145B—Lowest Price
180c—Brilliant Color
New PowerBooks

High-Performance Hard Drives
33 DRIVES AND DISK ARRAYS COMPARED

Creating 3-D Images
WHICH TYPE OF MODELER TO BUY

Real-Time Compression
ITS PROMISE AND PERILS
Upgrade to Microsoft Word 5.1 for the Macintosh.

The path to easier computing just got shorter, with the great 5.1 version of Microsoft Word. Now you can speed through your work with our intuitive new Toolbar. It puts all of the functions you use most into short and easy reach. With a click.

This powerful Toolbar features one-step bulleting and automatic envelope addressing. Two great new ways to get into the fast lane. Or hit the typecase button to quickly select cases. You can even personalize up to 30 buttons to shorten the trip through repetitive tasks.

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Now it's possible for you to easily create charts and tables or insert and edit your own text annotations. Your ideas look great in no time.

Microsoft Word 5.1 comes with special installation features and a new battery indicator for the Mac PowerBook. It also has QuickTime support, which allows you to add full-motion video as easily as inserting a simple graphic.

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Making it easier
Before you buy theirs,

Agfa Ares—133 line screen, factory default settings.

If you haven’t seen Silverscanner II,* you’re buying your scanner blindfolded.
When it comes to color scanning, talk is cheap. Seeing is believing.
That’s why we let Silverscanner II’s brilliant imagery speak for itself.
In one eye-opening comparison after another, Silverscanner II gives
you visibly richer color and finer detail than its nearest competitors.
You can’t tell how good a scanner is by looking at images on a
monitor, so don’t be fooled.

The scanner makes the image.
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perfectly balanced color, shadowy detail and crisp curved lines. Now
Silverscanner II enhances our award-winning image—with gorgeous
color, gray scale and line art right out of the box. Silverscanner II’s
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, bright scans with excellent detail and tonal range in the
highlights and shadow areas.

Howlett Packard Scanjet IIc—133 line screen, factory default settings.

The software makes the scanner.
People on deadlines don’t have time to waste. 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, variable scan settings, up to 400% scaling in 1% steps and up to
1600 dpi in 1 dpi steps—all in one pass—it’s easy to get great images
fast. And with new advanced features like a densitometer, white and
black limit, color histogram and auto image adjustment—all interactive
in preview—Silverscanner II is unsurpassed. It’s easy for the
beginner—yet still has powerful controls for the advanced user.

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warranty, unlimited toll free telephone technical support and the
confidence that comes with buying directly from a Quantum company,
with Fortune 500 resources, it’s easy to see why so many people choose
Silverscanner II.

“La Cie’s Photoshop plug-in is a delight to use.” Macweek

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Microtek ScanMaker II—133 line screen, factory default settings.

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FEATURES

Two New PowerBooks ................................................................. 86
BY CARY LU Active matrix color finally comes to the PowerBook as Apple introduces
the 180c, along with a new monochrome price leader—the 145B.

Depth-Defying Design ............................................................... 92
BY CARLOS DOMINGO MARTINEZ With nearly two dozen 3-D model-
elers on the market, finding the best fit for your needs can be a daunting process. We
make it easy.

Real-Time Compression ........................................................... 100
BY MATTHEW LEEDS It can double your disk storage space inexpensively, but is
data-compression software a good solution? To find out, Macworld Lab tests file-level and
driver-level products for speed, space savings, ease of use, and reliability.

Supersonic Storage ................................................................. 106
BY JIM HEID Looking for the ultimate performance for data-intensive tasks or mas-
sive graphics files? Macworld Lab tests 30 high-speed hard drives, plus several disk arrays and
SCSI accelerators.

Choosing a Storage Strategy .................................................. 116
BY MARJORIE BAER Are you looking for more—and portable—storage? To help
you find the right system, we evaluate all the removable-storage alternatives, from the new
Bernoullis and SyQuests to magneto-opticals and Flopticals.
REVIEWS

124 Macintosh Quadra 800
Macintosh computer

125 LaserWriter Select 300;
LaserWriter Select 310
Laser printers

128 ClarisWorks 2.0
Integrated software

129 Project Scheduler 5
Project-management software

130 Aldus Fetch 1.0; Cumulus
1.1; ImageAccess 1.0;
Kudo Image Browser 1.0
Image-cataloging software

138 Now Utilities 4.0.1
System utility collection

140 StuffIt Deluxe 3.0 with
SpaceSaver
Disk-compression utilities

142 Phaser 200i Color Printer
Thermal-wax color printer

144 Generic CADD 2.0
2-D computer-assisted
drafting program

144 ClenTrac 1.7.1
Contact-management software

145 MasterWord 5.1
Microsoft Word add-ons

146 Folio 1 Media Kit
Wraptures One;
Wraptures Two
Texture collections on
CD-ROM

148 Contact Ease 2.0.1
Sales-automation software

148 PosterWorks 3.0
Large-format graphics-
production tool

149 ClickChange 2.0
Desktop customizer

153 addDepth 1.0.2
Graphics utility

153 Apple Color Printer
Color QuickDraw printer

154 ArtZ ADB Tablet
Input device

154 Square One 1.5.2
Icon-based file launcher

156 Epson ES-800C
24-bit flatbed scanner

156 In Control 2.0
To-do list organizer

160 On The Air 1.0.1
Network intercom system

160 @Risk 1.1
Simulation add-on for Excel

161 Expert Draw 1.0
Drawing application

161 Memorizer 2.0
Dictation software

164 Amazing Universe 2.1
Space-image exploration

164 CircuitMaker 3.0
Digital circuit simulator

165 Roll Call 2.0
Church-management
software

165 Achieving Your
Career 1.02
Job-search organizing
software

DEPARTMENTS

20 How to Contact
Macworld

25 MacBulletin

27 State of the Mac
BY ADRIAN MELLO
Apple's Macintosh-naming crisis

29 Letters

39 Art Beat
BY CATHY ABES

51 The Iconoclast
BY STEVEN LEVY
General Magic tries to make history

57 Conspicuous
Consumer
BY DEBORAH BRANSCUM
Apple revs up service and support

65 Lab Notes
BY MARK HURLOW AND
MATTHEW LEEDS

69 News
BY DAN LITTMAN AND
TOM MORAN

169 The Desktop Critic
BY DAVID POGUE
Musical fun for nonmusicians

173 New Products

179 How To/Quick Tips
BY LON POOLE

189 How To/Getting
Started
BY JIM HEID
Macros and scripting

195 PowerBook Notes
BY CARY LU
The network connection

201 Star Ratings

280 Wise Guy
BY GUY KAWASAKI
How you can help save IBM
If you've ever hassle with hooking up SCSI devices, you'll immediately appreciate the foolproof design of Envisio's revolutionary SmartStack.™

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.

Untangle Your Life Connecting multiple SCSI devices used to be like black magic; what worked on one Mac wouldn't necessarily work on another. You're ready to work. All the connections are made internally, and automatically. SmartStack's 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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See How The Future Stacks Up Get smart, see your authorized Envisio dealer for the future of SCSI expansion.
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.

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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.

<table>
<thead>
<tr>
<th>Mirror Scanners</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!

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.

No Dealer Markup
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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10:12
Process

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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!

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Now you can get out of trouble before you get into it.

Owning most utility software is like belonging to the Auto Club. If your system crashes, or if you have an accident with your data, they can come to your rescue. But before you get back up and running, you have to spend a lot of time waiting by the side of the road.

Which is why Public Utilities, the ingenious new package from the creators of Suitcase, is the utility every Macintosh has been waiting for. Instead of getting you back up and running, Public Utilities concentrates on keeping you up and running. How? By automatically finding and fixing potential disk and data problems before they leave you stranded.

You see, Public Utilities quietly performs a detailed diagnostic scan of your disk whenever your Mac is idle. If anything is amiss, it politely lets you know and prompts you to run the appropriate repair program. All you have to do is click, and carry on with your work.

Now, it doesn't take an MIS type to know that Public Utilities can raise productivity and lower support costs. But if you are an MIS type, you'll be delighted to know that, in addition to protecting your people from disaster, Public Utilities also reminds them to do prudent things like perform backups and optimize their hard disks. It even launches the requisite software, at the stroke of a key.

Of course, even Public Utilities can't prevent people from deleting files or reformatting their hard disks. But it can bail them out of more difficult situations than any other utility software. And unlike other programs, it won't let them get into difficult situations in the first place.

That's because we left out Sector Editors and other such high-end, high risk things. And put in plenty of online, System 7 savvy HELP.

There's more. So pick up the phone. Call 800-477-8212. We'll tell you about our one-year money-back guarantee. And our vaunted 24-hour customer support.

Which is what you use to get out of trouble after you get into it.

SORRY TO INTERRUPT!

Public Utilities has discovered a problem on the disk "HD." The Volume Bitmap is incorrect. We suggest you fix this.

Don't Fix  Fix Now

$59 Upgrade!

* Through Sept 30, you can upgrade to
* Public Utilities from
* Norton Utilities, Sure II, MacTools or 68k for just $59. For details, be sure to name your nearest dealer or to order direct.
* call 800-477-8212
today!
8:00 Home Over breakfast, you check your calendar on your PowerBook Duo. The day looks like it'll be a breeze. You'll put a few finishing touches on the Q2 forecast presentation that's due in a few days, return some calls and have a free afternoon.

9:15 Your Office You slide your PowerBook Duo into the Duo Dock and start working.

Suddenly, e-mail chimes. Your boss wants you on the room shuttle to Boston, to present the Q2 forecast to his boss. Also, a client wants to see you ASAP. You hit the eject button.

2:50 Borrowed Office A colleague is at lunch, so you borrow his Duo Dock. You log onto e-mail back at the home office and learn your group has just won a new account. You put this news into your presentation (and change a few colors, too).

3:30 Conference Room You clip on the Duo MiniDock and run the presentation from your PowerBook Duo. Everyone's impressed—especially the guy who asks a series of questions about a six-month-old project. You've got your files, so you've got the answers.

No other computer could get

For years, you've been trying to keep up with computers. Now there's a computer that can actually keep up with you: the Apple® PowerBook Duo System.

It's nothing less than the most flexible, adaptable and personal computer in the world.

On the road, it's a slim, sleek and powerful notebook computer.

In the office, when plugged into a Duo Dock, it instantly becomes a fully expandable, no-compromise desktop computer that lets you work with a full-size keyboard and up to a 16-inch color monitor.

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lets you move in and out of the office with tremendous ease. There are no cables to fiddle with and no complicated "reconfiguring" procedures. Just slip the PowerBook Duo into the Duo Dock, and the system automatically recognizes all your networking resources and attached peripherals.

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PowerBook Duo from Apple
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YOU HAVE BETTER THINGS TO SPEND.

MONEY ON THAN A NEW PRINTER.

YOU NEED **PowerPrint™**

Now you can print from your Macintosh™ to over 1,000 DOS printers.

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PowerPrint/LT is everything you need to network and access just about any printer. For just $399.

And, for LaserWriter-like control of your networked printers, you need PowerPrint/NW™. Now you can easily share and print to over 1000 dot-matrix, inkjet, and laser printers connected to Novell® NetWare® printing services. And it’s simple to set up. For under $500.

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<table>
<thead>
<tr>
<th>FEATURE</th>
<th>WORDPERFECT WORKS</th>
<th>CLARIS WORKS</th>
<th>GREAT WORKS</th>
<th>MICROSOFT WORKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Context Editing (multiple documents)</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Paint and Draw</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Contextual hot tool</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Logic in a spreadsheet book</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Multiple zooms can be turned on</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Auto page lead</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

Then, we improved it, and backed it with a team of support specialists that are unmatched in the industry.

Seamless is the best way to describe using WordPerfect Works.

Thanks to a breakthrough technology called In-Context Editing that optimizes System 7's Publish and Subscribe feature, you can get into any of its modules (word processing, database, spreadsheet, chart, draw and paint) without leaving your current document. Double-click on an item, and the menu and tool bar change automatically to correspond to the program you’re using.

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WORKS.
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Evidence: Raven-040 is a trademark of MicroNet Technology, Inc. All other trademarks are property of their respective owners.
Apple to Make SIMMs? As users continue to have problems with many third-party composite SIMMs for the Quadra 800, the Centris 610 and 650, and the LC III (see MacBulletin, June 1993), Apple is considering putting high-capacity SIMMs on the list of products it offers for sale, according to a company representative.

Forever Amber: Apple recently disclosed it is developing Amber, a new document-centered software architecture. Under Amber, users will never have to leave the document they are working on to add or manipulate graphics, edit text, repaginate, and so on; instead they will access the functions of related applications without switching into those applications.

PowerPC Powering Up: Apple wowed the crowds at its Worldwide Developers Conference by demonstrating a prototype PowerPC RISC system running Macintosh applications. Almost as important for Mac owners, though, Apple also announced that it intends to offer PowerPC upgrade paths for the Mac IImx and Ili, Centris 610 and 650, Performa 600, and Quadra 800 systems. Both IBM and Motorola have announced preliminary shipments of PowerPC 601 microprocessors, and several major software companies (including Adobe, Claris, and Microsoft) announced at WWDC that they are writing PowerPC applications. Apple said it plans to have PowerPC machines ready in the first half of 1994.

New Print Driver Is Mixed Blessing: According to Apple’s own documentation, the LaserWriter 8.0 driver (codeveloped with Adobe, which is selling it as PSPrinter 8.0) can cause printing and PostScript problems with many older, and some newer, applications. Also, despite both companies’ statements that their versions are functionally identical, Adobe’s documentation details additional problems with applications from over 20 vendors (including Microsoft, Claris, and Aldus), which Apple doesn’t mention. Apple says that it is looking into the documentation differences.

Apple Slices Printer Prices: The retail price for the Apple Color Printer dropped from $2349 to $1659, and the Apple Personal LaserWriter NTR went from $1649 to $1179.

Airlines Shut Down PowerBooks: If you use your PowerBook on an airplane, chances are you will be asked to put it away at least twice during your flight. American, Northwest, Continental, TWA, JAL, and USAir all have policies in place restricting the use of personal electronic devices during takeoff and landing, and other airlines are openly considering changing their rules, based on well-publicized anecdotal evidence from pilots and an old FAA study indicating that electronic devices can interfere with cockpit systems.

Self-Teaching Agent: Open Sesame, from Charles River Analytics (617/491-3474), is a software program that will take over routine computing tasks. Unlike No Hands’ Magnet (see “Automating the Finder,” News, July 1992), Open Sesame can analyze what you do on your Mac and pops up with an offer to do it for you. Open Sesame will list for $99 or less and should begin shipping in late summer.
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STATE OF THE MAC

Name That Macintosh
BY ADRIAN MELLO

There's a Grave Crisis in the former orchards of Cupertino. Despite its best intentions, Apple seems unable to rise to a critical challenge that, if not overcome, may doom the company. The crisis? It's Apple's product names.

This month Apple continues its never-ending product rollout with two more PowerBooks, the color active matrix PowerBook 180c and the low-cost PowerBook 145B—both previewed in this issue. That means there are now seven PowerBooks—more than the total models in the entire Mac line just three or four years ago. At the rate the elves at Apple are popping out new Macs, there will be several hundred models by the year 2000.

How is Apple helping us keep track? Well, it has come up with a brilliant naming scheme that combines the way Mercedes-Benz and BMW name cars with the way Sylvester Stallone names movies. I would be pretending if I said I knew where Apple got its inspiration for naming Macs. However, I have a theory: these names come from an elite group of subgeniuses who make a bushelful of money for sitting around dreaming up product names. You can imagine these marketing poets seated in a tinted-glass conference room with white acoustic tile (come to think of it, maybe this is the inspiration for those little air holes in the front of the new Macs), in a pastoral industrial campus in Cupertino.

The truth is that without really understanding the meaning behind model names, we're forced to speculate. This follows in the tradition of other great ambiguous systems such as alchemy, numerology, palm reading, and Beatles albums (on that last subject, some hackers tell me that if you play one of the Macintosh system sounds backward it will say “Steve is dead”). I suspect there is some hidden meaning behind the Mac monikers. I for one am determined to get to the bottom of it. Perhaps we'll discover a new definition for the term fuzzy logic.

The Golden Delicious 205

If Apple had stuck to Apple-related names, perhaps there'd be no problem. A Macintosh, after all, is named after a variety of apple. I think there was a lot of potential in this idea, and Apple could have cultivated a virtual orchard of product names. What about the Golden Delicious 205, the Granny Smith II, or the Fuji 900ex? There are approximately 5000 varieties of apples, so Apple would face no danger of running out of names.

With this in mind, it's promising to see Apple working on the Newton. Apple's first logo was Sir Isaac under an apple tree, presumably about to get bopped. Following the Newton example, Apple could branch out into product lines named for historical figures known for their relationship with apples. Someday you might prepare a letter or a presentation on a Johnny Appleseed 180c, a William Tell III, or an Eve Plus. Instead Apple is using names that sound like a cross between fancy cars and Roman tyrants.

The Numbers Game

For several years you could count on Apple to christen new models with Roman numerals and the occasional letter. This all started with the Apple II, the Apple Ile, the Ile, and the IIGS. The company carried this scheme over to the Mac II, the Classic II, and the LC II. Someone once said that after the ill-fated Apple III (a chip would sometimes spontaneously leap out of the main system board!), the company would never again use the Roman numeral III. Well, the LC III proves that theory wrong. I've already heard some people in the industry speculating that the impending, next-generation PowerPC-based Mac will be referred to as the Mac III.

As majestic as Roman numerals are, you run into problems with big numbers. We've all seen those long impenetrable copyright dates trailing the end of movies—you know, MCMXCVIII. Can you imagine the Centris CXY or the Quadra CLIX?

Apple still uses Roman numerals, but the company wanted more freedom. Have you ever noticed that if you look at Roman numerals too long they begin to look an awful lot like letters? Perhaps one day, after a particularly brutal brainstorming session, the marketing poets noticed the same thing. This might explain the lettering on the Mac II line including the 11x, 15x, 16x, 17x, 18x, and, overseas, the 16x. For a long time, Mac owners tried to figure out what these letters stood for. I've never solved it, but a source told me that this naming arrangement was the sinister work of Mister Mxyzptlk, an enemy of Superman who could be defeated only by being tricked into saying his name backwards. Now I don't know a lot about this guy, but you can pretty much figure out two things from his name: (1) he didn't like vowels; and (2) he didn't win too many spelling bees as a child.

Even this naming arrangement ran out of steam a couple of years ago when Apple really kicked into product overdrive. The marketing poets must have known that they were going to run into problems with the big Roman numerals and ran out of two-letter combinations. I imagine one of them driving in to work one day, trying to figure out which brand-new German luxury car to buy this year. It was a tough call, but it came down to one of the BMW models, such as the 535i, 750i, or the 353i, or a Mercedes-Benz 500SL or 300CE. That's when it hit home—Macs could have meaningless combinations of three-digit numbers for names just like the big toys. That's how we got the Performa 200, 400, 405, 430, 450, and 600; the Centris 610 and 650; the Quadra 700, 800, 900, and 950; the PowerBook 100, 140, 145, 160, 170, and 180; and so on. My outmoded carbon-based brain tells me a bigger number is supposed to be better within each of the product lines, but beyond that I'm stumped.

The scariest development yet is that combinations of numbers and letters are coming back: the 145B, 165c, 180c. Now I ask you, why is the B capitalized, while the c is not? Whatever the reason, my guess is that as models proliferate we can expect to see more alphanumeric combinations. If only Apple would use names that mean something, continue.

The
Macintosh
Naming
Contest
Hexgl
even if just in vanity-plate speak. You know, TOTE MAC for one of the Duos, or 040 POWR for the Centris 650, or maybe even LUV MY MC for one of the Performas. Perhaps the naming scheme should be more grand and mythological—in the tradition of ancient Greek epithets such as Storm-Gatherer or Fire-Giver. The epithet scheme led to the one good name in the Mac line, the PowerBook. It actually tells you something about the system in question. Hmm. Scratch one marketing poet, who’s now unemployed.

Latin Tech Talk

THE LATEST DEVELOPMENT IN MACINTOSH PRODUCT NAMES IS THE USE OF LATIN-SOUNDING WORDS—DUO, QUADRA, CENTRIS—that seem both mysterious and technical at the same time. Quadra basically means four. Intel, which is doing pretty well these days, seems to have logged on to the same vibes as Apple’s marketing poets; the semiconductor company recently named its latest microprocessor Pentium, which roughly translates to “the fifth.” My guess is that Centris is not really another name for “one hundred”—that’s just a bonus. Centris is meant to imply the center—or midrange—of the Macintosh product line. Pretty clever, huh? This word is also part of the recent wave of company and product names that are mysterious-sounding words that end in is or ur, like Aldus, Claris, Nexus, and Lexus. If Apple continues in this direction we might end up with the Septius 700, the Quo Vadis IV, or the Extrems Ix.

Code Names

SOME OF APPLE’S CODE NAMES HAVE been much more interesting than the final names. Once upon a time there were Macs called Paris, Cabernet, Chablis, and Bobcat, before they were cast out onto dealers’ shelves. System software and applications continue to have even more interesting code names—Pink, Amber, Casper, Bedrock, Wildcard. Some of the best names even make it out into the light of day, like QuickDraw and QuickTime.

If you can figure out any meaningful system behind all of the Mac names and numbers, I’ll send you a small cash prize. And I’m sincere when I say small. Also, you can help curtail the Apple product-naming crisis by entering your own scheme in our Macintosh Naming Contest. If you think of any better suggestions for Mac product names, please send them to me, and perhaps I’ll publish the best ones. I sure could use any help you might offer, since I’m applying for a job as a marketing poet at Apple, and I’ve already got my eye on a German luxury car sporting a three-digit number.

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Future results may vary. All programs not available on all computers.
DigitalFilm Follies

THANKS TO DEBORAH BRANSCUM for exposing SuperMac's lack of R & D on their DigitalFilm product (Conspicuous Consumer, May 1993). What amazes me is that SuperMac's president, Mike McConnell, blames the inexperience of the user for the complaints that they have received. As an aircraft engineering friend of mine put it, "We don't get the luxury of blaming the passengers when one of our engines malfunctions. Why should they get away with blaming the end user for their engineering problems?"

Brian Michael Ross
via America Online

Sex Sells

DAVID HERSCHMAN REALIZES, quite correctly, what many people still don't believe: sexually oriented entertainment has become mainstream (The Iconoclast, June 1993). Heck, the number-one movie in the country is all about a woman who commits adultery for a quick million.

The fear of sexually transmitted diseases is making virtual sex a popular alternative to the real thing. People working in multimedia and virtual reality are poised to take advantage of this trend, and will certainly make a pile of money from it.

Will Cato
via CompuServe

THANK YOU, STEVEN LEVY, FOR ATTEMPTING to deal with the problem of computer pornography. Your column, however, was too easy on this hard-core software.

Explicit sexual multimedia is offensive. It turns women into sexual playthings and makes men out to be lust-filled animals controlled by their hormones. Those who produce this perversion do so for profit—smut dealers never think about the negative effects on the public. People like David Herschman should not be free to contribute to the moral decline of our nation with their prurient products.

Gary Kowalski
Warroad, Minnesota

STEVEN LEVY'S PRUDISH DIATRIBE is replete with irrational prejudice. For example, images of naked human beings created by Italian Renaissance painters are acceptable, but similar images produced by people with cameras are not. By this twisted logic, if Botticelli had a video camera instead of a paintbrush, he would have been a pornographer.

Virgil Haxton
San Diego, California

I WAS SEVERELY DISAPPOINTED THAT booth space at the San Francisco Macworld Expo was sold to pornographic software vendors.

The law defines sexual harassment in part as conduct of a sexual nature which creates an offensive or hostile work environment. Many women attended the Expo in a professional capacity, the majority of whom I'm sure were uncomfortable with the items on open display at several of these booths. What about the women who worked in adjacent booths? How do you think they felt about listening to the comments of male porno patrons for four days?

James Moratto
Santa Rosa, California

IR READ MR. LEVY'S COLUMN WITH some irritation and some amusement. The fact that you don't like these people's products doesn't give you the right to call them "sleaze merchants."

I myself have no use for violent arcade games, so I don't play them. I don't write personal attacks on their creators, complete with comments about what their mothers might think.

Deirdre Straughan
Milan, Italy

continues
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CORRECTIONS

In the March 1993 feature “First-Time Authoring,” Passport Producer should have been identified as supporting PostScript font scaling via ATM.

In the May 1993 MacBulletin, we incorrectly stated that eDisk requires that you format your hard drive on installation.

In the May 1993 feature “Here’s Looking at Monochrome Monitors,” the correct price for the 8-bit Radiance View Display video board is $550, not $259.

In the May 1993 feature “Dye-Sublimation,” the 3M Rainbow should have been given a “not tested” rating for technical support, and an “N/A” rating for RAM configuration. In the same feature, the following two sentences should have appeared in the sidebar “How Fast Are the Dye-Sublimation Printers?”: We used a Mac IIi with an Apple Cache Card and 8MB of RAM for our testing. The 3M machine should perform faster when running from a higher-end Mac, and also if letter-size paper is used.

In the June 1993 review of MathCAD 3.1, the University of Waterloo was incorrectly identified as being in Iowa. The correct location is Ontario, Canada.

In the June Desktop Critic, the GCC WriteMore II’s serial cable is 32 inches long, not 6 inches.

In the chart “System Upgrades” (“Upgrading Your Mac,” June 1993), we indicated that the Centris 610’s processor runs at 25MHz, and the Centris 650’s at 33MHz. The speeds should have been 20MHz and 25MHz, respectively. Also in that chart, the Mac has three NuBus slots, not two. Finally, all infant photography for the June issue was done by Luis Delgado.

Guy Kawasaki Fan Club, El Alia

Dear MacWorld Magazine,

[An edited version of the letter starts with a warm welcome and an expression of gratitude. The letter continues with a personal note about the impact of Kawasaki’s writings and his wisdom.]

Guy is a [lively/witty/philosophical/well-respected/witty/with-it/humorous]

Guy Kawasaki.

Guy Kawasaki Fan Club, El Alia

30 August 1993 MacWorld
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[I look forward to Macworld even more/I used to read Macworld from beginning to end—now it'll be the other way around/A very large chunk of the Mac magic is on Macworld's final page/ Macworld is the computer magazine with real soul food/Hooray for Macworld/I'm renewing my subscription].

Fans o' Guy via America Online, CompuServe, Internet, fax, and USPS

UY KAWASAKI DEMONSTRATES the take-it-or-leave-it attitude that just about destroyed Apple under Jobs and company. When Guy was employed at Apple, there were only three models of Macs and the entry price was $2000. This must have been his idea of the computer for the rest of us.

James Earl Marshall, Michigan

IF THE BEST USE THE KAWASAKI-meister has for a PowerBook is travel, let him read and learn (Wise Guy, June 1993).

You buy a PowerBook so that when your customers call you at home, you can grab the machine off your bed, bring up their file, and solve their problem while making small talk.

When a "Star Trek: The Next Generation" rerun comes on, you check your HyperCard stack and find out that you've got that episode on tape already. In the kitchen, you work from your electronic copy of the recipe for Cajun gumbo, which includes notes from previous preparations. After dinner, you check your Remember file to find out what's coming up for tomorrow.

Finally, as you're dropping off to sleep, a great letter to Macworld pops into your head. You grab the PowerBook in the dark, wake it up (nobody ever turns a PowerBook off), and jot a few notes. You could finish it up, plug in the phone cord, and send it right away, but you decide to wait and see if the subject looks different in the daylight.

That's the way to use a PowerBook.

Martin B. Title Ann Arbor, Michigan

I WAS NOT AMUSED BY MR. KAWASAKI's June column. Specifically, "... their round eyes glaze over and their Protestant brains..." why in the world did Macworld print such racist and prejudicial nonsense? I suppose that next you will print "squint-eyed Buddha brains" to describe the Asian computer executive establishment.

Jeff Frank Hawthorne, California

Talk about your middle-American, starch-white, my-way-or-the-highway attitudes—what's all the hostility for, Guy? Did someone steal your wallet in Shinjuku? Here's some advice for the man who can't imagine ever asking for any: keep your racial slurs to yourself, bub.

David Rose via America Online

Play It Again, Sam

I WAS IMPRESSED WITH THE MOVIE theme for "Here's Looking at Monochrome Monitors" (May 1993). I have considered attempting similar themes, but I was leery of copyright legalities. I could find no credits or studio/producer/actor acknowledgments anywhere in the magazine. Can you tell me... continues

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Paula Morris
Zanesville, Ohio
You haven’t been opening your Macworld forcefully enough. We ran a copyright notice twice—once on page 5 and once on page 113. But it’s on the far left side and hard to see unless you crack the spine. Most studios allow magazines to use still images from movies—pricing is usually determined by the popularity of the movie (or actor) and the size of the proposed project.—Ed.

Network Inaccuracies

Here are some inaccuracies in “Building an Expandable Network” (May 1993), by Douglas Welch, that could lead to trouble, not expandability.
Level 1 cable is intended for voice and low-speed data up to 20 Kbps, not 200 Kbps; Level 3 cable is intended for LAN applications up to 10 Mbps, not 20 Mbps; Level 4 cable is specified to 20 MHz and will support 16 Mbps; Level 5 cable is specified to 100 MHz and will support data rates up to 100 Mbps, not 200 Mbps. Also, while you can run LocalTalk 4500 feet on 22-gauge wire and 3000 feet on 24-gauge wire, you can only run 10BaseT on 328 feet of wire. Therefore, if you ever plan on upgrading your network (and even if you don’t plan on it), you should think of distances of 328 feet and no more. Since LocalTalk is not a future network, don’t design around it!
Michael Paré
Woods Hole, Massachusetts

Marking Time

In Charles Setter’s review of High Performance Systems’ ithink 2.2.1 (May 1993), I found it amusing that the cons summary read “Requires real training commitment for effective use.” Imagine, you have to know what you’re doing in order to use the software effectively! If taking the time to work through unfamiliar concepts is a shortcoming, then we’ve made less progress than ithink.
Barry Sellik
Walnut, California

Lapis Responds

We appreciate your generally positive review of L-TV in your May 1993 issue. However, it’s clear that the reviewer didn’t fully understand the product, and the few incompatibilities were not accurately addressed.
L-TV is a low-cost, entry-level multimedia tool, and the reviewed model was designed primarily to meet the needs of the K–12 teacher who is using the Mac LC in the classroom. It’s obviously no substitute for studio-quality equipment that costs much more.
The reviewer pointed out (as we do in the L-TV Read Me file), that there are possible conflicts with Macromedia’s Director. Director does not obey the QuickDraw rules, and L-TV is designed to operate with QuickDraw-based programs. We provide a special mode for Director and other non-QuickDraw-based programs that solves the problem.
Finally, the reviewer criticized the quality of text on the television screen. The display quality of a television set is inherently inferior to that of a computer monitor, but this is not the fault of L-TV. Picture quality on graphics and large text is excellent, and that is what the product was designed to display.
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<th>Standard Features</th>
<th>DEC\textsuperscript{XI} 1152</th>
<th>HP\textsuperscript{R} LaserJet IIIP</th>
<th>Apple LaserWriter\textsuperscript{R} NTR</th>
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<td>List Price</td>
<td>$999</td>
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Circle 120 on reader service card
We Don't Need No Stinkin' Slots

A DRIAN MELLO, IN HIS REVIEW OF the new Macintosh lineup (State of the Mac, May 1993), agrees with Apple's mistaken assumption that all Macintosh users want power and expandability in equal proportions. This might be true of users who focus on graphics, but many of us in the mainstream business community don't need expansion slots, but crave increased speed. Our ideal Mac would have a 33MHz 68040 in an LC case, or a Centris 610 case for those who want CD-ROM. We would even forgo an FPU if Motorola insists on its Intel-esque pricing scheme.

Craig Jacobson
New York, New York

ARA Again

I N THE MAY 1993 MACWORLD, YOU printed a letter that stated that V.42bis and MNP 5 hardware-based compression will work on top of AppleTalk Remote Access's software-based correction. In fact, ARA's modem scripts explicitly turn off hardware-based data compression and verification, leaving the work to be done by the software.

Jim Robertson
Ames, Iowa

Jim's got it right, and now, after several conversations with Apple, so do we.—Ed.

RSI Cry

F OUND THE UNMOUSE REVIEW (MAY 1993) interesting. Has Ann Garrison or anybody found a way around the repetitive-strain injury problem with the mouse-using arm and side of neck?

Paul C. Colombo
via CompuServe

Letters should be sent to Letters, Macworld, 501 Second St., San Francisco, CA 94107; via fax, 415/442-0766; or electronically to CompuServe (70370,702), MCI Mail (294-8078), America Online (Macworld), or AppleLink (Macworld), or via Internet (70370,702@compuserve.com). Include return address and daytime phone number. Due to the high volume of mail received, we can't respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of Macworld.
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Behind Macworld's Graphics

BY CATHY ABES

Artist: San Francisco-based Jim Ludtke is a skilled 3-D illustrator and animator whose work has been shown at New York's Museum of Modern Art. He has produced 3-D illustrations for such varied clients as Sony, Newsweek, Nintendo, and AT&T, and animations for Nickelodeon, the Residents, Time Warner New Media, and The Voyager Company, among others.

Hardware: Quadra 900 with 52MB of RAM and 650MB internal hard drive; SyQuest 44MB removable-cartridge drive; Hammer 650 rewritable optical drive; Wacom 12-inch graphics tablet; E-Machines 16-inch and AppleColor High-Res RGB 13-inch color monitors.

Software: MacroModel 1.5; ElectricImage Animation System 1.5; Adobe Photoshop 2.5; Adobe Illustrator 3.01.

How It Was Done: To create the opening illustration for this month's comparative review of 3-D modeling programs, Ludtke produced an elaborate three-dimensional scene that he created in six separate sections and ultimately composited together in Photoshop.

To create the bumpy ground, Ludtke used a Photoshop plug-in module called CyberSave, which converts two-dimensional gray-scale images into 3-D models in one of three shapes—a sphere, a cylinder, or a flat plane. Lighter areas of the image become raised, while darker areas are recessed.

After scanning a photo of some pebbles, Ludtke enhanced the image in Photoshop by giving the pebbles more-irregular shapes and by adding more elements such as bones and roots. He saved the image as a color texture map for later use in ElectricImage. Then, after converting the color texture map to grayscale in Photoshop, he painted those added elements a brighter shade of gray, and saved the image in CyberSave format. This resulted in a 3-D mesh with various elements upraised above the ground's surface.

Once he had imported the relief model of the ground into ElectricImage, Ludtke used the color texture map (the previously saved file of the surface textures) to add color to all the objects. Since both the three-dimensional model and the texture map were created from the same file, Ludtke was able to align them exactly—making the bones one color, the pebbles another color, the roots a third color, and so forth.

He modeled the hammer and chisel in MacroModel, and then imported them into ElectricImage, where he added texture maps he had previously created.

To create the curving, bumpy surface of the cave wall, Ludtke built a wireframe model in MacroModel. After drawing several wavy cross sections of the wall, he used MacroModel's skin tool to create a mesh between them. Then he saved the model and imported it into ElectricImage, where he added a texture map he'd previously created in Photoshop. The texture map was actually a collage combining scanned images of technical continues
diagrams with drawn images of cave paintings and hieroglyphics. In Photoshop's alpha channel, he had added more elements that would function as bump maps when the model was rendered in ElectricImage.

To create the rocks in MacroModel, Ludtke used the polyline tool to draw cross sections of various shapes. He then used the skin tool to create a mesh between them. After saving and importing the shapes into ElectricImage, he went back to Photoshop. There he drew a marbly texture in the RGB channel and a bump map in the alpha channel (just as he had for the cave wall) and used them together as a single texture map in ElectricImage.

To accentuate the craggy look of the rocks and the unevenness of the bump map, he positioned a white light above the rocks and a red light below the rocks. Then he saved and rendered the rocks.

Next, Ludtke went back to Photoshop's CyberSave to create the curved surface of the back of the dome. In Photoshop, after creating a gray-scale gradient from dark gray at the top to white at the bottom, he blocked out an area in the center of the gradient about half the gradient's size and made this area completely black. Then he exported the gradient to CyberSave as a cylinder. Where the gradient was dark, the cylinder got smaller, and where the gradient was light, the cylinder expanded—resulting in a dome shape. Since totally black areas do not generate 3-D geometry in CyberSave, the black area in the center of the gradient—now part of the dome—gave the illusion of a cutaway in the front of the dome. After importing the file into ElectricImage, he texture-mapped it with a file that was tiled around the inside of the model to give the appearance of a Renaissance dome.

To create the front of the dome, Ludtke duplicated the gray-scale art he'd created the cave wall in MacroModel by first drawing a wire-frame model with numerous wavy cross sections (above). Then he used MacroModel's skin tool to create a mesh between each cross section, overlaying the wire-frame model with a skin-like craggy surface texture (right).
After the model of the cave wall was imported into ElectricImage, Ludtke superimposed a color texture map he had previously created in Photoshop (left). In Photoshop's alpha channel, he created a gray-scale version of the texture map with some additional elements to use as a bump map (middle) for the final rendering of the wall (right).

In Photoshop, Ludtke created a gray-scale gradient with a black center (top) to generate the back curve of the dome, which he exported to CyberSave as a cylinder. Because the gradient was dark at the top and light at the bottom, the cylinder narrowed at the top and widened at the bottom, resulting in a dome-shaped wire frame (bottom).

For the front curve of the dome, Ludtke used the same image he'd used for the back—but this time he made the center area the gradient and the sides black (top). He used black to cut out various chunks in the center of the gradient before exporting it into CyberSave to create the wire frame of the dome's front (bottom).

To create the sky, Ludtke scanned in a photo of a sunset, then painted and color-enhanced it in Photoshop. He used the Twirl filter to swirl the clouds; then he darkened the top half of the sky using a gradient alpha channel. After drawing the curves and splines in Adobe Illustrator, he imported that file into Photoshop in antialiased PICT format, over which he superimposed the sky. The stars were simply painted in.

Once all the separate files were rendered, Ludtke opened each of them in Photoshop and composited them into the final image. The final image size was 14MB. The image took approximately 40 hours to complete.
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THE ICONOCLAST

Can This Be the Magic at Last?

BY STEVEN LEVY

The Mountain View, California, offices of General Magic—the Ultimate Start-up—consist of a sprawl of cubicles and conference rooms. Like Cracker Jack boxes, each one holds a surprise. Anchoring the corner cubicle in the second-floor warren (an apt metaphor, since a brown rabbit named Bowser makes his home here) is Bill Atkinson, the designer of MacPaint and HyperCard. Next to him is Andy Hertzfeld, key architect of the Macintosh ROM. From there, you go to Dan Winkler (who wrote HyperTalk), QuickTime designer Bruce Leak, and a slew of other esteemed veterans, along with a new generation of rookie wizards.

It’s the Silicon Valley equivalent of America’s 1992 Olympic basketball squad—a digital Dream Team. And what is the dream? To change the world by bringing powerful digital communications to the masses. One day, “Star Trek”-ish devices—combinations of computer, telephone, fax, Filofax, wristwatch, and maybe even lawn mower—will be standard equipment for just plain folks. General Magic wants, craves, desires to be, insists it will be, the company to make this happen.

Andy Hertzfeld puts it this way: “The passion is what distinguishes this team.” What pushes them, he says, is a desire “to do something that will be in the history books one day.”

History books? The idea haunts General Magic’s Mountain View headquarters. Like the Blues Brothers, the Magic people believe they are on a mission from God, only with stock options. As Rich Miller, General Magic’s VP of business development, told me, “how many times in your life do you have the chance to be truly at the right place at the right time?”

For some Mac veterans at General Magic, it’s the second time around—another chance to put a dent in the universe—maybe even a deeper one than the first.

Mystic Crystal Revelation

In a company where job descriptions often include the word wizard, president and chief executive officer Marc Porat might be considered the Oz-like figure behind the curtain. An intense, articulate baby boomer, Porat was working for Apple Computer in 1989, having come there by way of Stanford, Private Satellite Network, and the Aspen Institute. When Apple gave Porat the task of answering the question “What is beyond personal computing,” he quickly realized that the answer lay in communications.

Porat came up with a vision he called the Whole Person Paradigm. At first blush this sounds suspiciously warm and fuzzy, but it actually translates into a useful concept, the idea that people use three kinds of communication: with themselves (things like reminders and agendas), with others (phone, fax, electronic mail), and with the vast supply of knowledge in the world (databases, entertainment). The idea was to come up with a system that would address all three. He figured that the product, code-named Pocket Crystal, should be small, cheap, light, and incredibly easy to use.

Apple’s philosopher-king John Sculley liked Porat’s idea, but decided that something so broadly based could best be realized outside of Apple. So in 1990, Apple spun off Pocket Crystal as a new company called General Magic, and retained only a piece of the action. The new name came from Arthur Clarke’s remark that the best technology is indistinguishable from magic.

Marc Porat had a vision, and a business plan the size of a telephone book. But his most impressive asset was his talent for persuasion. It is no accident that the Wall Street Journal called him “a silver-tongued devil.”

While the project was still at Apple, Porat wooed Bill Atkinson, who is now chairman of General Magic’s board. The next convert was Hertzfeld, then Joanna Hoffman, the first marketing person on the Mac team. Soon the company was flooded with world-class talent. But Porat’s real test came in cajoling corporate giants in communications and consumer electronics to be part of the General Magic Alliance. After all, there are plenty of companies in Silicon Valley planning small devices that communicate—the winner of this sweepstakes will be the one that sets the standard. The best way to do this is by getting the big guys on your side. It took ten minutes of Porat’s gab to bring in Motorola, a giant in chips and wireless technology. A meeting with Sony’s CEO brought an agreement in an unprecedented five days.

Soon other corporations fell in line—Philips Electronics, Matsushita, and the biggest of all, AT&T.

Technologies R Us

At the public unveiling of the Alliance at a press briefing last February, no products were demonstrated or even announced. Instead, General Magic disclosed that its Dream Team was not so much making things, but devising technologies. Two, to be specific. One is a telecommunications scripting language called Telescript, and the other is a “communications applications platform” called Magic Cap.

General Magic’s plans rest on these two technologies. The first one, Telescript, is particularly interesting in that it did not come out of the personal computer culture, but from the comparatively arcane world of data communications. Its chief architect is Jim White, who has god-like status to those steeped in the lore of communications as the master of the X.400 protocol. Telescript is a language for “smart messaging” based on a giant breakthrough: it treats commands as if they were little computer programs. In this aspect, Telescript very much resembles PostScript, a page-description language that derives its power from the same principle. Smart messaging changes messages into messengers—instead of merely communicating, they go out and find the intended recipient(s), figure out the best way to get the content across, and then collaborate with other messages so that you can have a fruitful exchange without even knowing about it. (Are smart messages a species of software agent? Yes.)

General Magic VP Rich Miller gives an E-mail example. “I send a message saying, ‘Get it to him as quickly as possible, and notify me if he receives it. If you can’t get it to continue...”
him within the hour, fax it to his home number, and notify me that it went through." Or consider scheduling. You want to make a dentist appointment. Your smart message to the dentist would not only suggest alternate dates but also get back to you with the day that is open, and then stick the appointment into your calendar. And on the morning of root canal day, it sends you a reminder. Telescript can also use software agents to search databases.

Like PostScript, Telescript does not have a direct interface with the user, but works underneath applications and operating systems. AT&T plans to open an entire new division using Telescript-based devices for smart messaging. There's also talk that IBM is about to embrace this technology. That's just fine with General Magic, because if the company gets its way, Telescript will be a cash cow, licensed to anyone making a telephone, modem, or personal digital assistant.

The problem these magicians face is quite similar to the dilemma Apple tackled ten years ago: how can you allow people to do complicated things (personal computing, smart messaging) in an easy-to-learn, intuitive way? The solution in both cases is to create a sort of visual playground within the machines, a metaphorical outpost of cyberspace populated by icons that are easy to manipulate. While the Mac is standardized on a desktop metaphor, with files, folders, trash cans, and calculators, a desktop is only one possible scenario Magic Cap might offer. There might be shopping malls, libraries, encyclopedias, or neighborhood maps.

Magic Cap has a simple scripting language, like Atkinson's HyperCard. But most people will control Magic Cap devices by manipulating icons. As in Broderbund's Playroom program, users might trigger an event as easily as by tweaking an on-screen toy. In a desktop scenario, for instance, you might get to your schedule by touching a datebook on a desk. You could start to compose a note by touching a pad of paper, which would prompt a little typewriter keyboard to appear on screen for text input.

Here's another scenario. As if you were playing a graphic adventure game, you might scroll through a representation of a shopping mall. See a record shop? Touch the door to find your way to the blues bin and the new CD by Buddy Guy. Push a few more buttons and you've ordered the CD, which the distributor will automatically send to your home. The purchase might trigger a message that Buddy Guy is playing at Town Hall next week. A few touches in response to the message could change your display to a seating chart of the arena, with un-purchased seats highlighted. You might choose your seats right there. A digital equivalent of tickets, good for admission, would be sent straight to your device. Encryption technologies built into Telescript would ensure that only those tickets are valid for those seats.

I could go on with all sorts of examples. At the press launch, an AT&T executive was particularly fond of the scenario in which a gypsy in a boring business continues...
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*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.

Putting technology in its place.”

Circle 3 on reader service card
meeting sent a digital postcard to his dear old mother, whose General Magic-powered device lit up with an incoming message that brightened the dear lady's day. But suffice it to say that if General Magic manages to complete these technologies as planned, if the Alliance holds together, and if the public accepts the new devices, history will indeed have been made.

Unless of course, it doesn't. Chipping the paint job on the universe is easier said than done. Those three Ifs are big ones, as big as the vision itself. One probable source of disappointment will be the mad-dangingly slow rate at which wireless communications—which provide the true pizzazz to personal intelligent communicators—become ubiquitous and cheap enough to match the cost and utility of wired devices such as telephones. And there are other obstacles: the economy could get grungier. And there's the threat of serious competition: General Magic borders on phobic at the prospect of Microsoft getting into its business.

But the greatest potential pitfall for General Magic is its burden of insanely great expectations. The company isn't talking, but my guess is that the first implementations of General Magic technology will appear early next year. These will include small devices made by Alliance members Sony, Motorola, Philips, and Matsushita; AT&T's Telescript project; and—good news for Macintosh users—Apple Computer's software implementations for PowerBooks. (John Sculley has also announced that Newton devices will eventually use Telescript.)

Yet until massive numbers of people are actually messaging with Telescript, and until the futuristic telecommunications services I've described come online, General Magic devices won't be nearly as useful as the gee-whiz scenarios suggest. And even if the first implementations use wireless communications exclusively (which seems unlikely), the ongoing costs will be steep. Maybe steep enough to lead a few people to toss their sweet devices into the dumpee after the first bill appears.

Marc Porat is certainly aware of the perils of unrealistic expectations, and he urges people to expect a slow build. A very slow build. "I'm a walking antidote against hysteria and hype," says he. "I tell people this will take a long time. In some sense I'm working for my kids. We're talking about 20 years of development."

While Porat's kids are reaching majority, their college funds, with luck, will be enriched by General Magic's Telescript licensing fees, and the revenues paid by the early adopters who will use products with Magic Cap even before so-called personal intelligent communications become as common as pay phones. That, in a nutshell, is General Magic's plan. First the vision, then technologies, then the infrastructure. Finally, the history books.

Porat has to leave, and I'm left alone with a prototype he brought with him, a nonworking prototype of a potential General Magic device not much bigger than a Sony Walkman. On the front is a presentation of an early Magic Cap display; on the back is a little piece that drops out and unfolds into a tiny telephone receiver. Porat, forgetting his role, told me that John Sculley predicted this little thing would someday be in the Smithsonian. So much for being an antidote to hype.

But instead of saying "The Smithsonian? Hoo!" I hold the prototype respectfully, thinking of paradigms, Dream Teams, and digital postcards to my mother.

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LOWLY BUT SURELY, APPLE is getting the message. The company used to offer a 90-day warranty on its products; eventually that changed to the industry standard of one year. For most of the company's history, Apple technical support simply didn't exist; now Macworld is getting letters praising Apple for the kind of hand-holding that's second nature to virtually every other company in the industry.

In April the company announced Apple Assurance, a program of improvements in customer service and support. The changes include the addition of a toll-free support line (see "Calling on Apple"), an improved global warranty, and expanded service options. With a proof of purchase, warranties for Apple products will now be honored by any Apple-authorized service provider in the world. That should make life easier for international travelers. (Apple says it's the only company to offer global support across its entire product line.) The company has also expanded its warranty service program to provide on-site repair for most of its computer systems and many peripherals, including scanners, several LaserWriters, CD-ROM players, and all keyboards.

Are these changes real improvements, or simply window dressing? The improvements are real, according to Nicholas Martin, a Macworld reader and Apple customer since early 1986. Martin says he hated Apple several years ago because of a broken LaserWriter Plus and its two-month wait for repairs. Martin says the small laser service bureau he opened in 1986 went under because it couldn't function without a printer. Apple's unwillingness to intervene with the dealer repairing the printer destroyed his business, Martin claims.

Fast-forward to the spring of 1993, when Martin's new Quadra 800 began acting up. A misplaced Finder and System caused the problem, which he was unable to fix with Apple's start-up CD-ROM. So Martin went to a dealer, who charged $50 for booting the Quadra from a floppy and cleaning up a few files. Martin then called Apple's new support line and was told by a representative that the dealer "had no business charging me for such simple assistance and that he would make sure they credited me," he says in amazement. The support person "gave the dealer hell and ensured that the dealer gave me my money back."

Why did Apple get religion? Martin claims unbridled capitalism did the trick; responsive companies in the DOS/Windows world had already upgraded support, so Apple was forced to follow suit. That makes sense. But there's more to the story, according to the people behind Apple's new policies: Dan Byrne, vice president of the customer services division for Apple USA; Jackie Whiting, director of customer support; and Timothy Hayes, director of service.

Responding to Customers

ACCORDING TO THESE APPLE EXECUTIVES, about 18 months ago an invisible but important change took place at Apple that should ultimately mean better products and policies. The service and support groups began feeding information back to the product groups that actually create Apple computers and peripherals. Based on calls to its 800 number, the customer-support group now gathers information on the top ten customer issues and shares it with the rest of Apple. The group is also able to track bug reports, erroneous product specifications, and general customer unhappiness on any given topic.

All this information-gathering is useless unless it's acted upon. But Apple is paying attention, say these execs, who point to the Apple Assurance program as proof. For some time Apple has surveyed customer satisfaction. PowerBook owners—who had access to a phone line and mail-in warranty repairs—had far higher customer-satisfaction ratings than other Macintosh owners. That realization led Apple to introduce toll-free technical support for all customers—an overdue and welcome change in customer policies.

"The Apple Assurance program provides the customer with a choice," says Byrne. In the past, customers were restricted to dealers for help, and some, like Martin, got stranded. In those cases, customers now have recourse to Apple. "It's a safety net," says Byrne.

More Change Needed

THIS SAFETY NET IS A HUGE IMPROVEMENT over Apple's earlier stance on service and support. I got through to an Apple rep promptly one morning and got a quick and accurate answer to my question. Initial reports from readers suggest that many are also getting prompt help and are happy with the changes. But Apple needs to understand that true service and support goes far beyond the narrow definition suggested by warranty policies and phone lines.

Here's an example: Technical support alone won't keep customers happy if they have to wait months to buy a product. At the end of May, dealers said the popular LC III (particularly the 4/80 model) and LC III upgrades were in short supply. One dealer had no 4/80 LC III's and hadn't for a month. Such problems aren't new to Apple. In August 1992, Bradley Wilson of Irving, Texas, ordered a Power-Book 170 through the Apple educator program. The 170 was discontinued before his computer was scheduled to arrive, in October. He finally got a 180 in mid-March of this year.

Other examples abound. Express Modems for Power-Book Duos were late out of the gate; worse still, they don't work very well, according to several readers and a few dealers. Less recently, a pair of Macworld readers ordered a IIvx in October 1992 but didn't receive it until late December—and the cheaper, faster Centris line was announced a mere six weeks continues
Calling on Apple

Memorize this number: 800/767-2775. That's the number to call for Apple support. It translates into 800/SOS-APPL, for when you need information on getting your Mac up and running, have questions about compatibility, or want details on Apple products. You can talk to real people Monday through Friday, from 6 a.m. to 6 p.m. Pacific standard time, or simply listen to a 24-hour recorded question-and-answer line with responses to common questions. There's also a fax-on-demand system for faxing callers product information. (Call 800/950-2442 for info on fee-based support.)

Apple's general number, in Cupertino, California, is 408/996-1010. Hearing-impaired customers can dial Apple's Customer Assistance Center TDD at 800/833-6223. The company's Worldwide Disability Solutions group can be reached at 408/974-7910. For referrals, call 800/538-9696, ext. 525, to find a user group, authorized dealer, or service provider. Dial 408/974-9627 to be referred to a consultant.

In the United States, APDA (Apple Programmers' and Developers' Association) can be reached at 800/282-2732, in Canada, at 800/637-0029. APDA can also be reached directly at 408/562-3910. AppleLink users can dial the AppleLink Helpline at 408/974-3309 for information on billing, technical support, or on ordering AppleLink or the AppleLinkCD.

Canadian residents have access to Apple's Technical Assistance AnswerLine at 800/263-3394 for one year of support; Apple Canada can also be reached at 416/513-5548 for basic getting-up-and-running support. Or try 416/513-5782 for pre-sale information and for dealing with unresolved service and support issues. For a referral to a Canadian authorized dealer, call 800/665-2775. The general Apple Canada number is 416/477-5800.

Now that Apple offers a global warranty service, travelers to Germany, the United Kingdom, and Japan may want to keep track of these numbers. In Germany, you can dial Apple's general information line at 0130/7978. In the United Kingdom, dial 100 and ask for Freefone Apple to get customer assistance at no charge. In Japan, call 3-54118500 to get Apple's general line. Remember, you need proof of purchase in order to get warranty service abroad.

later. Another reader waited five months for his Illvx.

Of course, it's no small trick to plan and build excellent products, accurately predict demand, and then seamlessly produce them. Apple has beefed up support, and it appears the people running and staffing Apple's support groups are working hard to help Mac users. But the support people don't set policy. And it's at the policy level that Apple needs to get religion. But that doesn't have to be a problem—by simply following this Macworld wish list, Apple can create the Holy Grail of customer service and support. How?

• First, solve the supply problems. Wannabe customers are increasingly frustrated with product shortages.

• By replacing lemon computers. Joseph Borzelleca, a professor of pharmacology at the Medical College of Virginia in Richmond, bought a PowerBook 170 from an authorized Apple dealer in July 1992. The computer's battery never held a charge, according to Borzelleca, who sent it to his dealer once and to Apple for repair a total of five times. Apple execs say the company has made reasonable offers to resolve the problem. I disagree. The company's most recent offer was to replace his...
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**Conspicuous Consumer**

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Joe Clark of Toronto sings the praises of Jim Hoskins of CPUsed, a local dealer that buys and sells used Macintoshes. Clark writes that Hoskins "has swapped Radius Pivot monitors with the jitters more than once (costing him real money in repairs) and still is offering me an upgrade to a color monitor for a lousy $250." Not only that, Hoskins has "installed memory and ROMs before my very eyes and never asked for a cent for installation." What a dealer!

---

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2. Sweepstakes is open to all residents of the U.S. over 18 years of age except employees of La Cie and Quantum, and where prohibited or restricted by law which includes without limitation New York, Rhode Island and Florida.
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. (Price to be determined)
4. Winner to be notified by mail or phone and may be required to sign an affidavit of eligibility and release as a condition of receiving prize.
5. Entry 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.
6. Original entry form must be completely filled out to be eligible.
7. Taxes, shipping, and delivery of the prize are the responsibility of the winner.
8. For notification of the winner, send a stamped self-addressed envelope to La Cie, Ltd., a Quantum Company, 8700 S.W. Creekside Place, Beaverton, OR 97005.

*Porsche shown is not the actual sweepstakes prize described herein.

Enter now to win. Enter me in the La Cie Porsche Carrera 2 Sweepstakes

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Company
Title
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Macworld

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FILE COMPRESSION OFFERS THE PROMISE OF A LOT MORE STORAGE FOR A SMALL PRICE, BUT FILE COMPRESSION ISN'T NECESSARILY FOR EVERYONE. COMPRESSORS CHANGE HOW YOUR MAC WORKS WITH YOUR DATA, AND THAT CARRIES SEVERAL PENALTIES. THE FEATURE “REAL-TIME COMPRESSION” IN THIS ISSUE COMPARES FIVE PRODUCTS THAT PROMISE DOUBLED DISK SPACE (AS WELL AS THREE PRODUCTS THAT WERE UNAVAILABLE FOR FULL TESTING) AND EXPLAINS THE PITFALLS. KNOWING HOW THESE PROGRAMS WORK CAN HELP YOU DECIDE WHETHER THE POSSIBLE PITFALLS ARE WORTH THE SAVINGS.

How Compression Works


Different Compression Techniques

THE KEY DIFFERENCES AMONG PRODUCTS LIE NOT IN THE ALGORITHMS THEMSELVES BUT IN HOW THEY ARE IMPLEMENTED. THERE ARE TWO BASIC APPROACHES FOR A COMPRESSOR TO USE: FILE-LEVEL OR DRIVER-LEVEL. UNTIL RECENTLY, ALL MAC COMPRESSORS WERE FILE-LEVEL; MOST DOS COMPRESSORS ARE DRIVER-LEVEL. THE MAC’S COMPLEX DISK-DRIVER STRUCTURE DELAYED VENDORS FROM USING THE DRIVER-LEVEL APPROACH, WHICH IS TYPICALLY MORE EFFICIENT BUT MAKES DATA RECOVERY MORE DIFFICULT IF A DISK CRASHES.

With file-level compression, the application saves data to the hard drive in the normal way: first through the Macintosh Operating System, which handles file naming and folder details, and then through the disk driver, which directs how the bits are stored on the disk. The compression program — an INTL-LOOKS ON A DISK FOR DATA THAT IS UNCOMPRESSED AND, WHEN THE MAC IS IDLE FOR A FEW SECONDS, READS THE FILE, COMPRESSES THE DATA IN RAM, SAVES THE COMPRESSED VERSION OF THE FILE, DELETES THE ORIGINAL, AND GIVES THE NEW FILE THE ORIGINAL’S NAME.

A DRIVER-LEVEL COMPRESSOR REPLACES THE DISK DRIVER OR MODIFIES IT SO THAT THE WAY THE DRIVER WRITES DATA TO DISK ACTUALLY CHANGES. BEFORE WRITING THE BITS TO THE DISK, THE DRIVER FIRST COMPRESSES THE DATA. IT ALSO STORES THE BITS ON THE DISK IN A MORE-EFFICIENT WAY THAN A STANDARD MAC DRIVER DOES (SEE “COMPRESSION METHODS’ TRADE-OFFS” IN “REAL-TIME COMPRESSION” IN THIS ISSUE).

Pros and Cons

File-level compression has several advantages over driver-level compression. First, you can remove the compressor by simply dragging it out of the System Folder after decompressing all files. Second, since file-level compression is not an all-or-nothing procedure, you can exclude the applications and documents you use most so that they’re always quickly accessible (compression and decompression take time). Third, once a file is decompressed, it acts like a normal file—applications that read and write the file repeatedly while working on them, like Adobe Photoshop, don’t waste time compressing and decompressing.
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Circle 130 on reader service card

LAB NOTES

ing the same file over and over. Fourth, because file-level compression doesn’t alter how the Mac keeps track of files or how it allocates resources, file recovery is easier, since recovery software can deal with standard data and file structures.

The major disadvantage of file-level compression is that it requires occasional user intervention, such as changing compression settings to optimize performance and decompressing files before checking them with an antivirus program. Also, since file-level compressors leave the System Folder’s contents alone (system files are used so often that the constant compression and decompression would greatly slow down the Mac), file-level compressors typically offer less actual compression than do driver-level products.

**Compression Is Unequal**

Some files benefit more from compression than others. Word processing and spreadsheet documents usually compress the most, since they typically have many repeated patterns of data. Database documents also compress well, since many of their fixed-length fields contain either multiple blank spaces or data that is repetitive—for example, zip codes.

But scanned color or gray-scale files yield the least data compression—they’re much less likely to contain similar data, and the visual “noise” introduced by the scanning process doesn’t help either. Previously compressed files—such as archived data, LZW-compressed TIFF files, and JPEG-compressed QuickTime movies—gain little or no compression.

**Resource Compression**

ABE AND OTHER DEVELOPERS, NOT just users struggling with huge files and small hard drives—benefit from another type of compression. While Apple was developing System 7, the System file and Finder grew to the point that they would no longer fit on a single high-density floppy disk. Apple had always used a compression/decompression method on system resources that let compressed system files function while still compressed and without affecting system performance. The trick was hidden from developers until the release of System 7. Now an official method of accessing that resource-compression technique is available.

**How Resource Compression Works**

Each developer can create its own decompression code and store the code with compressed applications as a resource of type DCMP. When you launch a compressed application, the compressed portions are decompressed into RAM. This is much faster than first decompressing to disk. Also, only the resources that are needed at launch time need to be decompressed. Being smaller, a compressed application sometimes loads faster than an uncompressed application, even with the decompression overhead.

Several developers, including Aladdin Systems and Fifth Generation Systems, didn’t wait for Apple’s official method of using compressed resources, so their methods work both with System 7 and 6.

**Taking Advantage of Resource Compression**

AutoDoubler lets users apply its own version of this technique to system resources not originally designed to take advantage of this feature. With the AutoDoubler Internal Compressor (AIC), you can compress applications, control panels, and system extensions.

In our testing, only some applications could be compressed using this method, and only some launched faster than when they were compressed in the normal manner. Still, we found some dramatic improvements. For example, via resource compression, Photoshop took up 60 percent of its normal size and launched only 3 percent slower than in its uncompressed form. Via normal compression Photoshop took up 54 percent of its normal size but took 39 percent longer to launch.

**Alternatives to Compression**

You’ve decided that the performance penalty of on-the-fly compression isn’t for you and you can’t afford a bigger hard drive, consider some other methods for getting more disk space.

- Don’t install every file that comes with the System. When you perform a System upgrade, do a custom installation—install only the files you really need on your hard drive.
- If you have mostly very small files, partition your drive. The bigger the drive’s partition, the bigger the allocation block—which is how much space the Mac reserves for each chunk of data. If the file size is smaller than the block size, the unused space is wasted. A 230MB partition usually has 4KB blocks; an 80MB partition usually has 2KB blocks.
- Use the compression features that are built into some applications—for example, save files as compressed TIFF instead of TIFF.
- Remove tutorial, help, and other support files once you no longer use them. Ditto for unused sounds and fonts (back them up in case you want them later).
- Use an integrated package if you don’t need all the features of a high-end package—for example, try Microsoft Works instead of Word and Excel.
- Clean up your hard drive occasionally—you’ll be amazed how much room you can recover.
Oh, it's not a total downer. We stored our data on Verbatim, didn't we?

