Computer, 408/996-1010, B/230 $4679. Squat, yet curvy and attractive, this minitower system has fewer expansion opportunities than the Quadra 950, but just as much power. It's fast, slick, and moderately priced. Aug 93

★★★★★ MicroMac Plus Upgrade System, MicroMac, 714/362-1000, $598. This 68030 accelerator for the Mac Plus requires desoldering a Plus and using the Plus system board to assemble the MicroMac system. It speeds up the Plus dramatically, and supports an included external full-page monochrome monitor. Jun 93

★★★★★ MultiDisk 150, Iomega, 801/778-1000, $1225. Durable cartridges are one of the strongest reasons to choose this Bernoulli removable drive. Although the drive is slightly more expensive than a SyQuest drive, it's fast and reliable, and the disks are competitively priced. Jun 93

★★★★★ Performance/040 (33MHz), Impulse Technology, 404/889-8294, $2399. For disk-intensive tasks, this 68040 33MHz accelerator board tested slower than the native CPU and, in general, was slower than comparable accelerator boards. It is compatible with all Mac II's. Oct 92

★★★★★ PLI MiniArray 850MB, PLI MiniArray 2GB, Peripheral Land, 510/657-2211, $4999, $6999. These RAID storage systems contain multiple drives that work as a single unit; they're an excellent option for image processing or tasks that involve importing and exporting large files, but the price per megabyte is high. Jun 93

★★★★★ Quantum Passport XL 240, Quantum Corp., 800/624-5545, external chassis $469, 240MB drive $979. An excellent piece of engineering, this fast, trouble-free, removable hard drive solves the problem of how to transport data from one computer to another. The price is only somewhat discouraging. Oct 92

★★★★★ Radius Rocket 33, Radius, 408/434-1010, $2499. The accelerator board of choice for our reviewer, this 68040 33MHz board is fast, reasonably priced, and compatible with a Mac II (with Rev B ROM), IIx, IIci, or Ici. Oct 92

★★★★★ TokaMac II FX 33, Fusion Data Systems, 512/380-5326, $2595. CPU and FPU tasks on a Mac II is faster than on a Quadra 950 with this 68040 33MHz accelerator board, but video- and disk-intensive tasks are still slower. It may be worth the cost if your life already has a fast video board and more than enough memory. Oct 92

Video/Display

★★★★★ BookView Imperial, Computer Care, 612/271-0061, $1399 (includes 6MB of RAM). This notebook-display adapter supports all common sizes of monitors, including 16-inch and 19-inch, plus both Mac and VGA. It is expensive, however, and uses 2MB of system memory for video processing. Feb 93

★★★★★ LTV, Lapis Technologies, 510/748-1600, $349. Interface board allows a Mac LC, LC II, or Performa to use a standard television monitor as a display device. Unfortunately, a standard television is a poor substitute for a color monitor, so while the LTV does its job adequately, the setup is unsuitable for many applications. May 93

★★★★★ Lightning Effects II, Spectral Innovations, 408/955-0366, $1295. Digital-signal-processor chips dramatically speed up Photoshop operations with this expensive Photoshop-acceleration board. It had problems acquiring some JPEG files. May 93

★★★★★ Macintosh 16" Color Display, Apple Computer, 408/996-1010, $1495. The display quality of Apple's 16-inch monitor is tough to beat. It has realistic color, minimal curvature, and a uniform display. Jun 92

★★★★★ Power Portfolio, Sigma Designs, 510/770-0100, $899 or $949. Hook your Classic or PowerBook to this 15-inch portrait-style monochrome display. Built-in QuickDraw acceleration speeds up the slow SCSI connection on the one hand and results in a few software incompatibilities on the other. Feb 93

★★★★★ PowerVision, Mirror Technologies, 612/633-4450, $499 to $999. Separate VRAM means you don't lose system memory with this nicely priced notebook display adapter. It only supports 12-inch and 14-inch monitors, and 15-inch portrait gray-scale and black-and-white monitors. Feb 93

★★★★★ ThunderStorm, SuperMac Technology, 408/245-2202, $699. Photoshop-acceleration board uses digital-signal-processor chips to speed up some Photoshop operations. It's fast, with good JPEG compatibility and a great manual. May 93

★★★★★ VideoSpigot, SuperMac Technology, 408/245-2202, $449 to $1299. Grab video from a camcorder, video deck, TV, or monitor with this easy-to-install board and save it as a 24-bit QuickTime movie. Comes with ScreenPlay, an application that lets you choose from among several compression options, frame rates, and window sizes. May 93
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COMPETITIVE UPGRADES

Click2Change 2.0 Data-Click Software (818/888-2068) is offering this $89.95 desktop customization tool (Aug 93 **** review—"the most versatile tool in its class") for $49.99. Selective Macworld offers expire 10/31/93.

DiskFit Pro 1.1 Dantz Development (800/225-4880) is offering this $25 backup utility (Apr 92 **** review for version 1.0—"makes backing up easy") to users of any other backup program, for $29.95. Exclusive Macworld offers expire 10/31/93.

DISCOUNTS/REBATES/TRIALS

Aiki Seek 2.2 Aiki Software (206/286-2600) is offering this $39.95 file-finding utility (Jul 93 **** review for version 2.1—"a competent file-finder") for $19.95. Exclusive Macworld offers expire 10/31/93.

Alpha $17.99 (510/649-8176) is offering EndNote Plus, a $249 program that builds bibliographies automatically in all major word processors (May 92 **** review—"the best available for their respective interface") to users of Wallpaper, Chameleon, and Now Fun for $39.95. Exclusive Macworld offers expire 11/31/93.

DeltaGraph Professional 2.0 DeltaPoint (800/446-6955) is offering this $295 charting and graphing package (May 92 **** review—"the best general-purpose business and technical charting program available"; 1992 World-Class award) for $89.95 (includes free upgrade to version 3.0). Offer expires 9/30/93.

Easy Alarms 2.1 Nisus Software (800/432-1287) is offering this $49 calendar program (Nov 92 **** review for version 2.0.3—"plenty of nice features") for $29.95. Offer expires 10/31/93.

EndNote Plus 1.3; EndLink 1.1 Niles & Associates (510/649-8176) is offering End Note Plus, a $249 program that builds bibliographies automatically in all major word processors (Sep 93 **** review—"innovative and reasonably priced") for $59.95. Offer expires 10/31/93.

