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The 9-bit digital-to-analog converter (DAC) allows for gamma correction to be made without any on-screen color degradation.

**RGB MODE**

The ProColor 32 supports both RGB and CMYK modes, providing complete compatibility with existing RGB software as well as simultaneous on-screen display of both RGB and CMYK information.

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We left some things out of WriteNow 3.0

—Heidi Roizen, CEO, T/Maker Company

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Microtek removes the biggest barrier to owning a Slide Scanner

If price has been the barrier separating you from high quality color scanning, take a look at the ScanMaker 1850.

Another stunning price breakthrough from Microtek, the leader in affordable color scanning solutions.

The ScanMaker 1850 sports a formidable set of specs. 35 x 35mm scanning area. 24-bit color. 8-bit gray-scale. 1850 dpi resolution.

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For a listing of all available DPI/viewing modes and other neat stuff we didn't have room to include, call 1-800-NEC-INFO. In Canada, 1-800-343-4418. For immediate information via fax, call 1-800-366-0476, request #62234.

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Backup. For people who don't.
Everyone who uses a Macintosh ought to back up regularly. But most people don't back up at all. In fact, if the people in your company are like those at most other companies, about the only way you're going to get regular backups out of them is to do it without them.

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All you need is Fastback Plus.

The Macintosh version of the world's most popular backup software is also the Mac world's most flexible backup software.

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That's right. You can actually restore a Mac file directly onto a PC, and vice versa.

Nobody else can do that.

But then, nobody else can back up 1MB per minute on a Mac.

No other DOS, Windows or Network backup program can run fast enough to see our tail lights.

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FrameMaker.
The most comfortable seat in document publishing.

To experience a whole new comfort level in document publishing, have a seat in front of a Macintosh running FrameMaker.

FrameMaker integrates the entire publishing process into one easy-to-use application: Authoring, editing, graphics, page layout, production, even hypertext. Whether you create short, simple documents or long, structured documentation, you'll feel right at home with FrameMaker.

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That's the kind of innovation that earned FrameMaker an Editor's Choice award from MacWEEK and accolades from MacUser.

And of course, it's compatible with System 7.0.

So call 1-800-U4-FRAME ext. 955 for more information on FrameMaker 3.0 and the name of your nearest reseller. And feel how comfortable a position in publishing can be.
In the world of professional color publishing and prepress, Thunder/24 has left the competition in the dust! Its record-shattering power provides the industry's fastest QuickDraw" acceleration for color graphics on large-screen displays up to 21 inches. Speed that's as much as 1600 percent greater than the nearest rival! Thunder gives you unprecedented split-second response from key applications like QuarkXPress, Adobe Photoshop," and Aldus PageMaker and FreeHand. And with its breathtaking superiority in speeding screen redraw, text and layout manipulation, color retouching, preparing proofs and separations — you can spend your time creating, not waiting. Plus, the feature-packed Thunder/24 provides pan and zoom in hardware, a Virtual Desktop" of up to eight square feet for poster-size projects, and as much as 8MB of on-board GWorld memory for faster manipulation of large color images. See Thunder/24 in action today at your Authorized SuperMac Reseller. To find the reseller nearest you, just call 1-800-334-3005. For immediate information via fax, call SuperFacts: 1-800-541-7680. (In 408 area, call 524-4797.)

Circle 132 on reader service card
Fire danger has prompted Apple to offer free battery cases for spare PowerBook batteries. When the rechargeable batteries are outside the computer and unshielded, there is a small possibility of grounding causing a discharge or fire, Apple said. Call 800/377-4127.

Two Big Mergers: MacroMind Paracomp and Authorware are merging. The company’s new name was not set at press time. MacroMind Paracomp (415/442-0200) will take over sales and tech support. Microsoft intends to acquire Fox Software, subject to government approval; sales and tech support will remain at Fox (419/874-0162).

Radius blasts its Rocket 68040 accelerator to 33MHz—an increase over the speed of the company’s existing NuBus accelerator of about 30 percent. The Radius Rocket 33 lists for $2499 and is shipping from Radius (408/434-1010).

Who’s There? Nok Nok is a utility that tells you who is accessing your Mac under System 7’s file-sharing. It can be set to open the file-sharing window when someone logs on; then it can disconnect after a specified time. Nok Nok is $49.95 from Trik, 617/933-8810.

The ComboCache Ilsi from DayStar Digital (404/967-2077) adds 32K of RAM cache, a socket for an optional math coprocessor, and two PDS slots to the Ilsi. (The board fills the Ilsi’s PDS slot.) The $349 ComboCache is available now.

QMS cut prices on its QMS-PS 410, QMS-PS 2210, and QMS-PS 2220 laser printers. The 4-ppm 410 went from $2395 to $1995, while the 2210 and 2220, both 22-ppm network printers, went from $9995 to $8995 and from $12,495 to $9995, respectively. QMS is at 205/633-4300.

TrueForm Options: For owners of the orphaned Adobe TrueForm, Shana Corporation (403/463-3330) has published the $149 Informed TrueForm Conversion Kit to move TrueForm forms into Shana’s Informed format. Shana says almost all aspects of TrueForm forms are converted correctly, and a log of any problems is created.

Net Management News: The AG Group (510/937-7900) has upgraded Net Watchman to version 1.2. It supports Ex Machina’s Notify pager and can monitor a class of network devices (for example, all laser printers) across an internet. Version 1.2 lists for $295. AG Group’s $795 EtherPeek now works with all Ethernet devices based on the Sonic chip set, which includes the Quadra and most Mac Ilsi and LC boards.

New Vectors: Sign-making system vendor ScanVec (508/694-9488) is entering the Macintosh market with raster-to-vector software. ScanVec’s $1495 RVC/Mac has automatic smoothing that closes all objects. The company says it arranges polygons so they can be filled when a file is imported into Illustrator or FreeHand.

Ray Dream Revs: In version 2.0 of Ray Dream Designer, the LightForge modeling module has real-time preview and supports PostScript Type 1 and TrueType fonts. The new, $895 version’s SceneBuilder assembly and rendering module incorporates DreamNet, which can divide up a rendering job for several Macs on a network. Ray Dream, 415/960-0765.
Video Training Becoming Most Popular, Least Expensive Way to Learn Macintosh Programs

Macintosh Programs Can Now Be Learned in a Few Hours With A Unique MacAcademy Video Speed Learning System

Over the past five years I’ve been associated with over 100,000 people attempting to learn the Macintosh computer. I’ve watched as each one wagered their own personal, private battle trying to master the Mac and the most popular Macintosh programs.

I’ve felt their frustration, have empathized with their confusion and have understood their computer fears. I’ve talked to employees who had new computers and new programs dropped on their desk with the directive to “learn this.” I’ve listened to people who struggled night after night trying to read and understand a computer manual. It’s amazing how a computer manual can make a fairly bright person feel totally inept.

You’d be surprised at the number of people who have confided in me the fact they’ve given up trying to learn some of the programs. They’ve put the box on the shelf and simply written the expenditure off as a bad investment.

Hard Earned Money Wasted

Can you imagine how much money has been wasted on programs and computers that are sitting abandoned? Right now think of the people working on Macs in your office. Do they really understand the computer? How many programs are each of your people using? Have they really mastered the programs? Do they know the shortcuts and valuable techniques that will save you time, money and increase your professionalism?

An Excellent, Low Cost Training Answer

Five years ago I founded MacAcademy. My purpose was to create a training organization that provided training similar in nature to the Macintosh itself - simple, easy to use and effective.

Now, five years later the concept has proven to be a great success. Right now people are benefiting from MacAcademy training in over 100 cities in the U.S., in Canada, Great Britain, Australia, Japan, Hong Kong and 22 additional countries throughout the world.

MacAcademy training is successful for one reason - it works!

The Video Answer

Three years ago we introduced the MacAcademy Video Training Library. This library now includes over 80 different titles. Each video is 2 hours long and offers clear, concise, effective training. In some cases you can receive up to 8 hours of training for one program.

MacAcademy has resisted the temptation to follow competitive training programs who have recently implemented large price increases. Our videos started out at $49 each and are still only $49. This low cost training alternative has proven to be the Macintosh training choice of over 10,000 companies.

Guaranteed Results

The MacAcademy reputation is excellent. Our guarantee is simple: If you're not happy we'll refund your money. No hassles or problems.

To Order

Here is a partial list of over 80 MacAcademy Video training tapes now available. To order, simply send check, credit card information, or purchase order to MacAcademy Videos Dept. MW692 477 S. Nova Rd. Ormond Beach, FL 32174 or call the numbers listed below. Now is the time to start training. Thank you for allowing MacAcademy to help you in that effort.

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Adobe Photoshop Part 4
Canvas 3.0 Part 1
Canvas 3.0 Part 2
Canvas 3.0 Part 3
Claris Resolve Part 1
Claris Resolve Part 2
Claris Resolve Part 3
ClarisWorks Database
ClarisWorks Graphics

What did it take to get the editors at MacWeek and MacUser to agree on the best Macintosh utility product?

Unprecedented performance, compatibility, and value. In this case, a collection of 10 utilities that does for System 7 what products like SUM and Norton do for hard disks — only more so. As MacUser put it, “Now Utilities will make your Macintosh faster, easier, and more fun to use.” For example:

- **StartUp Manager™** provides complete extension management
- **Super Boomerang™** finds files and folders instantly
- **WYSIWYG Menus™** groups fonts in their own typefaces
- **NowMenus™** makes the Apple Menu hierarchical
- **AlarmsClock™** displays the time & reminders in the menubar
- **NowSave™** automatically saves files to prevent data loss
- **Screen Locker•M** keeps confidential information confidential
- **MultiMaster™** launches applications and files
- **Profiler™** analyzes system configurations
- **DeskPicture™** puts color and B&W pictures on the Desktop

In fact, every utility in the collection is the best of its kind. All of the utilities in the collection are also designed, tested, and guaranteed to work together — and with anything else your customers may have ... even System 6. No wonder MacUser gave it a perfect five mouse rating and called it “a must-have for experienced users and novices alike.”

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Electronic Magazines: Will You Read One?

By Jerry Borrell

Will you spend your evenings looking at a computer screen, reading the future's version of a magazine?

I will. Despite loving late nights reading a New Yorker article about the next elections in Bolivia, I'll have to get used to electronic magazines because the economics of publishing make it more expensive and inefficient to work with paper. The U.S. Postal Service adds with paper. The U.S. Postal Service adds.

Can You Wrap a Fish in Them?

That was the response of Newsweek magazines as we know them today are wrapping. Their point was that you couldn't curl up on a sofa with a computer screen, reading .

Electronic Magazines: Will You Read One?

The U.S. Postal Service adds.

Can You Wrap a Fish in Them?

That was the response of Newsweek magazines as we know them today are wrapping. Their point was that you couldn't curl up on a sofa with a computer screen, reading .

Communications Technology

So how will you obtain an electronic magazine? Certainly you'll buy them as CD ROMs. We published Macworld Interactive nearly two years ago and will publish more issues this year. But CD ROMs are, to me, a transitory distribution medium, suited for the current period. I think they will become antiquated with the introduction of better communications technologies.

After we've spent years of suffering with telephone-line-based 300-, 1200-, 2400- and 4800-bps connections to text-based online services, 9600-bps communications speeds have now become feasible. The slow improvement of modem speeds should have addressed the interminable delays experienced by online users, but every time a modem manufacturer makes another advance in technology, such as a 9600-bps modem, while dropping its prices, users demand greater performance.

Take 9600-bps service, for example. It's difficult (given the notoriously bad quality of phone connections) when an editor at one of the international Macworld magazines attempts to download a story from our San Francisco-based server. Downloading, or retrieving, 1MB-to-3MB PageMaker article files is fraught with problems like phone-line interruptions. The length of time required to download articles increases the likelihood that such problems will occur.

But ISDN and Switched Digital Services (SDS) at 64,000 and 56,000 bps, respectively, herald a new era. For the first time these high-speed services are available to users via standard telephone wires. We still have to pay a fee of around $500 to have these lines installed. Another $1500 worth of data communications equipment is required to connect a personal computer to them, but these prices will fall by half over the next year. And with ISDN and SDS, transmission of Macworld's editorial copy and images has finally become practical.

There are even more advantages to ISDN and SDS. Services are becoming available on a cost-per-use basis rather than on a lease-line basis, which drops prices to about $20 per minute rather than close to $2000 per month. Foreign editions working with Macworld are paying about $200 per month in costs now. And connection reliability is a powerful hidden benefit. After an initial painful period of establishing a connection with ISDN, we have experienced only occasional problems with our telephone lines—typically related to a new version of software installed on the server.

Most important, however, is the fact that during 1992 ISDN and SDS are being introduced to large segments of the U.S. population. One of the primary limits on these two services has been that you've had to be physically close (within one mile) to the digital switching equipment needed to use the services. And there have been only a few switches in the United States capable of allowing end user connection. Now several of the Regional Bell Operating Companies, the "Baby Bells," are introducing ISDN/SDS-continues.
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capable switching equipment in their areas of service. That allows people to use the service from within a 9-mile radius from a digital switch. The result is that most Americans should be able to connect to such services in the near term. Most won't due today's cost. Businesses will, and in large numbers. I believe that some ordinary mortals will connect to ISDN/SDS services this year, but only early adopters.

A near-future benefit of ISDN/SDS-type services is in their certain performance improvements. Speeds up to 128,000 bps are possible today by dedicating two pairs of phone lines to the service. Next year or in 1994, as connection equipment improves, these speeds may become possible over one line. So those of us working with the technology today can look forward to a significant performance improvement.

**Defining a New Kind of Publishing**

**STILL, SPEED IMPROVEMENT ALONE isn't enough.** Tens of thousands of our readers could connect via high-speed digital links to the central server where we store Macworld electronically, but not many of you would want to read our stories from PageMaker files. True, we already serve thousands of readers by placing the text of reviews, new products, and other segments of the magazine online in Macworld Online. But we don't serve these readers with feature articles because of the tables, graphics, and photography. Our sister publications throughout the world download our files, but they have a specialized need for the information in our stories. We need to provide readers with more than high-speed access to Macworld text or DTP files. Otherwise, we're disseminating a publication electronically, not offering access to an electronic magazine.

What we do today only hints tantalizingly at what we must accomplish this year to attract you to an electronic version of the magazine. For example, we will need to make available a preview version of the magazine that will allow you to quickly browse the stories and information that we can provide. Once you've looked at the latest stories, you may want to download a particular story as a compressed file to read at your leisure from your home or office computer. Or you may want to print out a copy to take with you. At current ISDN or SDS delivery rates, reading a story from a server accessed via phone lines is possible, but still a little too slow to be attractive. At 128,000 bps, you won't mind reading our stories. And when networks can deliver 1-megabit-per-second transmission speeds, you'll no longer notice that you're online. You'll actually want to read and browse online because then the technology and what constitutes a magazine will be dramatically different from what I'm proposing for 1992.

**What About Cable?**

**IN FACT, AT 1-MEGABIT-SECOND speeds, magazines could be provided over existing cable networks. This should strike a resonant note because most of America is wired for cable television today, so potentially we could deliver an electronic magazine in that way, or deliver it in a pay-per-view model, in the fashion of movies or special sporting events that you can already receive through cable.** The real problem with existing cable is viewers' inability to interact with magazine content. Phone-based systems will allow data and instructions to be exchanged at high speed at both ends. Cable, in its present form, is a much more passive, receive-only model.

That's another part of electronic magazines of the future. Publishers will be able to lure you with high-quality content, but the real key to these new technologies is much more than simply creating wizzy files incorporating several languages and QuickTime movies. The key lies in how you'll be able to interact with, modify, store, retrieve, and select information in electronic magazines.

**What Will They Look Like?**

**IN THE FUTURE, WILL A FEATURE be a feature? Articles will still be text and images combined on a page, but the page will have to shrink (or expand) to fit a screen. For small displays, text will have to be larger, the fonts carefully selected for legibility on a screen. Images will be active—that is, the static images that now appear in the magazine will actually be QuickTime movies that can be played. These movies will be PICT files, animations, and video.**

As a reader, you should have some rudimentary control over your viewing environment—say, a choice of text size, bits per pixel (8 or 24), language, voice narration (or lack thereof), and the size of the viewing window for images, graphics, and video.

Electronic magazines will be essentially different from what you read on paper today, but not entirely dissimilar. One difference will be in the fashion that we publish stories. You'll be able to read about new products and other stories shortly after we write them, not weeks later. Another difference is in how you'll be able to search through the massive...
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number of stories that we've published. And you'll be able to cut and paste portions of our work for your own use. (And pretty soon not only the Software Publishers Association will be voicing copyright concerns—traditional publishers will join it.) Some stories will be written (or rewritten in the case of articles like hard drive reviews) more frequently or have updates appended to them.

The entire realm of how we shape information in today's magazines—and how you use information—will change. All based upon instant access to new electronic magazines via phone lines. Which brings up an interesting topic, the threat that traditional publishers feel from electronic publishing.

**Antitrust Fears**

ONE OF THE RECENT CHANGES IN our society has been the regulation of public telephone networks. The federal courts decided some years ago to disallow quasipublic utilities, such as phone companies, from providing information services. In 1991, however, the courts reversed that decision and moved to allow the Bell companies and others to do just that. Shortly thereafter, newspapers, broadcasters, and other publishing companies began a noisy debate over whether the courts' decision should be countermanded through legislation. Newspaper publishers have been particularly outspoken in their criticism of the idea of allowing companies to combine phone services and information dissemination, saying that it will create a new oligarchy capable of controlling the public's access to information.

But some of us believe that the implementation of future information technologies will require that the Bell companies become participants. I happen to believe that smaller publishers will become more powerful, not less powerful, as a result of their ability to leverage resources from the phone companies' connections to every home in America. And, just as public access to cable systems is required through regulation, I believe that phone companies should be required to give all responsible parties access to phone-based information-distribution channels.

**Get Ready, Get Set**

SO WHAT WILL ELECTRONIC MAGAZINES LOOK LIKE? When will they be available? How will they improve our lives? They'll look like Macworld Interactive, which we'll be publishing again this summer. They'll be available in 1992. And they will definitely change how we access and use information. 

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MacUser, June '90

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Kept Wishing

JUST FINISHED READING JERRY Borrell's March column (Commentary), and I can't agree with him more. Apple is just not keeping up with the Joneses, or the Borrells or the Stevenses for that matter. Hardware capability has fallen way behind the capabilities of many leading-edge applications. I'm not sure how much longer I can remain a loyal Macintosh user as long as my needs keep outdistancing the hardware Apple is developing.

Larry Stevens
Atlanta, Georgia

LET'S SEE IF I GOT THIS RIGHT. IBM got Apple's system code and Apple got the IBM dress code. Since the 5th of July, Apple stock is up 50 percent and IBM's is down 25 percent. I don't know what the dress code has to do with anything, but either IBM did not get much or it doesn't know how to use what it did get!

And about that PrintMonitor. The first System 7 problem I encountered was the bug with the background printer in the Chooser the machine starts every time I turn off the background printer in the Chooser the machine starts every time and I have far fewer printing problems.

Am I the only one who has this problem? Nevertheless, I have no plans to trade in System 7 or my Apple stock.

Larry Hacker
Mabelvale, Arkansas

Forgotten CAD

READ WITH INTEREST DAVID Peltz's response to the December 1991 Commentary by Jerry Borrell regarding the state of Macintosh CAD (Letters, March 1992). I think both missed the point. Borrell is correct: Macintosh CAD is in a sad state. Unless you include as CAD nontraditional activities such as photo-realistic visualization, the Mac is woefully short of its competitors in market share.

I do agree with Peltz that the Mac's market share in this area is growing, but given the basic graphical nature of the Mac and the performance of the Mac II line, Apple should have been able to grab a major portion of the routine day-in, day-out 2-D design and drafting market several years ago. This market is significantly larger than the visualization market Macintosh Engineering & Scientific Report and Macworld write about. And to date, Apple is simply ignoring it.

Gary Shellenberger
Clearwater, Florida

Modern Rambos

STEVEN LEVY, YOU EGOTISTICAL %$#@head. Heh, just kidding. Levy has hit the nail precisely on the head (The Iconoclast, March 1992). People love to appoint themselves King o' the Net. Usually it's when people are on new virtual turf, away from their normal stomping grounds, that they take an aggressive stance on some issue. They figure that they'll never visit there again and it's usually 500 miles away from their desktop.

Although computer communications have been around for a few decades now, it's surely an eighties, oops, nineties Rambo-complex kind of thing.

Steven Mills
Iowa City, Iowa

Freedom of Expression is one of the most important issues in our nation, and in the budding electronics area we need to be aware of the power of our own expressions. I think people will always need a vent; the idea that volume and livid fervor might become an acceptable substitute for thoughtful discourse is worrisome at best.

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A Tempo macro can proceed in different ways, based on the presence of an alert dialog box, the message in the alert box, or even an image on the screen. And when you add conditional repeats to that conditional branching ability, a Tempo macro can perform the exact number of steps you need.

Richard Barron
President
Affinity Microsystems
Boulder, Colorado

Tips for Monitors and Memory

I had to thank you for the article “Color Display Bargains” (March 1992). I'd just put in an order for a Ilci and had very little money left when my mail arrived, bringing with it the latest issue of Macworld. This is the first time any magazine has given me the information I desperately needed just when I needed it most. Is Galen Gruman a mind reader?

Lon Poole in Quick Tips (January 1992) mentions some Macs that either work well or don’t work well with the two-chip 1MB SIMMs. However, he didn’t mention which category the Ilcx or the Ilfx fall into. The new Macs weren’t mentioned either, but I assume these SIMMs work well with them.

Traci Espinet-Marquez
via America Online

Decompressing to DOS

David Pogue’s review of file-compression software for the Macintosh (The Desktop Critic, March 1992) was like taking the subway in New York: crowded, bumpy, and it missed my stop.

While he did mention that several of the Macintosh files can decompress text files compressed on the DOS side, there is precious little support for the DOS user who wants to decompress a text file archived by any of the Macintosh programs covered.

As it stands, Stufflt Deluxe (I'm told by Aladdin support) allows a Mac to compress a file into the old Stufflt 1.5.1 shareware format. Once in that format there are several DOS utilities that let a PC unzip those files; but none work with the new and improved commercial Macintosh versions.

Bill Gram-Reefer
Concord, California

MACQUILL IS A COMMON SENSE FULL FEATURED WORD PROCESSOR, AND WITH A CLICK OF THE MOUSE CAN CONVERT WORD PROCESSING TO PAGE LAYOUT, OR BACK TO WORD PROCESSING.
More on the New Look

SINCERE CONGRATULATIONS ON your new layout design. In this day and age when computer publishing allows publications to change their format as often as changing socks, I hope that Macworld will stick with this design. The February issue was a pleasure to read.

The biggest improvement overall was, by far, the Macworld News section with its free-flowing style. I usually found this section quite lackluster, and it ended up being the part of the magazine that I read during porcelain library visits.

Christopher Hyatt
Pittsburgh, Pennsylvania

WHAT ON EARTH HAVE YOU done to your magazine? MacBulletin looks like an advertisement; I almost passed it by. Jerry Borrell's and Steven Levy's departments look positively cramped—whatever put the layout together must feel that leaving white space is the eighth deadly sin. On top of that, the pages of those two departments are strikingly uninteresting visually: no color, precious little variation in typeface, and black-and-white photos of the authors.

The News section is just the opposite taken to an extreme. Four skinny little columns; two different heading and body text fonts for the items; some sidebar items on a color background, others with a color box around them; some sidebars one column wide, others two; pictures scattered hither and yon. If the departments were visually uninteresting, the News section was a cacophony of fonts, boxes, and colors.

I have no quarrel with your writers and editors. Just stand back and look at the layout again, okay? I don't think my eyes can take too many more issues like February's.

Eric Rooamtree
Halifax, Nova Scotia, Canada

I HATE YOUR NEW PAGE-LAYOUT style. I have no desire to look through the magazine, much less browse or enjoy. The one improvement you've made is with the Contents page. After that it is a trip backward. I never minded the ads as long as the articles stood out more than the ads. That day seems to be gone. Now its hard to find or distinguish the feature articles quickly first before settling back with the ads later. I'm hoping this is just a transition period on the way back to a good look.

Betty Horner
Milpitas, California

I JUST BOUGHT MY FIRST MAC through the mail. The mail-order vendors know more about the hardware than the dealers do. They were willing to work with me and answer my questions. On the other hand, when I told the local Apple-authorized reseller I was more interested in processor speeds of the LaserWriter IIg and the IINTX, he failed to see why. Does Apple really expect me to pay full list price to a company that doesn't even know what it's selling? The key to successful mail ordering lies in knowing what you want. Being an informed consumer is essential.

Paul Saccone
Paoli, Pennsylvania

shops retail or mail order

I AM A BIG FAN AND USER OF CREDIT card-based mail-order merchants, but my most recent CPU shopping led me to a big surprise. The nearest mail-order competitor charged at least $100 more for a CPU than the walk-in retailer did, even including the tax. It seems the walk-in store paid attention to Apple's price reductions, while the mail-order companies think their CPUs are extra special.

Thomas Burke
Austin, Texas

shops retail or mail order

INTelligent accessories. Very smart prices.


Circle 199 on reader service card
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Full Page Power at Its Best.

Full-page power has never been easier to install or more affordable. Our 15" full-page Power Portrait™ display plugs directly into the SCSI port of your Mac. No cards to buy or install. No loss of slots. No external box. With Power Portrait, it’s so easy!

Built-in QuickDraw acceleration lets you race through graphic displays and minimize scrolling time. Select 72, 80, or 88 dpi to view your work at its best resolution. Hardware pan lets you create a virtual two-page desktop to power through multi-page tasks. And Power Portrait meets the latest Swedish guidelines for reduced VLF/ELF magnetic field emission. Power Portrait comes in two coordinated colors, granite or platinum, for a sleek, well-matched look.

Call (800) 845-8086 EXT 100 for details. You’re just a plug away from full-page power!
Loving the System 7 Finder

In response to the letter by Lawrence C. Stedman (Letters, March 1992), I want to say I find the enhanced Finder in System 7 the best thing going. It makes for the easiest computer interface on the market today and therefore should be the most productive. Of course there are basic concepts to learn to master its use, and there always will be. There is no such thing as a computer that is set up for every user right out of the box. If computer manufacturers tried to put everything everyone would like into their operating system, you wouldn't like it.

Mark Esposito
Houston, Texas

Curious about ELF

I am wondering if more specific research results on the VLF/ELF emissions issue have been published since July 1990, and if so, is it possible to obtain reprints.

Laurie Hoey
Point San Quentin, California

Power Psychology

Just what does everyone want from a Mac or any computer? What we want, admit it or not, is power. Power to manipulate information, to understand, to journey to new lands in cyberspace. If there were a Motorola 68090 that could manipulate the space-time continuum, we would all want it too. Perhaps the greatest needs of all are to understand and to create, and that is what drives us toward increased speed, productivity, performance, and potential.

The Macintosh graphical user interface is a most elegant extension of human learning psychology. Pundits in Macland worry about gifts to IBM and the unfriendly monoliths of corporate America. If Apple can only give this gift to IBM, then what a wonderful gift it will be.

Roger Fuller
Sabbattus, Maine

Adapt to Gray-Scale

Your January 1992 article “Getting Started with Choosing a Mac” said some unflattering things about the SE/30’s video capabilities. It says the monochrome screen can’t display shades of gray. The problem lies in the screen, but in the monochrome video circuitry. Micron Technology (208/368-2100, 800/642-7661) offers a gray-scale adapter that rectifies the problem. Also, the SE/30 has 32-bit color QuickDraw resident in ROM and can access gray and color external monitors. This ability for video expansion was one of the reasons I chose the SE/30. I have no desire to downgrade to the Classic II.

Charles Albrecht
Arvada, Colorado

Letters should be mailed to Letters, Macworld, 501 Second St., San Francisco, CA 94107, or sent electronically to CompuServe (70370,702), MCI Mail (294-8078), America Online (Macworld), or AppleLink (Macworld). Include a return address and a daytime telephone number. We regret that, due to the high volume of mail received, we are unable to respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of Macworld.
ilky question. For Lapis owners that is. You won't have to spend another second debating which comes first, because at Lapis they both do. Take our cards, for instance. For those of you who already have a monitor, we've got the most comprehensive line of display cards to drive it, both monochrome and color. We also have display cards for every Macintosh computer. In fact, you'll never have to go anywhere else for a display card. We've got all the bases covered. And when you turn to Lapis for a display solution, whether dual page mono-chrome, full page gray scale or full page monochrome, you'll get more than just a monitor, you'll get an entire system, Lapis card and all. You see, sometimes it's okay to put all of your eggs in one basket. So whether you're in the market for a display card or a complete display solution, Lapis makes sure that you'll always come out first. Of course that also goes for our service and support. We'll answer every question you ever wanted to ask when you call our technical support line. (Just don't try that chicken and egg one, it gets 'em every time.) Just call us at 1-800-43-LAPIS for the location of the nearest Lapis dealer. Any more questions?

Lapis has a full line of Apple-compatible, fixed and programmable, display cards.
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_{Fortune}_

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_{Business Week}_

“One of the best-designed products of the year.”
_{Time}_

“One of the best-designed products of the year.”
_{Time}_

“The power to be your best.

_{Apple}_
The new PowerBook® computer from Apple is more than the lightest, smallest Macintosh® computer ever. It's a whole new standard of mobile computing.

It's light. It's small. And it boasts the kind of bright, backlit, high-resolution screen required for Macintosh-quality graphics.

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System 7 is standard equipment. So is a rechargeable battery that runs for up to three hours.

It even includes a remarkable new program called AppleTalk® Remote Access. This allows a modem-equipped PowerBook to tap the power of your desktop Macintosh — and any office network that supports AppleTalk — from just about anywhere there is a telephone.

You can retrieve files from the Macintosh in your den without leaving your hotel room. Or print an order form on a printer in your office without leaving your client's office. Or send e-mail from wherever you happen to be to anyone on your network.

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It's the power to work anywhere you want, anytime you want, in whatever way works best for you. 'The power to be your best.'

The power to be your best.
microphone input (PowerBook 140/170 only)  
S-video port for up to 6 external peripherals  
Speak/telephone jack  
external data/fax modem port (140/170 only)  
internal data/fax modem (optional)  
ATA port for mouse or keypad  
printer/network port

The extremely affordable PowerBook 100 offers twice the performance of a Macintosh Classic.*

The AppleTalk Remote Access software (included) gives you access to the Macintosh on your desk via phone—so you can use your files, e-mail or network resources from almost anywhere.

**Every** PowerBook can run thousands of Macintosh business and education programs. And with the built-in AppleSuperDrive™ (an external option on the Powerbook 140), it can read from or write to MS-DOS formatted disks, too.

<table>
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*All PowerBook models compatible to MS-DOS.

For the name of your nearest authorized Apple reseller, call 1-800-445-1000, ext. 200. To run MS-DOS software, simply install a program like SoftMac® © 1992 Apple trademarks of Apple Computer, Inc. Classic is a registered trademark used under license by Apple Computer, Inc. MS-DOS is a registered trademark of Microsoft C.
The one-and-only Marlows’ Cafe.

Every town has one—if it’s lucky. A place where the locals come to chew the fat (so to speak), drink their coffee, digest the local gossip, and talk politics for hours on end. In our hometown that place is Marlows’ Cafe. No spelling error here; you see, the locals call themselves “Marlows.” And this place definitely belongs to them.

It’s been a diner of sorts for years—at one time it was a Harley-Davidson shop. But when Darlene and Ray bought it early last year they really turned it into something special. Not only did they do extensive renovations—Ray’s a contractor when he’s not running the grill—they also transformed it into what Darlene proudly calls “the greatest conversation place ever. Even flatlanders are made to feel right at home.”

You’ll never go hungry buying from us. Because we’ll always give you everything you need: the best information, the best service, the best support, and now, even the best food.

You see, we figured it would give you a nice feeling to know that, no matter what, there’s always a free home-cooked meal waiting for
awaits you in Marlow, NH.

you here in Marlow. That's why we're enclosing the coupon pictured above in every order we ship until June 30, 1992.

Keep it in your wallet or pin it on the wall. Either way, you can rest assured that next time you get a hankering for homemade chicken vegetable soup, or a Cheeseburger Deluxe (Thursday's special), or some raisin/cinnamon bread pudding, you can just hop on a plane, train, or car and point yourself in our direction.

You want atmosphere?

Marlows' Cafe takes the cake. There are great old photos of Marlow on the walls and even a letter from the White House thanking Darlene for her invitation to the president to visit during the primary. Outside, a big sign offers the daily special and/or a tasteful greeting like

Darlene is all ready to take your order at Marlows' Cafe.

"Buy American, eat here!" or (during hunting season) "Stop here or we'll shoot." And if you can't clean your plate, don't worry. All the leftovers are recycled by the neighborhood hogs.

As waitress and songwriter Diane puts it: "Yes everything tastes finer 'Cause you see it being made. Come to Darlene's Marlow Diner/So we can get paid!"

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We're first in more
Non-stop innovation since

1. Overnight Shipping 'til 3:15 a.m. $3.

What we’d really like is to be able to deliver your order a couple of seconds after you call. Unfortunately, the old space-time continuum makes that a bit difficult, but we have taken some quantum leaps in that direction. We were the first Mac company to offer $3 overnight shipping. And with our distribution center at Airborne Express, we can keep taking orders for “overnight” delivery of in-stock items ‘til 3:15 a.m. Eastern Time.

2. Order Weekends. Get it Monday. $3.

Working on the weekend? Call us Friday (or ‘til 3:15 a.m. Saturday) and we'll deliver by Saturday. Ordering on the weekend? Call by noon Sunday, and we’ll deliver on Monday—which makes a whole lot more sense than having to wait ‘til Tuesday. This service is for in-stock items and isn’t available to all areas, but it is in most places. The cost? Still just $3.


Some people don’t want to call our toll-free tech support line because they think it’s just for real complex questions. Well, even though we enjoy a good challenge now and then, we like the easy questions, too. After all, they’re easier to answer. So whether you’re using a product you just bought or discovering some strange wrinkle a few years down the road, give us a call. And find out why we were a 1991 Macworld World Class Award Nominee for Best Customer Support!

4. 30-60 Day Money-Back Guarantees.

Accept no substitutes! This is the only true money-back guarantee program, covering both opened and unopened boxes. If a product doesn’t work out, call for a return authorization and send it back with all the original packaging. Just check the line listing to see if (and for how long) the product you want is covered. (Note: in rare cases we’ve had to limit the number of returns.)
5. No Foam Peanuts.

Instead, we use a packing paper that's made from recycled magazines. And we print our catalogs on recycled paper. And we have an in-house recycling program that has reduced waste by 75%. And we make a concerted effort to encourage our vendors to minimize packaging. All of which puts us and our hometown of Marlow, NH (pop. 600 or thereabouts) at the forefront of Mac environmental politics. A position we're happy to share. Any ideas?

6. One-Minute Mail Order.

This little breakthrough is as much about ease as it is about speed. We use Caller ID* to access your previous ordering information instantly. Which means you don't have to rattle off all your vital statistics for the umpteenth time. So if you know what you want, including product numbers, we can take your order in record time. It's convenient, fast, and another way we keep our costs and your prices as low as possible.

7. A Free Lunch!

We don't want our customers to ever go away hungry. So from now through June 30, 1992 we're including a coupon for a free meal at Marlow's Cafe with every order. Just stop by next time you happen to be driving through Marlow on your way to Goshen, Gilsum, Stoddard, or Alstead. What's that? You don't have any plans to visit rural New Hampshire in the near future? Why not make a little detour next time you go to Boston? (Or a really big detour next time you go to Tokyo?) Don't worry, the coupon's good as long as Darlene and the crew are still really cookin'. And, until you make it up here to Marlow, the coupon is certainly suitable for framing.

*We can block at your request.
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Endless storage possibilities.
Removable cartridge drives are the answer for anyone archiving or transporting multi-megabytes of data—in other words, anyone trying to deal with today's sophisticated applications. And now we're selling MDS drives at a super-low price to make this essential technology available to more users. MDS Drives feature the acclaimed SyQuest mechanism and are designed specifically for use with a Mac. Choose the mild-mannered MDS 44 or the heavy-duty MDS 88. Each drive includes one cartridge and all necessary cables. Both drives have a 20ms average seek time—fast enough to use as your everyday drive as well as for backup—and 60,000-hour MTBF (mean time between failure). Other features include a push-button SCSI ID selector (so you can change the SCSI ID without special tools) and two switched power outlets (to power the drive and two other devices from a single switch). MDS drives are also easy to daisy chain because they have dual 50-pin SCSI connectors and an external terminator.
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And software to boot!
MDS drives come with all the software you need for low level formatting of cartridges, selecting interleaves for fastest data access, defining partitions, and initializing partitions in either Mac or AUX formats. There's also disk caching and volume password protection. You'll also get your choice of either Salient's AutoDoubler or Symantec's Norton Utilities for the Mac with each drive you purchase at no extra charge. It's quite a package: a dependable SyQuest drive mechanism, cartridge, formatting and operating software, and either AutoDoubler or Norton Utilities, all backed by a rock-solid 2-year warranty and our toll-free technical support. Ready to get removable? Give us a call.

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5532 MDS 44 SyQuest w/Norton Utilities 499.
5534 MDS 88 SyQuest w/AutoDoubler. 599.
5535 MDS 88 SyQuest w/Norton Utilities 599.
6952 44 MB Cart. (single) 69. 5529 (3) 199.
5526 44 MB Cart. (5 pak) 29. 9728 (10) 649.
5531 88 MB Cart. (3 pak) 312. 5530 (5) 512.

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We also carry 2 MB, 4 MB, and 6 MB PowerBook modules. We recommend the installation of the modules be done by an authorized Apple Service Center.

Note: prices and availability of SIMMs and PowerBook modules can be somewhat like the weather, and are subject to change without notice.

<table>
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<th>SIMM Type</th>
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<td>2 MB SIMM for IIsi or LC</td>
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Travel light.

Enjoy Mac compatibility.
With System 6.0.7 and 7. Plus the CPU and hard disk are upgradable. The Outbound 2030E compares favorably to Apple's PowerBook 140. It has a 25 MHz processor (vs. 16 MB) and up to 14 MB of RAM (vs. 8 MB). The Outbound 2030S races past the PowerBook 170 with a faster processor (33 MHz vs. 25 MHz) and more potential RAM (14 MB vs. 8 MB). Plus you get a full-size keyboard, 17% more displayable screen area, and a battery-backed silicon memory option in a lighter and smaller package. (Outbounds weigh just 6.25 lbs.) And we include over $400 of free software. By the way, MacConnection is the exclusive mail-order reseller for Outbound Notebook Systems.

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2655 2030E/680 (68020, 8 MB, 80 HD) $3399.
2653 2030E/882 (same w/mach copra.) $3499.
2106 2030S/460 (68030, 4 MB, 60 HD) $3399.
2105 2030S/462 (same w/mach copra.) $3499.
2673 2030S/880 (68030, 8 MB, 80 HD) $3859.
2669 2030S/882 (same w/mach copra.) $3999.

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Adobe Systems

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<td>Adobe TypeAlign for ATM 1.0.4</td>
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</table>

Adobe Type Sets for Business:

- Letters, Memos & Faxes: $95
- Invitations & Awards: $95
- Spreadsheets & Graphs: $95
- Overheads & Slides: $95
Fast and safe.

Electronic access control for the Mac.
The MaccessCard Reader is a very convenient new high-tech security add-on for your Mac. Forget about passwords. Working with FileGuard 2.5 or higher software, it controls access to your Mac using magnetically-stripped cards and an (optional) access key. You get two cards with the system, but you can quickly train it to recognize any ID card, such as your credit card, company or student ID card.

After an authorized user has turned on your system with MaccessCard Reader, FileGuard can continue to control access to all or any part of it (specific hard disk partitions, folders, files, applications, etc.). MacUser (5/91) gave both the hardware and software a 5 Mice rating and wrote: "It's sleek, fast and safe. I highly recommend it."

ASD Software ... 30 day MBG
9440 MaccessCard Reader (requires FileGuard) .......... $299.
7085 FileGuard 2.7 (1 user) ............ 138.
9439 MaccessCard/FileGuard (1) Bundle 399.

MacConnection 1-800/800-3333
Get to the heart of your Mac.
Uncover the mysteries, intricacies, and idiosyncrasies of your Mac with MacEKG II, the complete diagnostic utility for user and specialist alike. Now with advanced chip-level diagnostics previously available only to Authorized Apple Technicians. This intrepid program looks at your entire system, including the effects of applications loaded and accessories attached, and tells you how your resources are being used. Any processor hogs eating up performance? Any unnecessary INITs gumming up the works? MacEKG II will find them.

Responsible for multiple Macs? MacEKG II will really help speed diagnosis by revealing, for example, the extensions no one mentioned they were running. And you can use the Reactivator to repeatedly reboot while MacEKG II observes and maintains a log to point you in the direction of the problem. So make sure your Mac keeps on ticking with MacEKG II.

MicroMat Computer Systems
3732 0 MacEKG II (Apr '92) ......... $110.
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The merger of MacroMind and Paracomp has
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Swivel 3D Professional, MacRenderMan and
QuickPics, the industry standards for Mac 3D
modeling and rendering.

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Run DOS on Macs.

Your next PC could be a Mac.
Insignia Solutions has a wide range of options for running virtually any DOS program on your Mac. Universal SoftPC emulates a basic PC/AT and is recommended for text-based apps. For heavy-duty graphics and number crunching, SoftAT adds EGA graphics, a math coprocessor, expanded memory, and CD-ROM support. Add SoftNode to either one to share DOS applications over a Novell network. Entry Level SoftPC is designed for the occasional user who doesn’t need SoftNode compatibility or CD-ROM support. And AccessPC lets you mount, view, and manage DOS files on floppies, cartridges, and magneto-optical drives directly from your Mac.

Insignia Solutions

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MDS Removable SyQuest Drives come complete with one cartridge and all the software you need for low level formatting of cartridges, selecting interleave for fastest data access, defining partitions, and initializing partitions in either Mac or AUX formats. There's also disk caching and volume password protection. Plus, get a free copy of Salien's Auto Draht or Symantec's Norton Utilities for the Mac with each drive purchased. Quite a package, and backed by a 2yr warranty.  
5533 MDS 44 SyQuest w/AutoDraht ... $499.
5533 MDS 44 SyQuest w/Norton Utilities ... 499.
5534 MDS 88 SyQuest w/AutoDraht ... 599.
5533 MDS 88 SyQuest w/Norton Utilities ... 599.
44 MB at 88 MB SyQuest Car ... see line listing.

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<th>Model</th>
<th>MB Capacity</th>
<th>HD Capacity</th>
<th>Price</th>
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<td>2030S Series (33 MHz 68000)</td>
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<tr>
<td>2106</td>
<td>440 MB</td>
<td>40 MB</td>
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<td>40 MB HD (incl. math copro.)</td>
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<td>860 MB</td>
<td>60 MB HD</td>
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<td>862 MB</td>
<td>60 MB HD (incl. math copro.)</td>
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<td>80 MB HD (incl. math copro.)</td>
<td>$4499.</td>
</tr>
</tbody>
</table>

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Outbound Notebook Systems—Includes 25 MHz or 33 MHz 68000, 4-14 MB of memory, a 40, 60, or 80 MB hard drive and math coprocessor option. Limited time offer: receive free software bundle (over $400) with each unit. .. see listing.

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2109 | 462 MB, 60 MB HD (incl. math copro.) | 2999. |
2660 | 860 MB, 60 MB HD | 3139. |
2659 | 862 MB, 60 MB HD (incl. math copro.) | 3249. |
2655 | 864 MB, 80 MB HD | 3399. |
2653 | 865 MB, 80 MB HD (incl. math copro.) | 3499. |
2651 | 1660 MB, 60 MB HD | 3699. |
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2805  @Intouch 1.1 39. 9986  @Network Monitor 1.0 84.

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4488  @WalkThrough 1.03 ........ 309.

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6740  @Stuffit Deluxe 3.0 (May '92) . . 55.
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5737  @After Dark 2.0V ........ 28.
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2198  @More After Dark (M.A.D.) .... 23.
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2196  @Meta Dark & M.A.D. Bundles .... 40.
★ Apple Computer ... 30 day MBG
1593  @Drive 7 2.0 ........ 49.
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2492 O MicroPhone II 4.0 489.

2494 O MicroPhone II 4.0 489.

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1581 DC2120 23. 9931 DC2165 ... 32.

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5345 DG60M ... 16.

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1603 DG60M ... 16. 2520 DG60M ... 22.
8185 QD2040 ... 14. 1985 QD2120 ... 21.

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- Monster Design Group (minor) ... 1399.

### Applied Engineering
- QuickSilver Accelerator for the llsi ... 299.

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<tr>
<th>Item</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>SIMMs</td>
<td>with free video &amp; manual</td>
<td>$499.</td>
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</table>

RAM your Mac to System 7 specs and beyond. At the lowest prices around. All SIMMs come with a full 2-year warranty, plus free installation manual and video. We also carry SIMMs for the Quadra, and 2 MB, 4 MB, and 6 MB modules for Apple's PowerBook. So kick your Mac into overdrive and create huge spreadsheets & complex graphics with power to spare.

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New Product Blocks ELF Magnetic Radiation

NoRad Corporation is now shipping ELF ProTech, the first externally mounted Extremely Low Frequency (ELF) magnetic field radiation suppressor for video display terminals (VDTs). Independently tested on popular monitors, ELF ProTech reduces ELF magnetic fields to well below the latest Swedish standards (SWEDAC, MPR II).

NoRad's proprietary technology (patent pending) safely absorbs ELF magnetic radiation by up to 70% all around the display—front, back, sides and top. And, the higher the field strength, the greater the reduction.

For the first time, you can upgrade your current monitor with external shielding rather than buy a new, low magnetic radiation monitor. Installed in minutes without special tools, ELF ProTech preserves image quality and safeguards warranties and computer performance.

ELF ProTech's universal design fits all monitors, and is color-matched to today's displays.

New Shield Delivers Brighter Image

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Independent Tests Support NoRad Product Line

An independent, government-certified laboratory has tested the NoRad Shield and ELF ProTech to verify performance and shielding effectiveness.

Using U.S. Military Standard 285, the NoRad Shield was tested against the leading technologies which claim radiation protection. Only the NoRad Shield blocked 99.99% of virtually all electric field radiation—not only ELF and VLF, but all the way up into the microwave range, and greater than 50% of the total magnetic radiation above 30 KHz - the broadest protection available.

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Circle 133 on reader service card
Behind Macworld's Graphics

BY CATHY ABES

Artist: For the past three years, Macworld senior designer Arne Hurty has been creating the detailed, distinctive informational graphics that appear in Macworld feature articles and How To columns.

Hardware: Macintosh Quadra 700 with 8MB of RAM and 160MB internal hard drive; RasterOps 19-inch color monitor and 24-bit graphics board; Siemens grayscale scanner; QMS color printer.

Software: FreeHand 3.1.

How It Was Done: For the illustration that opens our feature on alternative input devices, Hurty began by doing a pencil sketch, because he felt that an image as complex as a human hand showing muscles, tendons, and bones would be too difficult and time-consuming to draw freehand in a graphics program. Since it was a line drawing without any gray shades, Hurty scanned the sketch and placed it in FreeHand as a 1-bit TIFF rather than as a grayscale file, so it would take up less memory.

Hurty first placed the original scanned image (on a layer he named Template) for use as a template from which to trace the different layers of the hand—skin, bones, muscles, and tendons. After saving the template, he created another layer for the skin, and with both the Template and Skin layers open, he began tracing the outline of the skin using the pen tool. Hurty used bright magenta for the line color so he could easily differentiate between the traced line and the original. Once the skin was traced and saved, Hurty turned off the Skin layer, and with the Template layer still on, created a new layer for the bones, where he repeated the same process (again using magenta for the line). Because there were so many tendons, he created two layers for them—one for the top layer of tendons and muscles and a second for the bottom layer.

Finally, he created a layer for the mouse. To draw the mouse in correct perspective, Hurty used a simple technique. He drew two sets of lines from two different vanishing points that originated far off the page. These he used as a guide for defining the boundaries of the mouse.

Next he created a set of colors for all the elements of the drawing—the bones, the tendons and muscles, the mouse, and the shadows. Then he applied the colors to the various elements using both solid and graduated fills.

To create the irregularly shaped lines that define most of the elements, Hurty first selected an element—for example, the shape of a bone—copied it to the Clipboard, and (using shift-V) pasted it behind the original. Then he gave the pasted image a Basic fill of black, and with all the points of the element still selected, he pulled each point out the desired amount to create a line of irregular width. Because FreeHand’s Snap to Point default setting makes it difficult to move points in slight increments and to place points very close to each other without allowing them to touch, Hurty turned it off before he began pulling out the individual points.

Hurty used this technique for all the outlines but varied it slightly for the skin. First he cloned the magenta outline of the skin, and then he slightly repositioned each point of the cloned line, except the end points. He joined the cloned and

Detail of the illustration that opens our feature on input devices, page 154.

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Hurty used his scanned pencil sketch as a template for tracing the various layers of the illustration (here, the Skin layer) in FreeHand 3.1, using a magenta line to differentiate between the template and the new layer.

The Bone layer was created by the same process Hurty used to trace the skin. He then colorized the bones by applying a combination of solid and gradient fills.

For the skin, Hurty cloned the magenta line, pulled out all the clone's points except the end points, which he joined to the end points of the original, creating a closed shape. Deleting the line and giving the shape a gray fill resulted in the skin's irregular outline.

To enable him to draw the mouse in correct perspective, Hurty used as guidelines two sets of lines, each set originating from a vanishing point far outside the boundaries of the drawing.

original lines at the end points to create one continuous (closed) element. By deleting the stroke (the magenta outline) and giving the element a fill of gray, he was able to produce a line of irregular width for defining the skin.

Now it was time to create the shadows. Hurty had previously defined each of the shadow colors as tints of black. The colors he selected for all of the other elements were combinations of the other three process colors—cyan, magenta, and yellow. Hurty took this step because he wanted to make sure the shadows would reliably overprint the other elements. If the shadows shared a common color with the other elements, FreeHand would default to the percentage of common color present in the overprinted area (the shadow), and distort the image. If the shadow contained 20 percent black, for example, and another element contained 60 percent black, 20 percent black would appear in the overlap area—not a color made up of 80 percent black.

Another interesting effect was the one Hurty used to create the ridges in the muscle tissue. He first drew a thin crescent shape and cloned it. Then he pulled the clone's points inward to create an even thinner crescent in the middle of the original. After assigning a light pink to the original and a dark pink to the clone, he created a seven-step blend between the two. When he placed the element on a light pink background—the same color as the original crescent shape, its edges appeared to blend into the background, giving it a smooth, ridged effect.
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AN EILERS SEEMS TO BE having the time of his life. His face wears the expression of a weekend poker player, finally allowed into a high-stakes match, who just drew an inside straight. Try as he may to prevent it, a giddy smile breaks through. He knows the smile isn't polite, but he's too excited to worry about it.

At least that's the impression I got when we sat down to discuss his nascent reign as president and CEO of Claris, the wholly owned software subsidiary of Apple Computer. After years of toiling at weighty but relatively low-profile jobs at Apple—most notably as the chief pursuer of the company's strategic investments group, an in-house venture-capital program—Eilers now revels in his new role as software magnate.

When it comes to software written for graphical interfaces such as the Macintosh Operating System, and even Microsoft's Windows environment, nobody does it better than his team, says Eilers. "We're very good at it," he assures me. "The best graphical interfaces such as the Macintosh will be in a lush meadow, a group of business-suited white men tossing the ball around, and being able to create great applications for the Macintosh." With this success, Apple decreed that the new company would have its own identity, would receive no special favors, and would, at the very least, be spun off as an independent entity in which Apple would hold a minority share. A management team was appointed, led by Bill Campbell, a gung-ho marketing type who informed me early in his tenure that Claris was destined to become the number one software company in the Mac marketplace.

Most big software companies start by creating a great product, growing with it, and spending the rest of their lives trying desperately to repeat their first big success before they milk the last ounce of gold from it. Claris was different. It began with unheard-of resources, a list of solid if underexploited applications, and the clout of its parent company. It was a multimillion-dollar company without trying.

Eventually Campbell and company earned the respect if not the awe of the industry by setting up the workable infrastructure of a major software operation, as well as establishing an identity for Claris independent of Apple's. But though it proved capable of using its fat coffers to acquire products, Claris never did develop any killer applications in-house. And it never even came close to knocking off Microsoft as the leader in Mac software, which many still believe was Claris's mission. The initial gripes of some of the competitors faded as they realized that Claris, while formidable, was in no way destined to bulldoze its way to domination. Anyway, they assumed, soon the company would be independent and that whole sticky problem would go away.

But in June 1990 Apple dropped a bombshell. Claris was not going public. Apple decreed that Claris would hereafter be a permanent, wholly owned subsidiary—Apple's official software wing. "It really was a rethinking of the entire situation," explains Al Eisenstat, Apple's chief legal officer and a board member of both companies. "Software operations played strategically into Apple's long-term plans. We realized that if we spun Claris out, we'd need to start a new Claris."

Two groups of people were unhappy with this. First were the Claris executives, potential shareholders in an independent company. No independent public offering meant that they would not be visiting the Ferrari dealerships yet. Apple, which has never had a problem with tossing small fortunes into the hands of its executives, tried to soothe the souls of Campbell and his top guns with millions of dollars in consolation prizes. But the disappointment stuck. Instead of being on their own, the Claris folks were wholly owned, permanently, by a company whose corporate credo was reorganization and confusion.