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LaserMaster has done it again. We've pushed the limits of ordinary laser printers to provide state-of-the-art typesetting with our new Unity™ 1200XL-O Plain-Paper Typesetter. Besides offering all the great features of the standard Unity, the Unity 1200xl-o includes a multi-purpose feeder and 32MB of RAM so you can print your 11 x 17-inch full-bleed documents with registration and crop marks. No other desktop printer can make that claim for any price! And of course, the Unity 1200xl-o prints 1200-dpi, camera-ready output on plain paper for just pennies a page.

Unity 1200xl-o gives you:
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Call LaserMaster today for a free sample of 1200-dpi output from the Unity 1200XL-O.

"The Professional's Choice"
Personal LaserWriter 300: More Gray for Less Green

THE LC III IS NOT the only example of Apple's new willingness to compete on a price-for-features basis instead of trading on the Macintosh mystique. The latest instance of this trend is the Personal LaserWriter 300, a 4-pages-per-minute, 300-dpi laser printer, designed for home or in-home-office use, with a list price of $700. Contrast that with four years ago, when the comparable LaserWriter IISC was introduced at $2799.

The Personal LaserWriter 300 competes head-to-head with GCC Technologies' Personal Laser Printer II, a longtime price-for-performance champion at $739. And at the street price you're likely to find a few months after introduction, the Personal LaserWriter 300 will be reasonably competitive with Hewlett-Packard's popular DeskWriter ink-jet printers.

The Personal LaserWriter 300 is a QuickDraw printer that ships with 39 TrueType scalable fonts and Apple's driver with GrayShare. GrayShare lets other users access the 300 from an AppleTalk network, but GrayShare's main value in the home will be significantly sharper gray-scale printing (see "New from Apple: 3 Printers & 1 Scanner," Macworld, March 1993).

With Adobe Type Manager you can print PostScript fonts, but Apple says at this time it has no plans for a PostScript upgrade (a $599 option for GCC's QuickDraw-based PLP II).

The 300 includes some design features that are likely to endear it to light-duty users. A single 100-sheet cassette holds standard and legal paper sizes. The 300 prints on transparencies or any standard paper stock. There's a straight-through paper path for printing on heavy stock or envelopes (which means no curled envelopes from a curved path). The 300 uses one special toner cartridge—it's a new design—that snaps easily into place and should print more than 2000 standard pages.

One particularly unusual feature is the absence of an on/off switch. As part of Apple's emphasis on energy savings (prompted by the federal government's Energy Star plan) the 300 maintains itself in an energy-conserving standby state, powering itself up only when the Mac tells it to print a document. The whole package, remarkably, weighs only 15 pounds.

Another unusual feature is the parallel port, the connection standard for DOS-based printers. The reason simply is that the Personal LaserWriter 300 is the same printer that Canon makes for the DOS/Windows world; Apple added the GrayShare driver, a parallel-to-serial adapter, and a new case design.

What you don't get at the 300's low price, besides PostScript, is speed—the 4-ppm figure is a maximum. Since in the QuickDraw world the Mac is doing the page-setup computation, complex or dense images will slow down the printer and the Mac. Apple says its market research shows home users average only a few printed pages a day, so it's quite likely that retail price—not print speed—constitutes the critical index for acceptance.

Still, the 300's print quality is very good, the price includes everything you need to start printing, and the unit is compact enough to tuck away neatly on the corner of a small desk. Apple says the 300 will ship June 14.

—CHARLES SEITER

Graphical Accounting Adds Up

You can store 21 megabytes* of data on a single 3M Floptical® diskette—just right for larger graphic, spreadsheet or backup files. Floptical technology is a practical and affordable way to increase your storage capacity—without giving up the convenience of diskettes. And with appropriate host adapter and driver software, Floptical drives are compatible with standard 3.5" diskettes.

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The bigger the job, the better you'll like it.

*Nominal capacity 3M 21 megabyte Floptical diskettes require compatible drives. Floptical is a registered trademark of I.B.M.® Peripheral. © 3M 1993.
Momentum’s point-and-click graphical interface will simplify such tasks as drilling down through accounts—for example, to open up the original transaction for a question-able line in the receivables. Momentum will support concurrent work on multiple databases and provide multiple levels of security.

State of the Art says Momentum will eventually have 21 modules, including some highly application-specific modules for multiple-currency businesses, bill of materials, union payroll reporting, and the like, ranging in price from about $500 to about $1500. The platform also has a BASIC-like language for programming additional functionality. State of the Art, 714/753-1222.—D.L.

Low-Cost Laser
Belts Out Color
QMS announced its ColorScript 1000, a color laser printer aimed at the business desktop. This 300-dpi printer has four toner cartridges: cyan, magenta, yellow, and a double-size black. This arrangement reflects what QMS believes will be typical office usage: primarily monochrome documents with a scattering of spot color.

The ColorScript 1000 can push out black-and-white pages at up to 8 pages per minute, and color pages at up to 2 ppm, according to the company. The printer-marking engine places toner on a wide belt in four passes (one pass for each cartridge color), assembles the image on the drum, and then transfers the image to the paper in a single pass.

The printer operates all its interfaces simultaneously (serial, Centronics, and LocalTalk are standard) and automatically switches between page-description languages, according to QMS. The ColorScript 1000 supports Apple’s ColorSync and EFI’s EFI-Color color-management systems and comes with emulations of PostScript Level 1 and Level 2, and of HP PCL 5c with GL/2. In addition, the firmware resides on an included 40MB internal hard drive and is downloadable to memory every time the printer is turned on. The benefit to this is that the firmware may be updated at any time, without requiring a logic-board replacement. According to the company, the printer will retail for under $15,000. QMS, 205/633-4300.

Omnis 7 Speaks SQL
Mac databases are growing up and adjusting to their place beside minicomputer client-server databases like Sybase and Oracle. As proof, this summer Blyth plans to ship Omnis 7 version 2, which the company says is identical on the Mac under Windows, with new features for a heterogeneous world, including the ability to translate Omnis queries into the de facto standard SQL, and to run multiple databases under one server.

Tools to Automate the Mac
A NEW COMPANY with aggressive plans is developing two software packages that automate working on the Mac.

Main Event’s Scripter puts a graphical interface on Apple’s forthcoming Mac-automation language, AppleScript (see “AppleScript at Last,” Macworld News, June 1993). Scripter interrogates applications for the AppleScript commands and data objects they provide, and presents the user with a list of commands and relevant options from which to choose. It also provides debugging tools for serious programmers. Scripter will ship for about $250 after AppleScript ships.

The second product, Rosanne (don’t ask), is a set of utilities for performing batch-oriented mainframe-style data-processing tasks on unstructured text files. Rosanne’s six mini-applications ($500 to $600 for all six), which will probably ship by the time you read this, are Sort, Select, Copy, Match, Aggregate, and Reformat. All are fully scriptable, so a series of data processing tasks can be lined up and scheduled to launch at a later time. Main Event, 202/298-9595.—D.L.

TURKEY SHOOT
DESIGN FLAWS NOTED

AutoRemounter for PowerBook 160 and 180
Is your 160 or 180 lonely? Maybe that’s the reason, whenever it gets the chance to hang out with its friends on the office network, it chatters so much that the network slows to a crawl. (Solution: Put a cork in it by trashing the AutoRemounter cd.)

Microsoft Word 5.1
Who says “Smart” Quotes is so smart? With “Smart” Quotes on, if you use a font that has no curly quote marks, Word enters blank spaces instead of straight quote marks.

FileMaker Pro 2.0
If you plan to check the spelling in that inventory database, plan on plenty of mouse-clicking, because FileMaker’s user-defined dictionary maxes out at 32K, or about 5000 words.

Macworld will send you a Turkey Shoot T-shirt if we shoot your turkey in this column. See How to Contact Macworld.

Omni’s 7’s Development Tools Include a Library Where You “Check Out” Shared Modules of an Application.

Version 2’s development environment creates shared object libraries that provide version control for multiple programmers collaborating on an application, adds a text editor to the scrolling command lists, and can update the end user’s application with the latest version at launch. Blyth says that because much of Omnis’s feature set is written in its own language, developers can provide end users with subsets of Omnis’s features, such as its report generator.

Omnis 7 version 2 will list for $3750 for developers and $3000 for a run-time ten-pack. Blyth, 415/371-0222.—D.L.
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-callibration 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.

It’s blazingly fast. 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 to scanning color, HP’s ScanJet IIC uses its excellent color-calibration method to make sure your scans are as accurate as possible.

TOP-NOTCH HARDWARE TEAMED WITH INNOVATIVE SOFTWARE MAKES HP’S NEW COLOR SCANNER A WINNER.

WINNER MacWEEK 1992 DIAMOND AWARD

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.

Hewlett-Packard’s ScanJet IIP sets a new standard for affordable desktop gray-scale scanners. From small to large, it’s a scanner that meets all your needs.

1992 Diamond Awards

Top honors in every scanner field.

“We were extremely impressed with the HP ScanJet IIC. It’s fast, reliable, and easy to use. It’s a great choice for anyone looking for a high-quality scanner at an affordable price.”

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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. TWAIN support allows scanning without having to switch between applications. And HP AccuPage technology with 400-dpi resolution can tackle the toughest OCR challenges. What's more, capabilities this advanced have never been this affordable. List price on the HP ScanJet IIC is just $1,599. The HP ScanJet IIP is just $879. And right now, the HP ScanJet IIC includes Adobe 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 about the HP ScanJet IIC and IIP or seminars in your area, call 1-800-SCANJET, Ext. 7364.

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To the hundreds of thousands of PowerBook™ owners who find themselves wishing there was a portable printer that lived up to their Macintosh...

INTRODUCING THE WRITEMOVE™ II PORTABLE PRINTER.

GCC Technologies® has created a printer for the PowerBook that awards you considerable range of motion. It's called WriteMove II: the "biggest" printer to ever come in an incredibly small package.

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.

MacWeek and MacUser have cited the WriteMove II as an excellent add-on to the PowerBook, noting its construction, portability, looks, and sophisticated software. MacWeek gave it 4 diamonds for its overall value.

We invite you to make your own comparisons. Then acquire a WriteMove II: a passport to printing mobility, for wherever life takes you.

The WriteMove II (including battery, A/C recharger, software, serial cable, and one year warranty) $599.

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Catalog producers, large-scale advertisers, and others who produce different versions of multiple-product promotions should find respite from chaos in Integrated Software’s Catalog Maker 2.0.

This $2495 Quark XTension allows the page producer to assign a category and ID number to QuarkXPress page elements that are to be updated. Catalog Maker then extracts the appropriate information—text, graphic, price, and so on—from an external product database. The database includes tags to identify each record’s function within the ad, and it can also have QuarkXPress Tags for formatting information.

Combined with Integrated’s Text Fit XTension (one of five XTensions bundled with Catalog Maker through 1993), the program can automatically adjust text to fit within a given area. For example, it can adjust the size of a price to fit within a starburst. Product DB, also from Integrated, is a $995 4th Dimension database optimized for working with Catalog Maker. Integrated Software is in New York at 212/545-0110.—STEVE ROTH

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**HP LaserJet under $1000**

INTRODUCED ON May 3, the 4-ppm, 300-dpi LaserJet 4L replaces the LaserJet IP as the most affordable Hewlett-Packard laser printer. A Macintosh version, the LaserJet 4ML, will follow in the second half of 1993 with a street price under $1000. The LaserJet 4ML uses a Canon engine, a 20MHz Intel 80960 RISC processor, 4MB of RAM, PostScript, TrueType fonts. The LaserJet 4ML supports simultaneous use on a Mac and PC, automatically switching between LocalTalk and parallel ports, and PCL 5 and PostScript Level 2 as needed. Hewlett-Packard, 800/538-8787.

—OWEN W. LINZMAYER

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**News**

**Fiber-Optics File Transfer**

Q: WHEN IS A NETWORK not a network? A: When it’s a dedicated, point-to-point file-transfer line. Retriever Plus, Augment Systems’ new hardware-and-software file-transfer package, runs over fiber-optic cable but avoids many of the usual hassles that accompany a network, fiber-optic or otherwise. Users plug a NuBus board into a Mac on each end of the transfer line, run Augment’s proprietary application, and designate a single folder on each end as a transfer folder. To send a file, a user brings up the Retriever Plus software, selects a file, and clicks on Send. Users can also retrieve any file that is placed in the transfer folder on the other end.

Augment Systems emphasizes that the Retriever system is not a replacement for a network, but rather a way for Macintosh users to transfer extremely large files from computer to computer. The Retriever Plus application occupies roughly 2MB of RAM and must be on both Macintoshes. The company claims that Retriever Plus can transfer a 30MB file in 20 to 30 seconds.

Each NuBus board (at least two are required) costs $1900, a 25-foot cable costs $200 (longer cables are available, up to the operational limit of 500 meters), and the software site license costs $800. Augment Systems, 617/271-0230.—CAMERON CROTTY

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**B U G R E P O R T**

**Ofo to 2.01** Crashes if you try to save line art as an EPS file. Light Source is working on a bug-fix to be available free to registered owners.

**Stuffit SpaceSaver 1.04** The feature that suppresses decompressing files when backing up doesn’t work with Retrospect Remote 2.0. Aladdin says SpaceSaver 1.05, available free to registered owners, will work properly.

**MacWrite Pro** Using the table editor on a Classic under System 6.0.7 or 6.0.8 crashes your Mac. Claris will make a patch available free via the online services.

MACWORLD WILL SEND YOU A BUG REPORT T-SHIRT IF YOU ARE THE FIRST PERSON TO INFORM US OF A SERIOUS, REPRODUCIBLE BUG THAT WE REPORT IN THIS COLUMN. SEE HOW TO CONTACT MACWORLD.

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**Universal E-mail Is En Route**

In 1988 the worldwide authority on computer communications, the Comité Consultatif International Téléphonique et Télégraphique (CCITT), published the X.400 family of standards that established a way for electronic-mail systems to talk to each other over local area and wide area networks. X.400 supports different types of messages and allows transfer of attachments, such as Macintosh programs and data files or universally understood ASCII text files.

As with most standards, X.400 has taken hold very gradually. In fact, there aren’t yet any Macintosh E-mail systems based entirely on X.400. Isoscor Corporation (310/476-2671) hopes to change all that later this year with its IsoPro for Macintosh, the first commercial X.400 client software for the Macintosh.

Until then, Macintosh users will follow in the second half of 1993 with a street price under $1000 for QuickMail ($995), which works with Apple’s MacX.400 server to pass QuickMail messages into an X.400 E-mail network. The Wollongong Group’s (415/962-7100) Pathway Messaging for Macintosh ($195) also provides X.400 mail features between Macintosh users when it’s used with Wollongong’s Pathway Services, a Unix-based mail server.

And due out from StarNine Technologies (510/548-0391) by the end of 1993 are Mac X.400 gateways for QuickMail and Microsoft Mail.

—JOEL SNYDER
GET THE BIG PICTURE, FAST.

True 600 dpi output yields sharp text, rich graphics, smooth curves and no jaggies.

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Microfine toner combined with 600 dpi optics produce ultrasharp output.

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The SelectPress 600 offers true 600 x 600 dpi resolution with all the latest advances in laser printing technology. It delivers the highest quality output of any GCC laser printer, ever. GCC's new microfine toner produces smaller dots and crisper edges than previously possible. SelectPress 600 incorporates precise laser optics with a small laser spot size and a vibration dampened paper path to ensure optimal print quality every time you print.

SelectPress 600 excels in today's business environment where a multiplicity of languages and networking standards exist. It is equally comfortable in either the Macintosh® or the Windows® world. SelectPress 600 includes full support for PostScript® Level 2 and PCL® 5. And it incorporates sophisticated hardware and software that supports LocalTalk® and EtherTalk® as standard, not as an overpriced option.

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to order, for more information, or for the location of your nearest GCC dealer.
**Trend**

**Smart Spreadsheets**

Spreadsheets just store numbers in a grid; it's up to the user to design them so that row and column labels identify data in the cells. Spreadsheets make it easy to set up models but tiresome to rearrange data. In contrast, category-based modeling programs know what a given number represents—for example, sales of refrigerators in the Midwest for winter 1993—which makes it easy to create different summaries and views of the data. Lotus Improv introduced category-based techniques on the NeXT and Windows platforms, and Objective Software's SpreadBase brought them to the Mac (see Reviews, Macworld, May 1993).

SofTeam's Flippant is a new category-based spreadsheet with several surprises. It's fast and small (approximately 200K), and it's unfinished. $129 buys you the beta version with a short list of known bugs and another list ofunchieved features, including tool palettes, charting, color, and Apple events. SofTeam expects customers to tell it which features to finish, and will send beta users the final version at no charge. Flippant promises significant features, such as up to 32 English-language categories per spreadsheet, self-explanatory formulas (such as Profit = Sales - Cost), and in-cell editing. SofTeam hopes that this novel mode of researching its market and financing Flippant's development, combined with Flippant's easy fit on a PowerBook, will bring category-based modeling to more Macintosh users. SofTeam, 404/304-2025.

—Charles Seiter

**60-Field Video at Last?**

**SO FAR, PRODUCING broadcast-quality video on a Macintosh has been a bad joke to video professionals.** They have seen a parade of developers promise a studio in a box (or on a board), only to bring the same 30-fields-per-second technology to market (a field equals one half of a video frame). Data Translation is making some familiar claims about its new digital video product, Media 100, but the company is also using terms that promise performance more in line with the needs of video professionals, specifically, 60-fields-per-second output; 4-track, 16-bit sound; and a price just under $12,000. According to Data Translation, users will be able to digitize video in real time (15 minutes per gigabyte at the highest quality level), edit clips, and then print back to tape or export an Edit-Decision List (EDL) in a number of different formats.

Data Translation has also licensed Adobe's Premiere plug-in software architecture. Media 100's editing software ships with 50 Adobe Premiere video effects and will be able to use any future Premiere effects, including those that support CMX EDL output.

Media 100 consists of two NuBus boards and the proprietary editing software. The product will require a Quadra 800 or 950 and a hard drive with an 11-millisecond or faster access time that can sustain a 3MB-per-second data rate. At press time, the company was planning to ship Media 100 in August at a list price of $11,995. Data Translation, 508/460-1600.

—Cameron Crotty

**Radius Launches Video and Graphics Boards**

**RADIUS HAS JOINED the digital video battle with VideoVision Studio, a single NuBus board that does 30-frames/60-fields-per-second capture and playback of 24-bit QuickTime video. The package is actually the company's VideoVision board with the Studio port piggybacked on an H-Bus connector. The product features JPEG compression; NTSC, PAL, and 5-Video input/output options (via an external breakout box); and support for screen sizes up to 1152 by 870 pixels at 8-bit color (640 by 480 in 24-bit color). Video-Vision Studio comes bundled with Adobe Premiere and VideoFusion at a price of $4499; current VideoVision Studio owners can upgrade their systems for $1999.

Also new from Radius is PrecisionColor Pro, an updated 24-bit graphics board. The board features on-the-fly resolution switching, supports screen sizes up to 1152 by 870, and at 7 inches long, will work with any NuBus-capable Mac. VideoVision Studio $4499: the PrecisionColor Pro's price was not set but was expected to be less than $2500. Radius, 408/434-1010.—Cameron Crotty

**Small-Business Accounting on a Shoestring**

**People running small businesses on the Mac have a new accounting program and an upgrade of another popular program to consider. The upgrade is version 4.0 of Quicken ($69.95), the personal-finance program that many small firms use to keep the books. The latest version includes a portfolio manager, automated entry of credit card charges (if you use a special Visa card), financial-planning calculators, charting, and a way to instantly zoom in on the figures behind report items. Quicken owners can upgrade for $29.95, with 50 Adobe Premiere video effects and will be able to use any future Premiere effects, including those that support CMX EDL output.**

Radius, 408/434-1010.

—Cameron Crotty

**Flippant: Members of Year and Fuel Categories Can Be Selected for Members of the Company Category.**

**DATA TRANSLATION'S MEDIA 100 WALKS THE WALK AND TALKS THE TALK, BUT WHAT WILL VIDEO PROS THINK?**

—Cameron Crotty

**TOP: CASHBIZ'S ACCOUNTS SETUP WINDOW. BOTTOM: QUICKEN 4.0'S INVESTMENTS AND LOANS FEATURES.**

M.USA, publisher of CashBiz, hopes to woo Quicken customers with features geared to small businesses. CashBiz's advantages over Quicken include double-entry bookkeeping, inventory, and an address book for customer lists. At $49.95, it's also less costly than Quicken. CashBiz imports and exports Quicken files and works with Quicken checks. Owners of other Macintosh accounting products can purchase CashBiz for $20 (plus $5.50 shipping and handling). Intuit, 415/322-0573; M.USA, 214/386-6100.

—Scott Beamer
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.

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Dealers circle 155 on reader service card
Apple Upgrades LaserWriter Driver

Version 8.0 of the Apple LaserWriter printer driver will improve performance of PostScript-compatible LaserWriter printers, especially those that support PostScript Level 2 (currently the Personal LaserWriter NTR and the LaserWriter Pro 600 and 630).

The driver, which shipped in April, also adds support for multiple paper trays and printer resolution via PostScript Printer Description files (PPDs). Third-party manufacturers will customize the driver to suit their specific printers.

Apple began shipping the driver with PostScript Level 2 LaserWriters this spring, and Adobe sells it under the brand name PSPrinter version 8.0, for $24.95. Current LaserWriter owners can buy the LaserWriter printer driver from Apple for $24.95 (800/769-2775, ext. 7873). Apple Computer, 408/996-1010; Adobe Systems, 415/961-4400, 800/833-6687.—Cameron Croddy

Direct-to-Plate Laser Printing

QUICK PRINTERS AND in-house printshops with large-format laser printers now can render Mac documents directly onto plates for printing on small offset presses. Poly-Pro Laser Plates, which come in sizes up to 12 by 20 inches, last for about 15,000 printed pages. The polyester-based plates cost 72 cents per square foot, or about 90 cents for an 11-by-17-inch plate. The maker also sells oversize paper trays and extra-wide laser printers. Printwave, 612/456-1400.—Nancy E. Dunn

Inhouse Printers at Pennsylvania-Based Federated Genetics Load Laser-Printed Plates on the Press.

Informix ViewPoint, which will cost about $800, is a graphically oriented user tool for generating reports and creating forms. It lets users build SQL queries and attach them to forms, with no need for the user to learn SQL syntax or even see the actual queries. ViewPoint gets its information from the corporate database through SuperViews, a feature of ViewPoint that’s also found in the new version of Informix-DBA, Informix’s MIS administrators’ tool (about $2500). SuperViews are MIS-designed subsets of the corporate database that typically span many tables with many connections. For example, the database administrator can give ViewPoint users in accounting a SuperView of relevant financial data; the accounting staff can find what it needs (and only what it needs) through ViewPoint without detailed knowledge of, or access to, the database structure. Informix Software, 415/926-6300.—Charles Seiter

Budget-Base 3-D Animation

SPECULAR INTERNATIONAL is developing an easy-to-use 3-D modeling and animation program that it intends to release this fall at a street price of about $100—less than one-third the price of any other Macintosh animation package available. Named LogoMotion, it will come with an extensible library of already animated, editable objects—for example, balls bouncing and pins juggling. LogoMotion will also have a library of cameras with different views (wide-angle, fish-eye, and so on), as well as different movements (panning, swooping, and so on), and a limited rendering engine. Specular’s flagship product, Infini-D, can import LogoMotion files. Specular, 413/549-7600.—Gideon Yaffe

Breakthrough Graphics Technology

Advanced Imaging S.A., a small French company, has developed a breakthrough graphics technology called Functional Interpolating Transformation System (FITS), which lets Macintoshes manipulate, scale, and zoom high-resolution, tabloid-size images at speeds surpassing those of fast workstations. For instance, in a demonstration, placing, scaling, and rotating a 100MB file took about five seconds.

FITS is resolution independent; it doesn’t record and manipulate images pixel-by-pixel, as do most graphics programs. Instead, FITS works on a mathematical model of the file. When the image is complete, the user requests a final version at any size and resolution, and FITS rasterizes the output to order. A $5000 application based on the new technology, called Live Picture, was scheduled to be released in France in May, with a less costly U.S. version to follow in June. The company plans to license the FITS technology to other Mac developers. HSC Software, which publishes a collection of Photoshop plug-ins called Kai’s Power Tools, plans to release a FITS version of KPT by late summer. Price was not set at press time. Until Advanced Imaging completes its move to the United States, the company can be reached through HSC at 310/392-8441.—Tom Negriño

Virus Watch

Type: Virus
First listed in Virus Watch: 8/93
Info: A HyperCard script that infects the Home card and spreads to stacks
Impact: Nondestructive but can cause HyperCard to quit; may slow the Mac to a crawl

Christmas Virus

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Portable Optical Drive

FUJITSU COMPUTER Products of America has released the DynaMO, a portable magneto-optical disk drive. Roughly the size of a paperback novel and only 1.2 pounds, the drive uses standard 3.5-inch 128MB MO cartridges, which cost about $55 each. The drive itself lists for $1225. It supports SCSI-2 and has an average access time of 38.5ms and a data-transfer rate of 1.09MB per second.

Designed for the publishing, graphics, and multimedia markets, the DynaMO will compete with removable hard drive media like the new 105MB 3.5-inch SyQuest cartridges. Magneto-optical drives tend to be cheaper and more reliable than removable hard drives but are also generally slower.

Fujitsu is selling the DynaMO as a portable unit, although it cannot be battery-powered. Its case is platinum, like desktop Macs, not granite like the PowerBooks. (For more on alternative storage products, see "Choosing a Storage Strategy," in this issue.) Fujitsu, 408/432-6333.

—JOANNA PEARLSTEIN

Apple's Portable CD Power

The PowerCD from Apple Computer is a lightweight, portable CD player that plays CD-ROM drive in the usual way. With a Macintosh running QuickTime, the PowerCD can easily access the digitized images on Kodak Photo CDs. The PowerCD can also display Photo CD images when connected to a television, using the included CVBS cinestyle video cable. The PowerCD remote control enables users to view, zoom in on, rotate, and crop images on the television. Finally, the PowerCD can play audio CDs when connected either to a Mac or to a stereo system.

The PowerCD uses a Philips mechanism with an average access time of 550ms—less than special speedwise, but a disk cache can improve performance. Apple expects to begin shipping this summer at a list price of under $500.

—WENDY SHARP

Do-It-Yourself RAID

TRILLIUM RESEARCH has released Remus, a software package that offers users increased storage speed and data reliability via a redundant array of inexpensive disks, or RAID. The product supports traditional RAID SCSI controllers from companies like Atto, L payable, and Sixty Eight Thousand, but it also supports the Mac SCSI port, meaning users can create their own arrays simply by daisy-chaining several SCSI drives.

Users can choose between RAID levels 0, 1, 4, or 5—at Level 1 and above, systems can sustain the failure of a single drive without losing data from the RAID. After the drive is replaced, the software rebuilds the data in the background, eliminating system downtime. Remus consists of a system extension and a set of drivers for different SCSI controller boards, and it has a list price of $795. Trillium Research, 715/381-1900.

—CAMERON CROTTY

Reconfigurable Documents

Like modular office systems, SGML documents are made to take apart and reassemble in different forms. Electronic Book Technology's DynaText provides tools to recast such documents in another form.

SGML, or Structured Generalized Markup Language, is an emerging standard that assigns a tag to every element in a document (headlines, figure captions, body text, and so on) to describe what the element is and where it fits in the hierarchy of elements. DynaText can assign formatting to tags in SGML-tagged text—instantly converting every figure caption to 10-point Helvetica, for example, or centering every chapter heading.

DynaText is more than a system for manipulating SGML tags, however. It provides programming tools to create sophisticated data-navigation interfaces for information distributed on CD-ROM or online, and supports hyper-text links, raster and vector graphics and other external data types, complex text searches, and other features. DynaText version 2.0 is due to ship this summer. Pricing depends on number of users and distribution method. Electronic Book Technology, 401/421-9550.

MACWORLD August 1993 81
WE OFFER THE MOST PROTECTION FROM RUTHLESS CRIMINALS LIKE THESE.

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 and 7.

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 Macintosh. All you need to do is load the program disk, double-click on the Installer Icon and let SAM do 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.
THE AMCOEX INDEX OF USED MAC PRICES

<table>
<thead>
<tr>
<th>Machine/RAM/Hard Drive</th>
<th>Average Sale Price</th>
<th>Monthly Change</th>
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<tbody>
<tr>
<td>Mac SE/2MB/20MB</td>
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<td>-$50</td>
</tr>
<tr>
<td>Mac Portable/1MB/40MB</td>
<td>$650</td>
<td>-$50</td>
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<tr>
<td>PowerBook 100/4MB/40MB</td>
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<td>$0</td>
</tr>
<tr>
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<tr>
<td>Mac SE/30/2MB/40MB</td>
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<tr>
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<td>Mac IIfs/4MB/80MB</td>
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<td>LaserWriter INT</td>
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</table>

Note provided by the American Computer Exchange of Atlanta, Georgia (800/786-0179). It reflects sales during week of May 14. Configurations include keyboard and optional monitor and display board for noncompact models.

Adobe Premiere 3.0 — Polishing the Apple

Ever since Apple announced QuickTime, desktop digital video has been the darling of the Mac market. Similarly, Adobe Premiere has been the darling of the Mac desktop video market. With Premiere 3.0, Adobe adds new tools and further refines the interface.

The most noticeable addition appears just after the splash screen: a dialog box that lets you choose compression settings, frame size, and frame rate from a list of preset style sheets. Each combination optimizes the program for a different video goal (brie fly explained in a help box), and more-advanced users can create and save customized style sheets. Adobe is also promising custom style sheets for individual video-capture boards.

Let Us Now Praise Famous CD-ROMs

Whether you’re looking for a QuickTime clip of Mercedes-Benz’s experimental C-Series cars, footage of FDR, or scenes of gas-mask drills, you can probably find what you need in the WPA multimedia collection. The WPA Film Library is one of the world’s largest film and video archives, and the parent company, Maljack Productions, has formed a separate division to make the WPA archives available in digital format. The new division, MPI Multimedia, released the first four CD-ROM collections in April: The Archives of History, Cars! Cars! Cars!, Wild, Weird & Wacky, and WPA Multimedia Sampler. These are $79.98 each. MPI Multimedia, 708/533-1540.

Apple Fine-Tunes QuickTime

VERSION 1.6 of QuickTime promises improved performance, sound, and graphics. Movies will play back about 10 percent faster, thanks to a new Sound Manager (version 3.0), and owners of third-party sound boards will be able to record and play 16-bit (CD-quality) sound from QuickTime movies. Finally, QuickTime 1.6 will support any color level, from black-and-white to 32-bit color, as well as Apple’s ColorSync color-matching system, to help ensure that movie colors remain the same from system to system. Apple plans to bundle QuickTime 1.6 with the System 7.1 upgrade kit and with all new Macintoshes. In addition, Apple plans to distribute QuickTime 1.6 via bulletin boards, user groups, and bundling with third-party applications. Apple Computer, 408/996-1010.

Macworld August 1993 83

Note to Our Readers:

"Top Fifteen Business Software Packages" will be back next month.


CAMERON CROTTY

A THREE-DIMENSIONAL PLOT IN MATHEMATICA 2.2. TO THE RIGHT IS MATHEMATICA'S NEW FUNCTION BROWSER.

2.1 + 2000 = Mathematica 2.2

THE NEW VERSION of Mathematica ($595) contains more than 2000 enhancements and corrections and many major new features. In the modest view of Wolfram Research, this calls for the version number to be raised from 2.1 to 2.2, with upgrade prices starting at $50.

New math capabilities include symbolic solution of both first-order partial differential equations and systems of nonlinear ordinary differential equations (at least for the nonlinear systems that have simple symbolic solutions). There are also new modules for calculus of variations, elliptic integrals, and splines, and for making 3-D contour plots of imported data. The program’s sound module adds real music capabilities.

The really important addition, however, is the Function Browser, scrolling hierarchical lists of functions, which are briefly explained. Users can select a function to paste or edit. What an improvement over the version 2.1 method: careful typing with a copy of the Mathematica text open in one’s lap. Wolfram Research, 217/398-0700.

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The long wait is over. Apple has delivered a crisp, brilliant, color image in its latest offering, the PowerBook 180c. It's the first PowerBook to show a standard 640-by-480-pixel image—no more cutting off the bottom 80 pixels. And the 180c costs only $270 more than its gray-scale cousin, the PowerBook 180, and about $1000 more than its other cousin, the passive matrix color PowerBook 165c. If you absolutely must have brilliant colors in a Macintosh, go out and get a 180c. You can skip the rest of this article.

If you're still reading, here's the disappointing news: the 180c is not the ultimate Mac laptop. Apple's first color PowerBook, the passive matrix 165c, was a predictable disappointment—its mottled images met nobody's dreams. Everyone—myself included—said "just wait for the active matrix PowerBook." But the eagerly awaited 180c is not the PowerBook of our dreams either.

With performance and features nearly identical to those of the 165c and 180, the 180c's great advantages and serious limitations revolve around its display. For all its beauty, that display is small, it's unreadable in daylight, and it draws so much power that the batteries only last an hour. These limitations render the 180c impractical as a general-purpose portable computer.

The Display

Consider screen size, a critical factor in that conclusion. The 180c's screen is just a bit larger than the image area of a Mac Classic or SE, even though the 180c's screen shows 75 percent more pixels. The result is a 94-dpi screen, considerably finer...
than any screen Apple has sold before and better than the traditional Mac standard of 72 to 75 dpi.

But Apple uses the smallest 640-by-480-pixel active matrix panel used in laptops, an 8.4-inch size (diagonal). Apple declines to name its supplier, but the only 8.4-inch panels available come from Sharp.

If you regularly work outdoors, a monochrome LCD screen is far more practical

Electronics in Tenri, Japan. Most laptop makers use the 8.4-inch panels because of size, lower cost, and relative availability. The larger panels—9.4- and 10.4-inch diagonals—are mainly used in laptops made by the companies that make those panels.

The 180c reduces images by 25 percent compared with standard Mac displays. And although many applications permit you to change the font size for text you input, much of what appears on screen has a fixed size. The “9-point” text in balloon help, for example, actually appears as 7-point text on a 180c. The screen is very sharp—each pixel is perfectly formed even under a magnifying glass, unlike the fuzzy pixels of a CRT display, so legibility is no problem if you can focus on the smaller-size type at a comfortable distance. (If you can read classified ads in the newspaper—they’re usually in 6- to 7-point type—without difficulty, you shouldn’t have trouble with the 180c’s image size.) But test the screen carefully before buying. Some users might need to consider using reading glasses or adjusting their eyeglass prescription.

The 180c’s screen suffers from another critical disadvantage—it’s a power hog. Dual backlights (found in all color LCDs)—along with nearly a million transistors deposited on the LCD panel itself—need so much power that the 180c runs about 15 to 30 minutes less per battery than the PowerBook 165c with its simpler LCD, and less than half as long as the 180, which has a single backlight and less than one-third as many screen transistors.

And like all computers with a color display, the 180c is useless outdoors except in deep shade. With monochrome LCD screens, light bouncing off the panel’s reflective interior makes images visible outdoors. But with a color screen, not enough light penetrates to the reflective material, due to the panel’s color filters. Those filters—three per pixel—create colors by blocking different wavelengths of light emitted by the PowerBook’s dual backlights. The blue filters, for example, must block all the green and red light. This prevents most incoming light from reflecting back. Therefore, if you regularly work outdoors or even next to a large window, a monochrome LCD is far more practical.

The 180c’s palette of 256 colors (8-bit color) is typical in today’s marketplace. Few laptops support more colors, because current designs do not leave enough space for adequate video RAM. More colors would improve the image, but LCDs can effectively show only a few thousand colors anyway, because of their limited tonal range—one area where a CRT remains superior.

The 640 by 480 pixels in the 180c, the industry-standard pixel count used by Macs and DOS or Windows machines, is a welcome improvement over the 640 by 400 used in earlier PowerBooks. Why did Apple stick with 640 by 400 for so long? That was a standard size for Japanese computers, so the panels were readily available. And 640 times 400 is 256,000, a number accommodated by one standard memory-chip—an important factor in past years when chips cost more.

Screen Flaws

AN ACTIVE MATRIX SCREEN RAISES THE SPECTER THAT HAS HAUNTED SOME POWERBOOK 170 and 180 owners—stuck pixels. Industry observers estimate that about half of all color active matrix screens are
thrown away during manufacturing. Those that pass are rarely perfect.

Fortunately, the stuck-pixel problem should be less serious for the 180c than for the 170 and 180. On a monochrome screen, a pixel can be stuck bright (a pixel void) or stuck dark. For a color active matrix screen, what gets stuck is not an entire pixel but a subpixel, one of the red, green, or blue components that make up a pixel. A color screen's stuck subpixel is much less visible than a stuck pixel in a monochrome screen, since two of the colors still work. (In rare cases, two or three subpixels of the same pixel may be stuck, with more obvious consequences.)

Usually, the stuck subpixels resemble photographic grain; they're not readily visible. The visibility of a stuck subpixel depends on the desktop pattern. To find stuck subpixels you have to fill the screen with red, green, blue, and black in turn (see the diagram, "Test Your Display for Flaws").

To evaluate its panels, Sharp assigns a weighted value depending on the kind of flaw. A stuck bright is worse than a stuck dark; a green subpixel stuck bright is worse than red, and red stuck bright is worse than blue. This ranking follows the eye's sensitivity to each color. I looked at two dozen panels on several different computer models. The panels typically had three to six flaws, mostly subpixels stuck dark.

As I'm writing this, Apple has not published a guideline for what level of flaws would merit screen replacement. (For the 170 and 180, Apple will replace a screen with more than five pixels stuck bright or two stuck bright within an inch of each other; Apple will also replace any screen with a single stuck black pixel, which looks like a spurious period or decimal point.)

No computer maker guarantees perfect panels; they claim that the cost would be prohibitive for a consumer product, at least today. In the future, panel manufacturers may deposit two transistors on each subpixel and cut out any defective ones with a laser; such techniques might make perfect panels common.

Little Else New

THE REST OF THE 180c FOLLOWS THE ESTABLISHED path of the 180 and 165c. A built-in video port sup-

Laptop Speed Check

<table>
<thead>
<tr>
<th>Processor Tasks</th>
<th>Drive-Access Tasks</th>
<th>Math Tasks</th>
<th>Display Tasks</th>
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<td>Time in seconds</td>
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The machines are listed from overall fastest to overall slowest, top to bottom. The Compaq LTE Lite 4/25c running on an Intel 486 processor, beats the PowerBook 180c and all other PowerBooks by a wide margin. All computers were tested with 4MB of RAM; color laptops were tested in 256-color mode. The Compaq machine used a 120MB hard drive (which partly accounts for its superior performance on drive-access tasks), the 145B used a 40MB hard drive; all others used an 80MB hard drive.
ports 256 colors on all standard Apple monitors from 12-inch to 16-inch, along with 16 grays on a one-page portrait monitor. And the 180c supports most VGA and Super VGA displays from the IBM PC world with an adapter plug, although at the flicker-prone refresh rates of 60Hz and 56Hz, respectively.

**The Compaq LTE Lite 4/25c performs substantially faster than any PowerBook**

The video port's capabilities cannot be expanded.

A 68030 CPU runs at 33MHz, and the 180c includes a math coprocessor. All standard ports—printer and modem serial ports, ADB, SCSI, sound-in (mono) and -out (stereo)—appear in the same back-panel configuration as on the earlier PowerBooks. A microphone is built into the molding around the screen hinge, and an internal slot accepts standard PowerBook modems. There are 4MB of 85-nanosecond RAM soldered in; RAM expansion boards can add up to 10MB more, for a total of 14MB. Be sure to add only 85ns RAM, which permits full-speed operation; 100ns RAM slows computing by about 10 percent.

Macworld Lab’s tests show that the 180c, 180, and 165c all perform at the same level, with the 180c trailing only in scrolling speed because of the additional computation needed to support 256 colors (as opposed to 16 grays for the 180) and the extra 80 rows of pixels (see the bar chart, “Laptop Speed Check”).

**Power and Battery Life**

APPLE DID NOT INCREASE THE SIZE AND WEIGHT of the batteries, choosing instead to use the same batteries and AC power adapters as with other PowerBooks (models 140 through 180), favoring easy interchangeability of components, and compact size and weight over battery life.

An hour of operation isn’t much; it requires constant awareness of battery life and where the next source of AC power resides. To work continuously on a flight from Los Angeles to New York, you’ll need to carry four spare batteries—boosting the 180c load to about 11 pounds. During that flight, plan carefully; battery changes require shutting down the computer, not simply putting it to sleep. This erases the RAM disk—a virtual hard drive, created in RAM, which greatly conserves power compared with normal hard drive use—and forces a complete restart. With a 180c, expect to do this often.

You can change batteries while the 180c is in sleep mode with PowerSwap ($39.95; from Utiltron, 214/727-2329, 800/428-8766), which delivers short-term power from a standard alkaline 9-volt battery.

**Stiff Competition**

A 180c COSTS ONLY ABOUT $270 MORE THAN A 180 with an active matrix gray-scale screen. This may seem a small premium to pay for color—but the 180 runs twice as long on batteries, and its 78-dpi screen is certainly easier on the eyes. If you don’t absolutely need color, go for the 180, a computer that doesn’t demand the compromises of the 180c.

You could also consider a Windows laptop with an active matrix screen running Microsoft Windows. A wide range of Windows laptops are available. (See “PowerBooks vs. Windows Laptops” for how representative Windows laptops compare with the PowerBook 180c.)

Windows is hardly equivalent to the Macintosh Operating System, but in addition to having lower prices and three-year warranties in many cases (compared with Apple’s one year), some Windows laptops offer larger screens and faster performance. The IBM ThinkPad 720C comes with an out-

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**POWERBOOKS VS. WINDOWS LAPTOPS**

<table>
<thead>
<tr>
<th>Apple Computer</th>
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90 August 1993 MACWORLD
standing 10.4-inch LCD display that puts the 180c's 8.4-inch screen to shame. Other Windows laptops use 9.4-inch screens.

Anecdotal accounts suggest that Windows laptops generally offer significantly longer battery life than a PowerBook 180c for two reasons. The Windows laptops profile use nickel-metal-hydride batteries, which offer about 25 percent more power per pound than the nickel-cadmium batteries used in the 180c. And laptops based on Intel or Intel-compatible CPUs come in more versions than ones based on Motorola CPUs.

Windows laptop makers can use CPUs with aggressive power-saving features; these CPUs can run on 3.3 volts instead of the 5V used by the PowerBook 180c. Power consumption goes up with the square of the voltage, so a 3.3V circuit needs less than half the power of a 5V circuit. For any color laptop, the main logic board draws less power than the display or the hard drive, but Apple will be at a disadvantage until 3.3V Motorola CPUs become available sometime next year.

To gauge speed differences, Macworld Lab measured the performance of a Compaq LTE Lite 4/25c, a Windows laptop with the same screen as the 180c. With its Intel 486SL Processor, the Compaq performs substantially faster than any PowerBook on both drive-access and processor-dependent tasks; the LTE Lite can also scroll a Microsoft Word document more than twice as fast as can the PowerBook 180c. Apple clearly needs to catch up.

But bear in mind that a Windows laptop requires Windows software, sharply increasing the total cost for users who already own Macintosh software; and many Mac programs do not have Windows equivalents. Likewise, Windows machines lack amenities that a PowerBook user takes for granted, such as built-in networking, sound, and a more ergonomic design. The clip-on trackballs necessary for most Windows laptops are hopelessly awkward; the built-in trackballs in a few Windows machines are minuscule and poorly placed compared with a PowerBook's.

### Sharp Screen, Faint Praise

Apple has produced an effective color PowerBook in the 180c, given the constraint of its existing logic board and other components. A complete redesign makes little sense until a new set of Motorola chips arrives next year with higher performance and lower power consumption. Then, with a new chassis and battery pack, Apple should be able to extend battery life past two hours for color PowerBooks and past four hours for monochrome. Larger color LCDs should be more readily available.

Yet color will remain a challenge. A color screen could consume less power if highly efficient color light sources were available, such as replacing the white backlight with an array of tiny red, green, and blue light-emitting diodes—though such solutions may be years from the reality of a consumer product.

For now, if you want color and already have a monochrome PowerBook, you may want to hold off for another year, until Apple does a thorough redesign. If you feel you've waited long enough already, check out the PowerBook 180c. You'll probably love the screen, and after all, that's what the 180c is all about.

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**Contributing editor and PowerBook Notes columnist CARY LU is author of The Apple Macintosh Book (Microsoft Press, 1992).**

Macworld Lab testing supervised by MARK HURLOW and DANNY LEE.
Throughout the ages, artists have tried to depict three-dimensional reality within the two-dimensional constraints of cave wall, parchment, or canvas. But as this evaluation of 22 three-dimensional design programs shows, artists can now construct, illuminate, texture, and animate two-dimensional objects to produce realistic 3-D images—something their predecessors couldn't have imagined.

In the past year, new products offering high-end modeling capabilities, such as Alias Sketch from Alias Research, Macromedia's MacroModel, System Soft's Shade II, Turbo 3D from View by View/Soft'X, and Will Vinton's Playmat from Anjon & Associates, entered the fray. And established products were refined while prices generally declined.

Many 3-D packages are getting easier to use. But if you are new to 3-D, don't expect to start building space stations right off. All of these programs demand time and effort to master. And remember that hardware requirements can be steep. Every 3-D design program will benefit from the fastest Mac you can afford, and most require a math coprocessor.

How 3-D Works
Most 3-D packages combine modeling, rendering, and animation. Modeling creates 3-D objects and scenes. Rendering adds lighting, textures, and material surfaces to produce realistic images. Animation moves the viewer through the scene or imparts motion to objects and lights.

Some 3-D packages are integrated programs that differ primarily in the emphasis given to the three components.

Visualizing Ideas
Most 3-D modelers can create object primitives, such as cubes, spheres, and cones, and most can import font outlines and files from illustration programs for extrusion or lathing into 3-D objects. But these basic capabilities may be inadequate for complex designs. In such cases, look for vertex editing, lofting, spline modeling, and Boolean operations. (Only Form Z from autodesys, Turbo 3D from View by View/Soft'X, and ASYM Technologies/Abvent SA's Zoom offer all four of those tools.)

With vertex editing you can individually manipulate every point defining an object's geometry or its surface mesh. Lofting applies a skin over a series of modeled elements, such as wall panels over a building's framing. Boolean operations calculate the interaction of the volumes or dimensions of objects. For example, you could use a sphere to shape a cavity on a cube—like the dimples in a golf ball—by subtracting from the cube the volume of the intersecting areas.

Spline-based modelers use genuine curves to form objects with smooth-flowing lines. They offer greater precision than polygon-based programs that approximate curves with straight-line segments. NURBS (nonuniform rational B-splines)—useful for such complex shapes as auto bodies—are the most precise but also the most computationally...
intensive splines. Sketch and Form Z are the only Mac modelers that offer NURBS.

Visualizing Images
NEARLY ALL MODELERS OFFER QUICK-rendering modes to put flesh on the bare bones of a model. Shading for finished products comes in progressively higher-quality but slower techniques.

- Gouraud shading gives a smooth surface with clear definition and reproduction of a scene's lighting.
- Phong shading provides better quality than Gouraud and, depending on the program, may add shadows, textures, reflections, and transparency.
- Ray tracing offers the highest rendering quality and an almost unlimited range of visual effects, but has an insatiable appetite for processor power. Ray tracing calculates values for every pixel based on the interaction of every ray of light in a scene, whether from a light source or a reflection, taking into account an object's surface properties. Complex scenes with numerous textured objects and multiple lights can take days to ray trace, even on the fastest Macs. If you regularly produce photo-realistic images, consider distributed processing and coprocessing (see Lab Notes, Macworld, June 1993).

If your renderings are to be transferred to videotape or combined with photos using image processors such as Adobe Photoshop, alpha-channel support is important. The alpha channel of 32-bit QuickDraw lets you produce masks that allow seamless superimposition—compositing—of images. Compositing individually rendered objects with a background image also reduces rendering times.

Visualizing Motion
SOME DESIGN PROGRAMS INCLUDE BASIC keyframe animation (also called tweaking), which defines specific points (frames) along the path of intended motion. The computer calculates how the object moves across intervening frames.

Some programs offer only basic tools for flying through the scene or moving and rotating objects. Good animators, such as Anjon & Associates' Playimation, Specular International's Infini-D, Strata's StrataVision 3D, VIDI's Presenter Pro, and System Soft's Shade II control over every element in a scene over time, including lights and viewpoints. A few products, such as Playimation and Infini-D, even let you alter textures and transform—morph—one object into another.

Top-level animators, such as Macmedia's Macmedia Three-D, Electric Image's ElectricImage Animation System, and Crystal Graphics' Crystal TOPAS for the Mac, offer total control over imaging, and broadcast-quality output.

Transferring Files
INCREASINGLY, 3-D PACKAGES OFFER DIRECT import/export of native-format files from other programs. If that's not available, look for RIB (RenderMan Interface ByteStream) and DXF (Drawing Exchange Format) support; both are de facto interapplication and cross-platform standards. DXF is the most common format for transferring 3-D models. But depending on how objects are handled by the sending, receiving, and translating programs, files can be distorted—sometimes substantially—or lost during transfer.

Some 3-D modeling systems use other formats. Transferring these files may require an independent translator, such as Kandu's CADmover ($495; 703/532-0213), an interpreter fluent in over a dozen formats.

Use 3-D design products for a while and pretty soon the cravings start—more textures, clip-art objects, and maybe utilities to enhance scenes or make modeling more convenient. Specular International, Macmedia, and Strata sell collections of clip objects for use with their respective programs. Strata also offers texture collections. And a variety of other companies sell custom kits or collections of canned images and textures—including animated textures (see Reviews, in this issue).

The capsule reviews that follow are arranged by list price in ascending order. But be aware that price doesn't always reflect capability.

Ray Dream Designer 2.0.6 ($299) Ray Dream's Ray Dream Designer—the lowest-priced full-fledged modeling and rendering package—is hampered by operating in two separate modules. It also lacks animation. But the modeling module supports multiple 2-D Bézier cross sections and can edit primitives as Bézier paths. Models appear in a quick-rendering preview window, where a click-and-drop rotates them.

The rendering module only offers ray tracing, but it's a relatively quick, high-quality version that uses procedural textures—mathematical descriptions of materials that, like wood grain, become an integral part of the object—rather than a surface effect.

Ray Dream Designer is an excellent choice for graphic artists working with print media. Affordability puts this product atop the price-performance list.
Easing the 2-D-to–3-D Transition

Daunted by the complexity of full-blown 3-D packages? Strata’s StrataType 3d ($295) and Pixar’s Typestry ($259) are 3-D typographers. Both can extrude objects from TrueType or PostScript Type 1 font outlines. StrataType provides various preset text arrangements (such as curved or bowed) and lets you kern individual letters and customize bevels. Typestry applies only preset bevels but lets you manipulate individual letters and includes basic keyframe animation.

Typestry offers 18 light sources, comes with a decent assortment of textures, and can use MacRenderMan Shaders. StrataType 3d offers unlimited light sources, color light gels, and a built-in utility to convert PICT images into textures. Both are good renderers, with the edge to Typestry.

Adobe Systems’ Dimensions ($198; 415/961-4400) and Ray Dream’s addDepth ($179) build 3-D objects from outlines produced with Aldus FreeHand, Adobe Illustrator, or Deneba’s Canvas. addDepth only extrudes, but includes tools for Bézier drawing and supports TrueType and Type 1 fonts. Adobe Dimensions both extrudes and latches outlines, giving it greater modeling versatility, but most objects, including text, must begin life in the 2-D program.

Both addDepth and Dimensions can produce primitives, offer good beveling tools, and export those 3-D objects back to the 2-D programs as editable Béziers. Dimensions also has a limited animation capability.

Either program can map a 2-D drawing onto an object, but Dimensions’ ability to apply drawings onto lathed surfaces gives it an advantage for product illustration. Both programs are limited to smooth surfaces and white lights, and neither program is in the same rendering class as full-fledged 3-D packages, or for that matter, StrataType or Typestry. addDepth and Dimensions’ advantages lie in the production of 3-D art with the editing ease of PostScript.

Upfront 1.02a ($425) An architecturally oriented modeler, Alias Research’s Upfront lets you draw with shaded objects in 3-D perspective, providing quick feedback as you design. Rendering capabilities are limited, but Upfront incorporates a good daylighting feature, and lets you align the model and its shadows with the perspective of a background image. Upfront is a capable modeler but its interface strays from Mac standards, making it more difficult to learn than ModelShop or DynaPerspective.

Virtus WalkThrough 1.1.3 ($495) WalkThrough, from Virtus, offers a unique feature: instantaneous, interactive access to 3-D scenes. Move the mouse and travel anywhere in the scene. WalkThrough comes with a library of architectural objects, can import and export DXF and ClarisCAD files as templates, and includes a utility for creating runtime documents. For quick, interactive, architectural massing studies, WalkThrough is unmatched.

But WalkThrough’s modeling tools are limited to customizable object primitives, and its renderings are simple flat-shadings with transparency effects, so it’s not for detailed prototyping.

Will Vinton’s Playmation 1.48.4 ($556) Playmation, from Anjon & Associates, is a character-animation-production studio in a box. Playmation’s spline-based modeler can build complex, organically shaped objects. Its animator can link objects with spline backbones to produce realistic coordinated movement and can morph an object’s surface-mesh to create effects like skin over a flexing bicep. The rendering module only ray-traces, but it offers thumbnail previews and provides rendering progress reports.

Playmation is a bargain, but you pay for it with an awkward hodgepodge of an interface based on Amiga and Windows conventions. And perhaps owing to its simultaneous development on three platforms, Playmation is a little unstable.

MacRenderMan 1.1/ShowPlace 1.1.1 ($695) Pixar’s MacRenderMan offers superlative rendering and many Shaders. Its big drawback is the snail-like speed expected with photo-realism.

ShowPlace—an interface to ease MacRenderMan’s complexity—lets you import RIB files, arrange objects in scenes, add lighting effects, and apply Shaders to objects. But Showplace lacks object-creation tools, and while you can adjust Shader values (such as reflectivity), you can’t customize Shaders. A modeler with strong links to MacRenderMan is better.

Swivel 3D Professional 2.0.4 ($695) Macromedia’s Swivel 3D Professional was once the best affordable 3-D modeler. Now it’s squeezed between the inexpensive Ray Dream Designer and more-accomplished modelers costing only a few hundred dollars more.

Swivel 3D Pro remains an excellent program, however, boasting competent modeling tools, a good interface, and unlike Ray Dream Designer, a workable animation component. Swivel 3D Pro’s rendering is fast and smooth even at its best-quality setting. SwivelMan—Swivel 3D Pro bundled with MacRenderMan—offers photo-realistic rendering for $200 more. But at SwivelMan’s price, consider programs with more-robust modeling or better built-in rendering.

ModelShop II 1.2 ($895) Macromedia’s ModelShop II is a good choice for architects. It handles simple architectural massing studies with ease, and with its Bézier walls, DXF and ClarisCAD file support, well-endowed parts library, and geographically accurate daylighting, ModelShop II can handle detailed models. It also provides a handy utility for building stand-alone run-time animations.

ModelShop II provides generic modeling tools, but for nonarchitectural design, Swivel 3D Pro or Ray Dream Designer are better and less costly. ModelShop’s rendering offers no textural frills, nor can it animate objects.

Alias Sketch 1.5 ($995) Alias Research’s Sketch is the lowest-priced program with top-quality modeling features. Once mastered, Sketch’s NURBS-based spline modeler excels at producing smooth, organically shaped objects. Its putty tool maintains intervertex relationships, so that tugging on one vertex deforms the vertices connecting to it. Sketch can align modeled objects with the perspective of a scanned background image—wonderful for placing models within a realistic environment.

Sketch lacks animation but offers high-quality, built-in rendering. Recent additions include MacRenderMan support, and tools to import outline text from FreeHand and Illustrator. At $995, it’s the price-performance leader among high-end modelers.

DynaPerspective 2.33 ($995) In addition to basic modeling tools, Dynaware USA’s DynaPerspective provides such architectural design niceties as wall, post,
DEPTH-DEFYING DESIGN

and stair tools, and drafting layers for floor plans. Built-in rendering offers transparency effects and a single light source. The program also supports MacRenderMan. A good producer of animated tours, DynaPerspective excels at hard drive-based presentations; these are not as seamless as videotapes, but are a convenient alternative.

Infini-D 2.5 ($995) Specular International’s Infini-D produces photo-realistic ray tracings and excellent Phong renderings that can incorporate reflection and fog effects. And the product includes many procedural textures. Infini-D’s animator is the easiest to master and offers such extras as the ability to animate textures, morph between objects with different numbers of vertices, and smooth out camera motion.

Infini-D’s modeling tools are well implemented but inadequate for complex shapes and constructions. However, it now extrudes and bevels Type 1 and TrueType fonts, and System 7 links provide instant updates in Infini-D of outlines edited in FreeHand or Illustrator. For graphic artists and animators, Infini-D offers a great balance of features.

StrataVision 3D 2.6 ($995) Strata’s StrataVision 3D is as well balanced as Infini-D, but with an accent on modeling. The modeler is harder to learn but has a larger, more-capable tool set, including a skin tool that produces flexible animated objects. Plug-in tools like 2-D-reshape

Text Variations David Poole modeled this image in VIDE’s now-defunct product Dimensions. The file was then exported to MacRenderMan for texturing and rendering. Notice the distinct textural variation—from the softness of the refrigerator surface and the dog’s snout, to the sharpness of the shadows on the cabinets.

### TOOLS TO FIT ANY JOB

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#### MODELING

- **3-D primitives**
- **Extrusion**
- **Lathing**
- **3-D vertex editing**
- **Lofting**
- **Spline modeling**
- **Boolean operations**
- **Font extrusion**

#### RENDERING

- **Phong shading**
- **Ray tracing**
- **Number of light sources**
- **Shadows**
- **Architectural daylighting**
- **Environment map**
- **Texture map**
- **Procedural textures**
- **Alpha channel**
- **MacRenderMan support**

#### ANIMATION

- **Keyframe**
- **Morphing**
- **QuickTime support**

#### IMPORT/EXPORT

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* = yes; 0 = no. * Also sold separately: Desktop Animator ($1995) and Crystal 3D Designer ($995), the animation and modeling components, respectively, of Crystal TOPAS. **Sculpt 4D, effects only.*** With Sculpt 4D only.
and extrude—give StrataVision an almost unlimited upgrade potential.

In addition to Gouraud and Phong shadings, StrataVision produces high-quality ray tracings and offers Raydiosity, a superb renderer for matte surfaces, albeit an incredibly slow one. StrataVision is the only program this side of Electric Image's $7495 ElectricImage Animation System that can separately texture each bevel on a single object.

StrataVision can animate textures and morph objects, but its animation controls can be hard to master. Still, designers looking for an all-in-one product will find StrataVision an excellent choice.

**Form Z 2.1.5 ($1495)** Form Z, from autodesys, is a solids modeler that defines objects by their volume, making it particularly adept at Boolean operations. Form Z also builds NURBS-based surface objects. You can apply them over solids, transform them into solids, and shape them like modeling clay. Conceived for architecture, Form Z also includes a built-in 2-D drafting component.

**Bump Mapping** Roy Santiago modeled this image in Swivel 3D Pro and rendered it in Macromedia Three-D. He created the 3-D texture on the globe's surface by first wrapping a flat image around the globe, then assigning colors along a gray scale. Santiago gave each shade of gray a different degree of relief, or bump, adding color to create the elevation effect. This image took 16 minutes to render.

Macromedia Three-D 1.2 offers the best animation interface, providing control over every element in a scene over time. Anyone familiar with Director, the excellent Bump Mapping tool, will find Form Z can model it.
2-D multimedia animator, will feel at home with Three-D’s score-and-cast metaphor.

Three-D’s best imaging mode is a high-quality Phong renderer, and Three-D can output scenes directly to MacRenderMan. Three-D bundles good utilities that composite images and provide videotape output; but its file translator is limited, and hard to install. Three-D’s steep learning curve will put off casual users. But for professional-level animation tools, Three-D is a bargain, weighing in at $1500 less than its closest competitors—Crystal TOPAS for the Mac and Presenter Professional.

**MacroModel 1.0 ($1495)** Think of Macromedia’s MacroModel as Swivel 3D’s smarter brother. A spline-based modeler with a clear, logical interface and excellent controls, MacroModel can transform any object into a free-flowing shape and gives you complete control over vertices and curves. More complex than Swivel, MacroModel is well worth the extra effort it requires to learn.

MacroModel offers quick and smooth rendering, but lacks Swivel’s texture- and environment-mapping effects. Like Swivel 3D, MacroModel can use Presets to apply MacRenderman Shaders. And Macromedia Three-D now accepts MacroModel files directly. Animation features similar to Swivel’s are expected with the next version, but tack on the cost of high-quality rendering and MacroModel suffers in comparison with Sketch.

**Zoom 3.0 ($2495)** Zoom (sold by ASYM Technologies) is a fast and highly capable solids modeler and renderer. A multitude of CAD-like tools gives Zoom great versatility.

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### Transparency Effects

John Ulliman and Josh Sarantitus modeled the museum room architecture and display cases in ArchiCAD. Then they used Sculpt 3D to create the objects in the cases. All the rendering was done in Sculpt 3D. Sculpt 3D creates realistic differences among up to 7 layers of glass in this image. The realistic lighting effects required 15 separate light sources. The power of Sculpt’s modeler is also revealed in the complex, asymmetrical object in the case on the far right.

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### Tools to Fit Any Job (Continued)

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* = yes; 0 = no. ¹SwivelMan, which is Swivel 3D Pro bundled with MacRenderMan, costs $895. ²From 2-D primitives only. ³Phong available in modeling module only.
Crystal TOPAS for the Mac 1.2 ($2995) Crystal Graphics' TOPAS is an all-in-one package with lots of power. It offers advanced modeling tools, including spline-surface manipulation. A speedy, high-quality renderer produces shadows, transparency, and fog effects. And its full-featured animator offers frame-accurate, broadcast-quality output. Crystal TOPAS competes well with Presenter Pro and Sculpt 3D/4D.

Crystal Graphics sells the animator component of TOPAS, Crystal Desktop Animator, for $1995. That product lacks support for video output but is comparable to Shade II. The modeler component of TOPAS sells separately as Crystal 3D Designer and costs $995.

Presenter Professional 1.5 ($2995) Among the first 3-D packages for the Mac, VIDI's Presenter Professional is still one of the best. Its roots in CAD endow it with tools not ordinarily found in 3-D modelers, enriching its modeling options. Presenter Pro also has keyframe animation, and good-quality, built-in rendering that takes advantage of YARC-board acceleration. And Presenter Pro has the best MacRenderMan interface, letting you access and apply Shaders directly.