Fair Witness 1.2.1 Chena Software is offering a $25 rebate (upon receipt of registration card and dated sales invoice) on the selling price of this $295 full-service information manager (Oct 92 **** review—"the best available for their respective tasks") at $49.95. Offer expires 9/30/93.

Final Draft 2.0 MacTools is offering this $349 desktop-publishing program (Apr 93 **** review—"well conceived and easily customized") through Dr. Mac (800/825-6227) and Mac's Place (800/881-3090). Anticipated price: $249 to $269 (regularly $299 to $349). Exclusive Macworld offers expire 9/30/93.

Managing Your Money 5.0 MECA Software (203/256-5000) is offering a free 30-day trial (plus $8.50 for shipping and handling) of this $79.95 financial-management program (Jan 93 **** review—"full featured, "excellent price"). Trial users can then purchase it for $29.95 (regularly $34 to $39). Offer expires 12/31/92.

Mathcad 3.1 MathSoft (517/577-1017) is offering this $495 general-purpose calculation tool (Jun 93 **** review—"easy to learn and easy to use") for $79.99. Offer expires 10/31/93.

MathType 3.0 Design Science (310/433-0685, 800/827-0685) is offering this $199 equation-writing program (Mar 93 **** review—"you wouldn't regret buying") as an upgrade to owners of Word 5.0 (which contains a mishmash of MathType) for $49. Exclusive Macworld offers expire 9/30/93.

NetWorks 3.0 Unlimited Caravelle Networks is offering this $995 network-monitoring software for AppleTalk, TCP/IP, Novell IPX, DECnet, and SMNP (Jun 92 **** review for NetWorks 3.0—"worth its weight in gold") for $699 to users and dealers, only through authorized reseller TeamNet Technologies (800/379-6429; fax 415/474-9075). Exclusive Macworld offers expire 10/31/93.

Office Manager and Mail Manager 2.6 White Crow Software (802/658-1270) is offering this $149 combination of a contact/project manager (Dec 92 **** review—"office Manager 2.1—"simple but powerful") and a mail manager for $79. Exclusive Macworld offers expire 12/31/93.

PosterWorks 3.0 S.H. Pence & Co. (617/338-2222) is offering a 10 percent rebate (upon receipt of registration card and dated sales invoice) on the selling price of this $395 large-format graphics production tool (Aug 93 **** review—"really has no competition") when purchased direct or through a reseller after 7/31/93. Exclusive Macworld offers expire 9/30/93.

SigaPlot 4.11 Jandel Scientific (415/453-7769) is offering this $495 scientific grapher (Jul 92 **** review—"a program every experimental scientist needs") for $199. Exclusive Macworld offers expire 12/31/93.

Thunder 7.1.5.3 Baseline Publishing (800/926-9677) is offering this $99.95 spelling checker and thesaurus (Jul 92 **** review for version 7.0—"its speed, customization, and features are admirable") for $49.95. Exclusive Macworld offers expire 10/31/93.

ZP4 11.8 Semaphore Corp. (408/688-9200) is offering four quarterly editions of this $24 zinc code verification software on CD-ROM (May 92 **** review for version 1.0—"an invaluable complement to database or mailing-list software") for the price of three, or $375 instead of $500. Exclusive Macworld offers expire 8/31/93.
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A quick and easy product index from MacWorld. Simply use this index to find the page or advertiser of the products which interest you. Then, use the reader service number for our FastFacts Product Information Card located on the next page.

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Please answer these questions so that we may better serve you.

A. Including yourself, approximately how many people are employed at your entire work-site? (Check all that apply.)
   □ 1000+  
   □ 999 - 100  
   □ 99 - 25  
   □ Under 25

B. Which of the following computers are installed at this entire work-site? (Check all that apply.)
   □ Apple Workgroup Servers/ 
      Mac Quadra-series  
   □ Macintosh Quadra-series/ 
      400/600/600SE/ 
      Performa/PowerBook/ 
      Pro Macintosh/ 
      Macintosh/ 
      PowerBook series/Duo-series

C. What is the total number of Mac 
   installed at this entire work-site? (Check one.)
   □ 500+  
   □ 499 - 100  
   □ 99 - 50  
   □ 49 - 10  
   □ 9 - 1  
   □ None

D. For how many Macintosh computers 
   within this entire work-site do you have 
   in-house spreadsheet and/or 
   graphics/publishing software? (Check one.)
   □ $99.999 - $50,000  
   □ $999.999 - $500,000  
   □ $9999.999 - $50,000,000  
   □ Under $10,000  
   □ None

E. In which areas are you ever involved 
   in purchase decisions for Macintosh 
   products at this entire work-site? (Check all that apply.)
   □ Bike/Buy/ 
   □ IT/IP/ 
   □ Server/ 
   □ Network/ 
   □ Network/ 
   □ MultiMedia/ 
   □ Mobile computing products

F. Over the next 12 months, how much 
   will the entire work-site spend on 
   Macintosh products and/or services? (Check one.)
   □ $1 million or more  
   □ $999,999 - $500,000  
   □ $999,999 - $100,000  
   □ $9999.999 - $50,000,000  
   □ Under $10,000  
   □ None

G. Considering the entire work-site, which 
   of the following Macintosh hardware 
   and software products are currently 
   installed? (Check all that apply.)
   □ Business software (Word 
      processing, spreadsheet, database, etc.)
   □ Graphics/publishing software
   □ Monitors/displays
   □ Printers/scanners
   □ Networking/communications 
      hardware and/or software
   □ Mobile computing products 
      (PowerBook, peripherals, software, etc.)

H. What is your primary job function? 
   (Check one.)
   □ Business software (Word 
      processing, spreadsheet, database, etc.)
   □ Graphics/publishing software
   □ Monitors/displays
   □ Printers/scanners
   □ Networking/communications 
      hardware and/or software
   □ Mobile computing products 
      (PowerBook, peripherals, software, etc.)