Within a year, the entire complement of top executives found reasons to leave. Few who witnessed it will forget the comical spectacle in the summer of 1991, when Claris held a press conference to introduce its new ClarisWorks integrated product. Before the demo, about a dozen members of the company's executive staff were introduced—and the most senior member of the group had been there only a few weeks. Not long after, in what current Claris vice president of product development Dick Mathews calls a ripple effect, the next level of management began trickling away, and months after that, some of the
the programmers. Some projects were nearly gutted. For instance, the team creating the long-overdue MacWrite Pro lost its engineering manager, the program's chief architect, and its boss.

**Profit Motive**

The other unhappy bunch consisted of companies competing with Claris. They were quick to note the flaw in Apple's logic: if it was necessary in 1987 to promise to spin off Claris to preserve fair competition, what had changed in 1990? What had changed was this: Apple was less beholden to its software developers. With the Macintosh a more proven success than ever, Apple figured the presence of its own software company would not keep potential developers away, and it certainly wouldn't force current developers to give up on the Mac. As long as Apple didn't give Claris egregious favors, it figured that people would pipe down.

Indeed, they did. Even Microsoft's executive vice president of worldwide products, Mike Maples, who says he watches out for those things, notes no special advantages doled out by Apple to its offspring. "Generally I've taken the position that it's not fair yelling 'Wolf!' until you see a wolf," says Maples. "To date, we haven't seen a wolf."

At least one competitor, however, says he's spotted one. Mark Simonsen, president of Beagle Bros, complains that Claris's assured access to Apple products is unfair to smaller developers. "We couldn't get a PowerBook to test our software on until the computers were already announced," he says.

But in my conversations with several other Claris competitors, I find such complaining rare these days. Instead, the gleeful word in the industry is that no one needs to worry about Claris, because Apple is screwing things up.

What evidence do these off-the-record bad-mouthers offer? First, Dan Eilers. They consider him a lightweight with little experience in the nuts and bolts of the software business. Then they note Apple's endemic propensity for destructive directional shifts—surely, they say, the presence of the Apple bureaucracy will hamper Claris's ability to respond to the twists and turns of the marketplace.

Finally, they howl with mirth at Claris's premiere in the Windows world with the presentations application called Hollywood, which is generally regarded as a dog. Anyway, why would Windows users buy their software from Apple? Would Macintosh devotees flock to IBM if the company started selling word processors for the Mac?

**Give 'Em a Break**

To be sure, Claris-bashing is fun. It's even more fun after hearing Eilers boast about the brilliance of his company's software, when in fact every one of the major Claris applications was inherited from Apple or purchased from outside developers. But I can only bash so far. Behind Eilers's bravado there's a lot of sense. Not to mention the multibillion-dollar company that makes the computer that runs the software.

For one thing, Apple has wisely decided that Claris should be run as a profit-making organization. Eilers says he has but one mandate: to turn a profit for his division. "There are only two profit centers at Apple," he explains. "One is run by Mike Spindler and has $7 billion in revenues, and the other is run by me and [reportedly] has $100 million in revenues." While the latter seems puny compared to the former, that Claris now lives by its..."
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bottom line can provide a necessary focus not present in all divisions of Apple.

Eilers also has a grand plan. First, Claris intends to rewrite all of its programs, tailoring them to fit on a single core of object-oriented coding that will allow for advanced scripting abilities between the applications. This will also translate to the Claris applications now being readied for other operating systems—in these post-IBM-Apple-agreement days, Claris can now develop software for Windows and no one raises an eyebrow. Eilers promises two more Windows applications by the end of the year, and also reveals that Claris is seeking budding new operating systems on which to write applications of the future. As Eilers puts it, “In 1992, we’ll choose one new hardware paradigm on which to place applications software.”

One of those “paradigms” (also known as computers) is bound to come from inside Apple, and here is where Claris has a true advantage over its competitors. As the official software arm of Apple, Claris sends its engineers all over Cupertino to participate in the big projects. This includes the Apple-IBM collaboration Taligent, Apple’s rumored notebook project (called Newton), and even a top-secret General Magic project, in which Apple has a minority stake, and which reportedly will result in a low-cost product sold through consumer channels. Claris’s ability to track the development of these systems, and even to affect them so that they will accommodate Claris’s specific needs, are valuable assets to the company.

As far as Eilers’s leadership is concerned, it’s much too soon to dismiss him. He may not have run a software company before, but he knows the back channels and intrigues of Apple politics—and for the leader of Claris, that may be more important than grokking distribution channels. Eilers also has the luxury of learning his job without the pressures of most of his recession-beleaguered competitors—Claris is loaded with resources, has a full complement of existing applications, and has the insider track to the new systems that will drive the applications of the future. And no matter how bad things get, his company has a built-in fail-safe—the Bozo Factor. This assumes that a certain percentage of bozos will always prefer software written by the company that makes their hardware. Thus, even the lamest Claris application will find its way to users blissfully unaware of whizzy alternatives. And a truly competitive application like ClarisWorks will get an extra boost.

If Eilers is smart, he will use these edges. He won’t beat Microsoft, but he will deliver a profit that will please his masters. If he doesn’t, maybe the next person in charge will do so. Or the next.

When I talked to the guys who began Claris five years ago, I took note of their brash confidence and suggested that they rename the company Hubris. After meeting Dan Eilers, I still think my name fits better. But that doesn’t mean that we could, or should, count Claris out, especially not because Apple Computer is bolted into the driver’s seat. Apple may have its foibles, but somehow it managed to introduce and sustain something very near to our hearts and pocketbooks—the Macintosh. And, as Claris veep Dick Mathews notes, the Macintosh itself was not a hardware breakthrough, but a software coup. Would it be unreasonable to assume that some success might come from Apple’s software arm?
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As May be nearing the end of traditional publishing, but for now, words on paper continue to appeal to a broad audience. In columns past I've covered general-interest books and software helpful to Macintosh users. This time I'd like to steer readers toward selected special-interest publications of note. Some of these periodicals are sold on newsstands; the more expensive ones may be available in public and university libraries.

**Computing**

**Macweek**, which is published 44 times a year, is indispensable for following Mac industry news. People who buy (or, perhaps, claim to buy) lots of Macs for their place of employment can get the publication for free; the rest of us pay $99 for an annual subscription. Call 609/461-2100 for details.

**HyperPub** is a stylish quarterly for HyperCard developers from former Dr. Dobb's Journal editor Michael Swaine. This attractive, 40-page black-and-white newsletter offers a "script lab" and XCMD tutorials every issue and also covers related hypermedia issues. An accompanying floppy disk contains an electronic version of HyperPub and other goodies each issue. A four-issue subscription is $40; mail payment to The Prose Lab, 31 Patrick Rd., Santa Cruz, CA 95060.

**Facts on File** (212/683-2244) cranks out many useful compilations, including Software Reviews On File, which excerpts passages from reviews of microcomputer software printed in nearly 200 publications. An annual subscription is $215.

**NSTL** (800/328-2776 in the United States and Canada) publishes the monthly Software Digest Macintosh Ratings Report, a 16-page newsletter that compares a different category of business software—such as advanced word processors or spreadsheets—each issue. NSTL is an independent testing group that accepts no advertising in its publications. A 12-issue subscription costs $202.

The **PC Market Monitor** from Computer Economics (619/438-8100) is a detailed survey of the street prices, used prices, leasing rates, and relative performance of selected personal computers, monitors, hard drives, printers, and software. It's designed to help Fortune 1000 companies locate dealers with the best prices, but smaller companies will find the info useful as well. Subscribers pay $395 for a three-ring binder with monthly updates on computer systems and printers. Other hardware and software prices are updated quarterly, as are used computer prices. A dealer section includes mail-order companies and lists open hours, credit card acceptance, and other helpful info.

**DTP and Graphics**

**ThePage** calls itself "the visual guide to desktop publishing on the Macintosh." This 20-page black-and-white newsletter carries no advertising but lots of practical information for its readers, most of whom use PageMaker. (Generally one article per issue deals with QuarkXPress.) ThePage offers advice on hardware as well as software issues and is one of the most useful publications I've seen for desktop publishers. "The Back Page" column by editor and publisher David Doty is especially entertaining. (In the May 1991 issue he gave readers a sixpoint plan for avoiding product-related stress. The points included refusing to upgrade applications, to buy more hardware equipment, or to install System 7. It was a great column, trust me.) After issue subscriptions are $65 and includes a booklet called Basics of Desktop Publishing on the Macintosh.

Another excellent monthly newsletter, **Step-By-Step Electronic Design**, uses a color layout to offer desktop designers how-to information. A recent issue offered tips on using Adobe Illustrator, discussed making masks in Adobe Photoshop; and explored the additions to PageMaker in version 4.2. Some readers may be acquainted with its sister publication, **Step-By-Step Graphics**, a beautiful how-to magazine that covers both traditional and electronic graphic arts. The January/February 1992 issue, for example, followed one illustrator's work in crafting a digital collage with Adobe Photoshop. Another piece offered 18 techniques for creating digital backgrounds. Subscriptions are priced at $48 for 12 issues of Electronic Design and $42 for a 6-issue subscription of Graphics. Call 800/255-8800 for details.

**MacPrePress** (fax 203/454-4962) claims to cover "the news that matters on Mac-based off-the-shelf prepress technology." Macworld's in-house DTP guru calls the black-and-white newsletter objective and insightful. Recent topics included the good news and bad news of DTP ("Image recording is no longer a major issue," but "large-file movement is a real difficulty"; "color science is no longer an issue," while "trapping is still problematical"). MacPrePress is distributed by fax 48 times per year; subscriptions run $295. A specialized monthly newsletter tackle technology, journalism, and publishing. The Cole Papers follows the triumphs and pitfalls of technology in the newsroom, including new product developments. A one-year subscription runs $99; request a sample is-continues...
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Reader David Atherton of San Diego was pleased by the service he received from APS. "I spend each year in three different locations—London, San Diego, and Hong Kong," he writes, "and during the past 12 months have ordered some 10 drives from APS on toll-free numbers. Unfortunately, three of the drives developed problems, but in each case a replacement was sent the day the company received my returned drive and, more importantly, they did the paperwork in such a way that there were no delays in customs."

Education

EDUCATORS PROBABLY ALREADY know about Syllabus, but people outside of universities might also be interested in Macintosh development in higher education. The Apple-sponsored quarterly is published by Syllabus Press (408/773-0670). A recent issue traced the history of the Mac in higher education and profiled development projects at several universities. Subscriptions are free to some professionals (including faculty members and software developers); others pay $18.

The Computing Teacher, the journal of the International Society for Technology in Education, covers using personal computers in curricula and offers professional techniques. The March issue included one article on a day in the life of a computer specialist and another on using a single computer for instructing an entire class. Call 503/346-4414 or 800/336-5191 for ordering information.

The Macintosh Education Software Collection is a catalog, not a magazine, but it may be helpful to teachers who are looking for courseware, administrative software, and shareware to use in their classrooms. Charriot Software Group of San Diego sells software through this catalog, which can be ordered at no cost at 619/298-0202.

Music and Multimedia

READERS WHO WANT TECHNOLOGY with rhythm can find it in Electronic Musician. A recent issue examined why so much MIDI-based music sounds bad and included a glossary of electronic-music terms. Call 615/377-3322 or 800/888-5139 to subscribe. A 12-issue subscription is $19.95.

Seybold Publications (215/565-2480) has made a name for itself with newsletters on desktop publishing and publishing systems. A fairly recent addition is Digital Media, edited by Denise Caruso. It's cogent and lacking in hype, a refreshing change from the usual blather about that arena. Recent topics include electronic books and fractal compression. At $395, a 12-month subscription is not cheap; a sample issue is available on request.

NewMedia could be considered Digital Media's juvenile counterpart—brash, loud, and not very good yet. Still, it has promise, and there's something endearing about its humor—a list of the top-selling CD ROMs in the year 2000, for example, included Whambi IV: Revenge of the Debauched Dwarf Lizards. Subscriptions run $36 for 12 issues. Call 609/764-1846 for subscription info.

Offbeat Fun

THE FOLLOWING TWO QUARTERLY glossies defy easy description but trendoids have been reading them for ages. Verbum, The Journal of Personal Computer Aesthetics, tracks the so-called digi-continues

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CONSPICUOUS CONSUMER

Artical art life-style. A recent issue included articles on creating type effects in Photoshop; a gallery of art; and an interview with Mac-using musician Graham Nash and his partner. The magazine is $7 on the newsstand; call 619/233-9977 for a one-year subscription ($24). Issue number five of Modo 2000 included several seriously strange fashion layouts (including vinyl, plastic, and rubber clothing from a Dutch designer); computer game reviews; and many interviews with musicians. A five-issue subscription is $24; call 510/845-9018 for details.

User Groups
USER GROUP NEWSLETTERS often make for good reading. BMUG is justly famous—the spring issue weighed in at 2 1/4 pounds and 467 pages. Several smaller publications are also worth perusing. My favorites include The Apple COREspendent, from the Lansing (Michigan) Area Mac and Lisa User Group; FatBits, from the Conejo-Ventura Macintosh User’s Group; and The Mac Street Journal from the New York Macintosh Users Group.

I read the ten-page Apple COREspendent largely for the opinionated writings of Andy Frederick, a sometimes caustic former user-group president. (It doesn’t hurt that the group gave me a subscription until the year 3000.) LAMALUG can be reached at P.O. Box 27372, Lansing, MI 48909; membership is $20.

The more substantial FatBits (30 pages) has no table of contents but more than makes up for that lapse with “The Rumor Mill,” a column by Johanna Michelle Grzywacz. One recent column covered computer chess champions, supermarkets, virtual reality, and the gender gap in earnings. CVMUG, the world’s first

The Mac
Street Journal tracks
NYMUG members’ complaints or problems
with specific companies

Macintosh user group, can be reached at P.O. Box 1139-CVMUG, Simi Valley, CA 93062. Membership is $30.

The New York Macintosh Users Group is a large MUG with plenty of professional Macintosh users, so it’s no surprise that The Mac Street Journal is so well done. Especially educational is the “Letters to the Vendor Liaison” section that follows members’ complaints or problems with specific companies. NYMUG can be reached at 212/691-0496; membership costs $45 (20 for students and seniors).

For additional resources, see Conspicuous Consumer, June 1990 and July 1991. Recent books are examined each month in the “Desktop Librarian” section of News. Let us know about other publications or resources that are particularly useful.

Research assistance by CAROLYN BICKFORD.

Send nominees for sainthood to Service Heroes, Macworld, 501 Second St., San Francisco, CA 94107, or via AppleLink (Macworld1) or America Online (Branscum). Conversely, drop Conspicuous Consumer a line if a company is ignoring you.

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Ark Workspace $78

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Minotaur Labyrinths of Crete $39

In Minotaur, two players compete against on another from their own computers via modem or serial cable. You and your opponents (up to 8 can play) are thrown into a huge randomly-generated labyrinth where you'll battle to the death with a number of magical and enchanted items. Bungie Software #00639

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Operation Desert Storm V1.5 $27

Join the forces in the gulf in this realistic full color battle simulation! Experience full screen action on any monitor as you command your M1A1 Abrams tank on a series of missions against a hostile, well-equipped enemy. Bungie Software #04106
TransWarp Accelerators
It's Like Getting A New, Faster Computer

High-Performance TransWarp Accelerators

TransWarp LC
33 Mhz w/ FPU
$988

Tired of waiting for your LC to catch up? TransWarp LC provides high speed performance for the Macintosh LC. This 68030 CPU/68882 FPU upgrade for the Mac LC helps eliminate the time you spend waiting on your computer. Desktop publishing, graphic design and CAD packages become fun again. Applied Engineering #04732

TransWarp SE
Accel 25Mhz w/FPU
$798

The TransWarp SE 030 gives you up to 10 times the speed of the standard SE. The board comes standard with a 68882 Floating Point Unit (FPU) math chip which greatly enhances the speed of any math functions, so your spreadsheets and CAD programs run faster than ever before. Applied Engineering #04325

Boost your Mac to Lightning Speeds with AE Cards

QuickSilver Ilsi CacheCard
$269

The QuickSilver Ilsi CacheCard is a 32K static RAM cache board for the Macintosh Ilsi. QuickSilver provides a 40% performance increase over the standard Ilsi. QuickSilver comes standard with an SE/30 slot extender, which allows SE/30 cards to be used in the Ilsi, and an optional 68882-20MHz FPU for increased floating point equation performance. Applied Engineering #00833

Quadralink w/ Shadow
$208

Quadralink gives your Mac II four additional serial ports. No more reaching behind your computer to unplug one printer and plug in another. No more shorting-out serial devices by connecting them while your computer is on. Quadralink works as an electronic switch box, allowing you to easily switch between any devices connected to one of its ports or your computer’s printer and modem ports. Applied Engineering #03673

Fast Math LC
$139

Make your LC a math whiz with the FastMath LC card. Its 68882-16MHz FPU dramatically increases the speed of math intensive applications. FastMath LC plugs easily into the LC’s processor direct slot (PDS) with no switches to flip or jumpers to move. Comes with a full five-year manufacturer’s warranty. Applied Engineering #04120

Applied Engineering has a card to fit most Macintosh computers. Applied Engineering accelerators boost the Macintosh SE, Classic, LC, II, IIX, IIIsi, IICx and IIci to lightning speeds. All Applied Engineering cards are backed with a manufacturer’s 30-day money back guarantee, and a full one-year warranty.
Meet the new Outbound® Notebook Systems. Smaller, lighter and faster than their Apple® counterparts, the Outbound Notebook Systems sport an ingenious modular design that lets you “mix and match” the CPU, hard drive, and memory you want, before and after you buy. You get the performance you need right from the start. Then, as your hunger for power grows, you can upgrade your Notebook simply and easily with standard low-cost modules.

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Outbound's “mix and match” system lets you choose from two to 14 MB of RAM, a hard disk from 20 to 120 MB, and lightning speeds of 20 to 33 MHz. With any combination, you’ll have all the power and memory you need for your demanding applications. Naturally, the Outbounds are equipped with all of the ports you'd demand, including RS-232, communications, sound, ADB and printer: There is even a built-in microphone and speaker.

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Perform big business in small places

Small enough to fit in most briefcases, all models measure 8.5 x 11 x 2.1 inches, weigh only 6.25 pounds, and boast a full-size, silent keyboard. In tight quarters, use the keyboard mounted TrackBar® to point and click. Or, add a mouse or other ADB pointing device. TheLCD display is large and easy to read, and provides 17% more usable area than the Apple PowerBook™ screens.

Notebook prices based on list prices. PowerBook prices list published Apple retail pricing. Technical specifications and prices subject to change without notice. Outbound name, logo and TrackBar are trademarks of Outbound Systems, Inc. Apple, Macintosh and ADB are trademarks of Apple Computer Inc. PowerBook and Apple PowerBook are trademarks of Apple Computer Inc. All other brand and product names mentioned herein are trademarks or registered trademarks of their respective holders.

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You can order your Outbound Notebook System right from the folks who make it. Just call toll-free and use your credit card. And, when you call, be sure to ask about our low-cost financing.

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There's no reason to wait. Start enjoying the Macintosh environment you know and love on the road now. Let us customize an Outbound Notebook for you today. There's no risk when you buy, because every Outbound Notebook System purchased direct comes with a FULL 10 DAY MONEY BACK GUARANTEE OF SATISFACTION, one year warranty, and toll-free customer support.

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MST, Visa, MasterCard and American Express accepted. Overnight shipping available.

WHAT THE EXPERTS SAY:

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BYTE Magazine

"Outbound's notebooks are solid machines and deserve serious consideration by anyone contemplating buying a Mac notebook."
MacUser Magazine

"Outbound's new Notebook System has the unique ability to grow along with your requirements—and your budget!"
MacUser Magazine

"Innovative touches, a high degree of compatibility, and moderate pricing make the Outbound Notebooks strong competitors with Apple's portable Macs."
Portable Office Magazine

"For me, the Outbound Notebook is the better choice."
BYTE Magazine

Circle 30 on reader service card
### Updates

**JUNE 1992**

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*V. = version #: Req. = min. RAM and system software required. *= last time (in the past year) this or an earlier version was reviewed. $ = cost of update to registered owners. NA = first version, not applicable. * = contact your dealer for update policy. Blue = new version. Yellow = reviewed product.

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**Outbound Monitor**

**Make your portable more productive.**

Take your notebook on the road, then quickly turn it into a full-sized office system by adding the Outbound Outrigger Intelligent Monitor. Its razor-sharp, full-page portrait display is 200% larger than a Mac Classic and 100% compatible with an Outbound Notebook, Apple PowerBook or any Macintosh computer. The Outrigger connects directly to your computer with just a SCSI cable - no expensive SCSI interface card required. The built-in 20MHz 68000 processor means fast redraw and an extra SCSI port gives you added versatility. Get more productivity with your notebook, add the Outrigger today.

Suggested Retail Price $949.

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Great with the Macintosh* PowerBook™

Great with the Plus, SE, SE/30, Classic™ and Classic II.
### Updates

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Accelerators: How Compatible Are They?

By Mark Hurlow

For this year's roundup of 68030 and 68040 accelerator boards, "The Need for Speed," Macworld Lab spent considerably more time on performance testing than for last year's batch. Aside from having many more accelerators and CPUs to test, incompatibility was the major problem. While we found a few accelerator boards to be compatible with all of our application tests, about 40 percent of the products had incompatibility problems in at least one of our testing categories, including software (such as Microsoft Word 4.0 and Excel 3.0); video boards; CPUs; and System 7 features, such as 32-bit addressing and virtual memory.

Hardware Incompatibilities

The first and most important compatibility issue is whether an accelerator board will peacefully coexist with your hardware. For example, while Radius's multiprocessing board, the Saturn V, runs on the Mac IIfx, the Radius Rocket (on which the Saturn is based) doesn't. And although the Rocket and Impulse Technology's Performance/040 are advertised as Mac II, NuBus-based 68040 accelerators, they're not compatible with all NuBus-based CPUs. If you plan to upgrade a Mac II with either of these boards, make sure you have the Rev. B ROM set—a ROM upgrade obtainable from Apple dealers—which makes it possible to transfer 32-bit data over NuBus. The Rev. A ROM, which is incompatible with the Mac II, limits the CPU's addressing to 1MB on each NuBus slot, compared with 256MB with the Rev. B ROM. The Performance/040 also requires a Paged Memory Management Unit (PMMU) on the Mac's logic board.

Some 68040-based accelerators, including the Radius Rocket and the Performance/040, also had trouble working with some NuBus boards. We found Fusion Data Systems' TokaMac SX 25 (on the IIIs) was incompatible with the SuperMac Spectrum/24 PDQ display board; the Rocket wouldn't work with some Raster-Ops video-interface boards (especially the ones for 13-inch monitors); and the TrueVision video board was incompatible with the Performance/040. Most video boards require a firmware revision to work with 68040 accelerators because to transfer data most video boards rely on an undocumented feature of the 68020 and 68030 processors called byte smearing, which the 68040 boards do not support. Make sure you check with your existing hardware compatibility issue.

The introduction of the Mac II made possible 32-bit addressing, which enables the CPU to access up to 1 gigabyte of RAM. However, the ROM that came with the Radius Rocket when installed on a Mac IIx, IIx, and IIcx—is unable to access more than 8MB of physical memory. To take full advantage of 32-bit addressing on these machines requires Mode32 (available free from Connectix Corporation, Apple dealers, bulletin boards, and user groups). But not all accelerators support Mode32. For example, without RocketWare 1.3 (which should be available by the time you read this) the Radius Rocket cannot access more than 8MB on the accelerator board when installed on a Mac IIx or IIcx. The TokaMac SX 25 (on the SE/30) is also incompatible with Mode32.

None of the Classic and SE accelerator boards support 32-bit addressing, since none of the compact Macs (the amitimes

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512K, Plus, SE, and Classic) have 32-bit clean ROMs to start with. To enable these 68000-based compact Macs to work with 32-bit addressing would require a major revision of the ROM, not a simple task.

To break the 4MB limit of the 68000-based machines—the Plus, the SE, and the Classic—some accelerator vendors are shipping their compact Mac 030 accelerator boards with Connectix’s Compact Virtual. If you need to access more than 4MB of RAM on a 68000-based compact Mac, get an accelerator board that supports Compact Virtual 3.0, which should be released by the time you read this. Like System 7’s virtual memory, Compact Virtual enables a CPU to use a SCSI storage device (such as a hard drive) as an extension of physical RAM. But unlike System 7’s virtual memory (VM), Compact Virtual allows you to access up to 16MB of physical RAM from the accelerator board itself.

Due to ROM limitations, System 7’s VM will not run on a 68000-based compact Mac, not even one equipped with a PMMU chip. The beta version of Compact Virtual 3.0 that we examined lets an accelerator board access up to 16MB of virtual or physical memory on a compact Mac and includes some nice features not provided by Apple’s VM, such as Disk Saver and RAM Disk. Disk Saver is a disk-partitioning scheme that’s more efficient than System 7’s VM. For example, if you have an 8MB CPU and need to access 10MB, with Disk Saver you need to allocate only 2MB of disk space of VM; System 7’s VM requires 10MB of disk space. RAM Disk shortens access time by using physical RAM as disk storage. Because it’s nonvolatile, it will survive a restart.

Although our tests showed that Dove Computer’s MarThon Racer 030, DayStar Digital’s PowerCache, and other 68030-based accelerators for modular Macs had no trouble running System 7’s VM, the 040-based boards don’t support it at all. Some vendors are trying to get virtual memory to run on their 040 accelerators. Impulse, for example, is talking with Connectix about creating a version of Compact Virtual that will be compatible with the Impulse board. Fusion Data, meanwhile, promises virtual memory support in the near future, either by reengineering some of the board’s start-up routine or through Virtual. Taking a different approach, Radius recommends its users purchase more RAM, since virtual memory is considerably slower than real memory.

A word of caution: If you think you’ll need virtual memory, don’t buy an accelerator with a 68EC030 or 68EC040 processor; these lack the PMMU required to run virtual memory.

While 030-based accelerators for modular Macs have no trouble running A/UX, Apple’s implementation of the Unix operating system, 040 boards don’t support A/UX at all. Fusion Data Systems is currently working with Apple A/UX engineers to determine the feasibility of running its PDS-based 040 accelerator boards with a Quadra-compatible version of A/UX, but neither Radius nor Impulse Technology has any plans to support A/UX in the near future. Because A/UX, like virtual memory, requires complete control of the 68040 processor’s Memory Management Unit, and each of these NuBus-based boards implements its own memory management for its on-board memory with the 68040’s MMU, supporting a radically different operating system would mean having to rewrite a lot of memory-management routines.

Software Incompatibilities

IN ADDITION TO HARDWARE AND SYSTEM incompatibilities, many accelerators had trouble running with certain applications. Some applications, like Excel 3.0, were incompatible with a few 68030-based accelerator boards. Others, like Word 4.0 and PageMaker 4.0, were unable to run with 68040 accelerators. Still other applications, like 4th Dimension, failed only on specific boards—in this case, the Impulse Performance/040.

The most common problem we found specific to 68030 boards was with Microsoft Excel running under System 7.0.1. At first we suspected the culprit was the SANE trap, which intercepts SANE calculations, translates them into floating-point calculations, and diverts these floating-point calculation instructions to the 68882 floating-point unit, or FPU (SANE, or Standard Apple Numerics Environment, is an extension to the Mac Operating System). However, the problem turned out to be HWPriv (Hardware Privilege), a system trap Excel 3.0 uses that Apple changed in System 7.0.1. This problem exists only on compact Macs that have an 020 or an 030 accelerator, and most vendors already have patches for it.

Another Microsoft product, Word 4.0, had compatibility problems, but only on 040-based accelerators. To run Word 4.0, you need to turn off the accelerator (through a control panel). To take full advantage of 040 processing power, you can upgrade to Word 5.0 or get Word 4.0e, the free maintenance version of 4.0.

Another problem was that most 040 accelerators couldn’t open PageMaker 4.01 in copy-back mode, an instruction and data-caching scheme in which information written to the cache is updated in main memory only when there is a spec-
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pecific instruction to do so. This can be avoided by removing most of the PageMaker filters from the System Folder. PageMaker 4.2, an $85 update, eliminates this problem.

A number of vendors we contacted told us that most 040-based accelerators have trouble with multisegmented cdevs (control panels in System 7), INITs, DAs, and filters compiled with older versions of Think C and Think Pascal, which used 68020/68030-specific instructions. Most software compiled with the older version of either Think C or Think Pascal should have updated versions available by now.

A few applications failed to run properly on only the Impulse Performance/040. We had to turn off copy-back mode to run 4th Dimension with the Impulse. The board's software reports the board as an O30, which makes 4D run under write-through mode, a scheme that runs more slowly than copy-back. Meanwhile the O40 board is running under copy-back mode. This mismatch causes 4D to quit. Other problems specific to the Performance/040 board include failure to perform calculations in Mathematica and freezing when quitting from MacDraw Pro. Impulse should have released a bug fix by the time you read this.

According to most of the accelerator vendors we contacted, many sound programs (such as SoundEdit) that avoid the Sound Manager by writing directly to the Mac's sound chip are likely to be incompatible with most O30 and O40 boards. Games with copy-protection schemes (which include self-modifying code) don't work with an O30 or O40 accelerator because the board's instruction cache prevents the modified code from being updated in RAM. Games that directly access logic board hardware, such as the video frame buffer or the sound chip, won't work either. Also, games that make assumptions about the environment of the CPU (for instance, assuming that if a 68030 is present it should have Color QuickDraw) might also fail.

Compatibility issues have existed since the introduction of the Mac II, and accelerators will continue to have such problems whenever they encounter new system software or new applications. While most accelerator vendors try to solve incompatibility problems, you can't expect them to find—or be able to solve—them all. So before you spend your hard-earned money (or your boss's smart-earned money) on an accelerator, you should first try out the board with your favorite applications, screen savers, and games to see if they run. If you can't do that, call the accelerator board vendor and ask for a compatibility list.

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REVIEWER'S NOTEBOOK: Now anyone can get typographic-quality effects and enhancements using their existing type, with FontMonger, the super fast, simple-to-use type customizer. Modify a wide range of your type's characteristics, from the ability to merge individual characters to create custom faces. Modify existing typefaces into all small caps and use characters you've never been able to access before.

This easy-to-use utility can save you hundreds (or even thousands) of dollars by converting PostScript Type 1 fonts to the advanced new TrueType format.

Here's another fascinating FontMonger capability: you can actually merge characters from several font families, to create unique small caps, composite characters, customized faces and logotypes.

FontMonger also offers support of Adobe Illustrator and Aldus Freehand files. You can create or modify characters within programs and build these modified characters back into a font. It's fast, easy and very handy when using multiple programs. FontMonger's type modification tools provide a vast assortment of intriguing capabilities including: access to unencoded characters, creation of oblique characters, generation of superscript and subscript characters along with generation of slash and bar fractions (some of which have been previously hidden, others you probably never knew you had).

Using FontMonger, you can convert fonts one face at a time, as you need them, or in batches so your entire library is at your service. Just one step converts the batch. In addition, you can control the character widths of your fonts (the space between characters) the horizontal and vertical scaling, the slant and change width.

Outline Fonts. Outline fonts that describe the lines and curves which make up their characters. They can be used to draw characters at any size on any screen or printer. With the availability of Adobe Type Manager (ATM) and Apple's System 7.0, you can now use outline fonts throughout your Macintosh system. Fonts you use this way must be in PostScript Type 1 format for ATM, and in TrueType format for System 7.0.

TrueType. The TrueType font format was developed by Apple for System 7.0. The format has been adopted by Microsoft for use with Windows.

Type 1. Before 1990, only Adobe could produce fonts in PostScript Type 1 format, so if you wanted to use ATM you had to buy Adobe fonts. Now, the Type 1 font specifications are publicly available, and you can buy Type 1 fonts from many vendors.

Type 3. Until the Type 1 format was made public, non-Adobe PostScript fonts were in the less capable Type 3 format. Type 3 fonts are usually slower to print, produce lower-quality results and do not work with ATM. You may never need to convert any fonts to Type 3 format with FontMonger (although you can). Instead, you will probably want to convert Type 1 fonts to Type 1 and TrueType formats.

Upgrade Or Switch to Publish-It! Easy 2.1 For Only $99.

REVIEWER'S NOTEBOOK: If you're about to enter the world of Macintosh desktop publishing, then an experienced user who wants fast, pro-quality results without digging through hundred page manuals, Publish-It! Easy is the award winning, System 7.0 ready product that MacWorld magazine calls "...the Swiss Army Knife of desktop publishers".

Now for a limited time, you'll be able to switch or upgrade to this and a half mice rated package for only $99 — if you currently own a desktop publisher or word processing program. This is a $150 savings off the suggested retail price of $249.95. Simply send us the little page of the DTP or word processing manual you are currently using, and you'll own Publish-It! Easy Version 2.1 for only $99. Publish-It! Easy is also available in the new Corporate Network File Server Version.

The printed page. It can be an adversary or a joy. If you've got new Publish-It! Easy loaded on your Mac, you can now create an example page out a page — and produce handsome newsletters, brochures, catalogs, reports, bulletins, advertisements, flyers, coupons and more! With the toolbox of advanced, easy-to-use features such as:

- The Slide Show (complete with dozens of features and effects, outperforming some stand alone packages), instant thumbnails (view and edit up to 100 pages), built-in database and mail merge, spell checker and thesaurus, your ideas will look extraordinary on paper as well as on screen. Draw, paint, edit text, add graphics instantly and use a host of other-state-of-the-art publishing tools with sleek controls. In fact, this time program eliminates the need and expense of having separate drawing, painting, word processing mail merge and presentation software — that's how incredibly full featured this package is! And don't worry — Publish-It! Easy doesn't punish you for mistakes or experimentation — it provides 5 levels of undo to get you right back to the beginning, so you can explore other creative avenues. Print your quality pages on any Chooser-selectable printer.

Publish-It! Easy 2.1
BBP2712 Publish-It! Easy 2.1 (Upgrade or Switch Offer) . $99.00
BBP2470 Publish-It! Easy 2.1 1-800-666-2562

Advanced Grayscale Image Enhancement

If you've got a scanner, this product is for you. A professional-quality image manipulation product with scores of tools, filters, masks, retouching features and more. Supports TIFF, PICT and EPS. Features a customizable tool palette, advanced magnification features and input/output device calibration for best-possible reproduction. It is a true second-generation grayscale image enhancer, so you have complete control of your scanned images, not just two or three options. Create images that you simply couldn't before — clean, crisp halftones from imperfect originals. Grab just parts of a photo, create montage, filter images for reproduction. MacRenderMan allows you to create incredibly realistic images, while Showplace allows you to import those images and create scenes, with complete control of lighting, texture, backgrounds, vantage points and dozens of other effects. Altogether amazing, surprisingly easy and fast. In fact, RenderMan was used in creating the academy award winning film, Tin Toy. Impressive results can be achieved in a short time, but if you get the urge, you can get crazy with these products and never be seen or heard from again...

Create Full 3-D, Photorealistic Images

MacRenderMan and Showplace (huddled together in this offer) represent the finest software available for 3D image creation, viewing and manipulation. MacRenderMan allows you to create incredibly realistic images, while Showplace allows you to import those images and create scenes, with complete control of lighting, texture, backgrounds, vantage points and dozens of other effects. Altogether amazing, surprisingly easy and fast. In fact, RenderMan was used in creating the academy award winning film, Tin Toy. Impressive results can be achieved in a short time, but if you get the urge, you can get crazy with these products and never be seen or heard from again...

Also Available in CD-ROM Version

MacRenderMan and Showplace applications, complete online documentation for both products, a gallery of images created with Pixar products and a sample of Pixar animation all on one CD-ROM!

Information & Orders: 1-800-666-2562

NEXl DAY JUST $300!
The Art Of The SCAN

REVIEWER'S NOTEBOOK: The Logitech series of advanced mice and scanners has won acclaim from the press — and thousands of loyal users. No other manufacturer engineers so much precision and innovation into their products. From an incredibly sharp hand scanner to the all new breed of "programmable" mice, they're a pleasure to work with. We put the ScanMan 32 hand scanner through its paces, performing over 50 scans of various black and white images — photos, line art, logos, type, illustrations — even poor-quality photos. The ScanMan 32 features 32 gray scale performance, with adjustable scanning resolutions from 100 dpi for quick scans; up to 400 dpi for magnificent finished images. Use scanned images in word processors, multi-media, desktop publishing, HyperCard, OCR and more. Hold a Logitech device in your hand and you'll notice the superior craftsmanship, the precise movement of the rollers and the extra large scanning window so you can see as you scan. Scan instead of re-keying data: capture text (with OCR software) with crisp, clean results.

The Science of Scanning. Logitech technology destroys the old barriers of scanning, increasing the speed and accuracy of anything you scan. Superior image quality, with the ability to produce halftones for reproduction. The set of output controls provide the best possible results on any printer or monitor screen. Its 4" wide scanning area allows full-page scans with just two quick passes.

And Logitech's rugged construction and precision roller system allows straight, unwaivering scans. No curvature, no skipping. The scanning speed indicator controls the movement for perfect scans every time. There are three settings for scanning photos and another for scanning line art. Its shape is perfect, its weight and components distributed equally for balance. All of which makes getting an image from paper-into your Mac, simple and easy.

The ScanMan 32 gives you a free set of software tools, including a 32 gray scale palette for detailed retouching. There's also a handy dimension box and tear off tool palette, with all the commands to incorporate them as a desk accessory. Pop up real-time brightness and contrast controls, refine images with amazing flexibility, rotate, flip and invert images. Save your scans in a variety of formats, including MacPaint, TIFF and PICT.

Here's What You Get: The ScanMan 32 contains everything you need. The Model 32 Gray Scale scanner, advanced technology gives you more flexibility, creative tools and value than any other scanner. Businesses use scanners to capture text as described above and for keeping log and other documents with instantaneous access. Logitech's advanced technology gives you more flexibility, creative tools and value than any other scanner.

Although there are two basic scanning modes in ScanMan, there are in fact three ways of scanning an image: Line art mode, Gray mode, or Mixed mode. Included with ScanMan 32 — CATCHWORD PRO: Powerful Optical Character Recognition (OCR) software that allows you to capture printed, hard-copy data by scanning it, rather than typing it. But, without quality software and a high quality scanner (like the ScanMan 32), scanning text won't work properly. "Dirty" scans produce unwanted characters and commands, requiring enormous cleanup — creating more work than rekeying.

CATCHWORD Pro delivers an amazing 99% accuracy in OCR testing, used in tandem with the ScanMan 32. CATCHWORD Pro is compatible with popular word processors, spreadsheets, databases and desktop publishers so you can scan information directly into your application and use it immediately! Different typestyles and sizes are no problem, any printed characters, in any size of typestyle are instantly recognized. It will even automatically convert two scans into one, full-page image.

WHAT ABOUT LARGER, MEMORY-INTENSIVE PHOTOS AND PAGES PACKED WITH SMALL TYPE — DON'T THEY SLOW MY SYSTEM TO A CRAWL? The answer is "no" and only Logitech can say that. While other scanners are notorious for system slowdown, all of your ScanMan 32 scans zip along with Logitech's Ingenious memory management features that automatically swap image data between your system's RAM and hard disk.

The instrument itself is a masterpiece. From the genius of the respected industrial design firm, Frogdesign — also responsible for the new line of NEC monitors and other distinctive hardware products, the ScanMan 32 is different from the ground up. First, you'll notice that it's heavier, with precision rollers that provide more "grip" along with a superior guidance system for light-touch control. All of which means you can scan quickly and accurately — once — and capture the image perfectly. While many other hand scanners rely on you to move in a straight line as you scan, the ScanMan 32 provides fully balanced, direct movement.

Using the ScanMan 32, you can create instant layouts, experiment with backgrounds and special effects. Add text and explore sizing and cropping options within seconds. That's why the hand scanner has caught fire in the design world: its ability to let you see many different visual combinations.

Included with ScanMan 32:

CATCHWORD PRO:
Optical Character Recognition software for capturing printed, hard-copy data by scanning it, rather than typing it. But, without quality software and a high contrast scanner (like the ScanMan 32), scanning text won't work properly. "Dirty" scans produce unwanted characters and commands, requiring enormous cleanup — creating more work than rekeying.

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Included with ScanMan 32:
The Intelligent Desktop

REVIEWER’S NOTEBOOK: Although OnCueII contains several individual features (each of which could be stand-alone products), one in particular caught our eye as an incredible time saver: KeyLauncheR. It allows you to launch any application from the keyboard, without opening layers of folders — by simply typing all or part of its name! That one capability can save an incredible amount of time by eliminating time-consuming steps. It’s worth the price of OnCueII alone — but there’s much more...

OnCueII satisfies the power user in us as elegantly as it satisfies our need for easy-to-use utilities that perform as promised and increase productivity. So it’s great for anyone. In seconds, you can personalize your menu configuration for maximum speed and efficiency. Just click to open an application, group documents together that will be used for a specific project, return to work on a recently-used document by retrieving a list of up to 100 files you’ve used, and launching any of them immediately. No other file and application manager gives you this degree of functionality. There’s even a cure for the “missing application” message using OnCueII’s unique MatchMaker feature. With it, you can launch files that have missing applications by assigning another application — any one you choose!

OnCueII also provides powerful, easy-to-use tools to help you instantly find seemingly lost files. You can conduct blistering fast searches by file name, file format (TIFF, PICT, etc.), creator application, dates created or modified, file size, or any combination. With this powerful search feature on your side, you’ll never misplace another file. Guaranteed. And with OnCueII’s amazing file management capabilities, you’ll be able to instantly find, get info, copy, move, delete, and rename files/folders from within any application — and without using the Finder. It doesn’t get any more convenient than that.

And there’s more! The On Startup feature gives you complete control of the programs that load when you turn on your Mac, like system extensions and control panels. You simply define the priority and groupings and OnCueII takes care of the rest. All of which makes OnCueII one of the most important new products to come along in years, giving you capabilities you’ve probably wished for but never thought possible. And we’ve just scratched the surface of OnCueII’s vast potential: it contains ten other time-saving features that users have screamed for: This is a product that does it all. Eliminate time-consuming steps with the following versatile features:

- On Cue II. Instantly launch any file or application, or simultaneously launch a group of files and applications — without opening layers of folders — all with a single mouse click.
- MatchMaker. Conveniently launch files that have missing applications by assigning another application of your choice.
- File Search. Quickly locate files by using the following search criteria: file name, file format, creator application, dates created or modified, file size, or any combination of these criteria.
- On Startup. Easily manage programs that load when you turn on your computer (e.g., system extensions) by defining the priority and groupings in which these programs are loaded.

...Plus 13 other time-saving features!

Full-Motion, Interactive Sherlock Holmes Mysteries!

Over 90 Minutes Of Adventure On One CD!

REVIEWER’S NOTEBOOK: An absolute must for electronic game fans, Sherlock aficionados and deductive reasons! Sherlock Holmes, Consulting Detective is the only game we’ve ever seen that features FULL MOTION VIDEO. You actually interact with the on-screen characters, embarking on three different cases with the super-sleuth himself, along with Watson and an intriguing collection of victims — suspects, generals, beautiful women and jealous sisters. It’s a fascinating new technology. The sound is incredible, taking advantage of your Mac’s full capabilities. Hours of fun and intrigue. The cases are well written adaptations of characters licensed from the Sir Arthur Conan Doyle estate. You interact with the characters. Your interrogations lead to valuable information and the evidence you uncover leads to clues needed to help Scotland Yard nab the villainous murderer. Members of the Tiger staff first saw this disc at the CD-ROM Expo in San Jose last summer. We knew then that this one was destined to become a classic. If you’ve got a CD-ROM reader, you’ll love it. This multimedia, full-motion blockbuster is worth it!

For the first time ever, over 90 minutes of full-motion video brings Sherlock Holmes to life. This revolutionary CD gaming experience lets you match wits with the super-sleuth himself. Guide Sherlock and Watson through the streets of London to interrogate suspects and solve three intriguing murder mysteries. Just slip in the CD and go to work.

The Case of the Mystified Murderess.

Two sisters. One beautiful. The other quiet and plain. A single man. Tall, handsome... and dead. Who did it? Was it jealousy or was it greed? Could the murderer be tied to a rash of burglaries causing panic in the upper-class communities of London?

The Case of the Mummy’s Curse.

Four men found dead. Some say the murderer is a 4000 year old Mummy exhumed during an archeological dig in Katebe, Egypt. Were their murders simply coincidental or were these men cursed from the crypt? Great sets and effects. You — and Holmes — try to unravel one of the century’s most bizarre murders.

The Case of the Tin Soldier.

Waterloo, 1815. Power and Passion. He was an officer but not a gentleman. Now, years later, the retired General has been murdered, a jewel stolen, and a king’s ransom waits to be claimed. Who killed General Arnsfield and why? Holmes enters the scene. This case is a baffle, there are no solid clues.

Instant file management — from within any application!
Find, get info, copy, move, delete, even rename files or folders without using the Finder!

OnCue II
888-2400 OnCueII ...$55.00
Any Macintosh computer running System 6.0.4 or later with at least 1 MB RAM.

MULTIMEDIA CD-ROM
888-2703 Sherlock Holmes, Consulting Detective CD-ROM . . . . $59.95
Sherlock Holmes requires CD-ROM reader and will run on a MAC Lc or greater.

CALL 1-800-666-2562 TIGER ORDER HOTLINE
GUARANTEED LOWEST PRICES ON ANY MACINTOSH PRODUCT

NEXI DAY JUST $3.00!
The Integrated Package That's Truly Integrated.

Work With All 7 Programs At Once! It's Seamless... It's BeagleWorks!

REVIEWER'S NOTEBOOK: Beagle Bros. Software has consistently offered up some of the finest products we've seen for the Apple Computer. Each is clean, powerful and easy to use. Now, Beagle Bros. assembled a product that offers an integrated software program with seven modules. Beagle Bros. went beyond the concept of integration to create a new concept of integration, allowing users instant access to all information in the modules. Their efforts have produced the integrated In-Context Editing™, which links the words processor (with spellers/thesaurus), spreadsheet, database, charting, drawing program, paint program and communications. This high level integration makes life very easy. Link documents and combine data from any of the individual modules into a single document and make changes without ever leaving that document. Feature for feature, BeagleWorks beats ClarisWorks, GreatWorks and Microsoft Works in every area we tested. It's the only one of the four that is System 7 S4VY, so it takes full advantage of Publish & Subscribe, Balloon Help, TrueType, AppleEvents, Virtual Memory, 32 bit file addressing and color icons. An incredible value, today's business climate, poorly written correspondence is separating success and failure. RightWriter's depth and attention to the details of written communication makes it the premier grammar checker for the Mac. Conclusive testing has established RightWriter as the most accurate, most flexible and easiest to use over any of its competitors.

RightWriter for the Mac. One of the more popular categories in software is the grammar checker, arguably the most important word processing add-in. With RightWriter for the Mac, you can actually combine information from any of the seven programs into a single document. Or create new information in another module without leaving the module in which you are currently working. And with the innovative In-Context Editing, when information is changed in one document, the information in the linked documents changes with it. Great starter application that won't be quickly "outgrown."

A new definition of integration. For example, you can automatically combine information from any of the seven programs into a single document. Or create new information in another module without leaving the module in which you are currently working. And with the innovative In-Context Editing, when information is changed in one document, the information in the linked documents changes with it. Automatically.

Publish & Subscribe information from any of the modules. BeagleWorks includes some powerful desktop publishing features like wrapping text around objects, setting multiple columns on and off anywhere on the page, and reduction and magnification as well as page preview in any module. You'll love the full-featured Spreadsheet that allows you to create up to 256 columns and 16,385 rows. A powerful bar and time-saving recall automatic summation features. The charting modules create robust, 256-color line, bar, column, area, scatter and exploded pie charts. The database module allows 16,000 records per file, 256 fields per record and easy mail merge. Sixty-four built-in functions are all at your command and BeagleWorks provides 32 report formats for your data.

Wanna' draw? Just pop open BeagleWorks' draw module and choose from a palette of tools, colors, patterns and line widths and shapes. The streamlined, tear-off menus make it a pleasure to work with. While you're in a creative state, zip into the paint module and get crazy with a host of festive studio tools — and some nifty special effects as well. Airbrush, spray can, paint bucket, pencil, line and more. Provides 256 custom colors and 128 patterns.

When you're ready to connect your Mac to the world, BeagleWorks' communications module makes use of Apple's Communications toolbox to give you powerful connectivity! It stores commonly used phone numbers with a variety of convenient settings. Autodial, autoanswer, uses a modem or direct serial connection.

Integrated Software: Who Leads The Pack?

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<th>GreatWorks</th>
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BeagleWorks is the clear winner overall when it comes to true integration and powerful features.

Integrated Software and Co for the Mac

Information & Orders: 1-800-666-2562

Int'l Orders: 305-443-8212  Fax: 305-444-5010

NEXT DAY JUST $3.00!
Reviewer's Notebook: The thoroughbred of Macintosh spreadsheets. Not a step child of the original DOS product, Lotus 1-2-3 for the Mac has been designed from the ground up to exploit the power and flexibility of the Mac. Revolutionizing financial software with true 3-D worksheet capabilities, Excel doesn't have it. Claris Resolve doesn't have it. Fully featured, with System 7 support, completely customizable with desktop tear-off menus, most functions require just a mouse click. Excel users will be surprised at the power and grace engineered into Lotus 1-2-3 for the Mac.

Lotus' deep understanding of advanced spreadsheet and financial modeling technology is present here. True 3-D worksheet management, incredibly nimble relational database power and easy-to-use formulas. Over 14 million people rely on Lotus concept to create budgets, perform precise forecasting and instant analysis. Proposals and presentations ring with clarity with Lotus' financial graphs and tables. It's easy to edit cells, create graphs, and import data, using the same menus, tools and file formats across worksheets, graphs and macros.

Using 1-2-3 for the Mac is fast and simple. It embraces new System 7 and provides the classic 1-2-3 menu for complete keystroke compatibility. We love the use of floating toolboxes and palettes, allowing customization of your workspace. Moving around is silky and streamlined, allowing you to quickly select ranges (before or after starting commands). You get in-cell editing and the ability to directly manipulate chart elements. You also get 256 colors, 49 different fill patterns and 230 line styles and thicknesses for use in your spreadsheets.

Along with the brutal power of 3-D worksheets, you can easily customize database forms for automatic fill-in and printing, perform a host of advanced relational capabilities, including sort queries (a particularly useful feature), an ever-active macro recorder (an incredible time saver), and automatic compression routines for any printers. By the way, Lotus throws in a free copy of Adobe Type Manager.

With 1-2-3 for the Mac, complicated tasks, like consolidation, don't require tedious linking or endless dialog box activity, just a couple of mouse clicks. Lotus 1-2-3 for Macintosh is fully compatible with all 1-2-3 files and macros, including PC versions. More than fourteen million people already rely on Lotus 1-2-3 for accounting, budgeting, forecasting, analysis, proposals, presentations and much more. Now Mac lovers can, too.

Lotus 1-2-3 for the Mac towers over the capabilities of Excel in a host of areas. Its ability to perform true 3-D functions is an enormous advantage. And the spectacular range of colors and graphic devices available within the worksheet. Excel doesn't allow pop-up functions or range names, Excel doesn't allow you to directly manipulate elements in charts, or perform in-cell editing Lotus 1-2-3 for the Mac does. Excel doesn't include relational capabilities, floating toolboxes or palettes, you can customize your workspace or have your macro recorder on all the time. 1-2-3 does.

When it comes to spreadsheet features, no one even comes close to 1-2-3 for the Mac. That's because only Lotus has engineered true 3-D worksheet power into 1-2-3. Excel users are converting in droves to the newest, hottest spreadsheet product, finding features like relational joins and queries, the 1-2-3 Classic menu for 100% keystroke compatibility, vast color and graphics support and a dozen other advantages. In fact, we've compiled a feature-by-feature comparison for your review. But there's an intangible difference: The proven 1-2-3 approach to the worksheet. Just the feel of the in-cell editor, pop-up functions and macros display the refined Lotus functionality. John Sculley, CEO of Apple says: "...This is a spectacular product." And Mac Week raves: "The most impressive aspect of the program is its implementation of the Macintosh interface. Mac aficionados will have no problems with the program - 1-2-3 Mac is a Mac application to the core." The numbers have never looked so good...

More Powerful Than A Locomotive. True 3-D worksheet management lets you tackle complex tasks, without complicated linking or dialog boxes. Bring remote data right into Lotus 1-2-3 through Datalens and the Apple Data Access Language. Then work with it using full relational database power and custom database forms. No matter what you're doing, you'll see only one set of menus, tools and file formats. You'll get so much done with so little to learn.

No Mac Is An Island. Share files, macros and applications with Excel users. With PC users? Yes. You heard right. 1-2-3 for Macintosh directly reads and writes Microsoft Excel for Macintosh files. So you can make the switch to 1-2-3 and never look back. What's more, 1-2-3 for Macintosh is fully compatible with all 1-2-3 files and macros, including PC versions. More than fourteen million people already rely on Lotus 1-2-3 for accounting, budgeting, forecasting, analysis, proposals, presentations and much more. Now Mac lovers can, too.