Turbo 3D 5.03 ($3495) Turbo 3D is an excellent modeler but one that is hard to master. The interface is not always intuitive, but Turbo 3D's range of tools is enough to do any CAD package proud. Turbo 3D's strength is detailed modeling; you wouldn't turn to it for graphic design or modeling. It incorporates an extensive 2-D drafting component and switches easily from 2-D to 3-D.

Turbo 3D's rendering is fairly basic, but the program can export files to MacRenderMan. The animation component is difficult to use and is limited to walkthrough sequences. Turbo 3D is a versatile design tool, but it's more CAD package than conceptualizer.

Shade II 1.4.2 ($4000) System Soft's Shade II is a versatile modeler that can build spline-based, compound-curved objects. This well-balanced product resembles Infini-D but with a high-end, more complex modeler. It offers extensive surface-mapping capabilities, procedural textures, and a facility for compositing models on PICT images. Rendering options include Phong shading, ray tracing, MacRenderMan output, YARC-board support, and a distributed-rendering utility. Good animation capabilities complete the package.

Overall, Shade II stacks up well against its high-end competitors. It's easier to navigate than Zoom, Turbo 3D, or Sculpt 3D. However, comparably equipped products—Crystal TOPAS and Presenter Pro—cost about $1000 less.

ElectricImage Animation System 1.5 ($7495) ElectricImage's Phong-based engine is a quick, high-quality renderer. It lacks procedural textures but excels at fine-tuning surface attributes. The animator provides total imaging control and frame-accurate, broadcast-quality output. Mr. Font, a bundled font-animation module, is excellent, and Transporter is the best file-transfer utility currently available with 3-D packages. For professional animators who need high-volume imaging throughput, ElectricImage is still the best choice. Sadly, only professionals can afford it.

A Little Perspective FINALLY, WHILE WELL-ROUNDED PROGRAMS like Infini-D and StrataVision 3D can do a credible job on almost any project, you may need to combine products for the best results. For example, the combination of MacroModel for modeling, MacRenderMan for rendering, and MacMind Three-D for animation and broadcast-quality output brings exceptional tools to each function.

People who make a living by modeling, rendering, and animating know this. Most own several products and use whichever fits the task. Like the artists who preceded them, modern 3-D designers understand the value of having the right tool for the job.
Anyone who has suddenly found a full hard drive where just a few months or even weeks ago there were megabytes of free space can relate to the often-repeated saying “Nature abhors a vacuum.” For much less than the price of a larger hard drive, on-the-fly compression products—those that work in the background, as you open and save files or when you are not working—promise to as much as double the storage space on your existing hard drive.

The appeal is obvious, as a little bit of math shows. Say that you want to expand from 80MB. You can get a compression program for between $50 and $70 from a discount outlet, compared with about $300 for an internal 170MB drive. (If you sell or trade in your 80MB drive, the cost is less, totaling about $200.) So a compression program can save you $150 to $250. (Of course, if you add a 170MB external drive, which costs about $330, you get a total of 250MB—more than a compression program can squeeze out of an 80MB drive.)

With compression programs claiming doubled storage at low prices, you have to ask if they’re too good to be true. Compression has long been available for DOS PCs, and the answer in that market has been mixed, with many users having no trouble and many others complaining about poor performance or unreliability (witness the problems some Microsoft DOS 6.0 owners had with DoubleSpace). Now, a host of products aimed at Mac owners raises the question anew. Some of the Macworld Lab results surprised us, and they may surprise you, too.

Choice of Technologies
We examined two classes of background compression products, file-level and driver-level, testing them for speed, space saved, ease of use, and reliability.

File-Level Compression A file-level compressor compresses files when your system is not in use, such as during pauses in your work. When you open a file, a file-level compressor either decompresses the data in the standard format your programs expect or loads it directly into memory.

In the file-level class, we tested AutoDoubler 2.0.1 from Fifth Generation Systems, StuffIt SpaceSaver 1.0.4 from Aladdin Systems, and More Disk Space 2.1 from Aysis Software Corporation. We also tested ETC Peripherals’ DataPress, a SCSI hardware-compression peripheral that uses More Disk Space as an interface. We also looked at a prerelease copy of Now Compress from Now Software, which should be shipping by the time you read this.

On-the-fly data compression is used in other products as well. Modems, backup utilities, JPEG boards, and even the system software running on your Mac, take advantage of some form of compression. PICT and QuickTime files use a form of compression, and there are many commercial and shareware applications for compressing files. What makes file-level compressors different is that they use a set of rules that you create to compress specified items on your hard drive whenever you’re not actively using your Macintosh.

Driver-Level Compression A driver-level product essentially replaces the Mac’s hard-drive driver, which controls how the Mac (and thus all programs) deals with files. Instead of compressing data when there’s idle time and then decompressing the data as it’s used, these products keep everything compressed on the hard drive and decompress data when the Mac reads it from the drive. There is no software interface to the compression product, so you don’t need to set up rules to decide what gets compressed or how long the Mac needs to sit idle before compression starts.

In this class, we tested TimesTwo 1.0.1 from Golden Triangle Computers. Stac Electronics was unable to provide a working prerelease version of Stacker for Macintosh (based on the popular DOS program), which may ship by the time you read this. The same is true of Aysis Software Corporation’s eDisk, which just started shipping as we went to press, despite having been advertised as long ago as February in publications like Macworld.

Setting Up File-Level Compressors
AutoDoubler and SpaceSaver are system extensions that run automatically. More Disk Space is an application...
that you must run manually or place in the Startup Items folder if you're running System 7.

Installation Installing AutoDoubler and SpaceSaver is straightforward, since their installers are easy to use. In contrast, the More Disk Space installer is confusing: you must register your software and select your setup options before installing the program. Plus, the installation instructions in the manual differed from a loose sheet included with the product that we received, and it took a while to figure out exactly what was expected. The manual for More Disk Space is tiny, confusing, and hard to understand. The other products' manuals are fine.

Common Features All the products take you through a process of defining the rules for what gets compressed, what is excluded from compression, when compression can occur, and some user interface options such as hot keys. Common to all are options to do the following:
- Set the idle time delay, the period of time your Mac must sit unused before compression begins. (Because of this approach, these file-level compressors are sometimes called idle-time compressors.)
- Use labels on files to mark items for inclusion or exclusion from compression.
- Use file-name prefixes or suffixes to
REAL-TIME COMPRESSION

mark items for inclusion or exclusion from compression.
• Use an exception list of applications not to be compressed.
• Provide a choice between faster file compression and smaller file size.
• Indicate which drive volumes and partitions will be compressed.

Based on the prerelease version we saw, Now Compress will offer several unique features, including compression at shutdown and the ability to schedule the start of idle-time compression, which is useful if you use your machine to remotely handle tasks at specific times and don't want other background events (like backup) occurring in the same period.

Missing Features Except for these common features, each program differs in its options and usage. In part this is due to companion products sold by some of the publishers. For example, in attempting to avoid overlapping functionality with existing products, Aladdin Systems and Fifth Generation Systems have left out useful (and necessary) functions, and for many users, that omission keeps these products from being transparent, single-product compression solutions.

For example, neither AutoDoubler nor SpaceSaver can segment a compressed file or folder so it can be copied to several disks if one disk won't hold it. (More Disk Space offers this option, as does the prerelease version of Now Compress.) AutoDoubler doesn't let you create self-extracting files that you can transport to other machines. It does include a utility, called CopyDoubler, that lets you copy compressed files in their compressed form (which is faster), or decompress them as you copy them to specific types of disks (aimed at users of removable media). SpaceSaver doesn't let you edit the list of programs, such as telecommunication or backup programs, that are allowed to read files in compressed form.

No virus-protection program can check compressed files for infection. This means that you should use caution if you receive compressed files from someone, regardless of what compression program they use. Several vendors of compression products are working with publishers of virus-detection products to provide a method for scanning compressed files, but for now, the only way to check a compressed file is to decompress it first.

For basic users, these and other issues may not be important. All the file-level products we looked at handle simple file-level compression fairly well, although AutoDoubler offers the most parameters for deciding what gets compressed. Of more interest may be just how fast compression and decompression occur, and how much space is saved.

The Hardware Option The hardware-based DataPress is the only SCSI compression peripheral on the market. It lets you daisy-chain up to seven drives from its SCSI port, which means you can compress data on multiple drives. Other features include so-called Super Volumes, which let you combine several drives into a single logical drive (for example, three 40MB drives would look like a single 120MB drive). ETC Peripherals says it is working on improvements that will quadruple the current compression speed and that will allow disk mirroring (which saves data twice on different drives to improve the chances of file recovery in case of a disk crash).

Setting Up Driver-Level Compressors GOLDEN TRIANGLE'S TIMES TWO, STAC ELECTRONICS' STacker for Macintosh, and Alys's eDisk take an entirely different approach.

TimesTwo Of the three, only TimesTwo was shipping in time for testing. This hard-drive driver, which replaces your Mac's existing driver, can usually be installed on a disk that already contains data, but Golden Triangle suggests that you first back up your data. The company also suggests that you run a disk-checking utility like Apple's Disk First Aid to make sure that your hard drive is in good shape before you install TimesTwo.

Installation is simple but time-consuming. You first must personalize the disk TimesTwo ships on, then select the drive you want to install the driver on. The installation program first does an extensive media check of the drive, then installs the driver and converts any existing data to compressed format.

On older Macs with slow hard drives, particularly if they are full of data, this can take a very long time—hours. You must have at least 5 percent free space, and no file can be larger than 25 percent of the total drive space. The speed of compression with TimesTwo is directly related to the speed of the Mac it is running on. On an SE or Classic the performance drop can be painful—about 2.5 times slower, as MacWorld Lab tests show.

If you install TimesTwo on a removable-media drive (like a SyQuest, Bernoulli), the driver stays with the media. This lets you increase the storage capacity of any removable medium regardless of what machine you use it on. You will need to use a mounting INIT like SCSI Probe to mount such disks, but Golden Triangle does not provide one with TimesTwo. Also, TimesTwo does not support partitioned hard drives; any existing partitions will be destroyed. (The company says a planned upgrade will provide these features.) TimesTwo is not compatible with security programs that protect volumes, folders, or files, and it cannot be safely installed on volumes with security software.

Unlike with file-level compressors, there is no way to deinstall TimesTwo. If for some reason you need to remove it from your hard drive, you have to back up all your data, then reformat the drive. TimesTwo, once installed, is much easier to use than the other products. There

ON-THE-FLY COMPRESSION PRODUCTS COMPARED

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Tested by Macworld Lab</th>
<th>List Price</th>
<th>Compression Type</th>
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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 bonuses and discounts, to derive the final rating. Ratings are for companies, not individual products, and we call only those companies whose products Macworld Lab tests. * Also sold as

102 August 1993 Macworld
Compression Methods' Trade-offs

FILE-LEVEL COMPRESSION

Compressing The Mac's operating system, working with a disk driver, saves files to disk (just as it would without a compressor). Storing The Mac's disk driver stores all files, decompressed or not, on a disk in blocks. The Mac's driver cannot put data from more than one file in a block. If a file, or piece of it, is smaller than the block, that leftover space is wasted. File-level compression does nothing to change this, and many blocks remain only partially filled.

DRIVER-LEVEL COMPRESSION

Compressing The Mac's operating system works with a disk driver that has been modified by the compression program. The modified driver does all compression as the file is being saved. This method is faster than file-level compression, plus it reduces the chance of losing data if the disk crashes while the driver is compressing a file.

Storing A driver-level compressor produces more-compressed files than a file-level compressor, by writing to the disk in a more efficient structure than a standard driver. This modified driver enables blocks to hold data from more than one file, eliminating wasted space. But the nonstandard block structure can interfere with file recovery after a crash.

are no rules to set up, no options to choose, no need to use freeware decompressors or create self-extracting archives when exchanging data with others. Whenever you copy or move a file from a TimesTwo drive to anything else, that file is decompressed, plainly and transparently (except for the slowdown).

TimesTwo creates an invisible file on the hard drive to use as a buffer space. The version we tested (1.0.1) creates a very large buffer, so large in fact that on a 20MB drive where you would expect 40MB of free space after installing TimesTwo, you get only 30MB. The buffer shrinks as the drive fills, but you sometimes need to run an included utility to make this adjustment occur. The company says this changed in the next version, which shipped as we went to press, and all registered users will be sent a free upgrade. Other additions will include a removable-media mounting INIT, password protection for volumes, and driver code modified to be reentrant (this will save memory if you have more than one TimesTwo volume attached to your Mac).

Stacker for Macintosh Although Stacker had not been released at press time, we were able to get some details on it. Instead of replacing your existing hard-drive driver (as TimesTwo does), Stacker is essentially an add-on to your existing driver. This means Stacker should be able to support some security programs and partitioned hard drives, but it also means Stac Electronics must shoulder the burden of ensuring compatibility with a wide range of third-party drivers, both now and as they are updated.

Also, it's possible that installing a new driver, or a program (like a security program) that modifies the driver while Stacker is running, will cause a problem. Stac engineers were uncertain if they would be able to detect such changes, and they warn users to turn Stacker off before such modifications.

Stacker doesn't have the sort of large, invisible buffer file that TimesTwo does, and it does have an uninstall option. But Stac acknowledges that the compressor will not work with drives that use block sizes smaller than 512K, which means that data on older Bernoulli drives (all but the new MultiDisk 150 drives) cannot be compressed.

eDisk As we went to press, Alys1s shipped eDisk. Alys1s developed its own compression algorithm, rather than use a variant of the standard Lempel-Ziv compression algorithm. The company had not done tests to compare compression size or speed, so the benefits of using a different algorithm were unclear.

eDisk also differs in that it combines the functions of a file-level compressor with those of a driver-level one. In our quick look at the program, we saw that eDisk normally functions as a driver-level compressor, like Stacker, but there is also an optimization option that tells the program to search a disk for files that are not compressed or not fully compressed. Such files are then recompressed. This makes sense as an option, since eDisk can be set to have compression slowed (the Faster setting) or turned off (the Fastest setting). You might select such an option when dealing with time-intensive work, like saving large image files, and then have eDisk later compress those files. You do have to restart when you change settings, though.

According to Alys1s, eDisk is not compatible with Apple's virtual memory because Apple does not release the specs. You can use virtual memory if you partition your drive and have the virtual memory active in an uncompressed partition. The company was unsure if eDisk was compatible with Connectix Corporation's Virtual or Compact Virtual programs, which give older Macs the ability to use virtual memory.
**REAL-TIME COMPRESSION**

**Testing Compatibility**

NOW COMPRESS requires at least System 6.0.7. The other products will work with earlier versions of the System (see "On-the-Fly Compression Products Compared"). We did our testing with System 7.1.

In Macworld Lab tests, we were pleasantly surprised to find only a single compatibility issue: More Disk Space corrupted a QuickTime file when we tried to read it. Repeated attempts to resolve this failed. Since DataPress uses More Disk Space, it had the same QuickTime file problem.

We also tested how gracefully all products handle running out of hard drive space. In all cases we got at least one alert dialog box letting us know we were out of space. TimesTwo gave us three different alerts, depending on how full the drive was. The initial alert let us know we were running low on free space on the drive, the second was much more strident in its warning, and the third told us we had run out of free space. We encountered no problem even when we ignored these alerts.

Although there is a lot of fear about reliability, we did not find it to be a significant concern.

A more significant, related concern is data recovery if a drive crashes. Scott Gaidano, president of DriveSavers, a Macintosh data-recovery company in Novato, California, believes that the use of compression products complicates the recovery of data from failed drives. "All of these products add a new layer of code that in the case of data loss has to be recovered perfectly to get data back," he cautions. "To recover a working file, you attempt to recover [at least some of it] as a text file, but if it has been compressed, that approach doesn't work. You need to get the entire file," he explains. Gaidano recommends that users of compressors back up more frequently: "You need more backups than you would normally do."

Despite these misgivings, Gaidano does see value for driver-level compressors when used with removable media. "There's no risk here, since the original file still exists," he says.

We also tested technical support by calling companies several times without revealing that we were from Macworld, so we could gauge how well customers are served. We had poor response from Fifth Generation Systems for its AutoDoubler product; the technicians were neither knowledgeable nor helpful. We had a satisfactory response from Alysia for More Disk Space, but we were concerned that the company had only one support technician to service the product and that he worked at home half the time. Although the company gave us his home number, that low amount of available support is troubling.

**Testing Speed and Size**

THE BIGGEST ISSUES FOR ON-THE-FLY compression products are how much time they take to do it and the amount of compression. Can you use these tools in a workday environment? Do they really double your hard drive space?

To answer these questions, Macworld Lab compared the launch times for applications and the opening times for files with each compression product against the times using no compression product. We also compared compression size results with a variety of files and applications in both faster and smaller modes where such options were available. All tests were run on a Mac IIci with a cache card, 8MB of RAM, and an 80MB Quantum hard drive.

"How Disk Compressors Stack Up" shows the test results.

We ran a second set of tests on a Classic with 4MB of RAM and a 40MB hard drive. These tests convinced us that using any of these products on 68000-based Macs (the Plus, SE, Classic, and PowerBook 100) is a process too painful to endure. For example, TimesTwo makes a IIci 1.6 times as slow, and a Classic 2.5 times as slow. A Classic is already about 2 times as slow as a IIci—so a 10-second save on an uncompressed IIci would take 50 seconds on a Classic using TimesTwo. For other Macs, you'll find a noticeable slowdown, but it may be acceptable depending on the type of work you do. We'd be uncomfortable using them even on an LC or a Mac II.

**What to Keep in Mind**

The more work you do with files—such as using programs like Adobe Photoshop that use temp files, or opening and closing many files each day—the less you'll like the slowdown.

How you interact with your files also has a bearing on the performance you'll get, since compression programs handle compression differently. For example, AutoDoubler reads files in their compressed form directly into memory and only decompresses a file if changes need to be written back to the disk. (Some applications store data within themselves as resources, in which case AutoDoubler must decompress the application to get such data.) Resource compression is often faster when opening files and launching applications. But if there are changes to a file, this as-needed decompression slows down system performance when you need to save, since the program must decompress the file before making changes to it, and then recompress the file. Now Compress also uses this method.

In contrast, SpaceSaver and More Disk Space decompress a file or application when opening or launching it. This makes saving changes faster when (and if) you do make the save. Of course, you have to wait as the file decompresses when you open it, but people tend to open a file just once and save it more often. So this approach is faster on the whole than the approach used by both AutoDoubler and Now Compress.

**How the Products Fared**

The DataPress clocked in with the fastest times for launching documents, with More Disk Space coming in a very close second and AutoDoubler a close third. We were surprised by how close the top three were and by how little gain the hardware-based DataPress offered over the software-only products.

When we checked the times for opening documents, SpaceSaver was in the lead regardless of which compression technique we used, AutoDoubler came in second when we used a locked QuickTime file, and the DataPress came in third. Locking the QuickTime file saved time by preventing MoviePlayer from its default action of writing back to disk after opening a file. When the QuickTime file was left unlocked, AutoDoubler took eight times as long to launch the file.

When you combine the two sets of speed tests and look at the overall scores, there is not much difference in the results. While the DataPress comes in the fastest, the extra cost for the hardware makes it hard to justify its purchase if all you gain is a very little in speed—especially since it didn't compress very much.

The size tests also show marginal differences among the three software-based products. Most users will see no meaningful differences. On smaller hard drives (40MB or less), the System Folder can take as much as 25 percent of the total drive space, and a driver-level compression scheme like that in TimesTwo handles System Folder compression more easily than a file-level compressor does. However, Macs likely to have 20MB or 40MB drives may not be fast enough for you to tolerate the performance loss of the driver-based approach.

If you place a higher value on speed or size alone, and you factor in the performance of your system, the differences among products may be less marginal. We see it as too close a call to recommend one over another, and you'll note that we've made no Editors' Choice for any of these products.
How Disk Compressors Stack Up

Red indicates best result in test. Products are listed in order of overall performance.

On-the-fly disk-compression programs make more disk space available by applying a mathematical algorithm to the sequence of bytes that make up applications and files to reduce their size. However, this efficiency in space comes at a cost: slower access times.

HOW MUCH SPACE COMPRESSORS ADD TO A DRIVE

Numbers represent how much more space a compressor adds, in percent of original drive capacity.

The compression algorithms used (most are variants on the Lempel-Ziv algorithm) are more successful with some file types than with others. You will see no difference for driver-level compressors like TimesTwo because they compress not just the files but also the disk file structure (see Lab Notes, this issue). To figure out how much total room a product would give you, multiply your drive size by the percentage for the product below, and then add the result to the drive's original size (for example, TimesTwo's 60 percent compression would give an 80MB drive 128MB of capacity).

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Applications</th>
<th>Data</th>
<th>Graphics</th>
<th>System-Level</th>
<th>Page Layout</th>
<th>QuickTime</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>TimesTwo</td>
<td>60%</td>
<td>49%</td>
<td>68%</td>
<td>92%</td>
<td>115%</td>
<td>210%</td>
<td>24%</td>
<td>88%</td>
</tr>
<tr>
<td>AutoDoubler</td>
<td>49%</td>
<td>48%</td>
<td>58%</td>
<td>72%</td>
<td>77%</td>
<td>153%</td>
<td>0%</td>
<td>53%</td>
</tr>
<tr>
<td>More Disk Space</td>
<td>41%</td>
<td>48%</td>
<td>58%</td>
<td>72%</td>
<td>77%</td>
<td>153%</td>
<td>0%</td>
<td>53%</td>
</tr>
<tr>
<td>Stuffit SpaceSaver A</td>
<td>39%</td>
<td>58%</td>
<td>72%</td>
<td>77%</td>
<td>153%</td>
<td>0%</td>
<td>53%</td>
<td></td>
</tr>
<tr>
<td>DataPress</td>
<td>33%</td>
<td>48%</td>
<td>72%</td>
<td>77%</td>
<td>153%</td>
<td>0%</td>
<td>53%</td>
<td></td>
</tr>
<tr>
<td>Stuffit SpaceSaver B</td>
<td>31%</td>
<td>46%</td>
<td>72%</td>
<td>77%</td>
<td>153%</td>
<td>0%</td>
<td>53%</td>
<td></td>
</tr>
</tbody>
</table>

HOW MUCH COMPRESSORS SLOW DOWN A MAC

Times slower than without compression. (Performance without compression is 1.0.) L = launch application; O = open file.

The compression algorithm takes time to apply, which is why Macs run more slowly with a compressor. Some vendors have reduced the performance penalty by optimizing how the algorithm works. The slowdown varies between application launching and file opening, so we tested both tasks. To figure out your actual slowdown, multiply the results below by how long your tasks now take. For example, TimesTwo's 1.6 times overall slowdown means a 30-second task on a Mac lci would take 48 seconds.

<table>
<thead>
<tr>
<th>Macintosh lci</th>
<th>Overall</th>
<th>Photoshop</th>
<th>PageMaker</th>
<th>MoviePlayer</th>
<th>FileMaker</th>
<th>MacDraw</th>
<th>Excel</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macintosh Ici</td>
<td>1.3</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>DataPress</td>
<td>1.3</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>AutoDoubler A</td>
<td>1.4</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>More Disk Space</td>
<td>1.4</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Stuffit SpaceSaver C</td>
<td>1.5</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>DataPress</td>
<td>1.6</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>AutoDoubler A</td>
<td>1.6</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
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<td>1.1</td>
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<tr>
<td>More Disk Space</td>
<td>1.7</td>
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<tr>
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<td>1.1</td>
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<td>1.1</td>
</tr>
<tr>
<td>AutoDoubler A</td>
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<td>1.1</td>
<td>1.2</td>
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<td>1.1</td>
</tr>
<tr>
<td>More Disk Space</td>
<td>2.5</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>1.4</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
</tbody>
</table>

* TimesTwo reports the same number of bytes for a compressed file as it would for the same file on an uncompressed disk, so it is not possible to calculate the savings for individual files. * Smaller compression enabled. * Faster compression enabled. * The Mac locked up during MoviePlayer tests. Overall results show faster performance than the product would be likely to have achieved had it worked with MoviePlayer. * Using standard settings. We tried to use the AutoDoubler internal Compressor (AIC) settings, but the program could not work with PageMaker, Word, or Excel. With other programs, it performed about 25 percent faster with AIC settings. * Photoshop and QuickTime require more resources than a Classic Mac, so we did not test these applications on the Classic.

Does Compression Make Sense?

GIVEN THE SLOWDOWN THEY CAUSE and the uncertainty they bring to file recovery, compressors make users justifiably wary. It's fair to wonder if compressors are just too good to be true.

Compression makes sense for archiving, but you can use programs such as the shareware Stuffit Lite from Aladdin Systems (408/761-6206) or any backup utility for archiving, compressing only those archived files that are stored on floppies, removable media, or external hard drives.

PowerBook users limited to a small internal drive may benefit from on-the-fly compression, but they can benefit more by adding an external drive. You can simulate the convenience of a Duo Dock by keeping applications and documents that you will need anywhere you go on the PowerBook's drive and keeping the items that you use at just one location (say at the office or at home) on the external drive. It's worth noting that both AutoDoubler and SpaceSaver have special PowerBook modes that keep them from doing background compression while the PowerBook is running on battery power. You get that feature because disk access consumes a fair amount of a PowerBook's limited battery power.

Overall, it's difficult to recommend on-the-fly compression. File-recovery expert Gaiddano considers the promised savings from these products to be an illusion: "It's much more economical to get a larger drive. You gain in both data integrity and performance. You pay a performance price for the extra disk space that over the long term is not worth the savings you get by putting off the purchase of a larger hard drive."

We agree. A few hundred dollars is not to be sneezed at, but the time wasted by compression slowdown over the lifetime of your drive has an even greater value.

MATTHEW LEEDS is the technical-services manager for a major software developer.

Macworld Lab testing supervised by MARK HURLOW.
Macworld Lab tests high-speed hard drives and disk arrays

The range of high-performance storage offerings changes so quickly that it's almost impossible to take a snapshot of them without getting a blurry image. This derives, in part, from increasing complexity. Forthcoming hard drive mechanisms promise superb performance but then require special adapter boards and innovative approaches to SCSI cabling.

And Apple has altered the market recently by including 500MB or 1GB hard drives in several Mac models, and by introducing a family of network file servers that use a high-speed SCSI controller board. These developments are spurring third-party storage companies to lower prices and develop more innovative products that set them apart from an increasingly competitive pack.

For this article, Macworld Lab tested 30 hard drives, ranging in capacity from 1GB to 2.9GB, and in price from $1269 to $7595. We also tested several lightning-fast disk arrays—aptly named because you may need a raise to afford one. Actually, arrays combine two or more hard drives with specialized controller circuitry to provide faster performance or greater reliability than a conventional drive can deliver. Prices for most configurations start above $4000 and rise into the tens of thousands of dollars for the most elaborate systems. We also looked at four SCSI adapter boards whose SCSI ports can transfer data more quickly than those built into most Macs.

If your storage needs or budget is more modest, you'll find roundups of midrange drives in "Midsize Hard Drives" (Macworld, March 1993), and of entry-level drives in "Low-Capacity Hard Drives" (August 1992). But if you're in the market for a high-end hard drive—whether to store multimedia productions, color images, or an officeful of documents and applications—the latest developments in high-end storage could affect your purchasing plans. Besides evaluating what's available now, I'll also forecast upcoming technologies and issues.

More for Less

The best news in hard drives is good news for hard times: prices are falling. In May 1992, when we last surveyed the summit of storage, the least expensive 520MB drive, from mail-order vendor Club Mac, cost $1309; this year, you can buy the same basic drive from mail-order vendor MacDirect
Fast performers: The Optima Technology MiniPak 1000 (top), the Sata-\nrae Edge 1000v (middle), and the PLI MiniArray 040 (bottom).
SUPERSONIC STORAGE

for $998. Last time around, a 1GB drive from FWB cost $5099; today, a faster version of the same drive retails for $2349. Prices may fall even more during the next several months, as drive vendors ramp up production and try to compete with the internal drives supplied in new Macintoshes. Apple's entry into high-capacity storage has helped force prices down just as its 68040-based Centris machines drove down accelerator board prices earlier this year.

As prices for hard drives are going down, capacities are going up. Many high-capacity drives still use 5.25-inch disk platters, but a growing number use smaller, 3.5-inch mechanisms. Last year, only drives in the 500MB ballpark were available in the 3.5-inch size; this time, we tested numerous 1GB 3.5-inch drives, and by the time you read this, capacities of up to 2GB should be available in the 3.5-inch package. Within a year, 5.25-inch drives may be the exception rather than the rule in the personal computer world.

As a result, some gigabyte-size drives fit inside a briefcase. Portable drives tested include (from smallest to largest) TMS Peripherals' Shadow Compact Portable, Liberty Systems' 70 Series 1.2 GB drive, La Cie's Tsunami 1225, Optima's Mini-Pak, and MacWarehouse Power User Pro. All use 3.5-inch mechanisms. The remaining drives vary in size, with most using either shoebox-size cases or zero-footprint cases, designed to fit beneath a compact Mac.

If you prefer an internal drive—for the extra security it provides or simply to control desktop clutter—the downsizing trend means you're more likely to find a high-capacity drive that will fit inside your Mac. Only the Mac II, Ix, Ix+, Ix+, Centris 610 and 650, Quadra 800, 900, and 950 models can accommodate an internal 5.25-inch drive; the other members of the desktop Mac family require 3.5-inch drives.

The trend toward 3.5-inch mechanisms helps performance, too. For one thing, bits are packed more closely in a smaller mechanism, allowing more bits to pass more rapidly beneath the drive's heads. For another, a smaller mechanism has lighter heads, and those heads do not have to travel as far to move from one edge of the disk platters to the other. This results in shorter seek times—the

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Among the faster drives were the Mac USA NuDesign 1.2 (top), the Mass Microsystems MasterDrive 2780 (left), and the Relax Technology Vista 3.5GB (right).

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<table>
<thead>
<tr>
<th>Company</th>
<th>Phone</th>
<th>Toll-Free Phone</th>
<th>Product</th>
<th>Tested by Macworld Lab</th>
<th>List Price</th>
<th>Supports SCSI-2 (Fast/Wide)</th>
<th>Uses DMA Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atto Technology</td>
<td>716/668-4259</td>
<td>O</td>
<td>Silicon Express II</td>
<td>O</td>
<td>$795</td>
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<td>O</td>
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<tr>
<td>Cooley Corporation</td>
<td>212/979-8824</td>
<td>O</td>
<td>SHA-100</td>
<td>O</td>
<td>$995</td>
<td>O</td>
<td>O</td>
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<tr>
<td>DayStar</td>
<td>404/967-2077</td>
<td>O</td>
<td>DiskRunner</td>
<td>O</td>
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</tr>
<tr>
<td>Dynatek</td>
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<td>Mach II</td>
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<td>$795</td>
<td>O</td>
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</tr>
<tr>
<td>FWB</td>
<td>415/474-8055</td>
<td>O</td>
<td>SCSI JackHammer</td>
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<tr>
<td>Lovel Computer</td>
<td>612/828-6800</td>
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<td>Arrow</td>
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</tr>
<tr>
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<td>512/472-8881</td>
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<td>Magic SCSI II</td>
<td>O</td>
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<td>O</td>
<td>O</td>
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<tr>
<td>Mass Microsystems</td>
<td>408/221-1260</td>
<td>O</td>
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<td>O</td>
<td>$899</td>
<td>O</td>
<td>O</td>
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<tr>
<td>MicroNet Technology</td>
<td>714/881-1540</td>
<td>O</td>
<td>SS-414NP ***</td>
<td>O</td>
<td>$1995</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>PLI</td>
<td>510/657-2211</td>
<td>O</td>
<td>QuickSCSI</td>
<td>O</td>
<td>$499</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Procom Technology</td>
<td>714/852-1000</td>
<td>O</td>
<td>Nu 32 SCSI Enabler</td>
<td>O</td>
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<tr>
<td>Storage Dimensions</td>
<td>408/954-6710</td>
<td>O</td>
<td>Data Cannon PDS/FX</td>
<td>O</td>
<td>$639</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

* = yes; O = no. ** Memory must be purchased separately. *** $799 with drive purchase. **** MicroNet's NuPort II SCSI-2 adapter is sold with a hard drive mechanism. Capacities range

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108 August 1993 MACWORLD
time required for the heads to reach a given track.

Rather than list every one of the more than 200 drives we identified in the 550MB-and-up capacity range, we provide details on the products we actually tested (see “Vital Stats on Tested Drives”). As you shop, keep in mind that far more drives are available from the vendors we list and others.

**Faster and Faster**

For color publishers, a hard drive can’t be too fast. Prepress professionals lose money every time they drum their fingers waiting for Adobe Photoshop images to open or save. Fast, high-capacity hard drives are also essential for professional-quality video work. And they’re the mainstays of network file servers that supply programs and documents to an office full of computers. A fast hard drive enables a server to keep up with the data demands of the users connected to it.

The latest drives meet these challenges. The widespread availability of mechanisms such as Seagate’s Elite-2 and Elite-3 and DEC’s DSP3103S make this year’s crop of hard drives faster as a group than last year’s. One reason the drives with these mechanisms are faster is that their internal platters spin faster. A fast spindle speed allows for a faster data-transfer rate, since more bits pass beneath the drive’s heads each second. A fast spindle speed also lowers latency—the time it takes for a particular spot on the drive’s platters to reach the drive’s heads.

Last year, the fastest drives had spindle speeds of 4500 and 5400 revolutions per minute, compared with the 3600-rpm speed most other drives used. Maxtor’s 1.2GB mechanism has since raised the speed limit to 6300 rpm. Seagate has also announced 6300-rpm mechanisms, and the firm’s forthcoming Barracuda drives will run at 7200 rpm—a dizzying 120 revolutions per second.

But this extra speed is wasted if the Mac can’t keep up. The fastest hard drives can send and receive data faster than any Mac except a Quadra or Centris 650. On a slower Mac, an ultrafast drive twiddles its digital thumbs as it waits for the bus—the SCSI bus.

**SCSI Goes Fast—and Wide**

The fact that a fast drive demands a fast input/output bus has helped spur development of an updated version of the SCSI specification, called SCSI-2. Understanding what SCSI-2 does and does not provide is an important first step in creating a performance-tuned storage system.

The most basic aspect of SCSI-2 involves an updated set of the commands that SCSI devices use when communicating. This aspect of SCSI-2 does not address performance; rather, it simply defines a new vocabulary for devices to use when communicating.

The aspects of SCSI-2 that do address performance are two data-transfer techniques called Fast and Wide. SCSI-2 Fast is just that—it describes new timing and data-packaging methods that boost the speed at which data can travel over a SCSI bus. SCSI-2 Fast allows for maximum sustained transfer rates of 10MB per second—twice the rate of standard SCSI.

SCSI-2 Wide doubles the number of data pathways from 8 to 16. The combination of SCSI-2 Fast and Wide allow for maximum data-transfer rates of 20MB per second. When 32-bit Wide devices appear in the future, that theoretical rate will double to 40MB per second. (And SCSI isn’t stopping there—the industry is already starting to talk about SCSI-3, which will support fiber-optic connections that promise gigabyte-per-second transfer rates.)

**When Do Arrays Pay Off?**

With relatively small files, RAID Level 0 arrays perform in the range of the fastest conventional hard drives. We used Adobe Photoshop files to demonstrate how large files must be before the speed benefits of RAID 0 are apparent. In the process of creating a working copy and an undo file, Photoshop 2.0 transfers five times the amount of data present in the original file. Thus, Photoshop transfers 100MB when opening a 20MB image. When Photoshop file sizes reach 20MB or so (100MB of data transferred), the benefits of the fastest arrays over standard hard drives emerge. The MicroNet Raven 040 and PLI MiniArray 040 achieved sustained data-transfer rates of about 5MB per second—almost twice the rate of a fast conventional drive, the Storage Dimensions MaciStor 2 Fast, which uses the Seagate Elite 3 mechanism. The larger the file, the stronger the argument for a Level 0 array. But not all Level 0 arrays show performance benefits even for large files, as seen with FWB’s SledgeHammer 2000FMF. All systems were tested using a Quadra 950.

<table>
<thead>
<tr>
<th>File size (in MB)</th>
<th>Throughput speed (in MB/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1MB</td>
<td>4MB</td>
</tr>
<tr>
<td>1MB</td>
<td>2MB</td>
</tr>
</tbody>
</table>

**From 400MB (listed here) to 2.7GB, which retails for $7395.**
on the path to fast storage (see “Outfitting a Mac for Fast SCSI”).

**Bigger May Not Be Faster**

UNTIL NOW, LARGER-CAPACITY DRIVES were almost always faster than their more-crammed cousins. That was not the case this time. The fastest performers were the 1GB drives, most of which use the latest 3.5-inch DEC or Fujitsu mechanisms (see “Hard Drive Speed Tests”). In the 1GB–1.3GB range, first place is occupied by two drives: Saturea’s DEC-based 1GB Edge 1000r and MicroNet’s Maxtor-based SS-1240, which includes MicroNet’s NuPort-II SCSI-2 board. FWB’s DEC-based Hammer 1000FMFs finished an extremely close second and MacUSA’s NuDesign 1.2 model a close third.

Within the 2GB–2.9GB range, the top finishers were MacTown’s Data Store HK2100/11 and MacProducts’ Magic 2.4GB. If you want top performance from a

| Color Key | Overall Fastest | 1.00 | Sature Edge 1000r (D) | 1.00 | MicroNet SS-1240 (M) | 0.99 | FWB Hammer 1000FMFs (D) | 0.98 | MacUSA NuDesign 1.2 (F) | 0.93 | Mass Microsystems MasterDrive 2780 (S) | 0.93 | Relax Vista 3.5GB (S) | 0.93 | Microtech Nova XL 2700 (S) | 0.92 | Optima MiniMark 1000 (M) | 0.92 | TMS Shadow Compact Portable (Q) | 0.91 | Procom Technology MTD 2900 (S) | 0.91 | Liberty 70 Series 1.2 GB (Q) | 0.91 | Storage Dimensions MacinStor 2Fast (S) | 0.90 | Club Mac 120AXM (F) | 0.90 | ETC Peripherals 1225 (Q) | 0.90 | APS F1.2 (F) | 0.89 | Lovel 1225 (Q) | 0.88 | La Cie Tsunami 1225 (Q) | 0.87 | MacWarehouse PowerUser Pro (D) | 0.86 | Spin Peripherals Cyclone 1 GB (D) | 0.85 | Hard Drives International PowerDrive 1750 (F) | 0.84 | MacTown Data Store HK2100/11 (S) | 0.82 | GCC Technologies UltraDrive 1300X (S) | 0.81 | Mirror 1GB External (Q) | 0.80 | Total Peripherals Quantum 1.2GX (Q) | 0.77 | MacProducts USA Magic 2.4 GB (S) | 0.75 | Tulin A-Hive 2100 (MI) | 0.75 | Focus Enhancements Focus 2.1XG XXL (MI) | 0.74 | CMS Enhancements PD 2100-II (MI) | 0.73 | Third Wave 1.2X (F) | 0.72 | Dynatek HDA1.2 (I) |

| Color Key | Overall Slowest | 0.72 | Dynatek HDA1.2 (I) | 0.72 | Mirror 1GB External (Q) | 0.70 | Total Peripherals Quantum 1.2GX (Q) | 0.70 | MacProducts USA Magic 2.4 GB (S) | 0.70 | Tulin A-Hive 2100 (MI) | 0.70 | Focus Enhancements Focus 2.1XG XXL (MI) | 0.70 | CMS Enhancements PD 2100-II (MI) | 0.70 | Third Wave 1.2X (F) | 0.72 | Dynatek HDA1.2 (I) |

All times are in seconds.

**Color Key**

- **Fastest**
- **Percent slower than fastest drive**
  - Up to 10%
  - 11%–20%
  - 21%–29%
  - 30% or more

The drives are listed from fastest (top) to slowest (bottom). To determine rankings, Macworld Lab indexed test results against the fastest drive in each test except noise. Thus, the Sature Edge 1000r gets a 1.00, and the Dynatek HDA1.2 gets a 0.72. Index numbers are listed to the left of the product names.

We measured each drive’s ability to duplicate a 3.2MB file and a 3.2MB folder, to search a 4th Dimension database for a specific record, and to compile code in Think C. We also averaged each drive’s speeds for opening and saving files from several applications, including Aldus PageMaker and Microsoft Excel. In the noise tests, the lower the decibel level, the quieter the drive. Drives with decibel levels in the upper 40s were noisy enough to be irritating.

Mechanism key: D = DEC; F = Fujitsu; I = IBM; M = Maxtor; MI = Micropolis; S = Seagate; Q = Quantum

**Bigger May Not Be Faster**

UNTIL NOW, LARGER-CAPACITY DRIVES were almost always faster than their more-crammed cousins. That was not the case this time. The fastest performers were the 1GB drives, most of which use the latest 3.5-inch DEC or Fujitsu mechanisms (see “Hard Drive Speed Tests”). In the 1GB–1.3GB range, first place is occupied by two drives: Saturea’s DEC-based 1GB Edge 1000r and MicroNet’s Maxtor-based SS-1240, which includes MicroNet’s NuPort-II SCSI-2 board. FWB’s DEC-based Hammer 1000FMFs finished an extremely close second and MacUSA’s NuDesign 1.2 model a close third.

Within the 2GB–2.9GB range, the top finishers were MacTown’s Data Store HK2100/11 and MacProducts’ Magic 2.4GB. If you want top performance from a 2GB drive, you might want to wait for a machine built around a fast 3.5-inch mechanism such as Seagate’s Barracuda 2, which was just becoming available to drive vendors at this writing.

Drives in the 2.7GB–2.9GB range performed faster as a group than the 2GB machines but were slower than the speediest 1GB drives. (Each of the 2.7GB drives tested used a Seagate Elite 3, a 5.25-inch mechanism whose unformatted capacity is 3.5GB.) First place was a tie between Mass Microsystems’ MasterDrive 2780, Relax Technology’s Vista 3.5GB, and Microtech’s Nova XL 2700, with Procom’s MTD 2900 and Storage Dimensions’ MacinStor 2Fast close behind.

Although all the 2.7GB–2.9GB drives performed similarly and contain identical mechanisms, they aren’t priced similarly. Relax’s Vista 3.5GB retail for $3499, while Storage Dimensions’ MacinStor 2Fast lists for $6369. The Storage Dimensions drive includes more sophisticated formatting software that offers a mirroring option—a worthwhile feature, but hardly worth the extra $2870. And did I mention that Relax gives you a five-year warranty, which Storage Dimensions charges extra for?

Similar price disparities exist throughout the hard drive world. The vendors of premium-price drives say they have more stringent quality-control measures and use higher-duty power supplies and other internal components. The drives I’ve opened up over the years bear out the latter claim, but at the same time, I haven’t seen any evidence that proves mail-order drives are less reliable over the long haul.

As for quality of technical support, we found wide variations among mail-order vendors. Two firms—Relax and MacUSA—scored poorly, but several others, including APS, Club Mac, La Cie, and Third Wave, scored very good to excel-
Outfitting a Mac for Fast SCSI

Unless you have a Quadra or Centris 650, you can't just buy a SCSI-2 Fast drive and expect to be up and flying. To allow a slower Mac to take full advantage of a fast drive, you need a SCSI-2 adapter. These are sometimes called SCSI accelerators, but the term can be misleading, since most adapters don't speed up the Mac's existing SCSI bus but instead add a SCSI-2 bus.

SCSI-2 adapters are available that install in a NuBus expansion slot or in the Processor Direct Slot (PDS) of a Quadra or Mac IIfx (see the table "Surveying SCSI Adapters").

A PDS-based SCSI-2 adapter can provide a significantly bigger performance boost than a NuBus adapter because the PDS has faster data-transfer speeds. If you have a Quadra or a IIfx, consider a PDS-based SCSI-2 adapter such as Storage Dimensions' Data Cannon PDS/FX (which supports SCSI-2 Fast mode) or the Data Cannon PDS/Quadra (which comes in a Fast version and a Wide version). A larger selection of NuBus SCSI-2 adapters is available, probably because manufacturers don't have to design separate boards for each Macintosh model.

Macworld Lab tested PLI's QuickSCSI, Storage Dimensions' Data Cannon PDS/Quadra Fast, MicroNet's NuPort II, and Atto's Silicon Express II. All of those units performed similarly, with first place shared by the PLI and Storage Dimensions boards.

One reason the Mac's built-in SCSI circuitry and driver software limit performance is that they require the computer's central processing unit (CPU) to be intimately involved in SCSI data transfers. The CPU must help supervise the transfer of every byte over the bus—a technique called asynchronous transfer. A more efficient way to ride the bus is through synchronous transfers, in which CPU-drive handshaking occurs less frequently. Most SCSI-2 adapters implement synchronous transfers as well as a data-transfer technique called direct memory access (DMA), which further reduces the role the Mac's CPU must play in moving data to and from the drive. SCSI-2 adapters that do not use DMA don't provide as high a maximum data-transfer rate.

A SCSI-2 adapter provides at least one advantage that goes beyond speed. By adding a second SCSI bus to a Macintosh, you double the number of SCSI devices you can connect. To maximize the efficiency of both SCSI buses, put all scanners, printers, optical drives, and SCSI-1 hard drives on the Mac's built-in SCSI bus, and reserve the SCSI-2 bus for SCSI-2 hard drives.

SCSI Adapter Alternatives

If you want to speed up your Mac's overall performance as well as its SCSI transfer rate, you might consider pairing a Radius Rocket accelerator with Radius's $299 SCSI-2 Booster, a piggyback board that attaches to the Processor Direct Slot that all Rockets have. A Radius Rocket (S1199-$2499; 408/434-1010) provides one of the best performance kicks for Mac II-class machines, but has some compatibility problems with QuickTime and sound-oriented products (see the series of articles on Macintosh upgrades, Macworld, June 1993). The Rocket also provides exotic multiprocessing capabilities when used with Radius's RocketShare software.

In the RocketShare environment, the SCSI-2 Booster has some appeal. Thanks to RocketShare's multiprocessing capabilities, you can start transferring megabytes of data across the SCSI-2 Booster's bus, and then switch back to the Mac's logic board (or to yet another Rocket) to work in a different program. This could save time for people who use a scanner or SCSI-based printer extensively.

Think twice about adding a SCSI-2 Booster to a Rocket if you don't use RocketShare, however. Without RocketShare, you can't use a drive connected to the SCSI-2 Booster as a start-up drive. Another drawback to the SCSI-2 Booster is that you can't connect an internal hard drive to it. Most other SCSI-2 adapters have a special connector for an internal drive.

You should also consider a product from DayStar Digital, the DiskRunner, formerly known as the SCSI PowerCard. This board, which sports its own 68000 processor and can accommodate up to 16MB of SIMM-based memory, can accurately be described as a SCSI accelerator. By caching data in its memory, it can effectively speed up an older hard drive, a removable-media SyQuest or Bernoulli drive, or even a CD-ROM player.

Finally, there's the new Apple Workgroup Server 95 PDS Card, which is the input/output cornerstone of the new Workgroup Server line (see News, Macworld, May 1993). The Workgroup Server 95 PDS Card provides cache memory that reduces the need for disk accesses, and sports a SCSI/DMA controller chip that provides DMA transfers, freeing the Mac's CPU for other tasks.

Unlike the other SCSI adapters described here, the Workgroup Server 95 PDS Card isn't designed to be a general-purpose SCSI booster; it's part of an upgrade package that turns a Quadra 900 or 950 into a Workgroup Server 95. The package includes A/UX, Apple's version of the multitasking Unix operating system. Because it includes this software, the board is considerably more expensive than the other adapters described here, retailing for $2499.
negotiating arrays

FOR TASKS THAT INVOLVE TRANSFERRING HUNDREDS OF MEGABYTES AT A TIME, you’ll get the best performance from a disk array, which combines two or more drive mechanisms with specialized controller circuitry and driver software that fools the Mac into thinking it’s communicating with a single drive.

Disk arrays come in several flavors, with each described according to a framework called a RAID—redundant array of inexpensive disks. RAID Level 0—the only level we evaluated for this article—is the simplest and least expensive; it uses a technique called data striping to split data evenly across two drives, boosting data-transfer rates by allowing disk reads and writes to occur simultaneously. The drawback is that the array is only half as reliable as a single mechanism—if one mechanism fails, you lose the contents of both. Despite the acronym’s first letter, there’s no redundancy in Level 0 RAID. But that drawback is minor if you back up regularly (and only a fool uses any hard drive without doing so).

The redundancy aspects of RAID surface in Levels 1 through 5. By using complex data-recording techniques, a Level 3 or Level 5 array can reconstruct the contents of any mechanism that fails. With most Level 3 or 5 arrays (RAID Levels 2

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The FWB SledgeHammer2000FMP (top) performed far below MicroNet’s Raven 040 array (two drives on bottom) in the critical throughput speed tests.
and 4 aren’t used in the Macintosh world), you can even replace a downed mechanism without shutting down the system. The drawback of such systems is that the extra overhead required to keep track of each mechanism’s contents slows overall performance.

A Level 1 array provides a better balance between performance and reliability using a technique called mirroring, which writes the same information to two mechanisms simultaneously. Disk reads from a Level 1 array are about as fast as from a Level 0 array, but writes take longer, since the data must be written twice—once for each disk in the pair. Most SCSI-2 adapter boards include software for setting up a mirroring array. Most arrays can be configured through software as either Level 0 or Level 1.

You can buy an array as a complete package that includes drive mechanisms, driver software, and in some cases, a controller board; or you can assemble an array yourself by combining two or more drive mechanisms with a SCSI-2 board that includes striping or mirroring software.

If you take the former route, note that most arrays for the Macintosh are designed for the Quadra 900 and 950. These Macs provide two electrically separate SCSI buses: one for internal devices and one for external ones. In arrays designed for these Quadras, one drive attaches to the internal SCSI bus and the other to the external one. Such arrays are generally available in three configurations: two external drives, two internal drives, or one of each.

An internal/external configuration provides the most security against theft and takes up no extra desk space, but requires the most effort to install—you must remove the metal sled that holds internal drives, attach the drive mechanisms to the sled, reseat it, and then connect a couple of fat cables and carefully route them through the case so that its lid will fit. The drive that would normally connect to the external SCSI port attaches to an internal connector on the Quadra’s logic board (see “Installing an Internal Array”). Tip: It’s easier to attach the cable to this internal-external connector if you remove the Quadra’s power supply before beginning.

Last year, numerous arrays had been announced but only one shipped: MicroNet’s Raven 040, a Level 0 array designed for the Quadra 700 and 900. The Raven has plenty of company this year. Macworld Lab tested four Level 0 arrays. MicroNet’s Raven 040 Q9e/e-2480R (just over 2GB of storage, with Maxtor mechanisms), PLI’s MiniArray 040 (2GB, with DEC mechanisms), and the internal/external version of FWB’s SledgeHammer2000FMF (2GB, with DEC mechanisms).

The external/external SledgeHammer is an appealing package—both drives and their controller circuitry are enclosed in a single case, making this one of the few arrays that can connect to any Macintosh. (You can also connect the drives to the Quadra’s internal and external SCSI buses.)

**Top Performers**

SO HOW FAST WERE THE ARRAYS? THE results were surprising. In Macworld
The PLI QuickSCSI SCSI adapter, which lists for only $499, was the fastest we tested.

Lab's real-world tests, the PLI 2GB MiniArray 040 was only slightly faster than the fastest conventional drive tested, Saturae's Edge 1000r, which uses the speedy DEC DSP3105S mechanism. The MicroNet and FWB arrays were actually slower than the Saturae drive. Indeed, MicroNet's conventional 1.2GB drive was faster in some tests than was MicroNet's Raven 040 array, yet both products use identical Maxtor mechanisms.

When Macworld Lab conducted some additional tests with some large Photoshop images, the fog cleared and revealed the reason. With relatively small files, a Level 0 array can be slower than a conventional hard drive, due to the extra overhead required to split the data-stream and route it to two mechanisms. When Photoshop files reach the 20MB ballpark, however, the tables turn and some of the arrays pull ahead. The MicroNet Raven 040 and PLI 2GB MiniArray 040 showed sustained data-transfer rates of about...
5MB per second, almost twice the pace of a fast conventional drive (see "When Do Arrays Pay Off?").

The FWB SledgeHammer never did break from the conventional drive pack; it’s a solid product for mirroring applications, but in our tests, the competition provided better performance in data-stripping configurations.

Arrays show their stuff when a Photoshop file reaches the 20MB ballpark, but you shouldn’t necessarily expect to see this effect in 20MB files created by other programs. When opening a file, Photoshop actually transfers five times the amount of data present in the file: Photoshop (like some other image-processing programs) reads the original file, creates a working copy, reads from this working copy, creates an undo file, and then reads the working file once more to create the screen display. Thus, Photoshop actually transfers 100MB when opening a 20MB image. Larger images obviously mean even larger data transfers—and a stronger argument for a Level 0 array.

So unless you work with gargantuan files on a regular basis, don’t buy a Level 0 array for its performance benefits—you can probably find the speed you need in a conventional drive.

Looking Ahead

I’ve mentioned that the next few months should bring new configurations incorporating Seagate’s Barracuda drives and other new mechanisms. What about the long-term future? One development on the distant horizon involves dual-channel drives—mechanisms containing two sets of heads that can read from or write to different parts of the drive’s platters simultaneously, reducing the drive’s effective seek time—ideal for file-server applications.

A new version that is of the Mac’s SCSI Manager, the portion of the Macintosh system software that is responsible for handling SCSI communications, should come to fruition sooner. A new SCSI Manager is in the works that will directly support SCSI-2 Fast devices as well as synchronous data transfers. Its release should make it possible for Quadras to take better advantage of the latest drive mechanisms without requiring a SCSI-2 adapter, and is also likely to streamline the development of SCSI-2 adapters and arrays.

As for today’s buying decisions, if your work demands a high-end hard drive—particularly one in the 2GB capacity range—and you can afford to wait until August or September, put off a purchase until the new, faster generation of 2GB mechanisms arrives. To put it another way, if you wait a while now, you’ll wait less later.


Macworld Lab testing supervised by Tim Warner.
BY MARJORIE BAER

Choosing a Storage Strategy

What's the best way to expand your storage?

Into the life of every Macintosh user there comes this day: you need more storage. The hard drive that once seemed a vast frontier waiting to be filled is now jammed with files and applications, fonts and system extensions, scanned photographs and page layouts, maybe even a couple of QuickTime movies and stereo sound. A bigger hard drive with, say, a couple hundred more megabytes won't do. You want space, like galactic space—boundless, limitless, extending infinitely.

But it's more than just limitless space you need, it's portable space—space that fits in your pocket or briefcase on your way to the service bureau, your client's office, your job, or your home.

If you're only toting a few spreadsheets or text documents around, the humble floppy disk will serve you well. An 800K disk holds a good 750 pages of plain text or a 10,000-cell spreadsheet, fits in a pocket, and is compatible with virtually any Macintosh. But you won't be able to squeeze even one high-resolution scanned photograph onto an 800K floppy disk, and you'd need the patience of a saint and 120 or more of these disks to back up an almost-full 100MB hard drive. And long gone are the days when you could fit the Macintosh System on a floppy. For all of these purposes you need an alternative form of storage.

You're in luck. The Mac supports several alternate-storarge technologies, each with rewritable removable-media cartridges or disks that effectively give you limitless storage to take anywhere.

To help you choose the right removable-storage solution—or solutions—Macworld looked at the array of available options and evaluated them in terms of speed, device price, price per megabyte of storage, and appropriateness for different work settings.

At the low end of the market ($400 to $600) you'll find Floptical and very-high-density floppy (VTDF) drives. Both drives offer roughly 20MB of storage (remember, that used to be a hard drive's worth) on a single 3.5-inch disk. At the high end of the market, with street prices around $1200 to $6000 but falling, magneto-optical mechanisms provide archival storage on virtually indestructible disks holding up to a gigabyte of data each.

Somewhere in between these two markets, you'll find the original removable-storage kings—the Bernoullis and SyQuests, two institutions that still dominate the market, and for good reason. They've proven their worth as reliable, sturdy, and cost-effective. And finally, removable and external hard drives and tape-backup systems fill out the bill.

If you're looking for simple, clear distinctions—price versus speed versus reliability, for example—be forewarned. The market is in flux, and price and performance differences are narrowing. The right solution depends as much on the
state of the technology as on the type of files you create and kind of work you do.

You may find—as many companies large and small have—that you need or want several removable-storage devices. Artists and graphics firms, for example, may find it effective to use a removable hard drive for work in progress and a SyQuest drive for transporting files to service bureaus. An accounting firm might keep a stack of digital audiotapes for daily backups but archive client records to a magneto-optical drive. With that said, here’s how to get unlimited and portable storage forever.

**Bernoullis and SyQuests**

UNTIL RECENTLY, WHEN REFERRING to removable-storage devices, people usually meant SyQuest-based drives, Iomega-based drives, or Bernoulli cartridge drives from Iomega, the first three removable-media mechanisms on the gate. (Ricoh recently exited this market.)

These highly versatile devices, which today support 44MB to 150MB media, gained rapid widespread popularity almost as soon as they hit the market in the mid-1980s, especially as mountable backup devices for hard drives and as convenient ways to transport large files. Because these drives use magnetic media, files stored on them are vulnerable to stray magnetic fields and to eventual weakening, but their superior speed and wide acceptance among Macintosh users make them an excellent choice where long-term durability is not essential.

Whether you opt for an internal or external drive, you can find a Bernoulli or SyQuest drive for roughly $600 to $1200, list price; street prices start around $400 with SyQuest cartridges ranging from about $65 to about $145, depending on capacity. Bernoullis are a bit more expensive, with prices of $79 for the 35MB disk to $245 for the 150MB.

SyQuest cartridges are available in the 5.25-inch format in either 44MB or 88MB capacity; newer 88MB drives can both read and write to, but not format, 44MB cartridges, although at irritatingly slow speeds, according to Macworld Lab tests. This spring, a 3.5-inch, 110MB mechanism (formatted disks hold 105MB of data) shipped to resellers, who in turn are just now bringing devices to the retail market. Macworld Lab looked at some of these mechanisms to compare them against other storage options (see “Comparing Storage-Media Performance”).

The original Bernoulli drives worked with 5.25-inch, 44MB cartridges and were succeeded by 90MB drives that could read but not write to the 44MB cartridges. The MultiDisk 150, introduced last year, works with a new range of cartridges—35MB, 65MB, 105MB, and 150MB—and can both read and write to the 44MB and the 90MB cartridges. The MultiDisk 150 gives consistently good speed on all of the new cartridges but there’s a substantial speed deficit when writing to the 90MB and 44MB cartridges. In Macworld Lab’s tests, the Bernoulli MultiDisk 150 was somewhat slower than both SyQuest’s new 3.5-inch 105MB drive and the 5.25-inch 88MB drive. On average, the Bernoulli MultiDisk 150 took about 23 percent longer than the SyQuest 105MB mechanism and about 22 percent longer than the SyQuest 88MB mechanism to open, copy, and save files.

This fall, SyQuest plans to introduce two high-capacity drives, a 256MB 3.5-inch mechanism and a 5.25-inch mechanism in the 170MB-to-200MB range. Both drives will be outfitted with servo mechanisms that can read from and write to lower-capacity cartridges as well. These high-capacity drives are sure to turn the hair gray on vendors of magneto-optical drives looking to penetrate the SyQuest market.

### Which One When?

IN THE MACINTOSH world, SyQuest drives, manufactured by SyQuest but packaged and retailed by an assortment of resellers, hold a sizable dominance over Bernoullis. In the DOS and Windows marketplace, the reverse is true. Service-bureau clients, however, can safely choose either system; all but the smallest service bureaus and prepress houses accommodate both SyQuests and Bernoullis, according to a 1992 survey.

While Bernoulli technology has enjoyed a reputation as being more reliable than SyQuest’s, the problems with early SyQuests have been fixed and the technology’s reliability is no longer an issue. Unlike the rigid disk inside a Sy­Quest, a Bernoulli uses a flexible medium, something like that inside a floppy disk. The read-write head floats slightly above the disk on a cushion of air that also whiskers away any dust that makes its way through the disk’s protective case. If the air current ceases (due to a loss of power, for example), the disk falls out of the way of the head, eliminating the threat of head crashes. While out-and-out head crashes are relatively rare in SyQuest drives, the drives are susceptible to dust, which can make individual files unreadable.

Also, the argument goes, as the sole producer of both mechanisms and media, Iomega has been able to maintain a consistent standard throughout its product line. Whatever the capacity of the cartridge, the driver is the same; a Bernoulli is a Bernoulli.

Historically, things have been slightly more complicated on the SyQuest side. Because 20 or more vendors produce SyQuest-based drives, each with its own driver software, switching cartridges can be a hassle. But SyQuest is fighting back. Last year SyQuest made available to resellers a new version of the SCSI Probe utility that automatically makes sure the proper driver is always in operation.

### Mighty Mo

**MO, AS IT’S OFTEN REFERRED TO, HAS plenty to recommend it. Though the initial cost for a magneto-optical system can be up to six times as much as a Bernoulli or Iomega drive, the price gets you access to superlow media costs. Each megabyte**

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*All prices are based on average list prices from several vendors. **50MB, 65MB, and 105MB, which run on the 150MB mechanism (the MultiDisk 150). | also available, ***Cost of the mechanism (drive) and media (5.25" cartridges) needed to store 480MB.
of MO storage runs you about 29 cents, as compared with $1.65 per megabyte for a typical SyQuest system. For those who need storage in truckloads, paying between $1200 for a 3.5-inch 128MB MO drive and $6000 for a high-end 5.25-inch gigabyte drive is a worthy investment.

If archival durability is your foremost concern, a system based on a magneto-optical drive is your best choice. The infrared laser beam in the mechanism's read-write head records information on a layer of medium that is safely sandwiched between two protective layers; even if you manage through exceptional malice or neglect to damage the coating, the focal depth of the laser reading the data is long enough (sometimes over an inch) to access data reliably.

Further, optical cartridges are several hundred times more resistant to magnetic-field corruption than are conventional magnetic media, making for a far longer shelf life, up to 30 years, for optical disks.

Not surprisingly, government agencies and insurance companies use opticals to store scanned-in collections of forms and to archive data on write-protected disks. Artists and graphics houses working with high-resolution scanned photographs use opticals to save multiple versions of images for reuse virtually indefinitely. And many service bureaus maintain optical archives for their clients.

Due to the low cost of media, many users back up to opticals as well. Optical drives may be more expensive than tape-backup drives, but like Bernoullis and SyQuests, opticals have two aces in the hole. You can boot up your system from an MO drive, and you can search data backed up to MO far more quickly than you could ever hope to with tape.

In the past, MO drives have been faulted for both their lack of industry-wide standards and their slow speed (compared with hard drives). In response to the former, the optical vendor community is nearing consensus on a whole range of media specifications, affecting everything from track density and disk height to the size of the spindle hole.

As for overall speed, in Macworld Lab's tests the 3.5-inch optical drives performed about 92 percent more slowly than SyQuests and 59 percent more slowly than Bernoullis. However, 5.25-inch opticals compare very favorably with SyQuests and slightly outperform Bernoullis.