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Phoneret 8pin minidin $25
Phoneret Star Controller .............. $879
Timbuktu ............. $119
Timbuktu Remote ... $129

PSI
PowerModem I ........ $149
PowerModem II ...... $225
PowerModem III .... $315
PowerModem IV .... $425
Comstation I ........ $135
Comstation V ....... $429

Prometheus
Home Office 24/96 ... $189
Ultimate Home Office $375

Shiva
LANPower/L ........ $599
Tech Works
GracelAN 50 user ... $275

Dayna
Daynaport E/Z .... $269
Daynaport E/SE .... $149
DosMounter Plus .... $54
Daystar HUB 24 ... $869
EtherPrint ......... $339

Dataviz
MacLink Plus Translators ............... $99
MacLink Plus/PC ... $119

Freesoft
WhiteKnight ........ $79
Sonic Systems
LaserBridge .......... $135
SuperBridge ......... $169

Are you Paying too Much for Networking?
MacNet offers a complete Networking Solution to allow Macs and PCs to communicate on High Speed Ethernet Networks. Experience the Difference!
NLS49 Thin, Thin, Twisted-Pair for NuBus Family
E6470 Thick, Thick, Twisted-Pair for SE/60, IIsi LC486 Thin and Twisted-Pair for LC, LCII, LCIII

Special Intro Offer on any Ethernet Card $99
Limit One Per End User • Limited to Models Shown Subject to change without notice.

Supra FAXModem 14,400 v.32bis
Turn your computer into a state-of-the-art telecommunications tool! The top of the line Supra FAXModem features 14,400 bps fax and data, v.32bis data compression, Silent Answer™ and optional Caller ID. And you also get Supra's revolutionary status display, with 28 different messages to tell you what your modem is doing! Includes FREE software and cable!

Supra FAXModem $289
Wacom 12x12 Tablet
Superior drawing tablet compatible with all popular drawing and publishing programs. Includes programmable-control pressure sensitive cordless stylus. Comes with 30 day money back guarantee!
12x12 Tablet
$688
12x12 Tablet
$788

Adobe
Illustrator $359
Super ATM $89

Aldus
Pagemaker 5.0 $579
Freehand $369
Fetch $189

Caere
Omnipage Direct $259
Omnipage pro $549
Image Assistant $329

Quark
Quark X Press $545

Fractal
Color Studio $489
Painter $269
Sketcher $95

Light Source
Ofoto $269

HSC
KAI's power tools $89
Supermac
Thunderstorm $569

Radius
Authorized Reseller

Rocket 33
Best Selling 040 Accelerator for Quadra 950 Performance!
New! On-Site Service!

Radius
$1399
RocketShare
for true Multitasking $399

UMAX

UMAX UG630 Scanner
Exclusive Offer! Now buy the UG630 Grayscale Scanner and receive a FREE kit to upgrade the UG630 to the UC630. UMAX's highly rated 600dpi 24-bit color scanner! Upgrade is user-installable or we will upgrade for nominal charge. Includes PhotoShop LE.

$795

UMAX UG630
with Upgrade Kit $795

UMAX UC840 Scanner
Highly rated 800dpi 24-bit color scanner includes full copy of new PhotoShop 2.5!

$1325
<table>
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<td>Word 5.1</td>
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<td>Claris</td>
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<td>MacWrite Pro</td>
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<td>Biz Plan Builder</td>
<td>$75</td>
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<tr>
<td>SEE OUR POLICIES ON LAST PAGE</td>
<td></td>
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</table>

**World's Fastest Double-Speed CD-ROM**

Let ProCom's MacCD Station-2 transform your Macintosh into an interactive reference, entertainment and learning system. It provides everything you need to get started, including 7 of the best multimedia CD-ROM software packages with amplified speakers and headphones. 100% Kodak single-session and multisession PhotoCD compatible, 200ms access time — world's fastest!

**MacCD Station-2**

**HARRIS**

**ACCELERATORS**

The Performer 2 series of accelerators for the Macintosh Classic and Macintosh SE will make your machine over 230% faster! Includes a custom 64K SRAM Direct Map Cache Circuit. Video Port for future large screen monitors. Plug and play installation.

**Harris SE Accelerator**

**Harris Classic Accelerator**
Sweet 16 Monitor

Affordable high resolution large screen color display solution

- Greater viewing area than 13" monitor
- Superior ergonomics — 75Hz refresh rate, plus tilt-swivel base
- Anti-glare screen coating
- Universal power supply

RasterOps Sweet 16 $995

Mac Depot

QUANTUM EXTERNAL HARD DRIVES
42mb ...........................................$229
85mb ..........................................$245
127mb .........................................$269
170mb .........................................$285
240mb .........................................$369
425mb .........................................$689
525mb .........................................$779
1.0GIG .......................................$1109
1.2GIG .......................................$1219
MAXTOR EXTERNAL HARD DRIVES
120mb ..........................................$259
212mb ..........................................$335
240mb ..........................................$399
340mb ..........................................$529
540mb ..........................................$919
1.2GIG .......................................$1379
(All drives includes FWB HD Tool Kit)

Global Village
(Teleport modems include Z-Term)
Teleport Bronze .........................$175
Teleport Silver ..........................$325
Teleport Gold ............................$375

PLI
Infinity 88/FW44 ........................ $689
Infinity 40 .................$499
Infinity Magneto
Optical 128mb .....................$1359
Multisession CDROM External .............................................$689
Multisession CDROM Internal .............................................$549
QuickSCSI
NuBus Card ..................................$349

SHARP
JX9600PS Laser Printer ..............$1099

MANNESMANN TALLY
Mobilewriter PS ......................$869
(Postscript portable printer)
Ribbon 5 pack .............................$59

SEE OUR POLICIES ON LAST PAGE

SONY High Performance 14" Color Monitor

- Vertically flat screen reduces distortion
- .25mm super fine dot pitch
- High resolution: up to 1024x768 non-interlaced
- Low magnetic emission: meets Swedish VLF and ELF standards

SONY CPD1304S $549
QuickImage 24
Video Frame Grabber Card

A MACDEPOT EXCLUSIVE — This great closeout Frame Grabber captures fast moving, full motion video images in 24-bit color or 8-bit grayscale. With special image filters, you have the ability to enhance all or portions of an image with blur, sharpen and solarize.

QUICKTIME COMPATIBLE!
Hurry! Very Limited Supply!

MASS Micro QuickImage 24 $139!