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<th>Microsoft Excel 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimized for Macintosh</td>
<td>Supports system 7 features</td>
<td>Yes</td>
</tr>
<tr>
<td>Floating toolboxes and palettes for custom workspace</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Direct manipulation chart elements</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>In-cell editing</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Context-sensitive, graphical help</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sort ranges before or after starting commands</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Supported colors/fill patterns/line styles and thicknesses</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Powerful Spreadsheet Features

- True 3-D worksheets
- Pop-up functions and range names
- Menu promotion
- Same menus, tools, and file formats across worksheets, graphs, and macros
- Adobe Type Manager included
- Automatic completion on all printers
- Recorder macro always active
- Customizable database forms
- Relational joins and queries
- Directly reads Excel files and DBASE files (.DBF)

Comparison:

- Reads and writes all 1-2-3 files
- Runs all 1-2-3 macros without translation
- Reads and writes Excel files

Fascinating charting including 2-D and 3-D charts in numerous styles and types - all available with the click of the mouse. And only 1-2-3 has floating toolboxes for ease of use.

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ADD SIX SERIAL PORTS - INSTANTLY!
Connect And Control Modems, Printers, Networks, Peripherals
And Other Serial Devices. Hardware And Software Included.

REVIEWER'S NOTEBOOK: One of the most useful new ideas in computing — Enables you to control — from a software interface — up to six serial devices. (Mac only come with 2 - Printer and Modem.) It's like adding six serial ports to your Mac (in fact, we found that it's almost like having TWO computers). Configure your equipment anyway you like: One Mac to six devices; One Mac to five networks or four Macs to two devices. A snap to install, simple to operate and fully System 7 compatible. Full two year warranty on everything.

So forget changing cables, swimming through wires and fiddling with AB switches (those things can actually cause system freeze-ups). Now you simply pop up the MultiPort screen, select the port you want to use from a graphical on-screen diagram — and you're done. Choose from six serial ports and five ADB ports — a total of eleven! The LED lights on the MultiPort unit indicate the port selected and your INSTALL installs setups for specific situations, each time the Mac is started. There are dozens of possibilities for the MultiPort, like using it "inside out" to allow up to 4 Macs to share two non-LocalTalk devices. You can even have more than one mouse connected to your Mac; your standard Mac mouse for normal use, and a trackball-type mouse for graphics and publishing work.

Performs beautifully with all Mac add-on equipment — we tested every Mac serial device we could find and saw 100% compatibility!

Must for the Mac user performing multiple tasks and working with assorted equipment. Everything you need to get going is included: controller box, detailed user's guide and accompanying software. Runs off of ADB power, no power supply is needed to operate the MP-91.

Software-Controlled Ports.
This compact little device — about the size of a paperback book — is the answer to connecting extra serial ports and controlling them on your Mac screen. Simple controls allow you to just click to select a port — or to invert the port in-out lines, or port character-printer or modem. The MultiPort MP-91 is the ideal accessory that's guaranteed to save you hours of time switching cables, running and rerouting wires. It's the easiest system available for multiple port switching.

Here Are The Installation Instructions:
The MultiPort MP-91 simply plugs into the printer, modem and ADB sockets on the back of your Mac. Your add-on equipment (printers, modems, scanners, etc.) are plugged into the MP-91. A software Desk Accessory goes into the System. That's it.

That Was Fast...
And using the MP-91 is even faster! All the selections you make are handled by the software, so there's really no need to touch the MP-91 again. Just tuck it away and enjoy its ingenious functionality. Our "Printer Sharing Test" saw connections of: Four Macs to one LaserWriter, Two Macs to two LaserWriters and two ImageWriters — and a modem; even One Mac connected to two LaserWriters, 1 ImageWriter on LocalTalk, a modem and a scanner. We connected, re-connected and re-routed as many different serial devices we could find — with easy control, selection and reliable performance — every time.

What's The MP-91 Secret?
The magic of Apple's ADB (Apple Desktop Bus). The MP-91 and its proprietary software combine to create a lightning fast data highway, similar to Ethernet, between the serial device — and your Mac.

Printer Drivers & The Chooser
All Mac printers are controlled by software programs called "drivers." These driver programs are represented by icons that appear in the selection panel of the Chooser. You select these drivers by clicking on them in the Chooser. MP-91 Control allows you to switch to an MP-91 serial port which may have any type of printer attached. BUT — you must first select the appropriate printer driver with the Chooser before initiating printing in your application if the printer type is different than the one already selected in the Chooser.

You have a LaserWriter attached to the "Printer" port and an ImageWriter attached to MultiPort #2. You have been using the LaserWriter, now you want to use the ImageWriter. It's the smoothest way to connect your Mac to half a dozen printers, modems, networks, or any other serial device. Fully automatic and software controlled. Or turn it around and share expensive devices (like a high-speed modem) with multiple Macs!

ADDITIONAL FEATURES:

Two more serial ports on the back are software defaults as startup and cannot be re-characterized. Always either "Printer" or "Modem".

MP-91 Control to select MultiPort #2 to use the ImageWriter.

Other Drivers
Modern use drivers, too. These, however, are usually part of the communication program (Such as MicroPhone II™ or AppleLink™). Therefore no driver selection is necessary using modems, just click to the port you want.

MP-91/2 Features

Six Serial Ports — Software Controlled
Five Full-Time ADB™ Ports
Easy Port Selection With Software
LEDs Indicate Port Selection
ADB™ Interface — No power Supply Needed
All Connections Easily At Hand
Compatible With All Macintosh Serial Printers And The Chooser™
Same Convenient Size As 3.5" Floppy
Compatible With All BusRider™ Products Such As The BC-91™ Bar Code Reader

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Compatible With All BusRider™ Products Such As The BC-91™ Bar Code Reader
The Industry's Only Continuous Hard Disk Backup.

Reviewer's Notebook: Ordinary backup systems make periodic backups of your data to a tape or floppy, and that's fine; but DiskTwin offers you automatic, continuous backup protection (great for workgroup servers, transparent while AppleShare runs). That means up-to-the-instant data backups from primary disk to secondary disk without any effort at all. Just install DiskTwin and never worry about it again. Another important advantage: DiskTwin features Automatic Cutover, which keeps your Mac on line during a system crash, seamlessly switching you to the second drive. DiskTwin has the ability to rebuild bad sectors, transparent while AppleShare runs.

Second drive. DiskTwin has the ability to rebuild bad sectors in your system, and that's fine; but DiskTwin offers you automatic, continuous backup protection (great for workgroup servers, transparent while AppleShare runs). That means up-to-the-instant data backups from primary disk to secondary disk without any effort at all. Just install DiskTwin and never worry about it again. Another important advantage: DiskTwin features Automatic Cutover, which keeps your Mac on line during a system crash, seamlessly switching you to the second drive. DiskTwin has the ability to rebuild bad sectors, transparent while AppleShare runs.

DiskTwin Scenario — AppleShare / E-Mail Server. Acme Widgets uses an SE/30 AppleShare server with an 80mb internal hard disk for a customer database and QuickMail. How can Acme's net work administrator protect her company from losing all of its customer records when a disk crashes and eliminates downtime from a busy workday?

The DiskTwin Solution. Using DiskTwin with a removable cartridge drive, the administrator can keep both an archive of the entire 80mb server disk and an up-to-instant backup. Every evening, she removes the twin cartridge for safekeeping and replaces it with another. By exchanging cartridges daily, the administrator has both a continuous server backup and an archive that's immediately usable, unlike a tape or floppy backup.

If Acme's server disk crashes, DiskTwin automatically cuts over and continues operation from the cartridge drive, preventing downtime and the loss of the day's work. Users continue working uninterrupted, unaffected by the disk crash. DiskTwin's QuickMail Notification sends an e-mail to the administrator and other designated users, warning them that a disk has failed. The crashed disk can be repaired or replaced at a convenient time.

Scenario #2 — Individual User. An illustrator uses a Macintosh IICl with a 330MB disk plus a 40 MB external to create large images for a daily newspaper. At any one time, he has about 40MB of current projects on his disk. From time to time he does a copy of key files from the 330MB disk to the 40MB disk. It takes a long time and he has to constantly remember to do it. The illustrator has learned to live with tight schedules, but his Mac has not. How can he ensure that he never misses a deadline?

The PartitionTwin Solution. Simply by adding the DiskTwin system to his existing configuration, the illustrator can keep a continuous backup of his current work. He can twin a 40MB partition from the larger disk to the 40MB disk, using Partition Twin. He keeps all his current projects in the partition on the big disk and as he works on them, DiskTwin automatically maintains a complete backup. If his larger disk ever fails, he has a ready-to-use backup.

DiskTwin gives you:
• Continuous, Up-To-The-Instant Backup
• No Data Loss With Hard Disk Failures
• Background Operation/Totally Transparent
• Fully AppleShare Compatible
• Uses Any Standard Mac SCSI Disk Drive
• No Performance Loss or Slow Down
• Fits Any Mac II, SE/30 or Quadra

"A godsend for network managers concerned about downtime."

MacWorld Magazine

Twitll — Backups On A Budget. DiskTwin is the software-only version of its illustrious bigger brother, DiskTwin. It provides the same fully automatic, continuous backup abilities for individual users and compact servers. Since no hardware is required, it runs beautifully on all Mac versions. It also works with all SCSI disks, with no reformatting or disk driver replacement necessary. DiskTwin also allows you to create archives, using removable cartridges or erasable optical disks. These archives are ready-to-use.

DiskMaker: New From The Makers Of DiskTwin. If you own a SCSI disk, why settle for the lightweight software that the manufacturer usually provides? DiskTwin is the universal SCSI disk formatter that works with any SCSI disk and eliminates disk software incompatibility. So if you have different types of disks, you won't have to scramble to learn the different software. And DiskMaker lets you do much more — much more. It features full System 7 support, with 32-bit addressing and virtual memory support.

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ORGANIZE TIME!

REVIEWER’S NOTEBOOK: First Things First is an award-winning time manage­ ment utility that has no learning curve — it’s immediately useful right out of the box. It uses a unique Floating Clock-Icon, which stays “on top” regardless of how your desktop gets. It not only always tells you the time and date, but also provides instant access to To-Do lists, to-do list form, and more. With 15 categories of tasks and things to do, you’ll quickly create categories, estab­ lish reminders and things to do, view and print your lists and have almost unlimited capabilities to custom­ ize First Things First to fit your personal style.

The Floating Deskclock is an access­ device unique to First Things First. In its 3-dimensional form, it actually deco­ rates your screen. Or, if you like, you can park it in a reduced form in the menu bar. Either way, you just double­ click on it any time you want to access your time management program. Nothing could make more sense from a user’s point of view!

You’ll quickly create categories, estab­ lish reminders and things to do, view and print your lists and have almost unlimited capabilities to custom­ ize First Things First to fit your personal style.

PRINTING is a snap. And First Things First gives you complete control of your output, with a variety of print fonts. Print just the items within a time range — or your entire weekly sched­ ule. Creating Reminders is simple — just click on the “Add Reminder” button, choose the text for your Reminder, and enter the text for your Reminder. You then choose Category for your Re­ minder and set the time and date.

Bone-crushing Radius Rocket Speed!

Scientifically Engineered Performance For The Desktop Studio.

REVIEWER’S NOTEBOOK: Radius has always been on the lips of art directors, designers and studio pro­ ducts who use Macs. For years, the creative commu­ nity has turned to Radius to speed their work and enhance their creativity. As an authorized Radius dealer, Tiger presents The Rockets: advanced Mo­ torola 68040 processing power at a new lower price.

The revolutionary Radius Color Pivot Display is the only monitor that works the way you do — in both portrait and landscape modes. See a full page without scrolling. A spectacular value, right now.

The Color Pivot is perfect for design professionals and advanced desktop publishers, but it’s also an ideal upgrade for everyday use, especially if you’re “in and out” of a variety of applications. Just pivot to see as much of the screen as you need. And it is an excellent value. Consider this — the only other way to see a full page is in absolute size without scrolling would be to buy a 19” or larger display — many hun­ dreds of dollars less! The Rocket 33 is the right board pro­

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If only you could design your own typesetter...

LaserMaster's patented TurboRes technology gives you 1000-dpi, camera-ready copy on plain paper.

TurboGray improves the appearance of halftone images by providing increased gray levels at higher screen frequencies.

SmartSense technology automatically switches to PostScript or PCL for each print job.

The standard 9 MB of memory can be expanded to 48 MB using industry-standard SIMMs.

An expansion port allows for optional Ethernet add-on solutions.

You can easily upgrade the Unity 1000 or add fonts by simply copying software files from a floppy disk to the printer.

135 Type 1 typefaces are pre-installed on an internal hard disk. There's also room for more than 200 additional typefaces, so downloading fonts is unnecessary.

With a high-speed, 40-MHz processor, 32K of fast SRAM cache, and special DMA circuitry, the Unity 1000 processes even complex documents faster than most PostScript devices.

Y
ou'd make it fast. You'd have it print camera-ready copy on plain paper. You'd design it to store so many typefaces that you'd never waste time downloading another font. You'd make it easy to expand and upgrade, so it wouldn't become obsolete. And you'd make it capable of printing from just about any computer out there, just in case you ever need to print camera-ready copy from another computer. While you're at it, you'd probably throw in a hundred free typefaces.

Sounds just like our new Unity 1000 Plain-Paper Typesetter. It's fast. It prints at 1000 dpi. It's expandable and software upgradable. It handles fonts like no other printer can. And, it comes with 135 Type 1 typefaces—that’s 100 more than other PostScript devices.

Combine these great features with multi-platform capabilities, and you have the kind of typesetter you've been waiting for. Unity provides simultaneous connectivity to virtually all operating environments, so if your office happens to use PCs as well as Macs, you're in luck.

Unity's HotPorts feature automatically selects the LocalTalk, parallel, serial, or optional EtherTalk interface, and SmartSense automatically switches to PostScript or PCL.

Give us a call to find out more about the Unity 1000. We bet it's the typesetter you've been waiting for.

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Mac, Unix, PC TurboRes Typesetting—FAST!

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THIS MONTH:
Apple's Color Matching
QuickMail Adds DOS Format
GCC's First Color Printer
Personal Information Managers

Strata's New Skin
Stratavision 3d version 2.5 has a new feature called skin modeling that works by wrapping a surface around ribs. For example, you create a model as a series of two-dimensional cross-sectional ribs that define an object's contours; Stratavision then interpolates the surface between ribs. Skin modeling works with another new feature called Flex Objects, a way of changing the shape of each rib over time to produce moving or metamor-
phosing objects. Version 2.5 can also convert TrueType and PostScript Type 1 text into Bezier curves, which can be extruded into 3-D space, modified, and rendered. Version 2.5 lists for $995. Strata has also announced a network rendering package, but price and ship date were not set at press time. Strata, 801/628-5218.—D.L.

2700-DPI Slide Scanner
The Mira 35 from Santos Technology is a low-cost color slide scanner that offers 2700-dpi resolution and a robust Mac interface. The one-pass scanner permits preview scanning at a variety of resolutions and cropings, and it accepts any positive or negative film or slide. For a greater dynamic color range the Mira 35 captures 30 bits of color information, which is processed to 24 bits for display and manipulation on the Mac.

The slide scanner takes about three minutes to scan an entire slide in full color. The Mira 35 was slated to begin shipping in April. Its suggested list price is $2695. Santos Technology, 213/320-8888.—T.M.

The Invisible Site
Silicon Valley companies, including Apple, can't seem to line up fast enough to support San Francisco multimedia performance artist George Coates. Coates has convinced them that productions like his Invisible Site: A Virtual Sho can create a more-than-virtual market for their products. Invisible Site features animated characters alongside real ones in what the audience, wearing 3-D glasses, is meant to see as a fully sensatory online world. Its hero and heroine arrange to meet on Prospero's cyberspace island, but a Rimbaud-obsessed hacker keeps them apart during detours through visually exotic locales. Performance Works, 415/863-4130.—Ann Garrison
Illustrators, the Pressure is On.

With the winning team of Aldus FreeHand® 3.1 for the Macintosh and Wacom’s pressure-sensitive tablet, your illustrations will pull ahead of the pack. Aldus FreeHand, linked to the Wacom stylus, works and feels just like a pen or brush. Now you can easily create those graceful thick and thin strokes that you used to have to make tediously, click by click.

Aldus FreeHand is a productivity tool, too. It’s also available for Windows 3.0, so you can freely exchange designs with PC users. You can take full advantage of Apple’s System 7 features. And a new hotlink from Aldus PageMaker® lets you work on Aldus FreeHand graphics from within the page layout.

Aldus FreeHand is one of a suite of graphic-arts products we’ve designed to work together as intuitively—and creatively—as you do. For a free self-running demo or working model, call 1-800-685-3563.
GCC’s First Color Printer

GCC Technologies has announced its first color printer, a dye-sublimation device called the ColorTone. The company has also introduced a wide-carrige QuickDraw printer called the WideWriter 360.

The 300-dpi ColorTone printer will approach photorealistic quality, according to GCC, and will come with 10MB of RAM and an internal 100MB hard drive that supports font caching, virtual memory, and easier updates to the printer’s software. It includes PhoenixTalk, and serial and parallel ports, and all the ports can be connected simultaneously. The price and availability for the ColorTone were not set at press time, but the price was expected to be under $10,000 and shipping was tentatively scheduled for the second quarter.

The WideWriter 360 is a QuickDraw-based printer built around a 360-dpi Canon ink-jet engine that can also produce 180 dpi in draft mode. The single-color printer is intended for CAD, spreadsheets, and other applications that require wider paper. It comes standard with one sheet feeder; a second sheet feeder will cost about $149, although the price was not set at press time. The WideWriter includes an AppleTalk connector and an RS-422 serial port and will list for $1599. GCC hoped to begin shipping the WideWriter 360 on April 15.

Mail Stop

Lotus Development’s cc:Mail is being revised to version 2.0, and another leading E-Mail package for DOS and Windows PCs called Da Vinci eMail is making its first foray into the Macintosh market.

By supporting multiple data types (graphics and sound, and color text-highlighting, for example) in one message, and enabling users to view attachments, play sounds, and run QuickTime movies from inside the message, cc:Mail 2.0 moves a little closer to the company’s goal of a compound document architecture. Lotus Development’s cc:Mail division, 415/ 961-8800.

Da Vinci is marketing MacAccess, developed by Action Technology, and working on a full-featured Macintosh version of Da Vinci eMail. MacAccess supports MHS (see “QuickMail and MHS” above), provides conversation threading, and can save a half-written message to be completed later. Da Vinci also plans to develop add-ons like its Assistant for Windows, which performs filing and mail forwarding, can send a stock reply to all incoming messages (for example, “Out of town until Friday”), and issues reminders.

Prices for all products depend on number of users. Da Vinci, 919/ 683-1232.—ANN GARRISON

Mac to Fabric

Silk-screened T-shirts may soon go the way of vinyl recordings and rotary-dial telephones. Graffoto has come out with Paro, special paper for transferring images—even four-color, photo-realistic scans—from the Mac to fabrics. Users send images to a Canon Color Laser Copier equipped with a special Canon controller or an EFI Fiery CLC Controller, which in effect turns a color copier into a computer printer. The image is printed on Paro paper and then heat-pressed onto fabric, eliminating the cost of a silk-screening setup for tests and short runs. Graffoto is working on a similar transfer for the Xerox 5775 Digital Color Copier. Graffoto, 604/ 683-1232.—ANN GARRISON

Agfa’s Type Tools

Miles Agfa Division is marketing two utilities for people who are serious about typography. KernEdit allows the user to create or edit kerning-pair tables for PostScript Type 1 and TrueType fonts. It maintains a list of words to display as examples while altering the kerning of a letter pair. KernEdit lists for $149. Agfa is also selling KernData, $99 collection of predefined kerning tables for a wide selection of fonts. TypeChart is a $99 collection of type specimens for printing out as a type book. It includes a utility for resolving font ID conflicts, and it supports changing the textblock specimen. Agfa, 508/ 658-5600.—D.L.

TREND

QuickMail and MHS

CE Software has announced plans for a version of QuickMail with support for Novell’s MHS (Message Handling Service). MHS is the dominant environment for messaging in the DOS world. MHS is a rich platform for building E-mail, groupware, and other messaging-based applications, providing such features as message encryption, sender and contents authentication, and message routing. About 120 commercial DOS and Windows applications support MHS. QuickMail for MHS will be able to communicate with all of them, and is likely to build momentum for other Mac-based MHS products. Pricing was not set at press time. CE Software, 515/224-1995.—D.L.

TURKEY SHOOT

DESIGN FLAWS NOTED

Macintosh LC and LC II Standards? We don’t need no stinkin’ standards! Who cares if your multisync monitor doesn’t work with your LC? After all, we don’t sell multisync monitors. (Fortunately, some monitor vendors sell an LC adapter; others build it in.)

Spelling Checkers and Ligatures Why is it that spelling checkers and related tools for virtually every product that has them—even desktop publishing software—can’t interpret ligatures correctly? Maybe someone thinks Mac users don’t care about typography?

Macworld will send you a Turkey Shoot T-shirt if we shoot your turkey in this column. See How to Contact Macworld.
Now, MS-DOS Files Can Look Just Like Mac Files.

With AccessPC®, you just pop any DOS floppy in your drive, and in a couple of clicks, what you see on your desktop are Mac files.

And they not only look just like Mac files, they act just like Mac files in Mac applications.

You can edit, copy, save, print, play with the numbers, print again, and give the PC folks back their diskette.

AccessPC is so easy to use, it gives new meaning to the word utility.

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Circle 235 on reader service card
Apple Standard for Color Matching

To reduce confusion and wasted motion in the field of color output, Apple Computer plans to add a color-matching extension for QuickDraw to its system software by the end of the year. Not yet officially announced, the Apple Color Matching System will be based on the CIE XYZ color space and will have the advantage of working with existing applications, because it will require only new device drivers instead of major rewrites of each application. If, as expected, the Apple method is adopted for QuickDraw to Its system, vendors of color input and output devices, the vendors will not have to put as many resources into creating and pushing their various color-matching methods. That lowered overhead may ultimately mean that a complete color-matched Mac system will cost less.

The Apple color-matching software will include Color Systems Manager, an exact copy of the QuickTime Component Manager, which will keep track of the gamma curves, RGB values, and color temperature of the different hardware devices attached to a user’s system. The Color Systems Manager will allow vendors of other color-matching methods to drop their algorithms into a folder and have them take precedence over the native Apple algorithms. The Apple algorithms, called Color Matching Utilities, are programs that translate between different color spaces.

At press time, Apple had not decided if it will charge for the Color Matching System, which will require System 7.

DESKTOP LIBRARIAN

Books on Word 5
This month we crack open four books on Microsoft Word 5.0.


* Getting Started with Microsoft Word for the Macintosh, Version 5, by Michael Boom (1992, $19.95). This beginning-level book includes tutorials, examples, and tips on topics ranging from creating a business letter to producing special documents with headers, footers, tables, and other graphics. Microsoft Press, 800/677-7377.—T.M.

FOUR OF THE LATEST BOOKS ON MICROSOFT WORD 5.0 TAKE DIFFERENT APPROACHES TO THE SUBJECT.

TREND

Saving Space
Software that compresses files to make more room available on a hard drive is nothing new. But the new generation of compression products have a key improvement: once installed, they can operate invisibly. The user does not have to create archive files, designate special folders, or modify file names.

Aladdin Systems’ StuffIt SpaceSaver ($59.95), Alys's Software’s More Disk Space ($99.95), and Salient Software’s AutoDoubler ($79.95, and the only product shipping at press time) all do essentially the same thing, though Alysis says More Disk Space can incorporate a decompression engine inside an application that decompresses resources only as they are required. Aladdin Systems, 408/761-6208; Alysis, 415/366-2263; Salient, 415/321-5375.—D.L.

New Wave
During the third semester of college, once they’ve taken the required math, serious physics students tackle the physics of vibrations. Now less-advanced students can learn the basics with Wavemaker, software that simulates the waves and oscillations of complex linear systems. Wavemaker’s innovations include preset and user-definable graphs that show relationships among variables, and an introduction to Fourier analysis.

Pricing and distribution were not set at press time. For information, call Charles Whitney, Harvard-Smithsonian Center for Astrophysics, 617/495-9798.—ANN GARRISON

Air Time
Ham radio operators have been doing what BBS users do for years: sending messages or setting up radio conferences to talk about religion, sex, politics, car repair, and the latest movies. Now hams are using radio to send digital messages between computers, and the FCC has a license for digital ham operators that doesn’t require knowing Morse code. The National Amateur Radio Association (NARA) has just released MacHam, a $34.95 coaching program for the license test. MacHam contains all 700 possible questions and generates practice exams. NARA, at 206/232-2579.—ANN GARRISON

Macworld June 1992 125

NEWS

Color Printer Makes Slides
General Parametrics has introduced the Spectra Star Model 450, a color thermal-wax transfer printer that includes a slide-making attachment. The Post-Script device can also produce transparencies. It incorporates a 32MB hard drive that can store the images to be made into slides.

The Model 450 produces 300-dpi output. It is shipping at a list price of $14,990. General Parametrics is also offering the slide-making attachment as a $6995 upgrade to its Spectra Star Model 440 and its other printers. General Parametrics, 510/524-3950.—T.M.

WAVEMAKER TUTORIAL
SOFTWARE SIMULATES VARIOUS WAVEFORMS.

USING A SPECIAL ATTACHMENT (RIGHT), THE SPECTRA STAR MODEL 450 COLOR PRINTER CAN ALSO MAKE SLIDES.

FOUR OF THE LATEST BOOKS ON MICROSOFT WORD 5.0 TAKE DIFFERENT APPROACHES TO THE SUBJECT.
The Pinnacle

Type: 3.5" optical
Capacity: 128 MB
Size: 6.75"(H) x 2.125"(W) x 8.25"(L)
Mounting: Vertical or horizontal

The Pinnacle. The top. The leader in optical storage. Since 1988, Pinnacle’s been the world’s leader in optical storage solutions, shipping more systems than any other company.

Introducing the Pinnacle Micro REO-1305 rewritable optical drive featuring the new Sony 3.5" mechanism. With its 38 msec access time, the REO-1305 is the perfect storage solution for personal computing, desktop publishing, multimedia, data distribution and backup.

Pricing advantage over Bernoulli® and Syquest™. Pinnacle’s REO-1305 offers a lower cost per megabyte compared to its magnetic storage competition. Users now need fewer disks while getting more storage capacity at a lower price.

---

Optical Technology has distinct advantages over the Bernoulli® and Syquest™ technology. Since optical drives use laser technology to store information there is no chance of head crashes. 3.5" optical has a much smaller footprint than 5.25" magnetic but holds 40% more data.

Reliability of optical media is 15 years (shelf life) - that's 3 times longer than Bernoulli® and Syquest™ magnetic disks. Since the 3.5" cartridges are removable, optical remains the most secure way of storing your data into the future.

Media Standards for 3.5" optical disks have both ISO and ANSI standards to support the technology, while Bernoulli® and Syquest™ have none. Each 3.5" disk can be recognized in any 3.5" ISO/ANSI standard optical drive.

The Pinnacle Advantage is clear. Pinnacle Micro dominates the optical storage industry by offering the largest selection of 3.5" and 5.25" optical drives and disk changers. Interface kits are available for MAC, SUN, DEC, IBM and compatibles. The Pinnacle. Your next storage system.
Does the PowerBook have its limits?

Not anymore.

You've got to love the PowerBook. Its innovations can take your work to the cutting edge. But with Envisio's NoteBook Display Adaptors, you can go further still. Now you've got the power to drive a range of external monitors and projectors. Suddenly, you've got a powerful desktop computer. A persuasive presentation tool. Connect to a full or two-page display, and you can view one or two 8.5" x 11" pages at once. And by connecting to an LCD overhead or RGB projector, you can share your work with an audience. Use NoteBook Display Adaptor 030 and you can view or project 256 brilliant colors on Apple's RGB Display or VGA monitor.

And fast? It's the obvious choice for animation and QuickTime. The PowerBook means freedom, so of course Envisio NoteBook Display Adaptors reside inside the unit. No external hardware, no hassle.

An Envisio Authorized Dealer can help you take your PowerBook to the limit. We suggest you visit one today.
**On the Surface**

National Instruments' LabView has an open architecture for adding modules called virtual instruments (Vls). One of the most interesting Vls is Metric Systems' SurfaceView, which plots three-dimensional wire-frames inside LabView from data from instruments or generated by LabView.

SurfaceView provides background grids, user-definable axes, and tools for rotating the plot or changing point of view. SurfaceView's Vls can be incorporated into the interface of a custom LabView application. SurfaceView lists for $230; LabView lists for $1995; Metric Systems, 512/388-4458.

**Upfront and Close**

Alias Research's Style division is preparing version 2 of Upfront, its 3-D architectural and conceptual solid-modeling package. New features in Upfront include Virtual Graffiti, which allows patterns or graphics mapped onto surfaces to retain their proper perspective when the point of view changes—this is especially useful for adding signage to a model without using 3-D letters—and Spider Vision, a refined method of controlling fly-through animations. Version 2 adds a true double-wall tool that eliminates the need to substitute vertical boxes for walls when constructing buildings, and that can import 3-D DXF files and export QuickTime movies. It will probably list for $895. Alias, 416/362-9181.

**Xante Printer Does 600 DPI**

Xante Corporation, maker of printer accelerators, has introduced its first complete printer, the 600-dpi Accel-a-Writer 8000. The 8-ppm printer includes a fast RISC processor, 6MB of RAM, and Xante's new Virtual Disk Technology, which uses optional Flash EPROM, instead of a hard drive, to store fonts. Flash EPROM is ROM that can be erased and rewritten many times as fonts are downloaded from the Mac. The EPROM stores the fonts until they are written over when other fonts are desired.

Enough EPROM to store 15 additional fonts lists for $100, while enough to store 30 additional fonts lists for $200. The printer comes standard with 35 resident fonts without using the Virtual Disk Technology. The Accel-a-Writer 8000 also has a SCSI port for attaching a hard drive. Now shipping, the printer lists for $4495. Xante, 205/476-8189.

**Signs of the Times**

How can taxi companies, department stores, and universities generate the hundreds of signs they need? They could turn to Amiable Technologies' FlexiSign. Unlike proprietary sign-making systems, FlexiSign uses standard fonts and can import illustrations from other graphics programs. It can drive machines that rout and emboss hard surfaces, or that cut colored adhesive vinyl or rubber sand-blasting stencils (it supports most makes of machining tools). Cutting signs requires some special techniques, which FlexiSign can apply. For example, colors must be separated into layers with the biggest (usually the sign's background color) on the bottom and the smallest (usually the letters) on the top. FlexiSign also has tools designed for drawing, layout, and alignment, and for distortion type.

FlexiSign lists for $1995; the $599 FlexiCut can cut illustrations created in other Macintosh software but lacks FlexiSign's high-end features. Amiable Technologies, 215/222-9066.
That’s easy. According to the experts at PC Week (1992 Analyst’s Choice) and Macworld (1992 Editors’ Choice Award), the #1 Multiplatform E-mail system is QuickMail. They agreed that, for ease-of-use, flexibility and connectivity, no E-mail communicates better across the most sophisticated environments—Macintosh®, DOS and Windows™ 3.x. And once you start using QuickMail, you’ll agree—no other E-mail system works so well for your entire organization. Here are some more numbers you should know: call 1-800-523-7638 and ask for Dept. CE31 to receive more information on QuickMail, or for the name of a dealer near you. For more information on the QuickMail International Distributor network, call 515-224-1995, or fax us at 515-224-4534.

Improving your environment is our business.”
Back in Form

The much-heralded, never-arrived Mac-based electronic forms market suffered from a confused identity. Would electronic forms be a front end for databases? Or would office workers design forms, laser print them, and fill them out with a pen?

Neither, says Purup Electronics, which sells dedicated form-design workstations. Its recently unbundled Mac software, FormsExpert, is aimed at skilled forms designers who create business forms for traditional printing methods.

To that end, FormsExpert's high-end features include support for tear-off stubs; designing in perforations, glue lines, and crop marks; making every edge of a box a different line weight; and pantographs (a repeated background pattern, commonly seen on imagesetters). Purup BOXES WITH DIFFERENT TOP AND BOTTOM CORNERS.

Low-Cost PostScript 2 Color Printer

Tektronix has broken new ground with its Phaser II Pxe, a 300-dpi thermal-wax transfer printer that incorporates Adobe PostScript Level 2 and lists for $4995. It also includes Tek's TekColor PS version 2 color-matching software.

The networkable printer contains a parallel port, a serial port, and an AppleTalk port and works with Tektronix's new 4511A Ethernet adapter for TCP/IP networks. The Ethernet adapter lists for $1495 and is available now. The Phaser II Pxe printer is currently shipping. Tektronix, 503/682-7377.

Darwin on a Disk

"We cannot speculate on man's position in . . . nature . . . while we keep his highest faculties out of our sight. Strip him of these faculties and he becomes entirely bestial." So said the outraged Reverend Adam Sedgwick in his review of Charles Darwin's The Origin of Species. Sedgwick's review can be found in Darwin, a $29.95 HyperCard stack, along with the reviews of Darwin's adherents and other critics. The stack includes Darwin's theories; the history of his life; the social, religious, and scientific context of his work in early nineteenth-century England; and an assessment of his works' impact in the twentieth century. Charriot Software, 619/298-0202.

U.S. Robotics Enters Mac Market

Modem vendor U.S. Robotics has brought out its first Mac-specific products: a 2400-bps fax modem and a 14.4Kbps fax modem. Called the Sportster 2400 Mac&Fax and the Sportster 14,400 Mac&Fax, both support the 9600-bps Group III fax standard.

The Sportster 14,400 includes V.32bis at 14,400 bps, while the Sportster 2400 offers the same standard at 2400 bps. Both fax modems support delayed transmission and group broadcasting of faxes. The two devices come with a Mac-compatible cable, an RJ-11 phone cord, and FAXSTF software from STF Technologies. The $549 Sportster 14,400 and $329 Sportster 2400 fax modems should both begin shipping in the second quarter. U.S. Robotics, 708/982-5010.

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TelePort/FullFax

Think of it as the Macintosh of fax.

Everything you imagined a fax modem could be. From the hardware to the human interface, everything about TelePort/FullFax™ is as easy to use and productive as your Macintosh. Our powerful GlobalFax™ software adds FAX to the menu bar of all your applications, so sending a fax is a snap. TelePort/FullFax plugs into an ADB port like the mouse, freeing up your serial port. And there are no batteries or power supplies. It also doubles as an MNP5 error-correcting data modem.

Wake up your Macintosh
On an incoming fax call, TelePort/FullFax powers up your Macintosh II family computer to receive a fax. And your icon flashes to inform you that a fax has been received. You can forward a fax to other destinations, and even have all incoming faxes automatically printed.

One line for voice and fax
TelePort/FullFax eliminates the hassle and expense of separate phone lines. A built-in phone/fax switch lets you share a single line for both voice and fax calls.

Sophisticated software that makes life simple
GlobalFax software lets you schedule a fax for an optimum time, reschedule or change a destination, and send to multiple or group destinations. Create custom cover sheets and let the Macintosh complete them for you each time you fax. You can even “envelope” documents from multiple applications and send them in one fax.

Welcome to the Global Village
We brought you TelePort, MacUser’s “Best Communications Product of the Year.” The tradition continues with TelePort/FullFax and GlobalFax software. For the name of your local TelePort dealer, call 1-800-736-4821 today, Pacific time.
Why you should try our fonts.

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Selection!
Because as PC Magazine 3/91 noted, "If there's a typeface you haven't been able to find, chances are you didn't look in the Image Club's Typofile Library—we have over 250 typefaces, and even more on the way. Whether you need fonts for your Macintosh™ or IBM® PC system or even on CD ROM, you're sure to find them at Image Club.

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*Regular font price is $95.00 per font. This offer expires June 30, 1991.

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The LetterPress is the entire Image Club Typefile Library, 655 fonts. And now, until May 31, 1991, you can purchase the LetterPress CD ROM System for only $999. That's $200 off the regular price. A more $3 per font! Order the LetterPress today and have a type store on your desktop tomorrow.

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The Grand Prize includes the incredible new TI microLaser™ Turbo. PLUS...

Grand Prize winner also gets a choice between the TI TravelMate™ 3000 WinSX™ or Apple Macintosh IIx PLUS...

Over $2,000 worth of publishing software: Adobe® Illustrator™, Corel Draw® and Aldus® PageMaker®.

Now between April 1, and June 30, 1992, when you see your TI dealer for a demo of the new microLaser Turbo or microLaser XL Turbo, you can register in the Get Turbo-Charged Value Sweepstakes. There's no purchase necessary.

The lucky Grand Prize winner drives off with a TI microLaser Turbo printer and a choice of the hottest computers on the market—the award-winning TI TravelMate 3000 WinSX or the Apple Macintosh IIx—plus three of the most popular desktop publishing software packages, Aldus PageMaker, Adobe Illustrator and Corel Draw.

Coming in second looks pretty hot, too. The Second Prize winner can choose between the TI TravelMate 3000 WinSX or the Apple Macintosh IIx.

After your test drive, if you buy a TI microLaser Turbo or microLaser XL Turbo loaded with PostScript® software from Adobe, you'll get a coupon for a free copy of Adobe Type Manager™ (ATM) software and Adobe Garamond® Font Package. That's a total retail value of $346—you pay just a $7.50 shipping and handling charge. Proving that you're always a winner when you chose TI.

Your dealer has all the details on the Get Turbo-Charged Value Sweepstakes. So, jump in today to see the best value in super-fast PostScript printing and fast through graphics software faster than other printers. And get your chance to win.

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The Grand Prize has an approximate retail value of $3,350. Second Prize has an approximate retail value of $4,000. Promotion will be supported by all participating dealers in the U.S. and Canada. Void in Quebec, Canadian residents must correctly answer a skill-testing question to win. In Ohio or Michigan, you may also call 1-800-527-3500 for an entry form. microLaser, TravelMate and WinSX are trademarks of Texas Instruments Incorporated. Apple Macintosh IIx is a registered trademark of Apple Computer, Inc. Adobe, PostScript and the PostScript logo are registered trademarks and Adobe Type Manager and Adobe Illustrator are trademarks of Adobe Systems Incorporated. Aldus and PageMaker are registered trademarks of Aldus Corporation. Corel Draw Is a property of Corel Systems Corporation.

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Circle 313 on reader service card
**Robot Reader**

TypeReader is a new omnifont optical character recognition package that publisher ExperVision claims is accurate enough for reading faxes, photocopies, and newspapers because it was developed to read 7000 kanji characters. The first version is for Latin-alphabet languages, with a kanji version to ship later.

TypeReader can scan, compress, and save a stack of pages and then perform recognition unattended or in the background (multiple documents are saved as separate files if a blank sheet is inserted between them during scanning). TypeReader recognizes tables as tables, not as columns, and saves them in tab-delimited format. TypeReader can differentiate between serif and sans serif fonts, and saves text in the correct size and style. It will list for $895. ExperVision, 408/428-9444.—D.L.

**Patching Genes**

Molecular biologists are piling up more and longer DNA sequences that create special database problems. A new Mac program called Sequencher looks like a convenient desktop solution to most of them.

One problem is linking the fragments of sequences found into genetically meaningful longer sequences. Sequencher can examine large sets of fragments to find overlapping regions, creating an on-screen genetic map of ways to stitch the fragments together to make a larger gene.

Sequencher also inspects sequences downloaded from GenBank and other large data-bases for contamination with the special small sequences that are used in the sequencing experiment. The program performs standard types of sequence manipulation with graphical views of gene maps and produces publication-ready output.

**Copyright Database**

How will copyright law apply when music, print, video, photos, and art are all mass-marketed in multimedia products? New York University’s Interactive Telecommunications Program (ITP) has established a Copyright Division, headed by writer and lawyer Donna Demac, to follow these issues as they evolve. One project will be Rightsbase, a multimedia database of information about U.S. copyright law, case studies, and current developments. Samples of creative work in question will be included to clarify the issues. The database will be accessible via modem, and callers will be able to share information. Professor Demac is at 212/998-1882.—ANN GARRISON

**Intelligent Vision**

If you need to find a needle in a haystack, the Adaptive Learning Image Analysis System (ALIAS — no relation to the 3-D vendor Alias Research) might be able to find it. ALIAS is a shell for developing image-analysis applications for such tasks as making change machines able to distinguish photocopied bills, analyzing print jobs as they come off a press to look for smeared ink, and detecting vehicles in aerial photos of a desert. Once you train a system, its database and knowledge can be moved to other devices.

**Technology Tepee**

Does TV compel us to shop? Are we trapped by technology beyond our control? Recent visitors to San Francisco’s Anon Salon discussed these questions on TPTV, a QuickTime video bulletin board set up inside a tepee. In TPTV’s main window they saw text and animations based on Jerry Mander’s new book, In the Absence of the Sacred, and a camera recorded their comments as QuickTime movies for later users. The bulletin board was created by multimedia artists and producers Abbe Don, Mark Petrakis, and Nick West, and interface designer Mitch Yawitz, a member of Apple’s QuickTime team. Nick West is at 415/775-7089.—ANN GARRISON
If there were a printer that could give you this kind of color, would you still make your presentations in black and white?

Do your business presentations go in one eye and out the other? The Colormate™ PS can easily and affordably give them the impact they deserve. Enhancing your work with truly amazing color, from brilliant primaries to soft pastels. All Pantone® approved.

The Colormate PS integrates readily with any network, PC or Mac. And it's compatible with most popular business presentation and graphics software. Of course, Adobe® PostScript® is standard. The Colormate PS comes in two models—the economical Model 40 with 4MB of memory and 17 resident fonts, and the fully featured Model 80 with 8MB of memory and 35 resident fonts. Both feature reliable 300 DPI thermal transfer technology.

For your free Color Presentations Guide and more information, call 1-800-NEC-INFO. Or call NEC FastFacts, 1-800-366-0476, document #26567, for info via fax.

After all, the world isn't black and white, why should your presentations be?
Office Talk
Cornice Software’s Officemaster adds a new twist to contact management and work planning. A user can link a contact history with a reminder to call someone, or link a scheduled meeting with notes on previous meetings. Using the program’s built-in messaging, someone in a networked group sharing an Officemaster system could send out a meeting reminder linked to a networked group sharing an Officemaster system could send out a meeting reminder linked to meetings on the same topic.

Officemaster lacks gateways to full-featured E-mail packages, which Cornice expects Apple’s Open Collaboration Environment to provide. Future plans also call for a project-management add-on, proxy support (that is, letting an assistant manage someone’s schedule), and remote-access capability. Officemaster lists for $179 for one user, $1299 for five, and $1799 for ten. Cornice Software, 714/985-8323.—D.L.

Cartridge Adds
PostScript Level 2

Hewlett-Packard has begun shipping the HP LaserJet PostScript Cartridge Plus, which adds Adobe PostScript Level 2 to HP’s popular LaserJet III, LaserJet IIIP, and LaserJet IID printers. The cartridge supports automatic language switching between PostScript and HP’s PCL 5, the widespread printer language for DOS machines. PostScript Level 2 also provides compression for faster data transmission, and other speed improvements.

The HP LaserJet PostScript Cartridge Plus has a suggested list price of $695. It requires at least 2MB of RAM in the printer. HP has also cut the price of its existing PostScript Level 1 cartridge from $695 to $495. Hewlett-Packard, 800/752-0900, 503/750-5856 for upgrades.—T.M.

BETA WAIT

Long-awaited products

Acius’s 4D Server

FoxPro/Mac
Discussed publicly winter 1990/91; Fox says will go to beta soon, no ship date projected.

Interleaf 5

Claris’s MacWrite Pro

AEC’s FilePower

Alysia’s SuperDisk 2.0

Atto Ships

SCSI-2 Board
Atto Technology is now offering the SiliconExpress II, a NuBus board that supports data transfers up to 10MB per second when used with SCSI-2 storage devices. Acting as a bus master, the SiliconExpress II gets around the NuBus/CPU bottleneck, freeing the CPU. The Silicon Express II also supports Block Transfer Mode on the Quadras for faster, burst data transmission. The board links to seven SCSI drives in addition to the Mac’s support for seven SCSI devices. More than one SiliconExpress II can be used to support many drives.

The SiliconExpress II has a list price of $1295. Atto, 716/688-4259.—T.M.
Microsoft Excel 4.0 – See

Microsoft Excel for the Macintosh just got even better. The new version 4.0 adds to this already incredible program by giving you more powerful features that make everyday spreadsheet tasks easier than ever. Even more important, Excel 4.0 offers a whole new wealth of built-in intelligence features. So Excel can actually anticipate the kind of information you’ll want, and then present it to you. And Excel 4.0 is designed to share information with other kinds of documents, and even across platforms. And that’s just for starters!

A whole new level of easy.

Believe it or not, you can actually create a spreadsheet in just about 60 seconds with Microsoft Excel 4.0. New intuitive features replace the long, steep learning curve with quick and powerful commands that have you up and running in a flash!

- Use Excel’s customizable Toolbar for one-step, on-screen access to the commands you most frequently use.
- Autosum lets you sum designated ranges or columns with a simple double-click.
- Autofill recognizes trends in your data, and extends them as far as you’d like.
- Shortcut menus pop up to give you instant access to common, context-sensitive commands.
- Best Fit automatically resizes columns to accommodate the widest entry.
- And the incredible new Wizards are always watching and waiting in the background, ready to guide you step-by-step through any complex task.

Powerful analytical tools put you in touch with your data.

Microsoft has added a host of new analysis tools to Excel 4.0, giving you entirely new ways to view and analyze your data.

- Use the Crosstabs feature to create crosstab tables based on database entries that you can sort by any criteria.
- Store related worksheets together in a single file with Workbooks.
- Consolidate data from multiple worksheets, regardless of formatting, file type, or file location.
- The Analysis ToolPak includes the most extensive set of financial, statistical, engineering, and scientific tools that you will find in any spreadsheet.
- Outlining lets you expand or collapse your worksheet to view the desired level of detail.
- Plus the extraordinary Scenario Manager, which lets you create and save multiple “what if” scenarios and create a summary of these scenarios in just minutes.

Improved graphics tools and presentation support

Excel 4.0 gives you even greater control over how your finished documents will look. It provides everything you need to create dazzling reports, complete with charts, graphs, and notes or annotations.

- Autoformat gives you one-step access to 16 professionally designed spreadsheet formats.
- Report Manager lets you merge different sections of different spreadsheets to produce customized reports that you design.
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Your choice of alignment options — left, right or centered — are only a mouse-click away.

Click on this icon and your selected data will be copied right to the Windows clipboard.

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Switch back and forth between spreadsheets with a simple mouse click here.

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Tracker the hours you spend on a project with WindoWatch. It's a must for professionals who bill their services by the hour (or minute). WindoWatch operates in the background, automatically gathering time sheets from team members across networks and export time-sheet information to a spreadsheet. Don't miss any opportunity to accurately bill your clients. After all, time is money. Publisher: ASD Software UT0264

**Norton Utilities for Macintosh 2.0**
- The Norton Utilities for Macintosh 2.0 combines and enhances the features from two award-winning products: SUM II and Norton Utilities. The combination of these two products results in the first Macintosh utility software package to offer fully integrated advanced disk repair & recovery, automatic backup, data security, productivity tools and system enhancements in one informative, easy-to-use product. This unbeatable combination allows you to protect valuable data and make day-to-day functions a breeze. Whether working on your Macintosh at home or while networked into a corporate-wide system if you own a hard drive, the Norton Utilities for Macintosh 2.0 is the product for you. Publisher: Symantec UT0151

**FileGuard 2.7**
- "It's sleek, fast, and safe - I highly recommend it." MacUser April 1991. Protect your hard drives and partitions from unauthorized access, copying and erasure, applications and file folders (including system folders) from unauthorized access, deletion, and/or illegal copying. DeskTop (including system folders) from alterations by unauthorized users. Keep an eye on System Users with the system log which continuously tracks user/group activity. System 7 compatible. Publisher: ASD Software

**Lotus 1-2-3 For Macintosh**
- At last, a 1-2-3 spreadsheet that is designed exclusively for the Macintosh computer. 1-2-3 for Macintosh takes full advantage of the rich graphical environment of Macintosh while delivering significant new spreadsheet features. And of course it's compatible with all new versions of 1-2-3 and Excel. A whole new kind of 1-2-3 created expressly for Macintosh. The result is a rich design that makes even the most complex spreadsheet tasks easy. 1-2-3 for Macintosh sets a new standard for what a Macintosh spreadsheet should be. System requirements: any Macintosh with a hard disk, 2MB RAM under System 6 or later, and 4 MB RAM under 7. Publisher: Lotus Development BU0188

**Software Bridge/Mac 2.0.1**
- Macintosh users translate between over 50 different Mac and PC word processing formats for over 800 possible translation paths. DOS to Mac translation is invisible; simply insert a DOS disk into a Mac SuperDrive, double-click on a DOS document, and Software Bridge automatically loads, identifies, translates and launches it into your Mac format, ready to edit. Uses the Document Manager for one-step Mac to DOS, Mac to Mac, and DOS to DOS translation. Also translates files located on external DOS disk drives or file servers. "It's strongest in the field of reliable DOS-to-Mac conversions of complex documents." (MacWeek 11/690). IncludesMount/C to access DOS disks from the Mac's SuperDrive as if they were Mac disks. Publisher: Argosy Software, Inc. COM0099

**WindoWatch 1.52**
- Track the hours you spend on a project with WindoWatch. It's a must for professionals who bill their services by the hour (or minute). WindoWatch operates in the background, automatically generating time sheets as you work. Use WindoWatch to keep track of time spent on projects and merge time sheets from team members over the network or export time sheet information to a spreadsheet. Don't miss any opportunity to accurately bill your clients. After all, time is money. Publisher: ASD Software UT0264

**Ray Dream Designer 2.0**
- You don't have to settle for flat illustrations and designs any longer. Ray Dream Designer's drawing and text tools, for creating lines, circles, ellipses, polygons, Bezier curves and subdangles, are virtually the same as those in most 2D illustration programs. The only difference is, now your objects have the realistic look of three dimensions. Wrap them around an object or twist for instant dimension. Comes with a library of pre-sold objects you can use inside or customize. Lighting, shadows, transparency, reflections and best of all, perspective are all handled automatically. Requires Mac II family with coprocessor, 12-bit QuickDraw, 4MB RAM and hard drive. Publisher: Ray Dream GRA0292
White Knight V.11

The perfect low-cost solution to almost any Mac telecommunication's needs. Offers the kind of power associated with products costing hundreds of dollars more, but is easier to learn and more flexible. 20+ page user manual is geared to all levels of experience. Winner of 11 awards including MacWorld's World Class Software Award 1987-1991. Publisher: FreeSoft

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FaxMania Business Fax Cover Sheets is an imaginative collection of 100 fax cover sheets designed for business, home, and fun. Send a Birthday fax and much more. The categories include: Meetings, Announcements, Ecology, International, Reminders, Sports, Travel and more. The fax cover sheets are provided in word processing formats. The formats for the Macintosh include: WriteNow, MacWrite, MacWrite and MS Word. They can be edited, sent electronically or printed and used as paper faxes. Publisher: P:\Maker GRM0317

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Create job-winning résumés quickly with Résumexpert. Ten conditions available by profession. Each condition features 10-25 professionally written and fully-formatted Microsoft Word résumé templates. Simple to use. Just select a template and substitute your personal information. MacUser 10/90 awarded. Résumexpert 4 mice and rated over its "excellent" manual and writing tips. Also rated a top 20 software program by MacUser 12/90, Requires MS Word, System 7 compatible. Publisher: A Living Impression

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CE SOFTWARE INC

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Publisher: Argosy Software, Inc. COMM998

Universal PowerCache

When you need the speed for speed, the award-winning PowerCache gives you the best combination of blazing-fast speeds (up to three times faster) and cost-effective price. More important, it's guaranteed 100% compatible with ALL your software and hardware, while running at full speed. The same board runs seven different Mac adapter required for non-100 installations. Manufacturer: DayStar Digital

Publisher: Argosy Software, Inc. COMM998

DiskFit Pro

For Finder-readable backup to floppy, cartridge or other hard disk, get DiskFit Pro. DiskFit Pro copies files from a hard disk to a "SmartSet" of floppy, and then updates the "SmartSet" with each subsequent backup. By replacing only the obsolete files in the backup set, DiskFit Pro keeps your SmartSet from growing every time you backup. Backups stay fast and backup size compact. And since files are stored in Finder format, a click and drag is all it takes to restore files directly from the backup. System 6 compatible. System 7 aware. Don't leave your data at risk, backup with DiskFit Pro.