But don't make a buying decision based on speed tests. While superfast access times are critical for a primary storage device, like a hard drive, they're not imperative for devices used for secondary storage. Few users run applications from MOs. Instead, most MOs are used as backup devices or as secondary storage for large files and images.

Meanwhile, prices for the MO's laser mechanism—the heart and soul of the device—have nearly halved since introduction. What's more, a new, split-head design for the read head, available in a few models, dramatically reduces the weight of the traveling portion of the head, enabling far greater access speeds. Even so, data-transfer rates are still about twice that of hard drives because, although the head can find data faster, the data itself goes through the logic board at the same rate once it's been found.

For users with astronomical storage needs, optical-drive makers have developed a mechanism known as the optical jukebox. Like its audio forebear, the optical jukebox holds multiple disks and places them into operation one at a time at the user's bidding. For example, the PMO 10GB from Pinnacle Micro (714/727-3300) holds 16 5.25-inch 650MB cartridges, and will set you back $9995 for the jukebox, assorted cables, software, and a set of 16 drives. That's a lot of random access, even if you do have to wait while the jukebox changes disks.

**Floppies on Steroids**

If your backup and archiving requirements are modest, and you are not too concerned about transporting files from Mac to Mac to Mac, two direct descendants of the venerable floppy drive can offer you a convenient and economical option. Around $300 to $600 (street prices start at around $400), Floptical drives and VHDF drives let you cram about 20MB of data onto one 3.5-inch disk that looks—
and performs—like its ancestors.

Of the two technologies, Flopticals have the clear edge. Drives such as the EchoDrive from Second Wave (512/343-9661) and the Floptical from Iomega (801/778-1000) are backward-compatible, so they can read and write to 1.44MB disks. VHDf drives, manufactured by Brier Technologies and available on the Mac only as the QuadFlextra from Quadram (404/923-6666), cannot read or write to regular floppies.

Both types of disk go for about $25 a pop, street price—comparable to the price per megabyte of Bernoulli and SyQuest cartridges. If you work with a small number of files, the 20MB ceiling might not trouble you. An inability to share files with other Macintosh users might, however; these drives have yet to penetrate deeply into the Mac market, which rules them out for sneaker net.

In Macworld Lab’s speed tests, the Floptical drives trailed the other removable media by a long shot, roughly taking twice as long as the 3.5-inch optical drives and about four times as long as the 88MB SyQuests. However, Floptical units tested performed overall about 57 percent faster than the Mac Ile’s internal SuperDrive. (The QuadFlextra has compatibility problems with the Mac. Macworld Lab has on several occasions attempted to test the device but has been unable to format the disks using supplied software.)

A few years back, these two super-floppy technologies might have turned some heads, maybe as a replacement for one of the Mac’s internal floppies, but for most people today, they offer too little too late. On the other hand, if you work mainly with small files, you may find super floppies an excellent low-cost and practical choice. According to the Floptical Technology Association, a 40MB capacity Floptical drive should come to market sometime next year. While Floptical developers are tight-lipped about projects under way, several avenues exist for improving capacity and speed—increasing linear bit density, increasing track density, and improving rotational speed.

The Old Standby: Hard Drives

Before succumbing to the siren song of the new storage technologies, don’t overlook the obvious: for all the hoopla over alternate-storage technology, the only storage medium that offers the performance of a hard drive is a hard drive. Removable hard drives and portable hard drives make it easy to carry away hundreds of megabytes, whether you’re taking your work on the road or securing it in a locked cabinet.

So if your hard drive runneth over but it’s not a chronic situation, the solution may be simply to purchase an additional portable or removable hard drive. For example, a $500 investment in a portable drive can easily net you 100MB or so of fast, flexible, reliable storage, and the dollar-to-megabyte ratio drops quickly as you reach the higher-capacity ranges.

Given adequate space on the second drive, you can devote separate partitions to seldom-used applications, password-protected data, and routine backups.

On the other hand, portable drives are not infinitely extensible. They come in a variety of capacities from the 80MB Mass Microsystems HitchHiker, which lists for $779, to the 210MB Liberty Systems (408/983-1127) Liberty 50240Q, which lists for $749. But once you fill a portable drive, that’s it. Just as with any hard drive, you have to clear files off the disk to make room for new ones.

Removable drives, which pop in and out of stationary docking stations, or chassis, operate very much like portable hard drives, with one added bonus: you can extend their capacity by purchasing additional storage units. La Cie’s (503/520-9000) Passport Removable Hard Drive, for example, begins with a chassis that goes for about $400 into which you can plug storage units from 50MB ($349 list) to 240MB ($819 list). A high price, yes, but if you have a chassis at home and one at work, a removable hard drive can be a convenient choice—with its protective carrying case it’s slightly smaller than a portable drive and you don’t need to connect the SCSI cable each time you use it. Nevertheless, expect to see these relatively rare devices become even rarer as removable-cartridge systems and MOs dominate the market.
**Comparing Storage-Media Performance**

Times are in seconds. Shorter bars are better.

<table>
<thead>
<tr>
<th>Color Key</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fastest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent slower than fastest</td>
<td>Up to 10%</td>
<td>11%–20%</td>
</tr>
</tbody>
</table>

How do different types of removable storage compare? To find out, Macworld Lab tested the relative performance of representative devices in five categories. With each device, we opened and saved a 3.9MB Photoshop file and a 2.6MB PageMaker file, duplicated a 10MB folder and a 3.2MB 4th Dimension database file, and conducted a search and then a compile on a 3.2MB 4D database. After the removable hard drive, which turned in the fastest speeds overall, the new 3.5-inch SyQuest was consistently the speediest device, followed closely by the 5.25-inch, 88MB SyQuest. Interestingly, the 5.25-inch magneto-optical drive edged out the 5.25-inch Bernoulli in all tests and bested even the removable hard drive in the compile test.

**Bernoulli**
- 5.25-inch/150MB (Bernoulli)
- Open: 64
- Save: 64
- Duplicate: 60
- Search: 35
- Compile: 34

**Floptical**
- 3.5-inch/21MB (Omega)*: 176
- 3.5-inch/21MB (Viper)**: 193
- Open: 176
- Save: 237
- Duplicate: 204
- Search: 21109
- Compile: 2187

**Magneto-Optical**
- 5.25-inch/1GB (Pinnacle): 62
- 3.5-inch/128MB (Relax): 80
- Removable Hard Drive: 45
- Open: 45
- Save: 29
- Duplicate: 34
- Search: 21109
- Compile: 2187

**SyQuest**
- 3.5-inch/105MB (SyQuest): 51
- 5.25-inch/88MB (SyQuest)**: 51
- 5.25-inch/44MB (SyQuest)**: 95
- Open: 51
- Save: 48
- Duplicate: 46
- Search: 32
- Compile: 31

---

**Tape Drives**

**Finally, Some Old News:** If it's backup storage you seek—and just backup—magnetic tape drives are still by far the cheapest way to go. You can set up your backup system to operate automatically and then virtually forget about it until you need to restore.

Individual users and others with reasonably modest storage needs can pick up a good-quality drive such as the APS Teac 155, with backup software, for under $500 (APS Technologies, 816/478-8300). With 150MB tape cartridges going for roughly $20 each, that's about 13 cents per megabyte of data.

Companies looking for network backup and those working with very large files can find gigabyte-plus drives using either helical-scan (8mm) or digital-audiotape (DAT) technology. The drives themselves range widely in price, from around $1300 to several thousand for a 5GB 8mm tape drive from companies like Macintosh or Storage Dimensions, but high-capacity tape cartridges bring the DAT's media price down below a penny per megabyte.

Although cheap and reliable, tapes are not sufficiently stable to provide long-term archiving. For routine backup you can confidently reuse cartridges many times. After a while, though, tapes stretch and wear out, just as audiotapes do, but with potentially disastrous effect. That's why many users maintain a stash of tape cartridges and cycle through them for weeks or months, replacing them periodically with fresh tapes.

Even if you use tapes only once and then put them away, the magnetic charge weakens with time. Files stored on magnetic tape—as on any magnetic medium—can become corrupted and unrecoverable after a couple of years.

The great advantage to tape is its low price. Its great disadvantage, and the one that sets it apart from all the other storage media discussed here, is that data access is sequential and not random. That means to restore data saved to tape, you've first got to find it by rolling forward or backward on the tape.

New software, such as Optima Technology's (714/476-0515) DeskTape, can index tape contents and place a directory folder on the desktop. With these applications, selectively restoring files and folders becomes a familiar—if still painfully slow—copy operation. (For more on tape drives as a backup medium, see “Tape Backup Bounty,” Macworld, December 1992.)

**Which Storage Universe?**

All removable systems provide virtually limitless storage. The question, then, is which standard is best for you.

If your main concerns are compatibility, versatility, device price, and speed, then the most flexible all-around choice remains, at least for now, SyQuest drives. With performance just slightly behind that of a hard drive, and with widespread use among Macintosh users, 88MB SyQuests make good sense for people who routinely carry large files around.

For a slightly higher investment, you can purchase a Bernoulli MultiDisk 150 and get the same flexibility and a little sturdier cartridge for your data. Either type of drive makes for a convenient, if not necessarily economical, backup device.

If you're more concerned about long-term data integrity or random access to gigabytes' worth of data, make the move to magneto-optical. Though the technology is still maturing, it's plenty stable, and the low media cost is surpassed only by tape. The optical industry is sure to respond in kind to SyQuest's aggressive competition, which means prices will continue to fall as performance rises.

If cost is an issue, here is the rule of thumb. If you work with small files or a modest number of files, the cost of the device is more important than the cost of the media. If you routinely work with color, video, scanned images, and other break-the-bank file sizes, you will save money in the long run by buying a device that offers low media cost, even if it means a higher investment in the device itself.

It's always tempting to hold out until the next unit ships—to wait for the high-capacity SyQuests or the next faster optical. Yes, whatever you buy today will be supplanted tomorrow by something better. But if your hard drive is bulging at the seams, there's no way to avoid it; take the plunge—and start saving up for your next purchase.

Macworld Lab testing supervised by MATTHEW CLARK.
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Circle 66 on reader service card
Macintosh Quadra 800

PROS: Powerful; moderately priced; CD-ROM and multiple hard drives can be installed within commodious drive bay; memory interleaving provides for speedier performance; new, ergonomic Mouse II. CONS: Installing RAM requires removal of system board; requires pricey 60ns 72-pin SIMMs; on-board video limited to 8-bit screen depth on 19-inch and larger monitors with maximum 1MB video RAM installed. COMPANY: Apple Computer (408/996-1010). LIST PRICE: With 8MB of RAM and 230MB hard drive $4679.

I GOT MY FIRST MAC IN 1989, IN THE early summer. It was a IIx, and it set me back nearly five grand. I also learned that keeping up with the latest and greatest in the computer world is an exercise in futility (and not terribly cost-effective). A few weeks later, Apple introduced the IIci, which quickly took the mantle of latest and greatest.

The Quadra 800 will undoubtedly be supplanted by faster and better Mac CPUs. But right now, the tests at Macworld Lab say it all. Although the 800 breaks no new ground, Apple has managed to simplify the circuit board, and the result is a computer that surpasses the Quadra 950 by 5 to 10 percent in our standard suite of benchmark tests (see “Quadra 800 Performance”). And the whole package has a street price of hundreds less than I paid for that vastly less powerful computer just four years ago.

Squat, yet curvy and attractive, the Quadra 800 is a true minitower. When you open its cover with the four large rear-mounted screws, you’ll find just one modestly sized circuit board. Apple has done its homework. By directly connecting the Quadra 800’s video subsystem to the 68040 processor bus, Apple gets speedier performance. More efficient design has reduced the number of application-specific integrated circuits from ten to three, providing better speed at reduced cost.

To extract that last iota of performance, Apple has introduced something that Macintosh users have already seen on the Radius Rocket 68040 accelerator board. It’s called memory interleaving, and it allows the CPU to address two SIMMs of the same size and speed as one, resulting in faster burst-transfers of data. The Quadra 800 also uses a type of SIMM previously found on some high-end PCs. These SIMMs have 72 pins, and each SIMM addresses a full 32 bits, meaning that you need to install just one chip rather than the previously requisite four. To take advantage of interleaving, you must buy a matched set; the 8MB of RAM soldered onto the system board is set up as two interleaved banks of 4MB each. Since the 72-pin SIMMs are apt to be in short supply for a while, and you need the 60ns variety for the Quadra 800, expect to pay a healthy price, at least for now. The chips are available in configurations of 4MB, 8MB, and 16MB, with 32MB on the near horizon. All told, you can install up to 136MB of RAM on a fully configured 800 once the largest chips are available. Composite SIMMs, which use many lower-capacity chips to provide the same amount of RAM as a standard SIMM, are not recommended for use with the Quadra 800, as they may work at speeds slower than their published rate.

In addition to the floppy drive, there’s a 5¼-inch drive bay for a CD-ROM or removable hard drive, such as a Bernoulli or SyQuest. In one of its optional configurations, the 800 comes with a CD-ROM mounted in the slot. There are also two 3½-inch bays for hard drives.
The three NuBus slots are mounted sideways, with a plastic bracket to hold the boards in place. At the very bottom of the NuBus array is a Processor Direct Slot, for installation of a cache card or other expansion board. Using the PDS slot effectively disables one NuBus slot, but few will miss this NuBus slot because, like all Quads, the 800 comes with Ethernet and speedy built-in video.

The standard 800's on-board video contains 512K of video RAM, enough for 8-bit video for a 16-inch or 17-inch monitor and 4-bit video for 19-inch and larger screens. The 800 suffers in comparison with the Quadra 950 here. To keep the 800's cost down, Apple limits you to a maximum of 1MB of VRAM, which gives you 16-bit color for a 16-inch or 17-inch monitor, and 8-bit for the larger models. While most users will find this satisfactory, if you need a large monitor for 16-bit or 24-bit color work, you have to seek out a third-party video board.

While installing an additional NuBus board is no more difficult on the 800 than on any other modular Mac, people who are used to popping SIMMs in and out of the slots on their Mac II's will be put off by the procedure for the 800. In order to install RAM, you have to remove a plastic bracket at the right-hand side of the chassis, to free the system board. Then you must slide the programmer's switch assembly out of the front panel and disconnect four plugs. While the whole process takes only a few minutes, it is probably best done by a dealer. Apple gives a stern warning in the manual that the product warranty does not cover damage caused by improperly installed RAM when the job is done by anyone other than an authorized Apple dealer.

Other than the difficult RAM installation, setting up the Quadra 800 is just like setting up other Macs. It comes out of the box ready to hook up to your monitor and other peripherals. The hard drive is preformatted with System 7.1 and includes the now-standard HyperCard Player and Macintosh Basics applications.

Once under way, you'll see the 800's speedy performance in virtually every function, from scrolling through a document to pulling down the menu bar, to doing a complex 3-D rendering or spreadsheet calculation. The benchmarks don't prepare you for the sheer speed of day-to-day operation. Even the basic 230MB drive (the familiar Quantum 240) is a sprinter, with read-write capabilities of 2MB per second and more (based on tests with FWHB Bench Test and La Cie's Time Drive). Application launch faster; large documents are saved often almost instantaneously; and in publishing programs that can take advantage of the 800's incredible speed, such as QuarkExpress, it can be nearly as fast to enter text as it would be in a word processor (up to now such entry has been a slow chore).

In day-to-day work, I found the 800 a joy to run. I didn't locate any new software incompatibilities or quirks in the new hardware. All of the software that I was able to use on previous Quadra models and on Macs equipped with 68040 accelerator boards ran perfectly on the 800. There were no significant problems—except for some older software that won't work on any Quadra model that has its cache enabled. If you need to use some of this older software, you can disable the 68040's cache mode (using the Cache Switch Control panel), which gives you stability but reduces performance to roughly the level of a Mac IIc.

Apple also deserves praise for its new ergonomic Mouse II, which is sculptured to fit into an average-size hand, and has a large, easy-to-click button at the top. Although I have often gone back and forth between the older-style Apple mouse and trackballs, I am very pleased with the Mouse II. Apple is selling it separately at $79, if you want to upgrade.

Unless you need its greater expansion capabilities (five NuBus slots, maximum RAM of 256MB, and other extras), the Quadra 950 is no longer the high-end Mac of choice. For now at least, that position has been filled by the Quadra 800.

It comes down to this: Would I buy a Quadra 800? Well, I would and I did. And that's the best recommendation I can offer.—GENE STEINBERG

**Quadra 800 Performance**

<table>
<thead>
<tr>
<th>Processor Tasks</th>
<th>Times in seconds:</th>
<th>Shorter bars are better.</th>
<th>Driver-Access Tasks</th>
<th>Display Tasks</th>
<th>Math Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our tests, including adding and subtracting numbers and finding multiple words, depend mainly on the speed of the processor.</td>
<td>95</td>
<td>172</td>
<td>74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our tests, including opening and saving files, require the processor to work with the hard drive.</td>
<td>69</td>
<td>138</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our tests, including scrolling, require the processor to work with the display circuitry.</td>
<td>74</td>
<td>144</td>
<td>76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our tests, including recalculation and rendering, depend heavily on a math coprocessor.</td>
<td>96</td>
<td>31</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LaserWriter Select 300**

**PROS:** Inexpensive; expandable; networkable; background printing; excellent gray-scale image quality (GrayShare and PhotoGrade); text and line-art edge-smoothing (FinePrint); high paper capacity. **CONS:** Slow; large; no adjustable paper guides; lacks preview mode; not Communications Toolbox-compatible. **COMPANY:** Apple Computer (408/996-1010). **LIST PRICE:** $839.

**LaserWriter Select 310**

**PROS:** True Adobe PostScript; expandable; serial and parallel ports; high paper capacity. **CONS:** Very slow; not networkable; no port-switching; large; no adjustable paper guides; lacks preview mode; not Communications Toolbox-compatible. **COMPANY:** Apple Computer (408/996-1010). **LIST PRICE:** $1099.

APPLE HAS REPLACED ITS LOW-END LaserWriter LS with the LaserWriter Select 300 and 310, two inexpensive laser printers with a host of new features designed to appeal to discriminating home users on a budget. While they look remarkably alike, these two printers are worlds apart. Surprisingly, the better of the two is the cheaper one.

**LaserWriter Select 300**

THE LASERWRITER SELECT 300 IS A "dumb" QuickDraw-based printer with a Fuji Xerox P0 engine rated at 5 pages per minute. I say dumb because Apple kept costs down by leaving out brains, instead relying on the host Mac for rasterizing. Therefore, print speed varies depending on the document complexity and the power of your Mac. In Macworld Lab's standard suite of test pages, the Select 300 ran neck and neck with the LaserWriter LS (see "Select Performance"). The Select 300 comes with 512K of memory soldered on the board, and it has a standard 30-pin socket that can accept 1MB SIMMs (for complex pages) or 4MB SIMMs (for PhotoGrade).

As the Mac processes each page, an animated dialog box displays the percentage of imaging completed, but due to the slow printing, an estimate of time elapsing and remaining would be much more helpful. Fortunately, Apple provides the option of background printing with PrintMonitor, so after a few seconds of...
REVIEWS
spooling you can get back to work while
the printer slowly generates hard copy.
You can share this serial printer on a
network using Apple's new GrayShare soft
ware. After selecting the Select 300 in the
Chooser, click on Setup to name the
printer and give it a password to restrict
access, if you wish. A log option tracks
all the print jobs the Select 300 handles.
Since it's no speed demon, the Select 300
is appropriate for sharing among small
workgroups only.
What the Select 300 lacks in speed it
makes up for with improved image qual
ity. Thanks to GrayShare, the standard
Select 300 prints up to 33 levels of gray,
comparable to PostScript output. For
even better images, add a 4MB SIMM to
take advantage of PhotoGrade, an option
that allows this 300-dpi printer to gen
erate 91 shades of gray-equivalent to
standard 1000-dpi printers, according to
Apple. I don't know about that, but the
PhotoGrade print quality is amazing for
a printer of this price. Half-tone dots that
normally can be detected with the naked
eye melt into smooth shades of gray.
Printing a full-page, 8-bit color image
using PhotoGrade takes almost twice as
long as with standard gray-scale mode,
but the results justify the wait.
Both GrayShare and PhotoGrade are
compatible with Apple's FinePrint edge
smoothing technology, which virtually
eliminates jaggies on line art and text. You
can't turn FinePrint off, but that's OK
because it really does improve print qual
ity. In fact, thanks to FinePrint, the
LaserWriter Select 300 (which comes with
39 TrueType fonts) prints text bet
ter than the Select 310 does.
LaserWriter Select 310
THE LASERWRITER SELECT 310 LOOKS
just like the Select 300 on the outside;
inside, the 310 has a logic board featur
ing Level 1 Adobe PostScript with 13
fonts (Apple offers a $349 upgrade from
the Select 300).
The Select 310 is powered by an
Advanced Micro Devices AM29205 RISC
processor. The printer comes standard
with 1.5MB of memory. Adding a 4MB
SIMM didn't increase print speed, but it
did enable us to print our TrueType doc
ument, which refused to print with less
memory unless we selected Unlimited
Downloadable Fonts in the LaserWriter
Options dialog box.
In our test on average even a fully
loaded Select 310 was only half as fast as
a LaserWriter LS. The primary downfall
of the Select 310 was the PageMaker doc
ument. It took almost 86 minutes to print,
versus just 4.7 minutes for the Laser
Writer LS and Select 300. At Apple's sugges
tion, we held down the option key to
bypass the Aldus driver, and this cut the
print time to about 28 minutes. Better,
but still unacceptably slow.
The Select 310 has serial and parallel
ports and can be connected to a sin
gle Mac (GrayShare is not an option) or
a PC running Microsoft Windows (driv
er and manual provided in the box).
Unlike other mixed-environment print
ers such as the Hewlett-Packard LaserJet
4ML, the Select 310 can't switch ports on
the fly. If you've been printing from a
Mac, you must turn the printer off and
then on before you can begin printing
from a PC. Hardly convenient.
Common Ground
THE SELECTS ARE SURPRISINGLY BIG FOR
printers designed for home use, where
space is often at a premium. They weigh
26 pounds and measure 15.5 inches wide,
18.25 inches deep, and 10.25 inches tall
(with the standard paper tray).
The paper tray holds 250 sheets and
fits entirely underneath the prin
ter. Additional trays with 250- and 500-sheet
capacities are available as options; they
attach to the existing tray. Using the Print
dialog box, you can select which tray to
use for first and subsequent pages. A man
ual-feed paper tray flips down on the
front of the printer for small jobs requir
ing personal attention. Unfortunately,
there are no self-centering guides to help
feed pieces smaller than 8.5 inches wide.
As a result, manually fed envelopes are
often slightly skewed. A 30-envelope casset
ette is available for $89.
Neither printer driver has a preview
mode, a big inconvenience and paper
waster. Also, neither is compatible with
Apple's Communications Toolbox, which
lets applications access more than the
standard two serial ports on the Mac
using third-party devices such as Applied
Engineering's QuadraLink board or the
Axiom Switch. As such, the printers need
to be connected to either the modem port
or the printer port. If you share the Select
300, the printer port is already used by
AppleTalk, so you must connect to the
modem port. Too bad if you wanted to
use that for something else.
Individuals or small workgroups look
for an inexpensive, low-capacity prin
ter to share on a network will find that the
LaserWriter Select 300 is an excellent buy
despite its few weaknesses. But I wouldn't
think of buying one without immediate
ly adding a 4MB SIMM to take advantage
of the amazing PhotoGrade capabilities.
Budget-conscious users who must have
PostScript might be tempted by the
Select 310 at first glance, but a more thor
ough examination reveals too many neg
atives to overlook.—OWEN W. LINZMAYER

Select Performance

<table>
<thead>
<tr>
<th>PERFORMANCE TESTS</th>
<th>(Times. are in seconds. Shorter bars are better.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVERALL</strong></td>
<td></td>
</tr>
</tbody>
</table>
| MULTIPLE FONTS    | We printed a 7-page Microsoft Word 5.0 doc
ument containing a variety of fonts, sizes, and styles. |
| Courier           | We printed a 20-page Microsoft Word 5.0 document containing 12-point Courier text in plain, bold, and italic styles. |
| MacDraw Pro       | We printed a graphic containing more than 2000 simple objects and several lines of Helvetica text. |
| FreeHand 3.1      | We printed an illustration that includes nonlinear blends and Bézier curves. |
| PageMaker 4.2a    | We printed a 4-page newsletter with several fonts, a MacPaint image, and a 3-gray-scale TIFF images. |
| TrueType          | We printed a 1-page Microsoft Word 5.0 document containing 4 fonts. |

Red indicates fastest result in test.

<table>
<thead>
<tr>
<th>Performance Test</th>
<th>Personal LaserWriter LS</th>
<th>LaserWriter Select 300</th>
<th>LaserWriter Select 310</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>355</td>
<td>353</td>
<td>354</td>
</tr>
<tr>
<td>Multiple Fonts</td>
<td>221</td>
<td>224</td>
<td>226</td>
</tr>
<tr>
<td>Courier</td>
<td>315</td>
<td>319</td>
<td>320</td>
</tr>
<tr>
<td>MacDraw Pro</td>
<td>289</td>
<td>289</td>
<td>290</td>
</tr>
<tr>
<td>FreeHand 3.1</td>
<td>317</td>
<td>317</td>
<td>317</td>
</tr>
<tr>
<td>PageMaker 4.2a</td>
<td>194</td>
<td>194</td>
<td>194</td>
</tr>
<tr>
<td>TrueType</td>
<td>89</td>
<td>89</td>
<td>89</td>
</tr>
</tbody>
</table>

*Time it took with option key held down to bypass Aldus driver. With PageMaker 4.2 instead of 4.2a, we were able to obtain a test result of less than 384 seconds.

The Apple LaserWriter Select 310

126 August 1993 MAC WORLD
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 custom 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.

Quality You Can Count On
AF TER ITS RELEASE TWO YEARS AGO, ClarisWorks 1.0 quickly became one of the best-selling integrated programs for the Mac. ClarisWorks 2.0 is even better, with significant improvements to all version 1.0 modules (Claris calls them environments): word processing, drawing, spreadsheet and charting, database, and communications. New to version 2.0 is a 24-bit paint environment.

The key to ClarisWorks' integration, the tool palette, has been expanded. The four main environment tools (text, spreadsheet, draw, and paint) allow you to create different environment frames in a single document; for example, in a word processing document, you can create a spreadsheet frame to add a table, or a draw frame to include a graphic. When you create a frame from a different environment, the menus change to reflect the new environment.

ClarisWorks 2.0 has added to its word processor an outlining mode for organizing documents and ideas. The outline is easy to use and supports several standard outline formats, including Harvard, legal, bullets, diamond, checklist, and numeric. You can even design your own outline format, though you're limited to just one custom format. You can expand, collapse, and move outline topics with either the mouse or the keyboard.

Useful as the outliner is, it needs a few improvements. There's no Expand All command, and you cannot mix an outline with regular text in the same document. I found a bug using the keyboard command for expanding and collapsing a topic. The expand command doesn't toggle between the expand and collapse states; if you collapse a topic using the keyboard command, then try to expand it using the keyboard, nothing happens. To expand the topic, you have to move the cursor out of the topic and move it back to the topic for the keyboard command to work correctly.

The word processor has several other new features. Text can now flow around graphic objects; you can have the text wrap in a rectangle around the object, or flow around an irregular object. The spelling checker now allows you to check a selection, instead of the entire document. Invisible characters, such as tabs, spaces, and returns, can be shown. You can define and name custom text styles, so if you often use 48-point Zapf Dingbats in purple, you can format text in one step. You can now set variable column widths by dragging the column guides. And tabs can now have leader characters, such as periods, dashes, or underlines.

The new paint environment uses all of the draw tools, plus standard paint tools such as the paint bucket, spray can, eraser, pencil, and magic wand. Since ClarisWorks holds documents in RAM, you may need to increase the RAM allocation for ClarisWorks.

The other environments have also been improved. The tool palette has additional drawing tools, such as a polygon and Bezier tool (the latter allows you to create closed objects using Bezier curves); new paint tools, such as a paintbrush and eyedropper; and a new gradient palette, which allows you to fill graphic objects with 32 preset 24-bit gradients. You can also design your own gradients. In the draw module, you can set a master page (good for reusing layouts for newsletters) and link text frames. Text can now flow from one linked frame to the next. You can also link spreadsheet and chart frames. Changing the spreadsheet data automatically changes the linked chart.

Text now wraps in spreadsheet cells, and more chart types are available. Creating layouts for mailing labels is much easier, thanks to a new pop-up list with more than 50 Avery-label formats. Database data entry is also easier, thanks to the pop-up lists of user-defined default values for fields. In the communications environment, Claris has added the Kermit file-transfer protocol (but still no Zmodem protocol) and a phone book for frequently called numbers. A new presentation feature is the Slide Show mode, which turns ClarisWorks pages into slides that can fill the screen, include QuickTime movies, and advance manually or automatically.

Shortcuts, a floating palette of button macros that perform a predefined sequence of actions, works in much the same way as the tool bars in Microsoft Word and Excel. For example, there are Shortcut buttons for all of the standard text-styling features (bold, italic, and so on), and for aligning objects in the draw environment. Claris provides Shortcut buttons for virtually every function in ClarisWorks. You can also record your own macros (a series of keystrokes, mouse-clicks, and commands), and you can put them into the Shortcuts palette. For example, to automate typing the closing of a letter, you can turn a macro recording, type Sincerely, hit a few returns, and type your name and title. Using the Shortcuts palette, ClarisWorks can automatically insert the closing.

Conversion of 1.0 documents to version 2.0 needs improvement. An alert dialog box appears when you open a ClarisWorks 1.0 document and tells you that a copy will be opened in 2.0 format, with the "[v2.0]" added to the file name. Click on OK and the converted copy opens. You then have to save the copy in order to end up with a 2.0 document. You go through this alert box every time you open a 1.0 document. For 1.0 users who may have created hundreds of ClarisWorks documents, this is useless and repetitive. It would be better to have an option the first time the alert box appears that says, "OK, and don't warn me anymore," or a selection in the program's general Preferences area. Best of all would be the ability to drag and drop your 1.0 documents onto the 2.0 program icon and have the program automatically convert all the documents.

ClarisWorks comes with a user guide, a Getting Started tutorial, and a quick-reference card. Documentation is up to Claris's usual high standards. Tech support, though not toll-free, is knowledgeable and prompt.

ClarisWorks 2.0 once again sets the standard by which other integrated programs must be judged. It provides more features, is easier to use and faster, and has much better integration between modules than Microsoft Works 3.0 (see Reviews, February 1993). Impressively, Claris has managed to improve ClarisWorks without raising the price and with only a small increase in the program's size (600K minimum, but it prefers 2MB). For now, ClarisWorks is the best choice in integrated packages—TOM NEGRINO
**Project Management Software**

**Project Scheduler 5**

**PROS:** Workgroup planning features; improved Gantt charting and reporting; analytical tools; tracks multiple projects.

**CONS:** Somewhat limited report formatting; extra data-entry steps.

**COMPANY:** Setor Corporation (415/570-7700).

**REQUIRES:** Mac Plus; System 6.0.

**PRICE:** $695.

---

**S** CITOR'S PROJECT SCHEDULER 5 FOR THE MACINTOSH (PSS) IS DESIGNED WITH CORPORATE USERS IN MIND. ALTHOUGH ITS INTERFACE LACKS MICROSOFT PROJECT'S SPLENDID TOOL BAR AND ON-SCREEN FORMATTING, PSS COMPENSATES BY ADDING TO AN ALREADY FULL LIST OF POWERFUL MIDRANGE PLANNING TOOLS.

Impressive multiproject features help you integrate schedules of different workgroups. Gantt chart enhancements, such as a project overview line, and reporting improvements are aimed at managers facing with communicating complex project information in large business settings. Yet PSS is also a good choice for more modest needs; the program won't confound you with complicated planning or schedule-tracking procedures.

**More Flexible**

PSS LETS YOU ENTER PROJECT INFORMATION USING UP TO EIGHT DIFFERENT WINDOWS.

To save time, the Job List window lets you record basic task, resource, and link information in tabular format. As projects grow in complexity, the other windows offer extra versatility. For example, the Assignment window lets you put an unlimited number of resources to work on any one task; moreover, you can decide exactly when each resource should start working after the job starts and for how long—both uncommon capabilities.

Data is available, a time line appears on the Gantt chart. From there it's simple to adjust a task's duration, starting or ending date, or percent complete by moving the task bar. Flexible Gantt charting includes a time scale that shows dates or period numbers (period numbers can count down to a particular milestone, say, then count up from that date). And you can place text anywhere around the Gantt bar. The status of each job is clearly displayed, including the portion that's complete and the current schedule versus the original plan.

PSS really excels at organizing project data according to work breakdown structure (WBS) or organizational breakdown structure (OBS) codes. Suppose you want the total duration of all manufacturing aspects of a project; just ask for all jobs that begin with the M code (for manufacturing) and they're rolled up into one neat task bar.

PSS lets you selectively hide Gantt bars and descriptions and control which tasks are summarized. Also, you can generate an overview line on the Gantt chart that shows important milestones—a great asset when creating presentations.

The report writer lets you select fonts and include additional headers. You get a variety of standard reports, from Gantt charts that consolidate information from multiple projects, to text-based variance reports for measuring how closely the project keeps to the original schedule and budget.

**Underlying Planning Power**

**This product stores resource information separately from other project data.** That's an important distinction, since numerous schedules can share a common pool of people or equipment. Then, if resources are already taken by a more important job or project, PSS automatically delays tasks that you've assigned as lower priority or indicates conflicts among critical jobs.

Workgroup connectivity is the most interesting addition to PSS. Say you have several managers working on different parts of a large job. Each manager could bring a project file to a meeting, and together the managers could build a master plan by linking the files with the Group command. You can easily accomplish this, and visually see how one project depends on another, with the PERT network diagram.

Linked projects do not act like subprojects (though subprojects are also available); PSS automatically separates a group-level plan back into individual project files—making it easy for project managers to maintain their own plans. The separated projects now indicate where they connect to another project, so managers know when changes will affect another schedule. Plus you can retrieve grouped files to see how the projects are progressing—or pinpoint problem areas; all the links you made remain intact. And perhaps most significant, PSS double-checks your work, so there's little chance of introducing logic errors into the plan.

**Project Organization**

**Project scheduler's new tree structure diagram helps you arrange a project much like a hierarchical organization chart—starting with major task groups that are further divided into specific tasks. A utility generates WBS or OBS codes from the tree structure so you don't have to reenter data for use in other parts of the program—a step required by some project managers.**

**These codes, plus RBS (Resource Breakdown Structure), are invaluable when comparing or reporting project data.** For instance, you can display a histogram and set the resource filter to show if the project is too dependent on a particular labor skill.

I found the Job List window valuable for more than data entry. You can resize column widths, choose which data fields appear, and display tasks in outline order (there's a modest indent option, but no multilevel outliner) for quick reporting.

Moreover, the Job List is good for batch data entry or large-scale editing, such as cutting and pasting groups of tasks. Adding or maintaining lists of resources has been simplified, too, thanks to sorting and renumbering functions. The PERT network, as before, lets you see the way tasks are connected at various zoom levels, while displaying schedule information in the task node boxes.

**Superior Analytical Tools**

**PROJECT SCHEDULER 5 RETAINS ITS PREDECESSOR'S PROBABILITY ANALYSIS MODE, which lets you enter the best-case, likely, and worst-case duration for a task.** Afterward, you can adjust the weighting factors to see the effect on schedules and costs. Since PSS's recalcs are fast, you can examine many scenarios before deciding on the best action.

PSS's cost curve is equally complete. It shows the current plan, baseline, actual, and completed costs for the whole project. Alternatively, you can sort and filter the cost graph to get different perspectives on the project, such as costs associated with a selected resource group.

PSS gives you expected mainstream project-management features including interactive and automatic resource leveling—and goes beyond the requisite scheduling options with inflation factors and unlimited projects in memory.

Yet what I admire most is visible: PSS conforms to accepted project-management standards, so you get consistent, predictable results; for instance, when you enter dates that must be met, the program doesn't override your requests with its own calculations. And technical support is outstanding.

Project Scheduler 5 can be confusing; its resource calendars are basic, while cost reports may be inadequate for government projects. However, for most midrange project planning, the program's many hits far outweigh the few misses.

—MIKE HECK
In the days when 200K files were still considered impressive, the Macintosh Scrapbook was handy for storing, browsing, and retrieving clip art. But to keep tabs on today's multimegabyte graphics, you need an image cataloger, a specialized database for keeping track of and searching for images. For this review, I looked at four image-cataloging programs for the Mac.

Creating Catalogs

All four of the Image-Cataloging applications work in a similar fashion: you specify a volume or folder to scan, and the program hunts for graphics files and catalogs them. Catalogs can reference files on local or remote volumes, as well as on removable media such as magneto-optical cartridges and CD-ROMs. All the products can read standard file formats like PICT and TIFF. Additionally, Cumulus, Kudo Image Browser, and Aldus Fetch let you catalog QuickTime movies, and Kudo Image Browser and Fetch are compatible with several types of sound files. Fetch is the only program that lets you specify file names and file types to exclude from the catalog, however.

To save catalog space, the catalogers use miniature representations of images called thumbnails. To some extent, all the programs except Kudo Image Browser let you tailor the thumbnails' color depth to fit your hardware setup. For example, 32-bit thumbnails require more storage, so it might make sense to use 8-bit thumbnails if that's all your monitor can display. To further conserve disk space, Aldus Fetch and Nikon's ImageAccess let you compress 32-bit thumbnails as they are being created. (Compressed 32-bit thumbnails are often smaller than 8-bit thumbnails, but they must be decompressed for viewing, so they may take longer to display.)

Aldus Fetch provides the most options for selecting bit depth and compression method, a significant advantage when you consider that the size of the catalog and the quality of the thumbnails depend on the compression technique. Fetch lets you choose between 1, 8, and 32 bits; you can select any QuickTime compressor when you create 32-bit thumbnails (all four applications ship with QuickTime).

ImageAccess gives you somewhat less control, letting you choose among 8-bit grayscale, 8-bit color, 24-bit uncompressed, and 24-bit compressed thumbnails. Cumulus offers only low-quality and high-quality settings for 8-bit thumbnails, and it uses a proprietary compression technique. Finally, Kudo Image Browser supports only uncompressed 8-bit thumbnails.

To gauge the programs' efficiency, I cataloged a set of 75 images in a mix of file types. While all four applications occasionally balked at reading a file, none of them crashed during cataloging. Overall, Fetch was the slowest but produced the smallest catalogs (see "Cataloging Stats"). Notably, Kudo Image Browser demanded much more memory than the others when cataloging large images—I had to boost its partition to 11MB to handle one 3MB file.

Views and Searching

All the programs let you view catalogs in a graphic format that displays thumbnails in a resizable window. This approach works fine as long as the catalog isn't too large, but paging through hundreds of thumbnails is tedious if you're working on a network or using a slow Mac. Fetch, Cumulus, and ImageAccess also provide a list view that shows information about each item in the catalog in text format only, so scrolling is much faster.

Kudo Image Browser's hybrid list view displays thumbnails along with text, so Kudo's scrolling is slower than with a text-only view. But Kudo Image Browser does include a unique feature called Riffle that enables you to scan thumbnails one at a time. You can zip through the catalog forward or backward at a rate of up to ten items a second, controlling speed and direction with the mouse. Using Riffle is similar to thumbing through the pages of a phone book, and it works quite well.

Finding an image in a large catalog would be a hit-or-miss proposition if you could only browse sequentially. Fortunately, all four programs also let you search for files based on text descriptions or keywords that you assign to each item (see "Search and Find"). For example, if you are cataloging a collection of animal photos and drawings, you might choose keywords based on species, size, and color. (Kudo Image Browser permits you to enter text descriptions, but not keywords.)

Fetch lets you derive keywords from file names as images are being cataloged, continues

### Cataloging Stats

<table>
<thead>
<tr>
<th>Product</th>
<th>Bit Depth</th>
<th>Time</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldus Fetch</td>
<td>B</td>
<td>8.27</td>
<td>581K</td>
</tr>
<tr>
<td></td>
<td>32**</td>
<td>11.24</td>
<td>2559K</td>
</tr>
<tr>
<td></td>
<td>32**</td>
<td>10.51</td>
<td>644K</td>
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<td>B</td>
<td>4.44</td>
<td>770K</td>
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<td></td>
<td>24**</td>
<td>6.00</td>
<td>1439K</td>
</tr>
<tr>
<td></td>
<td>24***</td>
<td>7.18</td>
<td>739K</td>
</tr>
<tr>
<td>Cumulus</td>
<td>Low</td>
<td>4.04</td>
<td>900K</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>4.04</td>
<td>966K</td>
</tr>
<tr>
<td>Kudo Image Browser</td>
<td>NA</td>
<td>4.02</td>
<td>177K</td>
</tr>
</tbody>
</table>

* Times are in minutes: seconds. ** Uncompressed. *** Maximum compression.

These times and sizes are the results for cataloging a set of 75 images in a variety of file types.
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a function that's useful if you routinely use file names that are descriptive. Fetch also is capable of extracting thumbnails, keywords, and descriptions directly from files that include them. Because keywords work best if they're used in a consistent fashion, it helps if you can define lists of keywords for users to choose from while cataloging, a feature found only in Cumulus. (Alas, none of the programs incorporate a thesaurus; so they do not know to look for dog and puppy when you search for canine.)

Both ImageAccess and Aldus Fetch let you search by multiple criteria simultaneously—for example, by file name, type, and keyword. The Fetch search dialog box is similar to System 7's Find command, so it's easy to use, and you can save search criteria for later use. ImageAccess's interface is less conventional; I found the combination of dark background and light text hard to read, especially on a black-and-white monitor.

**Manipulating Images**

WHEN YOU SELECT AN ITEM IN THE graphic or list view, all four of the catalogers let you open the original file using the application that created it. Aldus Fetch, ImageAccess, and Kudo Image Browser also let you preview images without leaving the program; if the item is a QuickTime movie, Fetch lets you play it using a standard QuickTime movie controller. If the item's volume cannot be found online, you are prompted to mount or locate it. (Both Fetch and Kudo Image Browser can also play sounds, although Image Browser oddly refers to them as images.)

The pasteboard, a window where you can temporarily store any number of thumbnails from an open catalog, is a welcome feature unique to Aldus Fetch. As with the main catalog window, you can display the pasteboard in either graphic or list format. Fetch also lets you define projects, subsets of items from a single catalog. Because projects contain references to items rather than thumbnails, they can be saved in compact files that you can distribute to other members of a workgroup.

All of the catalogers let you copy items into another application's document by cutting and pasting; Fetch also supports a function that lets you paste a reference to a file (rather than the whole file itself) into another document. And for programs that support Apple events, you can send file references to other applications without leaving Fetch. Although there are few compatible applications, this feature may become useful as more programs become Fetch-aware. Kudo Image Browser incorporates a similar function that lets you drag graphics to open documents in either Aldus PageMaker or QuarkXPress.

**Networking**

BOTH FETCH AND CUMULUS PROVIDE specific network support for workgroups. Fetch users can share catalogs under System 6 or 7, and multiple users can search and preview items at the same time. (Not all features are available under System 6, however.) Users must enter a password to update or delete items from the catalog.

Cumulus uses a server application and System 7 file-sharing and program-linking to let multiple users access a database. (The server workstation can be used for other tasks.) Cumulus relies heavily on features built into System 7—for example, you use the Users and Groups control panel to add new users and to set passwords. To help track catalog usage, Cumulus lets you record certain user actions (like opening or closing the database, or adding keywords) in a protocol file. Cumulus also lets you assign a status (say, Needs Keywords) to each item in the catalog. These features can be useful in group situations where it's important to know who's doing what to a catalog.

Performance in browsing and searching catalogs over a LocalTalk network is acceptable for both Aldus Fetch and Cumulus, although EtherTalk and a dedicated server are recommended for large workgroups and catalogs. However, it is important to keep in mind that previewing and opening images on remote volumes is bound to be slow, even over a fast network.

**Documentation and Support**

KUDO IMAGE BROWSER'S USER GUIDE IS the easiest documentation to read, although one minor feature is missing from both the manual and the Read Me file. The guides for Aldus Fetch and Image Access are also clear, although the latter would benefit from an index. The Cumulus manual provides a good deal of useful information, but its stilt wording and repetition make for slow reading. Telephone support was adequate for all of the applications except ImageAccess: two messages that I left on Nikon's tech-support line went unanswered for more than a week.

**Sorting It Out**

DESPITE ITS SLOW CATALOGING TIMES, Aldus Fetch is the clear winner because of its rich feature set and network support. For the same price or less, Fetch offers a number of important features that are missing from its competitors. Still, I would like to see Aldus add capabilities such as a keyword thesaurus and the ability to search Fetch catalogs from within other applications. For networked users who need to keep a tight rein on catalog usage, Cumulus would be a good second choice. ImageAccess and Kudo Image Browser perform as promised, and ImageAccess does provide direct support for Nikon's LS-3510AF film scanner via a plug-in module. However, for the price, neither ImageAccess nor Image Browser offers enough value to warrant a higher rating.—FRANKLIN N. TESSLER
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REVIEWS

Now Utilities 4.0.1

PROS: Collection is now better integrated, less confusing; most modules have more-logical design, additional useful options; Startup Manager no longer alters start-up files.

CONS: On-screen alarm, security lock, and desktop art modules are gone; poorly designed, memory-hungry Scrapsbook replacement; some menu module features don’t work with some applications and extensions.

COMPANY: Now Software (503/274-2800).

REQUIRES: Mac Plus; 2MB of RAM; hard drive; System 7.

LIST PRICE: $129.

Each new revision of Now Utilities resembles the classic corporate shake-up: less-productive utility modules are kicked out, others are given more work to do, and new modules join the group. As with many shake-ups, the one that produced Now Utilities 4.0.1 has both good and bad points. On the downside, owners of version 3 will not notice serious flaws has, happily, been eliminated. On the upside, the CE Toolbox and Claris XTND system files that used to be required by some version 3 modules have been replaced by a system extension called Now Toolbox. The Installer automatically installs Now Toolbox and, cleverly, Now Toolbox manages to avoid detection by many start-up managers, thus ensuring that it always loads first. Not so cleverly, the manual has very little to say about Now Toolbox (it’s not even listed in the index).

A more prominent newcomer is Now Scrapbook, an improved version of PictureBooks, a file-catalog program that originally was sold as a stand-alone utility. Unlike my Apple-issue Scrapbook, which occupies 35K of memory when in use, Now Scrapbook requires at least 500K and prefers 800K. In return for this major memory loss, you get a scrapbook capable of opening several files at once, each of which can contain text, sounds, QuickTime movies, and graphics in paint, PICT, TIFF, and EPS formats. You can view scrapbook items one at a time or as a collection of thumbnails; give each item a name and several keywords; search for items by name or keyword; rearrange the order of items; move items from scrapbook to scrapbook; edit text items; and crop, scale, measure, and select part of a graphic item. Sadly, Now Scrapbook retains all the awkwardnesses and inconveniences—and there are plenty—that made the old PictureBooks hard to like.

All the other modules in Now Utilities 4.0.1 are major or minor revisions of those found in version 3.0. As before, NowSave saves documents automatically after a specified number of minutes, keystrokes, or mouse-clicks. NowSave can also store keystrokes in a constantly updated text file. Should you have a power failure or a system crash, this file preserves the text that wasn’t yet saved. Though a very welcome addition, this option could have been designed so you have to traverse a control panel and then nest dialog boxes to get key capture running properly, and you can’t specify where the resulting file should be stored.

Startup Manager, Now Utilities’ extension and control panel manager, used to accomplish its tasks by altering extension and control panel files. This serious flaw has, happily, been eliminated (Startup Manager now simply moves the files in and out of folders).

While previous versions of Now Utilities had a confusing overabundance of menu-modification modules, version 4 has thankfully boiled them down to two, WYSIWYG Menus and NowMenus. WYSIWYG Menus retains all its old features: it displays items in the Font, Size, and Style menus in the stated font, size, or style; it organizes fonts in submenus by family; and it allows you to list fonts in any order. With version 4, WYSIWYG Menus also allows you to temporarily delete any font from the Font menu; assign key commands to any font, size, or style; change a font or font family names; and create a different custom Font menu for each of your applications.

NowMenus incorporates the old MultiMaster, and much as in the old days, this twoffer can create submenus in the Apple menu (for folders including the Control Panel, the Chooser, and now the Monitors control panel); create configurable menu-bar and/or pop-up menus of commonly used applications, files, and folders; switch color depth and sound level as you move from one application to another; and display useful information about current memory usage. With this revision, the options are much more logically organized, and you can reorder items in the Apple menu and assign each item its own font and size (except for items installed with an extension); easily assign key combinations to menu commands in the Finder and many applications (Microsoft Word being one of the notable exceptions); and create workarounds of applications and documents that launch all items with one command.

As in version 3, Super Boomerang remembers the files and folders you’ve used recently, adds menus to Open and Save dialog boxes and a submenu to the Apple menu and your application’s Open command, allows you to assign a key command to any file or folder for even faster retrieval, and returns you to your last position in every folder’s file list in the Open dialog box. Super Boomerang’s other major enhancement is its Find command, which can search the contents of compressed files as well as standard files.

Now Profile hasn’t changed much since version 3; it still scans your hardware and software and produces a (basic or detailed) report on your system software, extensions, desk accessories, drivers, fonts, memory, and system unit. While this information may be useful in an emergency, version 4’s two com options are more useful in daily life. These additions report duplicate files and orphaned aliases. Of course, Now Profile only tells you your problems; you have to clean up your files and aliases yourself.

Although this is Now Software’s fourth try, installation is still not as easy as it should be. You have to first install version 5, then update all the installed modules to 4.0.1 with a special updater program that, for some reason, doesn’t know where the different modules are stored. And as with previous versions, the manual is repetitious and at nearly 300 pages, too voluminous for its subject. But these and the other shortcomings described above (including the not-ready-for-prime-time Now Scrapbook) are greatly outweighed by the many thoughtful improvements and new features. In the end, I suppose the real test is whether you’re willing to throw out any of your favorite (usually single-purpose and expensive) utilities and replace them with the corresponding Now Utilities modules. In versions 1 through 3, that never happened to me. This time it did. Need I say more?—ROBERT C. ECKHARDT

Strange Bedfellows

By changing font family names in Now Utilities’ WYSIWYG Menus, you can collect any fonts you like in a pseudo-family that has its own listing and submenu in the Font menu.

138 August 1993 MACWORLD
The one color printer that handles any crowd.

Your system. Your network. Your application.

The new QMS ColorScript 230 printer is the one network color printer that is smart enough to keep data flowing for all users at the same time on any system, anywhere on your network. It delivers crowd-pleasing color for the most serious graphic applications, while handling the most challenging network needs. It's not only fast enough to meet demanding group deadlines, it won't inconvenience users or waste time holding up computers while it spoils or prints. Our crowd pleaser provides the color everyone wants, on any size paper up to 11x17/A3, full bleed, at a very low cost per page. And it has more resident type faces than any other printer with plenty of options to let the whole gang flex its creative talents. No other color printer offers better color reproduction, more speed, or more features for your money. For just $7995, the QMS ColorScript 230 can handle your entire department or small business.

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Circle 51 on reader service card
StuffIt Deluxe 3.0 with SpaceSaver

PROS: Online help; scripting; extensive archive-management tools; configurable automatic compression; converters for Unix, DOS, and other file formats.
CONS: Can't display original size for automatically compressed items; Get Info command sometimes invokes file expansion.
REQUIRES: Mac Plus, 2MB of RAM; System 6.0.5. LIST PRICE: $120.

A LADDIN SYSTEMS' STUFF DELUXE is the grandaddy of commercial Mac file-compression products. With version 3.0, it also becomes the genre's Uncle Jack-of-all-trades. The new version adds a slew of compression features and converters, as well as SpaceSaver, an automatic compression tool (also available separately for $59.95). The StuffIt Deluxe application enables you to perform ad hoc compression chores, while SpaceSaver provides background compression and automatic decompression. Finally, Magic Menu, a Finder extension, lets you easily invoke compression and decompression functions on selected files.

The package consists of two disks containing all the StuffIt tools (compressed, naturally); a hefty, well-written manual including an extensive index; and a quick-reference card. The one-step installation utility automatically decompresses all the StuffIt components and places them in appropriate folders on your hard drive. You can also opt to omit some features.

StuffIt Deluxe stores compressed files in a special file called an archive. To compress a single file with StuffIt Deluxe, you launch the StuffIt application, create a new archive, and then select one or more files to stuff into the archive. StuffIt also includes several utilities providing shortcuts to this sometimes-tedious process. The simplest of these is the Magic Menu extension, which adds a Magic menu to the end of the Finder's menu bar. You select one or more files or folders in the Finder, then choose either Stuff or Expand from the Magic menu.

System 7 users can also use the supplied drop-box utilities to perform the stuff/unstuff chores using the Finder's drag-and-drop feature. A third shortcut uses a SpaceSaver feature to compress all files having a particular suffix or Finder label. For example, changing the name of a folder from Articles to Articles.SIT instructs StuffIt Deluxe to create an archive containing the contents of that folder. Or you could select a group of files and use the Finder's Label menu to assign them all a label defined to invoke compression. The fourth and final shortcut is to write scripts in StuffIt's scripting language to automatically perform compression chores that you want done regularly, such as saving backup copies of frequently changed files in a StuffIt archive.

In addition to compressing and decompressing, the StuffIt Deluxe application lets you manage archive contents. You can use the View command to see the contents of a text or PICT file; selectively extract, add, or delete files within an archive; split a large archive into segments for storage on multiple floppy disks; and protect your archives with a password or encryption. StuffIt's many built-in conversion tools enable you to process foreign file formats as DOS.PKZ and .ARC; Unix text, tar, Z, binhex, and uuencode, and Mac AppleLink, CompactPro, and MacBinary.

The scripting language lets you perform any StuffIt operation on files selected by Finder attributes, such as label, modification date, or type/creator. After completing a scripted task, StuffIt optionally lets you launch some other application, such as an electronic-mail program, to process the resulting archive. Supplied XTND and XCMD components let you access StuffIt functions from within other applications that support such add-ons, such as CE Software's QuickKeys, Software Ventures' MicroPhone, and Claris's HyperCard.

The SpaceSaver extension provides for automatic background file compression. Whenever your Mac is on but not in use, SpaceSaver searches the hard drive for compressible files and compresses them. SpaceSaver stops the instant you resume work. It also automatically uncompressed files—including those that have been stuffed manually with StuffIt—whenever you open them, restoring them on saving. You can optionally delay recompression to occur during idle time, to eliminate compression delays when saving files.

You can control which files SpaceSaver compresses either by Finder label or by a customizable name suffix. The default name suffixes are small and big. Adding the former to any file name automatically instructs SpaceSaver to compress it; adding the latter prevents automatic compression (you can still compress manually). Corresponding Finder labels serve the same purpose. SpaceSaver's Preferences dialog box lets you configure these suffixes and Finder labels, specify which disk volumes to compress, choose between "faster" or "smaller" compression methods, and specify a file age threshold for automatic compression. Compressed files retain their original icons, so users see no obvious differences between compressed and uncompressed files other than size and the SpaceSaver status dialog box when a file is decompressed for use.

The only usability problems I encountered with SpaceSaver occurred when I wanted to determine the original size of a compressed file. The Finder's By Name view shows only the compressed size, and the Finder's Get Info command sometimes expands the file (if it contains a custom icon), which produces inconsistent size reports.

Tests with other compression utilities such as the shareware program CompactPro, More Disk Space (from Alysia), and AutoDoubler (from Fifth Generation Systems) showed StuffIt Deluxe to be the slowest at compression and decompression when using the "smaller" compression method. At worst, though, StuffIt was only 10 percent slower than the fastest compressor; StuffIt archive were in most instances nearly 25 percent smaller than those compressed by other methods. CompactPro, StuffIt's closest competitor in functionality and features, ran neck-and-neck with StuffIt in all tests.

StuffIt incorporates a number of reliability features to help prevent data loss due to failures during compression and decompression. First, by default StuffIt verifies all writes to an archive, protecting against archive corruption from disk errors during the compression process. Second, each file in an archive has a separate checksum, letting StuffIt detect and report a corrupted file on decompression, and to let you recover as many files as possible from a corrupt archive. Third, if there's not enough room to contain the original and a working version of the file being compressed, StuffIt will not permit compression, thus avoiding problems that some other compression utilities have when running out of disk space during compression. Finally, StuffIt does not delete the original version of files being compressed until the process is complete; if a crash occurs during compression, the original files remain intact.

With its many conversion tools, able feature set, automatic compression capabilities, reliability checks, and acceptable performance, StuffIt Deluxe makes a very good general-purpose compression tool.

—MEL BECKMAN
"I DON'T NEED (tick) YOUR DATA (tick) PROTECTION SOFTWARE (tick).
I'VE HAD MY MAC (tick) FOR YEARS AND (tick) IT HASN'T CRASHED (tick) YET."

Not to alarm you or anything. But if a lot of wishful thinking is all that's standing between you and a Mac meltdown, you may want to check out a more proven method of protection.

We suggest the Norton Utilities for Macintosh v2.0. It both prevents data loss and gives you the most effective data recovery features available. In other words, it's like giving your computer its own personal bomb squad.

For starters, let's talk prevention. The Norton Disk Doctor hunts down potential problems and lets you squash them before they become actual nightmares. Plus, Speed Disk defragments files and boosts performance of your hard disk, making data loss less likely in the first place. So far, so good.

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To learn more, dial FAST FAX 1-800-554-4403 and select option 1, document 411. (For information on easy network installation, choose option 1, document 481.) Better yet, pick up Norton Utilities at your local dealer for about $149.

You should probably do it today, though. Before your luck runs out.

*Suggested retail price. Actual price may vary. All names are trademarks of their respective companies. For more information in Europe, call 37-14-02-7711. In Australia, call 61-755-565771. In Canada, call 1-800-369-2596.
**Phaser 200i Color Printer**

**PROS:** Fast and compact; TekColor image-enhancement technologies provide excellent output quality; versatile paper-handling features. **CONS:** Output quality is poor on letterhead and inexperienced photocopier bond; $99 paper cassette required to use plain paper.  

**COMPANY:** Tektronix (503/682-7377)  
**LIST PRICE:** $5995.

As the buyers' guide in last May's Macworld showed, color printers are becoming mainstream peripherals. Several developments are bringing about the trend: falling prices, improving performance and output quality, and the ability of many printers to print on plain paper.

Tektronix's Phaser 200i delivers in each of these areas. The latest member of Tektronix's noble color-printer family costs less than the printer it replaces, the Phaser IIIPx. The 200i is considerably faster, thanks to its innovative engine design and a fast controller. And it can print on plain paper—if your definition of plain matches Tektronix's.

The Phaser 200i is a thermal-wax printer—it produces output by melting pigmented wax onto sheets of paper or transparency film. Thermal-wax printers deliver faster performance, brighter colors, and more-durable output than low-cost ink-jet printers do, but they don't provide the continuous-tone clarity of dye-sublimation machines. Thermal-wax printers are middle-class scribes—ideal for creating business presentation materials and proofing spot-color publications, but second-best choices for electronic photography and high-end color proofing. (See "How to Buy a Color Printer," Macworld, May 1993.)

The Phaser 200i has more in common with monochrome laser printers than with most other color printers. It's relatively compact. It uses a slide-in paper cassette that holds 100 sheets of paper, and it accepts an optional ($495) second 100-sheet tray. And the Phaser 200i is easy to set up: fill the paper tray, remove two foam shipping spacers, and drop the ink roll into place.

The Phaser 200i's rear panel sports the usual connectors: LocalTalk, serial, and Centronics parallel. Optional interfaces include EtherTalk ($695) and TCP/IP with DECnet ($1495). There's also a SCSI connector to which you can attach a hard drive in order to supplement the printer's 39 fonts and boost overall performance. All interfaces are active simultaneously; the printer's Adobe Level 2 PostScript controller responds to whichever port is receiving data.

Speaking of the controller, it's a fast one, thanks to an AMD29000 chip that runs at 24MHz. In almost all of Macworld's Lab's tests, the Phaser 200i turned in faster times than any thermal-wax printer tested for last May's roundup (see "Timing the Phaser 200i"). In the PowerPoint test, the Phaser 200i was almost twice as fast as the second-place finisher, Seiko's ColorPoint PSX Model 4. Tektronix has created a mean presentation-printing machine. But publishers take note: in the Adobe Photoshop test, the Phaser 200i finished a somewhat disappointing fourth.

That's too bad, because the Phaser 200i does an excellent job with scanned images. Tektronix's TekColor image-enhancement technologies, among other things, help to minimize the chunky appearance scanned images often have when they are printed on a thermal-wax printer. (Technically, TekColor provides a dithering scheme that improves on standard PostScript halftones.) Tektronix says it will provide a device profile for Apple's ColorSync color-management system as soon as Adobe releases a ColorSync-savvy version of its Level 2 printer driver, which Adobe says will happen by the end of this year.

And what about the plain-paper claim? The Phaser 200i's ink roll contains a primer medium that fills the minute peaks and valleys present on a sheet of paper. The primer is applied to only the areas that will receive ink, so the paper's overall finish appears consistent. This clever scheme, which Tektronix calls ColorCoat, allows for a wider range of paper surfaces and finishes, but still doesn't provide the wide media flexibility provided by monochrome printers as well as solid ink-jet printers such as Tektronix's Phaser IIIPx. Forget printing on bargain-basement photocopier bond or textured letterhead—the results are unsatisfactory. High-quality laser bond such as Hammermill's LaserPrint delivers acceptable results, but the best results come from Tektronix's special coated stock (1000 sheets for $80). Tektronix is compiling a list of compatible papers; at this writing, the firm had tested 42 stocks and graded only 16 as producing output with no discernible flaws.

And one more thing. Before you can save money by printing on plain paper, you may need to spend an additional $99 for a letter-size paper cassette. The cassette included with the printer holds only the special thermal stock, which is 12 1/4 inches long (the extra 1 1/4 inch is a perforated edge you must tear off). Given that Tektronix is pushing this printer's plain-paper capabilities, you'd think the company would include the tray you need to use the stuff.