TransWar 4300 $379
(LO/LO & Color Classic accelerators)
Plus Drive $279

Daystar Digital
Turbo 040 25MHz $1079
Turbo 040 33MHz $1329
Power Cache 33MHz $375
Power Cache 40MHz $539
Power Cache 50MHz $709
FastCache 700/800/900 $950 $375

Kensington
AntiGlare Filter 13" $59
Extra Long ADB Cable $25
Power Tree 20 $25
Power Tree 50 $35

Supermac
Futura SX $499
Futura MX $879
Futura LX $979
Spectrum '24 series IV $875

The first affordable high performance 1200dpi scanner!
High resolution image capturing is the latest requirement in high technology desktop publishing. Color accuracy combined with outstanding speed and reliability ensures Tamarack will remain on the cutting edge of scanning technology. Our optional transparency adapter gives you the added versatility of scanning transparent documents to a full 8.5x11.75".

Tamarack 1200 Scanner $1699

The Tamarack will change the color of the way you do business
Buy The Best

DGR Technologies Optical Storage Setting the Standard for Excellence

- DGR 128REMe
  3.5" Magneto-Optical
  768 Kbs Transfer Rate
  34 ms Average Seek Time
  < 1 ms Short Seek Time
  $999

- DGR 128REMi Turbo
  3.5" Magneto-Optical
  768 Kbs Transfer Rate
  30 ms Average Seek Time
  1.5 ms Short Seek Time
  $1149

- DGR 128REM
  3.5" Magneto-Optical
  625 Kbs Transfer Rate
  < 40 ms Average Seek Time
  < 1 ms Short Seek Time
  $1299

- DGR 256REM
  3.5" Magneto-Optical
  1.23 MBs Transfer Rate
  35 ms Average Seek Time
  1.2 ms Short Seek Time
  The DGR 256REM was not only the fastest drive we tested, but it can also store 256 megabytes of data on a single cartridge - and it is able to read from and write to 128-megabyte cartridges. - Harlshen Labs, April 1993
  $1799

- DGR 650REM
  5.25" Magneto-Optical
  680 Kbs Transfer Rate
  70 ms Average Seek Time
  2.2 ms Short Seek Time
  WORM Compatible
  $2199

Every industry has a leader. A company that is so far above the rest, they become the outstanding point of comparison for all the others.

But we didn't get here by accident.

DGR Technologies sweeps the industry in every major review because we strive for a standard of excellence that's a cut above the competition. We add the best driver software because we know people expect a blazing fast drive. We include the highest quality double-shielded SCSI cables and heavy duty metal enclosures to ensure long product life. And every DGR drive ships with the most outstanding optical media available - complete with a lifetime warranty and free data recovery. To top it off, DGR Technologies offers the most amazing service in the industry: A 30-day, no questions asked, money back guarantee. Up to a two-year warranty. And toll-free technical support.

Buy The Best, Direct from DGR Technologies. Or call to find an authorized dealer near you.

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Our Standard Of Service Leads the Industry.

- 30-Day Money Back Guarantee
- Full One-Year Warranty
- Toll-Free Technical Support

To order call TOLL FREE Monday-Friday 9am to 7pm CST. DGR Technologies accepts MC, Visa, Discover, Pre-Paid & COD Orders.

DGR TECHNOLOGIES 719 West Street, Suite 205 Austin, Texas 78701 • 512-476-6885 • Fax 512-476-0999 • AppleLink: DGR

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Circle 65 on reader service card

MacUser Labs

September 1993 293
<table>
<thead>
<tr>
<th>Product</th>
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<tbody>
<tr>
<td>Mass Microsystems</td>
<td>$809</td>
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<td>DataPak External SyQuest Drives</td>
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<td>44 MB</td>
<td>469</td>
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<td>68 MB (RW 44 MB)</td>
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<tr>
<td>105MB SyQuest</td>
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<td>DataPak External Magneto-Optical Drives</td>
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<td>128 MB</td>
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<td>650 MB</td>
<td>2,389</td>
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<td>CD-ROM Drive</td>
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<td>DataPak CD-ROM Drive</td>
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<td>120 MB</td>
<td>439</td>
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<td>210 MB</td>
<td>489</td>
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<td>1,279</td>
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<tr>
<td>1,000 MB</td>
<td>1,959</td>
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<tr>
<td>Mass/Max Internal Hard Drives</td>
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<tr>
<td>120MB</td>
<td>279</td>
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<td>60 MB</td>
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<td>HitchHiker Ultra Compact Hard Drives</td>
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<td>80 MB</td>
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<td>120 MB</td>
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<td>HitchHiker Drives for the PowerBook</td>
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<td>80 MB</td>
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<td>120 MB</td>
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<td>Asante MacCon 3 IV/IV/10-T</td>
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<tr>
<td>Asante EN/SC IV/IV/10-T</td>
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<tr>
<td>Call for Complete line of Asante products</td>
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<tr>
<td>Dayna L2/LCIV/IV/10-T</td>
<td>159/159</td>
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<tr>
<td>Dayna Friendly Net Tr or TO</td>
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<tr>
<td>Call for Complete line of Dayna products</td>
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<tr>
<td>Printers</td>
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<tr>
<td>GCC Writer/Move II Portable Printer</td>
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<td>Ti-PS17/PS3</td>
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<td>CoStar LabelWriter IV/IV+</td>
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<td>Call for other Brands/Models/Supplies</td>
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<td>OMS &amp; Others</td>
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<td>MAC Needs</td>
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<td>SIMM Remover</td>
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<td>Maxima 2.0/Option 32</td>
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<td>Virtual 3.0/Compact Virtual</td>
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<td>Kensington Mouse Mouse</td>
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<td>LC/Classic 16mz Math CoProcessor</td>
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<td>LC/M-Math Co-Processor</td>
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<td>Wriststave/Mousepad</td>
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<td>AXUSB 3 Port Serial Switch</td>
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<td>Quantum 86 PR20127PRO</td>
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<td>Quantum 170 PR20420PRO</td>
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<td>Quantum 525/1.2Gig. PR20127PRO</td>
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<td>LC 040 25MHz</td>
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<td>I.SI Adapter Card VS/FPU</td>
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<td><strong>Wacom</strong></td>
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<td>(Others models Available)</td>
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<td>350T Tablet</td>
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<td>250T Digitizer Tablet</td>
<td>389</td>
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<td><strong>DISPLAY &amp; VIDEO PRODUCTS</strong></td>
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<td>PaintBoard Turbo 20&quot;, 16&quot;, 13&quot;</td>
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<td>PaintBoard II 20&quot;, 16&quot;, 13&quot;</td>
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<td>24XLI 24&quot;, 16&quot;, 13&quot;</td>
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<td>Movie Pak Druggboard</td>
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<td><strong>Monitor</strong></td>
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<td>Sony 1440 14&quot; MultiScan</td>
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<td>Sony GUM Z56cs 26&quot; MultiScan</td>
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<tr>
<td><strong>Daystar Digital</strong></td>
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<tr>
<td>NEW! Turbo 040 Accelerators</td>
<td></td>
</tr>
<tr>
<td>Use the maximum in 8040 acceleration along with all the capabilities of the PowerCache. The effective way to increase productivity up to four times, or total gain: 8040 cache batch performance only.$899. 25 MHz Turbo 040</td>
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<tr>
<td>33MHz Turbo 040</td>
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<td>040 20MHz Turbo NO FPU</td>
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<td>040 33MHz Turbo NO FPU</td>
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<td>FastCache Quadra (700/900 Only)</td>
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<td>FastCache Quadra (ALL QUADRAS)</td>
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<td>RAM Power Card</td>
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<td>Charger</td>
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<td>120 MB</td>
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<td>1,959</td>
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<td>HitchHiker Ultra Compact Hard Drives</td>
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<td><strong>Universal Powercache</strong></td>
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<td>The PowerCache is an award winning design that gives you affordable DDS00 performance and the best in compatibility. Just slip it in and go - no cabling and it works with everything. Upgradeable to Turbo 3+ 33MHz/33MHz w/WPU</td>
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<tr>
<td>40MHz/40MHz w/WPU</td>
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<td>Adaptor</td>
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<td>Combocache HLI w/WPU</td>
<td>215/301</td>
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<td>Equilizer LC w/WPU</td>
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<td>Celeron HLI w/20MHz w/WPU</td>
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APS HARD DRIVES