Publisher: Dataz Development. UT0246

Tiles—the Intelligent Desktop

Nominated for Macuser's Editors Choice Award for Utility of the Year. Tiles puts everything you need at your fingertips! Whether you work with one file at a time or with several programs at once, you'll love Tiles. Set Tiles to create a single Tile for the project you're on. Later, when you need to get back to work, just click the Tile. Tiles automatically tracks and organizes what you need, from your favorite files and programs to entire projects. You can even use Tiles to launch QuickKeys with a single click! UT0215

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ExpertColor Paint

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- Use a Macintosh with non-Apple printers. Print Mac applications on HP Laserjet, Deskjet or compatible printers including all Series 5, 6s and the Deskjet 500. Print text and graphics at the printer's maximum resolution.
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**Active Memory 2.0**
- Turn your PowerBook into a power organizer with Active Memory! When traveling, manage info like sales leads, field results or travel expenses. Enter data your way in a free-form info field. Once back at headquarters, remind networked co-workers about upcoming deadlines. Import contact lists and sync reminders to call them. For daytimers, use Active Memory to print your things-to-do list or travel itinerary. Make it easier to manage your data in the office or on the road. Publisher: ASD Software

**Star Trek Sound Clips**
- Delivers your next presentation with these official digital Star Trek Sound Clips. Both volumes include sound effects, music cues, and dialog from Star Trek the Original Television Series. Now, you can easily slip in the transporter sound effect for a slide dissolve, or zap the Klingon competition with a phaser blast. They work with most desktop presentation and multimedia applications. The clips also work with SoundMastery (included) to replace those hoity-toity Mac System beeps with your favorite Star Trek sounds. Publisher: Sound Source

**BeagleWorks**
- With the introduction of BeagleWorks, the true meaning of integrated software has finally been defined. BeagleWorks includes seven modules so fully integrated you can easily access the Word Processor, Database, Spreadsheet, Chart, Paint, Draw and Communications modules from anywhere in the program. Exclusive to BeagleWorks is a revolutionary technology called Content Editing™. This gives you the ability to access or create an item from one file without having to know the module in which you are currently working. The word processor features irregular test wrap, multiple columns anywhere on the page. The spreadsheet boasts an automatic sort tool, as well as in-cell editing. And 256 custom colors are featured in all the modules except communications. Publisher: Beagle Brothers

**AutoDoubler**
- AutoDoubler is the easiest way to increase your hard disk capacity. It works in the background to automatically keep your hard disk compressed. It's lightning quick and completely transparent, so it won't interrupt your work. In fact, AutoDoubler's new patent-pending technology lets your Macintosh use files and applications while they are still compressed! It's fully compatible with almost all applications, disk accessories, and system extensions. Publisher: BMSoft

**Canvas 3**
- Canvas 3 is fast, powerful, easy to learn and provides all the tools you need to create and print professional quality color or monochrome graphics. Use in a wide range of design projects including desktop publishing, technical illustration, design graphics, architectural rendering, engineering drawings, presentations, multimedia and general business graphics. Canvas 3 offers unparalleled productivity. Create illustrations from scratch with our newThumbnail tool, or scan existing artwork and let Canvas auto trace it for you. System 7.5/7.6/7.6.1/7.5.2/7.5.2a. Publisher: General Softworks

**Accountant, Inc. 3.0**
- "BEST ACCOUNTING PACKAGE" 1991 MacUser's Editors' Choice Award. More features, more power, more flexibility. It's easy-to-use and gives you exceptional streamlined power. You only have to enter information once! Every transaction automatically posted to your General Ledger. Accountant, Inc.'s new revolutionary System 7 design gives you the advantages of customizing your forms, screens and reports by hot linking with your favorite form design, spreadsheet and database programs. You get Invoicing, Accounts Receivable, Inventory, Accounts payable, Check Writing, integrated General Ledger and Payroll. Accountant, Inc. is now available in single and multiuser versions. Publisher: Softbyte, Inc.

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**ULTRA 9600 Bundle**
- Hayes top performer... The Hayes ULTRA 96 comes with the award winning SmartCom II for the Macintosh software, RS-232 cables, and HayesConnect software. ULTRA 96 practically operates without you! Automatic Feature Negotiation creates the best combination of speed, error-control, and data compression whenever you use your ULTRA modem. It achieves 100% error-control using both the V.42 standard and MNP 2-5 protocols, and is 1 to 1 data compression for 8,400 bps throughputs with V.42bis. HayesConnect allows users to share modems or other serial devices such as plotters or printers across AppleTalk network. Manufacturer: Hayes M00065

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**DiskDoubler 3.7**
- DiskDoubler gives you total control of file compression--archiving for modern transfer, compressed backups, self-expanding files, and fast copying of files. AutoDoubler and DiskDoubler combined give you the ultimate in speed, convenience, and control. System 7 Savvy! Publisher: Softbyte, Inc.

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IT'S AN OLD STORY and a common one: your Mac doesn't seem to perform like it used to. Maybe you're using a new application whose operations take too long. Or maybe you have added a 24-bit display board or a large-screen monitor. Perhaps you have switched to System 7 and are using all the Finder options. Or you may want to take advantage of such System 7 functions as 32-bit addressing and virtual memory, but your Mac's logic board isn't designed to do so.

Any or all of these may lead you to consider trading in your current Mac for a faster one. One of the best and most popular ways to get a faster Mac without buying a new machine is to buy an accelerator board, a board that replaces your machine's processor and memory with faster versions.

Macworld Lab tested 28 accelerators for a range of Macs, from the Classic to the Quadra 700. (Accelerators that shipped after our testing deadline are listed in "Accelerator Details.") We did not test accelerators for the Mac Plus or earlier machines because it is more cost-effective to simply replace them with a faster Mac. You also get better components with a new Mac. But we found it makes sense for owners of most of the newer Macs to buy an accelerator board instead of a new machine or an Apple upgrade.

Most accelerators use either the Motorola 68030 processor found in the Mac IIx, IIcx, IIci, IIci, or the 68040 found in the Quadras. We did not test accelerators that are based on the 68000 processor used in earlier Macs. The 68000 doesn't support some of System 7's functions, and vendors are phasing out boards based on this processor. (We did test the 68000-based Harris Laboratories Classic Performer to show the kind of speedup such boards can provide to users who aren't interested in System 7 features.)

Whether to get a 68030-based or 68040-based accelerator is the toughest decision for most Mac owners. The 030 and 040 accelerators use different technologies to implement their functions. These differences may seem arcane at first, but they can actually be crucial for some applications.

68030 Technology
OWNERS OF A 68000-BASED SYSTEM WILL SEE MORE ADVANTAGES than just speedup by getting a 68030-based accelerator, since the 68030 processor has many more built-in capabilities than does a 68000. But owners of 68030-based Macs, too, should consider getting a 68030-based accelerator board with a faster processor.

Not all 68030 processors are the same. Some 68030-based accelerators (such as one version of the Mobius Technologies' One Page 030 Display) use Motorola's 68EC030 chip, which does not include a Paged Memory Management Unit (PMMU), a component required to run System 7's virtual memory. Vendors use the 68EC030 because it costs less than the full 68030, resulting in less expensive accelerators for consumers. Those who don't work with large files or lots of applications simultaneously may not need virtual memory.

Even if they use the full 030 processor, many accelerators do not support System 7's virtual memory, and require Connectix Corporation's Compact Virtual 3.0 to implement this feature. (This product does not work with modular Macs like the II and IIci.) Com-
Companies whose boards do support Apple System 7's virtual memory include DayStar Digital, Newer Technology, and Sigma Designs.

Owners of 68000-based Macs like the Classic and SE should note that Apple does not certify System 7's virtual memory to work with 68030-based accelerators installed in these older Macs, which were not designed for such memory. However, Compact Virtual 3.0 does work in many such environments. Several accelerator vendors bundle it with their accelerators (see "Accelerator Details").

The 68000 also does not support a floating-point unit (FPU) math processor; the 68030 supports the 68881 FPU, an improved and faster version of the 68881 used with the 68020. An FPU can dramatically speed up certain applications—such as spreadsheets, ray tracing, and rendering programs—that take advantage of an FPU's specialized calculation abilities. Accelerators using 68030 chips usually include a socket for an FPU. The FPU can operate at a different speed than the processor can, since each chip's speed is controlled independently. If you frequently use an application that uses floating-point math, you can improve that application's performance by getting an accelerator with a moderate processor speed, say 25MHz, and a fast FPU speed, say 33MHz—at a lower cost than buying a board with both the processor and FPU clocked at the higher speed, 33MHz. Companies that let you select the FPU speed include Mobius Technologies, MacProducts USA, and Novy Systems.

68040 Technology
THE 68040 PROCESSOR IS THE LATEST version of the 68000 family. It essentially combines the 68030 processor and 68882 FPU, adds larger instruction and data caches (which store frequently used commands and data to speed processing), and improves speeds processing by improving the pipeline (how tasks are divided internally in the chip). These changes improve performance, but they also reveal compatibility problems with some software (see Lab Notes, this issue, and "The Quadra Quandary," Macworld, March 1992). When the 040 was introduced, for example, popular programs like Microsoft Excel and Aldus PageMaker were incompatible with it; software fixes to make them compatible are now available.

The data caches on the 68040 use a new mode of operation called copy back. On the 68030, commonly used data and instructions are stored in main memory and are always available. The copy-back mode of the 68040's data caches writes such instructions to main memory only when requested, saving time by not having the CPU write every instruction to memory. But not all applications handle this mode correctly, resulting in errors.

Accelerators that use the 68040 include software to turn off the copy-back mode so the 68040 will work with all applications. But this fix has a price: turning off the 68040's copy-back mode can slow the 040 down significantly. Macworld Lab tests show that having copy-back mode turned on can increase application speed by 200 to 450 percent, with math-oriented applications benefiting the most.

Some boards come with software to detect 040-incompatible programs and automatically switch to running with the 040's caches turned off, but this software does not reenable the 040's caches unless you quit the 040-incompatible application. This means that if you are running more than one application, the caches remain off even when you switch to 040-compatible applications. However, an INIT called Compatibility from Alysis Corporation corrects this problem.

The 68040 has a built-in FPU, so you do not need to buy one separately. The built-in FPU is faster than the 68882 that works with the 030 processor. But to fit the FPU onto the 68040, Motorola removed some functions such as sine, cosine, and tangent (now supported via software). This means that the maximum FPU performance gains will be seen only when vendors start to develop 68040-specific applications, most likely in the areas of CAD/CAM and rendering.

The 68040's PMMU is less flexible than the 68030's, making it more sensitive to how software manages memory. Although this should not affect applications, it requires vendors to rewrite their virtual memory applications. Apple does not guarantee that System 7's virtual memory will work with third-party accelerators. Unless you can purchase a compatible third-party virtual memory solution, you may be stuck doing without.

At press time, no such product was available for 040-based accelerators running under System 7, though the new Virtual 3.0 being developed by Connectix may solve the problem when released.

Some older display boards—including Apple's Mac II Video Card and early versions of its Macintosh Display Card 4•8 and 8•24—do not work on machines using the 68040 and require a change in the boards' ROM chips.

As with the 68030, there are lower-cost versions of the 68040: the 68LC040 and the 68ELC040. The 68LC040 has its FPU portion disabled, the 68ELC040 has both its FPU and PMMU portions disabled. Using these processors means vendors can offer lower prices, and the loss of the FPU makes sense for many users, since most applications do not use the FPU. The Radius Rocket 251 uses the 68LC040 with the FPU disabled. Likewise, the loss of the PMMU makes sense for many users who don't use virtual memory capabilities.

Until recently the 68040 was available only as a 25MHz chip, but 33MHz versions are now available in small quantities. Some accelerator manufacturers have been waiting for the 33MHz version before introducing a 68040-based accelerator board. Our tests show that this has been a wise move, since the fastest 68030 accelerators (which run at 30MHz) performed as well as the 68040 accelerators (which run at 25MHz), and they often cost $100 to $150 less. Impulse Technology and Radius have begun shipping 33MHz 040-based accelerators and Fusion Data Systems has announced one.

Memory Considerations
MACS BASED ON THE 68000 CAN USE only 4MB of system memory because 68000-based Macs can't take advantage of the 32-bit address mode in System 7. With 32-bit addressing, Macs based on the 68020, 030, and 040 processors can address up to 128MB of memory (the Illsi is limited to 65MB, while the Quadra 900 can address 256MB).

For most Macs, the faster speeds of accelerators require faster RAM. The ac-
Accelerator Performance

Times are in seconds. Shorter bars are better.

**Top five performers**

- **Radius Rocket (II)**
- **Newer Technology fx/Overdrive**
- **Fusion Data Systems TokaMac CI 25**
- **Impulse Performance/040 (II)**
- **Macintosh IIc**

Products are listed in order of fastest to slowest overall performance, based on results from 36 tests that measure all aspects of performance. Times are reported in total seconds for each set of tests. Several boards are relabeled versions of another company's board, and results were identical. Results for the MacProducts USA RailGun boards are the same as for the Novy Systems Quick30, and the results for the Total Systems Magellan boards are the same as for the Fusion Data Systems TokaMacs. Boards appear twice if speeds on different Macs vary by more than 5 percent.

**Top Five Performers by User Specialty**

**Times are in seconds. Shorter bars are better.**

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**Infini-D render, for CAD/CAM users**

- **Radius Rocket (II)**
- **Newer Technology fx/Overdrive**
- **Fusion Data Systems TokaMac CI 25**
- **Impulse Performance/040 (II)**
- **Macintosh Quadra 900**

**4-D sort, for large database users**

- **Radius Rocket (II)**
- **Newer Technology fx/Overdrive**
- **Fusion Data Systems TokaMac CI 25**
- **Impulse Performance/040 (II)**
- **Macintosh IIc**

**Think C compilation, for developers and programmers**

- **Radius Rocket (II)**
- **Newer Technology fx/Overdrive**
- **Fusion Data Systems TokaMac CI 25**
- **Impulse Performance/040 (II)**
- **Macintosh IIc**

**Photoshop resample, for image editors and publishers**

- **Radius Rocket (II)**
- **Newer Technology fx/Overdrive**
- **Fusion Data Systems TokaMac CI 25**
- **Impulse Performance/040 (II)**
- **Macintosh IIc**
If you use slow RAM, the accelerator must use "wait states", which are pauses inserted in the processor's requests for data from the memory chips, to let the memory catch up to the processor. Macworld Lab tests show that each extra wait state can degrade an accelerator's performance by about 12 percent.

Boards for 68000-based Macs usually have slots for their own RAM, which they use instead of system RAM. In many cases, you can move the RAM already installed on your Mac to the accelerator's slots, but that RAM may not be fast enough to avoid extra wait states.

Some companies provide software that lets you leave the slower RAM on the logic board and use it as a RAM disk or RAM cache. (You'll still need to have RAM on the accelerator board to do this.)

The Dove Computer Marathon Racer 030 Classic and the Harris Laboratories Classic Performer support only static cache RAM, which acts as an intermediary between the memory chips and the processor. This limits your ability to expand total system RAM to what your logic board can handle.

Some accelerators, such as the Mobius, MacProducts, and Novy boards, provide the option of copying the contents of a Mac's ROM chips into the RAM on the accelerator board. This improves performance, since the processor can access the contents of RAM faster than it can the contents of ROM. Because they use only static cache RAM, the Marathon Racer 030 Classic and the Classic Performer don't give you this option.

Connection Issues

IN CREATING AN ACCELERATOR BOARD, designers start with a 68030 or 68040 chip and then must weigh a variety of other elements to create a fast, functional, and affordable device.
The first consideration is where and how the accelerator attaches to its host. Some products, such as the Marathon Racer 030 Classic and the Classic Performer, either replace or sit piggy-backed on the original processor. Some accelerators clip to an existing chip—the only option for a Classic accelerator. Occasionally these clips come loose if the computer is moved, but they have the advantage of not requiring modifications to the logic board's components.

Another type of accelerator board replaces an existing processor by plugging into the processor's socket, but not all Macs have such a socket. To use such a board on a Mac with no processor socket—like most IIcx's—you need to have a socket added to the computer's logic board. To use a DayStar's Power-Cache accelerator in a IIfx requires this modification (DayStar will modify your logic board at no additional cost).

Most accelerators are NuBus or Processor Direct Slot (PDS) boards, which can easily be installed in an empty slot. The PDS is the only slot on the SE, SE/30, IIsi, LC, and LC II. The IIfx and Quadras have NuBus slots and PDS's.

An accelerator installed in a PDS can give greater performance than an accelerator in a NuBus slot. The PDS connects directly to the processor, so instructions and data move between the accelerator board and the processor with no delay. NuBus slots do not connect directly to the processor; instead, the logic board refers traffic between the processor and all the NuBus slots, a process that can delay communication between the accelerator and the processor if several NuBus boards are vying for the processor's attention. Because almost every Mac has a different PDS design, accelerator makers produce only one kind of board with adapters for each type of PDS.

Accelerators based on the 68040 chip may include their own PDS or custom expansion slot—this slot connects to the accelerator's processor, not the processor on the Mac's logic board. Examples include the Radius Rocket, Impulse Technology Performance/040, and Applied Engineering TransWarp (arelabeled version of the Impulse accelerator). These slots often provide direct access to the 68040 chip and can themselves support a display accelerator, high-speed SCSI board, or other expansion device. This is especially useful on one-slot Macs like the IIsi. But beware: because there is no standard for the design of these slots, you will probably have to get any such expansion devices directly from the manufacturer of your accelerator. (Some manufacturers of 030-based accelerators, including DayStar Digital and Sigma Designs, provide a PDS adapter that provides two PDS connections for the IIsi. The accelerator occupies one, leaving the other available for other boards.)

The Apple Upgrade Option

Rather than buy an accelerator, you might consider a logic board upgrade from Apple. Upgrades are available for the SE (to an SE/30), the Mac II and IIfx (to a IIfx), the IIfx (to a IIfx), the Classic (to a Classic II), the IIfx and IIfx (to a Quadra 700), and soon the LC (to an LC II). A logic board upgrade gives you genuine Apple parts, with potentially fewer compatibility problems down the road. You might also find it easier to sell your system later, as not everyone is comfortable with modified systems.

In some cases, you gain new features beyond the speed increase. For example, with an upgrade from an SE to an SE/30, you get a new ROM that supports color; and with an upgrade from a IIfx to a IIfx, you get a faster SCSI bus.

Upgrading a Mac II or IIfx makes some sense. The performance increase is significant; you get hardware that a future version of the system software might take advantage of (for example, you would get the most recent SCSI chip, one that the forthcoming SCSI Manager will use to improve hard drive performance); and you can add an accelerator to your new IIfx later if you need more speed.

In some cases it may be cheaper to purchase a new Mac (remember, your old machine still has some resale value). Potential hidden costs to a logic board upgrade include buying additional or different-speed RAM, adding a SuperDrive, adding a better power supply, and paying a dealer to install the upgrade.

In all other cases, unless you've got a special consideration such as a PDS al-
THE NEED FOR SPEED

For the Classic

Gemini Classic The 50MHz version of the Gemini board was the fastest, offering better performance than a IIfx. Company: Total Systems. List price: $997.


For the SE

Gemini Ultra 50 Although edged out by the TransWarp SE board in our speed tests, the 50MHz Gemini Ultra 50's lower price makes it a better buy. Company: Total Systems. List price: $997.

PowerCache 40MHz This board brings performance up to Mac Iici levels. Company: Radius. List price: $1299.

PowerCache 50MHz These two boards tied in performance and are close in price. Company: Magellan, Total Systems; PowerCache, DayStar Digital. List price: Magellan $2097; PowerCache $2299.

For the IIfx

PowerCache 50MHz Although edged out in speed by the TokaMac CI 25, the PowerCache offers a better price. Company: DayStar Digital. List price: $2299.

Performance: Compact Macs

THE NEED FOR SPEED

also remarkably improve hard drive and display performance—in fact, the fastest accelerated SE outperformed a stock IIfx and in many tests either outperformed or kept up with a stock IIfx, as "Accelerator Performance" shows.

The fastest SE board was the Applied Engineering TransWarp SE 40MHz. The Total Systems Gemini Ultra 50 was a close second, but it had some problems with Microsoft Excel that the TransWarp SE board did not. Excel was a problem for several 030-based boards, but each manufacturer was developing patches during our testing period; all should have them available by the time you read this. Impulse Technology recently announced a Classic accelerator.

Several of the accelerators look very similar, and in fact are the same. The Mobius and MacProducts boards are built by Novy Systems. These related boards match the performance of the original manufacturers' versions, and they all offer the same options and software as the originals do. The only differences are the names on the packaging and the prices.

While you can speed up an SE by upgrading it to an SE/30, we recommend buying an accelerator board instead, since that will give you better performance.

Likewise, it makes more sense to accelerate a Classic than to upgrade to a Classic II. All the Classic accelerators we tested were faster than a Classic II—with the notable exception of the 68000-based Harris Laboratories Classic Performer, which we included to show differences between the older, 68000-based accelerators and the new crop of 68030-based boards. The fastest accelerator was the 50MHz Total Systems Gemini Classic, which ran faster than a stock IIfx. Dove Computer has recently begun shipping accelerators for the Classic and Impulse Technology has announced such accelerators.

For SE/30 acceleration, DayStar's PowerCache, which plugs into the PDS slot, was a runaway winner in speed. The combination of a static RAM cache and a high-speed processor--FPU pair ensured performance gains on all tests. Not surprisingly, considering their design, DayStar's products did well on other Mac systems also.

Performance: Modular Macs

ONLY TWO ACCELERATORS SPECIFICALLY designed for the LC were available for testing, and one (the Total Systems Magellan 040 LC) was simply a relabeled version of the other (the Fusion Data Systems TokaMac LC 25). Because they are the same product, these 040-based 25MHz boards performed the same. DayStar's 030-based PowerCache accelerators will also work with LCs, and Applied Engineering recently began shipping an 030-based LC accelerator, and Impulse Technology, which makes Applied Engineering's board, plans to ship its own version.

On modular Macs with NuBus slots (like the II, IIfx, and IIsi), the 50MHz, 68030-based DayStar PowerCache boards and the 25MHz, 68040-based Radius Rocke traded off the lead on tests. The PowerCache performed better on disk-based tests, and the Rocket excelled on processor-based tests. The PowerCache's advantage in disk-based tests is mainly due to its large on-board static RAM cache. Fusion Data Systems' TokaMac 25 series and Total Systems' Magellan 040 series (which is a relabeled version of the TokaMac 25 series) closely trailed the PowerCache and Rocket. For IIfx owners, Applied Engineering has announced a 50MHz, 68030-based accelerator.

For the SE/30 acceleration, DayStar's PowerCache performs better, and the PowerCache's advantage in disk-based tests is mainly due to its large on-board static RAM cache. Fusion Data Systems' TokaMac 25 series and Total Systems' Magellan 040 series (which is a relabeled version of the TokaMac 25 series) closely trailed the PowerCache and Rocket. For IIfx owners, Applied Engineering has announced a 50MHz, 68030-based accelerator.

The IIfx used to be the fastest Mac available. Then the Quadras came along. But with Newer Technology's 50MHz fx/Overdrive accelerator installed, an IIfx ran generally faster than a Quadra 900. Newer recently began shipping the fx/Overdrive-II, an upgrade that runs the IIfx's own processor faster rather than requiring it to be replaced. The fx/Overdrive-II costs only $850, compared with the original version's $1995. Newer has also announced the Quadra Overdrive, which runs the normally 25MHz Quadras at 33MHz.

Installation Notes

MACWORLD LAB FOUND THE BOARDS easy to install, with two exceptions.

First, the NewLife Accelerator SE did not fit in an older SE (Apple changed the SE's case a few years ago to give it more room, and NewLife apparently did not design its board with the previous cases in mind; NewLife says upcoming versions of its boards will correct the problem).

Second, installing Newer Technology's fx/Overdrive (but not the fx/Overdrive-II) requires removing the IIfx's processor and FPU chips. Although Newer supplies a chip puller, you run the risk of damaging these chips, making them unusable if you need to reinstall them later.

In both cases, let an experienced dealer install the boards.

Making a Choice

WHILE PERFORMANCE AND PRICE COMBINE to command the most attention in evaluating accelerators, there are other areas to consider: ease of installation, warranty, compatibility, cost of peripherals, bundled software, and expected longevity of the technology used. All the accelerator ven-
dors offer tech support via bulletin boards or online services except for Dove, Neve, and NewLife.

Owners of Mac II–series computers will no doubt be eyeing the 040-based accelerators, since they use the newest technology. Although an 040 may have more cachet, Macworld Lab tests show that a 50MHz 030-based accelerator is generally as fast as an 040-based accelerator. For some users, an 030-based board is a better option because of incompatibilities some applications have with 040-based Macs (see Lab Notes, this issue).

Price is another issue: the highest cost of an 040 accelerator coupled with the cost of upgrading to 040-compatible versions of your software may be too high. But the 030-based accelerators will not be able to keep up with newly released 33MHz 040s. And incompatibility problems should disappear as vendors upgrade their software.

However, compatibility questions should not be ignored. Not all vendors rigorously test a wide range of applications to ensure that their accelerators—whether based on an 030 or 040—are compatible with them. During our testing period, several vendors shipped us software upgrades to fix incompatibilities they had not detected before shipping their product. That means some dealers may sell a version of the board with the earlier software, which will require the user to encounter the bug, call technical support, and find out about the needed software upgrade. The company with the most incompatibilities was Impulse Technology, which shipped us three upgrades in a two-week period to fix incompatibilities with programs like MacDraw Pro. Impulse's accelerator also had several problems with ACIUS's 4th Dimension caused by the 68040's new cache modes. However, other 040-based accelerators did not have these problems or their makers had already detected and fixed them.

Before spending a couple thousand dollars on an accelerator, consider how much improvement you need. Adding a cache card instead of an accelerator to a IIci or IIsi can improve the speed of some applications (like Excel) by 25 percent, according to Macworld Lab tests; general improvement ranges from 15 to 30 percent. Cache card prices start around $125.

A cache card works like a RAM cache, except that it is faster because the cache card uses static RAM chips. The static RAM is fast enough to keep up with the processor, eliminating the wait states that are normally inserted to keep the processor and memory in sync. Cache cards come in different memory sizes, but you'll see about the same performance gain no matter what the size, since you quickly reach a point of diminishing returns.

Adding an FPU makes a big difference in the performance of applications that use floating-point arithmetic (as do some spreadsheet calculations, some ray-tracing and rendering tasks, and most CAD/CAM programs). For more standard math-oriented applications like simple spreadsheets, a SANE (Standard Apple Numerics Environment) trap is more effective. A SANE trap intercepts common mathematical calculations—from simple addition to complex trigonometric and logarithmic functions—built into the Apple ROM and substitutes less-precise but faster calculations. (In almost all cases, the very small changes in accuracy will go unnoticed.) Apple has included its own SANE traps, called Omega SANE, in System 7.0.1. But neither an FPU nor a SANE trap will speed all your operations. If you find all your applications are sluggish, you'll want a more comprehensive solution like getting an accelerator or a faster Mac.

The final thing to consider when deciding how to speed your Mac is whether you are making a long-term investment or just trying to get your current machine through one more year. Remember, next year a new crop of accelerators (and Macs) will hit the street.

See Where to Buy under "Accelerators" for contact information.

MATTHEW LEEDS works for a major software developer as its technical services manager.

Macworld Lab testing supervised by MARK HURLOW, with assistance from JIM FEELEY.

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Of the many innovations popularized by the Macintosh, none has become more intimately associated with the Mac than the mouse. Though mice had been invented nearly 20 years earlier, the Mac brought the mouse into mainstream computing for the first time. As Macworld's January 1984 premier issue noted, "The mouse may not be the ultimate device for interfacing with computers, but for the time being it's the best system yet devised for making computers more compatible with the people who use them."

Now, more than 8 years, 20 Macintosh models, and numerous system software revisions later, Macintosh users face a bewildering spectrum of pointing-device choices. Despite the wide range of options, most users settle for the Apple mouse that comes with the Mac. Are users shortchanging themselves by not considering other pointing devices? To answer that question, I spent several months living and working with more than 25 products from Apple and third-party vendors. The results may surprise you.

Sorting through Claims
Standing out in a crowded marketplace is never easy, so vendors make a variety of claims to convince users that a particular mouse, trackball, or other pointing device is better than the rest of the input-device pack.

For example, manufacturers often claim that their product is more comfortable to hold and manipulate. While differences among input devices have historically tended to be cosmetic, there is growing evidence suggesting that properly designed products are truly easier and safer to use.

Mechanical input devices like keyboards, mice, and trackballs force users to make repetitive, small movements that can take their toll over time and cause repetitive strain injuries (RSIs). Also known as cumulative trauma disorders, RSIs are exacerbated by unnatural applications of force and awkward body positions. Lack of rest or recovery time is another important contributing factor. But while concerns over RSIs are increasing, the scientific literature is far from unanimous on the subject of RSIs. Some medical experts contend that there is little evidence to support the relationship between chronic motion and injury.

Still, responding to the desire for devices that minimize the risk of RSI, input-device manufacturers say they are beginning to apply the science of ergonomics, the discipline devoted to the study of people interacting with their working environment. Altruistic motivations aside, vendors have discovered that claims of ergonomic design make good ad copy. Also, the trend toward legislative regulation of computers in the workplace at the federal, state, and municipal levels has spurred research in the relationship between input devices and RSIs.

Of the many factors contributing to RSIs, a product's design is most directly related to muscle tension. Minimizing muscle tension goes a long way toward making an input device less tiring to use. Ideally, the device should fit the cupped fingers should exert minimal tension when holding mouse or pushing buttons.
shape of the user's hand, not the other way around. The forearm, wrist, and hand shouldn't be forced into awkward positions, and the fingers should rest comfortably and naturally on the buttons.

In trackball design, the thumb's role is an especially important consideration. Most trackballs are designed to be controlled by the index finger, but some rely on the thumb. While the thumb is well suited for side-to-side grasping actions, some experts maintain that the thumb's limited freedom of movement makes it a poor choice for controlling up-and-down or circular motions. Button-pressing is a good compromise movement, provided that the thumb isn't overly stressed.

Although some companies maintain that their input devices have a better ergonomic design and are easier to use, those I contacted declined to discuss the results of the research underlying their claims, citing the competitive pressures of a crowded marketplace.

And even with technical resources like Apple's, there is no guarantee of ergonomic success. For example, just a few weeks with a PowerBook made me thankful for the built-in ADB port that let me use a mouse or pen instead of the built-in trackball. Despite Apple's claims that the PowerBooks are ergonomically designed, some users have sharply criticized the units' trackball, especially the location of the buttons and the central position of the ball. (This layout does have its fans.)

Another thorny issue is resolution, loosely defined as the precision with which the input device controls the cursor's motion. Rolling devices like mice and trackballs work by generating mechanical pulses, or counts, as they move. The Macintosh uses a device's software driver to translate counts into cursor motion. The more counts generated per inch of mouse movement or trackball rotation, the higher the resolution. While low resolution can lead to erratic cursor placement, increasing resolution can eventually exceed your ability to position your arm...
Trackballs are widely used as input devices. As these four devices show, the shape is even more important than internal construction. The boxy contour of the original Macintosh mouse made it tiring to hold for extended periods. By the time the Apple Desktop Bus Mouse debuted in 1987, Apple had improved its earlier design by giving the case a tapered profile front and back, making the mouse more comfortable to grasp. Logitech's MouseMan for the Macintosh, released in late 1990, took another step forward by sloping the mouse to one side to accommodate the palms of right-handed users. Most of the testers appreciated the contoured design.

Unfortunately, a contoured mouse for right-handed users leaves left-handed users—who make up about 8 percent of the general population and between 10 and 15 percent of computer users—out in the cold. Logitech may offer a contoured version for them in the future, as it does now in its version for DOS PCs.

Of all the features that distinguish Apple's mice from its competitors, none has been so sacrosanct as its single button, an approach long used as an argument in favor of the Mac's ease of use. But times are changing, and three of the seven mice I tested sport multiple buttons. In most cases, button operation can be configured via a control panel—for example, you can define any button to click-lock, eliminating the strain of holding it down for extended dragging operations; or to double-click, minimizing the rapid finger action users have to repeat so often. Some mice go even further by letting you assign keystrokes to buttons.

Unfortunately, of the multiple-button mice I tested, only the Advanced Gravis SuperMouse makes it easy to distinguish among the buttons by touch so that you’re less likely to push the wrong button acci-
Trackballs: Squeezing into Tight Spaces

DESPITE THE OBVIOUS, IF superficial similarity to upside-down mice, trackballs trace their lineage to the 1950s. Because they were sturdy and could be built into existing consoles, trackballs were often used in military hardware. Trackballs were later adapted for use in video games and computers.

Trackballs' limited clearance requirements make them ideal for setups where space is at a premium. Apple recognized this advantage and built trackballs into the Macintosh Portable and PowerBook computers. But Apple has never offered a stand-alone trackball, claiming that the market is sufficiently saturated by third-party products.

When buying a computer, most users give no more thought to the keyboard than to the pointing device, even though the keyboard is the part they have the most contact with. But a good keyboard can add comfort and efficiency to a well-thought-out work space.

Ideally, the fingers should rest on the keys with arms parallel to the ground; the wrists should be relaxed, not flexed.

Things have come a long way since the days of Apple's original keyboard. Alternatives offer innovation with an eye toward user comfort. Available for most Mac models—the 128K, 512K, Plus, SE, SE/30, and Mac II family—many feature adjustable keyboard tilt angles to give fingers a boost reaching the third row of keys or the function keys, use dual-tone key shading to break up the virtual monotony, and sport dual-legend function keys for split Mac-DOS PC use. Here's a sampler.

- **MacPro Plus,** $179, Key Tronic. Similar to the Mac-101E, the MacPro Plus has switchable control and caps-lock keys and a lock for the period and comma keys, and is backed by a three-year warranty. With a $15 kit, you can customize key resistance and tension so the keys will respond exactly as you like them to. Buyers can get the Tempo II macro software and an RJ-11 cable (for use with the Mac 128K, 512K, and Plus models) at no cost. Although its click is less audible than the Mac-101E's, the MacPro Plus's customizable tactileness makes it a top pick. (See Reviews, Macworld, September 1991.)
- **TrakPro,** $249, Key Tronic. Essentially like the MacPro Plus with a built-in trackball and a System 7-compatible control panel device to assign keyboard commands to the trackball, the TrakPro needs Key Tronic's $19.95 cable kit to work on Mac 128K, 512K, or Plus. Covered by a lifetime warranty. Our test units froze on several Macs under System 7. We did get them to work under System 6.0.7, but performance was inconsistent. When used on an SE, the TrakPro had fairly smooth trackball action, but on an SE/30, cursor movement became hopelessly erratic. Key Tronic said it is working on resolving quality problems with the trackball module's manufacturer.
- **Switchboard,** $239.95, Prometheus Products. Designed for the multiplatform office, Switchboard also works with IBM PS/2 and standard DOS PCs via DIP-switch settings; all necessary cabling is included. It has separate modules for the text, numeric, and cursor keys so you can rearrange them to suit handiness and other layout preferences. An optional trackball ($149) and vertical function keypads ($49) are also available. The Switchboard comes with a three-year warranty. (See Reviews, February 1991.)
- **Apple Keyboard II,** $129. The standard keyboard for use with the Mac 128K, 512K, and Plus has an nonadjustable keyboard lift, monochrome coloring, no function keys, no cursor or numeric keypads, and with its Mac-only key labeling, no recognition that anyone might use a non-Mac PC. It comes with a one-year warranty.
- **Apple Extended Keyboard II,** $229. This extended keyboard for Macs with ADB ports has the same monochrome coloring and permanent tilt as the regular Apple keyboard, but it adds function keys and numeric and cursor keypads. It has a one-year warranty.

Several alternatives to the standard typewriter keyboard have been designed, and their designers say they are working on Mac versions. They include:

- **Tony, Tony Hodies.** Use it like a standard keyboard or crack it in half and rotate it like a drawbridge (see Conspicuous Consumer, Macworld, August 1991).**
- **Datahand, Industrial Innovations.** A unique marriage of familiar typewriter key layout with radical, split keyboard hand rests. Instead of keystrokes, you move your fingers left, right, down, curled in, and flexed out—or sort of like typing in shorthand. This approach is meant to increase speed and accuracy of data entry while decreasing the risk of repetitive-motion stress to the hands and fingers (see Conspicuous Consumer, August 1991).
- **The Bat, Inif ogrif.** Another two-fisted data entry product, The Bat relies on chording (pressing several keys at once) to input data, much like a court reporter's machine. Inifogrif touts The Bat's enhanced speed, reduced repetitive strain, and easy input for disabled users.—SUZANNE COURTEAU

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**Input on Keyboards**

When buying a computer, most users give no more thought to the keyboard than to the pointing device, even though the keyboard is the part they have the most contact with. But a good keyboard can add comfort and efficiency to a well-thought-out work space. Ideally, the fingers should rest on the keys with arms parallel to the ground; the wrists should be relaxed, not flexed.

Things have come a long way since the days of Apple's original keyboard. Alternatives offer innovation with an eye toward user comfort. Available for most Mac models—the 128K, 512K, Plus, SE, SE/30, and Mac II family—many feature adjustable keyboard tilt angles to give fingers a boost reaching the third row of keys or the function keys, use dual-tone key shading to break up the virtual monotony, and sport dual-legend function keys for split Mac-DOS PC use. Here's a sampler.

- **MacPro Plus,** $179, Key Tronic. Similar to the Mac-101E, the MacPro Plus has switchable control and caps-lock keys and a lock for the period and comma keys, and is backed by a three-year warranty. With a $15 kit, you can customize key resistance and tension so the keys will respond exactly as you like them to. Buyers can get the Tempo II macro software and an RJ-11 cable (for use with the Mac 128K, 512K, and Plus models) at no cost. Although its click is less audible than the Mac-101E's, the MacPro Plus's customizable tactileness makes it a top pick. (See Reviews, Macworld, September 1991.)
- **TrakPro,** $249, Key Tronic. Essentially like the MacPro Plus with a built-in trackball and a System 7-compatible control panel device to assign keyboard commands to the trackball, the TrakPro needs Key Tronic's $19.95 cable kit to work on Mac 128K, 512K, or Plus. Covered by a lifetime warranty. Our test units froze on several Macs under System 7. We did get them to work under System 6.0.7, but performance was inconsistent. When used on an SE, the TrakPro had fairly smooth trackball action, but on an SE/30, cursor movement became hopelessly erratic. Key Tronic said it is working on resolving quality problems with the trackball module's manufacturer.
- **Switchboard,** $239.95, Prometheus Products. Designed for the multiplatform office, Switchboard also works with IBM PS/2 and standard DOS PCs via DIP-switch settings; all necessary cabling is included. It has separate modules for the text, numeric, and cursor keys so you can rearrange them to suit handiness and other layout preferences. An optional trackball ($149) and vertical function keypads ($49) are also available. The Switchboard comes with a three-year warranty. (See Reviews, February 1991.)
- **Apple Keyboard II,** $129. The standard keyboard for use with the Mac 128K, 512K, and Plus has an nonadjustable keyboard lift, monochrome coloring, no function keys, no cursor or numeric keypads, and with its Mac-only key labeling, no recognition that anyone might use a non-Mac PC. It comes with a one-year warranty.
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Although mice and trackballs are excellent pointing devices, they fall short for drawing and painting tasks.

While easier to control, a larger ball may be too massive to move effortlessly. Only the Silhouette gives the user a measure of control over the ball's mass—the product comes with four balls, each a different size and color, that you can swap in and out to suit your taste.

The ball's location also determines which fingers will generally be needed to move it. In most designs—where the ball is centered in the housing—the index and middle fingers are the most natural to use. A symmetrical layout is preferable if the trackball will be used by both right- and left-handed people. Most trackballs are designed this way. But the Silhouette's design is more suited to right-handed use, and the Logitech TrackMan for the Macintosh is designed for use only by right-handed people.

Button placement is another important concern in selecting a trackball. Buttons should be within easy reach. You don't usually move the ball with the thumb, which means the thumb is a good choice for activating the main button, as on the Silhouette. The large, contoured buttons on the GoStar Stingray serve as ideal thumb rests for both right- and left-handed users. Because it's awkward to move the ball while pushing the button, a drag button is another essential trackball feature. Trackball button functions can be configured by control panels.

Kraft Systems, with its Trackball ADB, and Curtis, with the MVP Mouse, also offer foot switches to supplement buttons on the main units. Although I found it tiring to rest my foot on either company's pedal for long stretches, foot controls can be a welcome addition for some disabled users.

Alternative Pointing Devices

Pointing devices that defy classification are a testament to inventors' ingenuity. Altra's Felix, for example, is a squat box about 6 inches on a side. In the center is a small plastic handle, which you grasp with your thumb and index finger, equipped by a switch that works like a standard mouse button. The handle moves freely within an operating area of about 2 square inches (a slightly smaller area than typical for mouse users). The light touch makes zipping the cursor around the screen almost too effortless, although you can map handle motion to apply to a small segment of the display for precision work. But it's hard to control at the edge of the operating area, which can make pull-down menu selections difficult. Most users didn't like the Felix's feel or control, but one loved it.

A unique feature called Window Manager lets you map the corners of the Felix's operating area to specific areas in the active window. For example, moving the handle along the left edge to the top-left corner automatically moves the cursor to the close box. Unfortunately, cursor motion tends to be jumpy, especially when you try to reach the extreme corners of the screen.

The MousePenMac, from Appoint, is another unusual mouse replacement. A cross between a pen and a mouse, it's designed to be used on soft surfaces such as fabric. (Slip mouse pads don't provide enough friction for this device.) Although I found the MousePenMac awkward for desktop use, it was great when used with a PowerBook notebook computer away from a desk. Sitting on a park bench with the PowerBook perched on my lap, I found the MousePenMac was often easier to use than the built-in trackball. As with the Felix and other unconventional pointing devices, you either love the MousePenMac or you hate it.

The Advanced Gravis MouseStick was the only joystick I received to test for this article. It performed well with arcade games and Microsoft Flight Simulator, although having to use a separate controller box was inconvenient. But a joystick makes a poor general-purpose input device. While it may be great for zapping aliens, a joystick is ill suited to more mundane tasks like word processing.

Two other input devices also deserve special mention: the AirMouse Remote Control and Appoint's Thumbelina are both designed for presentations. The AirMouse is a cordless mouse that communicates with a base unit (and the Mac) by infrared light. The AirMouse works well from across a room, as long as the Mac's display is large enough that you can see what you're doing. If you can't afford AirMouse's $595 price, Appoint's $99 handheld Thumbelina is fine for stand-up work at short range.

Drawing Tablets: Electronic Paper

Although mice and trackballs are excellent pointing devices, they fall short for drawing and painting tasks, an area where digitizing tablets excel. Tablets cost much more than other input devices and can take up much desktop real estate. Fortunately, most manufacturers have versions as small as 6 inches by 9 inches. Still, if you factor in extra space for power supplies and outboard processor boxes needed by tablets like Wacom's, you might end up making a trip to a furniture store for a bigger desk.

A drawing tablet is designed to facilitate the actions of an artist or draftsman. Most use a mouselike device (called a puck) or pen that is moved across the drawing surface, causing the cursor to follow on the screen. Getting used to a tablet takes a bit of practice, especially if you're used to a mouse. When you lift a mouse off the work surface and move it, the cursor stays put—with tablets, the cursor jumps to a new position. Two tablets—those from Summographics Corporation and Kurta Corporation—offer a mouse-emulation mode, but these emulations do not work when in drawing mode.

Some tablets, like Wacom's, can detect the amount of pressure being applied on the pen. Compatible Macintosh software can use this information to simulate the effect of a pen or brush on paper.

As a nonartist, I appreciated the ability to use the pens to trace drawings and photographs. I especially liked the segment of the Personal Writer PW105S tablet devoted to mimicking mouse and keyboard operations. For example, a virtual keyboard at the tablets' top left lets you enter text without using the keyboard.

Once you get used to one, a pen-based tablet can be more natural to use.
than a mouse. Several Macworld editors find that tablets produce less stress on their hands than do mice.

The Power of Speech

HAND-OPERATED POINTING DEVICES that directly steer the cursor are ideal for graphical user interfaces like the Mac's, but what about situations where hands-on control is inconvenient or impossible?

One approach to hands-free operation is voice control, a longtime staple of science fiction. Although true speech recognition is still years away, Articulate Systems' Voice Navigator II and MacSema's Voice Express bring limited voice control to the Macintosh. Both products let you associate brief voice commands with actions like key presses and menu selections by digitizing your voice and comparing it with recorded patterns. You train both devices by repeating three times the phrase you are associating with each action; because neither product truly understands speech, you can use almost any sound, as long as you're consistent. (You can have a lot of fun with this if you're inventive.) Still, neither product claims to replace a keyboard and pointing device.

The Pick of the Pointers

ALTHOUGH IT'S POSSIBLE TO ARGUE in favor of mice, trackballs, or other alternatives, experience with real Macintosh users has convinced me that choosing a pointing device is still largely a matter of personal preference. In fact, despite what some vendors claim, published research hasn't come up with a clear-cut winner, either—there is research that lauds and criticizes each type of device.

Among the mice, the Logitech MouseMan, with its contoured design, was a clear winner among our testers, with the Advanced Gravis SuperMouse (also made by Logitech) coming in second.

There was less consensus for the trackballs. I prefer the Curtis MVP Mouse and the EMac Silhouette, despite its low housing. Other testers also liked MicroSpeed's full-size MacTrac trackball.

While most users give little or no thought to choosing an input device, a poor decision—or no decision at all—can make using the Mac difficult, if not downright unhealthy. Fortunately, you don't have to be an expert in product design to apply ergonomics principles to your selection. Like buying a pair of shoes, finding a pointing device that works for you demands a critical eye and a generous helping of common sense. And just as you wouldn't walk out of the shoe store without a fitting, don't consider a mouse, trackball, or other alternative without a trial or money-back guarantee. You use them day in, day out, so don't settle for just any pointing device.

See Where to Buy under "Input Devices" for contact information.

A Macworld contributing editor, FRANKLIN N. TESSLER is an M.D. who uses a variety of hand-held devices as a radiologist specializing in ultrasound.

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### EVALUATING INPUT DEVICES

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>List Price</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MICE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Gravis</td>
<td>Gravis SuperMouse</td>
<td>$129.95</td>
<td>Better-contoured than the Apple mouse. Multiple buttons. Our second-favorite mouse.</td>
</tr>
<tr>
<td>AirMouse Remote Controls</td>
<td>AirMouse Remote Control</td>
<td>$595.00</td>
<td>Cordless infrared mouse. Good for stand-up presentations.</td>
</tr>
<tr>
<td>Apple Computer</td>
<td>Apple Desktop Bus Mouse</td>
<td>$99.00</td>
<td>Sharp angles on side make it harder to hold than contoured mice.</td>
</tr>
<tr>
<td>Logitech</td>
<td>MouseMan for the Macintosh</td>
<td>$129.00</td>
<td>Multiple buttons. Excellent feel. Contoured to fit right-handed users. Our overall favorite mouse.</td>
</tr>
<tr>
<td>Mouse Systems Corporation</td>
<td>A³ Mouse</td>
<td>$149.95</td>
<td>Multiple buttons. Special optical pad can cause tracking problems.</td>
</tr>
<tr>
<td></td>
<td>Little Mouse ADB</td>
<td>$134.95</td>
<td>Too narrow for most users' hands. Special optical pad can cause tracking problems.</td>
</tr>
<tr>
<td>Softcode Canada</td>
<td>SICOS Fancy Mouse</td>
<td>$89.00</td>
<td>Flatter shape than the Apple mouse. Hard to grip.</td>
</tr>
<tr>
<td><strong>TRACKBALLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ascher Engineering</td>
<td>Lynx Trackball</td>
<td>$99.00</td>
<td>Buttons can be hard to press. Overall flimsy feel.</td>
</tr>
<tr>
<td>CH Products</td>
<td>RollerMouse</td>
<td>$119.95</td>
<td>Comfortable casing. Large ball's weight requires extra effort.</td>
</tr>
<tr>
<td>CoStar Corporation</td>
<td>Stingray</td>
<td>$129.00</td>
<td>Low-profile case with large, contoured buttons.</td>
</tr>
<tr>
<td>Curtis Manufacturing</td>
<td>MVP Mouse</td>
<td>$149.95</td>
<td>Contoured case with wrist rest. Foot switch optional.</td>
</tr>
<tr>
<td>EMac</td>
<td>Silhouette Trackball</td>
<td>$99.95</td>
<td>Includes four replaceable balls with different weights, so you can choose most comfortable one. Positioned higher than other trackballs.</td>
</tr>
<tr>
<td>Kenington Microwave</td>
<td>Turbo Mouse ADB</td>
<td>$169.95</td>
<td>Excellent ball feel. Buttons easy to reach and press.</td>
</tr>
<tr>
<td>Kraft Systems</td>
<td>Trackball ADB</td>
<td>$119.95</td>
<td>Middle button hard to reach. Includes foot switch.</td>
</tr>
<tr>
<td>Logitech</td>
<td>TrackMan for the Macintosh</td>
<td>$149.00</td>
<td>Designed only for right-handed users. Ball controlled by thumb, which can be awkward.</td>
</tr>
<tr>
<td>MicroSpeed</td>
<td>MacTrac</td>
<td>$119.00</td>
<td>Tapered design. Comfortable hand position. Ball is a bit heavy.</td>
</tr>
<tr>
<td></td>
<td>MicroTrac</td>
<td>$89.95</td>
<td>Smallest trackball. Can be attached to side of keyboard or portable.</td>
</tr>
<tr>
<td>Mouse Systems Corporation</td>
<td>A³ Trackball</td>
<td>$139.95</td>
<td>Wrist rest. Large buttons are easy to reach but can be hard to press.</td>
</tr>
<tr>
<td><strong>DRAWING TABLETS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CalComp</td>
<td>DrawingBoard II</td>
<td>$495.00</td>
<td>Pressure-sensitive stylus available. Beta version evaluated was responsive. Cordless version $645.</td>
</tr>
<tr>
<td>Kurta Corporation</td>
<td>IS/ADB</td>
<td>$495.00</td>
<td>Easiest tablet to set up.</td>
</tr>
<tr>
<td>Personal Writer</td>
<td>PW10SL</td>
<td>$799.00</td>
<td>Includes special drawing area with a virtual keyboard.</td>
</tr>
<tr>
<td>Summagraphics Corporation</td>
<td>SummsSketch II ADB</td>
<td>$699.00</td>
<td>Mapping tablet to screen is difficult. Too many cables.</td>
</tr>
<tr>
<td>Wacom Technology Corporation</td>
<td>Wacom SD-421E</td>
<td>$1095.00</td>
<td>Pressure-sensitive stylus available. Easy to set up.</td>
</tr>
<tr>
<td></td>
<td>Wacom SD-510C</td>
<td>$695.00</td>
<td>9-by-6-inch drawing area. Pressure-sensitive stylus available. Requires separate controller box (included). Easy to set up.</td>
</tr>
<tr>
<td><strong>ALTERNATIVE DEVICES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Gravis</td>
<td>Gravis MouseStick</td>
<td>$99.95</td>
<td>Joystick. Uses separate controller box (included). Not appropriate for day-to-day tasks.</td>
</tr>
<tr>
<td>Altra</td>
<td>Felix</td>
<td>$129.00</td>
<td>Finger-operated. Cursor can be difficult to control.</td>
</tr>
<tr>
<td>Apport</td>
<td>MousePenMac</td>
<td>$99.00</td>
<td>Pen-like device. Can be used on most surfaces. Works well with portables.</td>
</tr>
<tr>
<td></td>
<td>Thumbelina</td>
<td>$99.00</td>
<td>Hand-held, thumb-operated trackball. Good for stand-up presentations.</td>
</tr>
</tbody>
</table>

* 12 by 12 inches unless noted otherwise. Tablets are available in larger sizes for dedicated uses like CAD.
Six integrated programs that give you a lot of power for a small investment
INTEGRATED SOFTWARE PROVIDES A wide variety of functions in a low-cost, compact package. Typically, an integrated package includes several different applications organized in cooperative modules: a word processor, a spreadsheet with charting capabilities, a database, a graphics program, and telecommunications software. Integrated programs are ideally suited to people on a budget and those who are running less-powerful Macs. Big jobs are best handled by dedicated software packages, none of the current crop of integrated programs are well suited to writing a book, maintaining a huge mailing list, or creating a complete set of complex financial projections. For people whose needs are more general, however, integrated programs can be a good value.

I evaluate six integrated software packages: Microsoft Corporation's Microsoft Works 2.0, Claris Corporation's ClarisWorks 1.0, Symantec Corporation's GreatWorks 2.0, MacVonk USA's HandiWorks 1.0, Zedcor's Desk 3.07, and Beagle Bros' BeagleWorks 1.0. For a quick look at how these packages compare, see "Integrated Overview."

In order to simulate how these programs are used in real-life situations, I invented Privacy Advocates of America (PAA), a small nonprofit organization working for personal privacy rights on the national and state level. In addition to standard business correspondence, PAA needs to keep a database of contributors, to whom the organization sends mail-merged letters. PAA also produces a graphically embellished newsletter of its activities, Privacy News, and sends it to members and news organizations. To track financial contributions, the organization uses a spreadsheet. And finally, PAA's executive director uses telecommunications software to log on to online services to do legal research.

The integrated packages I looked at use one of three methods to integrate their separate application modules. The simplest method, used by Microsoft Works and Desk, creates separate documents for each type of work (word processing, spreadsheet, and so on) and uses the standard Mac Clipboard to copy and paste information between modules.

The integration method used by ClarisWorks and HandiWorks lets you create compound documents by opening frames, areas in a document where you can do work from each of the modules. If you are writing a report and need to insert a table with a few calculations, you draw a spreadsheet frame right in your word processing document. When you click in the spreadsheet frame, the menu bar changes to reflect the spreadsheet functions. Clicking in the text brings you back to the word processor, and the menu bar changes back to word processing commands.

The newest path to integration is followed by BeagleWorks and GreatWorks. These programs use System 7's publish and subscribe capabilities to actively link information in one document to the same information in another document. This is similar to copying and pasting information, except that when you change the information in a publisher document, the corresponding information in the subscriber document changes automatically. In BeagleWorks, publish and subscribe is called In-Context editing, and the linking is mostly transparent; as with a frame-based system, when you click in the spreadsheet area of the word processing document, the menus change to spreadsheet mode and you can make changes. When you are done, you return to the word processor. But the publish-and-subscribe method of linking files differs from the frame-based method in that each kind of document (word processing, spreadsheet, and so on) exists as a separate document on the hard drive. GreatWorks uses the standard version of publish and subscribe, which requires you to open the publisher document and make your changes there; when you save changes, the subscriber document is updated.