The Phaser 200i has a less-expensive sibling: the $3695 Phaser 200c, which contains 17 fonts and a slower controller that lacks a SCSI port. Both printers are limited to 8 1/2-by-11-inch stock; if you need legal-size output (8 1/2 by 14 inches), consider QMS's ColorScript 210 instead. But if the letter-size limit isn't a problem, buy the Phaser 200i. It's significantly faster and provides better paper-handling features.—Jim Heid

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**Timing the Phaser 200i**

<table>
<thead>
<tr>
<th>Time Comparison</th>
<th>Tektronix Phaser 200i</th>
<th>Seiko USA ColorPoint PSX Model 4</th>
<th>Tektronix Phaser II PX</th>
<th>CipherColor Personal ColorPoint Plus</th>
<th>QMS ColorScript 210</th>
<th>Colcorp ColorMaster Plus</th>
<th>Seiko Personal ColorPoint PSE</th>
<th>NEC Colormate PS Model 80</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PostScript Graphic</strong></td>
<td>549</td>
<td>729</td>
<td>563</td>
<td>653</td>
<td>912</td>
<td>1086</td>
<td>1629</td>
<td>1441</td>
</tr>
<tr>
<td><strong>Presentation Graphic</strong></td>
<td>386</td>
<td>453</td>
<td>391</td>
<td>677</td>
<td>794</td>
<td>918</td>
<td>157</td>
<td>157</td>
</tr>
<tr>
<td><strong>Scanned Image</strong></td>
<td>61</td>
<td>111</td>
<td>120</td>
<td>113</td>
<td>132</td>
<td>138</td>
<td>304</td>
<td>271</td>
</tr>
</tbody>
</table>
Macintosh
PowerBook 160

Price
$2,429

Processor
25-MHz 68030

Memory
4MB of RAM, expandable to 14MB

Disk Storage
1.4MB internal Apple SuperDrive
40MB internal hard disk drive

Networking
Built-in LocalTalk connection; AppleTalk networking software

Display
Built-in 10-inch (diagonal) backlit supertwist LCD; 16 levels of gray; 640 by 400 pixels. Connects directly to many external Apple monochrome and color displays, VGA displays, and large projection monitors

Expansion Capabilities
Two slots: one for a modem, one for RAM; supports up to six SCSI devices

Sound
Input port, output port; built-in microphone

Additional Ports
Two serial ports, SCSI port, ADB port, power adapter port, video-output port. With optional SCSI disk adapter, SCSI port allows direct connection to another Macintosh for fast file transfer

Internal Modem
Optional Fax/Data Modem or Express Modem

Batteries
Nickel-cadmium; average life 2.5 to 3 hours; power adapter included

Size
9.3 by 11.25 by 2.25 in.

Weight
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So call for the PowerBook now. By tomorrow, you'll be carrying it with you everywhere.

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**Offer good only through The Apple Catalog and at no extra charge. Connections to some third-party networks may require an adapter cable.

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AFTER GROWING PAINS, INTERFACE refinements, and a corporate acquisition, Generic CADD has reached maturity with version 2.0. It's a competent, midlevel 2-D drafting program with a well-executed Mac interface, a good complement of tools, and a sprinkling of high-end features. But product development seems to be lagging. The change from CADD Level 1 to CADD 1.0 brought the revamped interface that remains the program's core. By contrast, the most salient feature of version 2.0 is its ability to directly import AutoCAD.DWG files. Moreover, this release adds System 7 support, enhanced text handling, and an improved DXF file-translation utility.

Generic CADD's interface is clean and familiar. Floating palettes hold tools and colors, provide information on objects, manage drawing layers, offer reminders on tool operation, and list the active symbol-library. Generic CADD has not succumbed to the intelligent-cursor trend, à la Ashlar Vellum, Claris CAD, and Graphsof's Blueprint, but Generic CADD does offer good snapping functions right on the tool palette.

The Info palette is particularly well thought out. In addition to using data readouts and entering object dimensions numerically, you can select line styles and widths, assign objects to layers, and even change one symbol to another. The Color palette is another story. Although CADD 2.0 supports 8-bit color, the palette holds only 80 unmodifiable colors.

Version 2.0 retains the two-letter commands found in all versions of Generic CADD. Once you learn them, they are great for switching tools on the fly. Unfortunately, palettes still can't be toggled on with two-letter codes, and only the Info palette has a 50-key sequence.

Tools for associative linear, radial, and angular dimensioning are awkward to use because a dimension attaches to a specific point on an object rather than to the entire object. Consequently, that dimension updates only if the object is edited using that specific construction point and both the object and dimension are selected—a cumbersome process.

Generic CADD's lack of a Group command means you can't lock objects and dimensions together. As a result, you can move an object and leave its dimension behind—or worse, inadvertently nudge the object and produce a plan with a wrong dimension. Similarly, you can't combine objects to work near them safely. The manual says that symbols are a better alternative to grouping, but the two features are neither interchangeable nor mutually exclusive. The lack of a Group command is a serious omission.

The implementation of symbols is very good. Objects joined as symbols are saved as files, independent of documents, that can be organized in folders, and selected by name from the Symbol List palette. Loading the contents of multiple folders into the palette saves you from continually changing libraries. Drag the symbol tool over the plan, and you can view a selected symbol and place it with accuracy. Together, the included libraries offer more than 2300 symbols.

Oddly, Generic CADD makes a distinction between creating and saving symbols. Consequently, you can lose a symbol if you don't place it in a document or you neglect to save it. A dialog box warning of unsaved symbols would be nice.

To edit symbols you must explode them back to component parts and rebuild them as new symbols. You can't just edit one symbol and change every copy in the document. The Select dialog box, which searches the drawing by object types, symbols, colors, and line styles and widths, is a better mechanism for executing global changes.

Generic CADD 2.0 reads 2-D AutoCAD.DWG files, but 3-D files lose 2-axis data. To transfer all the information, the 3-D file must first be reconstituted into 2-D plans in AutoCAD. Going in the other direction, CADD 2.0 cannot write DWG files, so you must resort to the program's DXF translator utility. However, the program can write PICT and EPS files, so you can export drawings for presentation and publication.

Generic CADD 2.0 works well, and I've always liked its elegant, pencil-line look. But today, it faces stiff competition from the lower-priced, equally adept Blueprint and the higher-cost, more accomplished PowerDraw from Engineded Software. Still, Generic CADD 2.0 offers excellent functionality with floating-point precision. And AutoCAD compatibility makes it a good low-cost alternative.—CARLOS DOMINGO MARTINEZ

## Reviews

### Generic CADD 2.0

**PROS:** Floating-point precision; extensive symbol libraries included. **CONS:** No Group command; no warning of unsaved symbols.

**COMPANY:** Autodesk (206/487-2233).

**REQUIRES:** Mac Plus; 2MB of RAM; hard drive; System 6.0.3 (System 6.0.5 and 32-bit QuickDraw for color). Recommended: 4MB of RAM; math coprocessor. **LIST PRICE:** $495.

### ClienTrac 1.7.1

**PROS:** Easy to learn and use; good linking between client data and related information.

**CONS:** No custom fields for client addresses; no alarms in scheduling; poor print formatting for reports. **COMPANY:** Whiskey Hill Software (415/895-8720). **REQUIRES:** Mac Plus; 2MB of RAM; hard drive; System 6.0.5; HyperCard 2.1. **LIST PRICE:** $135.
if you're on a Client Card, you can go to the Calendar, option-click on a date and time, and the name and address of that client is entered in the Calendar for an appointment. The program doesn't have alarms, so you have to check the Calendar to be reminded of appointments. There's also a To Do list linked to the Calendar; items that are not done at the end of the day are automatically forwarded to the next day.

Finding names in ClientTrac can be a bit tricky. Usually you locate a client's name through the Address Book display, which shows a picture of an address book with letter index tabs on the left side of the screen and a scrolling list of names on the right. Double-clicking on a name in the list jumps you to that Client Card. Unfortunately, entries in the Address Book depend on the File By index field on the Client Card, and if the File By index field on the Client Card is empty, the Address Book will not contain that client's name. The second client-finding method also uses the Find By field, but gives you a Find dialog box instead of the Address Book. You can find names without the File By field by searching all the text in the database, but it is a slower process. The Address Book also lacks a separate company field on the Client Card, therefore making it difficult to list people in the Address Book by company.

The program prints form letters, two sizes of Avery labels, and envelopes, as well as any of the client information cards.

Switching between cards, especially on 68000-based Macs, is slow. Importing records from a text file (it must be tab-delimited text) and selecting a list of clients based on search criteria is very slow. Most important, there is poor control over font and style text-formattting. The body of a form letter is one big text field, so you lack the usual word processor conveniences, like tabs, indents, and the like. In fairness, these are HyperCard shortcomings, not ClientTrac's, but they are still inconvenient.

The ClientTrac user manual is mainly a step-by-step tutorial. It would be helpful to include tips on how to use features like the Inventory and Check List cards. The manual tells you how, but not why or when, you should use these features. Despite the sketchy manual, ClientTrac is fairly easy to learn.

If ease of learning is paramount to you, then ClientTrac is worth considering. But if you generate lots of correspondence, you will be better served by a program that has a built-in, full-featured word processor. ClientTrac is a useful choice for anyone searching for a contact manager.—Tom Negrino

**Microsoft Word Add-Ons**

**MasterWord 5.1**

**PROS:** Handy tables feature; useful Help menu and index; able to print bar codes with Envelope command. **CONS:** Cannot import existing addresses to new address list; skimpy manual gives incomplete and sometimes inaccurate instructions; some features don't work as advertised. **COMPANY:** Alki Software Corporation (206/285-2660). **REQUIRES:** Mac Plus; System 6.0.2. **LIST PRICE:** $99.95.

**BEGINNING WITH VERSION 5.0,** Microsoft made Word extensible by providing the ability to add new features to the program via Commands modules. The first major package of new Word Commands is MasterWord from Alki Software.

MasterWord's centerpiece is a set of customizable tool bars, ranging from the ones included in Word 5.1 to one that remembers your frequently used features. A host of custom tool bars are devoted to specific functions, such as character, editing, tables, and more. You can also make new tool bars by adapting the standard sets or by selecting your own icons and features from among the hundreds available. If you don't like the icons provided, you can make your own with the built-in icon editor, which provides basic bitmap drawing tools.

MasterWord also improves on a number of other Word features. The Gallery of Tables provides a palette of preformatted tables, complete with rules and borders, all of which you can customize to your needs. There is also a new envelope printing that supports bar codes and address record-keeping. There's a brand-new Help menu for Word, complete with an index that lets you find help topics using a custom Find feature. Italicized index entries are defined through a pull-down menu. You can even print help descriptions. There are also enhancements to Word's find and replace, bullet, and fraction commands, as well as a new Watermark command.

Rounding out the package are a trio of desk accessories—Alki Cale, an engineering-level calculator; Alki Scale, a convenient proportion calculator; and Alki Seek, which brings Word's basic Find File capabilities to new heights of complexity and flexibility (see Reviews, July 1993).

It's hard not to admire the thought and effort that went into creating all those new tool bar features, but if you only use Word's keyboard commands or pull-down menus, those efforts will go to waste. Some users may even find it difficult to decide what Icon goes to which function without activating balloon help. The Frequent tool bar function can be even more confusing, since every time you relaunch Word you get a different tool bar based on the functions you used during the previous work session.

Some of the other features, though attractive at first glance, lack flexibility. Anyone who frequently uses tables will like the Gallery of Tables, but customizing the width of the table cells still requires the Table Cells command, despite the manual's claims. The Watermark command is supposed to enable you to insert rotated and shaded background text on your document. Unfortunately, I got nothing but a beep when I tried to activate this feature. Even if the watermark worked, it would function only with text you enter in a dialog box. You can't import a picture and use it as a watermark.

The new envelope feature allows you to print bar codes and store a basic address list, which you can export as text. However, you cannot import an existing address list. Addresses are stored in the MasterWord preferences file. If the preferences are lost for any reason, the address list is lost as well, and although the newly released MasterWord 5.1 seems stable, I experienced problems retaining preference settings.

The illustrated manual is not always helpful. In a few cases it's wrong; one command was described as a desk accessory, for example.

Equivalents of both Alki Cale and Alki Scale can be found among freeware and shareware. Alki Seek works well, but I had occasional crashes crashes when using Seek's option to link to Claris Xtd translators. I also found that the Copy function sometimes just didn't work. Alki's technical-support people were responsive and friendly but didn't have a ready solution.

As I said, a lot of thought and effort went into MasterWord. But it's somewhat rough around the edges. Given some development in a few key areas, it could become an indispensable addition to Microsoft Word—but not yet.

—Gene Steinberg

**An Ever-Changing Tool Bar** MasterWord's Frequent tool bar records your most-used commands and updates the tool bar from work session to work session.
Texture Collections on CD-ROM

Folio 1 Media Kit

**PROS:** Available in very high resolutions; crisp, colorful, flawless images; all images printed in a four-color catalog. **CONS:** High-resolution images hard to access; images do not repeat seamlessly if used as patterns. **COMPANY:** D'pix (614/299-7192). **REQUIRES:** Mac SE/30; 4MB of RAM; hard drive; color monitor; CD-ROM drive; System 6.0.5. **LIST PRICE:** $299.95.

**WRAPTURES ONE; WRAPTURES TWO**

**PROS:** Hefty supply of images; generally high-quality images; textures repeat seamlessly. **CONS:** Some low-resolution images are unrecognizable; no printed image library; browsing software is slow and works only in 8-bit screen mode. **COMPANY:** Form and Function (619/536-5999). **REQUIRES:** Mac II; 4MB of RAM; hard drive; color monitor; CD-ROM drive; System 6.0.7; QuicksTime 1.5. **LIST PRICE:** $95 each.

**ITMAPPED TEXTURES ARE AMONG an artist's handiest resources.** D'pix's Folio 1 Media Kit and Form and Function's Wraptures One and Wraptures Two are among the foremost collections of high-resolution texture images available on CD-ROM. The CDs feature a variety of natural and man-made textures, including everything from pine boughs to paper clips to human skin. You can use these textures as patterns in an image-editing or painting program, tiles in an illustration program, backgrounds in a presentation or desktop publishing application, or surface maps in a three-dimensional drawing and rendering package. You can even use a texture on the side to dress up your Finder desktop using a customizing utility such as 'Thought I Could's Wallpaper or Logical Solution's Chameleon.'

Both D'pix and Form and Function license their products for unlimited use in documents, slides, and video productions, so long as the texture represents only a minor portion of the work, not "the primary source of the creation's value," as Form and Function puts it. Bear in mind, however, that you are no more permitted to distribute any images from this disc than you are allowed to copy other kinds of software.

Folio 1 is a three-disc collection that contains 100 full-color (24-bit) images in each of two resolutions: 900 by 675 pixels and 3192 by 2394 pixels. These resolutions equate to roughly 3½ by 2½ inches and 12 by 9 inches, respectively, when printed at 260 dots per inch. The medium-resolution images are ideal for screen presentations, easily outgrowing the resolutions of 13-inch (640 by 480 pixels) and 16-inch (832 by 642 pixels) monitors. The high-resolution images consume about 23MB in memory, but they also deliver professional-quality output.

As for the merit of the images themselves, the Folio 1 discs feature some of the finest digital photography I've seen. Each image consistently provides a dynamic range of colors, highlights, and shadows; the images are free of artifacts like dust and hairs, both original photographs and scans are crisply focused; and the collection as a whole is well chosen.

Folio 1 ships with a four-color catalog of printed samples, so you can easily find an image without hunting around on disc. All of the Folio images are stored in the lossless TIFF format. Unfortunately, D'pix unnecessarily complicates things both by hiding the high-resolution images so you cannot see them in the Finder desktop and by compressing the images using Salient Software's Disk-Doubler. To access a high-resolution texture, you have to use a special control panel device to copy the image to your hard drive and then decompress it. The process is clumsy and requires a good deal of free disk space, somewhere in the neighborhood of 40MB just to decompress the image.

Despite the quality of the Folio 1 images, some users will be put off by the fact that D'pix's images do not repeat seamlessly. No thought has been given to matching the left edge of the texture with its right edge, or the top edge with the bottom edge. This is because Folio 1 images are designed to serve as textural backgrounds, not pattern tiles. If you need a repeating pattern, one of the Wraptures discs is more likely to fulfill your requirements.

Sold separately, Wraptures One contains 142 different patterns and Wraptures Two contains 157 patterns. The patterns are available in a variety of resolutions, anywhere from 64 by 64 pixels to 1024 by 512 pixels, in both 8-bit and 24-bit versions. Quality-wise, the images fall slightly short of those offered by D'pix. Though they are generally acceptable, some images are muddy and others are difficult to decipher at low resolutions. The craters in the lunar-surface texture, for example, degrade until they look like nothing more than random pixels at the 256-by-256-pixel resolution and lower. To their immense credit, however, the folks who edited the images did a wonderful job. I'll wager you won't be able to distinguish the tiles in the patterns (see "Two Varieties of Textures").

Sadly, the Wraptures discs ship without printed versions of their images. Instead, you have to slog through tedious run-time image browsers. The browser on the Wraptures One disc was created with Maeromedia Director; the browser on the Wraptures Two disc is a product of HyperCard. Both are as slow as molasses, even on a high-speed CD-ROM player, and neither browser works when your screen is set to 24-bit display (a fact that is mentioned nowhere in the discs' paltry documentation or electronic Read Me files).

Folio 1 and Wraptures One and Two qualify as sturdy additions to any artist's image library. If you're a professional looking for backgrounds and large surface textures, Folio 1 is clearly the better collection. If you prefer repeating patterns, the ample supply of images on the Wraptures discs makes for a good value. If Form and Function would only include something on paper—black-and-white laser prints would be better than nothing—it would help the package tremendously.

—DEKE MCCLELLAND
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CONTACT EASE IS DESIGNED TO HELP salespeople manage their sales leads, activities, and correspondence. It uses sales plans and very good contact tracking to automate the day-to-day work flow. Sales plans can automatically generate correspondence and remind the user of such actions as phone calls and meetings. The built-in word processor with mail merge capabilities makes generating letters easy. Printing any merged letter for a contact requires only three clicks of the mouse.

Contact Ease has the usual contact-manager features along with 20 custom fields or contact logs that are automatically updated with letters and phone calls, and three levels of password protection. Unfortunately, the program doesn't include a general scheduling calendar.

To set up Contact Ease, you first enter a sales plan, which is a list of the steps necessary for a sale. A step is usually a letter or a phone call. Depending on the outcome of a step, the plan jumps to the next step, or to a later step. For example, say your first step is to make a cold call on a lead. If the call results in a sale, the plan jumps to the Sale Made step and sends out a confirmation letter. If you're not so lucky and the lead just wants more information, the plan jumps to the Send Literature step and generates a letter with the requested information. Contact Ease is flexible enough that you can modify or extend sales plans after they are set into motion; have contacts that aren't on a plan; and have any number of different sales plans.

The Contact Ease interface is built around a floating palette with an in box and an out box, and three cards with index tabs for each customer, with detailed information (see "In and Out Boxes"). The in and out boxes are filled with items that need to be processed as a sales plan progresses; for example, when you initially start the program in the morning, the in box contains all of the day's scheduled telephone calls. The out box contains the automatically generated letters, envelopes, and mailing labels. You can print the contents of the in or out boxes with a single command. On two of the index cards, you enter the contact information, custom field data, and activities, which can be telephone calls, letters, meetings, or other. The third card is for monitoring a contact's progress through a sales plan.

Contact Ease's CyberSwap feature lets users transfer data to and from a Contact Ease database in the home office. Contact Ease creates a small text file containing just the changes, which is then sent via modem like any other file. In the home office, the Contact Ease operator imports the changes into the home office's Contact Ease database, then prints any items in the out box. With CyberSwap, the home office does all of the printing and subsequent updating of the clients' history. The updated client information can then be sent back to the users in the field. This import/export feature makes sure that everyone is using the same up-to-date client information.

Contact Ease has a few quirks. The strangest is that the field for return addresses on envelopes only accepts a PICT file pasted from the Clipboard; you can't simply type in your return address, and Contact Ease supports only one return address. Moreover, the documentation needs to be updated for the current version of the program; the screen shots don't always match what's actually on the screen.

My calls to WestWare's tech support were invariably answered by voice mail; I usually (but not always) got a call back from a technician the same day. Support answers were accurate.

Contact Ease is a good program; it helps you keep in touch with your contacts, makes it easy to generate letters, and maintains detailed records of your activities. Best of all, it accomplishes the prime mission of sales-automation software—it gives you more time with your customers, which is the key to increased sales.

—TOM NEGRIVO
The manual suffers from the same inflexible sequence of flaws for novices, can’t be beat when you have that urge to blow something up. — Suzanne Stefanac

Along with these templates, PosterWorks 3.0 owners receive a listing of more than two dozen service bureaus nationwide capable of accepting and printing large-format PosterWorks files. You can even send files over a modem (if you have a fast enough modem and plenty of time). Also included is a coupon that gives you a 50 percent discount when you employ one of these bureaus. This is a great incentive for those who want to create a single dramatic image.

PosterWorks really has no competition. Broderbund’s BannerMania sits at the low end, and a few proprietary systems occupy the farther reaches of high-end, multipanel output, but PosterWorks provides user-defined, full-color, large-format output robustly and elegantly.

It's ironic that my only gripe is a function of S.H. Pierce's willingness to add features. The seemingly infinite array of tools available to the would-be billboard production artist is at once exhilarating and intimidating. The options span the horizon with little feel for topography. The manual suffers from the same information overload. One solution might involve arranging options in a more tiered structure—short and long menus, or a clear-cut sequence of defaults for novices, perhaps. All in all, though, PosterWorks can't be beat when you have that urge to blow something up. — Suzanne Stefanac
**MiniCad+4**

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Colors in Our Documents that Look the Sheets. Changing paper sizes is quick, and Sync color-management software produces a business-size envelope to 11-by-7 inches for fonts and open Alus Freehand, the printer handles various sizes and weights and includes Apple's color-matching software, ColorSync. The Apple Color Printer is the least-expensive large-format ink-jet printer available and can handle jobs from a business-size envelope to 11-by-17-inch sheets. Changing paper sizes is quick, and the printer handles various sizes and weights without jamming.

Apple's claim that the included ColorSync color-management software produces "colors in your documents [that] look the same on the page as they did on the scanned image" is overstated. ColorSync makes a visible improvement in the print quality, but even so, several trials at matching the output to the scanned image using the various ColorSync options proved fruitless. This printer's color capabilities are best suited to rough visualization or other jobs where precise color-matching is not necessary. ColorSync's custom color-matching lets you choose your printer's profile and one of three color-matching methods to help you adjust output to better match source images over a range of printing papers and conditions. There is also a handy option for keeping a printer log, and—interestingly—password protection.

The printer outputs at 360 dpi—44 percent better than the 300-dpi resolution common to comparably priced printers—and yields a consistent screen. It does a good job with gradations, producing no noticeable shade stepping. The evaluated unit did leave some streaking in the direction of carriage travel, and some subtle gradations in the highlight and shadow areas of photos got a bit splotchy. Both TrueType and PostScript fonts turned out clear and sharp text, even at small sizes and on screened backgrounds.

Although the Apple Color Printer handles PostScript fonts with ease, it falls down at printing from PostScript applications. Pages printed from Adobe Illustrator and Alus FreeHand arrived in shades of gray. In the case of QuarkXPress, placed EPS images printed only as gray boxes. A PostScript upgrade would be very welcome.

Color printing is usually slow, and the Apple Color Printer is no exception. With ColorSync turned off, a two-page magazine spread with type, background tint, and a scanned image took 40 minutes to print from Aldus PageMaker. Turn ColorSync on, and printing slows even more; after about 50 minutes I went for a coffee break. Background printing helps; however, the color printer uses the host CPU for image processing. When called on to process additional jobs, the host Mac slows noticeably.

The printer comes with individual ink cartridges for cyan, magenta, yellow, and black, making it possible to replace one color at a time instead of all four at once. (Unfortunately, though, the ink coating the inside makes it impossible to see if a cartridge is empty or full.) Error messages, nozzle-cleaning routines, and test pages are conveniently handled through the front control panel's buttons and LED readout.

If you require large-format color output but not precision color-matching, the Apple Color Printer is a reasonable choice. It's well built and easy to use and maintain. If you need PostScript, however, you'll need to look elsewhere. And if you can do without the large-size output, you can find comparable printers at a better price.

—Matthew Nielsen
DIGITIZING TABLETS ARE THE computer-input-device of choice for graphic artists. Combining pressure-sensitive operation, manageable size, and a new pencil-thin stylus, the ArtZ ADB (Apple Desktop Bus) is perfect for artists looking for traditional-style control of their graphics programs.

Measuring 9½ by 13 inches, slightly more than ½ inch thick, and weighing less than 2 pounds, the ArtZ is thin and maneuverable. It rests comfortably on your lap, like a clipboard or sketch pad. The tablet's active area measures 6 by 8 inches and is covered with a plastic overlay that holds paper-based images in place for tracing. The active area can be scaled to represent the entire screen or a portion, oriented horizontally or vertically, and mapped to multiple monitors.

A button on the top-right edge of the tablet lets you start up the Mac directly from the tablet. The ArtZ's driver is a control panel, so you can adjust settings from within your graphics programs.

The ArtZ's cordless, one-piece stylus is thinner and lighter than that of previous Wacom tablets, and its tip remains in one position rather than compressing as pressure is applied. An immovable tip makes the stylus feel more like a pencil, but takes getting used to if you are accustomed to the play of other styluses. Tips are user-replaceable and several are included. A cordless stylus is great for drawing but is as easy to misplace as any pencil. Other Wacom tablets come with a stylus holder.

The stylus can now be calibrated to 120 levels of pressure, doubled from previous models. You can make pressure sensitivity softer or harder as your taste dictates, and you can plot custom response curves by moving sliders on a graph. With programs that support pressure input, including Fractal Design's Painter 2.0 and Sketcher and Aldus FreeHand 3.1, the ArtZ is marvelous. I kept twirling the stylus, looking for a sharp edge, as if it were a real pencil.

A stylus-barrel switch lets you automate a second function—for example, a double-click or a macro operation, such as an automated drawing sequence. The ArtZ comes with Affinity's Tempo macro-recording program, but you can use any other.

Both tablet and stylus are ruggedly constructed, but take care of that stylus—replacements cost $125. The ArtZ's ADB cable lacks a pass-through connector, so the tablet must be either the last device on the chain or connected to the second ADB port. (A two-connector cable is promised.) The documentation is complete and to the point. An installer automatically loads the driver and the Tempo utility.

In only a few years, pressure-sensitivity has grown from a curiosity to a graphics-application staple, offered by over two dozen programs. The ArtZ is an affordable, conveniently sized tablet that can draw out the best from today's natural-media- emulation graphics programs.

—CARLOS DOMINGO MARTINEZ

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Software Controls The ArtZ provides a graph for adjusting tablet responsiveness and lets you customize stylus barrel-switch and tip functions.

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ArtZ ADB Tablet

**PROS:** Light, thin stylus. Convenient tablet size and weight. 
**CONS:** Easily misplaced stylus.

**COMPANY:** Wacom Technology Corporation (206/750-8822). 
**REQUIRES:** Any Mac with ADB port; System 6.0. 
**LIST PRICE:** $449.

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Icon-based File Launcher

Square One 1.5.2

**PROS:** Attractive; well programmed; offers group file-launching, one-click QuickKeys triggers, and default document opening. 
**CONS:** Abysmal manual; complicated setup. 
**COMPANY:** Binary Software (310/592-8293). 
**REQUIRES:** Mac Plus; 2MB of RAM; System 7. 
**LIST PRICE:** $74.

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Square One sounds like another clone of Tiles (CE Software), QuickTools (Advanced Software), and At Ease (Apple)—programs that pile an icon-based launching window on top of the one you already have (the Finder).

You load up Square One's floating tile palette with your favorite file, folder, QuickKeys, program, desk accessory, and control panel icons. When you're finished setting up the palette (the most complicated part of using the program), a single click on a program's icon makes its list of associated documents appear. You can open a program (or any other tile) either from the keyboard or by double-clicking on its icon.

If Square One were only a launching pad, it would be no better than Now Utilities or Microseeds' HAM. But Square One also has a feature made famous by the glorious freeware Applicon: when you move the mouse to a corner of the screen, an Active Applications palette appears, listing all the programs you're running at the moment. A single click on an icon in this palette brings the corresponding program to the foreground—a distinct improvement over the hard-to-aim-for System 7 application menu.

Best of all, Square One is infinitely customizable. Again as in Applicon, you can view the palette squares as large or small icons, with or without file names. You can make the palette any size, shape, or position. You can add, remove, or rearrange tiles. Especially useful: you can construct a list of frequently used folders that pops out from the Folder tile. When you choose a folder name, you jump to the Finder, where that particular folder is open and waiting for you.

When you drag a document icon—a text file, say—onto the Square One icon on the desktop, a dialog box appears that lists all your programs capable of opening it (such as Word, TeachText, and WriteNow). With a double-click, you choose the program you want to use to open the document. This is very much how Easy Open, Apple's upcoming System enhancement, will work; and it's wonderful to have it now.

Not that there isn't room for improvement. Adding a QuickKeys macro to the palette is a painful process of typing its name precisely, letter for letter. I'd welcome a feature that automatically hides one program as you switch to another, as is found in Now Utilities and the Performa Macs. And don't forget that Square One is an actual application, continually updating up 400K of your Mac's memory.

Worst of all, the manual is an unproofread comprehensival disaster. In its 32 pages of text, there are 56 glaring grammatical errors.

Nonetheless, flexible, attractive Square One is the best kind of utility software: it does what you want, when you want it. More programs should be this well written.

—DAVID POGUE
How to do an honest day's work by using an alias.

The new Apple menu allows you to easily access anything on your Macintosh—files, applications, desk accessories, control panels, whatever—by simply placing it in your Apple Menu Items folder.

The Outline View feature lets you examine files inside a folder without having to open up a new window. Clicking on the triangle creates a drop-down list of that folder's contents.

Finding information fast with System 7.

System 7 software comes with an array of new tools that makes accessing information on your Macintosh easier and quicker than ever. To begin with, you can create an "alias." Designed to help you better organize your hard disk, aliases are not full-fledged copies of files but, rather, small 2K "pointers" to files, folders and applications, which you can put in as many places on your Mac as needed. When you click on an alias, you actually open the original—no matter where it's located. The new Find feature lets you search for files, folders and applications, and then actually brings them right to the front of your desktop for you.

And with Outline View, simply clicking on the triangle to the left of the folder icon creates a menu list of its contents. So you never fill up your computer screen with multiple windows trying to find that buried file.

Of course, these are just a few of the ways System 7 can help make you more productive.

They're also just a few 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 let System 7 give you the power to find what you have always been looking for. The power to be your best.
DAYSTAR JUST EXPERIENCED A TOTAL ECLIPSE.
Our engineers love a challenge. So when we asked them to develop a line of accelerators that would eclipse Daystar's, they didn't flinch. The result? More speed, more expandability, more of everything you look for in an accelerator. All at a better price.

**MORE SPEED.**

Nobody makes faster 030 accelerators than we do. Nobody. And our broad product line means there's one that's just your speed.

Our accelerators are available in a range of clock speeds (MHz), both with and without cache. And optional math coprocessors deliver additional speed for spreadsheets and other calculation-intensive applications.

Plus, our StepUp™ program lets you easily and economically move up to higher performance as your need for speed increases.

**MORE EXPANDABILITY.**

All AE accelerators feature expansion options for Ethernet and enhanced video. So when you plug them in, you can still add high-speed networking and a full-page display. They're also fully compatible with all applications running under both System 6.x and 7.x.

**MORE VALUE.**

Compare any of our accelerators feature-for-feature with the competition. Then look at the prices. At Applied Engineering, we're committed to giving you more for less. And that goes for our high-quality drives, modems and other products as well.

**FIRST CLASS SUPPORT.**

Applied Engineering has sold more Apple peripherals than anyone. And it's not just because of great products. Or competitive prices. It's also our fanatical dedication to your satisfaction.

All our accelerators carry a 30-day, hassle-free, money-back guarantee. Plus a full three-year warranty. So you can buy with confidence.

**CALL FOR YOUR FREE PRODUCT GUIDE.**

Let us send you a free AE product guide. Then choose the accelerator that's right for you - and move your Mac into the fast lane. Call today!

30-DAY MONEY BACK GUARANTEE
1-800-554-MACS (6227), X406

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**AE vs. DAYSTAR: COMPARE FOR YOURSELF**

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Circle 167 on reader service card.
On The Air 1.0.1

**PROS:** Simple interface; good technical-support documentation. **CONS:** Sometimes unreliable; could be more intuitive. **COMPANY:** Eclipse Software (510/547-5101).

**REQUIRES:** Mac Plus; System 7; AppleTalk network. **Recommended:** Microphone LIST PRICE: Two-user pack $79.99; 5 users $99.99; 20 users $639.99.

**USED TO BE THAT OFFICE WORKERS communicated through real-life, real-time speech. If Ayasha had to tell Robert something, he’d go over and say it. These days, in addition to the ancient tradition of shouting over cubicles, modern office workers have a variety of communications media available: E-mail, fancy phone systems, bulletin board services, and now, Digital Eclipse Software’s On The Air.**

On The Air bills itself as “the perfect intercom system for the Macintosh office.” Using On The Air is simple: launch the application, connect to a fellow On The Air user, choose a sound, and send it. If you have a microphone, you can record sounds and send them almost instantly. If you don’t have a microphone, you can buy a MacRecorder from Macromedia or Digital Eclipse for $99. Transmitted sounds play in the background on your coworker’s machine—and if someone makes your computer moo once too often, you can block sounds from that user. When you use On The Air’s Address Book, connecting to someone else is as easy as selecting an item from a menu.

The program must be open for sounds to be transmitted; it consumes 700K of memory. On The Air can open System 7 SND resources, SoundEdit, and AIFF (Audio Interchange File Format) sound files; sounds recorded from within On The Air can be saved as AIFF and SoundEdit-compatible files.

On The Air generally works well, with a few noteworthy exceptions. Sometimes it loses or significantly delays sounds when several are sent simultaneously. Also, it doesn’t provide you with the option to delay playing transmitted sounds; if you’re away from your computer when someone sends you something, it’s gone. Establishing your preferences is also significantly more difficult than it needs to be, involving several more copy-and-paste steps than seems necessary.

On The Air is well designed and performs decently. The sound quality of its recordings and transmissions are good, and it runs at slow but acceptable speeds over Ethernet and LocalTalk networks.

On The Air’s well-written manual is easy to follow; the only thing missing is an index. The documentation is also surprisingly forthcoming about potential problems with system configurations and settings.

It’s a nice product for a nice price—but do you need it? On The Air does much of what more-time-honored technology accomplishes. For me, this software is fun to play with, but it’s not much help in my daily work.

But if you’re a Powerbook user dialing into a network via AppleTalk Remote Access, you could use On The Air to speak to your coworkers miles away from the office. Or you might use On The Air if you work with sound or multimedia. Picture this: you’re trying to find the right ten-second clip of Mozart for your presentation, and your supervisor across the building needs to approve it. Each time you reedit the sound, you can send it to her machine.

If you’re only working with System 7 SND files and a Mac that comes with a microphone, though, simple file-sharing might serve the same purpose—and save you money and precious RAM, too. If you need to send sounds over a network, On The Air does its job well. Otherwise, paper airplanes might suffice.—JOANNA PEARLSTEIN AND THE JANE GANG TESTING CREW

Simulation Add-on for Excel

**@Risk 1.1**

**PROS:** Functions add directly to Excel function set; @Risk commands appear in Excel menu. **CONS:** Harder to use than Decisioneer’s Crystal Ball. **COMPANY:** Fallside Corporation (607/277-8000). **REQUIRES:** Mac SE/30; 2MB of RAM; hard drive; Excel 3.0.

LIST PRICE: $395.

IF YOU RUN A BUSINESS, YOU KNOW how much cash you have on hand, you know what you have in receivables, and you have a record of recent expenses. Almost every other significant number you could plug into a spreadsheet cell represents a speculation to some extent, since you really cannot predict a definite number for next quarter’s sales or invoices, or most expenses. In simple spreadsheet work, you try a series of best-guess numbers and inspect the resulting bottom line; in a more sophisticated application you specify a desired end result and then solve backward for conditions. But the underlying reality is that numbers in the future can best be represented by probability distributions around a most-likely central value; statistical products that work with spreadsheets are now available to model this situation.

@Risk (the @ symbol is the identifier for functions in Lotus 1-2-3), the most complete modeler of this type, is available as an Excel add-on. What add-on linkage means is that a new set of functions, prefaced Risk (for example, RiskGamma or RiskNormal), can be used in formulas, and that at @Risk menu, for specifying sampling and recalc conditions and report and graphics generation, appears on the Excel menu bar. The advantage of this approach is that existing worksheets, including 3-D linked worksheets, can be modified to introduce fuzziness into the financial data of a working, audited spreadsheet model. Also, since the resulting @Risk model is still an Excel worksheet, it’s possible to specify the results of a statistical simulation as graphics output in a properly annotated presentation graph. As a definitive capability for advanced modeling, @Risk models can be used with the built-in Solver to get information providing boundaries on the value distributions that yield specific target results.

@Risk has a few drawbacks. Because Crystal Ball, a similar product, operates as a separate program rather than an add-on, it’s easier to use for experimenting in basic modeling, and it has an appealing visual method for specifying distributions. @Risk also assumes that the typical user is an Excel power user who writes fairly complex formulas and can figure out how to use third-party macros to implement advanced applications. As an Excel macro document, @Risk is also slow (in Excel 4.0) using its default simulation settings on midrange Macs—the manual helpfully suggests using an IIX file or better. Finally, it’s mildly annoying that the Mac version ships with a manual with examples and figures from the Windows versions of the program.

Nonetheless, @Risk is capable of generating complex, statistically valid templates within Excel, and it is the first choice for analysts who work with probabilistic models every day.—CHARLES SEITER

**Guesswork** @Risk provides a function set for writing probabilistic formulas in Excel and a menu for directing modeling conditions. With HyperCube sampling and smaller sample sets, you can get worthwhile results even on low-end Macs.
**Drawing Application**

**Expert Draw 1.0**

**PROS**: Inexpensive; good set of basic tools; Grab Attributes tool saves effort. **CONS**: Parts of interface poorly implemented; polygon offers limited drawing precision. **COMPANY**: Expert Software (305/567-9990).

**REQUIRES**: Mac Plus; hard drive; System 6.0.7. **LIST PRICE**: $49.95.

**MW**

While **EXPERT DRAW IS NOT** really for experts (professional graphic artists will probably want to save up an additional few hundred bucks for a full-featured program like Aldus FreeHand or Adobe Illustrator), this object-oriented draw program does offer a decent set of basic drawing tools and commands.

A drawing can consist of as many layers as memory will support, allowing you to create a complex illustration by overlapping components in different layers. You can save objects in a library and open them from any Expert Draw document (the program also comes with several libraries of clip art, but the images are of only fair quality). As in other draw programs, you can group, align, rotate, scale, and reshape objects. The program supports 24-bit color, as well as such up-to-date features as publish and subscribe and QuickTime movie playback.

Expert Draw is lacking some features found in several other draw programs, however. It doesn't offer a Bézier-curve tool, which lets you draw intricate shapes made up of lines and curves. Nor does it have a set of bitmapped painting tools, as do its competitors Aldus SuperPaint, Deneba's artWorks, and Zedcor's DeskDraw and DeskPaint. But at $49.95, Expert Draw offers a list price that's less than half that of any of its rivals.

Expert Draw offers several advanced features (such as attaching text to a path or flowing it into a shape) but lacks some basic ones. For example, you can't reshape a block of text and have the words reflow into the new rectangle; you can't see a polygon's outline when you drag it, rather than just its bounding box; and you can't place custom colors in the color palette. Other features range from useful—like the Grab Attributes tool, which lets you transfer characteristics such as line weight, fill color, and text size from one object to others—to offbeat, like the option within the Blend command that creates intermediate steps between two patterns.

Expert Draw's manual is fairly informative, but the program suffers from a few interface problems. For example, when you draw a shape, you can open the color palette to set its line and fill colors. Choose a color and click on an icon, and the object's outline color changes; but do the same for the fill color, and nothing happens. It turns out you must first open the pattern palette and set the fill pattern to solid, instead of the default pattern, which is none. A small complaint, granted, but such anomalies can make a program difficult for beginners (or manual haters) to use.

Another interface problem pertains to the program's snap-to-grid function. While all draw programs have a snap-to-grid command, Expert Draw has two: Grid Snap in the Layout menu and Snap to Grid in the Arrange menu. While Grid Snap does what you'd expect, constraining objects to the measurement units you've specified, Snap to Grid has a disconcerting way of reshaping polygons, since it aligns each vertex in a polygon to the grid. Even simple polygon editing has its problems—when you add a vertex, you can't place it anywhere you like; it's automatically centered between two adjacent vertices.

Despite the interface quirks and the absence of a Bézier-curve tool, Expert Draw is a good program for beginning illustrators, office users, or anyone on a constrained budget. For a basic, no-frills draw program, Expert Draw is well worth its price.—**ERFERT FENTON**

**Dictation Software**

**Memorizer 2.0**

**PROS**: Simple to learn; works in the background. **CONS**: High RAM and disk requirements; incomplete, hard-to-read documentation; user interface irregularities; serious bugs. **COMPANY**: Brains Software Engineering (431-1-865-35-44 [Austria]). **REQUIRES**: Mac II; 4MB of RAM; microphone; hard drive; System 7; QuickTime. **LIST PRICE**: $100.

**MW**

**P**erry mason wouldn't have needed to say "Della, take a letter," if only he'd had a Mac with Memorizer software installed. Memorizer records dictation from a standard Mac microphone or add-on sound-input device as an audio-only (no picture) QuickTime movie. After recording dictation, you transcribe it by running Memorizer in the foreground and a word processor in the background. Still, you might prefer to stick with a hand-held tape recorder when you consider Memorizer's RAM and hard drive appetite, not to mention its propensity to crash.

Memorizer and QuickTime together use about 1MB of RAM and close to 1MB of hard drive space. Recordings use approximately 230K per minute. You can directly record to and play back from floppy disks with a serious but not crippling performance loss.

When Memorizer is the active application, you control it by clicking buttons and dragging sliders in its window. While transcribing dictation with Memorizer in the background, you control its functions from the keyboard. Keyboard control would be more effective if you could adjust playback speed to compensate for a slow talker or a fast talker, as you can with a conventional transcription machine.

Besides recording over any part of an existing recording like a conventional tape recorder, Memorizer can insert new dictation anywhere in an existing recording, something a tape recorder cannot do. To determine whether you want to replace or insert in the middle of an existing recording, Memorizer displays a poorly worded alert box. If you have Memorizer in the background at the time, this alert will probably be hidden by the foreground application's windows. Memorizer does not notify you that it needs to be brought to the front by such means as displaying an alert in the foreground and flashing its icon in the menu bar. If you don't anticipate the problem and bring Memorizer to the front so you can deal with the alert, you discover later that your dictation was not recorded.

Memorizer was developed in Austria, and the manual was obviously written by someone for whom English is a second language. It is incomplete, inaccurate, and in places hard to understand. Moreover, it is supplied only as a Word 5.0 document that you must reformat before printing on 8½-by-11-inch paper.

The manual does not mention that Memorizer forces balloon help to turn off. If you subsequently turn on balloon help in another application while Memorizer is running, the Mac soon bombs. Another undocumented problem is that you can rename a recording in the Memorizer window, but the Mac bombs if the name duplicates the name of another item in the same folder. Sometimes when you adjust the playback loudness, Memorizer turns off the alert sound in the Sound control panel, and you must quit Memorizer in order to get the alert sound working. My Mac often bombed if I used the fast-forward and rewind control continuously for more than about 30 seconds.

Memorizer's numerous shortcomings don't prevent it from being useful, they just make you work harder. If you dodge Memorizer's bugs, suffer its irregular interface, and have the necessary RAM and disk space, it can actually replace your tape recorder and transcription machine. —**LON POOLE**
**POWER PLEXS**

**SUPERMAC**

**NEW**

**Sigma ErgoView 17**
- 17" Trinitron Multisync display
- 0.25 mm aperture grill holes
- Multi-resolution: 1024 x 768, 1152 x 870, 1280 x 1024
- 60 Hz vertical refresh rate
- Advanced Microprocessor Control System
- LED display for screen resolution and 16 preset modes (shown below)
- User controls: brightness, contrast, position, size, picture quality, distortion, misalignment, backlight
- 9481 ... ErgoView 17 ... 297
- 11403 ... ColorMax 207 ... 1959

**SuperMatch 17" Trinitron**
- High Quality, Low Price 24-bit Color Monitor
- The SuperMatch 17T non-interlaced multisync monitor features three resolution modes: 1024 x 768, 832 x 624, and 640 x 480. This high resolution Trinitron monitor is compatible with Macs using built-in video. Comes with a lift and swivel base.

**VideoSpigot**
- Pour Video Into Your Mac
- The VideoSpigot Digital Video Frame Grabber is a digital-video system for making QuickTime movies. Captures full-motion video in real time at speeds up to 29.3 frames per second with 24-bit color in a 160 x 120 pixel window when used with a Macintosh Quadra. The VideoSpigot captures video in multiple sizes up to 320 x 240 resolution.

**SuperMac 20" Color Displays**
- The 20" Supermac display uses a Sony Trinitron CRT with a resolution of 1600 x 1200, a horizontal refresh rate of up to 60 Hz. It comes with a lift and swivel base, and a "Smart Touch" front control panel.

**IntelliColor Display**
- 20" Trinitron color monitor with switch-on-the-fly resolution and color depth switching. Anon, monochrome changes can be controlled from the keyboard, and uses a multisync interface. Works with built-in video on Quadra and Centre. Comes with anti-glare treatment and a lift and swivel base.
- 30 day MBG 1-Year Warranty
- 11299 ... IntelliColor Display 20 ... 2799
- 1729 ... PrecisionColor Display 205 ... 499

**Spectrum 24 Series IV**
- High Quality, Low Price 24-bit Video Card
- The Spectrum 24 Series IV is a 24-bit video card that has on-board QuickDraw acceleration which will speed up QuickDraw specific routines by up to 800%. Also included is hardware paint & zoom and a virtual desktop, dynamically simulable up to 4096 x 1536 pixels. This NuBus video card supports most displays.

**SuperMatch 20T XL**
- Uses a Sony Trinitron CRT with a resolution of 1600 x 1200, a horizontal refresh rate of up to 60 Hz. It comes with a lift and swivel base, and a "Smart Touch" front control panel.

**E-Machines**
- Nutmeg Systems offers a 16" black and white display for the Macintosh of a price that can't be beat. This 15" central monitor with video interface is available for the entire Macintosh II family, as well as Mac LC and Mac SE.

**Color-Page T16 II**
- 16" 24-bit color monitor with a Sony Trinitron CRT, supports 4 resolutions from 600 x 800 to 1152 x 870 and has a refresh rate of up to 75 Hz. The screen has anti-glare coating.

**Nutmeg 15" Display**
- Nutmeg Systems offers a 16" black and white display for the Macintosh at a price that can't be beat. This 15" central monitor with video interface is available for the entire Macintosh II family, as well as Mac LC and Mac SE.

**River Thunder**
- From Alice to Ocean
- One of the most extraordinary adventure stories ever published, from Rick Smolen, the creator of the acclaimed Life books. Includes the hardcover book and 2 CD-ROM discs, one of which is an interactive version of the book itself. River's even a narration that can be played on a standard audio CD player.

**Quantum Internals**
- All drives come with FWB Hard Disk ToolKit PE Software & 5 yr. Warranty
- 525 MB ... $859

**MDS Drives**
- 80 day MBG
- 11583 ... 120 MB External ... 839
- 11582 ... 120 MB External ... 499
- 11584 ... 120 MB External ... 649
- 11831 ... 80 MB Syquest Drive ... 119
- 11833 ... 240 MB External ... 149
- 11834 ... 240 MB External ... 199
- 11835 ... 240 MB External ... 239
- 11836 ... 240 MB External ... 299
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Amazing Universe 2.1

**PROS:** Huge collection of images; sophisticated image-editing software. **CONS:** Expects sophisticated users. **COMPANY:** Hopkins Technology (612/931-9376). **REQUIRES:** Mac Plus; 2MB of RAM; hard drive; CD-ROM drive; System 6.0.5. **LIST PRICE:** $79.95.

**EVERY NOW AND THEN, A PRODUCT lives up to its name.** Amazing Universe is indeed amazing, mostly in positive ways. You get an amazing variety and quality of astronomical images, an amazingly competent program (ProVision II) for modifying and inspecting those images, and some amazing assumptions about users (for example, that you aren't fazed by the prospect of writing your own image-convolution matrix in a text editor).

Most users of Amazing Universe will probably content themselves with perusing the beautiful images. There are satellite and space-probe photos of Earth, the Moon, the Sun, and all the planets, as well as other visually intriguing space objects (possible black holes, galaxies, surface close-ups from lander probes). Since the CD contains 48MB of images, and each image takes only 80K or so of disk space, you can cruise the universe for hours without repeating any pictures, especially if you pause to effect a few psychedelic changes in the color lookup table on your favorite images (the rings of Jupiter are a nice choice).

The centerpiece of Amazing Universe is not the set of images, spectacular though they may be, but the application ProVision II. ProVision is in most respects a more powerful image-modification program than Adobe Photoshop, lacking only Photoshop's capabilities for image export to the real world of commercial four-color printing. Besides general-purpose image filtering, including custom convolutions, ProVision offers edge finding, particle analysis and image densitometry (with 3-D histograms of sampled image values), a sophisticated macro language, and a respectable range of image formats.

All these capabilities are listed, but certainly not explained, in 37 manual pages that discuss not only image capture from scanners and color video cameras but also the application of the program to electrophoresis gel analysis. This last topic is a standard procedure in analytical biochemistry, and the fine print in ProVision's About box reveals that the program is a re-packaged of the celebrated program Images, by Wayne Rashand of the National Institutes of Health, provided by the Astronomical Research Network for this image-analysis context. As a piece of commercial software with proper documentation, ProVision would sell for about $695; if you already know something about image processing or are willing to experiment, it's an amazing bargain.

This program doesn't necessarily belong in every home, but if you have some interest in the rest of the universe, you can't beat Amazing Universe for price or features. Hopkins Technology is performing a real educational service by offering so much for so little.—CHARLES SEITER

Digital Circuit Simulator

**CircuitMaker 3.0**

**PROS:** Low price; macro capability; large component library. **CONS:** Doesn't support multiple monitors; can't output circuit netlist. **COMPANY:** MicroCode Engineering (801/226-4470). **REQUIRES:** Mac Plus; System 6.0. **LIST PRICE:** $200.

**DIGITAL ENGINEERS SPEND A LOT OF time tediously diagraming circuits and constructing prototypes.** CircuitMaker promises to relieve that tedium, by providing a circuit-drawing tool with a digital circuit simulator. The drawing tool lets you quickly lay out schematic diagrams with standard or custom components, and the digital simulator lets you validate the diagram without actually building a prototype. While other products offer these capabilities and more, their prices run to thousands of dollars. CircuitMaker provides a powerful set of basics for $200.

The package contains a single disk and a well-written, indexed manual. A tutorial, along with a half-dozen supplied experiments, makes up a minicourse in digital electronics.

You interact with CircuitMaker via a single scrollable window over a fixed-size, 48-inch-square drawing surface. A set of five menus gives you access to a large selection of standard circuit components, including switches, LEDs, seven-segment readouts, resistors, capacitors, diodes, transistors, and digital integrated circuits. After you select a component, it appears on the drawing, where you can position it as you wish. Various drawing tools let you lay down lines representing circuit paths; move, rotate, and rearrange components; and add annotating text. The wire tool provides a special long cursor to simplify aligning circuit paths and placing the closely routed parallel lines often found in digital designs. CircuitMaker includes some advanced capabilities you wouldn't expect in a low-end product. You can encapsulate any circuit as a macro, shrinking a complex design into a black-box package for use in another circuit. You can also create your own symbols in a drawing package, and then add those symbols to CircuitMaker's library.

While CircuitMaker lets you make reasonably clean circuit diagrams, it really shines in the simulation phase. Pressing the Run button gives you four different views of the operation of the digital part of your circuit (analog components are ignored during simulation). First, a logic probe lets you observe the changing state of any single connection. Second, any LED displays connected to your circuit change state just as they would in real life. Third, you can tap into the circuit at any number of places to display signal waveforms in a scrolling chart window. Finally, a trace feature simultaneously displays the binary state of every circuit leg as black or gray.

You can print the circuit diagram and waveform display, or save them as PICT documents for export to other applications. You can't, unfortunately, output the circuit as a netlist—a standard format used for exchanging circuits between packages on DOS PCs and Macs. Such a capability would let you use your circuits in sophisticated circuit-analysis programs such as pSpace, or create the printed circuit-board layouts necessary for actually constructing prototypes. MicroCode says a future addition will provide this capability. The only real glitches in an otherwise flawless product are some cosmetic screen-display bugs and the lack of support for multiple monitors.

If you're a professional engineer, CircuitMaker is useful even if you have access to high-end engineering software. CircuitMaker is much easier to use than pricier products, and for quick jobs you are likely to find it adequate. If you're a student or teacher, you'll find the ability to quickly design and test circuits makes this product a first-rate classroom aid.—MEL BECKMAN
**Roll Call 2.0**

**PROS:** Easy to learn and use. **CONS:** Some minor interface anomalies. **COMPANY:** By the Numbers (603/927-4508). **REQUIRES:** Mac Plus; 2MB of RAM; System 6.0.3; hard drive. **LIST PRICE:** $49.5

**ROLL CALL IS A 4TH DIMENSION DATABASE APPLICATION FOR CHURCHES.** Just about any church can use this program to manage information about the individuals associated with the organization. The program also helps church officials track donations, attendance, church-group membership, and visitation.

When entering information about an individual, in addition to the usual name, address, and telephone number, you also specify the person’s association with the church—whether the person is a member, nonmember, or visitor, or has some other relationship to the church. Roll Call also maintains other information, including the church groups people are involved in, the pledges they have made, and a record of visits made to them by the church. The program also stores important dates, such as birthdays and wedding anniversaries.

Roll Call uses the power of 4th Dimension to associate records for people who are members of the same family. This saves time, since it enables you to enter common information for the family (such as address and phone number) when the record for the head of the family is entered. Later when you add a record for another member of the family, you do not have to reenter the common information.

Some field values can be entered by using pop-up lists, check boxes, and radio buttons, making data entry easier. You can modify the values of several of the pop-up lists according to the needs of the church, and you can also define custom fields.

You can use Roll Call to record the attendance at three different meetings: morning, evening, or midweek. You record the total number in attendance, as well as the attendance of each person at a meeting. Roll Call also tracks Sunday-school enrollment and attendance.

You can use Roll Call to track the pledges that members make to the church, as well as actual donations.

Roll Call generates many kinds of reports. In addition to the large number of predefined reports the program offers, you can create and print custom reports, and you can preview the information on screen before committing to hard copy. Roll Call also prints mailing labels and donation receipts. The program allows you to do custom searching of the database.

In order to use the database, you must enter an authorized password. You use the Password Access editor to restrict access to the system by setting passwords and assigning one of four different levels of access to users. This is an important feature because access to confidential information, such as donations, can be restricted to church officials, while the general congregation can use the system to enroll in a Sunday-school class or other group.

Some aspects of the program could be improved. The Print Settings menu is known as Page Setup in other Macintosh programs. You also should be able to quit via @-Q. There is no cancel button on the dialog box that comes up when you select Enter New People. The Roll Call title screen is always displayed but serves no function.

Overall, Roll Call is a good program that provides many functions to help churches. The basics of the program can be learned in less than an hour, and it comes with a decent manual and free technical support. While Roll Call is not touted as a do-it-all church-management system, it is a fine complement to a general accounting program that can handle more in-depth financial management.—STEVEN HANKS

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**Achieving Your Career 1.02**

**PROS:** Well-thought-out organizing tools; automatically posts contact data to calendar and to-do list. **CONS:** Can’t enter recurring events in calendar, no documentation for new HyperCard users. **COMPANY:** Up Software (415/921-4691). **REQUIRES:** Mac SE; 2MB of RAM; hard drive; System 6.0.7. **LIST PRICE:** $69.

**FOR ALL BUT TRULY AUDACIOUS SELF-promoters, searching for work can be dispiriting and degrading. You begin to regard your home Mac with disgust—“If this thing is so smart and friendly, why doesn’t it find me a job?” Achieving Your Career can’t find you a job, but it does help the poor pilgrim keep slopping on. It provides a structure for identifying the letters you need to write, the phone calls you need to make, the interviews you need to follow up.

The program is built around four groups of tools. One has databases of companies and contacts, a calendar, and progress records. A second group contains résumés and cover letters that you can export to a word processor as templates and tailor to your needs. The third offers interactive exercises where disembodied voices engage you in interviewing, negotiating, and phone tag. Interviewers ask just why you think you can help them. After practicing your answer, you read on screen how to handle your responses. The fourth section contains relaxation exercises, tools for evaluating yourself and potential employers, and suggestions for learning from your experience.

The organizing tools are the best part of this program. The database helps you target the objects of your professional desires. It comes with 500 of the largest national companies already entered, and you can add companies according to industry, size, and region. This database is helpful for focusing on getting that critical thing for a job seeker—a friendly contact on the inside.

The contact list keeps track of everyone you deal with. Instead of shuffling business cards and scraps of paper with scribbled phone numbers, you enter the info in an address book, and the program maintains a history of your communications. The calendar displays your daily and weekly schedules. Frustratingly, though, it lacks a way to schedule recurring events so they appear every week. The progress tools help you track your accomplishments, define your goals, and budget time and money. This section includes a to-do list to track uncompleted tasks. The best feature of the progress section is that when you record information in one place—say, noting an upcoming meeting on a personal contact card—the information automatically posts to your calendar and to-do list.

When it moves from the practical to the motivational, Achieving Your Career gets a little superficial. A Learning section contains exercises designed to gauge how you view your own employability, your competition, and your prospective employers. Unfortunately, this is similar to a Scientology "personality test"—there’s no junk mail, but no evaluation either. In the very silly relaxation exercise, when you click on a picture of a sleeping cat, it barks. Managing stress and emotions is important, but for this you’d better off turning off the Mac and picking up a book. Fortunately, Achieving Your Career contains a useful bibliography on career development.

Two words of caution: If you’ve never worked in HyperCard before, the manual won’t help you out. And make sure your résumés and cover letters don’t repeat the manual’s punctuation and spelling errors.

Even if you already know the color of your parachute and have a darn good résumé, Achieving Your Career can help you turn that clutter on your desk into the valuable, organized information you need to go to work to get a job.—STEVEN HANKS
Easy to manage. Our new AppleShare Pro software delivers graphical tools to greatly simplify your server management tasks. So you can spend less time responding to workgroup requests, and more time being productive.

Lower cost of ownership. When server management is easier, it's also less expensive. The ease of use of AppleShare Pro translates into dramatic cost savings over time — in both single-server and multiple-server environments.

Workgroup strength. The Workgroup Server 95 is a new machine, optimized for workgroups. It's based on the Macintosh Quadra 950, with performance boosted by a processor-direct card with memory acceleration and up to a 512KB cache.

High performance made affordable. AppleShare Pro software exploits the hardware acceleration and high-performance A/UX of the Workgroup Server 95 to deliver up to four times the performance of a Macintosh Quadra 950 running AppleShare 3.0.

Grows with the group. It's easy to keep up with the workgroup as it gets bigger and more demanding. Memory is expandable to 256MB, and there's room to expand disk storage up to 20 gigabytes.

We now do for the workgroup what

When Apple introduced the first Macintosh™ computer, we proved that making a desktop computer easy to use could have a dramatic effect on an individual's productivity. Now we're going to repeat that demonstration on a much larger scale: Introducing the Apple® Workgroup Server 95.

It's an easily expanded, high-performance server designed to boost workgroup productivity in data-intensive environments. In typical Apple fashion, it's also designed to be very easy to use — demanding much less attention from you as a network manager.

The Workgroup Server 95 is built for speed and optimized to help large groups of users work together better. Starting with our most powerful Macintosh® Quadra™ system, we added hardware acceleration, half a megabyte of high-performance cache memory,
Built-in network support. With Ethernet, LocalTalk, TCP/IP and AppleTalk, software built in, the Workgroup Server 95 fits into just about every office environment with a minimum of effort.

Built-in backup. The optional built-in DAT 4mm tape backup drive lets you store gigabytes of information. Dantz Retrospect Remote automated backup software (bundled with the server) lets you safeguard system and data files in UNIX and Macintosh formats.

Database power. The Workgroup Server 95 has the power to drive the ORACLE relational database, supporting MS-DOS, Windows, Macintosh, OS/2 and UNIX clients. It also provides enhanced performance for 4D Server from ACL.

Now serving Windows. New software from Apple and Parallels lets MS-DOS and Windows users connect easily to the Workgroup Server 95 and Apple printers.

High-performance support. The AppleAssurance program provides 24-hour phone support to help you set up and start using your server, and on-site service options to keep it at peak performance for a lifetime.

at Macintosh did for the desktop.

enhanced SCSI/DMA driver support, disk I/O, memory expansion to 256MB and disk expansion up to 20 gigabytes.

It's all built around our performance-tuned UNIX-based system software: A/UX 3.01. Optimized to deliver stable, dependable file, print and database services as well as UNIX application processing, A/UX features the familiar, intuitive Macintosh interface.

Our new AppleShare Pro software (for file and print services) also delivers industrial-strength performance and reliability. However, ease of use may very well be its most powerful feature. Built into AppleShare Pro is a set of simple, graphical tools to help you maintain the server, whether you're adding new users, upgrading workgroup software or installing network-wide services like e-mail. It also has sophisticated on-line documentation.

Soon you'll be seeing more new Apple servers and solutions for every size budget. Each one has been designed to help people share information more productively, and to expand as your needs grow. Which means each one can deliver the most important kind of computing power: The power to be your best.

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Circle 135 on reader service card
Software for the Musically Impaired

BY DAVID POUGE

That the Mac is the ultimate musician's computer is not great secret. It records, plays, and orchestrates like a virtual virtuoso. But, it's also the ultimate nonmusician's computer. Whatever your skills, or lack of them, the Mac is a wonderful duet partner. It keeps time while you handle the melody, or carries the tune while you conduct. Imagine sounding terrific with neither a psychoacoustically designed performance space (the shower) nor alcoholically inspired chutzpah (karaoke).

Don't get scared off. We're not talking music education here. And we're not talking about baby games. We're talking pure musical fun for grown-ups who've never recovered from their music teachers' suggestion that they just mouth the words instead of singing them.

Rapmaster 1.0.1

If there were a beauty pageant for noncommercial software, this knockout would be walking down the aisle with Valetined teeth. Bryan "Beaker" Ressler has created an absolutely irresistible software boom box. One switch starts the booming funky bass line; another makes the happy hip-hop drum machine kick in. You even have your choice of rock style: House, Hard Rock, Latin, and so on.

Then, if you're not yet dancing, there's also a row of buttons to trigger handclaps, cowbell clanks, and orchestra hits. But the crown jewel is the Perry Como record. You grab your mouse and scratch-scratch across that virtual vinyl, and suddenly you're a rap artist. When inspiration strikes, you can use the Mac microphone (or a MacRecorder) to record a nine-second rhyming message of, say, political significance or unrequited love. Then, at the touch of an on-screen button, your rap is added to the mix. On a PowerBook, it's pure hilarity.