<table>
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<tr>
<th>Model</th>
<th>Internal</th>
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<td>APS Q 127</td>
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<td>APS MX 245</td>
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</tr>
<tr>
<td>APS Q 245</td>
<td>329</td>
<td>399</td>
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<tr>
<th>Model</th>
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<td>Powercache Adapter</td>
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<td>Fast Cache Quadra 700, 900</td>
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<td>Fast Cache Quadra (All)</td>
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<td>33 MHz Turbo 0-40</td>
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<td>Fast Cache Turbo 33-128Bk</td>
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**Model CD ROM**

Airbourne's Texcel External CD-ROM Drive $448

**SyQuest**

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**CD ROM**

Albourn's Texcel External CD-ROM Drive $448

**Modems**

**Prometheus**

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<tr>
<td>Home Office ext 14.4/14.4 Fax w/ V.42 bis &amp; voice</td>
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<td>Promodem 144e Internal for Powerbook 14/14.4 Fax w/ V.42 &amp; V.42 bis.</td>
<td>$258</td>
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<td>Promodem 24e ext 24/9656 Fax w/ V.42 &amp; V.42 bis</td>
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<td>Promodem Mini 2400 2400 BPS mini, data only</td>
<td>$79</td>
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<td>Faxmodem PKT Portable 96/96 SR Fax with 2400 BPS modem</td>
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<td>Faxmodem FXV V.42 bis/MNP5/2400 BPS, 96/96 SR Fax</td>
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<td>Faxmodem VX V.32 V.3.2 &amp; 4 data &amp; fax, V.42 bis/MNP5</td>
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**Zoom Telephonics**

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<td>All units come with Microphone LT &amp; STF FAX Software Promodem PBK for Internal Powerbook 96/48 SR Fax w/ 2400 BPS modem</td>
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<td>Faxmodem PKT Portable 96/96 SR Fax with 2400 BPS modem</td>
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<td>Faxmodem FXV V.42 bis/MNP5/2400 BPS, 96/96 SR Fax</td>
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**Scanners**

**UMAX**

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<td>UG630 - Grey Scale w/ Free Photoshop</td>
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<td>UG630 - Color w/ Free Photoshop</td>
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<td>UG840 - Color with Free Photoshop</td>
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**Optical & DAT Drives**

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<td>128 mb Epson Optical</td>
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<td>128 mb Fujitsu Optical</td>
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<td>256 mb Most Optical</td>
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**Memory**

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**Hard Drives**

**Conner**

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<td>85 mb LPS</td>
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<td>170 mb LPS</td>
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**Quantum**

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**Toshiba**

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<td>3.5&quot; &amp; 2.5&quot; Disk Drive (2 Year Warranty)</td>
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<td>2.5&quot; 213 mb</td>
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<td>3.5&quot; 830 mb</td>
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<td>3.5&quot; 1.2 Gig</td>
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**Fujitsu**

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<td>3.5&quot; 520 mb</td>
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<td>3.5&quot; 1.1 Gig</td>
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**Seagate**

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<td>3.5&quot; Half Height Drives (1 and 5 Year WARRANTIES)</td>
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<td>1.2 Gig</td>
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<td>Wren and Elite Series (3.5&quot; Full Height Drives)</td>
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<td>Wren 8.1 Gig</td>
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<td>Elite 1.6 Gig</td>
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<td>3.5&quot; 2.4 Gig</td>
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<td>3.5&quot; 3.4 Gig</td>
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**Media**

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<tr>
<td>SyQ16 cart</td>
<td>$104</td>
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**Circle 165 on reader service card**
EDITOR'S NOTE: Here at Tiger we love our Mac computers, but we keep finding "The application is not supposed to respond," and "AppleTalk has unexpectedly quit" messages. We found out that the amount of memory they came with from Apple just wasn't enough for the newer applications. So we called the Apple Dealer and procured extra memory. Now we can keep stock up to $256 MB of memory! We knew something wasn't right, so we set out to find a better way.