When I sat down and tried to send a mail-merged letter, create a database, design a newsletter, maintain a simple chart of accounts, create a graphic, or go online, the packages' strengths and weaknesses became clear. Here's what I found.
ALL-IN-ONE PROGRAMS

Word Processing Tasks

Most people use integrated programs to do writing more than any other activity. All the programs I evaluated have adequate word processors, covering basic features like WYSIWYG editing, font and style control, tabs, justification, margins, and headers. All the programs have spelling checkers; BeagleWorks, ClarisWorks, and GreatWorks also provide a thesaurus.

There are a few differentiating features, though. BeagleWorks can automatically wrap text around irregularly shaped graphics and lets you change column structure anywhere on the page. The program also has custom character and paragraph styles, a word-count feature, and multiple columns. And BeagleWorks' tool palette gives you access to most of the basic features without your having to resort to the menus.

GreatWorks provides custom character styles, a print preview, multiple columns, and a draw layer. GreatWorks also has a terrific envelope-printing feature. ClarisWorks' word processor is reminiscent of a stripped-down MacWrite II. It has multiple columns and autonumbered footnotes but is otherwise quite simple. HandiWorks is the only program that comes with a Spanish dictionary, and 17 other language dictionaries are available. The program also does automatic hyphenation and kerning. DeskWrite's remarkable features include a word counter and the ability to change text case (for example from small letters to all capitals) and add graphic borders around paragraphs. Microsoft Works brings up the rear in the word processing department. It has virtually no features beyond the basics.

For word processing I'd recommend BeagleWorks.

Creating Form Letters

Mail merge lets you create personalized form letters by melding a list of names (and other individualized items) from a database with a letter written in a word processor. To make the merge letter, I pasted the PAA logo into the header of a word processing document. In merge letters, field names from the database are placed into the document, usually in double angle brackets, like this: «Address». After you've written the letter and placed the merge field names where you want them, you tell the program to merge these fields from the database with the text of the letter. The program then adds the information you've specified from the database into the letter.

ClarisWorks, BeagleWorks, and GreatWorks all let you select from a dialog box the field names that you want to use, leaving a minimum of typing for you to do (see "Easy Mail Merge"). Mail merge in any of these programs is simple, but with ClarisWorks it's slightly easier than with the other programs. BeagleWorks has a feature that I like: the database can have up to 32 data layouts, with associated selection criteria. So, if you set up a layout to select only certain records (say, all contributors who gave more than $5000 last year), you can choose that layout in the mail merge, and print letters only for the select few.

Desk's DeskWrite and DeskFile work together for mail merge using much the same procedures as ClarisWorks and GreatWorks, but you have to type the brackets and field names into the merge letter manually, instead of selecting them from a dialog box.

Microsoft Works doesn't use bracketed fields in the merge letter; instead, you select a menu choice called Prepare To Merge. You're then presented with a list of database fields to choose from. The annoying thing about this process is that you have to select Prepare To Merge for each merge field in your letter.

HandiWorks does not have a full-featured database module; instead, it has an address-book-like desk accessory called Address Manager. Address Manager has standard name and address fields, plus two user-customizable fields. Entering data into Address Manager is straightforward, but when you create a merge letter in HandiWorks, you must create spreadsheet frames for the Address Manager fields. The spreadsheet frames need to contain an equation that references the Address Manager fields, and the Address Manager fields cannot even be referenced by name, only by the number of the field. So, instead of typing in «Address>, you type an equation in the spreadsheet frame that reads AMMailMerge (8). I found this needlessly difficult to master.

For the best mail-merge program, it is a close tie between ClarisWorks, BeagleWorks, and GreatWorks, in that order.

Laying Out the Newsletter

I created the front page of Privacy Advocates of America's newsletter in each of the integrated programs (see "Newsletter Layout"). The newsletter is in a two-column format, with the Privacy News logo centered at the top. I drew the two horizontal rules using the graphics tools in each package, and the cartoon at the bottom of the page is a MacPaint-format graphic from a clip art collection.

Creating the newsletter in ClarisWorks was a breeze. Starting in the draw mode, I created the two text columns and linked them. I wrote the text, letting it flow between the two linked columns, then adjusted the height of the columns until I had the specific text I wanted in each column. I pasted the Privacy News logo and the cartoon from the Scrapbook, dragging them directly to where I wanted them on the page. The headline and the masthead were each separate text blocks dropped into place. The "Inside This Issue" table of contents was another text block, and I drew the box around it with the rectangle tool. I then used the straight-line tool to make the two horizontal rules for the masthead. Eventually, I wrote the text that went into the cartoon balloon and nudged it into place with the arrow keys on the keyboard.

Easy Mail Merge

When creating mail merge fields in BeagleWorks, you simply pick the fields that you want to insert from a dialog box and double-click; the merge field then appears in your document with the double angle brackets already in place.

Memory Appetites

<table>
<thead>
<tr>
<th>Product</th>
<th>RAM Space</th>
<th>Drive Space</th>
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</thead>
<tbody>
<tr>
<td>BeagleWorks</td>
<td>1024K</td>
<td>904K</td>
</tr>
<tr>
<td>ClarisWorks</td>
<td>1009K</td>
<td>569K</td>
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<td>Desk (Total)</td>
<td>4881K</td>
<td>920K</td>
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<tr>
<td>DeskCalc</td>
<td>1000K</td>
<td>263K</td>
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<td>DeskCom</td>
<td>20K</td>
<td>30K</td>
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<tr>
<td>DeskDraw</td>
<td>384K</td>
<td>265K</td>
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<tr>
<td>DeskFile</td>
<td>1024K</td>
<td>146K</td>
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<td>DeskPaint</td>
<td>1953K</td>
<td>113K</td>
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<tr>
<td>DeskWrite</td>
<td>500K</td>
<td>103K</td>
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<tr>
<td>GreatWorks</td>
<td>1024K</td>
<td>588K</td>
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<tr>
<td>HandiWorks</td>
<td>750K</td>
<td>616K</td>
</tr>
<tr>
<td>Microsoft Works</td>
<td>768K</td>
<td>597K</td>
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</tbody>
</table>

1 Suggested RAM in Get Info box.
2 Program only; exclusive of dictionaries, translators, and so on.
Newsletter Layout  This document contains many of the common formatting elements used to create simple newsletters. Notice the PICT logo, horizontal lines, MacPaint cartoon, dual columns, and the boxed paragraph used for the table of contents.

Getting Connected  The BeagleWorks tool palette gives valuable information about the status of the telecommunications session in progress. The session has been going on for three minutes, the connection is at 2400 baud, the terminal emulation is TTY, and the currently selected file-transfer protocol is Xmodem. The other icons in the palette are to control file transfer, text capture, the Phone Book, dialing, and hanging up the phone.

Making newsletters in HandiWorks was almost as pleasant—because the program is completely frame-based, it is especially well suited to page-layout tasks. I simply drew frames, specified their type (text or picture), linked the text frames, pasted in the graphics from the Scrapbook, and added the extra text and graphic elements. HandiWorks has features normally found in more expensive, specialized programs, such as kerning; automatic hyphenation (in 17 languages), and good leading controls. A drawback to HandiWorks is that it has a sparse user interface that isn’t as clear as that of some of the other programs. The program’s tool palettes use some peculiar icons that require explanation and learning to deal with HandiWorks’ frame-based document structure takes a while.

Creating the newsletter in GreatWorks was quite different. I put the Privacy News logo and the cartoon into separate draw and paint documents, respectively, then linked them, using publish and subscribe, with the newsletter, created in the draw module. I wanted to use the write module for the newsletter because it has better text controls, but it doesn’t let you flow text around graphics, so I had to use the draw module to accomplish that layout task. And you can’t link text columns in the draw module; you have to cut and paste to move text between columns as you are laying out the page. If you’re going to be doing a newsletter regularly, GreatWorks isn’t a great choice.

BeagleWorks gave me a different series of problems. I linked the newsletter elements from several documents in the word processor. BeagleWorks lets text flow around graphics, so I placed the cartoon and table of contents, and the text repositioned itself. While BeagleWorks lets you mix different column structures on a page, it always balances the text evenly between multiple columns—if you have a two-column layout, BeagleWorks tries to make both columns the same height. In the Privacy News page, I wanted to have more text in the left column than in the right column; BeagleWorks took the text and made two even columns. To make the text flow correctly, I had to create the table of contents box as a draw graphic, then precisely position it in the second column until the text flowed the way I wanted it to.

Desk is the wrong package to use to create a newsletter. While I was able to create Privacy News in DeskDraw, it was a laborious process. There’s no provision for creating and linking text columns. Each element must be pasted into the layout, then dragged into place. This is a job only for the patient.

Microsoft Works required me to create the whole newsletter in the draw mode of the word processor because you can’t create columns in the word processing mode. And text created in the draw mode doesn’t use tabs, so it was difficult to get the table of contents to format correctly. All the text was created with the draw mode’s text tool and dragged into place. There was no way to link the two text columns, so I had to do a lot of tweaking of column heights to place the text properly. And text that needs to be moved from one column to the next must be cut and pasted. This resulted in a newsletter that took too much effort to create.

Future Watch

The integrated software wars won’t end with the products evaluated here. Two newer entries are expected to enter the fray by the time you read this. Symantec plans to offer Q&A for the Macintosh, based on its best-selling package for DOS. Q&A is a flat-file database with an integrated word processor. The database portion is expected to be similar to Claris’s FileMaker Pro, with the word processor much like MacWrite II. Users of the Q&A database will be able to share data over a network with DOS Q&A users. The word processor serves as a convenient way to do mail merges without switching to another program. Symantec hadn’t set pricing for Q&A for the Mac at press time.

Microsoft will deliver the long-awaited Microsoft Works 3.0 by late spring, according to Microsoft spokespersons. Microsoft showed me a beta version of the program in March, and while some features were expected to change, Works 3.0 now includes a separate draw module and more draw tools. The word processor has revamped the dictionary and thesaurus functions, and the communications module has gained Kermit file transfers. The database module shows the most improvement; you can now have multiple layouts, and the draw tools are available to the database form designer. Microsoft Works 3.0 follows the same path to integration as does its predecessor: cut and paste; publish and subscribe is not supported.

Microsoft will be using DataViz’s file translators in Works 3.0; this gives Works extensive file interchange options with dozens of other programs in both the Mac and DOS worlds. Microsoft Works 3.0 is expected to sell for the same $249 price as the current version.

Telecommunications

TELECOMMUNICATIONS IS THE WEAK­ est module in each of the packages, with the exception of HandiWorks, which lacks such a module altogether. I used
each of the other packages to log on to CompuServe, and I signed on to a local bulletin board system at both 2400 baud and 9600 baud and downloaded a file using the Xmodem protocol (a standard way to communicate between computers). While each of the programs works adequately, their lack of scripting and other tools designed to make routine communication easier makes the process harder than it needs to be.

If you spend a lot of time using your modem, you are probably best served by buying a separate telecommunications program such as FreeSoft’s White Knight or Software Venture’s MicroPhone II. These programs feature scripting—which lets you automate log-on sequences and online actions—and can handle a variety of file-transfer protocols, such as Xmodem, Zmodem, and Kermit, that ensure that files transferred between two modems are sent error-free.

Zedcor’s DeskCom is a simple desk accessory that handles connection, text capture to a file, basic Xmodem file transfers, and not much else. Microsoft Works adds VT102 emulation for those who need to communicate with mainframes, but it doesn’t really add anything else to the basic features list. Both DeskCom and Microsoft Works let you save up to eight phone numbers in a communications document, so you don’t have to retype frequently called numbers.

ClarisWorks, BeagleWorks, and GreatWorks build their communications modules around Apple’s Communications Toolbox, a set of software tools that is built into System 7 and can be installed on machines running System 6. The ClarisWorks and GreatWorks communications modules are almost identical. They are functional but sparse.

The best communications module is offered by BeagleWorks (see “Getting Connected”). Instead of saving each online service you call as a separate communications document, as do ClarisWorks and GreatWorks, BeagleWorks saves a Phone Book file in the System Folder. Each entry in the Phone Book file can have a set of parameters that include speed, terminal emulation, and other communications settings. Best of all, you can associate a simple log-on script with each Phone Book entry; BeagleWorks gives you four script commands—Wait For (text), Send (text), Password, and Pause—that let you handle most log-on sequences. After you create the script with the script editor, choosing the Phone Book entry and clicking on the Dial button calls the online service and logs you on automatically.

For telecommunications I would choose BeagleWorks.

**Spreadsheets**

PAA’s SPREADSHEET NEEDS AREN’T complex; it uses spreadsheets to track contributions and do some simple financial projections. Although in the past the organization tried using a spreadsheet for day-to-day accounting, it found that an off-the-shelf personal finance package was better suited to its accounting needs.

At the end of each month, PAA’s director takes the total amount of contributions and plugs it into a tracking worksheet. This worksheet has the months of the year across the top and the different sources of contribution (direct mail, corporate donations, meetings) down the side. The worksheet calculates the running totals and the percentage of total contributions that came from each source. PAA then generates year-to-date charts that show the state of contributions.

Making the spreadsheet is straightforward in all of the programs. It is charting where things get interesting. ClarisWorks lets you create a chart right in the spreadsheet, rather than as a separate document. ClarisWorks is also the smartest program, labeling the values and categories correctly and clearly without any tweaking (see “Year-to-Date Charting”). Other programs either group the category

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**INTEGRATED OVERVIEW**

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Modules</th>
<th>Retail Price</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beagle Bros</td>
<td>BeagleWorks 1.0</td>
<td>word processing, draw, color paint, spreadsheet, chart, database, communications</td>
<td>$299.95</td>
<td>good integration via System 7’s publish and subscribe, with ability to edit published data in the subscriber document; innovative user interface; deepest feature set; word processor supports multiple columns and irregular text wrap.</td>
</tr>
<tr>
<td>Claris Corp.</td>
<td>ClarisWorks 1.0</td>
<td>word processing, draw, spreadsheet, chart, database, communications</td>
<td>$299.00</td>
<td>best balance of power and ease of use; interfaces similar to those of more powerful Claris products; easy, transparent integration between word processing, spreadsheet, and draw modules.</td>
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<tr>
<td>Zedcor</td>
<td>Desk 3.07</td>
<td>word processing, draw, black-and-white paint, spreadsheet, chart, database, telecommunications</td>
<td>$399.95</td>
<td>individual applications are quite good; DeskPaint and DeskDraw are great for quick graphic tasks.</td>
</tr>
<tr>
<td>Symantec Corp.</td>
<td>GreatWorks 2.0</td>
<td>word processing, draw, color paint, spreadsheet, chart, database, telecommunications</td>
<td>$299.00</td>
<td>only package with an outlining module; interface consistent across modules; easy to use.</td>
</tr>
<tr>
<td>MacVonk USA</td>
<td>HandiWorks 1.0</td>
<td>word processing, draw, spreadsheet, chart, database, telecommunications</td>
<td>$175.00</td>
<td>inexpensive; very good at page-layout tasks; fine spreadsheet functions; multiple-language support for spelling and hyphenation.</td>
</tr>
<tr>
<td>Microsoft Corp.</td>
<td>Microsoft Works 2.0</td>
<td>word processing, draw, spreadsheet, chart, database, telecommunications</td>
<td>$249.00</td>
<td>old reliable; inexpensive; doesn’t shine, but gets the job done.</td>
</tr>
</tbody>
</table>

1 Limited to lines and boxes in the frame mode. 2 Address Manager DA only. 3 Draw tools available in word processor.
ries incorrectly (GreatWorks, Desk) or label them poorly (BeagleWorks, Microsoft Works).

- For spreadsheet users, I would recommend ClarisWorks.

**Graphics**

**ALL OF THE PROGRAMS HAVE DRAWING modules with object-oriented drawing tools.** DeskDraw gives you control over the transparency of objects. BeagleWorks has a nice object-duplication function. GreatWorks features a Bézier curve tool and gradient fills. None of these programs, however, are going to satisfy the professional artist, though they’re all more than adequate for moderate drawing tasks. HandiWorks is the exception, since it has only rudimentary box and line tools.

- No package stands above the rest in graphics, yet all are fine for occasional use.

**Databases**

**NONE OF THE PROGRAMS ESPECIALLY shine in the database department, either.** They are all simple databases that lack lookups, data formatting, and other features that distinguish stand-alone programs like Claris’s FileMaker Pro and ProVue’s Panorama II.

GreatWorks and BeagleWorks have the strongest databases overall and are the only programs that let you have picture fields in a database. GreatWorks also lets you assign automatic serial numbers to fields. BeagleWorks has the best sorting and selection feature.

The programs with the weakest database modules are Microsoft Works, because it only lets you have one limited form view, and HandiWorks, because its New Address Manager is a decent substitute for a real database.

- If you are going to keep track of people, places, or things with a database module, it’s a tie between BeagleWorks and GreatWorks.

**Limited Storage and RAM**

**THESE INTEGRATED PACKAGES ARE being targeted for use with the Macintosh Classic, the Classic II, and the LC, all of which often have limited drive space and limited RAM. And owners of the portable Mac PowerBooks, which currently have small hard drives and expensive RAM add-on costs, also need compact, efficient programs.** To evaluate how the integrated packages cope with limited resources, I ran all of them on a 2MB Mac Classic running System 6.0.7 and on a 2MB PowerBook 140 running System 7.0.1 (see “Memory Appetites”).

On the Classic running System 6.0.7, which gives you the option of turning MultiFinder off, thereby dedicating most of the machine’s RAM to the running application, all the programs opened and ran well. It was a different matter on the PowerBook 140, however. Running System 7.0.1 with all extensions off, there was only 1049K of RAM available for a program to use. In this tight environment, GreatWorks and BeagleWorks were at a disadvantage (see “Memory Appetites”). GreatWorks started up fine, but ran sluggishly with more than one document window open. BeagleWorks, which requires a minimum memory allocation of 1024K and prefers 1500K, ran slowly on the low-memory PowerBook. At press time, Beagle Bros was readying an update, due in April, that lowered the memory requirement to 900K, and stated that all registered users would get the update for free. The only two Desk applications I could open simultaneously were DeskWrite and DeskDraw. Attempting to open other Desk programs resulted in out-of-memory messages.

The best performers on the PowerBook were HandiWorks, Microsoft Works, and ClarisWorks, all of which handled the various documents I tried with no problems. Although you can get by with the minimum 2MB configuration, you’re much better off bumping RAM up to 4MB for the Classic, and to either 4MB, 6MB, or 8MB on the PowerBooks, which require System 7.

**Choosing the Right Package**

**MICROSOFT WORKS HAS LONG BEEN the leader in integrated software, partly by being the lone contender.** The newer packages clearly show that Microsoft Works is long in the tooth, and long overdue for a complete overhaul. Zebeda’s Desk isn’t really an integrated package, although some of the applications work together well.

HandiWorks is attractive for people who are looking mainly for word processing and page-layout tasks, but its weak Address Manager makes it a poor choice for users who need to keep track of lists of people.

BeagleWorks is full of whiz-bang features, but it is a bit more difficult to learn than the other packages I evaluated. With its many modules and unique version of publish and subscribe, it is also more powerful in creating compound documents that combine many disparate elements. For anyone willing to spend the time to master it, BeagleWorks gives ClarisWorks serious competition.

Symantec’s GreatWorks 2.0 is a big improvement over the original version. Integration via System 7’s publish and subscribe works well, although I still feel that the frame-based programs provide easier integration overall. GreatWorks gets high marks for including an outline module and a color paint module. GreatWorks is a solid program, and it’s worth a close look.

That leaves ClarisWorks with the best all-around combination of ease of use and integration. While ClarisWorks isn’t perfect—I’d like to see a better database module, in particular—it is more than enough for most beginning users.

See Where to Buy for contact information.

**Editors’ Choice**

ClarisWorks  With an excellent combination of power and ease of use, ClarisWorks nudges its way to the front of the integrated software pack. The program’s easy, no-hassle integration of word processing, drawing, and spreadsheets makes it the winner in this suddenly crowded field. **Company:** Claris Corporation. **List price:** $299.

**Disadvantages**

- Steep learning curve than the other programs; publish and subscribe can be cumbersome to set up
- Database and telecommunications modules could stand improvement
- Group of separate applications with minimal integration; poor memory management when modules are used simultaneously
- Average integration overall; publish and subscribe can be cumbersome to set up
- Address Manager isn’t as good as a real database module
- No telecommunications module; better drawing tools needed
- No paint tools
- Poor integration; clumsy draw layer in word processor
- Limited database; desperately seeking revision

See Where to Buy for contact information.

**Editors’ Choice**

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Macworld Lab finds that hubs—the devices that control transmission of data on 10BaseT networks—are highly reliable.

YOU ARE CURRENTLY UPGRADING your network from LocalTalk to Ethernet, you are probably installing the most popular type of wiring: 10BaseT, or unshielded twisted-pair wiring. It is inexpensive, easy to install, and reliable. With twisted-pair you use standard telephone wire to connect computers in a star layout. At the center of the star is a multiport repeater, or hub—an important piece of hardware that can make or break a network's reliability. The hub receives signals from any device connected to it and repeats them as full-strength, clear signals to all other devices. Without these high-quality signals, the network would slow down. For instance, if a signal fades away or becomes garbled before arriving at its destination, the sender must retransmit the signal.

The star configuration makes 10BaseT more reliable than forms of Ethernet that use a bus layout (where information is passed in a straight line from one device to another) because if one device in a bus layout is improperly terminated, breaks down, or becomes disconnected, the whole network may stop working. In contrast, if one branch of a 10BaseT star has trouble, the hub shuts down that branch, and the rest of the network continues working normally.

The number of 10BaseT hubs you can choose from may surprise you (see "Twisted-Pair Hubs Compared"); such a variety exists because hubs appeal to a number of markets. Twisted-pair wiring works with a wide variety of computer networks, including Novell NetWare and other networks on DOS computers, TCP/IP networks on Unix computers, DECnet networks on Digital Equipment Corporation computers, and AppleTalk networks on Macs. To help you decide which 10BaseT hub to get, Macworld Lab evaluated 11 of them (see "Testing 10BaseT Hubs").

**Hub Connections**

A 10BaseT hub has multiple ports; you can connect only one network device to each port. You don't daisy-chain multiple devices as you do with other forms of Ethernet, LocalTalk, or PhoneNet. Thus, the hub you buy needs enough ports for every device in the network, plus extra ports to accommodate growth. You can get 10BaseT hubs with a range of ports—common configurations are 8, 12, and 24—and you can interconnect a limited number of hubs. A special type of hub called a concentrator consists of a chassis to which you add modules, boards containing a number of ports. Concentrators make it easy to expand the number of ports.

You connect computers and other network devices to a 10BaseT hub using standard telephone wires and connectors. A 10BaseT cable consists of ordinary unshielded twisted-pair wires like the telephone wires installed in most buildings. If your building was wired in the past ten years, you may be able to use spare telephone wires to connect a 10BaseT network. 10BaseT uses two pairs of wires; one pair sends data and the other receives. A single twisted-pair segment—from hub to computer—can be up to 100 meters (328 feet) long.

Twisted-pair cables connect to most hubs with 8-pin RJ-45 modular connectors similar to the 4-pin modular connectors you use to plug a phone into a wall jack. The RJ-45 connectors make 10BaseT network hookup a snap, but can create a serious snarl of cables. For a neater, more permanent, and more expensive installation, you can use a hub with...
How 10BaseT Hubs Communicate

1. Ethernet boards and EtherTalk system software prepare AppleTalk data packets for transmission on Ethernet cables by adding Ethernet addressing information. EtherTalk systems send packets from one networked device to another. The packets are sent to the network by the AppleTalk system software. Transceivers convert an Ethernet adapter’s AUI (Attachment Unit Interface) or AUUI (Apple Attachment Unit Interface) port to a 10BaseT port.

2. Unshielded twisted-pair (UTP) wiring is attached to the 10BaseT port. A single signal wire is used to send the signal, and an unshielded twisted-pair (UTP) wiring is used to receive the signal back.

3. The hub receives the data packets and transmits them to its connected ports. The hub sends the packets to all connected devices.

4. Devices receive the packets and process them as needed. The packets are then sent back to the hub and forwarded to other devices.

5. The backbone cable connects the central device to the peripheral devices. The backbone cable is used to connect devices to the hub.

Adding More Ports

When a hub runs out of ports, you can connect another hub to it. A method called cascading involves running a twisted-pair cable from one hub’s 10BaseT port to another hub’s 10BaseT port. The hub’s receive lines are connected to each other and vice versa. You can use a regular 10BaseT cable instead of the crossover cable if one of the interconnected hubs has a switch that crosses the send and receive lines on one port. The cascading setup is similar to a star layout with connected devices. (You can connect another hub to it.)

Cascading creates a hierarchy of hubs. For example, you might have a central device with other hubs branching out from it in a star layout and computers branching out from the peripheral hubs. (You can connect another hub to it.)
could also connect computers to the central hub at 10BaseT ports not used for cascading.) In this scenario, data from a computer connected to one peripheral hub must go through three hubs to reach a computer connected to a different peripheral hub. The IEEE's Ethernet standard limits the hub hierarchy, specifying a maximum of four hubs between any two networked devices. In other words, data can hop through at most four hubs from the data source to the destination.

Instead of subjecting your network to the four-hop limit and using up 10BaseT ports to cascade hubs, you can connect multiple hubs to an Ethernet backbone cable. The hubs all need an AUI, BNC, or fiber-optic port. The type of connector determines the type of backbone cable you use. A BNC connector hooks up to thin Ethernet cable, and fiber-optic connectors hook up to fiber-optic cable. An AUI connector requires a transceiver to match the type of backbone cable—thin Ethernet, fiber-optic, or thick Ethernet.

Several manufacturers let you add alternate backbone connectors by plugging modules into the hub. Sonic has an unusual provision for increasing the number of ports in its StarBase T hub. The basic hub has 12 RJ-45 jacks, but only 6 work. You activate the others one pair at a time by installing SIMM-like hub modules.

For large networks, Cabletron, David Systems, Du Pont, and other companies offer concentrators. Their capacities range up to 228 10BaseT ports distributed among 3 to 20 modules. One module handles multiport repeater functions, and the other modules provide 10BaseT ports. You can use modules that work with different kinds of cabling and in some cases different sorts of networks. You can't mix and match modules made for different concentrators, however. Some hubs, such as David Systems' 13-port ExpressNet Hub, can be converted to concentrator modules to enlarge a network.

### Hubs in Action

All hubs that conform to the IEEE 10BaseT specification perform certain tasks. In its role as a network repeater, a 10BaseT hub receives a packet of data from a port, removes minor irregularities, and transmits the packet to all its working ports. The hub knows which ports are working well enough for the connected device to receive and respond to the hub's pulses. Most hubs have status lights that show which ports have passed the link test. Many hubs let you disable the link test for individual ports so you can use old Ethernet adapters, which do not respond to 10BaseT hub pulses.

Besides detecting faulty links, all 10BaseT hubs recognize and handle collisions that occur when two or more networked devices transmit data at the same time. A hub stops forwarding packets to or from a port, an action termed partitioning, when it detects too many consecutive collisions or too long a collision at that port. The hub continues to monitor port traffic and resumes normal packet forwarding when it sees the first valid packet to or from a partitioned port. Status lights on many hubs identify partitioned ports.

10BaseT hubs ignore continuous data transmissions that exceed the maximum Ethernet data-packet size. This excessive data-transmission condition, known as jabber, usually results in too many collisions and causes the hub to partition the jabbering port. Some hubs have a jabber indicator light that you can use along with partition status lights to diagnose the source of persistent jabber.
The NRC MultiGate Hub has a handy feature for reducing network traffic—the MultiGate can serve as a bridge between an Ethernet backbone and the hub's 10BaseT ports. A bridge reduces traffic by filtering data packets according to their destinations. Hubs that do not offer bridge functions route data packets to all working ports. The NRC MultiGate's bridge feature lets the hub filter data packets according to their network type, including AppleTalk, DECnet, Novell NetWare, and TCP/IP. Besides filtering network traffic, a bridge overcomes the IEEE limit of four hubs between sender and receiver by dividing the backbone and the 10BaseT ports into separate networks, each of which can have four hubs. Similarly, some concentrators, such as the David Systems ExpressNet Concentrator, support bridge modules.

**Hub Management**

To monitor most 10BaseT hubs, you stand in front of them and watch their lights. Status lights can tell you whether a port is busy but not how busy or that a collision is occurring but not how often. Status lights don't help analyze traffic to optimize network performance and plan network expansion; nor do they notify you at your Mac when problems occur.

To measure traffic, count errors, and receive trouble alerts, you need a managed hub, such as Cabletron Systems' MMAC FNB Concentrator and MRXI, Farallon's PhoneNet StarController EN, or NRC's MultiGate Hub. A managed hub, also known as a smart hub or intelligent hub, counts numerous traffic and error statistics for the whole hub and for each port 24 hours a day. The MultiGate Hub, for

### CONNECTED-PAIR HUBS COMPARED

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Number of Ports</th>
<th>Price</th>
<th>Management (In-Band/Out-of-Band)</th>
<th>Connectors Available</th>
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* = yes; O = no. * Concentrators include a multipORT repeater module and one or more 10BaseT modules. You can combine modules to create configurations with varying numbers and types of ports.
Some hubs include out-of-band management software that lets you gather statistics without adding overhead to the network and manage hubs even if the network is down. Other hubs, such as the MultiGate Hub, MMAC, and MRX1, let you manage a network out-of-band, albeit less elegantly—you gather statistics by running an inexpensive terminal program on any computer connected to the hub’s special management port.

Not only can you monitor managed hubs with management software, but you can also control them. Farallon and NRC software, for example, can turn individual ports on and off and can enable and disable the link-integrity test for any port.

Managed hubs can detect hub and port errors, such as jabber and collision, at the hardware level. Tracking such errors helps you spot electrical interference, cross talk, malfunctioning transceivers, and unreliable Ethernet adapters. What’s more, network analyzer programs gather statistics only while running on a networked Mac, whereas managed hubs gather statistics continuously.

Choosing a Hub

Managed hubs cost considerably more than unmanaged hubs. You can justify the extra expense if the success of your business depends on your network’s optimum performance and minimum downtime, which a managed hub’s statistics help you achieve. Traffic and error statistics can also save you time in setting up a large network or in expanding your network. Of the managed hubs we tested, Farallon’s PhoneNet StarController EN costs the least, but NRC’s MultiGate Hub in a configuration of 24 10BaseT ports is a better value with its out-of-band management, built-in bridge, and backbone port options. Cabletron’s MMAC will appeal only to those with large networks and large budgets.

If you want a managed hub, you have many to choose from. All hubs perform equally, and the ability to cascade 10BaseT hubs from different manufacturers makes them all inherently expandable. A backbone port increases expandability, and you must have one if you need to connect your hub to an Ethernet backbone. If you have old Ethernet adapters that don’t support 10BaseT’s link-integrity testing, you need a hub that lets you switch off link-integrity testing, port by port. Apart from those considerations, cost and the number of 10BaseT ports you need are the crucial variables. Get out your crystal ball and see how many ports you will need six months or a year from now (figure at least 50 percent more than you need now). Then buy the hub with the features you need and the best price per port. Keep in mind that you’ll pay less than the list price if you buy from a discount store or mail-order company.

Concentrators such as Cabletron’s MMAC-3 FNB Concentrator provide optimal expandability. You buy a chassis and then purchase modules (1) that provide connectors such as RJ-45 (2), fiber optic (3), and thick Ethernet (4). Modules can also provide extras such as a modem connector for out-of-band management (5) and status lights (6).

See Where to Buy under “Star Controller Hubs” for contact information.

Contributing editor LON POOLE is author of Macworld Guide to System 7 (IDG Books Worldwide, 1991) and Amazing Mac Facts (Microsoft Press, 1991). Macworld Lab testing supervised by TIM WARNER.
ANALYSIS

FIVE MATH PROGRAMS THAT HELP SCIENTISTS
AND ENGINEERS SOLVE COMPLEX COMPUTATIONS

by Charles Seiter

In the original vision of Charles Babbage, the computer was a steam-driven gear-and-ratchet machine that would calculate and print mathematical tables. In the visions of John von Neumann and Alan Turing almost a century later, the computer would be a general-purpose device capable of abstract manipulation of logical symbols. Finally, the vision of Alan Kay and others a few decades ago saw the computer as a dynamic notebook, using processor power to solve problems expressed in the user's own notation and to provide reference information.

A Macintosh outfitted with the latest mathematics software embodies all these visions and more. A few years ago an explosion of math software occurred, as multimegabyte Macs provided the memory needed to accommodate programs originally designed for workstations and minicomputers.

Today, there is a range of math software designed for many types of users, from chemical engineers to biologists to nuclear physicists. And even for pure mathematicians. These programs fall into two basic categories: symbolic manipulation and engineering.

Symbolic Manipulation

SYMBOLIC MATH PACKAGES CAN PERFORM ALGEBRAIC TRANSFORMATIONS ON EQUATIONS AND MATH EXPRESSIONS. BECAUSE MOST PRINCIPLES IN SCIENCE ARE SUMMARIZED WITH AN EQUATION RATHER THAN A NUMBER, TRANSFORMATION IS OFTEN USED TO SIMPLIFY RESULTS OR TO EXPAND EXPRESSIONS TO EXPLORE THE MEANING OF INDIVIDUAL TERMS.

The main programs in this category are Wolfram Research's Mathematica, Brooks/Cole Publishing's Maple, and Prescience Corporation's Theorist.

Mathematica This is probably the best-known symbolic math program. That's partly because it provides a comprehensive set of numerical and symbolic routines (2.0 includes 843 functions), but also because the reputation of its remarkable developer, Stephen Wolfram, secured its early adoption by leading research centers. Wolfram's background in many types of physics convinced him that a math program should contain any facil-
ity that a researcher is likely (or even unlikely) to need, and Mathematica's capabilities are indeed vast. Mathematica has a serious advantage over its competitors not only in scope and programmability but also in the quality and quantity of its support literature. The Mathematica Help Stack from Variable Symbols is a model technical help program; Stan Wagon's *Mathematica in Action* (W. H. Freeman, 1991) is one of the most entertaining, serious mathematics books yet produced; and the Mathematica book series from Addison-Wesley (1988-1992), covering topics from discrete mathematics to programming, is likewise excellent.

Cathy Stockwell, an engineer at Lockheed Technical Operations, needs all three types of capabilities that Mathematica offers for her work with satellite control: symbolic math for transforming and simplifying the equations of satellite orbital mechanics, numerical operations for computing actual trajectories, and 2-D/3-D graphics for inspecting the orbits. (Try to picture evaluating an orbital calculation from a table of computed results, and you see how crucial graphics are.)

All orbital problems have a distinct underlying similarity, which means you can use a set of related computations to handle them, rather than a completely new set for each problem. Mathematica offers a Notebooks feature that lets users easily produce active files of results from sets of related computations. Notebooks store dynamically linked equations, text, and figures; for example, a solution notebook for one type of satellite orbital problem can be extended into a series of notebooks with similar orbital maps, descriptions, and modified satellite data.

Wolfram Research sells three versions of Mathematica 2.0 (a Mac Plus/SE version for $595, a student version for $175, and a coprocessor version for $895). Most Mathematica users probably encounter the product through a site license.

The program is a tight fit in 4MB of RAM (6MB is necessary for serious work), so a stand-alone Plus or SE is not an ideal platform. Mathematica's memory demands are directly related to the high number of features in version 2.0. This new version has built-in sound capability and waveform analysis, numerical integration of differential equations, support for debugging and code tracing in the Mathematica programming language, a numerical-expression compiler, and nearly 300 new functions.

- **Maple V** Like Mathematica, Maple V ($450, $132 for the student version) offers every type of function normally encountered in math or science work to the Ph.D. level and beyond (the Maple manual index lists more than 1400 functions).

Maple’s roots, like Mathematica’s, reach back to the beginnings of symbol-manipulation programs (the mainframe-based Macsyma in the early 1970s), but Maple’s developers at the University of Waterloo in Canada took a more conservative programming approach than Wolfram Research did for Mathematica. Instead of being a single, giant package, Maple has a smaller core (about 600K) and modules of function sets (nearly 8MB all together) that you load as needed. Maple can thus run handily on a stock Mac SE—even on a 2MB Classic—making Maple a good choice for educational settings in which smaller Macs aren’t networked to more powerful hardware.

Phoebe Judson of Trinity University has designed her calculus lab around

Ted Mitchell, a business professor at the University of Nevada-Reno, finds the focused tool set of Prescience's Theorist ideal for business computations and visual analysis.
Mathematical Analysis

Maple and the Maple calculus workbook. She reports that beginning calculus students usually find the program easier to use than Mathematica, both for small special projects and for standard homework in differentiation and integration.

The $132 student version includes the complete Maple algebra system and library, and separate packages for linear algebra, number theory, graphics, basic statistics, optimization, and orthogonal polynomials. Judson thinks it's a bargain on price compared with Mathematica (the student system includes a coprocessor version) and a bargain on features compared to Thorkil (which lacks comprehensive advanced-math packages). Maple V is a rewritten and reoptimized version of Maple 4.2;1; additions include three-dimensional color graphics, fast Fourier transforms, and a Maple-to-C language translator.

- Theorist Prescience's Theorist 1.1 is unique among these symbolic-manipulation products in several respects. It's available only in a Mac version (the others are available for Unix workstations and DOS/Windows PCs). It represents equations in real math notation (Prescience also developed the equation-writing program Expressionist). Theorist depends mostly on menu-based commands for its operation (Mathematica and Maple are really extensions of C programming by comparison). And because it has a much smaller set of functions than the other main Mac symbol processors, Theorist can be mastered quickly.

This simplicity makes Ted Mitchell, a professor at the University of Nevada-Reno, believe that Theorist is the right math program for students in his business classes. For business students, the availability of number-theory modules or built-in Fourier transforms common to other programs is a distraction, he says.

With Theorist, Mitchell has developed a set of case studies in quantitative management methods, ranging from simple break-even models to formal time-series analysis of marketing data. Theorist offers complete graphics capabilities (including 3-D color surface plots), so Mitchell's case-study assignments on disk let students explore business data visually as well as computationally.

This approach recognizes that graphs and fairly simple equations are usually more appropriate than high-end math machinery for analyzing noisy and often incomplete business data. "Theorist lets the students think through the principles of an analysis without worrying about the mechanics of symbol manipulation in deriving simple results," Mitchell says.

Despite its simplicity, Theorist includes a respectable assortment of functions (including those for matrix algebra, special functions of physics, and symbolic calculus), an animation feature for reviewing the time evolution of computed graphics, and easy PICT/EPS file transfer for desktop publishing. To encourage undergraduate use, Prescience has a site license/academic discount program.

Engineering Analysis

ONE IMPORTANT CATEGORY OF Mathe­matics users is engineering, where the final result of an analysis is more often a number than a symbolic expression. Programs emphasizing numerics are faster than symbolic packages at raw calculation, which is an advantage to engineers working under deadlines, and the vendors have anticipated exactly what engineering users need, offering results tailored to specific engineering problems.

The mainstay applications for Mac-based engineers are The MathWorks' MatLab and MathSoft's MathCAD.

- MatLab The MathWorks' MatLab 3.5 ($795) offers the fastest matrix operations of any program available commercially, plus special toolboxes for modeling, time-series analysis, digital signal processing, and control systems, among others. In many cases, the combination of MatLab with a toolbox offers, in canned form, the required solution to a particular engineering problem.

But it is MatLab's script language that turns out to be one of the program's principal attractions for Michael Brooks, a scientist and electronics designer at Hughes Aircraft's radar applications division. In an environment full of Macs, DOS PCs, and Sun Sparstations, MatLab's script language lets Brooks write custom modifications of toolbox routines for computer-
aided control systems and simulating electronic filters. "We have all sorts of platforms and essentially every piece of published math software, and at many tasks we find MatLab to be the system to use," Brooks observes.

MathCAD  Version 2.0 ($495, $175 for educational institutions) offers another example of vendor concern for user productivity. Besides the basic program, MathSoft also sells two kinds of statistics applications packs, an advanced numerical-methods pack, an electrical engineering pack (MathCAD already includes an "electronics handbook" full of useful formulas and constants), two mechanical engineering packs, two packs for civil engineering and one for chemical engineering, and a special educational pack on basic math methods. From designing concrete beams to planning chemical batch reactors, MathSoft offers an off-the-shelf solution.

The program itself, while not as credibly fast as MatLab, includes an engineering equation solver; an advanced function library that includes Fourier transforms as well as matrix arithmetic; a reasonable approximation of correct math notation on screen; and nice integration of text, equations, and graphics for presentation-quality reports.

Because most of his students major in science or engineering rather than math, James Rowell of the University of Minnesota at Duluth uses MathCAD instead of Maple into .MathCAD, under an agreement, and has written a MathCAD solution machinery of the other packages, respectively. In the case of Mathematica, there are the additional advantages of the biggest infrastructure (books, tutorials, and classes) in scientific computing and a well-designed programming system; in the case of MatLab, there's a decade's experience in tailoring solutions to engineering problems.

For another category of scientists—biologists, economists, physical chemists, and surprisingly enough, some types of mathematicians—the routine computational load may not justify high-end hardware or much investment of time in mastering software details. These people should be pleased to hear that Maple now offers the same range of transformations as Mathematica does (Mathematica still has distinct advantages in graphics, in its new sound/DSP features, and in programming for complex problems), performs acceptably at numerics, and runs on a modest Mac.

MathCAD and Theorist also have modest hardware and training requirements, but take different approaches.

MathCAD is almost like an automated version of the famous Schaum's

SOME SOFTWARE CHOICES HERE ARE OBVIOUS. If you are a theoretical physicist at a major American university, you probably already have Mathematica. Similarly, if you design complex digital filters in the radionics division of an aerospace company, you are probably one of MatLab's 100,000-plus users.

These two application areas specifically call for the highest order of capabilities in symbolic and numerical computation respectively. In the case of Mathematica, there are the additional advantages of the biggest infrastructure (books, tutorials, and classes) in scientific computing and a well-designed programming system; in the case of MatLab, there's a decade's experience in tailoring solutions to engineering problems.

As a guideline in program selection, one last word may be helpful: base your decision on your limitations, not the program's. Any one of these packages, even on a low-end Mac, can do things scientists 20 years ago could only dream about. When you look at the range of the program's capabilities, ask yourself how much time you want to invest in getting the software to solve your problems. If you have complex and changing needs, the investment in a larger package is well repaid; if you need an answer by noon Friday and it's Thursday morning now, something smaller is the better choice.

See Where to Buy for contact information.

Charles Seiter, a Macworld contributing editor, has worked with symbolic math programs since the late 1970s.
Rendering Programs Let You Specify All

The Elements You Need

To Make a 3-D

Scene Look Realistic

Making Realistic 3-D Graphics

If you watch much television or read many magazines, then you've surely seen some slick three-dimensional graphics. But before you try to create your own, you need to carefully choose the software and hardware it takes to make realistic images—and you have to set aside a large chunk of time to master the process. First, you need a 3-D modeling package to build a representation of a scene (see "3-D: Structure, Surfaces, and Movement," Macworld, February 1992). Then you use a rendering program to specify surface attributes (textures, lighting, and special properties such as transparency or reflection) of objects in the scene. Finally, the Mac takes the data you have specified and renders a photo-realistic image of the scene. Whether it takes minutes or days to render an image depends on program performance, type of rendering, scene complexity, and type of Mac you use.

This article reviews 10 programs that offer photo-realistic rendering capabilities. These programs simulate realistic transparent, textured, and reflective objects. Capabilities vary widely enough that serious 3-D users may end up owning two or more of the programs.

Creating Surfaces

All of the renderers can create basic surface properties, such as matte, shiny, and transparent finishes. (These basic properties are generally used to create plastic, metal, and glass surfaces.) Most programs give you immediate visual feedback when you change the shininess or transparency of an object. Typically, the program displays a round ball on a patterned background within a dialog box. As you change the degree of, say, transparency for a selected object in the scene, the ball (which stands in for the selected object) becomes more or less see-through.

The only programs that don't give you immediate visual feedback for surface properties are Byte by Byte's Sculpt 3D, Sculpt 4D, and Pixar's MacRenderMan. These programs require you to render the scene or an individual object each time you want to see the effect of a change. Because rendering can be slow, this method discourages much experimentation. (MacRenderMan does come bundled with Showplace, a program Pixar developed as a front end for arranging and viewing objects without rendering.) To add texture, such as that of wood or marble, to an object, you need a renderer with texture-mapping capabilities. Texture mapping is the process of applying a PICT or...
TIFF image file to a 3-D object. The type of texture mapping you use depends on the shape of the object you are rendering. For example, if you're mapping an image of the earth onto a sphere, you use spherical texture mapping. Or if you need to map a brick texture onto a building, you use cubic mapping. Other common mapping types include cylindrical (for wrapping labels onto cans) and planar (for projecting images onto flat surfaces, like billboards).

Although all the programs can accomplish planar, cylindrical, and spherical mapping, not all of them support other types. Alias Research’s Alias Sketch and Sculpt 3D and 4D, for example, don’t offer cubic mapping. To get the effect of cubic mapping in Alias Sketch or Sculpt, you have to create six separate flat planes with a texture on each and then combine them to simulate a cube. Be careful when you use this type of texture-mapping kludge. If an object doesn’t have the right surface or texture, then the illusion you are trying to create may be destroyed.

Creating Bumps and Dents

Another popular way to create surface textures is to use a process called bump mapping, which creates the appearance of nicks, dents, or bumps in a 3-D model. If you needed to create a photo-realistic image of an orange, you’d be hard put to create a 3-D model that included all the dimples. An easier approach is to apply a bump map to a sphere; the bump texture employs the variation in light and shadow to create the impression that there are hundreds of little dimples on what is actually a plain old sphere.

A bump map, like a texture map, is an image file that is projected onto an object. Since bump mapping uses only the light and dark values of an image to create a bumpy surface, gray-scale images are generally used—the color information would be redundant. The most capable program for creating bump maps, Electric Image’s ElectricImage Animation System, offers in-depth control, allows you to have two bump-map images per object, and creates pronounced, high-quality bumps.

Creating Reflections

Adding reflections to metallic and glass surfaces can be accomplished by using either reflection maps or ray tracing. In ray tracing, the program uses algorithms based on natural laws to create reflections. These reflections are highly realistic, making objects appear to truly reflect their environment. Reflection maps produce less realistic images than does ray tracing. A reflection map, like a texture map, is an image file. Unlike texture files, which are attached to the object, reflection maps wrap around the space surrounding the object. This creates the illusion that the object reflects its environment, but makes it extremely difficult to mirror individual, detailed objects. Reflection maps work best on surfaces that distort whatever they reflect—say, on a curved candlestick or chrome logo.

Procedural Textures and Bumps

Procedural textures don’t require the use of an image file. They are generally used to create wood and marble textures and are generated by a computer from algorithms that define the color, size, pattern, and distortion of the texture. Procedural textures cover a 3-D object naturally, as if the object were carved from a hunk of the texture. Each
program uses its own algorithms for procedural textures, thereby creating different results. MacRenderMan offers incredibly high-quality procedural textures of great diversity.

Like procedural textures, procedural bumps are computer-generated. These algorithms create random nicks or bumps on an object. MacRenderMan excels at creating procedural bumps, with Sculpt 3D and 4D coming in a close second.

Light and Shadow

Rendering programs generally support four types of lights—ambient, radial, distant, and spot. Ambient light controls how dark and what color the darkest areas will be. High ambience gives the impression of daylight; low ambience creates a starkly lit scene, such as you would find at night or indoors. All the programs support ambient light. Radial lights generate light outward in all directions, much as does a light bulb. Distant lights can be pointed in a specific direction, giving the impression of, for instance, sunlight coming from the west. Spotlights focus one intense beam of light and behave very much like their theatrical counterparts.

As with texture mapping, the lighting capabilities of these programs differ greatly. Some programs offer all four light types. Some programs have ambient light but no spotlights. Others have spotlights but no distant lights. Sculpt 3D and 4D and AT&T Graphics Software Lab's MacTOPAS determine the position and intensity of a light, but don't let you aim it in a particular direction. MacRenderMan, ElectricImage, Strata's Stratavision, MacroMind Paracomp's MacroMind Three-D, and VIDI's Presenter Professional excel at lighting. MacroMind Three-D offers immediate visual feedback and is very flexible, allowing you to adjust the fuzziness of spotlights, the amount that the light will fade, and other parameters.

It would seem that if a program could simulate the appearance of bright sunlight, then it could produce shadows behind every well-lit object in a scene. Not so. Shadows are not treated equally by all rendering programs. Some programs allow only one light source to cast shadows, while other programs can create shadows only under certain conditions. To

Faster Rendering

Rendering speed is directly related to how complex an image or animation is. As you add more objects, lights, and textures, rendering speed decreases. This is why many people render elements separately and then composite them later by using alpha channel masks. The only other option is distributed processing.

Distributed processing is a loosely used term that basically means distributing the work load of one computer to other processors. In the case of rendering, it means sending various rendering tasks either to coprocessor boards installed in a Mac or to other Macs on a network. Unlike accelerator boards, coprocessor boards are designed specifically to speed rendering. Some informal tests that I conducted revealed that these boards are eight times faster than a Mac IIfx—a speed that is roughly equivalent to workstation performance. If you're after fast rendering, then buying one of these boards and a used Mac II is better than buying a new Quadra.

Currently, Yarc Systems and StarTech offer coprocessor boards that cost between $4000 and $8000, depending on the configuration you choose. The boards work only with certain programs, however. Yarc Systems' Nusprint board works with Sculpt 3D/4D and Presenter Professional, and StarTech's RenderEdge board speeds MacRenderMan. For a real speed boost, you can install three or four boards in one Mac and have them all work on one image. (The one exception is Presenter Professional, which does not support this feature while running on the Nusprint). Although a single- or multiple-board solution is expensive, you may find it worth the expense to increase performance by 10 to 20 times.

Radius plans to release Saturn V, a technology that will allow multiple Radius Rocket accelerators to work in tandem on a rendering job. This means that you could potentially have four Rockets in the same machine, each rendering a part of an image.

Another solution for increasing performance is network rendering, which works by parceling out pieces of an image to several Macs on a network. Ideally, network rendering cuts the rendering time proportionately, depending on the number and type of Macs on a network. Although no software was available for testing at the time this article was written, Ray Dream, Strata, Specular International, and VIDI will have solutions shortly. Pixar already has a version of NetRenderMan for the Mac, but it sends Mac image files to Unix machines, not Macs, for processing. (Pixar plans to release software that will render images on a Mac-only network.)
RENDERING: MAKING REALISTIC 3-D GRAPHICS

Rodney's Pond from Sculpt 3D This fanciful image uses numerous texture maps, which the artist precisely positioned. Sculpt 3D's rendering algorithm is designed to produce deep, rich colors. Note also the reflections of the fish and the water. The artist created a flat surface under the fish, applied a bump map, and set the level of reflection. Sculpt 3D automatically generated the reflections.

create a more realistic scene, Alias Sketch and MacTOPAS even allow you to type in time and location information (such as March 15, 4:20 p.m., at x longitude and y latitude) to create real-world outdoor lighting conditions.

Miscellaneous Features

SOME RENDERERS SUPPORT ATMOSPHERIC EFFECTS, such as fog or depth cueing. Fog is not as simple as it might sound—to create it, you use an image processing technique that lets you define, from your point of view, how the mist begins and how far it extends before obscuring the image entirely. Fog can add a high degree of realism, creating, for example, a skyscraper disappearing into clouds. Depth cueing makes objects in the distance appear naturally blurred.

Another feature that many users want is the ability to work with composite images. To offer this capability, a program must support at least one alpha channel, an antialiased mask that is included in the rendered image. The mask data in an alpha channel ensures that only the area that has rendered imagery will be used during compositing.

For still-image work, alpha channels make it possible to separate certain elements from each other for processing. An added benefit is that alpha channels can contain transparency information, which means that the background can show through an image (like a pane of glass) when you composite the rendered images.

Alpha channels are also extremely valuable for animation work. For example, when animating objects that will appear in front of a complex background image, it's more efficient to render each frame with the objects on a black background and composite the animated objects and the complex background through alpha channels afterward. This saves the renderer time and hard drive space. There are a number of ways, via hardware or software, to combine rendered images when compiling the layers of the animation for final production.

Selective Rendering

SELECTIVE RENDERING LETS YOU HIDE OBJECTS in order to avoid rendering an entire scene if all you want to do is work on one element. For example, if you are creating a museum showroom full of artifacts, you may want to spend extra time tweaking one particular object. Rather than render the entire scene each time you adjust the texture or lighting for that object, you can select only that object to render, thereby saving immense amounts of time.

Compound Surfaces

COMPOUND SURFACES ARE TEXTURES THAT ARE made up of two or more textures. A number of pro-
grams offer compound surfaces. Sculpt 3D and 4D allow you to combine two procedural textures to create a new surface, whereas Infini-D enables you to combine several layers of procedural and image-file textures. ElectricImage offers advanced capabilities, allowing you to have two texture maps, with accompanying alpha channels, as well as a reflection map for each object in a scene. Furthermore, ElectricImage lets you use alpha channels as a mask to control almost every aspect of surface attributes (such as luminosity, ambience, or reflection).