Online help, great graphics, a volume control that goes up to 11... and it's free. Get it from America Online (it's in the Macworld forum), or send a disk and pre-stamped return envelope to Beaker at 4660 Persimmon Place, San Jose, CA 95129.

Jam Session 2.1

Take the simple goofy joy of rapmaster, add more instruments to the mix, throw in a variety of full-fledged songs, and you have Jam Session ($59.95; Bogas Productions, 415/592-5129). In this program, the latest incarnation of the classic, the songs are already composed for you. In fact, that's the best part: they're all hit pop songs, from "La Bamba" to "Sledgehammer." The great-sounding arrangements play through your Mac speaker; on the screen, you see a picture of a rock band whose players switch in time to the sounds of their respective instruments.

While the performance is going on, you press keys on your keyboard. Each key triggers a guaranteed-to-sound-right solo or lick. You can change the tempo without affecting the pitch. Amazingly, you can even edit the little licks, using standard music notation.

The only downside is that the novelty wear-off factor is higher in this program than in others. For example, there are only five different visuals to watch during the 30 songs you get with the program. (You get 20 songs when you buy, and 10 when you send in your registration. You can also spend $19.95 for the Classic Songs disk set of another 10 songs and 2 visuals of higher visual and sonic quality.)

Instant Pleasure Music 1.1

Have you ever seen a six-year-old bang on the piano keys, blissfully unaware that the resulting music won't win any Grammys? Now imagine that the same random banging produced the beautifully played, fully formed chords of a familiar song.

That's the idea behind the delightfully oddball Instant Pleasure ($149; Instant Pleasure, 614/297-7600). It requires a MIDI keyboard (a synthesizer) connected to your Mac. You load a folk song of your choice (you get 25 with the program, and additional song disks for about $15 each). Then you make the notes of the song play by successively pressing any keys on your synthesizer or Mac keyboard. Yes, it's as weird as it sounds; essentially, you tap random keys in the rhythm you want. With each bang, you hear the next correctly played note or chord from your Mac speaker. (If you have a MIDI synthesizer hooked to your Mac, get the Instant Pleasure MIDI version. It lets you play random keys on your musical keyboard to trigger the chords—the harder you play, the louder the chord.)

You get a screen of bouncing-ball lyrics to follow, and it's a snap to change the key; and you can make the program play all by itself. Still, I can't for the life of me figure out what you'd do with this pricey thing. Conduct sing-alongs, I guess.

So You Want to be a Rock and Roll Star

Two months ago I complained, in this column, that not enough people are making clever use of the world's largest floppy disk, the CD-ROM. Interactive Records (415/285-8650) has done something about it. So You Want to be a Rock and Roll Star ($99.95), despite its dumb name, is an extremely creative and enjoyable disc. It contains six vintage pop songs: "Crazy," "Runaway," "Stand By Me," and so on. Using a stereo or headphones connected to your CD-ROM player, you listen to a professional recording of the song. While the song plays, you can watch one of three displays: the sheet music scrolling by; a series of still-frame paintings that tell a rock-vidoesque story; or a theoretical graph of the song.

A nicely done QuickTime movie tells the history of each song and singer.

The great part is, though, that you can turn off the singer, the piano player, or the guitarist. The rest of the band keeps playing, so that you can fill in, on your own piano, guitar, or imaginary microphone, for the part you've silenced.

Also, the program makes your Apple menu, and it's slow...
(that's CD-ROM for you), and I doubt you'll get much from the theory lessons. (“Natural minor scale: a scale that starts down a minor third from the tonic of the relative major.” Thanks, nudge.) Nonetheless, the on-screen how-you-play-it guitar and piano lessons are excellent. An absolute beginner learning to stumble through a song or two along with the disc-based band is perfectly conceivable. (My guess, however, is that you'll need somewhat more than this disc—a funny haircut and a marketing firm, perhaps—to reach rock-'n'-roll-star status.)

Band in a Box 5.06

BAND IN A BOX IS AN UNPUBLICIZED, grass-roots hit among Mac, IBM, and Atari musicians ($88; PG Music, 416/528-2368). It's drastically more complicated than anything else reviewed here—the badly edited manual is nearly impenetrable. You have to know enough about music to type chord symbols onto the screen (Cmaj7, G7, and so on). You also have to own a synthesizer and a MIDI interface to connect it to your Mac.

If you meet those qualifications, though, Band in a Box is an astounding piece of work. It plays the song you've sketched out in any of hundreds of musical styles, playing your synthesizer's bass, drums, piano, and guitar sounds in a fresh and professional way. And it comes with nearly 300 ready-to-go songs, from today's pop hits to golden oldies—and a choice of 115 musical styles, if you can believe that. You haven't lived until you've heard "As Time Goes By" played as a cha-cha.

You can use Band in a Box as a backup group for practicing; to try out arrangements; to study different playing and orchestration styles; or to save a MIDI file that you can open in a sequencer or notation program.

MiBAC Jazz 1.5.8

MiBAC JAZZ IS BAND IN A BOX'S HIPPER, less versatile, more serious cousin ($125; MiBAC Music Software, 507/645-5851). This one, too, requires you to hook up a MIDI keyboard and type chord symbols into an empty lead sheet. And here, too, your accompaniment is played by an electronic band. But this time, it's all jazz.

The Works

The heart of Songworks is its Autonotation menu (left). Autonotation makes the computer compose a tune, or make up chord symbols, or both. It can also write out a single-line melody that you plunk out on your Macintosh keyboard or MIDI synthesizer.

The program's snazzy improvisations aren't as richly orchestrated as Band in a Box's—MiBAC offers bass, drums, and piano only. Nor are they as flexible: you get only four swing styles. There are no ready-made songs to play, you can type in only two different chords per measure, and you can't record a melody (as you can in Band in a Box).

But those differences all spring from MiBAC's impressive dedication to its cause: helping you develop, play, and print jazz lead sheets with as much flexibility and efficiency as possible. The program handles the comping (improvised accompaniment) and transposing (to print a lead

There are big advantages to a small college. Just ask these people who graduated from small colleges and went on to accomplish great things.

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If you're considering college, consider a small independent college. For a free booklet, contact: Council of Independent Colleges, One Dupont Circle, Suite 320, Washington, D.C. 20036.

Small colleges can help you make it big.
Sheet, for a trumpet player, say). MiBAC
is dramatically easier to use, too; its
manual and interface are all-Mac, all-
readable, all-nice. I suppose MiBAC Jazz
isn't as much sheet fun as Band in a
Box. But especially in light of MiBAC's
song-structuring features and its superb
printing options, it may be better suited
for players, teachers, arrangers, and jazz
fans of any ilk.

Songworks 1.2.8
WHAT DO YOU GET WHEN YOU CROSS A
one-finger-accompaniment Casio key-
board with a tape recorder and a piece of
sheet music? Songworks ($125; Ars Nova
Software, 206/889-0927). You can actu-
ally play your Macintosh keyboard as
though the keys were piano keys—why
hasn't anyone ever thought of this be-
fore—and the program writes out what
you're playing on a single staff. You can
only play single notes—no chords, and
nothing fancy. (You can also use a MIDI
keyboard, if you have one.)

Of course, you can play the melody
back, type in lyrics, transpose to a new
key, and even print out your lead sheet.
But the real fun begins with the Auto-
notation menu. Choose Harmonize Mel-
ody, and Songworks makes up, writes in,
and even plays back the chords that fit
your doodled melody. (You can specify
how the chords play back, from same-pub
two-steps to rolling broken chords.) In-
credibly, there's also a Melodize Harmony
command: the program composes its
own new melody to fit the chord symbo-
s that are already there. The program can
even make up a new song of its own, tune
and chords. (Its compositions are simple
and usually forgettable. But every now and
then it surprises you.)

Songworks holds enough unexpected
lessons and instant gratification that it
ought to get a rave review—if it weren't
for the few remaining bugs. The author
promises to get it right, and send the new
version(s) free to all registered users.

The Upshot
THESE PROGRAMS ARE TOO DISSIMILAR
for me to recommend one above all the
others. But it'd be hard to go wrong with
Rapmaster (for the musically destitute),
Songworks (for the dabblers), or Band in a
Box (if you know chord theory). As a mat-
ter of fact, I used my Mac microphone to
make short recordings of all three, and
I've put the resulting sound files on
America Online, in the Macworld area, so
you can hear what you're getting into.

Don't tell my editors, but I had so
much fun playing with these products that
I would've written this month's column
for free. Armed with any of these pro-
grams, you can tell your friends that you
really know how to make your Mac sing—
and mean it.

Contributing editor DAVID POGUE is the author of the
Mac novel Hard Drive (Berkley Books, 1993). He's a
musician in New York, where he's a consultant for such
Broadway composers as Stephen Sondheim, John
Kander, and Cy Coleman.

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lazy DOS software emulators, OrangePC packs the power and features to get the job done
for serious corporate users at a price which eliminates the DOS clone alternative (386 starts
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(enhanced and protected mode); one AT bus slot for compatible PC network connection;
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Circle 33 on reader service card

MACWORLD August 1993 171
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Alys is a leading company in Macintosh compression products. Other Alys Products include More Disk Space and SuperDisk! We provide full compatibility with all Macintosh Software for your Quadra or Centris with our Compatibility Init.

ALYSIS

Circle 9 on reader service card
20" Professional Series II Monitor
If only we could hook this baby up to our cable boxes for the NFL preseason games. This 20-inch monitor features a Trinitron tube with a .31mm aperture pitch; a 76Hz refresh rate at 1024 by 768 resolution; and an LCD control panel for adjusting image size, convergence, contrast, brightness, and color temperature. The monitor meets the Swedish MFR II emissions guidelines. $2749. Epson America, 310/782-0770, 800/922-8911; fax 310/782-5179.

AVR 8800/CLX
This high-resolution flatbed scanner scans reflective materials in either gray scale or 24-bit color at 800-dpi optical resolution. The scanner handles materials up to 8½ by 11 inches, comes bundled with Adobe Photoshop, and is TWAIN compatible. The unit can be upgraded to handle transparent originals. $1700. AVR, 415/988-1415; fax 408/434-0968.

CrayonFX
This QuickDraw, color, thermal-wax printer prints 203 dpi on 8½-by-11-inch paper at roughly 2½ minutes per page. The printer uses either three or four color ribbons that provide 115 or 80 prints per roll, respectively. A monochrome ribbon is also available. The printer ships with 50 TrueType fonts. $1495. LaserMaster Corp., 612/944-9330, 800/950-6868; fax 612/944-0622.

FotoMan Plus
The new version of this portable digital camera features a larger main lens (65mm), longer battery life (over 100 hours), improved automatic flash control, faster downloading of stored pictures, and a 67 percent increase in resolution. Users can take black-and-white digital pictures and then download them to the Mac for editing or printing, $799. Logitech, 510/795-8500, 800/231-7717; fax 510/792-8901.

hammerCD
Calling a CD-ROM drive speedy is a bit like calling sugarcoated breakfast cereal nutritious. Still, this double-speed CD-ROM drive features a SCSI-2 interface, ships with PWBI's CD ROM Toolkit utility software, and is multisession Photo CD-compatible. $995. PWBI, 415/474-8055; fax 415/775-2125.

Laser Link III
Forget Congress—you can build your own data superhighway with this fiber-optic SCSI bus extender. A host unit plugs into the SCSI bus and transmits all data and commands over a fiber-optic cable up to 10m long. At the other end, a remote unit decodes the data and splits it out through a standard 50-pin SCSI port. The product does not require a SCSI bus address and is completely transparent to devices on the bus. $1695 per unit. Applied Concepts, 619/453-0090, 800/624-6808; fax 619/453-6715.

LFR Mark II
This SCSI digital film recorder records 35mm slides at 2000- or 4000-line resolution with up to 36-bit color; features a 16-character status display. Output times are 25 seconds for 2000-line images and 40 seconds for 4000-line images (doesn't include restrobing time). $14,995. Lasergraphics, 714/727-2651, 800/727-2655; fax 714/727-2653.

M3907C
Got tons of paper to scan? How does 40 pages per minute sound? This monochrome, flatbed, SCSI scanner handles reflective originals up to 11 by 17 inches. The 100-page document-feed attachment comes standard. $11,995. Fujitsu Computer Products, 408/432-6333, 800/626-4686; fax 408/894-1706.

MobileWriterPS
A portable PostScript PowerBook printer for portable people, this 6-ppm, 300-dpi, thermal-transfer unit emulates a LaserWriter IINT. The MobileWriterPS features the Microsoft version of PostScript, 35 fonts, support for TrueType, 2MB of RAM, and HP PCL emulation. The product connects to the Mac via an AppleTalk interface, and also includes a Centronics parallel port. $999. Manness-Tally, 206/251-5653; fax 206/251-5520.

OLB830 Plus/OLB850LED Page Printer
The OLB830 LED 6-ppm printers ship with 65 on-board fonts, an AppleTalk interface, and HP PCL5. The OLB830 Plus uses the same monitor software (SOK) runs in the background of each machine, managing read/write operations and updating shared-volume information at user-defined intervals. The connection cables can be up to 5m long, or up to 25m long using a differential protocol (which requires a converter box or SCSI-2 accelerator board in the sharing Macintosh). The product can be configured either with two single-ended and four differential ports or with six single-ended ports. Requires System 7. $5995. Transoft, 805/963-7181, 800/949-6463; fax 805/963-7178.

powerbox
This product features 200MB or 500MB of floptical storage in a case that fits underneath a PowerBook. The unit weighs less than 5 pounds and draws power from its own PowerBook battery or an included AC adapter. 2004 $1449; 5004 $2399. adambYTE, 415/988-1415; fax 415/988-1418.

PowerR Model CC-10
This adapter clips onto a Color Classic's logic board and provides a video-out port for a color LCD display panel. Other models are available for other Macs. $129. PowerR, 206/547-8000, 800/729-6970; fax 206/285-0520.

Pro Imager 7650C
If your idea of a hot time on the old town is scanning 11-by-17-inch reflective originals in 24-bit color at 1200 dpi (optical resolution), read on. This flatbed, three-pass scanner ships with PixelCraft's QuickScan scanning software and ColorAccess software for professional color correction and separation. $11,495. PixelCraft, 510/562-2480, 800/933-0330; fax 510/562-6451.

SCSI-Net
A configurable SCSI hub that allows you to share six Macs to share a single SCSI device. Ships with a driver that installs on the shared device and provides password-protected partitions. Included SCSI-Net monitor software (SOK) runs in the background of each machine, managing read/write operations and updating shared-volume information at user-defined intervals. The connection cables can be up to 5m long, or up to 25m long using a differential protocol (which requires a converter box or SCSI-2 accelerator board in the sharing Macintosh). The product can be configured either with two single-ended and four differential ports or with six single-ended ports. Requires System 7. $5995. Transoft, 805/963-7181, 800/949-6463; fax 805/963-7178.
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, flow charts, reports and proposals with Inspiration.

SK-5461 $1950. SysConNet, 408/725-4650; fax 408/725-4654.

SmartKit Deep inside every off-the-shelf consumer, there’s a do-it-yourselfer aching to come out. This product lets you take your old 3½-inch hard drives, put them inside SmartModules, and make them part of a SmartStack. The product accepts most 3½-inch mechanisms. An assembled SmartModule or SmartStack requires a SmartSource power supply (sold separately for $199) to operate. $99. Envisio, 612/628-6288; fax 612/633-1083.

VideoLinx PTV Mac This device converts Mac video output to standard NTSC signals for presentation or recording. The box plugs in between a Mac and its monitor and includes an additional video-in port for genlocking animation or titles onto existing video footage. The product also includes controls for flicker reduction and hue and black-level adjustment. $795. VideoLinx, 408/995-9593; 800/245-0930; fax 408/395-9094.

ViewSonic 17 A 17-inch monitor with a 28mm dot pitch and a 75Hz refresh rate at 1280 by 1024 pixels. The product features built-in color control, moire tuning, and video-input voltage adjustments. The product meets the Swedish MPR II emission guidelines. $1599. ViewSonic, 888/888-8583; fax 888/869-7958.

Adding Machine This Calculator replacement features memory keys; a user-definable key that automatically calculates a set percentage, types a double-zero, or does standard addition; a paper-tape record that users can open and save; dropdown menu; and round functions. $149.95. Kensington Microclaim, 415/797-2700, 800/535-4242; fax 415/797-9675.

Additional Effects This plug-in pack of special effects for CoSA’s After Effects includes a Bevel Edges effect, drop shadow, creation, ripple, blend, Brush Strokes, Twirl, and Unmultiply. Free to registered After Effects owners. CoSA, 401/831-2672; fax 401/274-7917.

Art-Scan 3.0 “Have scanner, will travel.” This Photoshop plug-in allows users to scan directly into Adobe Illustrator or EPS files and can automatically scale images to the desired size, sharpen them, descreen them, or rotate them to correct for improperly aligned originals. $395. DPI Electronic Imaging, 513/231-1231, 800/597-3837; fax 513/231-5618.

A-Train Construction Set Once you’ve completed continental railroad domination, what’s left to do except fiddle with your simulated world in godlike fashion? With the Construction Set, you can create cities from scratch, amass fortunes at the click of a mouse, sculpt the landscape, create impossibly complex mazes of track, or even assign assets to your computerized competitors for an extra challenge. $34.95. Macs, 510/254-9700; fax 510/253-3736.

Berlitz Interpreter If your international business takes you to Europe, this package has you covered. The software immediately translates typed words into four other languages and annotates the part of speech. The product features over 60,000 words in five languages: English, Spanish, French, Italian, and German. $49.95. Microlytics, 716/248-9150; fax 716/248-3868.

FileRunner If you’ve got too many files on your hands, or too many hands on your files, you might want to check this file-synchronization tool. The product allows users to synchronize any number of Macs, compensates for time zone changes, creates a complete log of all transfers, and automatically scans for viruses during transfers using DataWatch’s Virex. $99.95. MBIS Technologies, 412/941-5076; fax 412/941-5076.

Harbor Master 2.0 Surf’s up, dude. This package uses the harmonic method to predict tides and tidal currents throughout a three-year period, so you can boogie out of work just in time to catch perfect sets. Or, if you depend on the tide for your work, you might find this package useful. The product displays data in several formats, shows the moon phase, shows sunrise and sunset times, and annotates high- and low-tide times and heights, and as well as the time and speed for tidal ebb and flow. $150. Zihua, 408/372-0155, 800/669-0155; no fax.

Art-Scan 5.0

©1993 Inspiration Software, Inc.
At first glance, most Macintosh storage solutions all seem the same. So why is it that editors and analysts so frequently select Mirror drives as best of category or Editors' Choice?

**Details Make The Difference**

We like to believe it has a lot to do with our attention to detail. Details that define our products' look, feel, operation, and serviceability. Since entering the Macintosh drive market in 1985, Mirror has continually refined and enhanced our products to better address real-world applications. And the editors recognize this.

**Exclusive Software**

All Mirror hard drives are equipped with the fastest mechanisms and come with Media Manager, our exclusive software, to format, partition, and password protect your precious data. And Soft-Backup to make backing up truly effortless.

**Protect Your Data**

You don't have to look far to find a cheaper drive. But since your data is more valuable than any drive you might select, we choose not to compromise. Each drive is meticulously assembled, tested, and inspected, using only the fastest mechanisms, and backed by the most competent technical support in the business.

**Why So Many Awards?**

Mirror drives are available from 85Mb to 1.37Gb, and include a free copy of 7th Heaven utilities ($99 value).

- **NEW** 3.5" SyQuest drive stores 105Mb of data on a pocket-sized cartridge. With speed that rivals the fastest hard drives! $699
- Mirror SyQuest drives are a best buy 44 or 88Mb models, or a version that reads & writes both 44 & 88Mb cartridges. From $419
- Optical drive stores 128Mb on a 3.5" disk. At less than 50¢/Mb, optical cartridges are perfect for large files. $1199
- High-speed, low-cost backups on 2Gb DAT tapes. Now includes Retrospect ($199 value). $1399

**Order Direct Anytime**

800-643-0635

**Direct Price**  **Est.**  **List**

<table>
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<th>Drive</th>
<th>85Mb drive</th>
<th>127Mb drive</th>
<th>170Mb drive</th>
<th>240Mb drive</th>
<th>525Mb drive</th>
<th>1.2Gb drive</th>
<th>SyQuest 44</th>
<th>SyQuest 88</th>
<th>SyQuest 88C</th>
<th>105Mb SyQuest</th>
<th>128Mb Optical</th>
<th>CD-ROM drive</th>
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**NEW**

- 85Mb drive $299  $249
- 127Mb drive $339  $289
- 170Mb drive $369  $319
- 240Mb drive $479  $429
- 525Mb drive $1049  $999
- 1.2Gb drive $1599  $1549
- SyQuest 44 $399*  $499*
- SyQuest 88 $499*  $599*
- SyQuest 88C $599*  $699*
- 105Mb SyQuest $699*  
- 128Mb Optical $1149*  
- CD-ROM drive $599  
- DAT tape drive $1399*

**Circle 184 on reader service card**

*Prices subject to change. Mirrors are available only for Macintosh systems. © 1996 Studio Technologies. MacUser, MediaManager, and Edition Design are trademarks of Mirror.
No Wild, Wildlife.

Life in the wild can be pretty tough these days. Without the necessary ancient-forest habitat to live in, some species like the northern spotted owl of the Pacific Northwest are severely threatened.

At the Sierra Club, we believe that these owls and the ancient forest ecosystems they depend on need our help. The Sierra Club’s work to permanently protect our ancient forests also helps preserve the habitat of the northern spotted owl, giving them the range they need to help their population grow.

To learn more about our work protecting the forest habitats of endangered species such as the northern spotted owl, please write us at:

Sierra Club, Dept. PB
730 Polk Street
San Francisco, CA 94109
(415) 776-2211

NEW PRODUCTS

Helix Tracker
A workflow workflow workpackage for your Mac. Industry doublepeak aside, this package allows users to send tasks (which consist of documents, instructions, and due dates) to other users in a group. When one person finishes working on a task, Helix Tracker automatically sends the task to the next person assigned to work on it. Users may also return tasks back to the previous person if more work is required. The product tracks status and location of tasks, saves and tracks each new version of a document, and provides a storage area to archive both public and private documents. 1.2MB min. memory; requires LocalTalk, hard drive. Server and four clients $739; additional clients $199 each. Helix Technologies, 708/205-1669; fax 708/291-7091.

InTouch 2.0 Network
Client-server version of company’s contact-management software. InTouch server makes any designated InTouch file available to all users on the network. Server includes record-keeping capabilities and two levels of password protection. Included utility, Snap, lets users print envelopes or labels directly from a word processor without launching InTouch. Three-pack $249.95; ten-pack $629. Advanced Software, 408/733-0745, 800/346-5392; fax 408/733-2335.

MacAuthorize
So much for those goofy little credit card authorization pads you see in stores. This software package authorizes credit card transactions via authorization agencies. Users can perform authorizations in batches or individually. Transactions are stored and may be reviewed, printed, or exported to other applications. Note: Users must make their own arrangements with credit-authorization agencies. Company customizes the software to the user’s credit agency. Requires a modem. $195 to $600, depending on agency. Telian Software, 408/274-1110; fax 408/274-1110.

Mach Ten
Does the Mac Finder leave you cold? Are your fingers just aching for the comfort of Unix? Mach Ten Personal Unix is a 4.3BSD Unix environment with a Mach 2.5 microkernel. The package includes the full TCP/IP protocol suite, as well as UUCP and SLIP communications, NFS client and server software, and a software-development tool-set with an ANSI-standard C compiler. Mach Ten Professional Unix adds support for virtual memory, a source debugger, and a C++ compiler. 4MB min. memory. Personal Unix $495; Professional Unix $695. Tenon Internetsystems, 805/563-6983, 800/666-2410; fax 805/962-4202.

NetSecure
A chain is only as strong as its weakest link, and your data is only as secure as your network. NetSecure might help you beef up your weak links with password-controlled access to protected folders, optional DES data encryption, and AppleTalk Remote Access compatibility. Additionally, passwords never travel through the network, rendering wiretapping and network peaking ineffectual. Three-pack $249.95; ten-pack $629. Unix2 Software, 206/672-5387; fax 206/778-7146.

NovaLink Professional 3.0
This customizable server software allows users to set up bulletin board services, including electronic mail, public file areas, message forums, and real-time teleconferencing. Clients can access the server via serial modem. AppleTalk, the Mac Communications Toolbox, X.25, and TCP/IP access are available as separate options. The package features a graphic interface for server design and the ability to link multiple NovaLink servers. 4MB min. memory; requires System 7. $300. ResNova, 714/379-9000; fax 714/379-9014.

OCGS/Kerberos
Security software that supports both version 4 and 5 of the MIT Kerberos protocol. The software includes client utilities for requesting tickets, listing and destroying tickets, and changing a password. The product also supports fully encrypted remote log-in with VT100 terminal emulation and remote copy commands, using MacTCP. $95. Open Computing Security Group, 206/883-8721; fax 206/882-3489.

Optix Workflow
A package that allows businesses to move electronic documents along a user-definable routing path. This product ties into the company’s suite of workflow products that cover document imaging, text search, OCR, archiving and retrieving, and fax serving. The product features parallel routing and options for reuniting parallel processes. Entry-level price includes software, installation, training and support, server hardware, and one workstation. 8MB min. memory; requires Mac LC and 14-inch monitor. Entry-level system $775.00. Blueridge Technologies, 703/675-3015; fax 703/675-3130.

OCSG/Kerberos
Security software that supports both version 4 and 5 of the MIT Kerberos protocol. The software includes client utilities for requesting tickets, listing and destroying tickets, and changing a password. The product also supports fully encrypted remote log-in with VT100 terminal emulation and remote copy commands, using MacTCP. $95. Open Computing Security Group, 206/883-8721; fax 206/882-3489.

Optix Workflow
A package that allows businesses to move electronic documents along a user-definable routing path. This product ties into the company’s suite of workflow products that cover document imaging, text search, OCR, archiving and retrieving, and fax serving. The product features parallel routing and options for reuniting parallel processes. Entry-level price includes software, installation, training and support, server hardware, and one workstation. 8MB min. memory; requires Mac LC and 14-inch monitor. Entry-level system $775.00. Blueridge Technologies, 703/675-3015; fax 703/675-3130.

PathWay Messaging
Mac version of Messenger is a stand-alone E-mail client for exchanging messages with a Wollongong Group server or TCP/IP host (requires Mac TCP/IP 1.1). Messages can include text and encoded binary attachments (doc-continues
Distributing your document without Common Ground can get you nowhere.

With Common Ground, it gets you everywhere.

Now you can let anyone view and print your documents, without the creating application and fonts.

Have you ever sent or received a file that simply could not be opened, viewed, or printed due to a missing application? Or even worse, opened a document only to find the fonts replaced and the formatting ruined?

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NEW PRODUCTS

UNIX users. 2MB min. memory. $308.

Macintosh network transports, which
DOS, Windows,
memory; requires Mac II. $195. Woll on­

Paradise

Video-editing software that takes advan­
tage of Sony Videk’s time-code-based
architecture. Users can create storyboards;
make QuickTime thumbnails, or edit,
alphabetize, and log videotapes. 5MB min.
memory; requires Mac II and video-capture
board. $548. HATNet, 408/725-
2810; fax 408/725-0309.

PowerFlow Administrator

An application for managing files and jobs
over a workgroup. The software is based
on 4th Dimension 3.0 from ACI US
and provides automatic backup, archival and
purge operations, support for up to 40
online users at once, password protection,
and system-monitoring tools. 8MB min.
memory. Server license fee $250 to 4
users $375 per user; 5 to 9 users $325
per user; 10 to 24 users $275 per user;
25 and more users $225 per user. North
Atlantic Publishing Systems, 508/250-
8080; fax 508/250-8179.

Working Model

Motion simulator for building and testing
physical systems. Users gives objects
physical properties such as mass, friction,
and elasticity. When a simulation runs,
the software calculates the motion of each
object and displays it on the animated
movements. Users can import CAD data,
and animate them, and export their
animations in popular formats such as
Macromedia. Three-O and WaveFront,
5MB min. memory; requires SGI or
Mac. II. $995. Knowledge Ventures,
415/553-8135; fax 415/553-8012.

A Zillion Kajillion Rhymes

Who knows where Shakespeare would
have gone if he’d had this package? The
product’s search engine can strip prefixes
and suffixes to find double and triple
rhymes, and the dictionary contains com-
temporary, technical, literary, and slang words.
$34.95. Eccentric Software, 206/628-
2687; fax 206/628-2681.

CD-ROMS

1993 Guinness Multimedia Disc of Records

Guinness put the ex in biggest, fastest, and
strongest, and Golfer has put Guinness
on disc. This product features over
2000 new or updated records, over 700
pictures, and dozens of QuickTime video
cliips with audio. Requires Mac LC or
higher with 256 colors. $99. Groder Elec-
tronic Publishing, 203/797-3500, 800/356-
5959; fax 203/797-3835.

ACS 100/150

You can’t rip the roof off the joint with
that tiny Mac internal speaker, but this
satellite/subwoofer combination might
get, here’s a possible environment and
money saver. This System extension adds
a credit card-size two-button remote.
Users take over to broeking through
the images or to narrow the loca-
cus by typing in keywords. Users must
still negotiate router rights with company and
then obtain actual images. $175. Stock
Market, 212/684-7087, 800/999-
060; fax 212/532-0750.

The Oregon Trail

The Oregon Trail CD

Students have been traveling the Ore-
ge Trail since the Apple II was king, and
now they can see their fellow pioneers
and hear them talk. Players assume the
roles of settlers traveling by covered
wagon across the rugged landscape of
nineteenth-century America from Inde-
pendence, Missouri, to the Willamette
Valley in Oregon. 4MB min. memory;
$69. MECC, 612/569-1500, 800/685-
6322; fax 612/569-1551.

The Oregon Trail CD

You can’t rip the roof off the joint with
that tiny Mac internal speaker, but this
satellite/subwoofer combination might
help. Speakers are magnetically shielded
to prevent interference, and feature Digi-
tal Signal Processing circuitry to simulate
stereo from mono sources. The ACS 100
(satellite) will mix input from two audio
sources. The ACS 150 (subwoofer) fea-
tures two 4-inch drivers that should add
some punch to a presentation. ACS 100
$180; ACS 150 $150. Alter Lanning
Consumer Products, 717/296-4444,
800/258-3288; fax 717/296-2213.

ProPresenter

It’s a credit card. No, it’s a remote con-
trol. No wait, it’s … This package con-
ists of configuration software, a base
that plugs into the Mac ADB port, and
a credit card-size two-button remote.
Users flip through slides and sus-
vailing the audience at will, while
the Mac responds like a trained dog to
the user’s stealthy clicks. $99. Presentation
Electronics, 916/652-9281, 800/888-
9281; fax 615/652-9286.

ProPresenter

Fit to Print with QuarkXPress

This design primer teaches DTP funda-
amentals using QuarkXPress. Chapters
cover such topics as creating a visual
path for the reader to follow, using pic-
tures effectively, and working with print-
ers and service bureaus. Written by
Lauren Smith. 390 pages. M&T Books,
415/356-9500, 800/488-5233; fax 415/
356-8727.

MacWrite Pro Inside & Out

These authors had plenty of beta-test-
ing time to prepare their tome. This book
covers MacWrite Pro from basic docu-
ments to desktop publishing. Recipes for
creating resumes, newsletters, forms,
academic papers, and catalogs are in-
duded. Written by Steve Michel and Dale
Coleman. 439 pages. $24.95. Osborne/
McGraw-Hill, 415/549-6600, 800/227-
0900; fax 415/549-6603.

The Photoshop Wookt!t

Step-by-step guide for using Adobe
Photoshop 2.5. Book includes disk with
special-effects filters, keystroke pro-
grams, sample textures, and other en-
hancements. Written by Lineaa Daymon
and Jack Davis. 200 pages. $35. Peach-
Press, 510/548-4393, 800/283-
4444; fax 510/548-5991.

To have your product considered for
inclusion in New Products, send an
announcement with product name, description, minimum mem-
ory, peripherals required, pricing, company name, and phone number
to New Products Editor, Macworld, 591 Second St., San Francisco, CA
94107. Macworld reserves the right to edit all product announcements.
Questions and Tips from Macworld Readers

BY LON POOLE

The loan amortization spreadsheet in March’s Quick Tips calculates the wrong payment dates if the initial date is after the 28th of the month. To fix the problem, first add the following formula to cell E8:

=DATE(YEAR(C14)+1, MONTH(C14), 1)

Then change the formula for cell C15 as follows, and fill down from C15 to the bottom of your amortization table:

=DATE(YEAR(C14), MONTH(C14), 1)

The amortization table works in ClarisWorks 1.0, Claris Resolve 1.1v1, and Microsoft Excel 4.0. It also works in Microsoft Works 3.0 if you break down the long formula in C15 into four parts, using cells I15, I15, K15, and L15 for each part as follows (fill down from C15, I15, K15, and L15 to the end of your table):

C15 = DATE(YEAR(C14), MONTH(C14), 1)
I15 = YEAR(C14) - INT(MONTH(C14)/12)
J15 = MOD(MONTH(C14), 12) + 1
K15 = IF(SE8 < 29, SE8, IF(MONTH(C14) + 1 = 2, IF(YEAR(C14) / 4 = INT(YEAR(C14)/4), 29, 29), IF(SE8 < 31, SE8, CHOOSE(MONTH(C14), 28, 31, 30, 31, 30, 31, 30, 31, 31, 31)))
L15 = CHOOSE(MONTH(C14), 28, 31, 30, 31, 30, 31, 30, 31, 31, 31)

If you have trouble with the spreadsheet, ask someone else to proofread the formulas in your copy of it. With long formulas like these, it’s understandably easy to make typographical errors.

Back from the Trash

Q. I just got Norton Utilities for Macintosh (NUM). When I tried the UnErase feature, which claims to bring back deleted files, it presented me with a pretty big list of all the files I had trashed. Are all these trashed files still on my hard drive taking up space?

James B. Rodriguez
West Covina, California

A. The disk space occupied by deleted files is available for other files. The Empty Trash command removes a file’s entry from the relevant disk’s file directory and changes the disk sector allocation table to indicate that the disk sectors the file occupied are available for use by another file. To save time, the command does not erase file contents in those now-available sectors. Until the system allocates some of a deleted file’s sectors to a new or expanded file, NUM’s UnErase and similar utility software can resurrect the deleted file from its contents (creating a new directory entry for it and reallocating the sectors it occupies). Any blackguard with disk utility software can retrieve files you deleted—or view any fragment of their contents—unless you erase the contents of the files with utility software such as NUM’s WipeInfo.

QuickTime Primer

Q. I received QuickTime with my system software, but I do not know what I need to use it (for viewing movies).

JeffK7513
via America Online

Apple includes the QuickTime system extension and a new QuickTime-capable Scrapbook with its System 7.1 products (including System 7 Personal Upgrade Kit, which you can buy from a software retailer or directly from Apple by calling 800/769-2775). QuickTime works on any Mac originally equipped with a 68020, 68030, or 68040 CPU. The Mac needs a hard drive and at least 4MB of RAM. Sooner or later, you will also need a CD-ROM drive with an average seek time less than 400 milliseconds. With QuickTime installed in your Extensions folder, you can copy, paste, and play movies in the new Scrapbook and in the documents of many popular applications (see “Movie Control”). You can also compress individual graphics with QuickTime; when you open a compressed graphic, QuickTime automatically decompresses it. For the latest information on the QuickTime compatibility of a particular application, ask its publisher.

You can get prerecorded QuickTime movies on CD-ROM from user groups such as BMUG (510/549-2684, 800/776-2684) and BCS Mac (617/625-7080); Apple’s QuickTime Starter Kit (from software retailers); and commercial companies (for a sampling see “Top 10 CD ROMS,” Macworld, March 1993). If you don’t have a CD-ROM drive but do have a modem, you can download QuickTime movies from online information services such as CompuServe and America Online, but acquiring movies by modem can be expensive because of their hefty size (even brief—less than 15-second—QuickTime videos consume between 300K and 1MB).

To record your own QuickTime movies, you need at least 5MB of RAM and an unused expansion slot, gobs of hard disk space, a video source, and a video-capture board. Video sources include broadcast TV, VCRs, camcorders, and videodisc players. The video source feeds into the capture board, which is plugged into the Mac’s expansion slot and converts the incoming video to a QuickTime movie. Radius, RasterOps, SuperMac Technology, and Workstation Technologies make adapter boards that digitize full-motion video directly to disk (see “The Full-Motion Macintosh,” Macworld, January 1993).

The Mac can also create the video source material without a video-capture board. The Movie Converter utility software, which comes with Apple’s QuickTime Starter Kit, can create QuickTime movies from a series of PICT graphics files, contiguous PICT images in the Scrapbook, a PICS animation file, or an AIFF sound file. (PICT, PICS, and AIFF are standard types of Macintosh files.) Other applications, such as Macromedia’s Action 1.0, continues
Macromedia Director 3.1, and Broderbund's Kid Pix Companion, can save slide-show presentations and animations as QuickTime movies. You can edit QuickTime movies with video-editing and -composing programs such as Adobe Premiere and DiVA's VideoShop. Before including other people's video and QuickTime movies in your own productions, be sure to get permission from the copyright holders.

Lost in Color Space

Q. My sense of intellectual curiosity requires me to identify the mythical 256 colors that are inherent in my LC with a 12-inch monitor. Considering that each of the six categories—hue, saturation, brightness, red, green, and blue—can have a value from 0 to 65536, there are many mathematical options. I believe that 65,536 raised to the sixth power is 7.92282 x 10^36.

A. The Macintosh system software (System 7, and System 6.0.5 or later with 32-bit QuickDraw in ROM or in the System Folder) defines colors in terms of their red, green, and blue (RGB) components. For example, pink is a combination of intense red with less intense green and blue. The intensity of each component is specified by a 16-bit number between 0 and 65535, higher values for higher intensity. Theoretically, there are more RGB colors than the human eye can discern—2,814,749,767 x 10^4 (65536 red x 65536 green x 65536 blue). The system software works with several subsets of the complete set of RGB colors, and you select the subset size in the Monitors control panel—black and white, 4 colors or grays, 16 colors or grays, 256 colors or grays, thousands of colors (16,384), or millions of colors (about 16.8 million). Using fewer colors requires less RAM and disk space to store images.

Colors can also be defined in terms of their hue, saturation, and brightness instead of their red, green, and blue components. Color hues are identified by number (for instance, red is 0, green is 21845, and blue is 43690); saturation measures the color's intensity (the amount of white the color contains); and brightness measures the amount of black in the color. With this method, you would define pink as having a red hue, less than full saturation, and full brightness.
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**System Colors**

This standard palette of 256 colors is used by default to display all images when the Monitors control panel is set for 256 colors.

With the Monitors control panel set to 256 colors, the Mac system software works with a palette of 256 colors chosen from among the 16.8 million (see “System Colors”). Applications can modify the palette, for example, using a palette of blues to display works from Picasso’s blue period and a more varied palette for his later works. With some applications you can create your own alternative palettes.

**An Alias’s Alias**

Our network has several AppleShare file servers, each connected to one or more shared hard drives. Occasionally I want to move a shared drive from a busy server to an idle server, or I need to relocate the drives connected to a server needing repair. If I move a drive, however, users have to tediously search all servers (using the Chooser) for the moved drive unless I inform them of its new location.

I solved this problem by creating double aliases of the shared drives. First, working from a shared hard drive that is always available to everyone, I created an alias of every shared hard drive on the network. Then I created aliases of those hard drive aliases and copied the second set of aliases to each user’s Mac. With the double aliases in place, a shared hard drive named Crown Jewels, for example, could be accessed by double-clicking Crown Jewels alias alias on any user’s Mac that alias would point to Crown Jewels alias on the always-available shared drive, which in turn would point to Crown Jewels itself. Now, if I move Crown Jewels to a different file server, I merely make a new alias to replace the old Crown Jewels alias on the always-available shared drive. I do not have to update users’ copies of Crown Jewels alias alias, and users do not need to know that Crown Jewels moved. (Rather than use the Mac-generated alias names, continue...)

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**HOW TO/QUICK TIPS**

**System Colors**

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MacWorld, Jan. ’93

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Do Not Disturb While queuing documents for later background printing, you can keep PrintMonitor from pesterling you by choosing Preferences from its File menu and changing the settings as shown here. PrintMonitor is located in System 7's Extensions folder or in System 6's System Folder.

you can rename the aliases; for example, both the alias and the alias's alias could be named Crawford Jewelers like the hard drive.

Jecl C. Morris
Groton, Connecticut

Print Later TIP

When I travel with my PowerBook and I finish a document, I like to get it out of my head and not have to think about printing it later. So I turn on the Background Printing option in the Chooser and set preferences in the PrintMonitor program to not bother me if it can't find the printer (see "Do Not Disturb"). Now I can print any number of documents any time, and the printer driver saves the page images for each document as a spool file in the PrintMonitor Documents folder (inside the System Folder). If PrintMonitor can't find the printer, it flashes its icon in the menu bar. I know this means it wants to display an alert about the missing printer, so I ignore the flashing icon until I have a printer connected and ready. Then I open PrintMonitor, and when it asks what I want to do about the problem I click the Try Again button to have all the waiting spool files printed. While I have items that are waiting to be printed I put my PowerBook in sleep mode but never shut it down; otherwise I would lose the spool files waiting to be printed and would have to print them again.

Kurt Prasse
San Francisco, California

You can shut down your Mac without deleting spool files—but you must respond correctly to two alert dialog boxes that appear at the end of the shutdown process. The first alert tells you something is being printed, and asks if you want to finish printing or print later; you must click the Print Later button. Then another alert tells you the printer can't be found; click the Cancel Printing button to conclude

Preferences

Show the PrintMonitor window when printing:
No ____________ Yes ____________

When a printing error needs to be reported:
Only display in Application menu □
Also display icon in menu bar □
Also display alert □

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184 August 1993 MACWORLD

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Border Changes
Changes you make to Word's From Text and Line options in the Border command's dialog box only affect sides of the border that are selected in the border model—that is, sides marked with double-arrows at their ends. To select a side, click it; shift-click to select multiple sides.

the shutdown process without losing any spool files. (If you click Try Again instead, you abort the shutdown process and PrintMonitor tries again to find the missing printer.) This is somewhat confusing because clicking Cancel Printing ordinarily (except after clicking Print Later) does delete the spool file being printed.

Background printing is available with System 7 and with System 6 with MultiFinder active for the StyleWriter, most LaserWriter models, and some other types of printers.—L.P.

Near the Border
TIP
In Microsoft Word 5.0 and 5.1, don't try to change the amount of space between an existing border and the text it surrounds. Although you can enter a new value for the Border command's From Text option, Word always resets that option to the value it had when the border was created. The trick is to remove the border entirely, click OK to dismiss the Border command's dialog box, choose the Border command again, and enter a value for the From Text option before setting other border attributes.

Steve Berry
Seattle, Washington

Your method works—and applies to the Border command's Line option as well—but there's a simpler method for changing a border's line text offset and line style (see "Border Changes").—L.P.

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EXTENDING YOUR REACH WITH INNOVATION™
Macros and Scripting

BY JIM HEID

Watch me and learn," the master commanded, "so you can do it yourself next time."

No, you didn't pick up a martial arts magazine by mistake. The above sentence presents the gist of a hot trend in the Macintosh world, one that will probably change the way you use your Mac—if it hasn’t already. I'm referring to the ability to automate repetitive jobs by recording sequences of commands, keystrokes, and mouse movements for later playback. Such a sequence is called a macro, and it's a remote-control freak's fantasy. Imagine a Mac on autopilot—the pointer plowing across the screen, menu commands flashing, dialog boxes appearing and disappearing without any dialog. That's a macro.

Creating a simple macro involves choosing a recording command, performing some activities, and then choosing a stop-recording command. When you play back the macro, the Mac goes into autopilot while you go do something else.

Programs that let you record and play macros have been available for years—the two veterans are Affinity Microsystems' (303/442-4840) Tempo II Plus and CE Software's (800/523-7638) QuicKeys. But these utilities are being joined by a new generation of macro tools that provide finer controls by allowing you to create scripts—sequences of events that you can play back as well as edit and embellish. In its most advanced form, creating scripts is a form of programming. A script can contain IF-THEN options that enable it to play back different steps depending on certain conditions: "If I've created any files that haven't been backed up today, run my backup program and then shut down. Otherwise, just shut down."

Macro and scripting features are built into a growing number of programs, including Microsoft Excel and Works, ClarisWorks, Lotus 1-2-3, Aldus PageMaker, WordPerfect, and Claris FileMaker Pro. "Macros Spoken Here" compares these programs' automation features.

But the latest word in Mac automation is Apple's own AppleScript, a new enhancement to System 7 that lets you create scripts that control the Mac's Finder as well as application programs that support AppleScript. This month, I spotlight AppleScript's benefits and show how it relates to QuicKeys and Tempo II Plus and to the built-in macro and scripting features many programs provide.

Why Macros?

Before looking at specific macro and scripting tools, let's look at the ways you can put them to work.

- Create custom keyboard shortcuts. A macro doesn't have to perform step after step. One of the most useful uses for a macro product like QuicKeys is to create keyboard shortcuts that start programs or that choose menu commands, tools on palettes, or buttons in dialog boxes. It's a great way to put an extended keyboard's 15 function keys to work.

- Streamline system adjustments. If you frequently switch between monitor settings, network printers or file servers, or other control panel or Chooser-related options, you can set up macros that automate the process. QuicKeys is especially handy for this—it includes an entire category of macro options designed to cut down on trips to the Control Panels folder.

- Simulate the style sheets or glossaries found in word processors. Powerhouse word processors such as Microsoft Word have style-sheet features that automate repetitive formatting, and glossary features that let you store and recall often-used text (for more on style sheets, see Getting Started, March 1993). Most other programs don't have these features, but you can simulate them with macros that choose the desired font and formatting commands or insert often-used text.

- Automate search-and-replace or reformatting operations. Say you're a desktop publisher and one of your first steps in every job is removing the extra space that the folks in the typing pool always put after each sentence. Create a macro that chooses your word processor's Replace command, types two spaces in the Find What box and one space in the Replace With box, and then click on Replace All. Similarly, if you frequently retrieve data from the company mainframe and then reformat it for import into a database or spreadsheet, you can set up a macro that does the formating and importing for you.

- Batch-process files. Say you work with Adobe Photoshop and you always apply a certain filter to freshly scanned images. You can set up a macro that automatically opens a file in a given folder, applies the filter, saves the file, and then proceeds to the next file.

- Create a customized application. With the macro and scripting languages provided by programs such as Excel and Apple's HyperCard, you can create custom applications with pull-down menus and dialog boxes to prompt for information and allow users to choose various options—macro making at its most ambitious.

QuicKeys and Tempo II Plus

With either of these utilities you can accomplish all aspects of Mac automation except creating customized applications. Although they share similar features, each program takes its own approach to macro making.

Using the watch-me style of macro making, Tempo II Plus adds a menu to the Mac's menu bar to begin recording a macro, choose Start Recording from this menu. Then perform the steps you want to record—choose a menu command, type some text, click on a button. When you're done, choose Stop Recording, and Tempo asks you to save the macro and gives it a keyboard shortcut (see "In Tempo").

QuicKeys' record mode works similarly, but it takes a backseat to the QuicKeys control panel, which is where you'll probably create most of your macros. The QuicKeys control panel's Define menu is packed with predefined shortcuts: insert the time and date, close or scroll through windows, adjust system settings (see "QuicKeys Control").
Although macros are relatively simple to create, they may not always be problem-free. A number of pitfalls can trip up a novice macro writer, but QuicKeys and Tempo II Plus provide detours around them. (For a guide to solving the most common macro maladies, see “Macro Troubleshooting Tips.”) You get more reliable macros when you go beyond simply recording a series of events to take advantage of the “smart” features that QuicKeys and Tempo II Plus provide.

So which macro utility should you use? I'm partial to QuicKeys. For the simple macros I create—menu command and scrolling shortcuts, file-opening macros—QuicKeys lives up to its name. But Tempo II Plus does the edge when it comes to creating complex macro sequences whose playback depends on certain conditions being met. QuicKeys’ IF-THEN capabilities are more limited.

The AppleScript Difference
QUICKKEYS AND TEMPO II MUST PROVIDE their smart features because application programs are dumb—they aren’t designed to be operated by remote control. But what if an application was designed with automation in mind? What if it provided a vocabulary of explicit commands that a macro utility could use? The vocabulary would incorporate terms specific to the application—cells, ranges, and charts for spreadsheets, for instance; fields and records for a database; or paragraphs and words for a word processor. When you performed specific tasks, the application would broadcast messages describing what you did. A macro utility could record these messages, incorporating explicit instructions instead of simply simulating mouse-clicks and keystrokes.

Apple’s recently released AppleScript promises to bring this kind of intelligence to the macro world. AppleScript builds on a System 7 mechanism called Apple events, which allows programs to exchange commands and data. Last May’s column on data exchange looked at one aspect of Apple events—the publish-and-subscribe commands that let you create links between documents.

But just as application programs must be designed to support publish-and-subscribe, so must they be written to work with AppleScript. Apple, skilled jargon generator that it is, calls a program that supports AppleScript scriptable. A program can be scriptable on a few levels. A program

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**Macros Spoken Here**

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* = yes; O = no.

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A program that is recordable can work with a script editor utility to automatically create scripts as you work—much like Tempo II Plus and QuicKeys create macros by recording mouse-clicks and keystrokes. You can still create scripts for a program that isn't recordable, but only by typing the script manually.

A program that's attachable lets you assign, or attach, scripts to menu commands or to buttons or other on-screen elements. When you click on or otherwise activate an element to which a script is attached, the script runs. For example, you could customize the way a certain program's Save command works by adding a logging feature that tracks how much time you spent working with the file.

AppleScript also lets you turn a script into a tiny program that you can run directly from the Finder. Such a mini-program is called an applet. You can also create a special type of applet, called a droplet, that acts like a drop box—you can drag icons for files, folders, or disks to the icon of a droplet, and the droplet runs and then performs some kind of operation on those items. You might create a droplet that prints the files dragged to it, or creates aliases of them, or copies their names into a database, or duplicates them and then opens the duplicates.

At this writing, only one program fully supports AppleScript: Aldrin's Systems' StuffIt Deluxe 1.0.5 is both recordable and attachable. Numerous other programs, including Microsoft Excel 4.0, Claris FileMaker Pro 2.0, and Deneba's Canvas 3.0, support AppleScript to some extent, but it will probably be a few months before full scriptability becomes pervasive in the Macintosh world. Even the current version of the Mac's Finder doesn't fully support AppleScript. Apple is working on a recordable Finder, but hasn't announced an availability date.

At present, AppleScript is available only through the Apple Programmer's and Developer's Association (APDA), Apple's source for developer tools (800/282-2732). The $199 AppleScript Developer's Toolkit includes documentation and a utility, called Script Editor, that lets you record, edit, and play back scripts (see "Apple Script"). The AppleScript Developer's Toolkit includes a bare-bones word processor, called Quill, that is recordable. You can use Quill to experiment with the power of AppleScript until your favorite word processor is updated. APDA also sells the $20 AppleScript Runtime Kit, which doesn't include Quill and also lacks the extensive documentation that accompanies the developer's tool kit.

Recording a Script Editor script is similar to recording a Tempo II Plus or QuicKeys macro. Click on Script Editor's Record button, then switch to a recordable application program and perform the tasks you want to record. If you position your windows so that you can see both the program and Script Editor, you'll see program commands appear in Script Editor's window as you work. When you've finished, you can save the script conventionally or as an applet or a droplet.

What with only a few programs supporting it, AppleScript isn't likely to have an immediate impact on the way you use your Mac. Apple has poured the foundation for heavy-duty scripting, but it's up to the architects and carpenters of the software world to build on it. Expect to see AppleScript support included in the next major revision of your favorite programs. Also expect to see more sophisticated script editors appearing from third-party utility makers. When AppleScript hits its stride, there will be no end to the slick ways you can put your Mac to work.

### Macro Troubleshooting Tips

Here's how to avoid the most common macro pitfalls in Tempo II Plus and QuicKeys.

- **Problem:** A file-opening macro you create by invoking your utility's Record command and double-clicking on a file's icon won't work if you later move the icon; when Tempo II Plus or QuicKeys plays the macro, the Mac double-clicks on the wrong icon or no icon at all.
  
  **Solution:** Specify which file or program you want a macro to open. In Tempo II Plus, choose Options from the 3 file menu and click on either the Launch Application or Launch File button, and then choose the program or file to be opened. In the QuicKeys control panel, choose File from the Define menu and then select the desired program or file.

- **Problem:** Macros that choose menu commands can fail if a program changes its menu wording as it operates. (For instance, most word processors have a Show Ruler command that changes to Read Hide Ruler when the ruler is visible.)
  
  **Solution:** Tell the macro program to choose the command based on its position within a given menu rather than on its wording.

- **Problem:** A macro that checks a box within a dialog box can fail if the box is already checked when the macro runs.
  
  **Solution:** Enable Tempo II Plus's Smart Check Boxes option (in the Preferences dialog box) before recording the macro. In QuicKeys' Button dialog box, select the Only If Button Is Off option.

- **Problem:** A macro that selects a tool in a palette can fail if you move the palette elsewhere on the screen.
  
  **Solution:** Be sure Tempo II Plus's Enable Smart Features button is selected when recording the macro. In QuicKeys, use the Click Location dialog box to tell QuicKeys to click relative to the document window (in this case the palette).

- **Problem:** The macro utility may appear to skip some steps when playing back a multistep macro.
  
  **Solution:** Add pauses between the steps. Use the Pause command in QuicKeys' Define menu or the Pause for Interval command in Tempo II Plus.

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**End of Script**

**This is my 80th Getting Started column. It's also my last. Next month, I will be starting a new and improved column for Macworld. But I can't wrap up my stint as Mr. Getting Started without a double-click and a tip of the hat to my editor and colleague Cathy Abes, who took over Getting Started shortly after its inception in 1986 and has since expertly polished dozens of columns, too many of which involved missed deadlines and last-minute changes and corrections. It's been fun, and I hope my new editor is as patient and skilled—and as fond of my standard poohole.**

I hope you've enjoyed my attempts to demystify the Macintosh and I hope you'll join me in my new assignment.

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*Contributing editor Jim Heid looks at a different aspect of Mac fundamentals each month. His latest book is the second edition of *Inside the Apple Macintosh* (Brady, 1992), which he coauthored with Peter Norton.*
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Circle 92 on reader service card.
The Network Connection

TODAY, TO PARAPHRASE JOHN DONNE, no computer is an island, entire of itself. Nearly every computer is connected to a network at least part of the time—even the PowerBook, which works pretty well as an island. A network—with its mass of wires, passwords, and administrative decisions—is in some ways the antithesis of the PowerBook.

Yet nearly every PowerBook user has to cope with a network at some point—to use a laser printer, to exchange files, to send and retrieve electronic mail. Of course, you could avoid networks entirely by exchanging information via floppy disk; for the occasional file transfer, a floppy does the job with less fuss than a network. But in the long run, connecting to a network makes information-sharing much easier.

Connecting Up

ANY POWERBOOK CAN CONNECT TO A LocalTalk network just like any other Mac; you simply plug a connector box into the printer port. Depending on the wiring for a particular network, you need either Apple's LocalTalk connector kit or equivalent for a three-wire cable, or a Farallon PhoneNet connector or equivalent for a telephone-line jack. You don't need to carry both; you can just pack a PhoneNet connector and an adapter from Farallon that connects an RJ-11 plug to a three-pin mini-DIN plug to link up to Apple's connectors.

Attaching to and detaching from a network creates a problem for a PowerBook running on batteries. To save battery power, turn off AppleTalk when you don't need it. But if you start up the PowerBook with AppleTalk on, you must go into the Chooser, turn AppleTalk off, and then restart to connect to a network. If you start up with AppleTalk on, then you can toggle it on and off. Loading AppleTalk takes about 60K of RAM, however. Several utilities can toggle AppleTalk. Connectix CPU version 2 lets you set a PowerBook to always start up with AppleTalk; you can then turn it off with a menu command or by selecting a battery-power configuration.

Ethernet and Token Ring

THERE ARE TWO WAYS TO CONNECT TO Ethernet and Token Ring networks. The indirect method is to connect a PowerBook through a LocalTalk gateway on a host Macintosh that has a direct connection to Ethernet or Token Ring. PowerPath software ($149, Farallon, 510/814-5000) on the host Mac acts as a gateway. PowerPath runs in the background on the host Mac and supports just one Mac connected via LocalTalk. Farallon's LocalPath ($199) supports up to eight Macs connected to a host Mac that's connected to an Ethernet or Token Ring network.

PowerPath's indirect scheme works fine for printing, file transfer, and electronic mail; but LocalTalk is too slow for intensive network use—such as launching programs across the network or working interactively on large files.

You can circumvent LocalTalk's speed limits by connecting directly to Ethernet with a SCSI Ethernet adapter, which plugs into the PowerBook's SCSI port. If you travel, then the best choice is the Mini EN/SC adapter from Asante Technologies (408/435-8388, 800/662-9686). About the size of two cassette tape boxes, it comes with a SCSI Y connector that attaches directly to the PowerBook's SCSI port. It weighs about 1.3 pounds with cable and power supply. The Asante adapter comes in two forms. The $459 Mini EN/SC accepts two standard Ethernet cable types, 10BaseT—telephone-style unshielded twisted-pair (UTP) wires—and thin coaxial. The Mini EN/SC automatically selects the cable in use. The $399 Mini EN/SC-10T adapter accepts only UTP.

Other SCSI Ethernet adapters are larger, although not terribly burdensome for travel. Focus Enhancements offers one of the least expensive, the EtherLAN SC ($199.99 for UTP; add $20 for thin coax). You will also need Apple's HDI-30 SCSI System Cable adapter ($39) or equivalent to connect from a PowerBook.

Thus far, no one makes a Token Ring adapter that plugs into the SCSI port of a PowerBook; all the current adapters are designed for installation inside a desktop Mac. A NuBus board will work in Apple's large Duo Dock, but otherwise a PowerBook owner who needs to connect to Token Ring has to connect indirectly.

But watch out—whenever you need to connect to or disconnect from a network through a cable, first make sure that contains...
you're not going to bring down the network in the process. Network wiring arranged in a star configuration, such as 10BaseT Ethernet cabling, generally permits connection and removal of a node without fuss, since the cable that you attach to your PowerBook affects only your node. But when you connect to or disconnect from Ethernet coax wiring or Apple's LocalTalk wiring, the cable carries all the network traffic, so always check with the network manager before you pull any plug. If you are a guest on a network, the quickest way to get everyone's attention is to crash the network. You won't be a guest again.

**AppleTalk Remote Access**

**Instead of Plugging Your PowerBook into the network itself**, you can connect with AppleTalk Remote Access (ARA), a $199 software package from Apple that supports connection to AppleTalk by modem. (For a step-by-step guide to the installation and use of ARA, see “Remote Possibilities,” Macworld, January 1993.) If you use ARA regularly, I recommend replacing the application in ARA with ARACommander, a $19.95 program from Trilobyte Software (513/777-6641). You'll still need ARA's drivers, but ARACommander features a simpler interface than ARA; and ARACommander uses just 48K of RAM, compared with 230K for ARA.

The ARA license allows installation on up to three Macintoshes. The most common setup links a remote PowerBook (the ARA client) with an office-based Macintosh (the ARA server). Both Macs need a modem with a CCL (connection control language) script for ARA that is 9600 bits per second or faster; 2400-bps modems are too slow.

If you are traveling, will the server Macintosh be turned on when you dial in? You can leave a server on continuously, if you don't mind wasting electricity. Running a H1c1 with a color monitor around the clock instead of 40 hours a week adds about an extra $135 a year to your electric bill. In the future, desktop computers with an automatic sleep mode will solve this problem. With today's computers, you need to install a power switch that you can trigger remotely by phone. The $199 PowerSwitch LT from Radiant (415/296-8040) is a remote switch built into a LocalTalk node. When triggered by a ringing signal on the phone line, the PowerSwitch can start any desktop Mac—whether it's keyboard-driven or has a built-in power switch. With a single phone call, you can have multiple PowerSwitches on the network selectively turn on other Macs and peripherals.

If you need control over only one Mac, try the simpler PowerKeyRemote ($49; Sophisticated Circuits, 206/485-7979). It can start any keyboard-driven Mac, but for Macs that don’t start from the keyboard you also need a $119 PowerKey. The PowerKey products aren’t networkable, so you cannot selectively control which devices are turned on.

While ARA runs in the background, a server Mac can be used for normal operation; it can even be used for a second telecommunications process (except another ARA session)—if equipped with two modems and a Nullbus board that provides additional serial ports, such as a QuadraLink board from Applied Engineering (214/241-6060, 800/554-6227). The standard QuadraLink board costs $219 (the enhanced QuadraLink DMA isn't necessary for this application). But there are some potential problems. What if the server Mac crashes? Or someone turns off its power?

One way to minimize these problems is to use a dedicated ARA node, such as the $699 LanRover/L from Shiva Systems (617/270-8500, 800/458-3550). The LanRover/L is a small box with a LocalTalk connector for the network and a single serial port for a modem. Since the LanRover/L has no storage of its own, it depends on networked Macs for setup, configuration, and data storage—at least one Mac with file sharing enabled must be running whenever someone dials in to the LanRover/L, so you still have to guard against inadvertent shutdowns.

Another solution is dedicating a Mac to running ARA. But how powerful would that Mac have to be? According to Shiva, a LanRover/L is equivalent to a Mac Ici for network performance. But for most situations, a cheaper Mac will probably suffice as a dedicated ARA node. And a dedicated Mac offers some additional flexibility for setup and security: it doesn’t need a monitor or keyboard after setup; you can configure it from another Mac with Farallon’s Timbuktu (see “Grabbing a Computer”). But any desktop Mac takes up much more space than a LanRover/L.

For a large network with many users, several people may need to connect remotely to the network at the same time. None of the methods described above support multiple simultaneous remote connection. You could simply add ARA nodes, but the cleaner solution is a remote network server, a network node that supports multiple ARA sessions simultaneously. All the currently available remote network servers use Ethernet. (A multiport remote network server for LocalTalk should be available later this year.)
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If you need more ARA ports, you can buy several of these units and stack them in any combination; they all fit into standard 19-inch racks. Or you can get a NetBlazer ($2299-$8000; Telcedit, 408/734-4333, 800/835-3248), which comes in versions supporting up to 26 ports.

All of these products support ARA’s callback feature, another security measure. When you first dial in, you enter a password, and hang up. ARA dials you back at a phone number stored in its memory. Callback works fine when you are in a fixed location; it doesn’t work when you are traveling and staying at a succession of hotels. Although multiple-port products effectively share modems on a network, they cannot be used for general telecommunications such as dialing in to online services; this should change with software updates. The single-line LanRover/L lets anyone on the network dial out to online services.