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<th>Your Computer</th>
<th>Comes With</th>
<th>Upgrade To</th>
<th>Price</th>
<th>Order This Kit</th>
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<tr>
<td>Plus &amp; SE</td>
<td>1MB</td>
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<td>$79.00</td>
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**MACINTOSH MEMORY**

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<tr>
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<td>$169.00</td>
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Scan your prints out with four high-powered scanners. Scanned images look just like the original. Built to stand up to the punishment of constant use, the new ScanOffice grayscale scanner is the ultimate office scanning solution. The 600 dpi scanner is the perfect first scanner for Mac users wanting crisp, rich color. The 800 and 1200 dpi color scanners are the choice of professionals who demand the last word in ultra-sharp focus, crisp type detail and ultra-sharp focus. All ScanOffice scanners feature the best flatbed design and are crafted with extraordinary optics — on board self-alignment, pin-point precision and single-high accuracy. New software interpolation doubles the resolution — and it’s free with every scanner!

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After testing the most popular color scanners, PC Computing rated the UMAX 1200 and 600 as the industry's Best Color Scanners. Unmatched performance, reliability and value.

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**UC840 Color Scanner Sharp Images...** Vivid colors. The UMAX UC840 captures 16.8 million colors with a variable scanning resolution from one to 800 dots per inch. The UC840 merges award-winning technology with state-of-the-art craftsmanship, presenting crisp and clear images. The UC840 offers added flexibility with its four scanning modes, using color, grayscale, halftone and monochrome modes to create high-quality images.

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  - 127mb | 17ms | $199 | $259
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- **New Barracuda**
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    - 1.2GIG | ST1120N | 10.5ms | 1000mb | $995 | $1055
    - 2.4GIG | ST1240N | 9ms | 2000mb | $2129 | $2289
    - 2.4GIG | ST1255N | 8ms | 2050mb | $2399 | $2459

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    - 2.1GIG | ST2100N | 12.9ms | 1900mb | $1549 | $1649
    - 1.6GIG | ST1600N | 11.5ms | 1900mb | $1659 | $1759
    - 2.4GIG | ST2400N | 11ms | 2050mb | $2069 | $2169
    - 3.4GIG | ST3400N | 11ms | 2750mb | $2759 | $2859

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  - 212mb | 7210S | 15ms | 222mb | $269 | $329
  - 240mb | 7240S | 15ms | 255mb | $279 | $339
  - 345mb | 7345S | 12ms | 327mb | $399 | $459
  - 540mb | MXT-540 | 8.5ms | 621mb | $899 | $959
  - 1240mb | MXT-1240 | 8.5ms | 1150mb | $1289 | $1349

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  - 3.5GIG WangDAT 3100 DAT, DDS | $1045 | $1065
  - 3.5GIG WangDAT 3200 DAT, DDS | $1275 | $1295
  - 3.5GIG HP 3540A DAT, DDS | $1179 | $1199
  - 3.5GIG HP 3540A DAT, DDS | $1299 | $1319

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- SIMM
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- SuperMac 20/30 Multimode XL
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$438.

VideoFusion 1.5
The award-winning special effects software for QuickTime post production is now faster and boasts new features. Field rendering support means smoother movement when output to videotape. A new NTSC-safe filter corrects colors for broadcast opportunity. And special effects processing tools (like pan, zoom, rotate, warp, and morph) are accelerated by up to 100 percent. Minimum requirements: Mac II, 5MB RAM, System 7.0, QuickTime hard drive, and QuickTime.

$528.

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$99.

Aldus SuperPaint 3.5
Aldus SuperPaint is the complete painting, drawing, and image enhancement tool. It gives you the ability to create a wide range of graphics within a single environment. SuperPaint includes 1-, 8-, and 32-bit document capabilities. And you get an extensive gallery of colors, patterns, textures, gradients, and transfer modes, plus the freedom to create your own. Minimum requirements: Mac SE, 2MB RAM, System 6.0.5, a hard drive.

$1798.

ArtiScan 12000C with Photoshop 2.5 Bundle
Scan art with remarkable accuracy. TamracArt, ArtiScan gives you state-of-the-art resolution and impeccable color image quality. Art and technology unite in 1200 x 1200 dpi, high-resolution, so your pictures, photos, and graphics are reproduced on-screen with spectacular accuracy. Photoshop 2.5 is included and a transparency option is available. Adobe Photoshop 2.5 is the world's leading photo design and production tool. Design and produce color and black-and-white images, right at your desk. Start from scratch or with any scanned image. Add or correct color, create delicate outlines, paint illustration files, create diatoms, textures, and gradients, and more. Then produce it with professional controls for four-color process proofing and separations. Minimum requirements: SE, 2MB RAM, System 6.0.4, hard disk.

$88.* Action!

$489.

MacTransportable 90 Pro
Get Action for $88 when you buy the MacTransportable 90 Pro. Action makes it easy to create dazzling presentations that combine motion, sound, text, graphics, animations, and QuickTime movies. The built-in ClipMedia library of graphics, sounds, and animations gives your presentation a professional look and sound in an instant. (#6532, MacroMedia) The Bernoulli MacTransportable 90 PRO is designed especially for the Mac, at a low price. This external, removable disk drive comes complete with a 90MB cartridge and installs easily without an interface. You'll enjoy unlimited storage expandability, lock/key security, and portability. As with all Bernoulli, the pinched design resists head crash. And the sturdy discs can survive a drop of eight feet! (#5012, IOMEGA)

Must purchase MacTransportable 90 Pro or Multidisk 150. Minimum requirements: Mac Plus, System 6.0, 3MB RAM and System 6.0.2 for Action!

$798. MacTransportable Multidisk 150 (#5560)

$184.

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This graphics processing toolbox will save you time, effort, and money. It translates from and to over 50 bit mapped graphic file and animation formats for Mac, DCS, Windows, Silicon Graphics, Sun Microsystems, Amiga, and others. You can even edit images without the creating screen. Both processing and internal scaling functions save time by automating repetitive manipulation and editing tasks. Create QuickTime inter-screen effects with background reveal features. Debabelizer will also report and display differences between original and revised images. Jack Langman, VP Engineering at Berkeley Systems (makers of After Dark) says, "DeBabelizer has the best cross platform graphics translation for serious graphics production. We couldn't produce our graphics without it." Minimum requirements: Mac Plus, 2MB RAM, System 6.0.7.

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Minimum requirements: Mac Plus, 1MB RAM, System 6.0.5, hard drive or external floppy.

*Introductory price good through 8/31/93.