**Rendering Schemes**

**COMPUTERS CAN RENDER 3-D IMAGES VIA PHONG shading, ray tracing, radiosity, or Renderman. Many renderers offer a choice of rendering methods. Phong shading is the quickest method, and all the programs support it. The trade-off, however, is that you can’t create procedural textures with Phong shading. Ray tracing generally creates the most realistic 3-D imagery, but it’s also generally the slowest method. That’s because ray-tracing programs calculate the reflection of each beam of light off of every object in a scene. You get very realistic images with incredibly detailed reflections and realistic shadows. Unfortunately, the trade-off in rendering time for this realism can be prohibitive for large images or long animations. Ray Dream Designer, Alias Sketch, Presenter Professional, Sculpt 3D, Sculpt 4D, and Stratavision 3D allow you to suspend ray tracing. Renderman—or MacRenderMan, as the Mac version is called—is a specific type of rendering language created by Pixar. It uses algorithms to create textures, bumps, lights, fog, and practically every other element of an image. Renderman is currently the most widespread rendering scheme—you can render a Renderman file on the Mac and on DOS PCs, Unix workstations, and Next machines.

MacRenderMan provides an extremely sophisticated, and a sometimes difficult, way to generate 3-D images. Since MacRenderMan is a dedicated renderer, it cannot create models. The RIB files that modeling packages produce (and that MacRenderMan uses) vary, so it is sometimes necessary to modify them with a word processor—an involved process. Still, MacRenderMan’s quality is top-notch and Pixar’s Showplace helps with the modification process, so any problems you run into may be well worth solving.

Radiosity, a relatively unused approach, is currently supported only by Stratavision. (And in fact, radiosity is a proprietary technology—Strata has implemented its own version of this technology, which...

Pirates from Stratavision This complex image shows off the results you can get from ray tracing. For instance, the refraction on the shot glass realistically distorts the map image, and the reflections on the knife are highly realistic. Note also that the surface of the coins was created using a bump map.

MacTOPAS Piano This photo-realistic image uses a wood-grain texture for the table and cylindrical mapping to wrap the keyboard image around the mug. Transparency mapping was used to create the smoke rising from the mug.

* This feature is in Sculpt 4D only. Sculpt 4D includes animation features.
it terms "raydiosity."} Although even slower than ray tracing (some users feel its rendering times are prohibitive), Stratavision’s raydiosity feature provides sophisticated characteristics that are unavailable in other renderers. The most notable feature of raydiosity is its ability to deal with reflected light rays. For example, if you point a white light at a shiny red sphere, it will reflect that red light onto other objects in the vicinity of the ball.

**Speed: The Bottom Line**

Ask artists and animators, “What is the worst thing about 3-D graphics?” and they’ll tell you that it’s the amount of time it takes to render images. It’s common for a renderer to take a few hours or more to complete a complex image. Rendering a 30-second animation (requiring 30 images per second) could take three to four months. Hardly a realistic time frame, given that your employer or client will have forgotten who you are by then. Currently, only ElectricImage offers reasonable rendering speed on an ordinary Mac. To speed up other programs, you must use special hardware (see “Faster Rendering”).

Why are rendering times so slow? First of all, no Macintosh has the power of a 3-D workstation. Although the Quadra 900 may be able to render images at twice the speed of a Mac II, this is generally not enough of a performance increase to make the Mac a 3-D production system. And while installing an accelerator, such as a 68040-based Radius Rocket, is better than having no accelerator at all, you are still far outside the performance range that you need for creating complex work in a short amount of time.

**Speed versus Quality**

Rendering speed alone doesn’t tell you which program is the best renderer. You should also look at a program’s specific features and the quality of the images it creates. For example, ElectricImage creates extremely high-quality images. MacTOPAS and MacroMind Three-D also create high-quality images, albeit at slower speeds.

Ray Dream Designer, which is fast for a ray-tracing program, creates images that are so jaggy that Ray Dream recommends that you run them through its antialiasing utility, JAG. Stratavision and Sculpt 3D and 4D are extremely high-quality ray-tracing programs, but their rendering times are slow. Luckily, Sculpt 3D and 4D currently provide an option for increasing performance, and Strata is working on a scheme to speed up Stratavision (see “Faster Rendering”). Alias Sketch is a reasonably fast, high-quality renderer for both Phong shading and ray tracing.

**Prime Considerations**

All of the renderers can create photorealistic imagery—otherwise they differ greatly in capability. For instance, Infini-D’s antialiasing is not as high-quality as that of other programs, and Infini-D does not perform as well as some other programs—but it offers an amazing set of special effects that other programs don’t. Some of those effects include sine-wave patterns for creating rippling water, fractal mapping for creating random landscape patterns, and composite surfaces for combining multiple textures. Thus, you may end up buying Infini-D for its effects, and another product for its overall quality.

Keep in mind that rendering is only one part of the 3-D process. Take a look at the modeling and animation programs that work with the renderer. Many professionals take a modular approach, creating models in one program, animating them in another, and rendering them in yet another. If you’re truly interested in 3-D, then given the field of modeling, animation, and rendering programs, there’s a solution out there for you.

See Where to Buy for contact information.

David Poole is a consultant, animator, and graphic designer for Zen Over Zero in New York City. He has worked as a broadcast TV writer and producer and has been a consultant to ad agencies, video production facilities, and TV broadcasters for Mac graphics and video.
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Circle 72 on reader service card
IN THIS ISSUE: Macintosh 16" Color Display, Showplace, Muse, WordScan, ArchiCAD, FreeHand, Expert Color Paint, The Complete Annotated Alice, WordPerfect for the Mac, and more

Color Monitor

Macintosh 16" Color Display

PROS: True-to-life colors; uniform display quality; minimal curvature; built-in ADB connectors.
CONS: Works only with Macs. COMPANY: Apple Computer (408/996-1010). REQUIRELS: Mac IIci, IIx (with NuBus Adapter Card), or IIfx; Macintosh Display Card 8B24 or 8B24GC.
LIST PRICE: $1999.

APPLE'S LONG-AWAITED 16-INCH color monitor is something to behold. The Macintosh 16" Color Display is likely to be the standard against which other monitors in this size class are measured, even longtime players like E-Machines and its T16 monitor.

Vivid Display

IN 24-BIT MODE, THE MACINTOSH 16-inch monitor displays colors vividly across the spectrum, producing subtle colors subtly and dynamic colors dynamically. This range diversity means that artists and publishers working with images can confidently predict the results of their color changes based on what they see on the monitor.

Macworld Lab tests do show some strange color falloff patterns. Normally, a monitor shows high falloff as colors get darker. For example, it's typical for a monitor to display 12 percent blue when you specify 15 percent, and to display 6 percent when you specify 10 percent—the darker the color (the lower the brightness), the greater the difference in what appears. That's because it's hard to control the voltages of the electron beams at such low settings. But the Mac 16-inch monitor sometimes has sharp falloff, then little falloff, and finally sharp falloff as colors get darker. While this odd pattern is noticeable occasionally, most people won't encounter it in normal images.

In addition to very good color range, the Macintosh 16-inch monitor has excellent color uniformity, according to Macworld Lab tests. This means that a color displayed on one part of the screen will be nearly identical to the same color elsewhere on the screen. This may sound like a given, but the physics of the screen phosphors and of the electronic beams that strike and illuminate them result in differences across the screen unless the electronics controlling the monitor can compensate. The electronics of the Macintosh 16-inch monitor do just that.

The Color Display offers both high brightness and sharp contrast, which on a large monitor is no mean feat. The monitor needs to send a strong enough beam to all areas of the screen to gain high brightness and do so quickly enough to avoid flicker and slow image-refresh rates.

We did notice a slight reddish tinge to the monitor, which we've seen before in monitors using the Sony Trinitron tube (which the Apple monitor uses). Just as different brands of photographic film have different color casts, so do different brands of tubes. You can partially compensate for the reddish tinge by lowering
the contrast and brightness or by using the Monitors control panel to set the gamma (which controls how red, green, and blue are mixed) to Macintosh standard white, which tends to be bluer than paper white gamma or uncorrected white gamma.

The shape of the Trinitron tube makes the screen appear flat, despite a slight side-to-side curve. Flatness is especially important on a larger monitor, since a curve on its broad surface can distort how shapes appear. A rectangle, for example, can easily look bowed on a tube with a significant curve. The Macintosh 16-inch monitor is flat enough that bowing is not a problem.

The Trinitron tube has an aperture pitch of 0.26mm, which is typical of monitors of this size, giving the Macintosh 16" Color Display enough pixels to display images sharply. An 832-by-624-pixel resolution makes the Macintosh 16-inch monitor a 70-dots-per-inch display.

**Performance**

We tested the Macintosh 16" Color Display on a Quadra 700 with 2MB of video RAM, which let it easily handle 24-bit color at a resolution of 832 pixels by 624 pixels. The Quadra's built-in video was designed to handle large monitors at 24-bit color depth. Our results proved that its screen redraw is speedy in 24-bit color—in fact, speedier than in 8-bit, since the built-in video does not have to map 24-bit colors to 8-bit substitutes.

A sampling of extremely low-frequency (ELF) radiation emissions show the monitor to be well within the guidelines set by the Swedish government and now used as a de facto standard by monitor manufacturers.

**Ergonomics**

Recognizing that a large monitor may be too big to fit on a desk that has a Mac on it already, or too high when placed on top of that Mac, Apple built several ports into the Macintosh 16" Color Display: two sound-in, two sound-out, and three ADB. The inclusion of three ADB ports means you can move the Mac out of the way and still keep the keyboard and mouse accessible. You connect the monitor to the Mac's ADB port through a cable (included with the monitor) and then connect the keyboard and mouse to the monitor. The video cable is long enough to let you move the Mac away from the monitor and the user. The monitor's tilt-and-swivel stand is well designed.

The rest of the controls are characteristic of all of Apple's Macintosh monitors: power, brightness, and contrast. Degaussing (removing built-up magnetism, which can affect display quality) happens automatically when you turn on the power. The Color Display comes with no software, instead relying on the System 7 Monitors control panel.

Although touted as having an antiglare screen, the monitor has noticeable reflection, especially in dark areas. This is an engineering trade-off: the more glare protection added to a monitor, the less sharp the pixels, since the glare coating acts as a distorting lens. Using an OCLI antiglare screen developed by Optical Coating Laboratories would have cut glare without distorting image clarity, but it is expensive, and it cuts brightness considerably. Instead, Apple chose a light, standard coating and let users handle glare by changing lighting conditions.

The monitor's screen is antistatic, fulfilling government regulations in Europe limiting the amount of static electricity that a device may build up. Like ELF emissions, static buildup is an area where some research suggests potential health problems, although there is a great deal of debate over whether, much less at what levels, people should be concerned with ELF and static buildup. A nice side effect is dust won't settle as easily.

**Not a Multisync**

Like all of Apple's Mac Monitors, the Macintosh 16" Color Display works only with Macs. You cannot use it in a mixed environment of DOS, Unix, and Mac computers. For many users this is no loss. Others should look at vendors (like NEC, Ikegami, and Sony) that support multiple platforms with one device.

The Macintosh 16-inch monitor is also limited to one resolution—832 by 624 pixels—despite the trend toward monitors that can display images at several resolutions (typically 640 by 480, 832 by 624, and 1024 by 768) no matter what the screen size, in effect providing a zoom feature without losing detail.

This lack of multisync capability is why the Color Display has no options for repositioning the screen image. Multisync monitors have such controls because an image might be off-center after switching between resolutions or computers.

**A Quality Product**

Apple has a high-quality monitor in its 16-inch Color Display, legitimizing this new class of monitor size and setting a standard for its competitors. While others entering the market will stress features like multisync, color balancing, and software controls, monitor makers will be hard put to surpass the quality of the Macintosh 16-inch monitor's screen display.

—Galen Gruman and Tim Warner

**Showplace 1.1**

**PROS:** Straightforward interface; fine collection of objects and textures; produces predictable results; includes MacRenderMan for photo-realistic rendering; both applications support background processing.

**CONS:** Cannot align objects to each other or select random surfaces within an object; nonintuitive rendering scheme. **COMPANY:** Pixar (510/236–4000). **REQUIRES:** Mac with math coprocessor; 5MB of RAM; color monitor; System 6.0.3; 32-bit QuickDraw. **RECOMMENDED:** 8MB of RAM; 24-bit video board; 3-D modeling program. **LIST PRICE:** $995.

No one can dispute Pixar's contributions to the world of photo-realistic computer graphics. The company's award-winning shorts (Luxo Jr., Tin Toy) and ground-breaking television commercials (Lifesavers, Listerine) earned Pixar its reputation as a pioneer in the field. Also notable is Pixar's RenderMan Interface Bytestream (RIB) format, which has facilitated compatibility between software from different developers. The water monster from The Abyss and the liquid-steel effects from Terminator II, for example, while not rendered on a Macintosh, demonstrate the potential of the RIB format.

One of the few problems in this leader-of-the-pack scenario has been MacRenderMan, Pixar's shading and rendering software. True, you can render professional-quality images from MacRenderMan as easily—though certainly not as quickly—as printing a page from a word processor. However, the program supplies no graphical interface to apply any of the program's lighting and shading effects; you must resort to a module that is little more than a front end for a complex programming language.

That's where Showplace comes in. Recently upgraded to version 1.1, Showplace is a straightforward graphics application that organizes the process of shading and rendering into five basic components—importing and manipulating objects, applying surface detail, selecting and placing light sources, positioning the camera, and rendering the final scene. The effect is rather like having a small photographer's studio right inside your monitor.

**Assembling the Pieces**

Showplace is neither a modeler nor an animation program; its purpose is to render still scenes within a specified continue
frame size. To assemble such a scene, you can import one or more objects stored in the RIB format. Showplace provides a starter library of 42 ClipObjects, ranging from simple discs and spheres to full-blown images, but you'll find yourself either purchasing additional ClipObject libraries or using a modeling application to create your own. If modeling isn't your strong point, you can purchase additional ClipObjects libraries from third-party developers, including Acme Animation Group (Emerson, NJ; 201/261-5977), Acuris (Palo Alto, CA; 415/329-1920), and the Valis Group (Point Richmond, CA; 510/236-4124).

Once you've imported an object, you position it relative to other objects in the current scene, resizing and rotating it as you want. All objects in the ClipObjects starter library are scaled accurately with respect to one another, so you should import all the objects you plan to use before resizing any of them.

With every scene, Showplace provides a reference plane that serves as a grid for your creations. You can align the width, height, or depth of one or more selected objects to the plane. Because Showplace always aligns the exact center of an object to the center of a plane, you can align only one side of a selection at a time. You can't apply a different texture to each object, either—a major drawback, in my book.

**Computer Detailing**

To apply textures to an object, you select the portion of the object that you want to affect, then select a texture from the Looks library. Unfortunately, this is the only instance in which you can select one detail in an object separately from the rest of the object. Even then, the details are predefined by whatever modeling application was used to create the object; if the two wheels of a bicycle have been assigned to the same surface group in Swivel 3D, for example, you cannot apply a different texture to each wheel with Showplace.

You can modify the color and luster of many textures after their application, or use the LabelMaker utility to create your own looks. The upgraded LabelMaker 1.1 allows you to bevel fonts (similar to carving characters' edges) to create 3-D logos and other special text effects. For example, by making the white portions of a label transparent, you create a decal, which is useful for making emblems that appear painted or etched onto other surfaces. When you label an object, however, you replace the previous texture, so if you want to apply a decal over an existing surface (as demonstrated by the sun symbol in "Stargazing"), you have to import a flat object such as a disc, position the disc over the textured object, and apply the decal to the disc.

**Lights, Camera, Ad Infinitum**

Lighting is one of the program's most satisfying features. You can choose from four kinds of lighting: unfocused ambient light, distant parallel light (as from the sun), point light (as from a light bulb), and focused spotlight. You can create as many lights as you want, and each may be of a different color; you can also position and orient lights at precise x-, y-, and z-coordinates throughout your graphic. Best of all, a light can affect all objects that surround it, or it can dissipate gradually, as in real life.

You define the field of view using Showplace's camera tools. Each tool allows you to change the position of the camera (that is, the viewer) and that of the "lookat point," which represents the exact center of the area seen by the camera. This distinction can be confusing at first, but becomes extremely useful once you're up and running with the program. For example, you can instruct the camera to look at a selected object, then move the camera so that you're viewing the object from an entirely new angle. If you think you'll want to revisit a view, you can save the camera position with the current file. After a while, you'll find yourself moving the camera regularly to examine all angles of your scene.

Rendering is Showplace's most powerful feature. The program relies on a draft-quality renderer, which is satisfactory when rendering to videotape, but otherwise only fit for proofing purposes. If you intend to output the final scene to a high-resolution imagesetter or film recorder, you need to install the photo-realistic rendering module included with MacRenderMan. To specify which rendering module you want to use, you have to select it from the Chooser, not a step normally associated with rendering a file to disk. A single set of rendering preferences controls all rendering, whether you're creating a final image or merely previewing the objects on screen. It's not uncommon, therefore, to specify a low-quality screen preview while rendering to the screen, then forget to change the setting before rendering the final image. Once even low-resolution images can take an hour or more to render, you waste valuable time before you notice your mistake. You also have to take into consideration the amount of time it takes Showplace to write to disk enormous lighting and texture files to calculate the appearance of shadows and other memory-intensive elements. (Showplace required 39MB of disk space to render the stage image shown in "Stargazing").

On the upside, both Showplace and MacRenderMan make use of the RenderMonitor application, which renders scenes in the background. Over the course of several days of rendering various images in the background, I encountered no system errors or sluggish performance while working in the foreground application. Once, RenderMonitor canceled a project because it ran out of disk space, but it saved the portion of the scene it had rendered up to that point. This allowed me to reconfigure Showplace to render the scene from that point on, thereby minimizing time loss.

Showplace's simplified interface is ideal for beginners; you need only learn a small set of tools and commands to begin rendering in earnest. The program also meets the needs of intermediate users by providing a library of objects and surface textures that can be mixed and matched.

If you've used other modeling and rendering applications, you may find Showplace's feature set too small. Of course, you can always switch over to the more powerful MacRenderMan as your requirements expand, but I can't imagine many users wanting to make the leap from Showplace to the minimalist, nuts-and-bolts interface of MacRenderMan.

So, while Showplace presents a rare opportunity for the entry-level user to jump into the world of 3-D programs, I expect that a more powerful version will be necessary to make a dent in the Macintosh computer graphics market.

—Deke McClelland
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End user’s circle 260 on reader service card

Dealers circle 262 on reader service card
A new college professor of mine liked to snap his fingers to show us how fast our brain cells were firing. Well, whether it's because my brain is shrinking or the data on my hard drive is expanding, I do seem to have more trouble keeping track of my files these days. But where there's a need, there's a utility, or in this case, two utilities.

**Gofer**

**PROS:** Extensive text search options; doesn't require indexing. **CONS:** Slow; can only view files; can't search by file name. **COMPANY:** Microlytics (716/248-9150). **REQUIRES:** Mac 512KE. **LIST PRICE:** $79.95.

**On Location 2.0.1**

**PROS:** Fast; displays formatted files; indexes in background. **CONS:** Takes time to index; can't exclude search strings; can't use wild-card characters. **COMPANY:** On Technology (617/876-0900). **REQUIRES:** Mac Plus; System 6.0.4. **LIST PRICE:** $129.95.

**Analysis**

**Gofer**

Gofer is the ultimate keyboard search utility. But it's not always useful. The indexes are fairly compact, usually occupying less than 3 percent of the files indexed. If storage is tight, you can save space by excluding specific file types or numbers from the index.

Gofer's search functions are more than flexible enough for most users. You can locate files that contain *Tom* or *Dick* but not *Harry*, for example. You can even tell Gofer how many lines separate two text strings you're looking for. An asterisk (*) acts as a wild card for any character, and a pound sign (#) substitutes for any digit.

Gofer can search for text in most Mac file types, and volumes don't have to be preindexed. Unfortunately, you pay a price for convenience: Gofer is relatively poky, even on a fast hard drive. Gofer wastes time by continuing to process files after the search text has been found—there should be a way to stop the search after you have found the text you want. Although you can speed things up by limiting searches to specific folders, that's not much consolation if you don't know where to begin looking.

**On Location**

The newest version of On Location adds several useful features to an already-popular utility. Now you can perform multistring searches, and you can specify if all of the words have to be in the file, or if any one word will do. Wild-card characters still aren't allowed, though you can scan by word root if you're unsure of spelling. Although On Technology claims that most people don't need the extensive Boolean options such as those Gofer offers, I would like to be able to exclude files containing specific text strings. The algorithm used for searching also isn't perfect—rarely, On Location finds a document without any true word matches, and only when you try to view the file does it tell you that word is not in the file.

Unlike Gofer, On Location can scan file names as well as embedded text, and you can delete, copy, move, or rename files. Documents can be displayed with styling intact if the appropriate XTND translator file is in the System Folder. (On Location ships with 11 XTND filters.) On Location also lets you open or print a document if you have the application that created it.

On Location's greatest advantage is speed: when you search by name, new files pop up almost as fast as you can type. Text searches are slower but still leave Gofer in the dust. In one test, On Location took 33 seconds to scan 689 files for my last name, compared with Gofer's 9 minutes. The key to On Location's performance is precompiled indexes, which you have to create for each volume you want to search. The indexes are fairly compact, usually occupying less than 3 percent of the files indexed. If storage is tight, you can save space by excluding specific file types or numbers from the index.

Indexing a large volume can take hours, though. Occasionally, On Location freezes while it's generating an index, forcing you to remove the problem document and start again. (After four frustrating attempts at indexing my hard drive, I disabled nonessential INITs.)

On Location keeps up with changes to your files by updating indexes in the background. You can vary the frequency of automatic indexing, or you can eliminate it entirely if it bothers you. Over many months of testing, On Location's background processing was never obtrusive.

Unlike the tortoise's steady pace, speed makes On Location the undisputed winner in this race. It's ideal for keeping tabs on huge volumes like CD ROMs, and the ability to view formatted text is a plus. On Location is one of the few utilities I wouldn't want to be without.

—FRANKLIN N. TESSLER

**Input Devices**

**MouseMan**

**PROS:** Comfortable shape; three programmable buttons; click-lock feature enables precise movement. **CONS:** Takes some getting used to; three-button advantage sometimes moot. **COMPANY:** Logitech (510/795-8500). **REQUIRES:** Any Mac with ADB port; System 6.0. **LIST PRICE:** $119.

**TrackMan**

**PROS:** Three programmable buttons plus track-ball; click-lock feature enables precise movement. **CONS:** Right-hand bias; can be uncomfortable with extended use. **COMPANY:** Logitech (510/795-8500). **REQUIRES:** Any Mac with ADB port; System 6.0. **LIST PRICE:** $139.

**A3 Mouse**

**PROS:** Smooth ride; high resolution; ships with Nu-Paint DA. **CONS:** Murky software and documentation; compatibility problems. **COMPANY:** Mouse Systems Corporation (510/656-1117). **REQUIRES:** Any Mac with ADB port. **LIST PRICE:** $149.95.
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REVIEWS

MouseMan, has a convex top, a dimple on
its squarish casing. Strong software would
make the A¹ Mouse an attractive package.

Unfortunately, the A²'s software limits you
to keyboard commands; you can't assi
Assign mouse-click variations to the extra
buttons. Thus, for example, you could as
Assign #0 to one button for opening fold
ers and files, but you'd have to highlight
the icon first with a single click.

Moreover, the A² is incompatible with
some very common commercial INITs.
The software turned off both After Dark
and Adobe 'Type Manager on my SE run
ning System 7. Mouse Systems' technical
support claimed that moving A²'s control
panel to the System Extension file would
cure this, but it didn't. Reshuffling and
reconfiguring my other INITs didn't help
either. The A² also ships with NuPaint,
a paint desk accessory that also evinced
compatibility problems.

What's Your Pointer?
The reason for all the varieties
of input devices is to provide comfortable,
efficient ways for people's hands to com
municate with computers, so that people
can work (or play) with minimum risk of
repetitive strain injuries. The only sure
way to avoid computer-related hand inju
ries is to take periodic breaks. The only
sure way to find the best input device for
you is to experiment. See if a trackball
(large or small) works for you, check out
the software, and decide whether progran
mable buttons make a positive differen
t in the way you work. And avoid buy
ing a pointer you can't return. You may
not find out that you and your new
HyperTurboRodent don't get along unti
you've been acquainted a week or
three.—TERESA NIelsen HAYDEN

Data-Analysis Software

Muse 1.0

PROS: Innovative approach to organizing and re
porting data; free-form query language; carries units
and scale with data items. CONS: Conceptually
demanding; output is limited to spreadsheets and
graphs (no reports); limited graphics and analysis
capabilities; error messages unhelpful. COMPANY:
Occam Research Corporation (617/923-3545).
REQUIRES: Mac II; 6MB of RAM; System 6.0.5;
hard drive with 10MB of free space. Recommended:
Math coprocessor; System 7. LIST PRICE: $695.

MOST BUSINESS ANALYSES ARE
not difficult to carry out or under
stand. Often, though, the process of find
ing and assembling the required data is
a lot of work and error-prone besides.
Moreover, it's often hard to extract exactly
what you need because a single datum is
located at the intersection of many dimen
sions. For example, your current salary is
located by at least three indicators: who
you are, what point in time is of interest
(current), and what data item is wanted
(salary). Wouldn't it be useful to have a
program that lets you specify data extrac
tion, analysis, and display, and enables you
to do so in a natural, interactive way?

Muse is such a program—almost. It is
based on a large, ambitious vision of how
to organize and use data. It has relational
databases, called DataBooks, from which
you extract the data of interest. It has
spreadsheets, called WorkBooks, in which
the data are presented and analyzed. And
it has graphs for presenting data visually.
Underlying all of this is a dictionary-
based, syntax-driven query language around which all Muse activities revolve.
The language is enough like English to
fool you, at least for a little while. English
or not, it should be easy enough to learn
how to request simple analyses.

Scaling, Scaling
MUSE OFFERS A UNIQUE AND POWER
ful combination of several capabilities not
available in other data-analysis programs.
Muse keeps units and scaling with each
data item and understands how to use
them. For example, the query six feet by
eight inches returns 5 square feet. Typing
$123 thousand in French francs yields
700,854.70 French francs (Muse unders
stands the word thousand). Data can be
indexed by up to eight indicators (keys).
Spreadsheets are organized not only in
rows and columns, but also in pages and
charts, making them capable of display
ing data indexed by all eight keys. Muse
smoothly changes views for you when you
display with different keys (see "Compar
ning Apples and Oranges"). This capabil
ity alone is worth the price of the package.

Muse can have up to 15 DataBooks
open at once, and it automatically estab
lishes relational links among variables that
have the same name and definition (you
provide the names and definitions when
loading the data). If the name is the same
but the definition is different, a dialog box
asks you if you want to link the variables
anyway. For example, the definition of fis
cal year might be different for two compa
nies being compared. You can also link
variables manually. Each DataBook can
include one script as well, so that special
ized analyses, unit conversions, and so
forth can travel with the data to which
they refer.

Data can be entered from many exter
nal sources into a DataBook. Occam Re
search recommends loading data into a
WorkBook first and reorganizing them
continues.
IF YOU DON'T HAVE THE PLP II, YOU'LL NEED SPECIAL EQUIPMENT TO GET EDGE-TO-EDGE PRINTING.

If you want a printer that's a cut above the competition, look no further than the $949 Personal Laser-Printer™ II (PLP™ II) from GCC Technologies. GCC's exclusive edge-to-edge printing gives you the power to produce larger graphics, flow charts, and much more. With other printers, like the Apple® Personal LaserWriter® LS, you're forced to cope with margins that confine your graphics and narrow your options.

Edge-to-edge printing is just one of the features that set the PLP II apart from the pack. Other features include:

- **PostScript upgrade.** Provides an upgrade path to PostScript® and AppleTalk® networking.
- **Greater scaling capabilities.** Scales from 25% to 400% in 1% increments, compared with the Personal LaserWriter LS, which is limited to 50% and 75%.
- **Straight-through paper path.** Ensures wrinkle-free printing of heavy stocks, envelopes, labels, etc.
- **New! Background printing.** Lets you get back to work on your computer faster, and allows sharing using AppleShare® with System 7.0.
- **Faster print time.** Prints faster than the Personal LaserWriter LS. In fact, MacUser (May 1991) found the PLP II to be 20% faster than the Apple Personal LaserWriter LS on their Microsoft® Word test document, 40% faster on their MacDraw® II test, and twice as fast on their Excel test.
- **On-screen page preview.** Saves time, toner and paper.

Of course, the PLP II also features the unmatched reliability and innovation that go hand-in-hand with the GCC Technologies name. It's the name to count on when you're looking for a high-quality, affordable laser printer. And there's no margin for error.

**Easy Ordering. 800-422-7777, extension 763.**

To acquire your new PLP II, simply call us toll-free, and we'll give you the name of the GCC Technologies dealer nearest you. Or order direct from us, with a 30-day money-back guarantee and $9 overnight delivery.

End user's circle 231 on reader service card

Dealers circle 232 on reader service card

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there, then saving them to their final destination. Muse supports WKS, WK1, DBF, DIF, and SYLK formats, along with tab- or comma-delimited text, and fixed-field data. The documentation is thorough and clear about how best to organize data into an optimal form for flexible access. Files can also be imported directly from a flat-file database into a databook.

Putting It Out
OUTPUT FROM MUSE IS LIMITED TO spreadsheets and graphs. This is fine if you’re giving a presentation to the boss, but generating written reports requires a lot of cutting and pasting. Conventional database applications support mail merge-like output such as “Dear Mr. XXXX. We notice that your YYYY invoice for ZZZZZ is WWW months overdue…” Muse has nothing like this. Its graphics are flexible but limited. If two- and three-dimensional bar charts aren’t enough, you can animate a 3-D chart to give it a fourth dimension. You can change colors, fonts, backgrounds, and axes to your heart’s content—you can even change the perspective on 3-D plots. In the end, though, only the usual business-type graphics are supported: bar, column, and pie charts, as well as scatterplots and x-y graphs. In general they’re showy but not very informative.

Muse support sophisticated analyses such as time series projections. It concentrates instead on calculating factors such as sales by region, and yield per unit of raw material. Given its extensive library of scientific constants, units, and functions, you’d think Muse would be useful in the laboratory, but it has no scientific analyses such as curve fitting. Nor does it support any technical graphics such as true contour plots and histograms; it supports only linear and log scatterplots and line graphs. Muse’s units and scaling functions are confusing as well as useful. A request for one century in days returns Units Conflict. Yes, it’s true that this century has 36,524 days and the next one will have 36,525, but give me a break—this could be a useful conversion. At least give the user a hint as to the problem. Muse also attempts to handle the delicate question of significant figures, and the result is mixed. Typically, returned answers have far too many significant digits given the precision of the question.

My biggest concern is the language interface. Muse’s queries—its programming language—are deceptively easy to misread as English. It’s much harder to write correct queries than it appears to be. Most amateur attempts result in diagnostic messages such as ‘What’ cannot begin a sentence, right after five successful questions beginning with What. More pernicious, though, are the improperly framed questions that do get answered. Buried in the back of the reference manual are all the rules for precedence of operators and parsing sequences, but it takes experience to know how to interpret and use them. Any programmer knows that understanding these rules is crucial for getting the right answer. Do I read 5 * 6 + 4 as (5 * 6) + 4, which equals 34, or as 5 * (6 + 4), which equals 50? Muse’s tutorial teaches by example, and the reference material clearly explains a few ways to avoid going wrong, but it’s not enough. Nonprogrammers will either plow ahead and make some unseen mistakes or bog down and give up. Don’t misunderstand—this is a major issue for anyone who deals with natural language, but it’s still a problem.

Muse’s extensive documentation is well written and helpful, if a bit tedious and repetitious. The program makes use of System 7 balloon help and includes a nice elementary tutorial. What’s missing is a large example that a student can work through from data loading through final output. In this problem of scope and complexity, this is essential.

I found a few bugs and Mac interface anomalies. The zoom box fills all possible monitors in a multiscreen Mac II setup; it should fill just the currently active one. Multiple selection in scrolling lists is done by dragging, not shift-clicking, and there’s no Select All function. To restore a deleted data entry, you press the escape key, but if you clear a cell using %B, you use %Z to undo.

If You’ve Got a Niche
OVERALL, I’M VERY IMPRESSED BY THE scope and ambition of Muse, and it clearly fills a niche not currently addressed. It’s an excellent environment for certain kinds of data handling—for example, if you want to analyze your little corner of an enormous corporate database. As the product and its user base mature, Muse should realize its potential.—PHILIP STEIN

Educational Games

Number Munchers 1.1
PROS: Combines arcade excitement with teaching; outstanding color graphics. CONS: Repetitive cartoon sequences; no mechanism for creating custom word lists. COMPANY: MECC (612/569-1500). REQUIRES: Mac Plus; System 6.0.2. LIST PRICE: $49.95; with teacher materials $69; five-pack $149; network license $399.

Super Munchers 1.0

Word Munchers 1.0
PROS: Combines arcade excitement with teaching; outstanding color graphics and digitized voice cues. COMPANY: MECC (612/569-1500). REQUIRES: Mac Plus; System 6.0.2. LIST PRICE: $49.95; with teacher materials $69; five-pack $149; network license $399.

Number Munchers
IN NUMBER MUNCHERS, THE PLAYER maneuvers a cartoon Muncher around a matrix game board, finding and gobbling up numbers. In a typical game the player’s job is to navigate the Muncher to each multiple of four so it can eat the number. Correctly chomped numbers earn points; incorrect bites wipe out the Muncher. Each game begins with four Munchers and ends when all four are gone.

To make things more interesting, evil
If you said you could buy an 040 upgrade for under $1500, people would call you crazy.
Word Munchers

**Word Munchers is essentially the same game, but the Muncher's job is to eat words with vowel sounds that match the target sound. For example, if the message says "u as in huge," the Muncher gets points for eating cube, feud, and sweet, but loses big if he tries to eat truck. Players who have trouble reading the word can use the Hear Vowel command to hear a digitized voice pronounce the sound; there's no option for pronouncing the words in the grid, though.**

Super Munchers

**FROM A KID'S POINT OF VIEW, SUPER MUNCHERS has a longer-lasting appeal than the two other Muncher games. It's targeted for the home market, and the game titles sound like categories on a TV quiz show: Animals, Famous Americans, Food and Health, Geography, Music, Odds 'n' Ends, and Challenge. A word or phrase at the top of each screen represents a "target rule," such as European countries, romantic composers, and animals with an exoskeleton. The Muncher is supposed to swallow words conforming to that rule.**

Most of all, kids like the arcade extras, new to Super Munchers. Get 20 consecutive correct answers, and a Transformation Cell temporarily turns a Muncher into a Super Muncher capable of gobbling Troggles and pecking at correct answers. And for every three levels completed, Super Munchers rewards the player with one of five interactive minigames ranging from simple logic games to fast-paced arcade games.

Food for Thought

**ALL THREE GAMES CONTAIN PASSWORD-PROTECTED MANAGEMENT menus that allow parents and teachers to control the curriculum. Word Munchers lets you specify the difficulty level (from grade 1 to grade 5+) and choose any or all of 20 distinct vowel sounds. Number Munchers can be set up to ask for multiples, factors, primes, equalities, and inequalities; each of these categories can be fine-tuned. You can also choose a predetermined curriculum**

<table>
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<tr>
<th>OCR Programs</th>
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<td><strong>Wordscan 1.0</strong></td>
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<tr>
<td><strong>Wordscan Plus 1.0</strong></td>
</tr>
<tr>
<td><strong>PROS:</strong> Read any font accurately with little setup; recognize dot matrix characters; highlight errors in text editor; support PICT and TIFF file formats generated by scanner or fax modem. <strong>CONS:</strong> Idiosyncratic interface; incompatible with some hardware and system functions. <strong>COMPANY:</strong> Calera Recognition Systems (408/720-8300). <strong>REQUIRES:</strong> Mac Plus; 3MB of RAM; hard drive. <strong>LIST PRICE:</strong> WordScan $495; WordScan Plus $895.</td>
</tr>
</tbody>
</table>

**CALERA'S TOPSCAN OPTICAL CHARACTER RECOGNITION (OCR) system has been widely praised for speed and accuracy, but its price tag (approximately $20,000) limits its use base to corporations and a few prosperous service bureaus. Calera now addresses the needs of us mere Mac mortals with two software-only products, WordScan and WordScan Plus. Both provide scanning and text-recognition options that easily put them in a league with the current OCR champs, Xerox Imaging Systems' AccuText and Caere's OmniPage (see "OCR: Teaching Your Mac to Read," Macworld, November 1991). WordScan Plus goes a few steps further, adding style sheets, a pop-up window to compare a word to what was originally scanned, and a feature that automatically identifies graphics on a scanned page and saves them to separate files. Throw in user-definable dictionaries, support for deferred processing (scanning pages, then running the OCR software later), and the ability to jump from one questionably recognized word to the next inside the text editor—features found in WordScan and WordScan Plus—and you're looking at two of the finest OCR programs for the Macintosh.**

Lean and Mean

**THE BEST THING ABOUT WORDSCAN (I am using the product name to include both WordScan and WordScan Plus) is the degree of automation it offers. In addition to the ability to read virtually any typeface, including draft-quality dot matrix text—an attribute equaled only by OmniPage and AccuText—WordScan can automatically subdivide a page into the appropriate number of columns. In OmniPage and AccuText, you have to either specify the number of columns prior to recognizing a page, or preview a scanned page and determine the boundaries of each text block. In WordScan, previewing is necessary only when you want to isolate a specific area of a scanned page, such as a single story on the front page of a newspaper. The program automatically reads through each column and displays a progress window to let you know what percentage it has recognized. WordScan Plus allows you to manually select and link columns, but this laborious process is rarely necessary.**

While OmniPage and AccuText are commendably accurate text readers, you must fuss around with brightness and contrast settings to yield the most favorable results. WordScan is the only OCR program I've used that lets you sit down and immediately begin scanning. Without any scanner adjustment whatsoever, WordScan consistently performed better than either of its competitors (though, with sufficient effort, OmniPage and AccuText can be made to read as well as or better than WordScan). As with the Macintosh itself, you just plug WordScan in and it's ready to use.**

One Word or Another

**TO MAINTAIN ACCURACY, AS WORDSCAN reads words, it compares them to those in a built-in dictionary. AccuText also provides this function, but WordScan's version is considerably faster.**
No one will think you're skeptical, money conscious or overly cautious for not considering the Radius Rocket 25i. Just basically insane.

Simply because the Rocket is the easiest way to turn your Mac into one bad apple. It easily plugs into your NuBus slot and protects your current investment by utilizing your Macintosh, not replacing it. Rocket enables your existing motherboard to handle I/O commands while its 040 co-processor races up to six times faster than your Mac II.

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If you're interested in an incredible 040 upgrade with the $1,499 Rocket 25i, or the $1,999 Rocket with the integrated math coprocessor, call us at 1-800-227-2795 for a free Rocket Lift-Off compatibility disk and brochure. Or dial 1-800-966-7360 for faxed information.

If you'd like, we'll reserve you a brand new Rocket. If not, we'd love to reserve you a suite at Happy Acres.

©1992 Radius Inc. The Radius logo and all Radius product names are trademarks of Radius Inc. For your local Radius International Reseller, call 408-434-1010. *Compatible with the Macintosh II, IIx, IIcx and IIc. Tested under System 6 Finder with RAM cache off. Tests performed in black and white on 12- or 13-inch monitors, with AppleTalk off, minimum disk cache and extensions turned off. MacWEEK 10/22/91. Circle 178 on reader service card
MicroNet's RAVEN brought unbeatable disk array performance to the Macintosh II. Now there's a more powerful Macintosh. The Quadra 900! It's based on 68040 technology and it's fast. The performance of the Quadra can be greatly increased by use of a MicroNet RAVEN-040 disk array.

The RAVEN-040 is a two-drive array that employs FAST-SCSI-2 technology. With data bursts as fast as 10 MBytes/sec, and average access times as low as 7 ms, these new systems are four times faster than the standard 160 MByte drive. They install internally and range in capacity from 624 to 2,020 MBytes.

The RAVEN-040 is expressly designed to use the built-in SCSI-2 ports of the Quadra 900. The PDS and all five NuBus slots remain open for other use.

The RAVEN-040's built-in performance makes it ideal for graphics, animation, pre-press, digital sound, multimedia, CAD/CAM, and file-servers, where speed and capacity are paramount.

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Circle 113 on reader service card
like any OCR program, WordScan frequently misreads text. But rather than requiring you to find and correct errors on your own, WordScan highlights recognition errors—words that don't match its dictionary—and lets you jump from one error to the next. WordScan provides no post-recognition spelling checker, as OmniPage does, but it does provide a search-and-replace command. WordScan Plus enables you to display an enlarged detail of the questionable entry so you can proof and correct a mistake without the original hard copy.

Once mistakes have been corrected, WordScan Plus provides a style-sheet feature that can automatically format a current document, including character and paragraph attributes. Unlike similar functions in word processors that save style sheets within documents, WordScan Plus saves style-sheet definitions to a preferences file, so that they can be applied to other documents. Unfortunately, you cannot apply more than one style sheet per document.

WordScan provides drivers for Apple, Epson, Hewlett-Packard, and Microtek scanners. WordScan also recognizes text from PICT and TIFF files, whether scanned to disk or received via fax modem. Additionally, if a fax image has a low resolution, as in the supported 100-by-200-pixel picture received by a Dove fax modem, WordScan doubles the horizontal or vertical resolution of the image to increase the potential for recognition.

Some of WordScan’s commands could be better implemented. It took me several minutes to figure out that choosing the Pop-Up Verifier command takes you to the built-in text editor. I encountered a handful of problems not mentioned in the documentation. For example, while Calera claims that WordScan is fully compatible with System 7, the program does not allow you to position scanner drivers in the Extensions folder, despite the fact that WordScan’s drivers are Chooser extensions. The program is incompatible with 24-bit color display.

I don't consider any of WordScan’s problems debilitating—especially in light of the deluge of problems normally associated with OCR. In fact, once I got used to its idiosyncratic interface, I found WordScan worked more accurately with less effort than either OmniPage or Accu-Text. WordScan Plus offers some nice conveniences, but I’m not sure they justify the $400 difference in price. If Calera were to knock $300 off the list price of WordScan Plus, I would easily recommend it over any other OCR product costing less than $1000. Of the two programs, I lean toward the less expensive WordScan. It gets the job done, and in the world of OCR, straightforward recognition is what it's all about.—Deke McClelland

**REVIEWS**

**Cheat Sheet** WordScan Plus shows you a detail of the original scanned page to compare with questionable words and misread characters.

**Dymac Model 1**

**PROS:** Compact; easy to use. **CONS:** Produces gray-scale images only; short battery life.

**COMPANY:** Dymac (818/998-8008). **REQUIRES:** Mac SE; 32-bit QuickDraw. **LIST PRICE:** $895.

---

**Canon RC250**

**PROS:** Stores up to 50 color images per video floppy disk; easy to use; hooks up to any television.

**CONS:** Included video-digitizing board adds video artifacts to images. **COMPANY:** Canon (516/488-6700, ext. 3359). **REQUIRES:** Mac II; 2MB of RAM; 8- or 24-bit graphics display. **Recommended:** Hard drive. **LIST PRICE:** $1099.

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Captured video frames are excellent components of desktop presentations and, with the advent of QuickTime, are becoming more widely used. The primary video sources for frame capture are prerecorded formats like videotape and laser disc, and live, full-motion video from a camcorder. But they're not your only choices.

A still-video camera is much like a regular film camera, except that it captures a video image and saves it on a miniature floppy disk or in RAM.

**Canon RC250**

**THE CANON RC250** (FORMERLY CALLED the Xap Shot) resembles a standard 35mm film camera, but instead of exposing film, the RC250 captures images on a solid-state chip called a charge-coupled device (CCD). The CCD captures one field of 16-bit color video. Up to 50 images can be stored in an analog format on a 2-inch video floppy disk. Resolution is comparable to that of many VHS camcorders, and you can play back your pictures on most televisions, using the supplied video adapter and battery charger. The camera has a built-in automatic flash, a small LCD panel showing the number of shots taken, and a few buttons that control recording and let you step through your shots on playback.

To get these still pictures into the Mac, you need a video-capture board, which digitizes the analog image saved on the video floppy disk. Canon bundles the RC250 with Digital Vision’s ComputerEyes/Pro bundle. The RC250—ComputerEyes/Pro bundle is easy to use. After charging the camera’s battery, I inserted the video floppy, turned on the camera, and started taking shots. After taking a variety of shots, I hooked up the camera to the charger/video adapter, and connected the adapter to my television via a standard RCA-plug video cable. The pictures appeared on the screen.

The picture quality is extremely dependent on the available light. Some shots that I took outdoors just before sundown were too dark, although there was plenty of light to the eye. With sufficient light, the pictures are much clearer and more detailed, although video scan lines are quite noticeable. The ComputerEyes/Pro digitizing board is just as easy to use as the RC250. After loading the board’s software and placing the board into a NuBus slot on my Mac, I plugged the camera adapter’s video-out into the digitizing board. The video-capture application allows you to preview an image and make adjustments to the brightness and color balance before you capture the frame to disk. You can save the captured image in PICT or TIFF format. As previously reported in Macworld (see “Frame by Frame,” March 1992), the ComputerEyes/Pro’s captures lack contrast, and the board tends to add color speckles, smearing of fine details, and other video artifacts into the picture. I was able to get cleaner captures from two other video-capture boards, but in fairness, those boards each cost more than the whole RC250—ComputerEyes/Pro bundle. For the user looking for an inexpensive still-video system, the ComputerEyes/Pro board provides adequate captures.

**Dymac Model 1**

**THE DYMAC MODEL 1 DIGITAL STILL Camera uses a different approach than that of the RC250. The flat, vertically shaped camera has a built-in flash and a fixed-focal length lens. The Dymac records images in 8-bit gray scale, digitizing and saving them to RAM inside the camcorder.**
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era. There’s enough RAM to store 32 images, but you can’t store them for long—the rechargeable batteries inside the Model 1 ran out of juice overnight (the manual warns you to recharge the batteries as often as possible). Recharging takes about six hours. The Dycam Model 1, however, is easy to use; you simply point and shoot. The flash works automatically; there’s no manual override.

Using Dycam’s software, you download the images to the Macintosh via a cable plugged into the modem port. You can save the images as TIFF files. The Dycam creates detailed gray-scale images, and it also supplies a limited gray-scale-editing program.

I prefer the RC250 to the Dycam. The RC250 stores images permanently on floppy disks, it plays them back on any standard TV, and the images are in color. The Dycam Model 1 is uncomfortable to hold and shoot because of its vertical shape, and you need to quickly download the images. The Dycam pictures, although gray-scale, are more detailed and better balanced than the RC250’s, without the RC250’s scan-line problems. If you don’t need color and if detail is of primary importance to you, the Dycam is the better choice. However, at $895, the Dycam is overpriced. You can get the RC250—Compu­terEyes/Pro bundle for not much more money, and you’ll be getting a more convenient, color product.

—Tom Negri

Architectural CAD Software

Archicad 4.02

Pros: Good 3-D importing and exporting capabilities; includes photo-realistic renderer with Phong shading; has large library of 3-D objects; stand-alone plotting software accepts most CAD formats; powerful macro language. Cons: Cannot draw in section view; slow redraw in some views; weak 2-D drafting tools. Company: Graphisoft USA (415/737-8665). Requires: 5E/30 or Mac II with coprocessor; 4MB of RAM; System 6.0; hard drive with 6MB of free space. List price: Version 4.1 $3450.

Archicad by Graphisoft is a powerful, full-featured, integrated CAD package designed especially for the architecture and engineering markets. Archicad’s graphic interface is considerably improved over previous versions and now includes a selection tool for stretching and moving objects with the mouse.

The program’s 3-D interface is simple but powerful. It builds on a construction metaphor, using basic block shapes to represent slabs, walls, and roofs, which the user defines (along with their material attributes) through a dialog box. These elements can then be combined and manipulated to produce architectural forms—from simplified buildings to complex interior spaces and urban-design projects.

Once you’ve defined a block, Archicad’s 3-D tools let you cut, stretch, and rotate it, punch multisided holes into it, and combine it with other blocks to form curved surfaces. Blocks can be multiscoped and faces need not be vertical. The Cleanup Intersections command can be invoked manually or automatically to tidy up wall intersections.

Archicad comes with a powerful macro language called GDL (Geometric Description Language). With GDL you can create parametrically defined solid objects that represent building components such as structural elements, doors, windows, and furniture. My experience, however, is that most architects are not experienced with programming and will leave GDL to the techie types. Archicad also allows you to import complex 3-D objects directly from any modeler that creates export files in DXF format.

You begin by entering a design in plan view. Archicad’s database structure enables you to make all revisions from there, updating all elevations, sections, 3-D views, and materials requirements accordingly. The floating-point-based database is extremely accurate. Unfortunately, unless you use one of the faster Macs (ideally a IIx or Quadra), even simple structures usually redraw very slowly. System 7.0.1’s SANE (Standard Apple Numerics Environment) patch helps, as does turning off hatching and using smaller windows, but then, why bother to have those expensive 19-inch monitors?

Another shortcoming is that while the program lets you view a design from almost any viewpoint (plan, section, elevations, perspective, and isometric), you can only draw in the plan view. This means that creating, modifying, and selecting stacked objects (such as transom windows above doors) all require extensive use of dialog boxes to set parameters (height). This quickly becomes tedious in a production situation.

One impressive aspect of program design is Archicad’s ability to cut more than one oblique section plane through a 3-D object, in any of three viewing windows, effectively carving a new object from the original. The new part can be saved to the program’s 3-D object library.

Archicad comes with a large library of parametrically defined 3-D objects. Doors and windows are available as both 3-D objects and related 2-D plan symbols. Graphisoft’s libraries are based on the American Institute of Architects’ architectural graphics standards and organized according to the 16-division Masterformat classification system—a nice touch.

When you’ve completed a design (or while you’re working on it) you can do a complete quantities takeoff (calculation of necessary materials) of your project. The Bill of Materials spreadsheet provides materials descriptions, shows areas and volumes, and calculates cost estimates based on unit costs you supply in the creation dialog boxes. However, finding net areas in Archicad is much more difficult than with a competing product, Architrion, from Gimeor.

You can print or plot directly from Archicad, but the package also includes a stand-alone program, PlotMaker, for combining, arranging, and plotting CAD files from almost any source. I was unable to test PlotMaker, but according to the documentation, it accepts Archicad, DXF, HPGL, and PICT formats, as well as supporting all the popular pen and electrostatic plotters and laser printers.

Rendering and Animation

The most significant improvements in Archicad version 4.02 are its photo-realistic renderer and animation tools. The program accurately casts building shadows based on solar date, time, and location on earth. Archicad accounts for a material’s surface qualities and can define its reflectivity (both specular and diffuse) and the degree of transparency or emission (glowing). You can select faster flat shading or slower but more realistic Phong shading, and you can also include antialiasing.

The program allows you to place PICT images, such as a cloudy sky, to create a background behind a model. The renderer has only one light source, but models can be easily exported to either Pixar’s MacRenderMan or Strata’s StrataVision 3d for rendering with multiple continues.
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light sources, texture mapping, or ray tracing.

ArchiCAD’s animation tool, Fly Through, lets you set a sequence of views through a project. These can be saved as a sequence of PICT or PICS files for use in animations or QuickTime movies.

ArchiCAD incorporates most of the features that an architect could want in an integrated package. That is not to say there aren’t deficiencies. The 2-D drawing and dimensioning tools are weak, lacking the automatic tangent, fillets, and perpendiculars options that competing products have (Graphisoft says version 4.1 greatly strengthens the 2-D drawing tools). Also, not being able to work in section view is a serious shortcoming, one that I hope will be corrected in the future.

The construction metaphor is good, but in the early stages of a design (massing studies, for example) I would like to work online network of ArchiCAD users, in addition to Graphisoft’s own America

index-a rarity among CAD manuals. The tutorial guide is also well done, with a good sample building project.

The tutorial guide is also well done, with studies, for example) I would like to work online network of ArchiCAD users, in addition to Graphisoft’s own America

nor and one major upgrade per year), and people who will both provide an overall orientation of the software’s features and tailor training to fit the way your office works. Graphisoft has a regular upgrade cycle for its software (averaging one minor and one major upgrade per year), and offers free upgrades and unlimited toll-free telephone support for the first year. A maintenance contract is available after the first year. In addition, Graphisoft provides training seminars throughout the United States, and ArchiCAD user groups have been formed regionally. The company has a mentor program that connects new users with experienced users to help them get started. There’s even an active online network of ArchiCAD users, in addition to Graphisoft’s own America Online tech support.—DANIEL M. GONZALES

At $4450, ArchiCAD is not an impulse purchase. The ongoing support relationship with a software company is as important as the software’s feature set. Good, knowledgeable CAD dealers are also important. You want to deal with people who will both provide an overall orientation of the software’s features and tailor training to fit the way your office works. Graphisoft has a regular upgrade cycle for its software (averaging one minor and one major upgrade per year), and offers free upgrades and unlimited toll-free telephone support for the first year. A maintenance contract is available after the first year. In addition, Graphisoft provides training seminars throughout the United States, and ArchiCAD user groups have been formed regionally. The company has a mentor program that connects new users with experienced users to help them get started. There’s even an active online network of ArchiCAD users, in addition to Graphisoft’s own America Online tech support.—DANIEL M. GONZALES

WE CAN PROBABLY AGREE THAT the Mac’s little built-in speaker doesn’t stir the blood of audiophiles everywhere. But even if you need better sound quality (because you’re a musician or a megalomultimedia for instance), why do you need special speakers?

Unfortunately, speakers are basically electromagnets. So you need shielded powered speakers, which have a special interior lining to prevent any magnetic distortion of your delicate computer.