Choosing Devices

IF YOU CONNECT YOUR POWERBOOK TO different networks—either directly or remotely—you’ll encounter some problems and pitfalls not faced by permanent network residents. Each time you switch networks you have to change the printer selection through the Chooser; on a large network with many zones and printer choices, this process is especially slow. Connectix’s CPU version 2 makes this easier by remembering your printer choice for each network you connect to.

For most printing jobs, changing the Chooser selection suffices, but not always—some applications need to know the type of printer as well as its print capabilities. For example, one printer might be a standard 300-dpi PostScript printer able to print a halftone at 53 lines per inch; a second printer might have PhotoGrade and print halftones at 106 lpi. When you switch printers, you may have to change these settings within the application to get the best results.

Apple’s Chooser displays a flat listing of all network zones and devices—fine for small networks, but tedious with large ones. And the Chooser’s view of network zones is created when it’s launched, a static view that remains for however long you are connected to the network. If the network changes—if someone plugs in a PowerBook or connects via ARA—you won’t see the change.

You can avoid these nuisances by installing Silver Cloud from AG Group ($109, Gizmo Technology, 510/623-7899) which enables sharing of other Apple QuickDraw printers and includes many printing features such as notification when a print job is done. For sharing label printers and modems as well as printers, try ShadowLAN from Applied Engineering ($109). As a general-purpose program, ShadowLAN lets the printer-oriented features of ShadowWriter.

If you do a lot of interactive work on a network, synchronizing all the clocks will help. NetTime ($69 for two users, $299 for ten users; Jeddak, 408/894-6900, 800/982-6900) can synchronize all Macintosh clocks over a network—including connected PowerBooks—through the server Mac. A NetTime-equipped PowerBook resets its clock whenever it connects to the network, whether by direct connection or by ARA.

Large Networks

POW E R B O O K S CAN CONNECT E ASI L Y TO any of the major PC networks. Novell NetWare, Banyan VINES, Microsoft LAN Manager, and Windows NT all offer support for Mac clients—either as a built-in feature or with optional software. You can also connect to a NetWare server through NetMounter, part of Dayna Communications’ DOS Mounter Plus ($99.95 per user, 801/269-7200, 800/531-0600). Or you can connect as a PC client with Universal SoftPC ($325) and SoftNode ($199) from Insignia Solutions (415/694-7600, 888/848-7677).

Another way you can connect a PowerBook to almost any PC network is through Personal MACLAN Connect (PMC), a $199 program from Miramar (805/966-2432). PMC is a Windows program that runs on a DOS machine connected to a PC network. With the addition of a LocalTalk board, the DOS computer can be connected with up to ten Macs. The Macs require no special software—they remain AppleShare nodes rather than becoming clients of the PC network—but they can share files on the PC network through PMC. PMC works with LANtastic, Windows for Workgroups, Invisible LAN, and other small-scale networks, as well as with NetWare, VINES, and LAN Manager. The more ambitious MacLAN Connect ($695) turns a dedicated PC into a gateway to the same types of networks.

Next Steps

DESpite ALL THE CONFUSION AND COMPLEXITIES involved in connecting a PowerBook to a network, some improvements are on the horizon. Today, ARA establishes connections for AppleTalk only. In the near future, point-to-point protocol (PPP) will enhance dial-up communications. PPP is a communication protocol standard that will do for serial connections what Ethernet does for network wiring. PPP will support multiple transport protocols—AppleTalk, TCP/IP, Novell’s IPX, and others. Developed by a committee of companies that produce network products, PPP embeds unique network-protocol identifiers in data packets that enable you to connect to your network—regardless of its operating system—through a modem.

Suppose all PowerBooks came equipped with an infrared transmitter and receiver. You would walk into the office and connect your PowerBook to the network by infrared beam, and you wouldn’t have to fuss with cables and adapters. The Collaborative Mac, a tiny infrared LocalTalk transceiver powered through any Mac’s ADB port, will make this possible; Photonics Corporation (408/370-3033, 800/628-3033) plans to offer it this year. To use one, you’ll need a second transceiver plugged into the wired network through a PhoneNet connector. The price has not been set; it should be in the few-hundred-dollar range.

Cary Lu is a Macworld contributing editor and author of The Apple Macintosh Book (Microsoft Press, 1992).
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Edited by Wendy Sharp

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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, $99. In a straightforward, unimmitating 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, Satori Software, 206/443-0763, $795 per module. Simple, flexible architecture sets a new design standard for Macintosh accounting software, but 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.

Job Cost/Time Billing 1.05 (1.06), Satori Software, 206/443-0765, $1495. Professional billing software incorporates high-end job-cost and accounts-receivable features in one module, plus an excellent report function; but confusing elements, minor bugs, and inaccuracies in the documentation are weaknesses. Aug 92

MacinTax 1992, ChipSoft, 619/453-8722, $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

MYOB 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.

Quicken 3.0, Intuit, 415/852-9696, $59.95. Track assets, liabilities, income, and expenses with this personal-finance package. It has a good Mac interface and is easy to learn and use.

Timeslips III 2.1, Timeslips 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, ACI US, 408/252-4444, three users $1495, six users $2495, ten users $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, $895. 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, $899. Professional-level mail-list management tool on CD-ROM is the most comprehensive system available, but its messy documentation and inexcurable user-interface violations make our reviewer reluctant to recommend it. May 93

Atlas Pro 1.0 (2.0), Strategic Mapping, 408/985-7400, $795. Although this mapping software is not a complete geographic-information system, it boasts a rich feature set and a competitive price. Nov 92

Bar Code Pro 1.0 (1.3), Synerx, 718/499-6293, $450. Easy-to-use desk accessory creates bar codes in EPS or PICT for use in desktop publishing or labeling programs. It does well what it sets out to do, but lacks automatic sequential coding and fails to catch invalid characters. Sep 92

DeltaGraph Professional 2.01 (2.03), DeltaPoint, 408/648-4000, $295. A smooth interface and outstanding technical support are only two of the stellar features in this graphing and charting program. This upgrade adds 13 new chart types and a number of presentation capabilities. May 92

Fair Witness 1.1 (1.2.1), Chena Software, 215/770-1210, $295. A valuable tool for planning any project, this software coherently integrates outlining, information charts, scheduling, and time charts. Oct 92

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

FilrMaker Pro 2.0, Claris Corp., 408/727-8227, $295. User-friendly, improved mailing labels and text-handling, and support for QuickTime and Apple events are the major new features of this upgraded, multitier, flat-file/database. Although it has some minor bugs, this is a strong upgrade to an excellent program. Jan 93

FlowChart Express 1.0 (1.01), Kaetron Software Corp., 713/800-3434, $145. Inexpensive, easy-to-use flowchart software readily meets the needs of most flowchart creators, although those with extensive requirements will need a larger, more powerful feature set. Jan 93

GeoQuery 3.02, GeoQuery Corp., 708/827-0535, $395. Gain geographic perspective with this custom-map generator and data-analysis software that uses zip codes to create "pushpin" maps of files from your spreadsheet or database. Nov 92

GraphMaster 1.3a (1.34), Visual Business Systems, 404/325-0325, $195. Excellent general-purpose charting and graphing program offers a number of unusual features, including pictographs and continues.
### Macworld Star Ratings

360-degree free rotation. A frequent inability to undo actions is the only serious irritation. May 92

**Helix Express 1.0**, Helix Technologies, 708/205-1669, $439. One of the most distinctive database products ever developed, this relational database has an iconic programming language that sometimes baffles traditional database programmers, but provides an easy route into basic data-handling chores for nonprogrammers. Helix Express is still the ultimate in multiluser simplicity for relational databases. Jul 93

**iThink 2.2.1.1, High Performance Systems**, 603/643-9636, $695. Although it requires a real training commitment for effective use, this product is an attractive dynamic business modeling system. It's a good bet for identifying cloudy spots in the crystal ball. May 93

**Lotus 1-2-3 for Macintosh 1.0 (1.1)**, Lotus Development Corp., 800/543-5414, $495. Spreadsheet program from the other side holds its own against Mac competitors. Its many strengths include graphing, well-implemented linking, compatibility with the DOS version, and an outstanding Help system. Apr 93

**MacBarCode 2.2.4, ComputaLabel**, 508/462-0993, three-code version $349; single-code professional version $495; six-code professional package $895. Compact, simple-to-use desk accessory creates bar codes in either EPS or Adobe Illustrator 1.1 format. DA cannot automatically create serial codes. Jun 93

**MacProject Pro, Claris Corp.**, 408/727-8227, $599. If you're working on a midsize project and like using PERT charts (where tasks appear in boxes and are connected by straight lines), this may be the project-management software for you. However, the multistep scheduling process and the limited integration between charts is frustrating if you prefer Gantt charts. May 93

**Microsoft Excel 4.0**, Microsoft Corp., 206/882-8080, $495. Create impressive spreadsheets with this upgrade that includes all the features you wished 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 unspectacular 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

**MultiBase Pro 1.5 (1.7)**, Tactic 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)**, Oryx Associates, 415/563-9971, $595. 4D-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

**Onnis 7 1.1, Blyth Software**, 415/312-7100, $1250. The plain, businesslike functionality of this database-development system produces solid applications without much fuss. Dec 92

**OrgChart Express 1.0**, Kaerion Software, 713/880-3434, $279. Organization-chart software links a database to standard box-drawing 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. Disarmingly easy-to-learn flat-file database is full of labor-saving data-entry features, plus 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, 800/352-7352, $1299.95. 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

**PowerPlay 1.1 (1.0)**, Cognos, 617/229-6600, $695. A good program for a very limited range of business-analytic tasks. The views of data and graphs are small and manageable, and the program tabulates them in several colorful ways. Aug 92

**SpreadBase 1.0.1, Objective Software**, 415/306-7410, $695. Powerful business data-analytic tool is a unique combination of database and spreadsheet functions. It's worth a close look for power users, despite meager documentation and a cranky macro language. May 93

**Wings 1.1ace, Informix Software**, 913/599-7100, $399. If you want a low-overhead spreadsheet with advanced-math functionality, this is an attractive product. What you get is a competent calculating engine with superior charts; what you miss is outlining, real 3-D spreadsheet linking, and the host of third-party add-ons offered for Microsoft Excel. Jul 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 users should generally be pleased. Jun 93

### Communications/Networks

**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

**AccessPC 2.0, Insogna Solutions**, 415/694-7600, $99.95. Slick control over formatting multiple types of DOS media is the major advantage of this file-transfer utility. Oct 92

**CompuServe Information Manager 2.0.1, CompuServe**, 614/457-8600, $49.95. The goal of this product is to give friendlier 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, $79. For basic file-transfer, this control panel device allowing cross-platform file sharing is fine, but it's hardly state-of-the-art. Oct 92

**MicroPhone II 4.0 (4.0.2)**, Software Ventures Corp., 510/644-3323, $295. Refinements are evident throughout this telecommunications software's upgrade, but not everyone needs $295 worth of sophistication. The impressive scripting facility is countered by poor help features. Jul 93

**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

**NetVista 2.0, Eclectec**, 408/462-2040, $595, unlimited nodes $4985. One-of-a-kind network-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 SuperVisor 2.01, CSG Technologies**, 412/471-7170, $495. Fast and accurate data collection is the strong point of this network-management utility, but the interface isn't intuitive. Aug 92

**Network Vital Signs 1.0 (1.1)**, Dayna Communications, 801/531-0600, $449. 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

**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 internets, but too pricey for small networks. Oct 92

**SoftPC with Windows, Insogna 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 languor. Jun 93

**TechWorks Net Utilities 1.0, Technology Works**, 512/794-8533, $129. Collection of five separate applications provides essential network-monitoring tools at a price that would please anyone. Dec 92

**Timbuktu 5.0.1, Farallon Computing**, 510/814-5000, single user $199, multiuser $995 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 another computer. this terminal-emulation product allows to use resources almost anywhere on a network. Despite minor kinkies, it's a clear winner. Mar 93

**Vicom Terminal Emulators (4.2)**, Vicom Technology, 604/684-9517, $195 to $3500. These bare-bones, British-designed terminal emulators lack many common U.S. modem configurations, but do support multiple simultaneous sessions. Aug 92

**WhiteKnight 11 (11.14)**, The FreeSoft Company, 412/846-2700, $130. In the right hands, this product is the precision tool of communications software.
but it does assume familiarity with telecommunications and
with programming concepts.

DESKTOP PUBLISHING

Aldus PageMaker 4.2, Aldus Corp., 206/
628-2320, $795. Intuitive 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 Personal Press 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 fine-tuning difficult and is almost
certain to confuse and confound beginners. Mar 92

Systems, Apple Font Pack, Apple Computer, 408/
956-1010, 599. Apple's first collection of TrueType fonts
includes only 12 fonts that haven't been available since the
early eighties in the PageMaker format. Still, it's not a bad
deal, considering that Adobe PostScript fonts cost four times
as much. Mar 93

Fontographer 3.5 (3.5.1), Alesys 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

Lazy Dog Foundry Personal Font, Lazy Dog
Foundry, 612/291-0306, $199.99, full 180-
character set $499.99. Type 1 font made from your
handwriting is clean, even legible—whether or not your
writing is. Apr 93

LetraStudeto 2.0, Letraset USA, 201/
845-6100, $249. Precise, intuitive control over charactere
spaceing and spacing, as well as a straightforward interfa-
face, make this program a great choice for manipulating
type, but it lacks flashy effects, such as gradient fills. Oct 92

MacQuill 1.0, Nest Software, 408/441-
1944, $59.95. Friendly, inexpensive page-layout pro-
gram is missing basic features, such as kerning and import-
ring, and suffers from some bugs and deficiencies, but for
simple word processing and page-layout, it's service-
able. Aug 92

Multiple Master Myriad 1.0, Adobe
Systems, 415/961-4400, $185. Elegant execution
and functional design combine in this two-axle Multiple Master
typeface that exceeds all previous ideas of electronic
type design. 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 93

Publish It Easy 3.0, Timeworks, 708/
559-1300, $199.95. Desktop-publishing program of-
ers writing, editing, formatting, page-layout, drawing, and
Painting tools with 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-
ation-relievers 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/
438-2839, $695. A strange mixture of power and over-
size, this page-design and -layout software provides sev-
eral 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-generator. Printing specimen sheets in
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

Algebra, Brodbrd Software, 415/
382-4400, $89.95, school edition $99.95. Interac-
tive, imaginative math tutorial is keyed to the standard
textbook order of topics, but offers much more. It is par-
ticularly strong on word problems and graphing. May 93

The Ca stle of Dr. Brain 1.0, Sierra On-
line, 209/633-4468, $99. After applying for a
job as a fab assistant with the local mad scientist, use logic
and raw brain-power to navigate a series of rooms, mazes,
and hallways on the way to your interview. Puzzles range
from simple and mundane to creatively laborious. Dec 92

Comprehensive Review in Biology, Queue,
203/335-0980, $295. There isn't a textbook publisher
in North America with the nerve to publish a black-and-
white book with nothing more than text and basic
line drawings, much less charge several hundred dollars for
these educational adventure games. Imaginary landscapes
and worlds appeal to younger readers, but the high cost and sluggish
performance may be prohibitive. Apr 93

Eco-Adventures in the Ocean, Eco-
Adv entures 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 may
confuse some students. Nov 92

Headline Harry and the Great Paper
Race 1.0, Davidson & Associates, 310/793-0600,
$55.95. Travel through time and across the country as a
journalist in this history/geography game. While not an
educational masterpiece, it is lots of fun. Dec 92

MacGlobe 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 in data
export, it provides a fascinating intellectual adventure for
home and school use. Feb 93

Maths Festival's Interactive
Teaching Typing 2.0, The Software Toolworks, 415/883-
3000, $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 soft-
ware provides a variety of ways for preschoolers to experi-
mint with numbers and counting. It's entertaining and
engaging, 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

NihongoWario, Vol. 1, Qualitas Trading
Company, 510/847-9080, $349. Although this Japan-
ese language CD-ROM offers solid instruction, it's so ex-
pensive and so limited in its word selection that it's not an
economical choice for individual users. Jan 93

Picture It 1.0 (1.4), Penton Overseas, 619/
431-0060, $69.95. If you add custom word lists, this
interactive English-French picture dictionary may serve as a
dependable aid to a more complete curriculum, but it's buggy
and of uneven quality. Aug 92

The Secret Codes of C.Y.P.H.E.R. 1.0 (1.1),
Tanager Software Productions, 510/430-0900,
$59.95. Intriguing facts about mammals and a variety of
alphabets provide the interest in this educational game,
but the indecipherable, repetitive animations are a major
drawback. Apr 93

The Secret Island of Dr. Quandary 1.0
(1.0), Aluis BBS/1500, $49.95, teacher's
edition $69.95. Clever package of gorgeous landscapes,
catchy sounds, and tempting arcade-games puzzles uses math,
logic, and reading skills. Although somewhat slow, it's fun
for parents and kids. Jun 93

Stickybear's Reading Room 2.2a, Op-
Optimum Resource, 803/785-7441, $59.95. Edu-
cational game with four different activities takes a sedate
but direct path to building primary-level reading skills. It's
appropriate for ages four to eight, but probably too juve-
nile for older kids. Jun 93

Time Treks 1.0, Earthquest, 415/321-
5838, $59.95. An eccentric archaeologist opens portals to
through time, and you must close them in this educational, HyperCard-based game. Slow response time and limited animation and color are somewhat disappointing, but overall it's a fun way to browse through history. See p. 72.****

Where in the World Is Carmen Sandiego? 1.0 (1.3), Broderbund Software, 415/382-4400, $44.95. Travel through time and the U.S. chasing those V.I.P.E. crooks in this clever educational history/geography game that's challenging for all ages. Mar 93

Where in America's Past Is Carmen Sandiego? Deluxe Edition, Broderbund Software, 415/382-4400, $59.95. The V.I.P.E. gang is at it again, stealing famous objects and fleeing to locations around the world. In this deluxe version of the well-known geography 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-disk copy protection, geometric figures, and the inability to save games in progress make 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. Apr 93

America Alive, MediaAlive/CD Technology, 408/752-B500, $99. QuickTime movies, color photographs and maps, and text and audio mingle in this multimedia CD-ROM guide to the United States. 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 arouse 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

AudioShip 1.0 (1.05), Opcode Systems, 415/856-3333, $69.95. Audiophiles will get a kick out of applying sound effects to any sound file on their Macs. You can also control the order of songs or sounds on an audio CD played on a CD-ROM player. A number of quirks may confuse new users. Sep 92

Beatle-Made Chess CD ROM, Interplay Productions, 714/553-6678, $79.95. Elaborately detailed cartoon characters act out little-known stories of the Beatles' career against the backdrop of classic chess games that will give nine-year-olds mad with glee but may annoy experienced chess players. Mar 93

The Battle of Britain, Deadly Games, 215/235-2284, $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, $59.95. Sarelle's graphics in this fantasy martial-arts game are spectacular—across from Okk and Seuss—but the arcade action is extremely difficult to master. Sep 92

Capitalist Pig 1.0 (1.02), Plasma Software, 602/969-4441, $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, retiring, and writing novels is not an option. Sep 92

Cognito 1.0, Inline 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 tiles. The deviously simple twist is that clicking on the arrows that control movement results in reversing the action that offers smooth graphics, good special effects, and great documentation. Apr 93

Cyberblast 2.0, Innerprise Software, 410/560-2434, $49.95. Aliens have overrun the earth. It's a nice, basic shoot-'em-up, with clever execution and appealing graphics. Sep 92

Death and Transfiguration, The Voyager Company, 310/451-1383, $59.95. This is the CD-ROM's lively text. However, the discussion is relatively unhackling and the musical performance, though well embeulement, is relatively simple. For the price, other music-education CD-ROMs present better values. Apr 93

The Orchestra: The Instruments Revealed, Warner New Media, 818/955-9999, $79.98. The many-branched, interwoven hypertext style of this music-education CD-ROM makes the program hard to navigate and digest, despite its richness. For the price, other music-education CD-ROMs present better values. Apr 93

Poetry in Motion, The Voyager Company, 310/451-1383, $29.95. Performance videos of contemporary poets are juxtaposed with the texts of their poems and taped interviews in this intriguing CD-ROM that combines the excitement of the stage with the reflective appeal of the page. Feb 93

Prince of Persia, Broderbund Software, 415/382-4400, $49.95. A high tolerance for frustration is necessary to negotiate the 12 maze-like levels of dungeon and palace in this adventure adventure, but amazingly realistic (albeit gory) animation, stunning graphics, and entertaining challenges make it worthwhile. Sep 92

Red Baron 1.0, Dynamix, 800/326-6624, $69.95. The romance of history and the realism of a flight simulator combine in this World War I flight game. Despite small annoyances, including too many dialog boxes to get to the simulation, this game will charm any aspiring ace. Nov 92

Richard Strauss: Three Tone Poems, The Voyager Company, 310/451-1383, $59.95. Dan Ioan, Till Eulenspiegel, and Death and Transfiguration are the three works included in this CD-ROM, with a program written by Russell Steinberg. The musical analysis is satisfying and the lush orchestral music will appeal to both novice and experienced classical music listeners. Apr 93

Rodney's Wonder Window, The Voyager Company, 310/461-1383, $39.95. Collection of 23 colorful, wacky graphics and animations by Rodney Alan Greenblat is charming but uneven. The overall look is surreal and cartoonish, but while some modules are elaborately and sophisticated, others are simple and not particularly interesting. Mar 93

Schubert: "The Trout" Quintet, The Voyager Company, 310/451-1383, $59.95. 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 unhackling 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 quirky copy protection only slightly spoil the delight. Sep 92

Sherlock Holmes, Consulting Detective 1.0, Icon Simulations, 708/520-4440, $69.95. Accompany Sherlock Holmes and Watson as they investigate three CD-ROM-based mysteries. Primarily made up of video scenes, this game's only slightly more interactive than TV, and the picture's not as good. Aug 92

Mozart: The "Dissonant" Quartet, The Voyager Company, 310/451-1383, $59.95. This CD-ROM includes an unusual essay on the anatomy of stringed instruments, brief discussions of general musical concepts, an analytical overview of the quartet, and a taped miniculture on Mozart's life, but sadly enough the music is limited almost entirely to the title piece. Apr 93
Sherlock Holmes, Consulting Detective, Volume II, Icon Simulations, 708/520-4400, $69.95. Match wits with the legendary detective by solving three difficult mysteries in this CD-ROM game. May 93

SimLife, Maxis, $10/254-9700, $69.95. A megolomaniac's dream come true, this amazing 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 I: Bach and Before, The Voyager Company, 310/451-1383, $24.95. Engaging text by classical-music critic and lecturer Alan Rich describes nearly two millennia of western music (up to the mid-eighteenth century) in this CD-ROM. It offers a unique and affordable opportunity to sample 50 or so performances, styles, and compositions. Feb 93

Space Quest 1: Roger Wilco in the Sarien Encounter, Sierra Online, 209/683/8989, $19.95. As Roger Wilco, starship janitor, 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

Spaceward Ho 2.01 (3.01), Delta Tao Software, 408/730-9336, $39. A happy planet is a profitable planet in this absorbing, humorous strategy game of interstellar capitalism and imperialism. Aug 92

Super Mines 1.0, Callistone Corp., 508/655-0707, $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, 410/560-0973, $59.95. Surgical-simulation game with realistic graphics and sound can be entertaining and educational, but it's overly intolerant of mistakes—not for the faint of heart or the easily frustrated. Sep 92

Warlords, Strategic Studies Group, 904/494-9372, $49.50. A medieval fantasy based on the real-world game of strategy and conquest with beautiful graphics. Unfortunately, the computer opponents are not challenging enough for an experienced wargamer, although human opponents may be. Dec 92

Who Killed Sam Rupert, Creative Multimedia Corp., 502/241-4351, $39.99. You're a police detective trying to solve the murder of a popular restaurateur in this interactive CD-ROM that exploits the full range of multimedia options and provides a wealth of clues and surprises to hold your interest. May 93

Adobe Dimensions, Adobe Systems, 415/961-4400, $199. This three-dimensional-effects utility may seem very limited, with white-only light and no surface texturing, but it's a ground-breaking product. It performs its 3-D illusions within the object-oriented, resolution-independent world of PostScript and is an excellent tool for anyone who works extensively in Adobe Illustrator or Aldus Freehand. Apr 93

Adobe Illustrator 3.01 (3.23), Adobe Systems, 415/961-4400, $695. Adapt transformation and reshaping capabilities and superb text-handling stand out in this object-oriented illustration program. It also includes features found in no other Macintosh draw program, such as tools to create line and bar graphs.

Adobe Photoshop 2.5, Adobe Systems, 415/961-4400, $895. No graphics program is as universally loved as and downright deserving of user loyalty as this one, but while this upgrade builds on the program's wide range of capabilities, it ignores some minor weaknesses that have begun to peek through the product's armor. It's still great but perhaps not perfect. Jun 93

Aldus FreeHand 3.1 (3.11), Aldus Corp., 206/628-2320, $595. A pressure-sensitive freehand tool is the most remarkable new feature of this updated drawing program. Substitution for missing fonts is another good addition, but skimpy text-editing tools and incomplete support for EPS continue to diminish its value. Jun 93

Aldas Sketch 1.5, Alias Research, 416/362-9181, $995. The enhanced modeling and revamped rendering capabilities of this 3-D illustration program contribute to a tremendous and reliable upgrade, a heartening example of a company listening to its users and delivering on its promises. Jul 93

ArchicAD 4.0 (4.1.2), Graphisoft USA, 415/737-8665, $4450. The simple yet powerful 3-D interface in this CAD package builds on a construction metaphor. The integrated product incorporates most of the features an architect needs. Jun 93

ArtBeat Professional 1.0, Pie Practical Solutions, 201/902-9500, $249. Despite a smattering of unique capabilities, this inexpensive draw and paint program lacks many of the features of equivalent programs. Apr 93

artWorks 1.0, Deneba Software, 305/596-6644, $149. If you're expecting a graphics dynamic, this combination paint and draw program will leave you a little cold. But despite its flaws, it ranks as one of the best graphics programs available under $200. Jun 93

AutoCAD Release 11, Autodesk, 415/332-2344, $3500. Customizable, bare-bones drafting upgrade partially implements a graphical user interface. Few add-ons are currently available. Apr 93

Blueprint 4.0, Graphisoft, 410/461-9488, $295. Entry-level 2-D drafting program is a wonderful antidote to the complicated CAD system blues. Don't be misled by the low price; this "full-fledged" drafting package is powerful enough to serve professionals who appreciate the value of simplicity. Jul 93

CA- CricketDraw III 1.0, Computer Associates International, 408/432-1727, $249. Although not revolutionary, this draw program boasts some original implementations, including dramatically improved graduations. May 93

Cachet 1.0 (1.2), Electronics for Imaging, 415/742-3400, $595. The tools, interface, output, and documentation of this color-image editor are all quite impressive for a first version, but serious failings include slowness and disappointing sharpening. Dec 92

Canvas 3.0 (3.0.6), Deneba Software, 805/596-6444, $399. Discovering the complex nuances of this draw program's immense feature list isn't easy, but it's well worth the effort. The precision drawing functions in particular should appeal to many users.

Color It 2.0.1, Timeworks, 708/559-1300, $299.95. Overpriced color paint program has a full range of painting and image-recouping capabilities, including 15 levels of undo and an impressive magic wand tool, but its naming conventions are bewildering. Apr 93

C PMC Graphic Tutor 1 & 2, Casesy's Page Mill, 303/220-1463, $489 per volume. Although some neophytes may find these CD-ROM tutorials on Adobe Illustrator and Adobe Photoshop helpful, the programs' disorienting interfaces, inconsistent execution, lack of polish, and high price weigh strongly against them. May 93

DesignCAD 2D/3D 3.01 (4.0), DesignCAD, 918/825-4048, $499.95. Despite slow rendering, this general-purpose 3-D modeler with 2-D drafting capabilities represents a price and performance breakthrough in 3-D modeling programs. Nov 92

Easy Color Paint 3.0, MECC, 612/569-1500, $59.95. For a program that purports simplicity, this color paint program is anything but. Possibly the weakest, least intuitive paint program for the Mac, it's unnecessarily complex and frustrating. Jul 93

ElectricImage Animation System 1.5, Electric Image, 818/577-1627, $7945. The most powerful animation program for the Mac improves its documentation and rendering, and adds an intuitive project window that allows you to control all aspects of animation from a single location. Unfortunately, it still retails for the price of a European vacation for two. Feb 93

Fractal Design Painter 2.0, Fractal Design Corp., 408/688-8800, $399. If you can put up with a few inconveniences and surprises, this color paint software will earn your admiration. It provides the real meat-and-potatoes tools required by professional artists, and many of its functions—natural media brushes, the color-sensitive magic wand, 2-D lighting effects—are entirely without peer. Jul 93

Image Assistant 1.0, Caer Corp., 408/395-7000, $495. Besides unsatisfactorily addressing Adobe Photoshop's small list of liabilities, this image-editing software is barely able to keep up with less expensive bitmap editors. Problems include an unforbearable lack of animated text, no selective revert function, and an incorrectly implemented smudge tool. Apr 93

IntellIDraw 2.0 (2.5), Spectrual International, 413/549-7600, $995. Rich combination of 3-D modeling, rendering, and animation tools at a relatively affordable price. Visualization program works well, offers a nicely integrated approach to rendering, and is generally stable. Jan 93

Kai's Power Tools Volume 1 1.0, HSC Software, 310/392-8441, $149. Photoshop plug-ins include image-editing filters; texture, gradient, and fractal generators; and special-effects tools. Although at times monstrously complicated, this collection represents a virtually infinite supply of visual resources. It's an amazing tool that no regular Photoshop user should be without. May 93

MacRenderMan 1.0 (1.3), Pixa, 510/236-4000, $695. This dedicated renderer provides an extremely sophisticated, albeit sometimes difficult, way to generate 3-D images. Currently the most widespread rendering scheme, it uses algorithms to create textures, bumps, and more.
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MACWORLD maintained its features—champion status and easier to use. It's highly competent CAD package's evolution into 3-D. It has maintained its features—champion status and easier to use. June 92

Paint It 1.0, Timeworks, 708/559-1300, $59.55. Straightforward color paint program lacks image-editing tools but has a versatile cast of selection and painting tools—and it's priced to sell. Apr 93

Ray Dream Designer 2.02 (2.06), Ray Dream, 415/960-0765, $299. Experienced 3-D aficionados will find this 3-D-imaging software a welcome addition to their arsenal, and beginners may find it ideal for the leap from two dimensions to three. Improved text-handling and viewing capabilities would make it even better. Sep 92

Skecher, Fractal Design, 408/688-8800, $1149. A variety of effects reproduce styles and techniques of traditional drawing tools with this wonderful gray-scale paint and image-processing program. Feb 93

Smoothie 1.02, Peirce Software, 408/244-6554, $1499. Create smoother screen images with this handy utility that antialias 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, $1195. The ruler, texture palette, custom brushes, 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), Macromedia, 415/252-2000, $695. Relatively unusual cross-sectional technique makes this 3-D modeler a great tool, especially for fast prototyping. It provides a quick and easy way to create a variety of shapes.

Tree, Onyx Computing, 617/876-3876, $295. Single-purpose program generates life-like 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

Typetype 1.0 (1.1), Pixar, 510/236-4000, $2299. Type 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. Nov 92

Virtus WalkThrough 1.1.3, Virtus Corp., 919/467-9700, $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

Zeus 0.91 (0.94), Delta Tao Software, 408/730-9336, $499. Color paint program tries hard to match capabilities found in more expensive programs, but not always successfully. It's trimming with good ideas that are poorly implemented. Aug 92

MACWORLD Star Ratings

M A T H / S C I E N C E

Caduceus Physics 1.0, Scientia, 617/776-3427, $130. Giant HyperCard stack consists of carefully indexed cards covering small conceptual bites of physics, it's the first in a series of programs designed to prepare students for the Medical College Admissions Test (MCAT). Jan 93

Data Desk 4.0 (4.1), Data Description, 607/257-1000, $595. For finding patterns in data, this statistical-analysis program has no peer. Years of refinement have made it a unique, and uniquely valuable, tool for analysis, despite its lack of some tools found in larger programs. May 93

Expert Astronomer 1.0 (1.1), Expert Software, 305/567-9990, $49.95. Draws 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 (3.01), Prescience Corp., 415/543-2252, $199.95. 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

HIQ 1.0 (2.0), Bmillinium Corp., 408/354-7511, $995. A script language, which exhibits an enduring 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, 415/553-8153, $339. 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

MacBreadboard 1.1 (1.13), Yoeric Software, 919/644-1620, $599.50. Useful educational engineering software simulates excruciating detail every aspect of a digital integrated-circuit breadboard trainer. It accurately replicates and even surpasses the behavior of a physical breadboard—without burning out IC chips. Dec 92

MacPhase 1.2, 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, $495.95. For functional scope 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 computing 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, 310/433-0685, $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 (2.0.8), Gene Codes Corp., 313/769-7249, $2299. 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

SigmAPlot for the Macintosh 4.11, Jandel Scientific, 415/924-8640, $495. This scientific graphing software offers a short path from raw data to publishable graphs. The Mac fundamentals need polish, but the program offers unique analytic capabilities. Jul 92

Simulink 1.2, The MathWorks, 508/635-1415, $3995. If you hear the word "route-plote 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

Spyglass Dicer 2.0, Spyglass, 217/355-6000, $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 only the game in town. Jul 93

StatView 4.0m, Abacus Concepts, 510/540-1949, $599. 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, $449.95. 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 star-filled sky holds more than a moment's fascination for you, you need to know about this astronomy program. In a firmament of mostly faint and forgettable astronomy software, 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

ACT 1.0 (1.01), Contact Software International, 214/919-9560, $395. While this contact manager has several laudable features, such as customizable contact views and an integrated word processor, learning how to use it is a frustrating experience. Feb 93

Active Memory 2.0, ASD Software, 714/624-2594, $199. Personal organizer distinguishes itself by providing strong network support, although it may be overkill for a lone user. Aug 92

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 straight-
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, 415/961-4400, $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 professional's dream as well. Jan 93

Aldus Persuasion 2.1 (2.12), Aldus Corp., 415/377-0136, $595. For presentations that need to be written down, 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. Feb 93

Camera 1.0 (1.1), Vision Software International, 408/748-8411, $149. If you need to record continuous screen operations, this screen recording 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 93

Cinematlon 1.0, Vividus Corp., 415/494-2111, $495. Easy-to-use program merges animation, interactivity, and presentation features, but image- and text-handling capabilities are less than stellar. Jul 92

Comet CG 1.0.3, M3I, 317/842-5097, $995. Program for generating digitized text over live video is reasonably priced compared with dedicated graphics systems, but you're likely to be as astonished 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 lousy manual, and an occasionally clumsy interface. Jul 92

Hi Rez Audio Volume 1.0, Presto Studios, 619/689-4895, $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 lighthearted approach, but navigating the lessons is frustrating. Jun 93

Macromedia Director 3.1 (3.1.1), Macromedia, 415/352-2000, $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 $149 addition to the price makes it an upgrade most users can afford to miss. Feb 93

Microsoft PowerPoint 3.0, Microsoft, 206/882-0800, $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., 619/454-6834, $149. With patience and practice, you can become a high-tech special-effects wizard using this image-melding movie utility that "melts" one image into another. While using it is simplicity itself, you can only import Macintosh images, and the program suffers from some first-release glitches. Nov 93

Motion Works ProMotion 1.0 (1.03), Motion Works, 604/685-9975, $395. Inexpensive animation program consolidates a stew of tempting features, including flexible path tools and ambitious support for Apple events, but the capabilities are strung together with a weak and problem-ridden interface. Nov 92

MovieWorks 1.1, Interactive Solutions, 415/377-0136, $995. Over 100 bugs were fixed in version 1.0.1 of this multimedia authoring software that takes an address 23 scripting commands, QuickTime importing and editing, and a utility that compiles movies into a faster playback format. Mar 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 Video Corp., 415/948-0745, $399. While this entry-level multimedia package has all the tools you need to continue...
assemble interactive screen presentations that burst with motion and sound, it has a disorienting interface and lacks the polish and power of other similarly priced programs. Aug 93

** VideoFusion 1.0.1, VideoFusion, 419/891-1090, $649. Collection of special effects for 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), Schenmer, 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

** 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 autodefining classic flowcharts but could use some flashier features, such as shaded backgrounds, for presentations. Mar 93

** Future BASIC 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

** Object Logo Student Edition, Paradigm Software, 617/576-7675, $49.95. This book-plus-disk package offers a wide-ranging introduction to programming concepts. It’s aimed roughly at the high-school educational level and lets you see something happen for every few lines of code you type. Jul 93

** Object Master 1.0.2, ACI USA, 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

** PGiPro 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 Mac program. Jul 93

** Sirius Programmer 3.0, Sirius Corp., 801/261-7900, $385. 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 93

** Think Pascal 4.0, Symantec Corp., 408/252-3570, $249. A remarkable achievement—a programming language and environment full-featured enough for professional programmers while still inviting for novices. No weak points and dozens of strengths. Aug 92

** UserLand Frontier 1.0 (2.0), UserLand Software, 415/369-6600, $249. A robust scripting language distinguishes this ground-breaking desktop programming tool that can automate desktop functions, repetitive data-management tasks, and more. Jul 93

** 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 elegantly done, but not entirely 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 lets you combine multiple search criteria. It cannot search in the background or find text in compressed files. Jul 93

** AlSoft Power Utilities 1.0.1 (1.0.2), AlSoft, 713/553-4090, $129.95. Buying this set of seven utilities is more economical than purchasing the included disk optimizer and resource manager (DiskExpress II and Masterluggage) separately, but the other five utilities are unimpressive. Aug 92

** 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

** AutoDoubler 1.0.7 (2.0.1), Salient Software, 415/321-5375, $89.95. Designed to operate transparently, this automatic file-compression utility is a practical solution for users short on desk space, but it’s missing many of the features of dedicated file-compression utilities, and it provides only limited control over the process. Sep 92

** Billy Steinberg’s PBTools 1.0.1, Inline Design, 203/435-4995, $99.95. If you want basic PowerBook management without added frills or complex menu bar displays, this collection of four utilities may be just your cup of tea. Jul 93

** Conflict Catcher and Other Innovative Utilities 1.0 (1.3.8), Cassady & Greene, 408/484-9228, $79.95. Enable 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, CSC Technologies, 412/471-7170, $49. If you can justify spending $99 purely for the sake of efficiency, this straightforward utility replaces the Finder’s copy function, unobtrusively copying files to or from your Mac, in the background, while you move on to more interesting things. Apr 93

** CPU 1.0.2 (2.0), Connectix Corp., 415/571-5100, $99. Indispensable 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., $1849-0293, $49.95. Basic but efficient backup system is simple and painless enough to foster better backup habits in anyone who uses it. It doesn’t back up to hard drives or tape drives. May 93

** Drive 7.2.3 (2.34), Casa Blanca Works, 415/461-2227, $79.95. Universal hard drive updater and faxenabler has an attractive, uncluttered interface that’s so easy to use it makes hard drive maintenance almost relaxing. Jan 93

** DynaPage 2.0, Portfolio 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, SFO, 408/253-8081, $29.95. nifty utility lets you switch printers without using the Chooser. It’s a bargain for network users and those who frequently change output devices. Oct 92

** Hard Disk Toolkit 1.1.2, FWB Software, 415/474-8055, $79. The more 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, 203/435-4995, $79.95. This INIT manager’s ability to load all INITs over a network will interest network managers. While it doesn’t prevent INITs from crashing at start-up, it doesn’t help you identify the cause of INIT conflicts that don’t cause the Mac to crash at start-up. Mar 93

** Inline Sync 1.0 (1.01), Inline Design, 203/435-4995, $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

** KidDesk 1.0, Edmark Corp., 206/556-8484, $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

** Kiwi Power Windows 1.5 (1.5.3), Kiwi Software, 805/685-4031, $79.95. Our skeptical reviewer found this system extension surprisingly handy, its hierarchical menu lists all the open windows in the Finder and any applications. Jul 92

** MacPalette II 2.2 (2.3), Microsoft USA, 408/253-2000, $65. You can print images from 8-bit and 24-bit color programs when you use an 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, Aki’s Personal Edition 1.1.2, FWB Software, 415/474-8055, $79.95. This utility collection for the PowerBook displays a clean, alluring 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. May 92

** MasterFinder 1.2.1, Olduvai Corp., 612/909-8822, $149.50. The consistent, 3-D-style interface makes this a remarkable achievement—a programming language and environment full-featured enough for professional programmers while still inviting for novices. No weak points and dozens of strengths. Aug 92
More Disk Space 1.1 (2.1), Alysiss Software Corp., 415/566-2286, $99.95. Automatically compreses and expands files with this utility. Although it doesn't identify compressed files, and must run as a stand-alone application to work automatically, it does offer a measure of control that similar utilities lack. Sep 92

NightWatch 2.0.1b (2.01c), Kent Marsh, 713/522-5265, $159.95. Although skilful snoops can override the screen-locker feature of this hard drive security utility, the password protection provides a flexible and safe method of restricting access to anyone turning on your hard drive. Nov 92

Nok Nok 1.0 (1.0.4), Tril, 617/933-8810, $49.95. Plug the security holes that System 7 file sharing created, with this effective file-share monitoring utility that helps your people's attempts to connect to your Mac, alerts you when someone does connect, and sets time limits for file share users. Oct 92

Norton Essentials for PowerBook 1.0, Symantec Corp., 310/453-4600, $129. Unseen 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. Apr 93

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. Oct 92

Peace of Mind 1.2.2, Polybus Systems Corp., 716/871-6533, $149. Hardware diagnostic tools perform exhaustive batch, interactive, and benchmark tests on virtually all major Mac hardware components; does an excellent job of diagnosing simple simulated hardware errors (such as SMIM twinking). The program has minor bugs and lacks a comparative test-history feature. Jun 93

PicturePress 2.5, Storm Technology, 415/691-6600, $159. 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. Mar 93

PowerMerge 1.0.2, Leader Technologies, 714/757-1787, $129. File-synchronization utility has a potentially confusing interface, but is a handy means of updating selected files so that different Macs end up with identical versions of the selected documents. Apr 93

Public Utilities for the Macintosh 1.0, Fifth Generation Systems, 504/291-7221, $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. Jun 93

RapidTrak 1.0.1, Insignia Solutions, 415/694-7600, $99.95. If you've got RAM to spare, this hard drive formatter offers driver-level RAM caching to store frequently used data and improve performance, especially on slower-speed drives. May 93

Retrieve It 1.0, Clars 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. Nov 92

Safe and Sound, Central Point Software, 503/690-8090, $49.95. Limited but useful disk-protection and -safety utility has a clean, simple interface and is an efficient emergency recovery tool. Jan 93

Silverlining S-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. Jan 93

SnapBack 1.0, Golden Triangle Computers, 619/279-2100, $129. For regular 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

Star Trek: The Screen Saver, Berkeley Systems, 510/540-5533, $59.95. Go where no Mac has gone before with this screen saver based on the original "Star Trek" Modules. This simple version of the Trek-inspired fonts to an endless parade across the ship's main screen of aliens, spacecraft, and artifacts from different eras. May 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 an 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

UpDff 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 SW 2.3, Articulate Software, 617/935-5656, $399. Talk back to your Mac (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 QuicksDraw printers and accelerates printing of pictures on PostScript printers. Jan 93

V E R T I C A L M A R K E T S

Compare-A-Loan 4.0.2 (4.1), SoftSftair, 612/894-3357, $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 payoff schedules of various home-loan options. Apr 93

ConstructionMac 1.2 (2.5), Revelar Software, 801/485-3291, $159. With a lot of work from you, this software will organize your construction or remodeling project. Oct 92

Diet Balancer 1.0 (1.05), 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-oriented 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 to-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 2.0 (2.5), InfoSolutions, 814/435-2983, $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), SoftSftair, 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 worth while 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 it 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-iterate, the friendly dialog boxes and reminders may get in the way. Dec 92

Nolo's Living Trust 1.0, Nolo Press, 510/549-1976, $79.95. Gracefully guiding users through the process of drafting a living trust, this product is carefully thought out and a great value for simple trusts. Aug 92

Nutri-Calc Plus 1.2, Camdeo Corp., 602/926-2632, $159. Designed for knowledgeable and serious users. This powerful, flexible program manages nutrients...
tion information and analyzes diets. Dec 92

** Star-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 Grammar 3.0 (3.6), Wordstar International, 415/382-8000, $99. Logical and inappropriate recommendations are a hallmark of all grammar checkers, but this one also violates Mac conventions in irritating ways. Aug 92

** 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, 408/733-6745, $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), Niels 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 Macs automate typing of common phrases such as "fade to black." Apr 93

** IdeaFisher 2.0, Fisher Idea Systems, 714/474-8111, $595. Inspiration never comes easily, but this creativity tool with a question bank of 6000 questions and an idea bank of 61,000 words and 700,000 links might help get the juices flowing. Jan 93

** Just Joking 1.0, WordStar International, 415/382-8000, $49. HyperCard stack of around 2800 humorous quotations offers a serviceable selection of sayings from a diverse group of humorists, comedians, philosophers, and writers, among others. Apr 93

** LetterPerfect for Macintosh 2.1, WordPerfect Corp., 801/225-5000, $149. Stripped-down version of WordPerfect measures up as a serviceable low-end word processor, with clean, accurate documentation and an uncluttered interface. Jan 93

** MacWrite Pro, Claris Corp., 408/987-7000, $249. Many of the new features of this upgrade are very well executed, including the easy-to-use table feature, simple but elegant palettes, and an almost pain-free mail merge feature. The program could still use some polish, however. Jul 93

** Microsoft Word 5.1, Microsoft, 206/882-8080, $495. Small, solid upgrade fine-tunes some plug-in modules and adds new modules including an icon tool bar, text annotation, and other features. The numerous minor enhancements make it worth the upgrade price, but it won't give Word 5.0 users goosebumps. Mar 93

** Nisus Compact 3.3 (3.31), Nisus Software, 619/481-1477, $150. Inexpensive price and low disk-space requirements don't compensate for this word processor's many missing features, including mail merge, macros, and word count. Memory quirks are an additional problem. Aug 92

** RightWriter for the Mac 5.0, Que Software, 317/573-2500, $99.95. Grammar checker looks at writing style, word usage, punctuation, and capitalization, as well as grammar. Customizable writing-style filters and multiple approaches to analysis are nice, but—as with all grammar checkers—not all of the program's advice is great. May 93

** ShowScape 4.1, Lake Compuframes, 914/941-1998, $429, with WordPerfect 2.0 $679. This script-writing software formats scripts in either screenplay format or dual-column format (for audio and video) and allows you to choose the number of shots displayed per page, but it requires you to own and work in WordPerfect. Apr 93

** StoryLine 1.02 (1.5), Truby's Writers Studio, 310/575-3050, $295. Frustrating and sometimes haphazard HyperCard-based program attempts to offer expert training in the craft of plot development. Aug 92

** Thunder 7.1-0.5 (1.5.2), Baseline Publishing, 501/682-9676, $99.95. The speed, customizing options, and overall feature-set of this stand-alone spelling checker and thesaurus are admirable, but before you can trust it implicitly, it needs a dictionary with greater detail. Jul 92

** TypeReader 1.0, ExpertVision, 408/428-9898, $695. Speed and accuracy combine with a straightforward operating style in this high-end OCR software that doesn't do everything it claims to do, but is a major contender nonetheless. Feb 93

** VersionMaster 1.5, ASK Technologies, 508/486-8352, $199.95, five users $799.95, ten users $1199.95. Document-management utility helps you archive and track versions of a file by maintaining a database of altered documents. It's recommended only for workgroups that routinely follow check-out procedures and that don't need detailed reports of the changes to a file. Apr 93

** WordPerfect for Macintosh 2.1 (2.1.3), WordPerfect Corp., 801/225-5000, $495. Play QuickTime movies in your text files or publish and subscribe with this upgrade. It continues to provide the best desktop publishing and graphics capabilities of any word processor, but it lacks glossary- and table-creation features. Jun 92

** WriteNow 3.0, WordStar International, 415/382-8000, $119. The streamlined approach of this low-end word processor will appeal to many Macintosh users, especially the storage-conscious. A nice mix of features includes impressive implementation of style sheets. Sep 92

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** Hardware

** INPUT DEVICES

** A' Mouse, Mouse Systems Corp, 510/656-1177, $134.95. A smooth ride and tight resolution characterize this optical device with three light-touch keys. Stronger software would have made it a more attractive package; the software's incompatibilities and limitations are a problem. Jun 92

** Accet for Macintosh, AccCAD, 408/655-1900, $149. It's the hands-down winner in the digitizing-tablet price competition, but although this product works well, it lacks some of the amenities of higher-end tablets. Aug 92

** Apple Adjustable Keyboard, Apple Computer, 408/996-1010, $219. Adjustable keyboard is a slight improvement on the flat-stab keyboard, but hopefully it will be the last. Theoretically, it corrects or corrects in the wrist known as ulnar deviation, but many sufferers of repetitive stress injuries are still hoping for a keyboard that adjusts on a vertical plane. Jul 93

** The Bat, Inforgrif, 504/766-8082, $495. Right- and left-hand keypads slant the little fingers down and the thumbs up, with built-in wrist rests. Our reviewer considered it the best ergonomic device she'd seen; the downside is type to type all over again. Oct 92

** DrawingBoard II, Drawing Pad, CalComp, 800/992-1212, $645, $395. Two likeable features of these digitizing tablets are the transparent, hinged cover for storing artwork, and a menu strip with buttons for changing drawing modes and accessing macros. Stylus problems and CalComp's haphazard tech support are drawbacks. Jul 93

** Mouse-Track, Ic System, 214/494-3073, $179. Well-positioned, easy-to-rotate trackball with a soft wrist-pad is comfortable to use, but must be disassembled to reconfigure the buttons. Nov 92

** MouseMan, Logitech, 510/795-8500, $129. Bear-paw-shape mouse with three programmable buttons is handsome and solidly made. It may be too big for some hands. Jun 92

** TrackMan, Logitech, 510/795-8500, $99. There's a right-hand bias to this trackball with three programmable buttons and a click-lock feature. Jun 92

** Turbo Mouse 4.0, Kensington Microware, 415/572-2700, $169.95. Large buttons on either side of this trackball provide just the right measure of tactile feedback: the removable ball glides freely. But the breakthrough feature is the software that lets you customize any of the trackball's functions. Nov 92

** The UnMouse, MicroTouch Systems, 508/659-1900, $53. Sleek and attractive cordless mouse works reliably and is attractively priced, but suffers from the same line-of-site limitations as other infrared devices (such as TV remote controls). Dec 92

** Voice Navigator II, Articulate Systems, 617/935-6565, $699. Stand-alone SCSI device has an impressive, full-featured set of tools for voice control of your Mac, but mastering them takes time and effort. Apr 92

** Z-Nic Cordless SuperMouse, DynaPoint, 818/854-6440, $99. Sleek and attractive cordless mouse works reliably and is attractively priced, but suffers from the same line-of-site limitations as other infrared devices (such as TV remote controls). Dec 92
MIDI interface adheres to the life-simplifying General MIDI standard. The simple, straightforward interface and handy QuickFax DA are positives; uninformative error messages are minor negatives. Jun 92

*** Comstation 4, PSI Integration, 408/559-8544, $459. An otherwise solid fax/data modem for network use is hurt by an awkward process for distributing faxes, plus the need for a separate file server and fax server. Jun 92

EtherPrint 1.0 (2.6), 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

EtherPrint Plus, Dayna Communications, 801/531-0600, $599. Support four LocalTalk products on an Ethernet network using this device that can also serve as an inexpensive AppleTalk router. Dec 92

EtherWrite, Computer Supplies 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, $999. Far 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, $599. 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, 415/259-0700, $499. If you need 14,400-bps throughput, this data/fax modem is a champ. Its improved software and packaging raise the standards for PowerLook modems. Dec 92

Sportster 14,400 Fax/Data Modem, U.S. Robotics, 708/982-5001, $299. Several nice features, including an easily accessible power button and a front-mounted volume-control dial, make this 100 percent Mac-friendly. Nov 92

SupraFaxModem V.32bis, Supra Corp., 503/967-2400, $399.95. Send and receive faxes and data at speeds up 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, 503/629-9600, $499. When 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, 805/499-5751, $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 MPS, U.S. Robotics, 708/982-5001, $499. Only slightly larger than a deck of cards, this 9600-bps modem is geared toward PC users, with a user guide that never mentions Macs and software that is only for PC compatibles. Jan 93

C. Ithah PrintWriter Printer, C-Tech Electronics, 714/893-1165, $2395. Not only is this laser printer more expensive than most personal page printers, it also offers less impressive features and so-so output. Nov 92

DEClaser 1152, Digital Equipment Corp., 508/493-5111, $1299. Four-page-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, 800/725-0900, $5299. This is an otherwise solid ink-jet printer won't satisfy demanding graphic arts professionals, but it's great for business users interested in punching up their presentations. Oct 92

** PowerPort/Gold, IBM LaserPrinter 10A, IBM Corp., 800/358-5835, $2499. Beautifully designed, fast, 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, 408/996-1060, 600 $2099, 630 $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. Sep 92

** LZR 960, Dataproducts Corp., 818/887-8000, $3395. Tabloid-size 400-dpi laser printer blazed 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

** PrintPartner 10W, Fujitsu Computer Products, 408/432-6333, $2450. While this multimedia printer is fast, relatively inexpensive, and prints clearly, many Macintosh users will find it more frustrating than it's worth; it can't print TrueType fonts that are not stored internally, including some that are shipped as part of System 7. Jul 93

** RasterOps CorrectPrint 300, RasterOps Corp., 800/562-2400, $999.99. The cost of high-quality, photo-realistic color printing can take a nosedive with this 300-dpi, dye-sublimation printer. The relatively small (8.1 by 8.6 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 III, Apple Computer, 408/479-3939, continues...
Precious Life

Not too many years ago, this nurse was a patient at St. Jude Children's Research Hospital. She fought a tough battle with childhood cancer. And won.

Now married and with a child of her own, she has returned to St. Jude Hospital to care for cancer-stricken children.

Until every child can be saved, our scientists and doctors must continue their research in a race against time.

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ST. JUDE CHILDREN'S RESEARCH HOSPITAL
Danny Thomas, Founder

MACWORLD

Star Ratings

996-1010, $539. Apple's ink-jet printer retains the best features of its predecessor, but costs less. New features, such as gray-scale 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 Texas Instrument's microLaser Plus, this PostScript Level 2 printer is an admirable performer and a dependable machine, but it leaves you wondering whether the extra $300 is worth it. Jul 92

★★★★ WideWriter, GCC Technologies, 617/275-5800, $1659. 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 or manually feed sheets 17 inches wide with a unlimted 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 unpolulated 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

★★★★ HP ScanJet IIIP, Hewlett-Packard, 800/752-0900, $879. An elegant piece of technology, this desktop gray-scale scanner produces excellent results for a street price of around $750. Muddled online help and a flimsy hinge are minor problems. Aug 92

★★★★ LighteningScan Pro 256, Thunderware, 510/254-6581, $649. Well-executed hand-held gray-scale 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

★★★★ Mirror 600 Color Scanner, Mirror Technologies, 612/633-4450, $1199. Three-pass scanner with 600-dpi vertical and 300-dpi horizontal resolution is fast, precise, and an excellent value. The only liability is its somewhat quirky software. Apr 92

★★★★ Nikon LS-3510AF Film Scanner, Nikon, 516/547-4355, 8-bit $953, 24-bit $11,310. The bread-box-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, 415/344-2781, $795. A brilliant idea with unfortunate rough spots. Gray-scale, hand-held scanner/image scans full-page or larger images and produces 300-dpi gray-scale files, but the process and software are agonizingly slow; the buttons are hypersensitive; and the product is expensive. Jun 92

★★★★ RasterOps Expresso Personal Slide Scanner, RasterOps Corp., 408/562-4200, $849. Essentially a video camera mounted above an illuminated stage, this slide scanner outputs NTSC video. It's fast, convenient, and economical, but limited to digital images; its best file locks worse than output from a 24-bit flatbed or slide scanner. Apr 92

SYSTEMS/STORAGE

★★★★ FastCache Quadra, Daystar Digital, 404/967-2077, Quadra 950/900/700 version $449, 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 floppy 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 2MB, Peripheral Land, 510/657-2211, $582. The good points of this floptical drive include extensive documentation, switchable termination, and an autoexposure 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 3.5, Peripheral Land, 510/657-2211, $1998. 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 1/2-inch disks that store 120MB of data, deserves a look. Jun 93

★★★★ Macintosh Centris 610, Apple Computer, 408/996-1010, 4/80 $1859. Slim-design Mac uses a 20MHz 68LC040 processor at a price-to-performance ratio that comes close to competing with low-price Windows PCs; however its expandability is severely limited. Jun 93

★★★★ Macintosh Centris 650, Apple Computer, 408/996-1010, 4/80 68LC040 $2699. Moderately priced but fast 400 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 IIci. Jun 93

★★★★ Macintosh Duo Dock, Apple Computer, 408/996-1010, $1079. Impossibly 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 file, some details, such as the difficulty of installing NuBus boards, belies Apple's usual attention to detail. Mar 93

★★★★ Macintosh LC II, Apple Computer, 408/996-1010, $1349 4/80. Base system comes equipped with a 25MHz 68030 processor, 4MB of RAM soldered to the logic board, an 80MB internal drive, and 512K of VRAM. This is a machine that fits the bill and the pocketbook for most home and small-business owners. Jul 93

★★★★ Macintosh PowerBook 150, Apple Computer, 408/996-1010, $29149 to $24995. 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, $24299 to $3149. A built-in video port and gray-scale capability are the new continues
Show them you mean business.

MacFlow 3.7
Flowchart Design and Development
Lay it all out for them—the process, the procedures, the relationships. Business works best when everything is clear, and there is no better way to make things clear than a detailed flowchart.

The best way to create flowcharts is MacFlow—the highest-rated flowcharting program. Neither drawing programs nor pencil and paper can create flowcharts as easily as MacFlow. And no program is simpler to learn or use. Graphically organize complex processes, projects, and structures—minutes after opening the package.

Simply drag pre-drawn symbols onto a page and connect with curved or straight lines. Place text in symbols and on lines, as well as in freestanding notes. Change the chart as desired; lines stretch and stay attached to symbols. Even create stand-alone flowcharts that can be freely distributed to any Macintosh user (and any Windows user with an optional viewer). MacFlow is also System 7-savvy, letting you publish your charts and subscribe to text. Translate to and from text in ASCII and RTF formats as well as outlines created in Acta 7 and MORE.

MacFlow actually enhances your thought process because the interface is so simple and intuitive, nothing stands between your ideas and a presentation-quality flowchart. In fact, you'll find just creating flowcharts keeps your thoughts organized and helps you get a handle on any task.

Show them you're serious—get MacFlow today.

MacSchedule 3.0
Project Planning and Tracking
Lay it all out for them—the plan, the people, the cost. Give them a path to follow and a way to track progress. Successful projects need a roadmap, and nothing can beat a simple yet comprehensive project schedule.

The best way to create quick, presentation-quality project schedules is MacSchedule. The Gantt-chart interface lets you create schedules, with integrated financial data, minutes after you open the application—unlike complex project management software. And MacSchedule is as easy to learn as it is to use.

MacSchedule automatically creates and manages a project calendar. Just enter task names, then indicate timing with a click and drag of the mouse. Status tracking is also easy—just click on a task bar to show progress.

MacSchedule helps track a project from initial estimates to current status by automatically developing calendarized cost estimates and reporting cost and schedule variances in an Earned Value summary. MacSchedule is also System 7-savvy, letting you publish your schedules and data as well as subscribe to data from other programs. Place schedules in documents for proposals and reports or print schedules as slides, overheads, or wallcharts.

With MacSchedule's graphic feedback, you can tell at a glance where your project is and where it's headed. It's the perfect tool for any manager.

Show them your plans for success—get MacSchedule today.

For a free demo disk and catalog, phone, write, or fax Mainstay today.
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 as a primary screen.