$138.

**Rae Assist**

Rae Assist has everything you need to successfully manage your contacts, schedule, to do's, projects, notes, pictures, and other personal and business information. All your information is in one convenient and highly-integrated application. Feel; find and link information for easy retrieval. For example, you could list or find all entries that are tagged "clients" or "suppliers." Tags are fully customizable, and linking files keeps you organized. A built-in smart assistant helps you save time. Easy entry and import your data once, and start using it in multiple ways. Quickly find, sort, and print all your information. Ideal for the PowerBook. Also featured is "The Super File." 

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Do the PC one better by bringing PC applications to your Mac! There's no need to add hardware. With SoftPC, software does it all. SoftPC Professional 3.0 emulates VGA graphics, giving you 256 colors and increased monitor resolutions to show crisp, realistic, and vibrant graphics. It emulates an 80286 processor and an Intel 8087 math coprocessor. Run protected-mode MS-DOS applications which have been written to utilize extended memory. MS-DOS 5.0 is pre-installed. Also, Microsoft CD-ROM extensions are also included, which means that you can run PC CD-ROMs with your Mac CD-ROM drive. Plus, you can easily copy and paste text and graphics between PC and Mac applications.

Minimum requirements: SE/30, 1MB RAM, System 6.0, 4MB hard drive space.

$288.

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Minimum requirements: Mac Plus, System 6.0.2.

$82.

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This is the new version of the 1992 Editor's Choice winner. It's the only to-do list manager that lets you organise all your activities in an outline, a prioritized list, and on your calendar. So you choose what works best for you. Includes FREE DynoPage Lite which prints pages for Day Timers, Day Runners, and other organizers.

Minimum requirements: Mac Plus, 32K RAM, System 6.0.7.

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Minimum requirements: Mac Plus, 1MB RAM, System 4.1.

$99.

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Minimum requirements: Mac Plus, 1 MB RAM, and System 6.0.3.

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Minimum requirements: Mac Plus, 1 MB RAM, System 6.0.

**$148.**

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"FutureBASIC is a complete, easy-to-learn, real-world programming tool," says Macworld. It has high-level, object-oriented extensions to the BASIC language for creating windows, menus, buttons, and even scrolling text/edit fields with a single statement. It also supports an in-line assembler, unrestricted access to the Mac toolbox, and the ability to compile virtually any size of Mac code resource.

Minimum requirements: Mac Plus, 1 MB RAM, System 6.0.

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Minimum requirements: Mac Plus, 1 MB RAM, System 6.0.3.

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Minimum requirements: Mac Plus, 1 MB RAM.

**Sony HD 3.5" 10-Pack**


Minimum requirements: Mac Plus, 1 MB RAM, System 6.0.3.

**PGPRO 1.5**

Macworld says, "Stac Software has produced the equivalent of an object-oriented programming (OOP) environment that doesn't require previous OOP experience." PGPRO adds a graphical development interface to FutureBASIC and other object-oriented extensions. It lets you draw your interface and then generate the source code and resources necessary to recreate it.

Minimum requirements: Mac Plus, 1 MB RAM, System 6.0.

**FutureBASIC**

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Minimum requirements: Mac Plus, 1 MB RAM, System 6.0.

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  - 24-bit Color, 1,200x1,200 dpi
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<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Internal</th>
<th>External</th>
<th>Price</th>
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<tbody>
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<td></td>
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### DESKTOP SCANNERS

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<tr>
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<td>800x600</td>
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<tr>
<td>Microtek</td>
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<td>$1,069</td>
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### 3.5” OPTICAL DRIVES

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<tr>
<td>Fujitsu</td>
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<td>Sony</td>
<td>256MB</td>
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<td>Maxoptix</td>
<td>512MB</td>
<td>$699</td>
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### SYQUEST DRIVES

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<td>4MB</td>
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<td></td>
<td>8MB</td>
<td>$599</td>
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</table>

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- **Sony 946/550mb**
  - In LO as...$45

### TOSHIBA

- **877MB**
  - $1,011
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  - $1,019
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  - $1,299

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  - Multi Session/Dual Spin
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  - $469
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- Display $1927
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- Power Card $219
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<th>Model</th>
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#### POWERBOOK MEMORY

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<td>PBDUO210/230-20MB</td>
<td>$1695</td>
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</table>

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TWO YEAR WARRANTY

FUJITSU

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<td>2.4 GB</td>
<td>11ms</td>
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FIVE YEAR WARRANTY

MAXTOR

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SEAGATE

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<td>5.25&quot;</td>
<td>11ms</td>
<td>2209.95</td>
<td>2309.95</td>
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<td>5.25&quot;</td>
<td>11ms</td>
<td>2795.95</td>
<td>2895.95</td>
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TWO YEAR WARRANTY

MICROPOLIS

<table>
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<th>3.5&quot;</th>
<th>Intern</th>
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<td>1.2 GB</td>
<td>10ms</td>
<td>1050.55</td>
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FIVE YEAR WARRANTY

SYQUEST

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<td>44</td>
<td>45ms</td>
<td>345.95</td>
<td>375.95</td>
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<td>88</td>
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<td>445.95</td>
<td>475.95</td>
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<td>88x</td>
<td>50ms</td>
<td>509.95</td>
<td>539.95</td>
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<tr>
<td>105</td>
<td>45ms</td>
<td>649.95</td>
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All Syquest drives include Cartridge, Software and Manual

OPTICAL DRIVES

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<tr>
<td>FUJITSU</td>
<td>128 MB</td>
<td>35ms</td>
</tr>
<tr>
<td>SONY</td>
<td>128 MB</td>
<td>45ms</td>
</tr>
<tr>
<td>PANASONIC</td>
<td>128 MB</td>
<td>45ms</td>
</tr>
</tbody>
</table>