MacSpeaker

THE MACSPEAKER IS A PAIR OF SLEEK, platinum-color speakers 8½ inches tall; they come with Velcro to fasten them to the sides of the Mac. For people who care, they’ve got 10 watts per channel and have a frequency response from 70Hz to 18,000Hz. What’s more, the MacSpeakers, unlike normal stereo speakers, are designed to be positioned only 2 feet apart, and you’re supposed to listen to them from only a few feet away.

What’s especially likable is that the messy power and Mac jack cables are attached to the left speaker. Only a single thin cord snakes behind the Mac to the right speaker; nonetheless, the volume, stereo-imaging, and bass knobs on the left speaker control the sound coming out of both. What’s not so likable is the power transformer: it’s a gargantuan 2-pound black cube halfway along the AC cord.

But most noteworthy is the stereo-imaging sound control. You can adjust a knob on the left speaker to make it sound as if the right and left sound sources are farther apart. This is handy for three reasons: first, you can adjust the focus point of the stereo sound to accommodate your distance from the Macintosh. Second, making the stereo-image sound wider means that more than one person can receive the full stereo effect, without being perfectly centered between the two speakers. And finally, the sound experience when the speakers seem to drift apart is really cool. And they sound pretty good. They’re three-element speakers, meaning there are three individual speaker cones in each; the results are crisp highs and a meaty midrange. The bass is wimpy, though, even at the bass control’s highest position. If you need a fuller sound Persona sells the MS Sub, a compatible subwoofer unit that should put the “not enough bass” complaints to rest.

Bose RoomMates

THE BOSE ROOMMATE COMPUTER Monitor speakers are identical to the regular RoomMate speakers, except for the added shielding and the platinum color. They’re at least twice as heavy and a third wider and deeper than the MacSpeakers; that makes them sound bassier and quite a bit richer, although the single 4½-inch speaker cone in each cannot make the highs sparkle like the MacSpeakers can. Although Bose refuses to release its product specifications, a friendly technician revealed that the RoomMates have an 80Hz to 15,000Hz frequency response with 6w to 8w per channel. The Bose speakers are clearly the choice where power and room-filling sound is important.

The physical design is nice enough: the volume knob is cleverly set into the face of the speaker for easy access, and there’s no ugly transformer box—only a thin power cord that emerges from the left speaker. There’s no way to mount them on the Mac, but Bose offers a $50 mounting stand for your desk. The RoomMates’ key aspect is that they can double as regular bookshelf speakers for a stereo system; of course, that’s the flip side of saying that they’re not really designed for close-up listening as the MacSpeakers are.

So what do you buy? The MacSpeakers have the edge on price ($100 less), sound clarity, and attractiveness. The RoomMates sound fuller and have more power, but lack the crisp highs. Otherwise, both speaker sets work well with regular audio equipment and with what few stereo Mac products there are. But stereo sound isn’t all speakers are good for; anything the Mac utters benefits from amplification and crisp, clear broadcast.

The Talking Moose never had it so good.

—DAVID POGUE

<table>
<thead>
<tr>
<th>Shielded Stereo Speakers</th>
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</thead>
<tbody>
<tr>
<td><strong>Bose RoomMate</strong></td>
</tr>
<tr>
<td><strong>PROS:</strong> Rich, bassy sound; doubles as regular stereo bookshelf speakers.</td>
</tr>
<tr>
<td><strong>CONS:</strong> Heavy; expensive; muddy highs.</td>
</tr>
<tr>
<td><strong>COMPANY:</strong> Bose Corporation (508/879-7330).</td>
</tr>
<tr>
<td><strong>REQUIRES:</strong> Mac Plus; Mac II series for stereo.</td>
</tr>
<tr>
<td><strong>LIST PRICE:</strong> $339.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MacSpeaker</th>
</tr>
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<tbody>
<tr>
<td><strong>PROS:</strong> Beautifully designed for close-up listening; unique movable stereo image; crystal-clear highs.</td>
</tr>
<tr>
<td><strong>CONS:</strong> Weak bass; not powerful enough for use as regular stereo-system speakers; unwieldy transformer.</td>
</tr>
<tr>
<td><strong>COMPANY:</strong> Persona Technologies (415/871-6000).</td>
</tr>
<tr>
<td><strong>REQUIRES:</strong> Mac Plus; Mac II series for stereo.</td>
</tr>
<tr>
<td><strong>LIST PRICE:</strong> $249.</td>
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</tbody>
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—DAVID POGUE

MacSpeakers (left), Bose RoomMates (right)
Nobunaga's Ambition

PROS: An absorbing, challenging game with good historical background; beautiful sounds; limited but nice graphics. CONS: Black and white only; manual not designed for Mac; interface sometimes annoying. COMPANY: Koei (415/348-0200).

REQUIRES: Mac Plus; System 6.0.3.
LIST PRICE: $595.

Nobunaga's Ambition is a fascinating strategy game in which one to eight human players are each cast as the daimiento, or warlord, of a small part of feudal Japan in 1560, during the bloody and tumultuous Warring States period. This is the age of Tokugawa Ieyasu (Claveil's Tora Naga in Shogun), who unified Japan and established the Tokugawa Shogunate after the epoch-ending Battle of Sekigahara in 1600. Also ruling different feuds are the famous Takeda, Ashikaga, and Hojo clans, among others, and of course Oda Nobunaga, a feared warrior who died just as he nearly realized his ambition of unifying Japan. Your aim, like his, is to conquer all the small states and usher in an era of peace.

The game teaches what all wise feudal leaders knew: a strong peasantry is the key to long-term success. Through the judicious use of rice and gold you must improve peasant loyalty, peasant wealth, productivity, flood control, army size, and army loyalty; and you must expand the fief's main town. Meanwhile, the neighboring lords are either invading your fief or sending ninja who steal your peasants, set fire to your town, or destroy your flood-control dams right before the summer typhoons. The game's designers say they have added as much historical accuracy as possible. If you destroy the enemy command unit, all the enemy troops surrender and become loyal to you. But at times the enemy command unit will advance against or even attack a superior unit. It doesn't make tactical sense, but it fits with Bushido, the samurai code of honor.

The game's most annoying flaw is its interface: when you attack, you get a dialog box, with a slide bar, that asks how many thousands of soldiers you want for your invasion. After you move the slide bar to the number, the program brings up another slide bar and asks how much rice you want to bring along. Unfortunately, the default mode sets to only one unit of rice. You can set the proper amount, but if you hit the return key before changing the default setting, your army will not have enough rice to feed itself. At that point you can't stop the invasion, and your carefully trained and expensive army will defect to the enemy.

It's important to read the manual because there are lots of important subtleties. For instance, an army's command unit is marked by an X or O instead of a unit number. It's not immediately apparent that the X means that an ordinary general is commanding the army, while the O means that the lord himself is with the troops.

The manual, although informative and full of historical information, was written for the PC version, and not all the commands are parallel. Overall, I really enjoyed playing Nobunaga's Ambition. If you appreciate games like Risk, Diplomacy, Strategic Conquest, or Spaceward Ho, and especially if you have an interest in medieval Japan, you'll find it totally absorbing.—TOM MORAN

Aldus FreeHand 3.1

PROS: Pressure-sensitive freehand tool works with or without tablet; exports to PICT format; substitutes missing screen fonts. CONS: Flawed support for stationery pads; insufficient text tools; most old problems unresolved. COMPANY: Aldus Corporation (206/622-5500).

REQUIRES: Mac Plus; 2MB of RAM; System 6.0.5. Recommended: 5MB of RAM; System 7.0. LIST PRICE: $595.

IN 1991 DENEBA SOFTWARE'S CANVAS and Adobe Illustrator both nudged out FreeHand in major awards as the best drawing packages of the year. If the new upgrade of FreeHand is any indication, however, Aldus is back in fighting form.

The most remarkable new feature in FreeHand 3.1 has got to be the pressure-sensitive freehand tool, the first of its kind in any vector-based drawing package. Tied with a pressure-sensitive stylus and tablet, the freehand tool produces calligraphic lines of varying weight. Technically, this is impossible because lines printed to a PostScript printer must be constant in weight; FreeHand's workaround is to define the freehand line as a closed path—that is, a snaking shape that becomes thick and thin with the pressure of the stroke. Even without a tablet, you can vary the weight of a line from the keyboard.

FreeHand 3.1 fully supports TrueType fonts, even letting you convert a TrueType character to Bézier paths—a function previously offered only in Canvas. The upgrade also supports System 7 balloon help and publish and subscribe. The only slipup is in the implementation of stationery pads. If you change an illustration file to a stationery pad at the Finder level, you convert the file to a FreeHand template, which opens as an untitled document. If you save a file as a template from within FreeHand, however, the file is not perceived as a stationery pad at the Finder level, which means that you can't search for it by kind, you can't view the icon in the Open dialog box, and so on.

When you export an EPS file from FreeHand 3.1, the program creates a link between the EPS file and its current illustration file. If, after you've placed the EPS file into a PageMaker document, you want to edit the original file, PageMaker will launch FreeHand and instruct it to open the original illustration, allowing you to make the desired changes. When you save the edited original, FreeHand automatically updates the EPS file on disk, and PageMaker automatically updates the placed version inside the PageMaker document. This procedure also works for EPS files placed in a FreeHand document.

The fact that FreeHand can now open and edit some of its own EPS files qualifies as a step in the right direction. (I also place in this category FreeHand 3.1's ability to export in PICT format. FreeHand beats Illustrator in exporting PICT files, but plays catchup to every other drawing package.) Other changes, such as the smaller font size used in the palette lists, are only cosmetic.

But many enhancements are bona fide improvements. For starters, FreeHand 3.1 lets you substitute fonts for those present in an illustration but absent in your System file. When you open an illustration that contains text for which FreeHand cannot locate the correct screen font, the program gives you the option of printing the text in Courier (the FreeHand 3.0 solution) or formatting the text in a new font.

FreeHand 3.1 still needs improvement. Its text-editing tools, for example, rank among the worst in any draw program. (The new FreeHand 3.0 for Windows lets you create and edit text directly in the drawing area. FreeHand 3.1 for the Mac still requires that you create and edit text within a cumbersome dialog box.) And virtually all of the other complaints I had about FreeHand 3.0 still exist (see Reviews, Macworld, August 1991). Even so, FreeHand 3.1 is a move in the right direction.—DEKE McCLELLAND
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**Object-Oriented Development Environment**

Prograph 2.5

**PROS:** Data-flow diagram is the program; supports all standard OOP features; completely supports **Inside Macintosh** standards; includes multilayer database engine; excellent tutorial and documentation.

**CONS:** Steep learning curve; difficult to use on small screen. **COMPANY:** TGS Systems (602/455-4446). **REQUIRES:** Mac Plus; 2MB of RAM; hard drive; System 6.0 or A/UX. **LIST PRICE:** $495 (additional interfaces and tool kits optional).

MW ✽✽✽

Prograph 2.5 places Macintosh custom application development within the reach of Mac enthusiasts who have some programming experience. More-experienced developers can take advantage of the icon primitives that implement routines presented in **Inside Macintosh**, Apple Computer’s six-volume guide to programming. Prograph’s compiler creates stand-alone applications that fully conform to Macintosh interface standards. Version 2.5 takes advantage of the features of System 7, including IAC, balloon help, and 32-bit memory mode. Prograph is elegantly designed and its documentation is excellent, especially the tutorial overview. Learning the program requires some time, but the effort is amply rewarded.

Prograph is a fully object-oriented system. It supports data abstraction by encapsulation, which shields the user from complexity; inheritance, which lets objects take on characteristics of a parent; and polymorphism, which means that each object responds with a method appropriate to its class.

Conceptually, Prograph is more advanced than traditional object-oriented programming (OOP) in that Prograph sends a copy of the object through the data-flow diagram rather than just messages from an object. Prograph’s visual language shows input data and the resultant output data from an icon as connecting lines, as in any data-flow diagram. Diagrams, tables, forms, and icons are the programming elements of the Prograph visual environment, making it easy to visualize a program’s logical branching.

Prograph’s tool kit helps you specify application components, such as menus and windows, by using system classes for these elements. Components appear on screen just as they will in the finished application; you don’t have to write code. The tool kit integrates the Prograph development environment with the Mac ROM-based toolbox and Mac Operating System managers. Toolboxes for C, Pascal, and SQL databases are also available from TGS Systems.

In adapting the program for the Mac from earlier IBM-compatible and Apple IIGS versions, StudyWare failed to put geometrical figures or paragraph-length text on screen. Thus you find yourself reading the questions from a booklet but answering them on screen, which gets awkward. The interface is pretty stark, and some features of program operation (the timer, for example) aren’t adequately explained. On-screen graphics and text windows—promised (along with MultiFinder compatibility) for future editions—will be a significant improvement.

The program presents four full sample tests that emulate the SAT; a test on standard written English; and a series of drills on math (four levels of algebra, computation, and word problems), on verbal skills (synonyms and antonyms, analogies, vocabulary, and so on), and on reading.

In **Tutor** mode, the drills give one-line explanations when you answer incorrectly (see "That's SAT"). That's not an awful lot of tutorial assistance, but it provides more training than the **Test** mode does. By contrast, **Score Improvement** for the SAT ($99.95 from Queue) makes up custom drills based on the student’s weak areas in a preliminary test. You can perform the drills in timed mode to simulate real SAT pressure.

StudyWare is most appropriate for students who need a quick brushup in some test areas and want to familiarize themselves with the SAT format, rather than those who need extensive work in the basics. To make a fair evaluation of the program, I first took two sample tests, then worked through all the available drills and the Cliffs guide, and took the remaining two tests. From my improved scores in the second pass at the tests, I estimate that conscientious work through the drills and sample tests is worth between 50 and 120 points each on the verbal and math parts of the SAT.

That’s not bad for $50 (or as little as $27 from mail-order distributors), considering that high-school letter jackets cost more than $150 and a prom date can run several hundred. The modest investment in money—and time—may pay off in some lasting results.—MARY S. TOTH

SAT Training Program

StudyWare for the SAT 3.7N

**PROS:** Inexpensive; acquaints student with test formats; on-screen timer. **CONS:** No mathematical graphics; some supplied booklets not coordinated with program. **COMPANY:** StudyWare Corporation (619/495-0190). **REQUIRES:** Mac 512K; second disk drive. **LIST PRICE:** $49.95.

SAT scores are one of the more terrifying aspects of high-school life. StudyWare Corporation, a leading vendor of drill programs for the whole alphabet soup of standardized tests that confront American students—ACT, GRE, GMAT, LSAT, and so on—offers a low-cost Mac study aid for the Scholastic Aptitude Test that can help lessen students’ fears.

The StudyWare package includes a 250-page Cliffs SAT Preparation Guide as well as two booklets containing long text passages and geometrical figures. This material is not, however, as helpful as most of the widely available large-format SAT handbooks, such as Barron’s. The program itself is essentially a follow-up quiz on the printed study material, with some additional drills.

Prograph is well poised to take advantage of parallel processing computers. Its data-flow diagram is mature and powerful. Icons of different shapes help differentiate the processes. There is a standard set of classes, which the user can augment. TGS provides 15 icons for operations such as Get Attribute and Set Attribute, and 13 for controls such as Loop, List, and Next Case; more-refined distinctions among the icons are handled by labeling them.

Prograph manages the event loop for you, simplifying Macintosh programming. The integrated editor/interpreter lets you build an application, run it, stop the application to make changes, and then resume running.

C, Pascal, and FORTRAN language routines can be used from within Prograph. You can also invoke XCMDs and XFCNs that were created for use with Apple’s HyperCard or Spinnaker Plus. New to version 2.5 is a database engine for creating flat-file, relational, and object-oriented databases. A sample flat-file database comes with the package, along with the source diagram so you can make changes.

Prograph has an international following notably in Japan, where the graphics-based program is particularly appreciated. With the program’s solid design and expanded capabilities, Prograph’s user base should broaden even further.—DAN SCHUSTER
E-Machines continues to set the 16-inch standard for business productivity. With "switch-on-the-fly" dual resolutions, accelerated 24-bit color, video-out and integrated 10BaseT Ethernet networking. On one card, that drives any display, costs less than a single function card and takes up only one slot. You get the increased productivity of viewing up to two pages, and fast Ethernet data exchange that allows you to see more and do more in a lot less time. Nice with any display. Just right with an E-Machines 16-inch display.

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**Cordless Input Devices**

**SICOS Cordless Rechargeable Mouse**

**PROS:** More freedom of movement than with corded mice; rechargeable. **CONS:** Flat case is hard to grip; material on desk can interfere with transmission; limited tactile feedback. **COMPANY:** Softcode Canada (416/477-5474). **REQUIRES:** Any Mac with ADB port. **LIST PRICE:** $89.

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**SICOS Cordless Trackball**

**PROS:** More freedom of movement than with corded trackballs. **CONS:** Click-lock button is hard to reach; material on desk can interfere with transmission. **COMPANY:** Softcode Canada (416/477-5474). **REQUIRES:** Any Mac with ADB port. **LIST PRICE:** $109.

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**PageBrush Professional**

**PROS:** Ingenious concept; can scan full-page (or larger) images; produces 300-dpi gray-scale images. **CONS:** Very slow; hypersensitive mouse buttons; expensive. **COMPANY:** Mitsubishi International (415/544-2781). **REQUIRES:** Mac II; 2MB of RAM; hard drive with 4MB of free space; System 6.0.5. **LIST PRICE:** $795.

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**Gray-Scale Hand-Held Scanner**

**SURELY IT'S A CURSE OUT OF GREEK mythology—to be blessed with a brilliant idea, but condemned to see it poorly executed. So it seems to be with Mitsubishi, whose PageBrush Professional gray-scale scanner (formerly marketed by Mouse Systems) is so clever that it makes your jaw drop—but the final product's rough spots make your heart sink. The idea is that you can swipe this chalkboard eraser-size scanner across a full-size page in a zigzag, as though you're wiping the image with a sponge. As you scan, you actually see the image melt onto the screen, stroke by stroke, at up to 300 dots per inch, looking sharp. The software continually stitches the image together from your swaths across the page—so if you miss a spot, it's perfectly OK to rub back over it. When you're finished scanning, you can touch up the on-screen image with a simple but well-designed set of painting tools and effects (Lighten, Darken, Enhance Contrast, and so on).

For the first time, you're freed from the hassle of SCSI and power cords: the PageBrush Pro NaBus board slips into a Mac II, and the scanner itself is the only thing that dangles from the Mac.

Unfortunately, the rest is disappointing news. First, the unit doubles as a mouse—an evidently great idea in the DOS PC version, but a clunker for the Macintosh. As a mouse, the PageBrush Pro is too big, its trackers are far too sensitive (making the pointer fly across the screen with the slightest twitch), and the two hair-trigger mouse buttons almost click just by looking at them. What's wrong with oversensitive buttons? Nothing—except that the tricky scan-preparation process for this particular scanner involves two delicately timed mouse clicks; a third click ends the scan. Brush a button at the wrong time, and you've blown the whole scan.

Trying to avoid those buttons isn't the only physical challenge you have while scanning. You can't move the mouse/scanner faster than about an inch per second across the page, or its stitching-brain gets confused and you have to start over. Even if you do everything perfectly, successive wipes of the page can still get misaligned by a pixel or two, producing visible seams in scanned images containing physical or implied straight lines (like text columns).

The other problem is that the software is agonizingly slow. Applying an image filter to a 2-inch-square selection takes 2 minutes—you're hardly encouraged to experiment. Saving a postcard-size gray-scale TIFF file took 15 minutes (Photoshop, by comparison, took 33 seconds).

Oh, what a disappointment. If the PageBrush Pro scanning-setup process weren't so slow and finicky, if the manual had been proofread, if the clear plastic sheet weren't so vulnerable to fingerprints and scratches, and if the scanner weren't a mouse, then the impressive technology built into this device would shine through, making it an eminently practical piece of graphics gear.

Still, though—what about the money you save? Isn't it worth the inconveniences to avoid the expense of a flatbed scanner? You decide. At this writing, you can get a Microtek gray-scale flatbed scanner by mail order for $30 more.—DAVID POUGE
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Center the characters within the boxes just below them using the broken lines as a base. Try to write neatly. Don't forget the punctuation! Remember, what you write here will become the final font.

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Minicab is one of the oldest statistical-analysis packages, and one of the best. It supports a broad (though not exhaustive) set of statistical tools; it's easy to learn from and easy to use. As a result, it has always been a favorite for teaching statistical computing. Its emphasis on graphics naturally leads students away from a fixation on the numbers, toward a greater understanding of the meaning that lies beneath.

Minicab was first designed for mainframes and minicomputers. The user typed in commands via a dumb terminal and received results (including graphs) in typed form. This command-line interface is a poor fit in the Mac world, and Minicab has been seen as a second-class citizen, its only advantage being uniformity across platforms.

PRO-CITE 2.0 BRINGS WELCOME relief for scholarly disorganization. A database program designed for bibliographic references, it enables researchers to store and retrieve bibliographic records for a wide range of materials. A variety of output formats make it easy to produce bibliographies in many styles, including those required by academic journals and professional associations. Pro-Cite can manage multiple data-bases of 100,000 records each, making it useful in professional settings such as libraries as well as to individuals.

A pop-up menu gives access to 20 predefined data-entry forms (called workforms)—from those for books and periodicals to those for letters, manuscripts, works of art, music scores, and computer programs. You can add up to 6 custom forms. Records can contain up to 45 fields of variable length. Standard library bibliographic fields include author, title, publication dates, and call number (Library of Congress or Dewey decimal). For more specialized needs, you can add fields for such items as a reference within a source; storage location; type of document; or an abstract. The manual explains how to correlate bibliographic styles with Pro-Cite workforms. For example, a record for a published conference proceedings uses the Book, Long Form workform; unpublished proceedings use the Conference Proceedings workform; interviews take the Manuscript workform.

When it comes to selecting references for a bibliography, you can search a particular field, all fields, or fields using Boolean modifiers. You can save search expressions for reuse during a later retrieval. In addition, you can simply browse records, marking selections for a bibliography one by one.

Besides letting you create a bibliographic database from scratch, Pro-Cite imports records easily from the DOS version of the program and imports ASCII files from other databases. If you have PBS's Biblio-Link application ($195), you can import and format records from online data-bases and CD ROM products.

Minitab 8.2

**PROS:** Complete statistics package; uniform over many platforms; excellent teaching tool. **CONS:** Weak, typewriter-like graphics and output; results are static, requiring repeated analyses to view changes. **COMPANY:** Minitab (814/238-3280). **REQUIRES:** Mac Plus; hard drive; System 6.0. **LIST PRICE:** $995; for educators $395.

**BIBLIOGRAPHIC DATABASE MANAGER**

**PRO-CITE 2.0**

**PROS:** Flexible; 20 predefined and 6 user-defined record forms; sorts by Dewey decimal and Library of Congress call numbers; compatible with DOS-based database program designed for bibliographic databases. **CONS:** 27-page manual explains how to correlate bibliographic styles with Pro-Cite workforms. **COMPANY:** Personal Bibliographic Software (PBS) (313/996-1580). **REQUIRES:** Mac Plus; System 6.0.2. Recommended: Hard drive. **LIST PRICE:** $395; search-only version $195.

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FolderBolt 1.02

PROS: Easy to use; extremely flexible; excellent online help. CONS: No file encryption; does not work over a network. COMPANY: Kent Marsh (713/522-5625). REQUIRES: Mac 512KE; System 6.0.4. LIST PRICE: $129.95.

FolderBolt isn’t designed to protect entire disks or individual files. Instead, it works at the folder level. You can designate three levels of folder protection. Read-only folders contain documents that can be read by applications but cannot be altered without a password. This type of folder is particularly useful on a shared computer, where sets of important documents need to be accessible to everyone, but only one person (the one with the password) is charged with keeping the data up-to-date.

A second level of protection is the drop folder. Anyone can deposit files in a drop folder, but only those who know the folder’s password can see or read them. Coworkers can leave files for you in a drop folder on your hard drive, confident that no one else will be able to see or change them.

FolderBolt’s highest level of security is the password-protected folder, which requires a password to do anything to the files—delete, copy, modify, or add new files. What’s special about FolderBolt is its flexibility. Virtually everything can be configured to your preference. For passwords, you can specify a minimum length, how they display when typed, whether they’re case-sensitive, and whether they should be verified when first entered. When you choose Shut Down from the Special menu, FolderBolt can automatically unlock all folders.

You can also designate several bolted folders as belonging to a set, allowing you to deal with them collectively at startup or shutdown, for instance.

The FolderBolt Administrator program provides a safety net for a forgotten password. As long as you have the original Administrator (or a copy made from the original disk), you can unlock any folder, set of folders, or all bolted folders. Since you also use the Administrator to set preferences and view the activity log, you’ll probably want to keep a copy of it on the hard drive, too. To maintain security, you can require a password to run the Administrator.

There are a few compatibility issues. DiskTop can circumvent FolderBolt’s read-only folders and make copies of items within the folders. And TOPS 3.0 is incompatible, though later versions work.

Of greater concern to most users is that FolderBolt security may make other types of file, folder, and hard drive protection less convenient to perform. Disk-recovery tools, such as those included in SUM, MacTools Deluxe, and The Norton Utilities for the Macintosh, cannot operate on FolderBolt-protected folders. Similarly, backup programs cannot back up FolderBolt-protected folders. The workaround is to periodically use the FolderBolt Administrator to override the entire drive’s protection, run the disk-recovery or backup program, and then restore FolderBolt protection.

Although FolderBolt works well under System 6.0.4 and later versions, it works best with System 7. Under System 7 you can use folders to protect applications, for instance, placing an application inside a read-only folder to make certain that none of your colleagues unknowingly alter the program. Or you might want to put that same program in a password-protected folder so that no one other than you can run it. Double-clicking on a document made by the program still results in launching the program, but under System 7, FolderBolt denies access to the application.

If you don’t need encryption, FolderBolt should easily meet your security needs.

If you decide later that you want encryption too, Kent Marsh sells an Encryptlnit that works hand in hand with FolderBolt.

—STEVEN SCHWARTZ

Patton Strikes Back: The Battle of the Bulge


In the past, military simulation games—with all their military jargon and hefty manuals—took weeks to figure out. With Patton Strikes Back, however, veteran programmer Chris Crawford scores a direct hit. This easy-to-play and entertaining game pits your military skill against the Mac’s in a simulation of World War II’s critical Battle of the Bulge.

Patton Strikes Back has enough variations that you can avoid playing the same game twice. In the Historical setup, weather conditions and reinforcements closely follow those of the historic battle; in the Random setup they vary randomly. There are five difficulty levels, varying as to the speed and complexity of the warehouse of information not covered in the anecdotes.

Patton Strikes Back does have its quirks. If you’re really thrashing one of the opposing units, the Mac tries to figure out a way to beat you, and the game slows down noticeably or even stops. My other complaint is the game’s off-disk copy protection. But overall, I strongly recommend Patton Strikes Back. It’s simple to learn but complex enough to keep even the most sophisticated player entertained.

—ANDREW MILLER
If you've ever wished you could afford to print in vivid color, the new Canon Color Bubble Jet™ printers are for you. The first thing you'll notice is the brilliant, rich color. That's because both the BJC-800 and the BJC-820 print up to 360 dpi using four snap-in ink cartridges: black, cyan, magenta, and yellow. So you get true black and richer darker shades.

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Now you can be as creative as you want, preparing stunning presentations, graphics, even posters, right in your office. You'll be able to see results and make changes immediately, which saves time and gives you more control.

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**Arcade Word Game**

**Wordtris 1.0**

**PROS:** Fun for all ages; multitude of variations.

**CONS:** A little sluggish on slower Macs; copy protected.

**COMPANY:** Spectrum Holobyte (510/522-3584). REQUIRES: Mac Plus; System 6.0.3; 2MB of RAM and hard drive for color. **LIST PRICE:** $49.95.

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That's the basic idea, but there are plenty of embellishments. For example, one "magic" word is always displayed at the top of the screen; if you can spell that word out of the random stream of falling letters, you earn extra points and clear the well. There's also an occasional "mystery tile" that has a question mark instead of a letter; if you type a letter soon enough, the mystery tile turns into that letter. And every once in a while, a falling eraser allows you to remove a tile.

Wordtris has a way of steadily raising your pulse as you advance to higher levels and the pace increases. But Wordtris isn't for the purely arcade crowd; it's a word puzzle game that rewards strategy, literacy, and quick thinking under pressure. Wordtris is an arcade game for Scrabble lovers.

Wordtris is surrounded with graphics and music that reflect its Russian origins. The package includes both color and monochrome versions of Wordtris. The color version has stunning graphics, but not without cost; it demands 3MB of hard drive space and 2MB of memory.

If it included only the basic single-player game, Wordtris would rank as a first-rate Macintosh game. But Wordtris has all kinds of variations on the basic theme. Rare is the game that gives the user so much control. A Children's mode slows down the action so kids can keep pace. Tournament mode allows players to take turns with the same block sequence. Two people can play at the same time in the same well, choosing either Competitive mode or Cooperative mode. Head-to-Head enables two players to compete on separate Macs that are connected by a network or by modem; each word completed on one Mac puts a rock in the bottom of the other Mac's well. Head-to-head games can be especially exciting, but they tend to favor the faster Mac.

Wordtris uses a 60,000-word dictionary to determine whether letters make words, and you can add up to 1000 custom words. (If only English teachers and editors were so forgiving!) Wordtris is, in short, a supergame. Let's hope it's not the last word in the tris series.—GEORGE BEEKMAN AND THE SHOOGEDOOBOP SOFTWARE TESTING TEAM

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**Color Painting Program**

**Expert Color Paint 1.0**

**PROS:** Inexpensive; 15 levels of Undo; built-in virtual memory; versatile selection tools. **CONS:** buggy at low memory settings. **COMPANY:** Softsync (305/444-0080). REQUIRES: Mac II; 2MB of RAM; System 6.0.3; 32-bit QuickDraw. Recommended: 4MB of RAM; color monitor; System 7. **LIST PRICE:** $49.95.

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One day, I'm dismayed at how expensive software can be; the next, I'm wondering how much lower prices will go. Now, for example, for a street price of around $28, Expert Color Paint offers more capabilities than Delta Tao's Color MacCheese ($99.95) and nearly as many as MicroFrontier's Color It ($119.95). In fact, in a blind taste test, few users would be able to tell Color It and Expert Color Paint apart. The look-and-feel of the two programs is just short of identical; they share unusual command traits such as 15 levels of Undo; they even feature the same wacky set of default fill patterns.

The reason for the similarities is that MicroFrontier is responsible for both programs. As the story goes, Softsync admired Color It and asked MicroFrontier to write a similar product. But with the users' best interest in mind, Softsync also recognized problems in Color It's interface and sought to remedy these in its new paint program. But is the result better than Color It, or is it just cheaper?

Like Color It, Expert Color Paint supplies a virtual memory feature that allows you to open an image whose size exceeds the amount of available application RAM. But where Color It has a complicated collection of memory-allocation options, Expert Color Paint doesn't bother you with details. This is both good and bad—good because it streamlines the interface, bad because it takes away a level of control that advanced users might appreciate. In Color It, for example, you can instruct the program to stop short of filling up the hard drive or to switch over to a second drive, floppy, or cartridge drive when the first becomes full—two options that can prove especially useful when scanning large images. By contrast, Expert Color Paint uses the start-up disk; when that disk is full, you're out of luck. Also unlike Color It, you cannot scan images into Expert Color Paint.

Expert Color Paint equals Color It in many respects—Expert provides antialiasing, full support for System 7, and superior selection capabilities including a flexible magic wand tool that can be used to select multiple areas of color. But Expert Color Paint lacks some of Color It's more sophisticated options. Color It provides support for the GIF, JPEG, and Photoshop formats; Expert Color Paint supports only the basic three: MacPaint, PICT, and TIFF. Color It provides masks, selection feathering, and unique dithering capabilities. Expert Color Paint does not.

But Expert Color Paint offers a straightforward interface that most users can master without reading the manual. In fact, I found its collection of moderate capabilities to be generally in keeping with its astonishingly low price tag. The only real problem I had with the program was at low memory settings. By default, Expert Color Paint is set to use 900K of application RAM when running under MultiFinder or under System 7. At 900K, I encountered bugs, particularly when trying to use patterns. Sometimes I could not select the pattern I wanted; other times when I tried selecting multiple patterns, most of the patterns never took effect. When I increased the RAM setting, these problems disappeared.

If you're a seasoned Macintosh artist, Expert Color Paint isn't likely to excite much interest. But for the novice, its tidy collection of features and low price tag make it a wonderful value, not to mention an ideal introduction to the color painting environment.—DEKE MCCLELLAND
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Circle 94 on reader service card
If you wear a pager, you know the service it provides. You have the exciting possibility of being contacted day and night. Someone dials your pager, plugs in a phone number for you to call, and as soon as you can get to a phone, you're connected. But it's not always easy to find a telephone, especially if you're stuck in traffic or sitting in the middle of a theater. Then, you pull off the road or climb over 11 pairs of knees just to receive an urgent, life-shattering message like, "The caterer is out of Camembert—will Brie do?" Using Ex Machina's Notify in combination with a Mac, a modem, and an alphanumeric pager can provide a brief message along with your page. But, like most version 1.0 applications, Notify has some limitations and lots of room to grow.

The concept and operation of Notify are simple enough. The application allows you (or a designated messenger) to type a message of up to 240 characters on your Mac. The message is queued in the Notify Server (in the System Folder) for transmission via modem to the paging company. The paging company transmits the message over radio airwaves straight to the pagee.

During my testing, Notify worked fine about 80 percent of the time. I made an alias of Notify and put it in my Apple Menu Items folder and launched it from there. The interface for sending a message is straightforward and intuitive. You only need to enter the addressee and the message.

It was after I constructed my first message that I started encountering minor problems. On more than one occasion, after queuing a message into the Notify Server, the machine froze until Notify finished sending the message over the modem. On other occasions, immediately after startup, my machine mysteriously began sending messages over the modem. I never received a page from this transaction so I chalked it up to a bug in the software. I made an alias of Notify and put it in my Apple Menu Items folder and launched it from there. The interface for sending a message is straightforward and intuitive. You only need to enter the addressee and the message.

Unfortunately, it's not always easy to lay blame for these problems on the application or the paging company. This new way of communicating needs some hard testing and/or error correction before it can be accepted. Paging companies need to increase their awareness of this technology, and software companies need to establish more stringent error checking with paging services.

Notify needs some work before it can become an effective business tool that enjoys widespread use. I am anxious to see the results. —Matthew R. Clark
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WORDPERFECT FOR THE MAC

The power of the Macintosh has evolved from a product that only a converted DOS PC user could tolerate to a powerful alternative to Microsoft Word. With version 2.1, WordPerfect goes a step further by adding support for a number of System 7 functions and QuickTime, the new video-display and compression technology.

WordPerfect 2.1 provides both the regular online help found in the previous version plus comprehensive balloon help under System 7. And although the Save dialog box lacks a New Folder button, version 2.1 does a good job of supporting System 7's publish and subscribe, stationery pads, and TrueType fonts. Basic Apple events are also supported.

WordPerfect 2.1 is the first, and so far the only, word processor to support QuickTime. It even includes the 44.1K QuickTime extension. When you select an imported QuickTime movie, a play bar appears below the image. You use the play buttons or simply double-click on the movie to play it, sound and all; you click on the movie to pause at the current frame. You can even vary the sound level while the movie is playing. Thanks to version 2.1's improved handling of competing word processing formats, such as Microsoft Word and WriteNow, WordPerfect has become an ideal application for inserting visual demonstrations into a wide range of existing documents.

WordPerfect 2.1 lets you add words to its main dictionary and edit the hyphenation of any word in its dictionary. This feature is ideal for users with specialized needs, as well as for Canadian and British users and others who subscribe to different word spellings (color instead of colour, for example). But to edit the main dictionary, you have to use the Spell/Thesaurus Maintenance Utility, a separate program that is entirely undocumented — no information in the manual, no ReadMe file, no online help. In fact, there is absolutely no mention of it or its capabilities except in the press release.

If you already own WordPerfect 2.0, you can upgrade to version 2.1 for $89 or, if you want to forgo the expanded (though still incomplete) documentation, pay $39 for the disks only. If you're a corporate Mac manager, this news may seem hardly worth mentioning; you'll pay what you have to pay. But if you use WordPerfect at home or in a small office, $89 amounts to a third of the Street price many users paid for the original product ($278). A gratis upgrade might have been a better way of promoting the company's reputation on the Mac. WordPerfect 2.1 is priced comparably to other high-end word processors, but except for serious QuickTime enthusiasts and self-guided dictionary editors, few owners of WordPerfect 2.0 will find the upgrade to version 2.1 worth the price.—DEKE MCCLELLAND

**9600-bps PowerBook Data/Fax Modem**

**PowerPort/V32**

**PROS:** Internally mounted; V.42bis compression; attenuates noise on the line; sends and receives faxes; fax autoprint option. **CONS:** External telephone interface; limited modem-status information. **COMPANY:** Global Village Communication (415/329-0700). **REQUIRES:** Mac PowerBook. **LIST PRICE:** $795.

In the world of modems, the V.32 fac/data modem is becoming a standard commodity. It not only exchanges faxes at 9600 bits per second (bps), but also exchanges data at the same fast rate. The PowerPort/V.32 supports sending and receiving faxes; V.42, MNP Class 5, and LAP-M error-correction protocols; and V.42bis and MNP Class 5 data compression. The well-written and complete manual includes detailed installation instructions, with clear photos detailing how to open the PowerBook, mount the modem board, and close the computer successfully. To preserve your Apple warranty, though, you must have the modem installed by an authorized dealer.

Because the PowerPort's electronics take up all available in-board space, Global Village put the analog telephone interface and jacks into an outboard credit card–size adapter that attaches to the PowerBook via a stubby 4-inch cable. There are some advantages to this approach: the adapter contains an extra jack for plugging in a telephone, and different adapters provide various European phone connectors (although only a U.S. adapter is supplied). The disadvantage is that you must carry, and avoid losing, the external adapter.

The PowerPort has no speaker, external switches, or status lights. When a Mac application activates the modem, a miniature bar graph appears in the menu bar, depicting the volume of data flow through the modem. Dialing and connecting sounds are routed directly through the PowerBook's built-in speaker.

In speed and compatibility tests with a dozen popular Mac communications programs, the PowerPort performed flawlessly in 2400- and 9600-bps operations. With V.42bis data compression turned on, throughput on long file transfers jumped to about 29,000 bps.

The PowerPort is in a unique position to take advantage of 9600-bps data speeds using Apple's AppleTalk Remote Access (ARA). ARA lets you call your base-station Mac while on the road and establish a network connection just as if you were hooked up locally via AppleTalk.

To send a fax, you choose a destination address from the built-in phone directory, and then choose among options for image quality, cover-page style, and so on. You can send the document immediately or spool it for later transmission. The transmission process operates in the background. The menu-bar status display lets you monitor the progress of the transmission page by page. The PowerPort performs automatic error recovery, attempting to retransmit a document a predetermined number of times.

You can set up the PowerPort to answer the phone and receive faxes automatically, or to receive faxes manually. Using automatic mode, you can optionally have the PowerPort wake up your sleeping PowerBook to answer incoming calls. You also can set an option to automatically print incoming faxes. Receiving and printing, like sending, occur in the background.

A stand-alone application called FaxCenter lets you view and print received faxes and use a drag-and-drop interface for scheduling faxes for transmission. You can combine faxes (enveloping), and forward (retransmit) received faxes to another location. The FaxCenter utility also maintains a fax activity log that records every fax transmission and any errors that occur.

Overall, PowerPort is a capable and reliable communications tool well suited to PowerBook users' needs.—MEL BECKMAN
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*The first rule is to remember these dates: April 20 to July 31, 1992. Those are the days you can enter our sweepstakes. No entries will be accepted later. There are two ways to enter. Every time you place an order between the dates above, you'll be asked if you want to enter our sweepstakes. Obviously, the more times you order, the more times you'll be entered in the sweepstakes. If you're not ready to order, you can enter by writing your name, address and phone number on a postcard and sending it to: Sweepstakes Offer, Mac's Place, 8461 154th Ave NE, Redmond, WA 98052. All correspondence, including addressing, must be in your personal handwriting. No machined and/or electronic correspondence will be accepted. No mass/bulk mailing of any kind will be accepted. Please note that we cannot take sweepstakes entries over the phone without an order. Sweepstakes drawing will be held on August 14, 1992. Mac's Place employees and their families are not eligible to enter. Good luck!
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hidden on one of the warehouse shelves?"
**LightningScan Pro 256**

**PROS:** Creates 8-bit scans at up to 400 dots per inch; images scanned in two passes can be joined flawlessly. **CONS:** Large files scroll very slowly in ThunderWorks software. **COMPANY:** Thunderware (510/254-6581). **REQUIRES:** Mac Plus; 2MB of RAM; System 6.0.2. Recommended: 4MB of RAM; gray-scale monitor; 68020 or 68030 processor to run Enhance software. **LIST PRICE:** $649.

**THE LIGHTNINGSCAN PRO 256 IS an excellent piece of equipment. It does all Thunderware claims it can with hardly a hitch. It outperforms other hand-held gray-scale scanners and compares favorably with flattened scanners that cost much more.**

A true gray-scale unit, the LightningScan Pro 256 records images as wide as 4 inches, in 256 shades of gray, at up to 400 dpi. (The file for an 8-bit, 400-dpi image is 8 MB; join two passes and it becomes 16 MB.) The resulting image was virtually indistinguishable from the same halftone scanned in one pass. This is something other hand-held scanners cannot do. The software also lets users calibrate the scan head and compensate for normal manufacturing variations that might affect scanned images. ThunderWorks does have a few minor shortcomings. I found its memory partition needed to be at least 3.5MB. Large images scroll very slowly, and saving a TIFF file takes noticeably longer than in Adobe Photoshop.

The scan head has three controls—resolution, contrast, and output—as well as a light that warns you when you drag the scanner too fast. To help you make straight scans, there's a plastic guide that snaps onto the bottom of the scanner. The controller is a box roughly 6 by 8 by 2 inches; it has two 25-pin SCSI outlets, a SCSI ID switch, and an external power supply. Thunderware supplies a 25-pin SCSI terminator and a 25-to-25-pin SCSI cable. (If the scanner isn't the first item in a SCSI chain, you'll need a 25-to-50-pin SCSI connector.) The scanner and software are System 7-compatible and, according to Thunderware, 32-bit clean.

The LightningScan Pro 256 ships with MicroFrontier's Enhance gray-scale-editing software (a good low-cost product, but no match for Adobe Photoshop); Olduvai's Read-It OCR software; and a plug-in for scanning from within Enhance, Photoshop, Read-It, and Silicon Beach Software's Aldus SuperPaint and Aldus Digital Darkroom.

The LightningScan Pro 256 lists for about $200 more than competing products, but it's such a well-executed product that it's worth the difference.—**BILL JUSTIN**

**RateFinder 1.5**

**PROS:** Facilitates shipping-rate comparisons; all-inclusive rate tables. **CONS:** Slow; numerous user-interface violations; weights must be entered in pounds or in ounces; manual lacks index. **COMPANY:** Elefunt Software (510/843-7275). **REQUIRES:** Mac Plus; 2MB of RAM; 5MB free hard drive space. **LIST PRICE:** $149.

**I GET A LOT OF EVALUATION SOFTWARE delivered by the friendly Fed Ex folks. Software publishers constantly use overnight-mail service, and they consistently choose the most expensive carriers. But who can blame them? Comparing shipping costs is a hassle, with what the myriad carriers, service classes, surcharges, discounts, and so on. RateFinder compares the costs of shipping via various carriers.**

RateFinder comes with national and international rate tables for Federal Express, United Parcel Service (UPS), and the U.S. Postal Service for packages weighing less than 150 pounds. A sample Airborne Express rate table is also included, but it must be adjusted to reflect actual rates assigned by Airborne based on shipping volume. You can also enter information for any other carriers, but the process is very tedious.

You enter your zip code (of the point of origin) plus the weight and destination of the package. Unfortunately, the method for entering weights is inflexible and clumsy, and you can't use the metric system.

Entering international destinations is also awkward. Domestic packages require only the five-digit zip code of the recipient, but for international packages you must enter the country's full name or select it from a pop-up menu with a clumsy Find feature.

After you enter the weight and destination, RateFinder consults its tables and displays the rates charged by the various carriers for different classes of service. On my Mac Ici, RateFinder took about 15 seconds to display information for a typical domestic package. RateFinder is no speed demon, but it's significantly quicker than flipping manually through several rate tables.

If the package doesn't meet a carrier's requirements, no rate appears for the invalid class of service. I'd prefer an option to hide invalid carriers and classes altogether. And there should be a way to list the carriers from the lowest to the highest rate.

Double-clicking on a carrier line in the Rate Shop window presents the Rate Totals window, where you can compute the total shipping cost, taking into consideration the charges for insurance, return receipts, and pickups, as well as allowances for applicable discounts. A dimensional weight calculator allows you to enter in the package's height, width, length, and divisor (dimensional weight).

Because RateFinder was developed using Odestra's Double Helix, it is slow and has numerous user-interface violations (some windows that appear almost off the screen, nonstandard confirmation dialog boxes, radio buttons improperly used to initiate actions). Having worked with the initial release of RateFinder, however, I appreciate the effort the company put into improving the performance, simplifying the interface, and adding new features.

One particularly noteworthy new feature is the Rate Find window, where you can quickly look up a rate for a particular carrier. MacFederal and MacParcel ($39.95 each from Computer:applications) offer much the same functionality of the Rate Find window, but handle only domestic Federal Express and UPS queries, respectively.

RateFinder beats the old-fashioned task of checking rate tables by hand. Even if you send only a few packages a week, RateFinder will pay for itself in less than a year's time by finding the least expensive way to ship. And given Elefunt's track record of prompt upgrades, I expect RateFinder will significantly improve before that year is up. —**OWEN W. LINZMAYER**
Both packages consist of a fax/data modem and fax software; ComStation 4 also has fax-server software. The modem is a standard 2400-bits-per-second data modem and 9600-bps fax modem that plugs into the serial port of the fax-server Mac or your Mac. To set up the ComStation 4 for network use, the fax-server Mac must have the FaxMonitor INIT installed. However, for other network users to send or receive faxes, they must have a fax folder in their name in the fax folder on the AppleShare server.

The software for sending and receiving faxes is the same for both ComStation 2 and 4. To send a fax, you simply select the NetFaxPrint (or FaxPrint for ComStation 2) icon in the Chooser and print the document as usual. The Mac converts the document to a bitmapped fax file as if you were printing the file. The NetFaxPrint (or FaxPrint) software then asks you to select a telephone number from your address book, or you can enter the name and telephone number of the recipient. Until the ComStation 4 FaxMonitor sends the file, fax files are stored in the fax folder bearing the sender’s name, on the AppleShare server. The FaxMonitor INIT periodically checks each user’s folder in the fax folder for documents waiting to be faxed, retrieves them, and faxes them to the appropriate telephone numbers.

Receiving a fax is a different story. All incoming faxes arrive at one location, the FaxSpool folder on the ComStation 4 fax server. The server administrator must read each fax, using ComStation’s FaxManager software, and send a copy of the fax to the appropriate user’s folder on the AppleShare server. This all is fairly awkward; it would be easier if the recipient could use a Copy command within the FaxManager program so that the fax could be directed to the appropriate folder after viewing.

Once a fax is stored in a user’s folder on the AppleShare server, the user can read the file using the copy of the FaxManager software. You can also store the fax as a TIFF or PICT file once it has been opened. (With ComStation 2, sending and receiving faxes takes place in the background on your Mac; you can use the FaxStatus DA to monitor incoming and outgoing fax transmissions.) The ComStation 2 has well-designed fax software and a handy QuickFax DA for sending short memos as faxes.

ComStation 4’s requirement of a separate fax server and file server is a distinct disadvantage; both functions should be on one Mac, or the FaxMonitor should be on the AppleShare server. ComStation 4’s FaxManager interface is easy to use, and the QuickFax DA, which lets you send up to 255 characters of text as a fax, is handy for short faxes. But the process for distributing incoming faxes is still a bit awkward and needs some improvement.—DAVE KOsiUR

Citadel with Shredder

PROS: Feature packed; easy to use.
CONS: Passwords require at least eight characters; encrypted files must be removed from vaults before using them. COMPANY: Microcom (617/762-9310). REQUIRES: Mac Plus; System 6.0. Recommended: Hard drive. LIST PRICE: $149.95; five-user pack $499.

Citadel’s security tools are designed to prevent unauthorized use of a Mac’s drives and files. You can encrypt files, lock up hard drive volumes and removable media (SyQuest cartridges, for instance), prevent people from using the floppy drive, permanently erase sensitive documents, invoke a password-protected screen saver, and scan disks for viruses.

You can assign a separate password to each hard drive or removable. After locking a volume, there’s no way to mount it on the desktop without knowing the password; even starting up from a floppy or carrying the drive or disk to a different Mac won’t let you bypass the protection. You can also lock the floppy drive so that without the password, no one will be able to copy files to or from the Mac. This option also helps protect your system from viruses.

Citadel enables you to create vaults for protecting sensitive files and folders. Each vault receives its own password and can hold as many files as the drive has space for. To open a vault, you simply double-click on its icon or use one of the Citadel utilities, and then provide the password. Files can be moved into and out of unlocked vaults as needed and encrypted with any of three data-encryption algorithms.

Citadel’s screen locker blanks the screen to protect it from burn-in and also locks up the Mac. When the screen locker is active, pressing a key or using the mouse brings up a password screen. Users who lack the password are denied access to the Mac.

The program provides two ways to remove important files permanently from your disks. By overwriting deleted files with a string of zeros, Disk Cleaner makes it impossible to restore such files using a file-recovery program. The Shredder INIT (not to be confused with DLM Software’s file-erasure utility Shredder) intercepts the Finder’s Empty Trash command and asks whether you want to delete its contents manually or replace the contents with zeros; optionally, Shredder also handles files deleted from within programs, such as by using Microsoft Word’s Delete command.

Citadel also includes a copy of the Virex INT, which can scan any file, folder, or drive for viruses; can automatically scan disks on insertion; can check each file as it’s opened; and can scan at start-up or shut-down. Note that the INIT is for detection only. To remove viruses, you need a virus-protection utility.

Citadel has only two weaknesses. First, every password must be at least eight characters long. Second, encrypted files are inaccessible from the creator programs’ Open dialog boxes. You must use Citadel, the DA, or the INIT to move the files to the desktop and then move them back into the vault after a save, which is a hassle. (During testing, I uncovered a bug. Closing the Shredder Options dialog box on a Mac Plus running System 7 causes the screen to lock and the system to crash. This does not occur on other configurations.)

Citadel provides an emergency access procedure: the Administrator disk can open any Citadel-locked drive, even if you’ve forgotten the password. Since it can bypass all passwords, it should be treated with the same respect as the passwords themselves—don’t leave it lying around.

Overall, Citadel’s utilities are extremely easy to use and appear to cover all bases, from a security standpoint. Having multiple methods to access vaults and lock drives increases the convenience of using Citadel, too.—STEVEN SCHWARTZ

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REVIEWS

The Complete Annotated Alice

PROS: Contains "lost" out-of-print chapter;
large-print option.
CONS: Slow; reading may strain
eyes; no index to illustrations; quickly discharges
battery.
COMPANY: The Voyager Company (310/451-1383).
REQUIRES: Mac SE/30; 640-by-
400-pixel monitor; System 6.0.7; HyperCard 2.1.
LIST PRICE: $19.95.

The Complete Annotated Alice is one of three expanded Books published by The Voyager Company especially for PowerBook users. It consists of Alice in Wonderland and Through the Looking Glass, integrated with Martin Gardner's The Annotated Alice (New American Library, 1960) and More Annotated Alice (Random House, 1990). Dedicated Carrollians will rejoice at the inclusion of a famous "lost" episode available only in this HyperCard edition. Alice comes compressed on a 1.4MB floppy disk; decompressed it consumes nearly 2MB of hard drive space. It requires HyperCard 2.1 (the run-time version that comes with the PowerBook works fine).

This story is about my adventures in Alice's newly computerized world, and what I saw there. Alice opens briefly to the book's pleasant "cover" artwork, then to the table of contents. The keyboard arrow keys let you leaf through 60 pages of prefaces and introductions and then on through the two Alice books. You can also click on a chapter title to go directly to that chapter.

Carroll's prose and Sir John Tenniel's illustrations appear murky compared with my freshly typeset $2.50 paperback edition (Bantam, 1981). This is not necessarily a complaint, because most users of the Expanded Books version will probably play with Alice rather than read it. Reading anything on screen for a long time is fatiguing, but the Expanded Book's most annoying quirk is its slowness, even on a PowerBook 170.

To be fair, the electronic version does let you set bookmarks, go directly to a page, and monitor your progress with a progress gauge. In the wide white margin you can type notes or mark passages with black lines. Still, reading from the screen felt claustrophobic. I never got the satisfying sense of being transported that reading customarily inspires.

The product succeeds as a type of literary hypertext hide-and-seek. Underlined words and phrases indicate hot buttons that are linked to annotations. Click on one and the annotation appears. You can search for key words within the text and annotations. Pressing on any word reveals a pop-up menu that lets you search for the word's next, last, or every occurrence, in context if you like. These features make it easy to bounce between words, annotations, and books.

Alice demands nearly continuous hard drive access. Set to rest after 30 seconds of inactivity, my hard drive awakened whenever I turned a page, selected an annotation—did anything involving a command. Beginning with a fully charged battery, I was able to use Alice for about 90 minutes.