Feb 93

Macintosh PowerBook 16Sc, Apple Computer, 408/996-1010, S3399 4/80. 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, $4109 to $4469. 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) $1839, 230 (4/80) $2299. Apple’s smallest computers have the pleasing feel, size, and shape of hardbound books but pack the horsepower of 680 chips. Although the screen, keyboard, and trackball (more of a “trackmarble”) feel small, these computers virtuously cry out to be picked up, handled, and used. Mar 93

MicroMac Plus Upgrade System, MicroMac, 714/362-1000, $998. This 68030 accelerator for the Mac Plus requires reassembling 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, 408/889-8294, $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 93

PLI MiniArray 850MB, PLI MiniArray 2GB, Peripheral Land, 510/657-2211, $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

QuadFlexta, Quadram, 404/923-6666, $495. Remarkable super-high-density floppy drive uses an ingenious disk-formatting method to put just over 20MB on a single 3¼-inch floppy disk, but it may not be as cost-efficient as other options. Apr 92

Quantum Passport XL 240, Quantum Corp., 800/624-5545, external chassis $495, 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 disappointing. 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), IX, IXc, or IIc. Oct 92


tocama II FX 33, Fusion Data Systems, 512/338-5326, $2595. CPU and FPU tasks on a Mac IIx are 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 IIx already has a fast video board and more than enough memory. Oct 92

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 some 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, $1459. 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

PowerPortrait, Sigma Designs, 510/770-0100, $899 or $999. Hook your Classic or PowerBook to this 19-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, with no RAM $499, with 2MB of RAM $699, with 4MB of RAM $999. Separate VIAM 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, $999. 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

VideoSpigol, 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 92
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<thead>
<tr>
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<th>Reader Svc. No.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Advanced Business Center</td>
<td>41</td>
<td>800/274-7747</td>
</tr>
<tr>
<td>Agilo</td>
<td>608/683-2446</td>
<td></td>
</tr>
<tr>
<td>Aditus</td>
<td>230-237 Alliance Peripheral System</td>
<td>31</td>
</tr>
<tr>
<td>Alysys Software</td>
<td>9</td>
<td>800-8ALYSIS</td>
</tr>
<tr>
<td>America Online</td>
<td>185-186</td>
<td>—</td>
</tr>
<tr>
<td>Antro</td>
<td>800-325-3841</td>
<td></td>
</tr>
<tr>
<td>Aplos</td>
<td>800-795-1000</td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td>166-167</td>
<td>—</td>
</tr>
<tr>
<td>Apple</td>
<td>184</td>
<td>—</td>
</tr>
<tr>
<td>Apple</td>
<td>192</td>
<td>—</td>
</tr>
<tr>
<td>Applied Engineering</td>
<td>158-159</td>
<td>800/554-MACS</td>
</tr>
<tr>
<td>ASD Software</td>
<td>40</td>
<td>999/624-2594</td>
</tr>
<tr>
<td>Berkeley Systems</td>
<td>38</td>
<td>800-248-0800</td>
</tr>
<tr>
<td>Bullen L Duration</td>
<td>225-227</td>
<td>63</td>
</tr>
<tr>
<td>Case Corp.</td>
<td>59</td>
<td>800/535-SCAN</td>
</tr>
<tr>
<td>Cannon USA</td>
<td>8</td>
<td>110</td>
</tr>
<tr>
<td>Cadence &amp; Genesi</td>
<td>276</td>
<td>800/359-4520</td>
</tr>
<tr>
<td>Central Point Software</td>
<td>54</td>
<td>24</td>
</tr>
<tr>
<td>CDs</td>
<td>20</td>
<td>800/544-5554</td>
</tr>
<tr>
<td>Club Mac</td>
<td>223</td>
<td>800/259-3622</td>
</tr>
<tr>
<td>Corprosone</td>
<td>122-123</td>
<td>800/848-9199</td>
</tr>
<tr>
<td>Computer Associates</td>
<td>13</td>
<td>141</td>
</tr>
<tr>
<td>Computer Associates</td>
<td>193</td>
<td>10</td>
</tr>
<tr>
<td>Dantz Development</td>
<td>182</td>
<td>510/849-0293</td>
</tr>
<tr>
<td>Data Desk</td>
<td>60</td>
<td>108</td>
</tr>
<tr>
<td>DataWatch</td>
<td>52</td>
<td>37</td>
</tr>
<tr>
<td>Daysys Digital</td>
<td>131</td>
<td>7</td>
</tr>
<tr>
<td>DCC</td>
<td>26</td>
<td>157</td>
</tr>
<tr>
<td>Digital Equipment Corp</td>
<td>36</td>
<td>120</td>
</tr>
<tr>
<td>Direct Connections</td>
<td>248</td>
<td>121</td>
</tr>
<tr>
<td>Docket Connection</td>
<td>216</td>
<td>30</td>
</tr>
<tr>
<td>Dr. Mac</td>
<td>217</td>
<td>177</td>
</tr>
<tr>
<td>E-Machines</td>
<td>17</td>
<td>136</td>
</tr>
<tr>
<td>Eastman Kodak</td>
<td>84-95</td>
<td>47</td>
</tr>
<tr>
<td>Educational Resources</td>
<td>245</td>
<td>28</td>
</tr>
<tr>
<td>Educorp</td>
<td>279</td>
<td>157</td>
</tr>
<tr>
<td>Engineering Software</td>
<td>182</td>
<td>12</td>
</tr>
<tr>
<td>Envisio</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>ETC Peripherals</td>
<td>168</td>
<td>135</td>
</tr>
<tr>
<td>Express Direct</td>
<td>234-235</td>
<td>80</td>
</tr>
<tr>
<td>Fifth Generation Systems</td>
<td>9</td>
<td>97</td>
</tr>
<tr>
<td>Fractal Design</td>
<td>29</td>
<td>190</td>
</tr>
<tr>
<td>GCC Technologies</td>
<td>74</td>
<td>151/152</td>
</tr>
<tr>
<td>GCC Technologies</td>
<td>78</td>
<td>155/156</td>
</tr>
<tr>
<td>GCC Technologies</td>
<td>76</td>
<td>153/154</td>
</tr>
<tr>
<td>Got Softw</td>
<td>122</td>
<td>42</td>
</tr>
<tr>
<td>Global Village</td>
<td>198B-199C</td>
<td>137</td>
</tr>
<tr>
<td>Hewlett Packard</td>
<td>72-73</td>
<td>—</td>
</tr>
<tr>
<td>IDG Books</td>
<td>248</td>
<td>—</td>
</tr>
<tr>
<td>Image Club</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>Innovative Data Design</td>
<td>274</td>
<td>128</td>
</tr>
<tr>
<td>Insignia Solutions</td>
<td>34</td>
<td>800/648-7677</td>
</tr>
<tr>
<td>Inspiration Software</td>
<td>174</td>
<td>104</td>
</tr>
<tr>
<td>International Mac</td>
<td>244</td>
<td>103</td>
</tr>
<tr>
<td>Integra 10</td>
<td>104</td>
<td>800/467-0326</td>
</tr>
<tr>
<td>Kensigton</td>
<td>8C</td>
<td>800/535-4242</td>
</tr>
<tr>
<td>La Cie</td>
<td>2-3</td>
<td>53</td>
</tr>
<tr>
<td>La Cie</td>
<td>51-63</td>
<td>52</td>
</tr>
<tr>
<td>La Cie</td>
<td>181</td>
<td>54</td>
</tr>
<tr>
<td>LaserMaster</td>
<td>68</td>
<td>43</td>
</tr>
<tr>
<td>LLS Computer, Inc.</td>
<td>222-223</td>
<td>35</td>
</tr>
<tr>
<td>Mac and More</td>
<td>224</td>
<td>800/436-5688</td>
</tr>
<tr>
<td>MacZone / Zone, The</td>
<td>132-135</td>
<td>70</td>
</tr>
<tr>
<td>Mac's Place</td>
<td>229-222</td>
<td>800/218-0009</td>
</tr>
<tr>
<td>MacAcademy</td>
<td>74</td>
<td>106</td>
</tr>
<tr>
<td>MacCenter</td>
<td>241</td>
<td>105</td>
</tr>
<tr>
<td>MailConnection</td>
<td>42-49</td>
<td>800/699-3333</td>
</tr>
<tr>
<td>MailMaster</td>
<td>238-238</td>
<td>58</td>
</tr>
<tr>
<td>MailMaster</td>
<td>240</td>
<td>172</td>
</tr>
<tr>
<td>MailMaster</td>
<td>269-274</td>
<td>175</td>
</tr>
<tr>
<td>MailMaster</td>
<td>266-270</td>
<td>30</td>
</tr>
<tr>
<td>MailMaster</td>
<td>267-268</td>
<td>150</td>
</tr>
<tr>
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<td>269-270</td>
<td>66</td>
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<tr>
<td>MailMaster</td>
<td>271-272</td>
<td>130</td>
</tr>
<tr>
<td>MailMaster</td>
<td>273-274</td>
<td>206-267</td>
</tr>
<tr>
<td>MailMaster</td>
<td>275-276</td>
<td>215</td>
</tr>
<tr>
<td>MediaMate</td>
<td>59</td>
<td>189</td>
</tr>
<tr>
<td>MicroFile Technology</td>
<td>24</td>
<td>113</td>
</tr>
<tr>
<td>MicroFile Technology</td>
<td>127</td>
<td>139</td>
</tr>
<tr>
<td>MicroFile Technology</td>
<td>128</td>
<td>800/223-3577</td>
</tr>
<tr>
<td>MicroFile Technology</td>
<td>129</td>
<td>146</td>
</tr>
<tr>
<td>Minor Technologies</td>
<td>7</td>
<td>102</td>
</tr>
<tr>
<td>Minor Technologies</td>
<td>50</td>
<td>122</td>
</tr>
<tr>
<td>Minor Technologies</td>
<td>137</td>
<td>125</td>
</tr>
<tr>
<td>Minor Technologies</td>
<td>175</td>
<td>800/643-6835</td>
</tr>
<tr>
<td>MountainGate Data Systems</td>
<td>194</td>
<td>800/556-0222</td>
</tr>
<tr>
<td>NEC Technologies</td>
<td>105</td>
<td>—</td>
</tr>
<tr>
<td>No Hands Software</td>
<td>177</td>
<td>27</td>
</tr>
<tr>
<td>Novell</td>
<td>65</td>
<td>140</td>
</tr>
<tr>
<td>Nordic Software</td>
<td>275</td>
<td>168</td>
</tr>
<tr>
<td>Now Software</td>
<td>32</td>
<td>49</td>
</tr>
<tr>
<td>Now Software</td>
<td>183</td>
<td>133</td>
</tr>
<tr>
<td>Orange Micro</td>
<td>171</td>
<td>33</td>
</tr>
<tr>
<td>Philips Consumer Electronics</td>
<td>55</td>
<td>19</td>
</tr>
<tr>
<td>Platinum Micro</td>
<td>31</td>
<td>55</td>
</tr>
<tr>
<td>Ponzi Micro</td>
<td>64</td>
<td>115</td>
</tr>
<tr>
<td>Pinnacle</td>
<td>277</td>
<td>56</td>
</tr>
<tr>
<td>Pli</td>
<td>290</td>
<td>112</td>
</tr>
<tr>
<td>Printer Connection</td>
<td>278</td>
<td>91</td>
</tr>
<tr>
<td>Quantum Leap Technologies</td>
<td>275</td>
<td>80</td>
</tr>
<tr>
<td>Quantum Leap Technologies</td>
<td>129</td>
<td>51</td>
</tr>
<tr>
<td>Radius</td>
<td>33</td>
<td>—</td>
</tr>
<tr>
<td>Radius</td>
<td>35</td>
<td>—</td>
</tr>
</tbody>
</table>

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A. Including yourself, approximately how many people are employed at your
work-site (i.e., employees in your office, building, or cluster of buildings)?
00 1000+ 99-100 99-25 Under 25

B. Which of the following computers are installed at this entire work-site?
0 Apple Workgroup Servers/ Mac Quadra-series
00 Macintosh-series/ LC series/LC III/ Performa/ 600/512SE, 50
00 Mac LC II/ Performa (386/486/ 400/500 Classic-series/5SE Plus/ 512K/128K/Portable
00 Mac PowerBook-series/Duo-series

C. What is the total number of Macs installed at this entire work-site?
(0 Check one)
0 500+ 499-100 99-50 49-10 9-1 None

D. For how many Macintosh computers within this entire work-site do you have purchase involvement for products and/or services?
(0 Check one)
0 500+ 499-100 99-50 49-10 9-1 None

E. In which ways are you ever involved in purchase decisions for Macintosh products at this entire work-site?
(0 Check all that apply)
0 Initiate/Determine need for product capabilities/features
0 Evaluate, recommend, or approve brand/models
0 Evaluate, recommend, or approve purchase source
0 Authorize purchases

F. Over the next 12 months, how much will this entire work-site spend on Macintosh products and/or services?
(0 Check one)
0 $1 million or more 0 $999,999 - $500,000
0 $499,999 - $100,000 0 $99,999 - $50,000
0 $49,999 - $10,000 0 Under $10,000

G. Considering the entire work-site, which of the following Macintosh hardware and software products are currently installed?
(0 Check all that apply)
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0 Graphics/publishing software
0 Monitor/displays
0 Printers/scanners
0 Networking/communications hardware and/or software
0 Multimedia/Audio hardware and/or software
0 Mobile computing products (PowerBooks, peripherals, software, etc.)
0 Networking/communications software information

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SOFTWARE

BUSINESS

12-111 Apolo
54 Central Point Software
123-123 Comprise
13 Computer Associates
103 Computer Associates
10 Data Desk
34 Imaging Solutions
174 Inspiration Software
215 Mindstyle
IFC-01 Microsoft
157 Stelth
197 Sanmarco-Norton
29 T.B.&P.
14-15 WordPerfect

CAD/CAM

182 Engineering Software
274 Innterface Data Design

CD ROM

279 Educorp
66 Macintosh CD Vendors
187 Macintosh CD Vendors
275 Quantum Leap Technologies

COMMUNICATION

276 Casady & Greene
265 ISA

DATA MANAGEMENT

215 Mainstyle

EDUCATIONAL

245 Educational Resources
276 Nordic Software

ENTERTAINMENT

276 Nordic Software

GRAPHICS/DTP

18-10 Altair
29 Fractal Design
30 Image Club
274 Innovative Data Design
277 Pagez

MISCELLANEOUS

10-11 Apolo
10 GDT Software
174 Inspiration Software

OCR

59 Corel

PWRBOOK

177 No Hands Software
32 Now Software
197 Symantec-Norton
141 Symantec-Num

SECURITY

52 CardWares
275 SecureIt

STATISTICAL

60 Data Desk
157 Stelth

UTILITIES

172 Aplus Software
40 ASD Software
39 Berkeley Systems
276 Casady & Greene
54 Central Point Software
20 Claris
182 Dantz Development
9 FIFTH Generation Systems
12 GDT Software
34 Imagina Solutions
177 No Hands Software
32 Now Software
49 Norsoft
194A Smile
92 Symantec-Num
62 Symantec-San

VERITAL

28 T.B.&P.

WORD PROCESSING

IFC-01 Microsoft
14-15 WordPerfect

HARDWARE

BOARDS

159-159 Applied Engineering
171 Orange Micro
35 Radius
37 Radius
38 Radius
39 Radius

CD ROM

279 Educorp
64 Pinwheel/Mayo

COMMUITER SYSTEMS

228 Advanced Business Center
143 Apple
155 Apple
184 Apple
192 Apple
225-227 Bitware Distribution
231-235 Express Direct
278 Printer Connection

DIGITIZERS/SCANNERS

59 Claret Corp.
72-73 Hewlett Packard
147 Merco Labs, Inc.
7 Minor Technologies
102 Watson

DISPLAY

234-235 Express Direct
238-239 MidDirect
240 Matrox
177 Minor Technologies
59 Minor Technologies
3 NEC Technologies
59 Philips Consumer Electronics

HARD DISKS/STORAGE

70 SM Data Storage
236-237 Alliance Peripheral System
239 Casady & Greene
248 Direct Commodities
6 Easeware
168 LTC Peripherals

ACCESSORIES

FLOPPY DISKS/HOLDERS

70 SM Data Storage
109 Verbatim

FURNITURE

194 Apple
157 Antino
30 MacTable/Scanso

MISCELLANEOUS

216 Discoteconnection
248 IDE Books
4 Kensington
30 MacTableSoftware
59 Modux
e
55 Not Held

MAILORDER

228 Advanced Business Center
236-237 Alliance Peripheral Systems
225-227 Bottomline Distribution
233 Club Micro
248 Direct Connections
215 Discrete Connection
217 Dr. Mac
215 Educational Resources
214 International Mac Specialists
222-223 LBL Company, The
224 Mic and More
132-135 Mac Zone, The
228-229 Mac's Place
241 MicCenter
42-49 MicConnection
238-239 MidDirect
249 Micros
246-247 MicProducts USA
150-152 MicWarehouse
7 Minor Technologies
137 Minor Technologies
175 Minor Technologies
50 Minor Technologies
278 Printer Connection
162-163 Rave Computer
249 Tiger Software

SERVICES

ON LINE

105-106 America Online
122-123 CompuServe

TRADESHOWS/CONFERENCES

268-267 Macworld Expo Congress

TRAINING

74 MacAcademy

MACWORLD August 1993 221
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MEMORY

1x8x80 ........................................... 35
1x8x80 (bx) .................................. 35
2x6x80 ......................................... 65
4x8x80 ........................................... 135
6x8x80 ........................................... 135
4x8x80 (ibx) ................................... 135
16x8x80 (High Profile) ......................... 579
16x8x80 (Low Profile) ......................... 689
Mac Portables 3MB/4MB ...................... 410/449
Carnis & LECII - 70ns/Quadra 800 - 60ns
4MB -70ns/4MB -80ns ......................... 130/135
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16MB -70ns/16MB -60ns ..................... 595/739
32MB -60ns .................................. 2,211
PB 100 2/4/6 .................................. 85/195/229
PB 110-170 2/4/6 .............................. 85/195/219
PB 160-180 4/6/10 ........................... 180/245/259/419
PB 165C-4/6/8 ................................. 209/299/399
PB Duo 4/6/8/10 .............................. 210/299/379/475

POWERBOOK NEEDS

Battery Charger/Battery 140-180 ............ 135
Global Village PowerPort Gold .............. 309
PSo PowerModem IV ........................ 318
Supra 3.2x8s PB 14.4 ......................... 295
DoveFax PB 24/66/48 ......................... 99
Bookview Supernova ........................ 799

MODEMS

SUPRA
v.32bis S/Fax 14.4 .......................... 259
v.32bis S/Fax 14.4 with 6SW ............. 299
2400 Modem ONLY (NO CABLE) ........ 69
Fax 2400/900/9000 ........................ 199
Supra V.32bis PowerBook 14.4 ........... 299

GLOBAL VILLAGE
PowerPort/Teleport GOLD 14.4 ........... 359
PowerPort/Teleport SILVER 96 ............ 359
PowerPort/Teleport BRONZE 24/56 ...... 179

ZOOM MODEMS
AMX 2400 bps Modem ....................... 68
FX1 2400/3600 S/Fax ........................ 129
VFM 22 bps 14.400 Fax ..................... 279

HAYES
Accura 2400 bps Data Modem ............... 95
Accura 5600 bps Data/Fax 95 .............. 247
Accura 14.4 bps Data/Fax 14.4 .......... 329

CYPRESS
FaxPro II 66 ................................ 629
FaxPro II 15.4 ............................... 729

NETWORKING

Asante MacCon 3 Thr/Thr/10-T ............. 239
Asante E/SCE Thr/Ft/16-1T ................. 309
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MAC NEEDS

SIMMs Installation Toolkit ................. 8
SIMM Remover ............................. 3
Maxima 2.0 .................................. 44
Optima 3.2 .................................. 149
Virtual 3.9 .................................. 136
Virtual-RAM 512K ......................... 50
Quicksilver RAM (256K-80ns) ......... 31
Mac 1011 Keyboard ....................... 120
Kensington Turbo Mouse .................. 106
LC/Classic 16MHz Math CoProcessor .. 59
LCII - Math Co-Processor ............... 79
TwinSlot LC ................................. 239
Wristwaver ................................. 12
Wristwaver Mousepad ..................... 12
AKON 3 Sport Serial Switch ............. 125

PLI DRIVES

PLI Infinity 68 Turbo ...................... $619
PLI Super Floppy ......................... 319
Infinity 44 Turbo (Metal) ................. 405
Infinity 44 Turbo (Plastic Case) ....... 449
Infinity 85MB44 (Metal) ................. 689
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Infinity 165 Turbo (Plastic Case) ...... 705
Infinity 165 Turbo Internal ............. 729

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SIMM Remover ............................. 3
Maxima 2.0 .................................. 44
Optima 3.2 .................................. 149
Virtual 3.9 .................................. 136
Virtual-RAM 512K ......................... 50
Quicksilver RAM (256K-80ns) ......... 31
Mac 1011 Keyboard ....................... 120
Kensington Turbo Mouse .................. 106
LC/Classic 16MHz Math CoProcessor .. 59
LCII - Math Co-Processor ............... 79
TwinSlot LC ................................. 239
Wristwaver ................................. 12
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DataLife External SyQuest Drives
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Quanum

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Quantum 127 PRO .................... 239
Quantum 170 PRO .................... 299
Quantum 420 PRO .................... 399
Quantum 525 PRO .................... 999
Quantum 1000 PRO ................... 1,339

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FNB, INC.

PocketHammer 128 MB Portable .... 69
PocketHammer 240 MB Portable ..... 79

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APPLIED ENGINEERING

LC030-25MHz w/128k Cache .......... 325
LC030-40MHz w/128k Cache .......... 309
SE/Classic C60-25MHz ............... 189
SE/Classic C60-40MHz ............... 209
SE/Classic C60-40MHz w/FPU ....... 429
Quadralink 128 MB ................... 209
Quadralink 64MB ...................... 339
Plus Drive (3.5" 441MB Flappy) ....... 209
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Minimum requirements: Mac Plus, 2MB RAM, System 6.0.4.

Get a SyQuest Cartidge for only $50 with the purchase of Times Two. (82219, limit 5)

---

**Infinity 105**

The Infinity 105 is the smallest and fastest removable SyQuest drive available. It provides sustained data transfer rates of up to 1.75MB/sec. and access time of 14 ms. It allows you unlimited storage capabilities by simply adding additional optional SyQuest 3.5" cartridges. The Infinity 105 is an ideal storage device for animators, on-line editors, and users of interactive multimedia who need to take their shows on the road. It's about the size of a paperback novel so it's a perfect portable storage solution. And it can also be bus-powered to other devices for desktop use with an external power supply. (#6255, FEI)

$88. SuperSave

$145. Retrospect Remote 2.0

$74.8. Infinity 105

---

**Star Trek The Screen Saver**

Beam out barn-in with Star Trek The Screen Saver, the Editors award winner with over 15 sights and sounds of Tribbles, Captain Kirk, Spock, Klingon battleships, and more. It's a stand-alone product that's also compatible with After Dark's 30 displays. (#5341, Berkeley Systems)

Minimum requirements: Mac Plus, 2MB RAM, System 6.0.4.

#36, After Dark and More After Dark Bundle (#352)

"After $5 manufacturer rebate. Offer expires 7/31/83"
TOLL-FREE FAX UPGRADE LINE!

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Owners of previous versions qualify for these upgrades.

Name of previous version:

<table>
<thead>
<tr>
<th>Upgrade</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe Illustrator 5.0 Upgrade</td>
<td>$148</td>
</tr>
<tr>
<td>Adobe Illustrator 5.0 Deluxe CU Upgrade</td>
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<td>Adobe Premiere 2.0 Upgrade</td>
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<td>Apple Computer System 7.1 Personal Update</td>
<td>$279</td>
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<td>Claris Works 2.8 Upgrade</td>
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<td>Emaker Pro 2.8 Upgrade</td>
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<td>$98</td>
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<td>MacProject Pro Upgrade</td>
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<td>MacWorks Pro Upgrade</td>
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<tr>
<td>Microsoft Excel 4.0 Upgrade</td>
<td>$124</td>
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<td>Microsoft PowerPoint 3.0 Upgrade</td>
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<td>Microsoft Word 5.1 Upgrade</td>
<td>$76</td>
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<td>Microsoft Works 3.0 Upgrade</td>
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<td>Portfolio Systems Dynamic 3.0 Upgrade</td>
<td>$278</td>
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<tr>
<td>Symantec C+ Upgrade</td>
<td>$129</td>
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<td>Symantec Think 3.0 Upgrade</td>
<td>$49</td>
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<tr>
<td>WordPerfect 2.1 Upgrade</td>
<td>$76</td>
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</table>

Competing products in the same category qualify for these upgrades. Call us at 1-800-367-4222 if you have any questions.

Just fill in the form, check which upgrade(s) you want, add up the total with shipping, and fire off a fax with the serial number and first page of your owners manual as proof of ownership.

### System Compatibility

What system software version are you currently running? (Not sure? Call Mac's Place at 1-800-367-4222)

What Macintosh model do you have?

### Method of Payment

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Account #:

Expiration date:

Signature:

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Fax toll-free

1-800-881-3090
$128.

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Minimum requirements: Mac Plus, 2MB RAM, System 6.0.5, a hard drive.

$328.

cc:Mail Platform Pack
$228

cc:Mail 10-User Pack
cc:Mail Platform Pack is a fun e-mail system that lets you send messages effortlessly across Windows, DOS, OS/2, Unix, or Macintosh without the need for gateways. Click on mail icons to check your Inbox, prepare messages, store messages, or send messages. Plus, send and receive text, files, faxes, QuickTime videos, and voice annotations — up to 20 mixed media items within a single message. A unique scalable architecture accommodates growth, from 5 people to 500,000. Purchase one cc:Mail Platform Pack per server. cc:Mail uses whichever file server you have — AppleShare, NetWare, LAN Manager, DEC Pathworks, and more. Also, purchase a sufficient number of cc:Mail User Packs to cover your total number of users. (#5921/6160, Lotus)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.4.
$235. cc:Mail Remote (#6537)

$348.

Yamaha HELLO! MUSIC!
The HELLO! MUSIC! system includes the Yamaha CBX-T3 Tone Generator and easy-to-use "MIDI Player" software. It's fully "General MIDI" compatible, so the world of pre-programmed MIDI music is at your fingertips. If you're a musician, the CBX-T3 can act as your computer's MIDI interface. And you get Passport's Trax, FREE. Enter music into Trax by playing your MIDI instrument live or one note at a time, or you can even enter individual notes on screen with your mouse. You also get 192 16-bit samples of CD-quality sound. An audio input terminal lets you mix in material from any audio device for custom sampling. The CBX-T3 plugs into the serial port on your Mac or PC. (#6546, Yamaha)
Minimum requirements: IBM RAM under System 7.

$85.

Power Pak 415
"The best case I have ever seen," says MacUser. The Power Pak is a rugged equipment carry case with the organization of a briefcase and the room of a travel bag. A padded front pocket has 16 divisions to hold diskettes, a calculator, checkbook, pen, and other loose items. Unzipping the bag doubles its capacity. The leather hand grip and wide shoulder strap keep travel comfortable. (#5359, Tenba)
$10. Power Pak 415 Carrying Case (#6150)

$338.

Symantec C++
Symantec C++ for Macintosh combines the speed of a fast native C++ compiler with the speed and functionality of the THINK development environment. C++ provides an object-oriented approach for faster and easier-to-code development. The THINK Class Library gives you an application framework with all the C++ building blocks you need to write Mac applications. (#6488, Symantec)
Minimum requirements: Mac Plus, 1MB RAM, System 6.0.5, a hard drive.

$48.

MacFLY
Get fast reaction control and the ultimate in realism for flight simulators and your favorite Macintosh games with the MacFLY joystick. Customize the settings to your tastes with the included software. Two independent fire buttons with two modes provide double the functions. Your mouse stays active when you use the MacFLY, just move either device to automatically switch control. (#6458, IZU Products)
Minimum requirements: Mac SE, 1MB RAM, System 6.0.4.

$30.

Capitalist Pig
Build and run your own business under authentic economic conditions in this exciting simulation. Experience the challenge of business, scandals, fires, terrorism, and more, as you battle for billions or bankruptcy. Packed with sound, animation, and fun, Capitalist Pig is a must-have game. You never knew business could be so much fun! (4610, Pluma)
Minimum requirements: Mac Plus, System 6.0.

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• For schematic orders, see Computer (4635-065).
• Order from Mary at Mac's Place, (6537-065), or America Online (MacPlace).
• Mac's Place is open from 8 a.m. to 8 p.m. M-F Pacific Time, 7 a.m. to 8 p.m. Sat. 8 a.m. to 6 p.m. Sun.
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Mac Centris 650

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Dataproducts LZR 965
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Dataproducts LZR 960
• 300 dpi • 11x17
• 3 Input trays
• RISC PostScript Processor

CALL
Dataproducts LZR 1560
• 1200 dpi • 11x17
• 3 Input trays
• RISC PostScript Processor

CALL
Dataproducts Jolt
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APS HARD DRIVES

<table>
<thead>
<tr>
<th>Model</th>
<th>Internal</th>
<th>External</th>
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</thead>
<tbody>
<tr>
<td><strong>85MB - 240MB</strong></td>
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<td>APS F 520 ³</td>
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<tr>
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<td>APS Q 1225 ³</td>
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<td>APS MX 1240 ³</td>
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<td>$2249</td>
<td>$2349</td>
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<tr>
<td>APS MS 2.4G ³</td>
<td>$2699</td>
<td>$2799</td>
</tr>
</tbody>
</table>

- 30-day money-back guarantee
- All drives products carry a 30-day money-back guarantee. Your risk in the transaction is the cost of shipping.
- Disk free disk replacement warranty - Shown, most Quantum, Maxtor and Hitachi are warranty for two years. The Maxtor 1.2, 1.6G and Hitachi drives are warranty for five years. When Quantum 2.0, 2.8, and 2.12GB drives and most Quantum, 1.44GB drives are warranty for three years. The Quantum 1.3GB are warranty for one year. The Hitachi 638 MB drives are warranty for one year. Shirt and specifications subject to change without notice. Reduced orders subject to restocking fee.

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Model | MB | External
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APS SQ 555 | 44MB | $389
APS SQ 5110 | 88MB | 489
APS SQ 5110c | 44/88 | 569
APS SQ 3105 | 105MB | 749

POWER BOOK DRIVES

Model | Internal | External
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APS 80GRS | $279 | $409
APS 120 | 329 | 459
APS 160GRS | 479 | 609
APS T 213 | 569 | 699

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Model | Internal* | External
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Model | External | Special*
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I-800 874-1428

MAC WORLD AUGUST 1993

237
Hard Drive Headquarters

Fujitsu Drives

<table>
<thead>
<tr>
<th>Drive Size</th>
<th>Internal</th>
<th>External</th>
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<td>$258</td>
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<tr>
<td>520 MB 3.5&quot;</td>
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Conner Drives

<table>
<thead>
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<th>Internal</th>
<th>External</th>
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<tr>
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<tr>
<td>C 170 MB 3.5&quot;</td>
<td>$258</td>
<td>$318</td>
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<tr>
<td>C 212 MB 3.5&quot;</td>
<td>$328</td>
<td>$388</td>
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<tr>
<td>C 540 MB 3.5&quot;</td>
<td>$858</td>
<td>$918</td>
</tr>
</tbody>
</table>

These new Conner drives are so reliable, that Conner has been one of Apple's largest suppliers of drives. The 150,000 hours Mean Time Between Failure and the incredible speed of the 140 are just two reasons to buy a Conner.

Toshiba Drives

<table>
<thead>
<tr>
<th>Drive Size</th>
<th>Internal</th>
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<tbody>
<tr>
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<td>830 MB 3.5&quot;</td>
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<tr>
<td>213 MB 2.5&quot; PowerBook Drive</td>
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<td>$648</td>
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Seagate Drives

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<tr>
<td>1.2 Gig 3.5&quot;</td>
<td>$1198</td>
<td>$1298</td>
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<tr>
<td>2.1 Gig Wren 9.5&quot; 12ms, 5 Year warranty</td>
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<td>$1798</td>
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<tr>
<td>1.6 Gig Elite 1 5.25&quot; 11ms, 1 Year warranty</td>
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<td>$1948</td>
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<tr>
<td>2.4 Gig Elite 2 5.25&quot; 11ms, 5 Year warranty</td>
<td>$2398</td>
<td>$2498</td>
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<tr>
<td>3.4 Gig Elite 3 5.25&quot; 11ms, 5 Year warranty</td>
<td>$2998</td>
<td>$3098</td>
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Syquest Removable Drives

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<td>88C MB Removable</td>
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<tr>
<td>105 MB Removable</td>
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Color & Greyscale Monitors

<table>
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<tr>
<th>Monitor</th>
<th>Price</th>
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<tbody>
<tr>
<td>Sampo 20&quot; 8 Bit Color System</td>
<td>$998.00</td>
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<tr>
<td>Trinitron 20&quot; Color System Monitor Only</td>
<td>$1898.00</td>
</tr>
<tr>
<td>NuDesign Full Page Greyscale</td>
<td>$398.00</td>
</tr>
<tr>
<td>16&quot; Sony Trinitron</td>
<td>$1098.00</td>
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<tr>
<td>14&quot; Sony Trinitron</td>
<td>$428.00</td>
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DAT Drives

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<tr>
<td>5.0 Gig</td>
<td>$1398</td>
<td>$1458</td>
</tr>
</tbody>
</table>

DAT Drives from Nu Design includes free 90m DAT W/Retrospect Remote/Software.

Conner Drives

<table>
<thead>
<tr>
<th>Drive Size</th>
<th>Internal</th>
<th>External</th>
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<tbody>
<tr>
<td>C 85 MB 3.5&quot;</td>
<td>$198</td>
<td>$258</td>
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<tr>
<td>C 170 MB 3.5&quot;</td>
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<td>$318</td>
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<td>C 212 MB 3.5&quot;</td>
<td>$328</td>
<td>$388</td>
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<tr>
<td>C 540 MB 3.5&quot;</td>
<td>$858</td>
<td>$918</td>
</tr>
</tbody>
</table>

These new Conner drives are so reliable, that Conner has been one of Apple's largest suppliers of drives. The 150,000 hours Mean Time Between Failure and the incredible speed of the 140 are just two reasons to buy a Conner.

Seagate Drives

<table>
<thead>
<tr>
<th>Drive Size</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Gig 3.5&quot;</td>
<td>$1198</td>
<td>$1298</td>
</tr>
<tr>
<td>2.1 Gig Wren 9.5&quot; 12ms, 5 Year warranty</td>
<td>$1698</td>
<td>$1798</td>
</tr>
<tr>
<td>1.6 Gig Elite 1 5.25&quot; 11ms, 1 Year warranty</td>
<td>$1848</td>
<td>$1948</td>
</tr>
<tr>
<td>2.4 Gig Elite 2 5.25&quot; 11ms, 5 Year warranty</td>
<td>$2398</td>
<td>$2498</td>
</tr>
<tr>
<td>3.4 Gig Elite 3 5.25&quot; 11ms, 5 Year warranty</td>
<td>$2998</td>
<td>$3098</td>
</tr>
</tbody>
</table>

Syquest Removable Drives

<table>
<thead>
<tr>
<th>Drive Size</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 MB Removable</td>
<td>$388</td>
<td>$388</td>
</tr>
<tr>
<td>88 MB Removable</td>
<td>$498</td>
<td>$498</td>
</tr>
<tr>
<td>88C MB Removable</td>
<td>$598</td>
<td>$598</td>
</tr>
<tr>
<td>105 MB Removable</td>
<td>$748</td>
<td>$748</td>
</tr>
</tbody>
</table>

800-621-8462

or Fax us at: 312-664-9784

Hours: 8:30 - 8:00 CST, Saturdays 10:00 - 4:00

Technical Support (8:30-5:00) 800-759-2133
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Dual Speed, Multisession, 200ms $548

Textel DM-3024 Photo CD
Dual Speed, Multisession, 265ms $418

NEC Intersect
Portable, Headphone Jack $178

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5. CD-ROM DTP and Fonts Bundle Includes:
   Font House, Font Pro Vol. 1, Publish It! & Fonts, Color It! $636 $89

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Umax UC-1260
With Photoshop 2.5 $1898.00
- 24 Bit Color
- 2MB Internal Buffer

Umax UC-1200S
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- Single-pass design increases scanning speed
- Rated fastest by MacUser (Dec '91)

Umax Scan Office Greyscale Scanner
With Typewriter OCR Software, Ofoto and Publish It $898.00
- An incredible OCR package with over $1000 in software alone,
- Incredible OCR, includes 1 billion colors internally
- Single-pass design increases scanning speed
- Rated fastest by MacUser (Dec '91)

DayStar Digital Accelerators Available...Call!

New-Modems!!

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Pro Ultima Home Office $398
Promodem 144i $288
Promodem 144e $288
Promodem 24e $138
Promodem Mini 2400 $89

Zoom Modems
Zoom Faxmodem PBK $129
Zoom Faxmodem PKT $149
Zoom Faxmodem FXV $188
Zoom Faxmodem VFX $298

Photoshop
Version 2.5
Is now shipped with every color scanner

Umax UC-630
With Photoshop LE 2.5 $898.00
Umax UC-840
With Photoshop 2.5 $1298.00
Umax UC-1260
With Photoshop 2.5 $1898.00
- 24 Bit Color
- 2MB Internal Buffer

Umax Scan Office Greyscale Scanner
With Typewriter OCR Software, Ofoto and Publish It $898.00
- An incredible OCR package with over $1000 in software alone,
- Incredible OCR, includes 1 billion colors internally
- Single-pass design increases scanning speed
- Rated fastest by MacUser (Dec '91)

DayStar Digital Accelerators Available...Call!
Products...Price...Now!

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Call

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Magnavox 14" color display
399

SuperMatch 20" TXL Trinitron
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Tamarack Artisan 6000C
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Tamarack Artisan 8000C
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Sony Trinitron 14"/16"
Call/Call

E-Machines 16"/17" XL 1295/2595

E-Machines Presets for notebooks
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Magnavox 14" color display
399

SuperMatch 20" TXL Trinitron
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44MB removable
489

ATOM Int/Ext 120MB HD
559

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Mac Centris 650 Color System
$3,995


Macs

Centris 610, 480
Call

Centris 650, 8/230
Call

Quadra 800 8/230
Call

PowerBooks 160, 180 & Duos
Call

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Hayes ACCURA 144+FAX 144
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Send/Receive Fax up to 57,600 bps data
V-42bis data compression.

Hayes ACCURA 24
74

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Circle 172 on reader service card
## Macintosh CPUs

We stock all PowerBooks: 1450, 1460, 150, 160, 165c, 180, 180c, zzx.

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PowerBook 160 4/40</td>
<td>$1999</td>
</tr>
<tr>
<td>PowerBook 180c 4/160</td>
<td>CALL</td>
</tr>
<tr>
<td>Centris 610 8/230 w/CD ROM</td>
<td>$2399</td>
</tr>
<tr>
<td>Centris 650 8/230 w/CD ROM</td>
<td>$3399</td>
</tr>
<tr>
<td>Quadra 800 8/500</td>
<td>$4799</td>
</tr>
</tbody>
</table>

MaCENter® also stocks Classic, LC II, Centris and Quadras. Why travel across town, fighting traffic, to spend hours with someone who can't even spell Macintosh, and then have to lug your new system back home and set it up yourself? MacCENter® can help you choose your system over the telephone in the comfort of your home or office. Our experienced and knowledgeable salespeople can even help you custom design your new PowerBook or Macintosh with more memory, larger hard drives, and any NEC, SuperMac, E-Machines, Sigma, Radius or RasterOps monitor and/or video cards, including the new SuperMac Thunder II. We configure and test your system, formatting all drives and installing all software, and ship it to your door ready to plug in and start working.

## Accelerators

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>DayStar 50Mhz PowerCache</td>
<td>$749/859</td>
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<tr>
<td>DayStar Turbo '040 25Mhz</td>
<td>$1099</td>
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<tr>
<td>Newer Technology Quadra Overdrive</td>
<td>$259</td>
</tr>
<tr>
<td>Logica 50Mhz</td>
<td>CALL</td>
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<tr>
<td>Radius Rocket 33</td>
<td>$1479</td>
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### SIMMs

**LIFETIME WARRANTY**

<table>
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<th>Capacity</th>
<th>Price</th>
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<tbody>
<tr>
<td>4 M, 80 ns</td>
<td>$105</td>
</tr>
<tr>
<td>4 MB x 32, 80 ns</td>
<td>$125</td>
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<tr>
<td>1 MB</td>
<td>$32</td>
</tr>
<tr>
<td>10 MB PowerBook 160/180</td>
<td>$419</td>
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### Fax Modems

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>US Robotics Sportstar 14.4/14.4</td>
<td>$249</td>
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<tr>
<td>Supra Fax Modem 14.4/14.4</td>
<td>$299</td>
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<tr>
<td>Supra PowerBook Modem 14.4/14.4</td>
<td>$299</td>
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<tr>
<td>Global Village PowerPort Bronze</td>
<td>$189</td>
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<tr>
<td>Global Village PowerPort Silver/Gold</td>
<td>$339/359</td>
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### CD ROMs

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Toshiba XM3401</td>
<td>$599</td>
</tr>
<tr>
<td>Apple CD300 w/6 CD's</td>
<td>$599</td>
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</table>

### Storage Systems

All MacCENter® storage products include FWD Hard Disk Toolkit PE, double shielded SCSI cables & external terminator.

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Puma 256</td>
<td>$1799</td>
</tr>
<tr>
<td>Puma 128</td>
<td>$699/999</td>
</tr>
<tr>
<td>Eagle SyQuest Drives</td>
<td>$259</td>
</tr>
<tr>
<td>Eagle 105</td>
<td>$749</td>
</tr>
<tr>
<td>Eagle 147</td>
<td>$1499</td>
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<tr>
<td>Eagle DAT (8.0 GB) 9MB per minute</td>
<td>$1499</td>
</tr>
<tr>
<td>Eagle DAT (2.0 GB) 4MB per min. transfer rate</td>
<td>$1299</td>
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</table>

### Falcon Hard Drives

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micropolis 1.2 GB</td>
<td>$1299/1399</td>
</tr>
<tr>
<td>Fujitsu 1.2 GB</td>
<td>$1199/1299</td>
</tr>
<tr>
<td>Toshiba 1.4 GB</td>
<td>$1099/1199</td>
</tr>
</tbody>
</table>

### Printers

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SilentWriter Model 95f</td>
<td>$1199</td>
</tr>
<tr>
<td>SilentWriter Model 95fx</td>
<td>$1499</td>
</tr>
<tr>
<td>MicroWriter PS23</td>
<td>$899</td>
</tr>
<tr>
<td>MicroLaser PS17</td>
<td>$1099</td>
</tr>
<tr>
<td>MicroLaser Turbo</td>
<td>$1399</td>
</tr>
<tr>
<td>Hewlett Packard LaserJet 4M</td>
<td>$1949</td>
</tr>
<tr>
<td>OMS 860 Hammerhead</td>
<td>$3999</td>
</tr>
<tr>
<td>ColorScript 210</td>
<td>$4299</td>
</tr>
<tr>
<td>Apple LaserWriter Pro 630</td>
<td>$2349</td>
</tr>
</tbody>
</table>

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All drives have selectable active termination, efficient, quiet fans and universal power supplies.*

<table>
<thead>
<tr>
<th>Quantum</th>
<th>Internal</th>
<th>ZFP</th>
<th>Tsunami</th>
</tr>
</thead>
<tbody>
<tr>
<td>40MB (3½&quot;)</td>
<td>$159</td>
<td>$219</td>
<td>$289</td>
</tr>
<tr>
<td>85MB (3½&quot;)</td>
<td>$199</td>
<td>$259</td>
<td>$329</td>
</tr>
<tr>
<td>120MB (3½&quot;)</td>
<td>$269</td>
<td>$329</td>
<td>$389</td>
</tr>
<tr>
<td>127MB (3½&quot;)</td>
<td>$219</td>
<td>$279</td>
<td>$349</td>
</tr>
<tr>
<td>170MB (3½&quot;)</td>
<td>$239</td>
<td>$299</td>
<td>$369</td>
</tr>
<tr>
<td>240MB (3½&quot;)</td>
<td>$329</td>
<td>$389</td>
<td>$459</td>
</tr>
<tr>
<td>525MB (3½&quot;)</td>
<td>$839</td>
<td>$899</td>
<td>$969</td>
</tr>
<tr>
<td>700MB (3½&quot;)</td>
<td>$1039</td>
<td>$1099</td>
<td>$1169</td>
</tr>
<tr>
<td>1.05GB (3¼&quot;)</td>
<td>$1129</td>
<td>$1189</td>
<td>$1259</td>
</tr>
<tr>
<td>1.2GB (3¼&quot;)</td>
<td>$1289</td>
<td>$1349</td>
<td>$1419</td>
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Seagate

<table>
<thead>
<tr>
<th>Internal</th>
<th>ZFP+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6GB (5¼&quot;)</td>
<td>$1749</td>
</tr>
<tr>
<td>2.1GB (5¼&quot;)</td>
<td>$1849</td>
</tr>
<tr>
<td>2.4GB (5¼&quot;)</td>
<td>$2689</td>
</tr>
</tbody>
</table>

PocketDrive™

Get a convenient desktop connection at a great price. Genuine Quantum drives.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>ZFP+ Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>40MB (2½&quot;) incl. T-connector</td>
<td>$299</td>
</tr>
<tr>
<td>80MB (2½&quot;) incl. T-connector</td>
<td>$499</td>
</tr>
<tr>
<td>120MB (2½&quot;) incl. T-connector</td>
<td>$599</td>
</tr>
<tr>
<td>160MB (2½&quot;) incl. T-connector</td>
<td>$729</td>
</tr>
</tbody>
</table>

Optional PocketDock Cable | $59
Extra T-Connector | $59
110V Accessory Kit | $69

Powerbook Internals

Includes brackets & instructions.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>80MB Powerbook Internal</td>
<td>$289</td>
</tr>
<tr>
<td>120MB Powerbook Internal</td>
<td>$339</td>
</tr>
<tr>
<td>160MB Powerbook Internal</td>
<td>$469</td>
</tr>
</tbody>
</table>

“T.M. now taking the safer course of buying from corporate-owned companies such as Quantum-backed La Cie.”
Macworld

*Call for data sheets, conditions, limited money back guarantee and free offer. System 7.6.1 software included only with certain configurations. ZFP+ Drives do not have selectable termination. Prices do not include shipping and apply to products shipped within the continental United States. Please contact La Cie for international distribution. Additional tax where applicable. ZFP, ZFP+, Tsunami, PocketDock, PocketDock ExpressDock, SilverStreak, SilverStreak, La Cie and the La Cie logo are trademarks of La Cie, Ltd. a Quantum Company. FORTUNE 500 is a registered trademark of Time Inc. Magazine Company. All other trademarks are the property of their respective companies. All prices, specifications, offers, promotions, products and services herein are subject to change without notice or warranty. © Copyright 1993 La Cie, Ltd. 8555 SW Tidewater Place, Beaverton, OR 97005. Phone: (503) 520-9000. Fax: (503) 520-9146. All rights reserved. Printed in U.S.A.
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28MB Optical Disk $79

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88MB Drive (88C) $629
105MB 3 1/2" Drive $779
44MB Cartridge $79
88MB Cartridge $119
105MB 3 1/2" Cartridge $139

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1.3-2.0GB DAT $1439
4-8GB Comp.DAT $1549

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La Cie Silverscanner Closeout
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with Photoshop & Read-It Pro! $1349

Call now to order direct.
800-999-0215
### FUJITSU

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Model</th>
<th>Form Factor</th>
<th>Int.</th>
</tr>
</thead>
<tbody>
<tr>
<td>520MB</td>
<td>M2624FA</td>
<td>3.5 HH 9</td>
<td>$779</td>
</tr>
<tr>
<td>1.1GB</td>
<td>M2694SA</td>
<td>3.5 HH 8.5</td>
<td>$1199</td>
</tr>
<tr>
<td>1.2GB</td>
<td>M2266SA</td>
<td>5.25 HH 12.9</td>
<td>$1245</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>$1299</td>
</tr>
<tr>
<td>2.0GB</td>
<td>M2625SA</td>
<td>5.25 HH 14.5</td>
<td>$1990</td>
</tr>
<tr>
<td>2.4GB</td>
<td>M2625SA</td>
<td>5.25 HH 14.5</td>
<td>$2209</td>
</tr>
</tbody>
</table>

- Five year warranty

### QUANTUM

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Model</th>
<th>Form Factor</th>
<th>Int.</th>
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<tbody>
<tr>
<td>42MB</td>
<td>ELS42</td>
<td>3.5 17</td>
<td>$169</td>
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<tr>
<td>85MB</td>
<td>ELS85</td>
<td>3.5 17</td>
<td>$195</td>
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<tr>
<td>127MB</td>
<td>EL127</td>
<td>3.5 17</td>
<td>$219</td>
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<tr>
<td>170MB</td>
<td>EL170</td>
<td>3.5 17</td>
<td>$239</td>
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<td>240MB</td>
<td>LPS240</td>
<td>3.5 10</td>
<td>$325</td>
</tr>
<tr>
<td>525MB</td>
<td>LPS525</td>
<td>3.5 10</td>
<td>$639</td>
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<td>700MB</td>
<td>PRO700</td>
<td>3.5 HH 10</td>
<td>$1075</td>
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<td>1.0GB</td>
<td>PRO1050</td>
<td>3.5 HH 10</td>
<td>$1119</td>
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<td>1.2GB</td>
<td>PRO1225</td>
<td>3.5 HH 11</td>
<td>$1279</td>
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<td>80GB</td>
<td>Go•Drive</td>
<td>2.5 17</td>
<td>$289</td>
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<td>120MB</td>
<td>Go•Drive</td>
<td>2.5 17</td>
<td>$329</td>
</tr>
<tr>
<td>160MB</td>
<td>Go•Drive</td>
<td>2.5 17</td>
<td>$469</td>
</tr>
</tbody>
</table>

- ELS, LPS, PRO two year warranty
- Go•Drives one year warranty

### SYQUEST

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Model</th>
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<tr>
<td>44MB</td>
<td>IMS 44MB External</td>
<td>Single</td>
<td>$379</td>
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<tr>
<td>88MB</td>
<td>IMS 88MB External</td>
<td>Single</td>
<td>$479</td>
</tr>
<tr>
<td>88MB</td>
<td>IMS 88C External</td>
<td>New</td>
<td>$599</td>
</tr>
<tr>
<td>105MB</td>
<td>IMS 105MB External</td>
<td>New</td>
<td>$1045</td>
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</table>

- Drives ship with one cartridge
- Drives have two year warranty

### MAXTOR

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Model</th>
<th>Form Factor</th>
<th>Int.</th>
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</thead>
<tbody>
<tr>
<td>120MB</td>
<td>7120</td>
<td>3.5 15</td>
<td>$215</td>
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<tr>
<td>207MB</td>
<td>7213</td>
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<td>330MB</td>
<td>LXT-340</td>
<td>3.5 HH 15</td>
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<td>3.5 HH 8.5</td>
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<td>MXT-1240S</td>
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<td>PO-125</td>
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<td>PI-175</td>
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- 5.25" drives two year warranty

### SEAGATE

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<td>2.1GB</td>
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<td>ST43400N</td>
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<td>$2949</td>
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- One year warranty

### MICROPOLIS

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<td>660MB</td>
<td>1624</td>
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<td>$1219</td>
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<tr>
<td>1.0GB</td>
<td>2112</td>
<td>3.5 HH 10</td>
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<td>2.0GB</td>
<td>2924</td>
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<td>$2499</td>
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- Five year warranty

### EXTERNAL DRIVE HOUSINGS

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<th>Model</th>
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<tr>
<td>Full</td>
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<tr>
<td>Half</td>
<td>$85</td>
<td></td>
</tr>
<tr>
<td>2.5&quot; Mini</td>
<td>$99</td>
<td></td>
</tr>
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</table>

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<tr>
<th>Modems</th>
<th>Price</th>
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<tr>
<td>24/96 PowerTwin</td>
<td>$312</td>
</tr>
<tr>
<td>Internal 2400/data, 9600/send, 4800/receive</td>
<td>$129</td>
</tr>
</tbody>
</table>

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271
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272

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272
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CIRCLE 424 ON READER SERVICE CARD

Continued...
### COMPUTER EXTRAVAGANZA!!

#### NEW

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>iMac 4/0</td>
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<td>iMac 4/230</td>
<td>$1,599.00</td>
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<td>iMac 4/260</td>
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<tr>
<td>Classic 2/40</td>
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<tr>
<td>Classic II 4/40</td>
<td>$799.00</td>
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<tr>
<td>Quadra 900 4/70</td>
<td>$2,995.00</td>
</tr>
<tr>
<td>PowerBook 100, 140, 170</td>
<td>CALL</td>
</tr>
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*Call for Latest Pricing on Centris, LC III, PB, etc.*

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>Personal LW NTR</td>
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<tr>
<td>Personal LW NT</td>
<td>$899.00</td>
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<td>Personal LW LS</td>
<td>$599.00</td>
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<td>Mac Plus</td>
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<tr>
<td>Mac SE 1/20 (SOOK)</td>
<td>$399.00</td>
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<tr>
<td>Classic II 2/40</td>
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<td>Classic II 4/20</td>
<td>$849.00</td>
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<td>Mac LC 2/40</td>
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<td>Mac LC 4/40</td>
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<td>Mac II 2/60</td>
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<td>Mac IIE 3/40</td>
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<td>Mac IIe 1/0</td>
<td>$2,799.00</td>
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<tr>
<td>PowerBook 100, 140, 170</td>
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#### USED

<table>
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<tr>
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<td>Apple 16&quot; RGB</td>
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<td>Apple 13&quot; RGB</td>
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<tr>
<td>Apple 12&quot; RGB</td>
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<tr>
<td>Apple 12&quot; Mono</td>
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<td>Apple 8 Bit Video Card</td>
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<tr>
<td>Apple 8&quot;/24GC Card</td>
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<td>Apple Scanner</td>
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<td>Apple One Scanner</td>
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<td>Laser Int</td>
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<tr>
<td>Laser Ints</td>
<td>$1,095.00</td>
</tr>
</tbody>
</table>

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**QMS PS-410** - $799.00*

(...with purchase of turner)

**QMS ColorScript 100** - $1,599.00 (List $9,995.00) 300 dpi Color Laser/PostScript, USED

#### EXTRA SPECIALS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>EMAC 5000B Ext. w/V.22/42-MNPX</td>
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<td>EMAC 4000 Ext. w/5-MNPX</td>
<td>$300.00</td>
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<td>EMAC 24/56Data Fax w/end-receive</td>
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<td>Pocket Modem</td>
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<td>Hayes 2800B Int. Modem</td>
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<tr>
<td>Apple Personal Modem 300/1200B</td>
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<td>Apple IICache Card</td>
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<td>Hardline PowerView</td>
<td>$280.00</td>
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<tr>
<td>MAC LC III Card</td>
<td>$65.00</td>
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<tr>
<td>Hardline Accelerators</td>
<td>SAVE</td>
</tr>
<tr>
<td>Radius TV</td>
<td>$899.00</td>
</tr>
<tr>
<td>NuQuest Cards (4/32)</td>
<td>$82.00</td>
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<tr>
<td>Macintosh Image Compression Card</td>
<td>$299.00</td>
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<tr>
<td>Apple Personal LP Cassette Base</td>
<td>$79.00</td>
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<td>EMAC SpeedTalk Ethernet</td>
<td>$399.00</td>
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<td>EMAC SpeedTalk PC LocalTalk Card</td>
<td>$45.00</td>
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<tr>
<td>Apple Portable Ext. Battery Recharger</td>
<td>$89.00</td>
</tr>
<tr>
<td>SuperMac SuperMatch Color Calibrator</td>
<td>$139.00</td>
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#### DRIVE SPECIALS

<table>
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<th>Drive</th>
<th>Price</th>
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<tr>
<td>Apple FC 5.25&quot; Drive</td>
<td>$15.00</td>
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<tr>
<td>PC Drive Card 6E or Mac B</td>
<td>$15.00</td>
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<tr>
<td>Radius 21&quot; Color</td>
<td>$1,899.00</td>
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<tr>
<td>Radius 21&quot; Mono</td>
<td>$999.00</td>
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<tr>
<td>Radius Color Printer</td>
<td>$340.00</td>
</tr>
<tr>
<td>Radius Other Boards</td>
<td>CALL</td>
</tr>
</tbody>
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CENTRIS 610 8/20 W/D ETH $1859
CENTRIS 610 8/30 W/C $2359
CENTRIS 650 4/60 $2252
CENTRIS 650 8/60 $2899
CENTRIS 650 8/160 $3558
QUADRA 800 8/20 $1639
QUADRA 800 8/500 W/C $4695
QUADRA 800 8/500 $4279
QUADRA 950 8/500 $5569
QUADRA 950 8/1000 $7195

PB DUOs
DUO 230 4/120 $2390
DUO 230 4/120 MINI $949
DUO MINI DOCK $529

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APPLE 14" COLOR $489
APPLE 16" COLOR $1195

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DUO 230 4/120 $2390
DUO 230 4/120 MINI $949
DUO MINI DOCK $529

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APPLE 14" COLOR $489
APPLE 16" COLOR $1195

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HP Deskwriter $345
Laserwriter PRO 600 $1898
Laserwriter PRO 650 $2299
APPLE COLOR PRINTER $1599
HP Deskwriter 550C $698

PowerBooks
PowerBook 145B $825
PowerBook 165C 4/80 $2499
PowerBook 165 $2799
PowerBook 160 8/200 $2799
PowerBook 185 $2799
PowerBook 180 8/200 $4195

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- Plus video card $30
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- 2x8x70 .................................. 65
- 4x8x80 .................................. 135
- 4x8x70 .................................. 137
- 4x8x80 II/II ................................ 140
- 4x8x70 II/1bx ........................... 142
- 8x8x80 .................................. 359
- 16x8x80 (High profile) .............. 559
- 16x8x70 (Low profile) ............... 605
- 1x8x80fx .................................. 34
- 1x8x70fx .................................. 36
- 4x8x80fx .................................. 136
- 4x8x70fx .................................. 138
- 8x8x80fx .................................. 359
- 16x8x80fx .................................. 579

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- 8MB (70 NS) ............................. 259
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- 60 NS
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- 8MB (60 NS) ............................. 309
- 16MB (60 NS) ............................ 729
- 32MB (60 NS) ............................ 2099

**POWERBOOK MEMORY**

- PB100/140/170-2MB ................. 77
- PB100/4MB .............................. 179
- PB100/6MB .............................. 259
- PB140/170-4MB ....................... 159
- PB140/170-6MB ....................... 210
- PB160/180-4MB ....................... 182
- PB160/180-6MB ....................... 225
- PB160/180-8MB ....................... 349
- PB160/180-10MB ..................... 409
- PB165C/4MB ........................... 202
- PB165C/6MB ........................... 294
- PB165C/8MB ........................... 409
- PBDUO 210/230-4MB ............... 199
- PBDUO210/230-6MB ............... 279
- PBDUO210/230-8MB ............... 349
- PBDUO210/230-10MB .......... 469
- PBDUO210/230-12MB ........... 549

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- SyQuest 44/w/Divax ............... 68
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<table>
<thead>
<tr>
<th>Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Megabyte</td>
<td>129.00</td>
</tr>
<tr>
<td>8 Megabyte</td>
<td>275.00</td>
</tr>
<tr>
<td>16 Megabyte</td>
<td>507.00</td>
</tr>
</tbody>
</table>

**Standard SGRAMs**

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- 512K Mac LC URAM: $49.00
- 512K Mac IIx URAM: $59.00

**PowerBook Memory**

<table>
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<tr>
<th>Module Size</th>
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<td>2 MB Module</td>
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<td>8 MB Module</td>
<td>359.00</td>
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<tr>
<td>10 MB Module</td>
<td>459.00</td>
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</tbody>
</table>

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<th>Model</th>
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<td>PowerBook Duo Systems</td>
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### Drives

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### CD-ROMS

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### Multimedia

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<td>SuperMac Digital Film</td>
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<td>SuperMac Video Pigout</td>
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### Memory

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<td>Ventana PowerBook Display</td>
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<td>Adapter and memory</td>
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### Modems

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<td>US Robotics 14.4K Ext. Fax Modem-v.32</td>
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<td>US Robotics 14.4K 1st. Fax Modem-v.32</td>
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<td>v32 Turbo w/42 bis w/MNP Software</td>
<td>329</td>
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<td>Supra Fax Modern 14.4 V.32 bis (ext)</td>
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<td>PSI Connection Four</td>
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<td>PSI Connection Five</td>
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### Modems

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<td>Global Village Gold 14/4/16 for Powerbook</td>
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<td>IDE K 17&quot; Autocopy SVGA Color</td>
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### Monitors/Cards

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### Printers

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### Scanners

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Eleven Simple Things You Can Do to Save IBM

BY GUY KAWASAKI

EM IS IN TROUBLE: SALES ARE down, red ink and blood are flowing through its halls, and no one wanted the CEO job after John Akers "resigned." It's time to wipe the silicon-eating grins off our faces and help the Inferior But Marketable, Intimidated By Macintosh, and Incredibly Boring Machine Corporation. Otherwise, we face a world dominated by the arrogation of Apple and the intimidation of Microsoft. So here are 11 things you can do to save the world's (formerly) most profitable corporation from ignominy.

1. Encourage John Sculley to replace Louis Gerstner, Jr., as chairman of IBM. Corporate America uttered a collective "Huh?" when IBM announced the hiring of Gerstner, former chairman and CEO of RJR Nabisco, the cigarette (Camels) and consumer products (Oreo cookies) holding company. (In fact, this choice makes some sense: hire someone who headed a company whose goal appears to be getting people addicted to something that might kill them. It fits right in with IBM's past strategy.) Sculley would do a much better job at least he knows the difference between a Newton and a Fig Newton. I'm not sure who would sit next to Hillary Rodham Clinton at press conferences, because Sculley would be a lot busier at International Biscuit Machine than he is at Apple.

2. Get Richard Hackborn to be the president and chief operating officer of IBM. Who is Richard Hackborn? He is an executive vice president at Hewlett-Packard. Specifically, he runs HP's Boise, Idaho-based printer business. This renegade division exemplifies how to run a large, high-technology business: decentralized, independent, and profitable. It accounts for 40 percent of HP's income before interest and taxes. What could be a better model for the new IBM?

3. Buy a Lexmark printer. Lexmark is a company that IBM spun off. Lexmark produces laser printers. If its sales and profits increase, that will show IBM that breaking up its behemoth, Stalinist structure is the way to cope with the nanosecond nineties.

4. Get the Apple board to replace John Sculley with an executive from Nabisco. I can see it now: Joe Camel as a software agent. Another possibility for Sculley's replacement is the brother or sister of an Apple executive who once used a Macintosh. Using IBM's recruiting standards, that's a sufficient qualification to run Apple; until recently Gerstner's brother was a high-ranking IBM employee, and Gerstner supposedly used an IBM PC once—probably to calculate the legal costs of all the lung cancer lawsuits.

5. Buy up all the birth-control devices in Washington state. Marriage alone might defocus Young William from running Microsoft as well as he does, but a baby would certainly do the trick. Since most Mac owners don't have sex, you can use the condoms to prevent your extra PowerBook batteries from hitting metal objects in your briefcase and shorting out. Today's brands make excellent shock-absorbing feet for Quadras, and Norpants make good plant-food spikes.

6. Send Bill Gates an MCI Mail message with your company's technical secrets, and then tip off the police. Gordon Eubanks, CEO of Symantec, is in trouble because someone he hired from Borland allegedly sent him technical secrets before leaving Borland. Maybe you could get Bill Gates in similar trouble. Bill and Gordon could share a cell—imagine the conversations: "Microsoft BASIC is the best language. "No way, you geek! Think C is.""

7. Build a basketball court for Steve Capps. Steve is a co-author of the Finder, and he's the de facto engineering study of the Newton project. It's in IBM's best interest that the market not change, so IBM can catch up. One way to do this is to slow down projects like Newton. Steve's favorite pastime? It's a toss-up between basketball and programming, and his house doesn't have a basketball court.

8. Send Stewart Alsop a pizza and Esther Dyson a plane ticket to Russia. Stewart is the editor-in-chief of InfoWorld. Esther is an industry analyst. They are two of the smartest and most critical thinkers in the personal-computer business. IBM needs breathing room, so we need to reduce criticism of its efforts in the press. The most effective way to defocus Stewart is to send him something to eat. Esther is fascinated by the role high technology can play in rejuvenating Russian society. The most effective way to defocus her is to give her a trip to Russia.

9. Tell Apple you want more models of Macintosh. The Akihabara Syndrome aside, we've got to help IBM. What better way to create more confusion in the market than with more Mac models? We need a Quadra 925, an LC II, and a PowerBook 175. If things get really bad for IBM, we could tell Apple to produce more modems.

10. Send Michael Dell, CEO of Dell Computer Corporation, to Harvard to get an M.B.A. What does Young Michael (age 28) know? He's only built up a $2 billion business that provides support and sells computers at reasonable prices. He needs an M.B.A. He needs a B.A., as well, because he dropped out of school at age 19. By the time he finishes the degrees, maybe IBM could rebound.

11. Buy an IBM PC. I didn't say saving IBM would be easy or painless. What can you do after you buy one? I asked around for ideas, and the best suggestion I got was to put them in toilet tanks as "displacement devices" to reduce the amount of water flushed. (Admittedly, the people I asked were hardly unbiased.) What's good for IBM is good for the earth.

GUY KAWASAKI's views are his own and only sporadically represent those of Macworld. His latest book is The Computer Curmudgeon (Hayden Books, 1992). He has investments in After Hours Software, Objective Software, Global Village Communications, Bookmaker Corporation, and others.
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