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<tr>
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<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetModem/E Thick, Thin or 10BaseT</td>
<td>$1399</td>
</tr>
<tr>
<td>NetModem V.32</td>
<td>$975</td>
</tr>
<tr>
<td>FastPath 5R Router/Gateway</td>
<td>$1649</td>
</tr>
<tr>
<td>EtherGate Router</td>
<td>$1225</td>
</tr>
<tr>
<td>LanRover/E 4-port</td>
<td>$1649</td>
</tr>
<tr>
<td>LanRover/E 8-port</td>
<td>$2449</td>
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<tr>
<td>LanRover/L</td>
<td>$579</td>
</tr>
<tr>
<td>Shiva</td>
<td></td>
</tr>
<tr>
<td>PhoneNET® Ethernet Cards</td>
<td>$79</td>
</tr>
<tr>
<td>Timbuktu® only</td>
<td>$49</td>
</tr>
<tr>
<td>EtherMac™ II or LC 10T or Thirmet</td>
<td>$1399</td>
</tr>
<tr>
<td>Ether 10-T Starlet™</td>
<td>$259</td>
</tr>
<tr>
<td>PhoneNET Liaison™</td>
<td>$249</td>
</tr>
<tr>
<td>AppleTalk software router for LocalTalk and EtherTalk, and TokenTalk. Complete line of Farallon products available</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Village Communications</td>
<td></td>
</tr>
<tr>
<td>PowerPort™/Gold.</td>
<td>$369</td>
</tr>
<tr>
<td>14,400 bps data; 14,400 bps fax send/recv.</td>
<td></td>
</tr>
<tr>
<td>PowerPort/Silver</td>
<td>$319</td>
</tr>
<tr>
<td>9600 bps data; 9600 bps fax send/recv.</td>
<td></td>
</tr>
<tr>
<td>PowerPort/Bronze</td>
<td>$169</td>
</tr>
<tr>
<td>2400 bps data; 9600/4800 bps fax send/recv.</td>
<td></td>
</tr>
<tr>
<td>TelePort™/Gold, external</td>
<td>$399</td>
</tr>
<tr>
<td>14,400 bps data; 14,400 bps fax send/recv.</td>
<td></td>
</tr>
<tr>
<td>TelePort/Silver, external</td>
<td>$345</td>
</tr>
<tr>
<td>9600 bps data; 9600 bps fax send/recv.</td>
<td></td>
</tr>
<tr>
<td>TelePort/Bronze, external</td>
<td>$199</td>
</tr>
<tr>
<td>2400 bps data; 9600/4800 bps fax send/recv.</td>
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<tr>
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<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procom macCD/MX external</td>
<td>$569</td>
</tr>
<tr>
<td>Fast 200ms access time, 330KB/sec double-speed performance, Toshiba mechanism, Kodak PhotoCD™ ready, includes QuickTime™ and Apple PhotoCD Access software.</td>
<td></td>
</tr>
<tr>
<td>Procom macCD Station2™</td>
<td>$769</td>
</tr>
<tr>
<td>Procom CDR-74-1</td>
<td>$599</td>
</tr>
<tr>
<td>Kodak compatible, mutli-speed</td>
<td></td>
</tr>
<tr>
<td>Procom CDR-74 with CD Gallery</td>
<td>$799</td>
</tr>
<tr>
<td>includes speakers, headphones, and 8 CD titles.</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
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<tbody>
<tr>
<td>UMAX UC-630</td>
<td>$1079</td>
</tr>
<tr>
<td>with Photoshop®</td>
<td></td>
</tr>
<tr>
<td>UMAX UC-840</td>
<td>$1299</td>
</tr>
<tr>
<td>with Photoshop®</td>
<td></td>
</tr>
<tr>
<td>UMAX UC-1260</td>
<td>$1839</td>
</tr>
<tr>
<td>with Photoshop®</td>
<td></td>
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</table>

### Keyboards

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suntouch Extended Keyboard</td>
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The Goal of a New Machine

Give us a telephone with a computer, not the other way around

BY GUY KAWASAKI

Spec Sheet

SO MUCH FOR FUNCTIONS; HERE ARE the hardware specs to make it a success.

- Size, 7 inches long (the smallest length possible for a usable keyboard), 4 inches wide, and 2.5 inches tall; weight, 3 pounds maximum
- An LCD display à la Sharp's Wizard (battery life is more important than readability for this product)
- A push-button light to illuminate the screen briefly, as with digital watches
- AC power, a cigarette-lighter adapter, and a rechargeable battery with 12-hour standby and 2-hour talk life (it should accept AA-size batteries in case you don't have a charged battery)
- A 14.4-Kbps fax modem
- A serial port to send and receive data files from a personal computer
- A trackball (as opposed to trackball) pointing device

Here's the point: the PTA is a wonderful telephone instead of a lousy computer. An LCD display on a computer is lousy. On a telephone with a keyboard, it's terrific. The glass is half full, not half empty.

Software Specs

THE PTA WOULD REQUIRE ONLY A FEW essential programs. You could add others, but the following should be bundled in.

- A calendar program
- A contact-management program
- Various E-mail programs (AppleLink, America Online, CompuServe) and terminal emulation
- A simple word processor

I should be able to search my contact-management program, find a person, and have the PTA dial that person or send E-mail or a fax.

This little wonder should cost about $1000. A cellular phone like the Motorola MicroTac costs about $500; a Sharp Wizard costs about $500; and a fax modem costs about $500. Some company should be able to squeeze out $500 to bring the total price to $1000.

This price is a little high, but I can rationalize spending $1000 because the PTA is a cellular phone—something I know I'll use—and for only $500 more, I get both a computer and a fax modem!

Initially, the best companies to build the PTA would be Hewlett-Packard or Motorola, or Hewlett-Packard and Motorola. HP has shown the ability to build something like this with its Omnibook 300. Motorola makes the MicroTac cellular phone—I rest my case. AT&T is a dark horse; it has the most to gain, but the company's distribution is pathetic.

So far, the PDA closest to the PTA is the EO 440 (owned by AT&T). It's a pen-based computer with a cellular phone and modem attached. But for me it is too large (about 8.5 by 11 inches), too expensive (about $4000), and lacks a keyboard. It is a pen-based computer with telephony, not a telephone with a computer.

Where Do I Send the Check?

MY PTA WOULD BE PRETTY EASY TO build and sell because all the components already exist, the channel is in place, and it's easy to explain. If someone from HP or Motorola is reading this, let me know where to send my check. Better, send me an evaluation unit, and I'll review it.

GUY KAWASAKI's views are his own and only specifically represent those of Macworld. He has investments in Bit Jugglers, Objective Software, Global Village Communications, and Bookmaker Corporation. He is currently working on a book titled Sights.
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