To my mind, Alice's most significant feature is the large-print option, which simply changes the screen font to an easier-to-read 18-point. Thanks to this, the visually impaired can more freely journey to Wonderland. Amazing how a few hundred extra dots can change a person's view of the world. Applause, Voyager.—JOE HUTSKO

Network Management and Paging Utility

NetWorks 1.0.1

PROS: Uses little system memory; versatile; flexible.
CONS: None. COMPANY: Casavelle Networks
Corporation (613/596-2802; fax 613/596-9695).
REQUIRES: Mac Plus; System 6.0.5.
LIST PRICE: 20-device version $495; unlimited devices

SO YOU GET THIS SOFTWARE TO
monitor your busy network. The box
pictures an executive type sitting at a table
with a steaming cup of coffee and a pager
in her hand. She looks relaxed, in control.
Immediately you think, "What do I have
in common with this woman? Not a bead of
sweat rolls down her face." After using
Networks, I know why she is so imperturbable—NetWorks works. It's easy to use, flexible, and it doesn't require a lot of system resources. The main window has six buttons that enable you to quickly configure NetWorks: Add, Remove, Start, Stop, Get Info, and Attach. When you click on the Add button, NetWorks quickly scans the network for network devices. Built-in, customizable filters let you select only the devices you want to add. On-screen status lights indicate if devices are Up, Down, Not Tested, or On Hold (useful for out-of-service equipment).

Waiting for that Down indicator to flash is obviously impractical. NetWorks' alternative is to attach a notification to any or all of the selected network devices. There are six notification methods: a simple message on your computer; an electronic message sent via modem; a recorded message; an audio message; an E-Mail message; and a pager notification. You can customize notification messages, or use NetWorks' default message, which includes the device name, the zone, and the time the device went down. These messages can be collected in a log or exported to a spreadsheet, database, or word processor for detailed evaluation of equipment performance.

You can decide when and how often you want to be disturbed—er, ah . . . notified—when the network device or service goes down, goes up, or both. You can set notifications to go off at different intervals depending on the importance of a device. For example, for a rarely used printer you could set NetWorks to notify you with a screen message after 5 minutes and a pager message when the device is down for 30 minutes. For a critical file server you have to set an immediate notification via pager.

I used the Motorola Advisor paging service (approximately $20 per month) with NetWorks and it was terrific. After working out a few technical problems with the paging company (setting the baud rate, for example), I felt I knew exactly what was happening on the network at all times. If you decide to use a pager with NetWorks, I suggest an alphanumeric pager that allows a few lines of display; a strictly numeric pager doesn't give you enough information.

NetWorks uses only 256K of RAM, although it allot 512K, and it can run in the background under MultiFinder, or be hidden in System 7.

The documentation is concise and well written; the baud rate information should be included in the manual, however. NetWorks might seem pricey, but eliminating end users' calls makes it worth its weight in gold.—MATTHEW R. CLARK
Collaborative Software

Aspects 1.01

PROS: Good control of simultaneous multiplayer access to documents; offers both individual and linked views of a document. CONS: Lacks outlining and spreadsheet modules; limited import facilities for word processing documents.

COMPANY: Group Technologies (703/528-1555). REQUIRES: Mac Plus; any network or a modem; System 6.0. LIST PRICE: Version 1.02 $299; 5-pack $895; 10-pack $1295; 100-pack $7995.

Aspects provides the tools for a group of 16 workers to collaborate and generate ideas over a network, or for 2 participants to work together via modem. Participants can work with text and bitmapped or object-oriented graphics. Changes made to Aspects documents automatically appear to all the participants in the current session. You can create documents during a session, or you can import Microsoft Word (versions 3.0 and 4.0), MacWrite II, MacWrite 5.0, ASCII, PICT, and MacPaint files.

The organizer, or moderator, of a session decides who participates and to what extent each participant can change the document. The moderator chooses one of three mediation levels: Free For All, Medium, and Full. The Free For All level lets all participants edit a document at the same time. Medium mediation allows only one participant at a time to edit a document, although participants can edit other documents belonging to the session while someone is editing the main document. Full mediation allows only one participant at a time to make changes to any of the Aspects documents belonging to the session. The moderator decides who can edit a document and can assign or withdraw edit control.

When you're working in Full or Medium mediation, icons appear in a floating Conference Tools window to let you know whether or not you can edit the document. An upraised hand means it's not your turn to edit, the pen-in-hand means you can edit, and a closed pen means you cannot edit the document. To request edit control, you click on the closed pen. A list of participants can be displayed as a pop-up menu from within the Conference Tools floating window.

Having several people edit one document is chaotic. Aspects gets around this problem in several ways. Each participant uses a unique pointer that appears to the other participants; unfortunately, you can't tell which pointer belongs to whom. Aspects also limits multiplayer editing according to the type of document being worked on.
TOOL FOR

Every toolbox has a variety of tools. And each one has a different purpose. You wouldn't use a screwdriver to drive a nail, so why use an artistic program to do your technical drawings?

If you need to do artistic illustration, it makes sense to look at one of the artistic programs shown here. But if you do technical illustration, MacDraft's the right tool for you.

MacDraft is designed specifically for architectural/engineering design & drafting and technical illustration. It provides you with a complete scaled drafting environment designed to respond quickly and accurately to the way you think and work. You can create multi-layered drawings and even assign a different scale to each layer to create details. As you switch between layers, MacDraft will automatically display the sizes of objects, dimension lines and area calculations in the units of that particular layer. You can also create custom line styles and store commonly used graphics in user-created symbol libraries.

When it's time to get your technical drawings done, you need a tool designed specifically for the task at hand. You'll find MacDraft's finely crafted drawing tools incredibly easy to use, powerful and amazingly accurate. In addition, most tools provide a number of options that will allow you to tailor the tool to meet your drawing needs. For example, with a simple click of the mouse, you can choose to draw arcs by their radius, any 3 points or even draw an elliptical arc.

So for your technical drawing needs, choose the tool that was designed specifically for the job. MacDraft. For your Macintosh® and now available for Windows.

Call Innovative Data Design at 510-680-6818 for more information or to order a Demon Disk.
MacDraft is a registered trademark of Innovative Data Design, Inc. Macintosh is a registered trademark of Apple Computer, Inc. Windows is a trademark of Microsoft Corporation.

For information on MacDraft for the Macintosh:
Circle 129 on reader service card

For information on MacDraft for Windows:
Circle 229 on reader service card
Look It Up!

BY DAVID POGUE

THE CONDEMN ALOFT, SWALLOW IT OR NAY, IS WHAT YOU BLARNEY ANON YOU SUFFER A BRACE OF RAINCOAT THESAURUSES WHORISH ON THIS DOOM.

The sentence above, believe it or not, is what you get when you let a couple of Macintosh thesauruses loose on this sentence. Which just goes to show ya: you are still the brains of the operation; an electronic reference book can only make suggestions.

But lately, companies are making a lot of dictionaries, and the dictionaries are getting smarter. These online dictionaries and thesauruses are abridged, of course, so as not to completely engulf your hard drive; otherwise, they're twice as good as their physical counterparts—faster, easier to use, and paper-cut-free.

American Heritage Electronic Dictionary

THIS ELECTRONIC DICTIONARY/THESAURUS desk accessory (Wordstar International, $99) was obviously prepared by some big-time word nerds: the definitions are generous, juicy, and painstakingly crafted. Entry words are in bold, parts of speech are italicized, and there's plenty of what graphic designers call white space in the window, making AHED the easiest-to-read dictionary on the market. Like all electronic references, AHED also lets you look up a word within a definition by double-clicking. Or click on Thesaurus, and get a screenful of synonyms (see "Words at Work"). You can also work in reverse, for those moments when you know there's a word for something, but your brain's just not operating—you can type in a couple of words you think would be in the definition (like influence and payment), and let AHED find the entry for you (kickback).

AHED's Mac integration, alas, has some woeful drawbacks. For example, its nine files (3MB total) must live in the System Folder—loose and cluttery. More astonishing: AHED has virtually no interaction with your word processor. (Other programs can look up a highlighted word in a document, and automatically replace it with a synonym you select.) You can copy and paste single words to and from AHED, but—and this is a big but—you can't copy definitions.

Still, AHED remains the word lover's dictionary of choice—with its built-in anagram maker (which tells you that maw is a scrambled manatee), how could it not be? And believe it or not, AHED is the only electronic dictionary that shows you pronunciations—a critical feature for those of us who talk.

Funk & Wagnalls Standard Desk Dictionary

THE FUNK & WAGNALLS (INDUCTEL, $79.95) has no thesaurus, anagram module, or pronunciation guide. (You really miss that pronunciation guide, too—how else do you settle the argument about whether it's barass or harass?) It displays a glitch or two under System 7. And this dictionary, like AHED, requires you to type (or paste) the word you want defined—it can't look up a highlighted word unless you're in System 6 and MultiFinder. (A new version is en route, which has System 7 features, autolookup of a highlighted word, and that anagram thing.)

Sounds wretched, right? It's not. Its definitions are less attractively displayed than AHED's, but there are many more entries—nearly 5.5MB's worth. (Inductel claims it has 103,000 definitions, but I stopped counting at around 25.) You get to choose the font for the display. And F&W searches are much quicker than AHED's.

Finally, Inductel includes a set of secondary dictionaries that give the F&W more breadth than its rival: Computer Terms, Gazetteer (place names), Abbreviations, Biographies, and so on. The entries therein are a bit abrupt (United States: "country, North America; pop. 226,545,805; cap. Washington"), but they're nice to have online. If you're a System 7 user, steer clear until the update appears; if not, get AHED for eloquence and the thesaurus, or F&W for speed and word count.

Word Finder Plus 4.0

WOULD YOU BELIEVE THAT this 1 million-word thesaurus (Microlytics, $69.95) takes up less than 300K of disk space? I have no idea how they did that. But it's the right idea—and the only option for use with a Mac PowerBook.

Highlight a word in any program and choose Lookup from the Word Finder Plus menu. After a moment, a list of synonyms appears, grouped by shade of meaning. Microlytics touts its sophisticated autoinflection feature, which automatically displays words that match the part of speech and tense of the selected word. (In the olden days, a search for eating gave you synonyms like devour, munch, and so on—with the -ing.) Sorry to burst Microlytics' bubble, but every thesaurus I could find (except Microsoft Word's) does autoinflectioning.

No, what really makes Word Finder Plus attractive is its smart word selection. While it produces far fewer synonyms than Thunder 7 does, the ones it does display are much more useful. (Even so, in my unscientific test of ten words, WF+ produced almost four times as many synonyms as did Word or AHED.) A simple double-click returns you to your word processor, where the original word is replaced. At 290K and under $70, this is a slick little package.

Thunder 7 1.0.5

WHAT'S A SPELLING CHECKER DOING here? It turns out Thunder 7 (Baseline Publishing, $99.95) is a thesaurus too. It works just like Word Finder Plus, except you get scads more synonyms. They're sort of hard to read, since there are no blank lines between groups, and ugly underlining mars the type. (Yo, Baseline! We use italics now!) But what's nice about Thunder's search results is that the words aren't simply grouped by shade of meaning; each meaning-group gets a definition as they do in the American Heritage thesaurus.

There are lots of nice things about Thunder—the spelling-checker, of course—its glossary feature is the coolest—but the thesaurus can be pretty dumb. Some of the thesaurus's synonym-group definitions sound like they continue.

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came from a Monty Python skit: for fish, the program comes up with "one who is victimized or made to look foolish." For blood, Thunder’s first definition is "a man who is conspicuously fashionable." And my personal fave: Thunder’s first-choice definition of mouse is "a woman who is a man’s usual or preferred companion." Well, maybe for Mickey. Thunder misses other boats, too—like boat, which produces no synonyms at all. (Word Finder Plus offers vessel, skiff, ship, and so on.) Sometimes you can find what you are looking for way down the list—and sometimes not (storm offers several meaning groups, none of which refers to the weather). I don’t know what Thunder 7’s thesaurus is thinking, but maybe it ought to read the dictionary.

Rhyme Design 2.1
YES, THERE’S AN IMPERFECT RHYME in the very title of this rhyming dictionary (Rapture Studios, $89.95). But by golly, the thing really works: type in a word, get a list of words that rhyme with it. If you enter a word with alternate pronunciations, like wind, the program smartly asks you whether it sounds like blind or grinned.

Rhyme Design’s most disappointing quirk is that it only rhymes one-syllable words. You can’t enter bubble and get trouble. Then, too, there are some odd missed opportunities: list doesn’t give you any past-participle rhymes like missed. And I guess I have to mention the copy protection, although I understand the impulse—when your market is the handful of Mac-owning lyricists, even one illegal copy can be 5 percent of your potential sales. But hey—in the next version, gimmie two-syllable rhymes and better-spelled-different/sounds-alike support, and I’ll persuade the rest of the handful to buy.

The Random House Encyclopedia 1.0
DIDN’T PEOPLE ALWAYS SAY, “SEE THIS floppy disk? You could fit the whole encyclopedia on one of these”?

<table>
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<th>WORDS AT WORK</th>
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<td>Thesaurus</td>
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<td>Roget’s</td>
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<td>AHED</td>
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<td>Thunder 7</td>
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<tr>
<td>Word Finder Plus</td>
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Ten words were flung at each program; this table shows the average number of meaning groups and synonyms offered per search. The hardbound Roget’s Thesaurus, Fourth Edition is shown for comparison (not shown: the quality of synonyms). The test results, including the actual words, are downloadable from the Macworld section of America Online.

AHED and Funk Both online Mac dictionaries are excellent for different reasons. The American Heritage dictionary (top) contains a more attractive layout, complete with pronunciation and a direct link to a thesaurus. The Funk & Wagnalls definitions are sometimes more complete, and there are more total entries.

In reality, it takes seven floppy cards to hold this encyclopedia (Microlytics, $119). It’s exactly what you’d hope for: type in a topic, or some keywords, and get a list of encyclopedia entries that match. Considering that the program has several million years’ worth of events to cull, the searches are remarkably quick. The articles, though rarely as long as a page, are nonetheless thoughtful, painstakingly nonpartisan, and unbelievably succinct.

Even at 5MB how could a program possibly give appropriate coverage to every major event, person, concept, and place? Somehow RHE comes close; my searches were fruitful about 90 percent of the time. The only holes are some weird choices in recent American culture: entries for Oprah but not Donahue; the Beatles but not Michael Jackson; acid rain but not AIDS. (The encyclopedia is current to 1989.)

You can copy an article to the Clipboard, but it’s in that gross format where there’s a carriage return at the end of each line. Otherwise, RHE is one Really Handy Encyclopedia.

Correct Quotes 1.0
OH, GIMME A BREAK. WORDSTAR INTERNATIONAL is selling a HyperCard stack for $49.95? How good could a famous-quotations stack be?

Well, better than you’d think. Six thousand quotations may not sound like many, but the people in charge of content have made some creditable choices. For each topic (from Ability and Absence through Zeal and Zest), you get a couple screens of quotations (and their authors); profundity outweighs wittiness, but you can find both if you’re patient.

Suppose you’re writing a speech about the Apple-IBM joint venture, and you want to open with a zinger. You might search for cooperation, which would yield this: "Great discoveries and improvements invariably involve the cooperation of many minds" (Alexander Graham Bell). Nah. So you’d check out the compromise card, and find "Compromise is never anything but an ignoble truce between the duty of a man and the terror of a coward" (Reginald Wright Kaufman). Hmm. That ought to get them buzzing.

This stack would be four times better if it were twice as well-stocked. Still, you can always add your own choice of quotations and topics; as Charles Caleb Colton said, "Where we cannot invent, we may at least improve."

Microsoft Word 5.0
THE BEST THING ABOUT WORD’S NEW built-in thesaurus is that it’s built-in, and you don’t pay extra for it. It’s extremely simple to use: highlight a word (or don’t even bother—Word will look up the word closest to the cursor), choose Thesaurus, and a double list appears. On the left, you see a list of meaning groups (for water: liquid [noun] and irrigate [verb]); on the right, a list of synonyms for the currently selected meaning (for liquid: rain, ice, pond, and so on).

While the synonyms it produces are remarkably usable, Word’s thesaurus is highly wimpy in sheer word count (see "Words at Work"); you simply get fewer choices. If you care at all about word power, here’s a tip: trash the 386K U.S. English Thesaurus from the Word Commands folder; use Word Finder Plus instead. You get five times as many words—for 150K less disk space.

The Upshot
THERE ARE A COUPLE OF DELIBERATE omissions: BigThesaurus and Spelling Coach Professional (Deneba Software) and Language Master (Franklin Electronic Publishers) are getting major overhauls and weren’t available for this column. In the meantime, however, I slightly prefer the American Heritage dictionary, despite its "I don’t have to interact" attitude, and Word Finder Plus for a thesaurus. We don’t have much market choice in encyclopedias, quotation collections, or rhyming dictionaries—fortunately, there’s one of each, and they’re just fine (agreeable, bright, good, pleasant . . .).
At Last, An LCD Projection Panel With All The Colors You Need To Get Your Presentation Moving.

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"...its looks knocked me out. What a pleasant surprise that it came complete with cables and elegant software... everything I needed to 'plug and play.'"  —Laurie Reis, MIS Mgr.

"The Xeba is priced lower than most of the send/receive fax modems now available. With Faxst included, it is a solid buy that'll give you a full range of fax features and a data modem that will perform well—even in a wind tunnel."

—Joseph Schorl, Macworld, April '92

**9624 bps Fax/Modem**

Everything you could want in a fax/modem. All the style of Xeba—complete with software, cables and power supply. 9600 send and receive fax with 2400 bps/ V.42 bis modem. List: $429

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**V.32 bis Fax/Modem**

Speed through large files at rates from 14.4K bps up to 57.6K bps when connected to a similar modem. 14.4K send/receive fax capability, software and cable. List: $864

**Limited Offer $449**

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Quicktel modems from Logicode Technology, Inc., 1817 DeHavilland Drive, Newbury Park, CA 91320  (805)499-4443 Fax: (805)499-8588

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Note: We're adding two exciting new capabilities, concurrent voice communication and caller identification. These features are not yet available from any modem manufacturer, but as soon as the technology permits (estimated to be third quarter of '92), we will offer it in an easy upgrade to our Xeba line. Caller identification may not be allowed in all states.
**New Products**

**The Latest Macintosh Releases**

**Edited by Evan Cooper**

THIS SECTION COVERS MACINTOSH PRODUCTS FORMALLY ANNOUNCED BUT NOT YET EVALUATED BY MACWORLD. ALL PRICES ARE SUGGESTED RETAIL. PLEASE CALL VENDORS FOR INFORMATION ON AVAILABILITY.

**Hardware**

**10T Hub/8**
An eight-port 10BaseT Ethernet concentrator that automatically shuts down a bad port when jamming signals are detected, thus isolating network failures. In addition to the eight RJ-45 ports, the product includes a BNC port for connecting thin coaxial cable, and an 8754.

**Accele-A-Writer 8000**
A laser printer based on the Canon SX print engine and the PhoenixPage PostScript interpreter with a user-selectable resolution from 300 by 300 pixels to 600 by 600 pixels, and 35 resident fonts. The printer incorporates the company’s Virtual Disk technology, which uses the product’s 512K of onboard memory as a virtual disk to store additional fonts. It also has a SCSI port for adding a hard drive, and comes with 6MB of RAM upgradeable to 16MB. $4995. Xarco, 205/476-8189; fax 205/476-9421.

**Acecat**
A digitzing tablet that uses electromagnetic inductive technology and supports resolutions of up to 1000 lines per inch. Product weighs 1.2 pounds and comes with a stylus for use on the tablet; a serial interface cable; and a 5-volt power adapter. $149. Acecad, 408/695-1900, 800/676-4223; fax 408/695-1919.

**Art-Getter**
A three-pass charge-coupled device (CCD) scanner that scans line art at up to 2400 dpi and in 24-bit color and gray-scale at 600 dpi. The device is built around a UMAX Technologies scanner engine and takes documents up to 8 ½ by 14 inches. Adobe Photoshop 2.0, Adobe Streamline, a driver for Corel’s Omnipage, and a plug-in module for Photoshop are among the software included. $2795. Digi Electronic Imaging, 513/474-4028; fax 513/474-4029.

**BridgePort EX**
A board that fits into the expansion slot on the HP LaserJet III series printer to allow nonnetworked DOS PCs, networked PCs, and Macintoshes Ethernet support. The board features Automatic LAN Switching, a technology that determines whether an incoming print job is PostScript or PCL and automatically configures the printer to the appropriate language; product also supports 10BaseT and thin-coaxial connections. $995. Extended Systems, 406/587-7579, 800/235-7576; fax 800/377-1906.

**CirrusOptical**
External, magneto-optical drive that uses cartridges that are identical in size to a floppy disk, but each has a 128MB capacity. The company claims the drive has a 45 minutes average seek time. Includes Silverlining drive-management software, SMB of public domain shareware, and one blank cartridge. $1699. La Cie, 503/691-0771, 800/999-0143; fax 503/691-0590.

**DOFloppy Drive**
An external SCSI floppy drive that allows the Macintosh to access files from 1.4MB and 360K 5 ½-inch DOS-formatted floppy disks. Using AccessPC and SoftPC from BridgePort EX, the product features Automatic LAN Switching, a technology that determines whether an incoming print job is PostScript or PCL and automatically configures the printer to the appropriate language; product also supports 10BaseT and thin-coaxial connections. $995. Extended Systems, 406/587-7579, 800/235-7576; fax 800/377-1906.

**Fax2800DI**
A plain-paper laser fax machine that can serve as a stand-alone Group III fax, or as a fax terminal on a network with the use of Ricoh’s ImageNet software (available for $395). For network use, the fax machine communicates at 19.2 Kbps and can use a networked computer’s memory for tasks such as automated document distribution, and image storage and retrieval. The product has a 126-number autodialer and a 30-page automatic document feeder and prints at resolutions up to 196 by 392 lines per inch. $4995. Ricoh, 201/882-2000; fax 201/882-2506.

**Flex 8 LC and Flex 8 SI**
8-bit graphics boards for the Mac LC and IIIfi that provide 16 different sets of resolutions up to 1152 by 882 pixels and that support monitor sizes of up to 21 inches. The boards feature hardware-based pan and zoom, allowing the user to enlarge images on screen by up to 200 percent above an application’s enlargement capabilities, and display 256 colors or shades of gray. $999 each. Nutmeg Systems, 203/966-3226, 800/777-8439; fax 203/966-7972.

**HP EtherTwist 28692A ThinLAN Hub Plus**
A multiprotocol, thin-coaxial repeater for use in Ethernet and IEEE 802.3 local area networks; supports SNMP/IP and IPX-based network management. The hub has nine thin-coaxial ports and one AUI port for connection to thin- or thick-coaxial, fiber-optic or twisted-pair cables. Status LEDs on the device aid in troubleshooting; using SNMP-based network-management applications from HP or other vendors, network managers can configure, monitor, and control the hub remotely or from a station on the network. $2900. Hewlett Packard, 415/857-1901, 800/752-0900.

**IDSQ Series**
External, removable-cartridge drives with Winchester drive mechanisms, available in 44MB and 88MB formats with a 1:1 interleave ratio. The 5 ½-inch drives feature a 20ms average seek time, according to identity, and a 1-year warranty. 44MB drives $999, 88MB $1499. Identity Technologies, 214/235-3330, 800/723-8324.

**Infinity MaxOptical 1GB**
Magnepto-optical drive that uses a proprietary method of disk formatting called zoned constant angular velocity (ZCAV) that allows the drive to use 1GB cartridges; drive also accepts standard ISO/ANSI 600MB cartridges. Using ZCAV, the drive adds more sectors of information to the storage medium’s data tracks as they get farther from the center of the platter, allowing for the 1GB capacity. The company claims the MaxOptical has an average access time of 48ms, $5995. Pl, 510/657-2211, 800/288-8794; fax 510/693-9713.

**LM-300**
A hand-held laser barcode scanner that connects through an ADB port and weighs less than 11 ounces. Software allows the user to program prefix and suffix characters and bar-code formats. The device sends scanned bar codes directly continues...
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Help! is a configuration problem solving utility. It’s the first intelligent Macintosh program which pinpoints conflicts, incompatibilities, and other problems and tells you how to fix them. With Help!, you can improve the efficiency of your Macintosh and avoid disastrous system crashes. It’s like having a Mac expert right at your desktop!

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3923 Coconut Palm Drive
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Circle 142 on reader service card
SupraFax/Modem V.32bis
Fax and data modem with Group III fax capability, MNP Class 1 and Class 2 commands, and a data-transmission rate of up to 14,400 bps. Modem also supports V.42bis, MNP 2-5, and MNP 10 data-compression and error-correction protocols. The status display shows up to 25 different messages, and a firmware upgrade scheduled for release in mid-1992 will enable modem to include voice and caller-ID features. $399.95. Supra Corp., 503/967-2400; fax 503/967-2401.

TokaMac ci 25i
Processor Direct Slot (PDS) accelerator for the Mac IIci; utilizes the 68LC040 version of the Motorola 68040 processor (the 68LC040 does not include a built-in math coprocessor). The product installs in the cache slot of the IIci, has an on-board cache, and processes 20 MIPS. Three software programs included in the package let the user control the board's functions and adjust scanning parameters in a low-resolution preview phase. $29.95. Danagraf, 314/535-8807, 800/855-7689; fax 314/535-9829.

HiQ is the first software environment that integrates all the tools you need to solve Real World engineering problems:

- The Project Worksheet interface, which lets you organize and link everything you create in HiQ.
- Over 600 built-in functions.
- Problem Solvers graphical interfaces for solving most standard applied math problems.
- HiQ-Script, a new structured "4GL" programming language for engineers.
- The Grapher, a real-time 2D & 3D interactive graphical editor.

HiQ is available for your Macintosh for just $695.
Call 1-800-488-8662 today!

Circle 233 on reader service card
ing interactive presentations with animation, sound, and QuickTime movie clips. Software includes a 24-bit paint program, a stand-alone application for playing back CinemaVision movies, and a MovieWindow XCMD for playing and controlling presentations from within HyperCard. The program’s AutoMotion feature lets users import Microsoft PowerPoint and Aldus Persuasion files and add motion to them, and a ghosting command displays any series of movie frames through a transparent easel so the user can paint in-between frames or align objects in context. Comes with 12MB of clip animation, templates, and sounds. 1MB min. memory. $495. Vividus Corp., 415/494-2111; fax 415/494-2221.

CMaster
A program that installs into Think C version 4.0 or 5.0 and adds tools for editing code in C, including an icon bar, a menu bar, and keyboard commands, all of which can be customized. The program also allows you to add markers to code, save window positions in memory, and has parentheses-kissing capabilities. 2MB min. memory. $69.95. Jeray Scientific, 212/736-6406; fax 212/947-4981.

Communism and the Cold War
An interactive educational videodisc with accompanying software that was developed by ABC News Interactive and the Florida Department of Education. The videodisc provides information on communism in Eastern Europe and the former Soviet Union and a chronology of events leading to the breakdown of communism in these regions. It also includes case studies on regional conflicts and proxy wars, and it has a video glossary as well as biographical information. The videodisc is narrated in Spanish and English and is close-captioned for hearing-impaired students. It includes bar-coded lesson plans and a printed directory. $618.75. Optical Data Corp., 908/668-0022, 800/524-2481; fax 908/668-1322.

DateBook
A personal organizer that creates and organizes to-do lists, has scheduling and reminder features, and can search and print. The product integrates with the company’s contact-management application, TouchBase, to import contact information from existing TouchBase files. Schedules can be viewed by month, year, week, and day, and in text, Cantichart, or time-bar format within each view. 2MB min. memory. $125. After Hours Software, 818/780-2220; fax 818/780-2666.

FaxOCR
A software package that recognizes faxes received at both 200-by-200 and 200-by-100 resolutions, and converts them to text format. According to press materials, the product converts a one-page document to text in less than 30 seconds. Converted documents can be saved in Word, PageMaker, and other popular formats. 2MB min. memory. $199. PSI Integration, 908/559-8544, 800/622-1722; fax 408/559-8548.

Font Sampler
A program that runs in HyperCard 2.1 (included) and lets the user print out sample sheets and keyboard maps for any fonts that are installed in the user’s system. Sample sheets can be customized to contain a phrase of the user’s choosing. 1MB min. memory. $19.95. Daedalus Scientific Software, 718/423-3881; fax 718/423-3881.

FrontCard
A HyperCard-based program that provides quick ways to create and edit mainframes that includes a 3270 terminal emulator and XCMDs for the development of HyperCard applications. The functions provided in the package are 3270-specific and let the user transfer files, modify terminal settings, remap keyboards, read and write function keys to the host session, and check for host error messages. The software requires a MacMainFrame Workstation or Gateway product cooperate. 4MB min. memory. $2495. Avatar Corp., 508/435-3000; fax 508/435-2470.

Half-QWERTY
Software for configuring a standard Macintosh keyboard to work as a one-handed keyboard by superimposing the keys on the right side over the keys on the left in a mirror image. By pressing a modifier key, user can switch between left- and right-side keys. User can touch-type with one hand while using the mouse with the other. 2MB min. memory. $79.95. The Matias Corp., 416/749-3124.

Heaven & Earth
A game with three segments that can play separately or combined to form a fourth module called The Pilgrimage. The three modules are the Heaven & Earth card game based on the Japanese game Hanafuda, played with 48 cards of 12 suits. The Illusions, which has four levels, each having 13 types of brain teasers; and The Pendulum, a series of 12 animated simulations. 1MB min. memory. $59.95. Buena Vista Software, 818/841-3326, 800/688-1520; fax 716/873-0606.

IcePick
A view editor and development environment that allows MacApp programmers to quickly see and change view hierarchies, run programs to test views, and select multiple objects. This prototyping tool supports QuickTime, HyperCard, and the Common Lisp language. The software is built for the Macintosh using the HyperCard shell.

Rub lamp and say:
"I want vivid color from an affordable printer." 
"I want vivid color from an affordable printer."
"I want vivid color from an affordable printer."

If that doesn’t work call 1-800-835-6100, Dept. 22C.

The Phaser™ II PXe color printer produces 16.7 million of the world's brightest, most vivid colors. It prints at 300 dpi onto transparencies or paper using PostScript Language-Level 2. It works with PC or Mac applications, it's fast, it's networkable and at $4995, unexpectedly affordable. Rub for awhile, then call. Tektronix
Incubator
A program that allows the user to create customized TrueType fonts by modifying existing ones. The user can adjust a font’s lightness and darkness, width, contrast, and slant; the application then styles the new font and saves it as a TrueType file. The application can also read .AFM metric data and apply it to any font, or create new .AFM data for newly created fonts. 2MB min. memory. $149.95. Type Solutions, 603/382-6400; fax 603/382-4839.

The Kerning Palette
A QuarkXtension that allows the user to edit kerning tables for fonts from within QuarkXPress using a floating palette that displays selected letter pairs with their current kerning value and lets the user edit the values for problem pairs. Modified kerning tables can be stored in suitcase files or in the XPress preferences file.

MacUser's Guide
The library can be output as text files. 4MB min. memory. $295. Clearface, 212/529-4362; 800/538-6779; fax 212/673-0114.

LibraryBrowser
An online public-access program designed to replace traditional card catalogs and assist users in searching library catalogs built with LibraryWorks. The program accepts full Boolean searches of call numbers, authors, titles, subjects, and keywords. Records can be displayed in card format or in short, medium, or long report formats. After the program has been inactive for a predefined length of time, all fields are automatically cleared. A lock feature prevents users from quitting the program without a password. 1MB min. memory. $195. Caspr, 408/446-3075; 800/852-2777; fax 408/446-1574.

MacNumerics-II
An application that allows the user to input data using mathematical notations found in textbooks and create graphs that can be edited, labeled, exported, and printed. Online help screens and a Show Steps function aid students in understanding mathematical concepts and problem solving. Program can graph conic sections, matrices, polynomials, and polar equations, among other things. Designed for use by high school, junior college, and university students. 2MB min. memory. $289.95. Spring Branch Software, 319/927-6537.

NetMod
A network modeling tool that enables network designers to generate complex configurations and evaluate a variety of design alternatives. The program was created in HyperCard and comes configured with the operating characteristics for numerous network technologies as well as vendor-specific network devices. NetMod applies mathematical models that use closed-form analytical techniques to calculate component utilization, throughput, and packet delays, and it can create model networks with more than 50,000 nodes. 1MB min. memory. Single user $695; multiuser package $1495. Oxry Associates, 415/563-9971; fax 415/563-0238.

PacerForum
A conferencing application that runs as a desktop accessory for distributing information, group brainstorming, collaborative design, and project planning; essentially works as a local bulletin board service. The conference area is organized into a set of bulletin boards—each with one or more supervisors. Users can arrange and view bulletin boards by priority. Messages may include any combination of text, graphics, Macintosh files, and sounds; users can select from a variety of notification options. 1MB min. memory. 5-user pack $549; 25-user pack $1995. Pacer Software, 619/454-0665; fax 619/454-6267.

PowerPrint
A QuickDraw printer driver package that includes software drivers and a serial-to-parallel-port cable that enable the Mac to print to more than 850 different types of printers, including models by Canon, NEC, Hewlett-Packard, and Epson. Software options allow for custom paper sizes, two-sided printing, reducing and enlarging images, and producing cover pages. 1MB min. memory. $149. CDT Softworks, 604/291-9121; fax 604/291-9689.

PrintMatch
A family of Photoshop-compatible plug-in filters, each customized to calibrate colors for one desktop color digital printer. User applies a PrintMatch filter to a Photoshop image to calibrate the image to the printer’s color space. continues
We never interrupt your program for these important messages.

Individual filters are available separately or in groups. Company is working with third-party vendors and printer manufacturers to supply filters for all popular color printers. 4MB min. memory. Under $200. Savitar, 415/243-3030; fax 415/243-3080.

Programmers Bag of Tricks
Programmer's six-section library that includes source code written in Think C and Interface files for MWP and Think Pascal. Sections include lists, Modem and Communications, Offscreen Drawing, and Scroll bars. Each section and its associated routines are documented and ready for use in programs. 2MB min. memory. $134.90. DataPak Software, 206/573-9155; fax 206/573-9269.

Sequencer
A package of software tools designed to aid in DNA sequencing. The product's alignment algorithms detect overlapping ends and assembles them into a consensus sequence called a contig. Notes can be attached to each fragment, and changes to bases in each sequence are highlighted for easy identification. Sequences can be read back through the Mac's speaker, and the package gives multiple views of assembled data. 2MB min. memory. Noncommercial license $1200; commercial $2000. Gene Codes, 313/769-7249.

The Whirlitzer of Wisdom
Virtual jukebox containing enlightenment, funny quotes, and wit. Jukebox-like interface works like an electronic fortune cookie, displaying bits of information on the screen and opening pathways to further metaphysical adventures. Requires HyperCard 1.2 or later. 1MB min. memory. $39.95. 2BS Foundation, 518/695-6106.

Workspace
A program that runs under HyperCard and acts as a graphical user interface for organizing work, automating routine computer functions, and keeping track of time spent on projects. The application creates a three-dimensional office space with a worktable where projects are opened and closed, a bookshelf with binders for storing and accessing other applications, portfolios to hold documents, and a calendar that tracks time expenditures. 2MB min. memory. $149. Ask Interface, 206/654-4127; fax 206/654-4188.

Xpress Tips
HyperCard-based application designed to run alongside a QuarkXPress document under MultiFinder and offer tips and hints for QuarkXPress. Tips cover topics like how to easily create style sheets and how to increase the application's speed. 2MB min. memory, $19.95. Dan Graphics, 612/870-4596; fax 612/870-4596.

Sky: Volume One
Version of Radius's Impress It! 1.1 to decompress files. 1MB min. memory. $129.95. CD Folios, 818/887-2003, 800/688-3666; fax 818/887-6950.

Soundtrack
Database and library of 150 original songs in MIDI format. Some songs played back on MIDI equipment or previewed in 8-bit digital audio. Songs can be searched and cataloged by description or style using the installed software, and exported as MIDI files or to programs such as HyperCard. User can mix audio with a 16-channel mixer window that includes automated fade-in and fade-out. 1MB min. memory. $395.95. Opcode Systems, 415/369-8131; fax 415/369-1747.

Talking Classic Tales CD
A collection of five fairy tales on CD that are fully narrated in a digitized human voice and are accompanied by color illustrations. Users can click on difficult words, which are highlighted, to hear a definition read aloud; clicking on action buttons causes animated sequences to play. The stories in the collection are: The Frog Prince, Rumpelstiltskin, The Elves and the Shoemaker, The Queen Bee, and Puss in Boots. 2MB min. memory. $79. Compton's New Media, 619/793-4817, 800/532-3766; fax 619/793-4813.

The Virtual Portfolio
A multimedia showcase compiled to help corporate buyers find artists, designers, writers, and musicians for the creation of projects ranging from ad copy to interactive multimedia presentations. The CD contains over 400MB of samples of graphics, sounds, and animation from more than 250 entries. Entries are cross-referenced and indexed visually and by medium used. Artists pay a per-megabyte fee for inclusion, and the CD is distributed free to qualified corporate art and presentation departments. 5MB min. memory. $39. One World Interactives, 503/683-4020; fax 503/683-3157.

Mouse Grip
A product made of thermoplastic elastomer that adheres to the top and sides of a standard Mac ADB mouse to provide a better grip and a larger area for the user to grab. Available in blue and neon green. $10.95. Surface Concepts, 408/265-7236, 800/453-4747; fax 408/265-7236.

Parosingle
System for transferring computer graphics to fabric surfaces, such as cotton T-shirts or canvas. Requires a Mac connected to a color laser copier via a parallel or an EPL Fidy CLC Conroller. Paper also works with color copiers that are not connected to a Mac. Images are printed on the paper and then are transferred to fabric using a heat press. 100 sheets $150. Grafoto, 604/683-1232, 800/888-7838; fax 604/ 683-1235.

Sentinelle
Hardware and software package enables developers to provide a software program.
StatView
The Best Macintosh Statistics Software

You said it! Macworld readers have voted StatView the “Best Statistics Software on the Macintosh” for the fourth time. No other statistics software has ever won this award.

Why?
Because StatView combines powerful statistics with a remarkably easy-to-use interface. And StatView is the only statistics package with fully-integrated presentation graphics, enabling you to analyze data and present your results all in one program.

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To find out more about StatView, call 1-800-666-STAT, ext. 231.


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Circle 10 on reader service card
Questions and Tips from Macworld Readers

BY LON POOLE

If You Installed the Wild Magic control panel along with Apple’s new QuickTime software, you may have discovered that After Dark (Berkeley Systems, 510/540-5536) no longer displays your favorite screen-saver module. Wild Magic works with System 7 to retrofit the copying, pasting, and playing of QuickTime movies to most word processors, spreadsheets, and other applications that can display PICT graphics but lack built-in QuickTime capabilities. An old version, Wild Magic 2.0b8, conflicts with the After Dark control panel unless you force Wild Magic to load before After Dark at start-up time, as described in last month’s sage tip about such problems, “Conflict Resolution.” For example, you could prefix After Dark’s name with a tilde (~), as suggested by Matthew Bender of Poseyville, Indiana. Better yet, you can get Wild Magic 2.0 or later from a user group such as BCS Mac (617/625-7080) or BMUG (510/549-2684); Wild Magic is also available from online information services such as America Online. (Although QuickTime works with System 6.0.7, Wild Magic requires System 7.)

Fax-OCR Mystery

In December 1991 I said OmniPage, optical character recognition (OCR) software from Caere (408/395-7000 or 800/535-7226), can convert the text from a fax modem’s graphic image to text you can edit. JoJo Mastrianni of Schenectady, New York, couldn’t get OmniPage 2.0 (an old version) to open fax image files. According to Caere, most fax modems save fax image files in Type 3 or Type 4 TIFF graphics formats (both also known as CCITT TIFF), which even OmniPage 3.0 purportedly can’t open. Inexplicably, OmniPage 3.0 opened and converted my sample fax files from two hard drives and an AppleShare file server but, I later discovered by accident, not from four other drives. Caere’s flagship OCR software, OmniPage Professional 2.0, can open and convert black-and-white (also called line-art) TIFF formats 1 through 4, making it compatible with most receive-fax modems. It worked with my sample fax files (received and saved by Global Village’s TelePort/FullFax) on all the hard drives I tried it with. An upgrade from any version of OmniPage to OmniPage Professional 2.0 costs $150.

Better Centesimals

The formula in last October’s Quick Tip for averaging times that include centesimals (hundredths of a second) did not correctly calculate the average centesimals. It ignored all but the centesimals themselves in that calculation, whereas the other values (hours, minutes, and seconds) can all have an effect on the average centesimals. For instance, if there were seven times that summed to exactly 1 hour, the original formula would give an average time of 8:34.00, but the correct average is 8:34.29. The original formula was based on a spreadsheet with the columns in cells B2:D9 representing hours, minutes, and seconds, and totals of each column in cells B10:D10. Using the same cells, Tyler Abbott of San Francisco suggests calculating the total number of seconds with the following formula in cell D11:

\[
= \frac{(B10 \times 3600 + C10 \times 60 + D10)}{ROWS(B2:D9)}
\]

To display the average, use this formula:

\[
= \text{TEXT(} \text{TRUNC(D11),"0.00"}) \text{) & TEXT(D11, "h:mm:ss")}
\]

Missing Control Panel

While trying to install a screen saver DA using Font/DA Mover on my Mac LC, I mistakenly removed the Control Panel desk accessory. I couldn’t find it in the Trash or in the System Folder. I used the Finder, MacTools, and everything else I could think of, without success. Where did my Control Panel go and how do I get it back?

Louise Pettus
Rock Hill, South Carolina

A.

Since you’re using Font/DA Mover and were able to remove the Control Panel with it, you must be using System 6. (With System 7 you don’t need Font/DA Mover, and the Control Panel is a folder inside the System Folder. You install desk accessories in System 7’s Apple menu by dragging them to the System Folder icon, or you can open them directly by double-clicking them.)

When Font/DA Mover removes a desk accessory or a font, that item is gone. You can’t undo the removal and you can’t recover a removed font or desk accessory with a disk utility program like MacTools. To get the Control Panel back, use Font/DA Mover to copy it from a backup of the System file or from the System file on your original system software floppy disks. Be careful to lock the disk before inserting it so you can’t accidentally remove anything from it. If you need more.

Designing big desktop patterns, configuring multiple monitors, and...
Now there are two ways to make an 11" x 17" sheet of paper fly.

The new LZR 1560 from Dataproducts is a complete departure from ordinary laser printers. At 15 ppm it's not only faster than most laser printers, it can also deliver output up to 11" x 17". Which means it can print spreadsheets, illustrations—any two-page layout—in the time it normally takes to process a letter-size page.

This kind of performance is the result of combining two powerful innovations. Namely, a RISC-based controller, for quicker rendering of fonts and graphics, and PostScript® Level 2, an advanced printing language that delivers PostScript’s vast graphic capabilities faster than ever before. Plus, while most laser printers

<table>
<thead>
<tr>
<th>Manufacturer/Model</th>
<th>Resolution (DP)</th>
<th>Speed (PPM/Processor)</th>
<th>Page Description Language</th>
<th>List Price</th>
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<tr>
<td>Dataproducts LZR 1560</td>
<td>300x300 OR 400x100</td>
<td>15  Weiztek 8200 RISC Adobe PostScript Level 2 &amp; PCL4</td>
<td>$8,498</td>
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<td>20  Motorola 68020</td>
<td>Adobe PostScript</td>
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<td>ATI LC6000</td>
<td>300x300</td>
<td>20  Motorola 68020</td>
<td>ATI LaserDrive &amp; PostScript</td>
<td>$15,995</td>
</tr>
</tbody>
</table>

300 dpi can be done with a click of the mouse. Imagine creating two-page desktop publishing layouts without cutting and pasting. Or finally getting your full production timeline on a single page that has legible 6-point type. You'll still have a desk to work on too, since the LZR 1560 is the smallest 11" x 17" printer available. And with one, two or three paper input tray models available, even your biggest jobs are handled easily.

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replacement system software disks, ask a friend, a coworker, a local dealer, or a Macintosh user group (call 800/538-9696 to locate a user group).

**Multiple-Monitor Configuration**

Q. My Macintosh IIx has two monitors, a 14-inch color and a 2-page gray-scale display. I made the gray-scale monitor the main monitor by dragging the miniature menu bar in the Monitors section of the Control Panel, but the start-up screen and INIT icons still appear on the color monitor. How can I move them to the gray-scale monitor? Swapping video boards in the NuBus slots did not work.

Michael T. Fussell
Missoula, Montana

A. Two monitors aren't just for Mac II systems. For example, an SE or SE/30 can have a large-screen monitor connected to its expansion slot and still use the built-in monitor. A Plus or Classic can have a similar arrangement even though neither one has an expansion slot. You can use the Monitors section of the Control Panel (in System 7) to change the monitor used at start-up time (see “Monitors Option”). If you also drag the monitors in the Control Panel to rearrange them, you may have trouble aligning them so that you can slide the pointer smoothly across the top (or the bottom) from one monitor to the other. Pressing one of the arrow keys nudges the selected monitor in the control panel, helping you precisely align the monitors. To quickly check alignment, close Monitors and open it again. If the monitors aren’t lined up perfectly, adjust them and check again. Sometimes it helps to press the shift key and drag all the monitors as a group to a different spot in the Control Panel.

Confused Ruler

Q. I alternate between two Macs with 9-inch monitors and have noticed that Microsoft Word’s ruler shows 6.7 inches on one Mac and only 6 inches on the other. How do I change the 6-inch ruler to fit 6.7 inches across the screen?

Andrew I. Sue-A-Quan
Don Mills, Ontario, Canada

A. Most word processors adjust their formatting rulers according to the resolution (dot density) of the printer last selected with the Chooser desk accessory. You may have noticed that when you close the Chooser after you change printers, the Chooser tells you to choose Page Setup and click OK in all your open applications. Doing that resets the ruler to match the newly selected printer. You get a 6.7-inch ruler with a LaserWriter, StyleWriter, or Personal LaserWriter LS. With an ImageWriter, you get a 6.7-inch ruler if the Page Setup command’s Tall Adjusted option is on, but you get a 6-inch ruler if that option is off. You can select any type of printer listed in the Chooser whether the Mac is connected to one of those printers or not. For example, you might select LaserWriter in the Chooser on your ImageWriter-equipped Macintosh at home or your Mac PowerBook in flight so the documents you create would be ready to print later on a LaserWriter at work. To add another type of printer to the Chooser’s list, simply copy the printer driver file that has that printer’s name and icon to the System Folder.

**Big Desktop Patterns**

**TIP** With ResEdit 2.1 or later you can modify System 7 to decorate your desktop with a custom pattern of up to 64 by 64 pixels. (The standard desktop patterns you select with the General control panel are 8 by 8 pixels.) Unfortunately, designing 64-by-64-pixel patterns can be quite tedious. The Terraform module of Berkeley Systems’ More After Dark (which requires After Dark 2.0—L.P.) can create beautiful patterns that repeat perfectly on the desktop. Here’s how:

1. In After Dark, select the Terraform module and set the Repeat Size option to 64. Activate After Dark by moving the pointer to the sleep corner or by clicking...
Frequency Distribution

A university instructor who teaches large classes, Larry MacPhee of Irvine, California, likes to examine a frequency distribution of his students' test scores before he signs them letter grades. Creating histograms that graphically depict data distributions should be easy, but Microsoft Excel offers this function only as a library macro with less-than-clear instructions. After much trial and error, MacPhee figured out the correct procedure and recorded it using Apple’s MacroMaker system expansion so he could forget all the convolutions. He had better luck with MacroMaker than with Excel's built-in macro recorder. (MacroMaker doesn’t work reliably with System 7, but you could use CE Software’s QuickKeys 2.1.1 instead.) Here are the steps for Excel 3.0.

1. Enter student grades in a column with a label such as Grades at the top of the column (in this example, column A). Copy that column into the adjacent column (in this example, column B). You have to copy the data because Excel’s Crosstabs macro requires at least two columns of data to generate a distribution. Next select the block of cells containing data and labels (A1:B15 here) and choose Set Database from the Data menu. Open the Crosstabs file, which is located in the Macro Library folder in the Excel folder. If you want to automate the procedure, start recording with MacroMaker or QuickKeys now. Then run the Crosstabs macro by choosing Crosstabs from the Data menu.

2. In the Crosstabs dialog box that appears, click the Row Options button, and another dialog box appears. In it change the Row Field option to Groups and enter 10 in the Groups box to set the number of intervals in the distribution. To set the distribution range manually, you must turn off the Min and Max options. Enter 0 in the From box and 100 in the To box, and then click the Col. Options button. Do everything the same way in the Col. Options dialog box, except enter 1 in the Groups box instead of 10. Click OK to return to the main Crosstabs dialog box and click OK there to run the Crosstabs macro.

3. A new worksheet appears reporting the frequency distribution in intervals. Stop recording in MacroMaker or QuickKeys and save your recording so that next time you can let the machine set the intervals and ranges automatically. Finally, select the data in the worksheet table and create a new bar chart of the distribution based on the data.
Fancy Desktops
You can use ResEdit to replace System 7's standard gray 8-by-8-pixel desktop pattern with a big, colorful 64-by-64 pattern made by More After Dark's Terraform module (top). Or replace patterns with a picture (bottom) by installing DeskPict or DeskPicture software in your System 6 or System 7 System Folder. (This picture was created by Macworld associate editor Cathy Abes using an After Dark MultiModule.)

1. Turn on the Demo button. Wait until you see a pattern you like and then press ⌘-shift-3 to have System 7 capture the screen in a PICT file at the root level of your startup disk (not in a folder). You can experiment with colors and textures by clicking the Terraform module's Terrain button and trying different settings in the dialog box that appears.

2. Open the screen capture, named Picture 1, with a program that enables you to select a 64-by-64-pixel piece. I use GIFConverter 2.2.8, which shows the size of the selection as you use the marquee tool (selection rectangle). Select the 64-by-64 area that you want to become your desktop pattern, and copy it to the Clipboard (with the Edit menu's Copy command).

3. Copy the System file with the Finder—for example, press option while dragging the System file from the System Folder to the startup disk icon—and then open the copy with ResEdit 2.1 or later. In ResEdit, scroll until you see the icon for the resource named ppat (pixel pattern) and double-click it to open it. There should be one resource numbered 16; open it by double-clicking. A pattern-editing window appears along with three new menus—Transform, Color, and ppat. Choose Pattern Size from the ppat menu and set the pattern size to 64 by 64, making the pattern-editing window larger. Paste the pattern from the Clipboard to replace the standard gray pattern. Quit ResEdit, answering yes when it asks whether you want to save changes to the System file.

4. Drag the unedited System file out of the System Folder, drag the edited System file into that folder, and restart. When the Finder’s menu bar appears, you should be rewarded with a very pleasing desktop pattern.

James Crawford
Baltimore, Maryland

ResEdit, Apple's resource editor for manipulating icons, patterns, and much more, is available from user groups and online information services. So is GIFConverter, a shareware program by Kevin A. Mitchell for viewing and converting the format of graphics files. Many commercial graphics programs also show the selection size, including Canvas 3.01, PixelPaint Pro, Studio/8 1.0, and SuperPaint 3.0. To take desktop patterns to the next step—multiple patterns in sizes up to 128 by 128—you can get the Wallpaper control panel (Thought I Could, 212/673-9724). It works with System 6.0.5 and later, as well as System 7, on any color-capable Macintosh (including the Classic II and the SE/30) and includes pattern-editing tools. Instead of a desktop pattern, you can display a desktop picture (see “Fancy Desktops”) by installing the DeskPict system extension (available from user groups and online information services) or the DeskPicture control panel (part of Now Software’s Now Utilities, 503/274-2800).—L.P.

Label-Alignment Check

TIP To check the position of laser-printed mailing labels without wasting sheets of labels, make a template by removing every other label from one sheet, leaving a checkerboard pattern of spaces where the translucent backing paper shows through. Print test labels on plain paper and lay the template over it to check alignment.

Alan M. Winslow
Pleasanton, California

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Customizing Word Processors

BY JIM HEID

How to: Word

Click on the Add button in the Spelling dialog box. Microsoft Word 5 can work with numerous custom dictionaries at once; consider creating separate dictionaries for different types of terms—legal terms, names, and so on. Use the Spelling option in the Preferences dialog box to switch among and edit custom dictionaries (see “Editing Dictionaries”). To add a word to a specific custom dictionary, select the dictionary’s name from the Add Word To pop-up menu before clicking on Add.

To add a word to a custom dictionary in Word 4, select the dictionary’s name and then click on the plus sign (+) button in the Spelling dialog box. Better yet, upgrade to Word 5; its spelling checker is greatly improved.

How to: WordPerfect

Click on the Add button in the Speller dialog box. To edit the user dictionary, use the ST Utility program that comes with WordPerfect 2.1. To edit the user dictionary in WordPerfect 2.0, choose Open, select the All option from the Show pop-up menu, and then double-click on the file named USA-User Dictionary.

Word and WordPerfect also let you customize other aspects of their spelling checkers. You can use the Spelling option in the Preferences dialog box to tell Word to ignore words in all capitals as well as words containing numbers (such as 100K). You can use the Check menu in WordPerfect’s Speller dialog box to tell the program to watch for duplicate words (such as as and as) and ignore words containing numbers.

If you work in the legal or medical profession or with languages other than English, you might consider buying a specialized spelling checker dictionary. For Word 5, Alki Software Corporation’s Comprehensive Proofing Tools series includes a custom dictionary containing 74,100 medical, legal, and business terms. Alki Software also sells the dictionaries Microsoft ships in countries other than the United States. WordPerfect Corporation sells a variety of dictionaries.

Create Stationery

IF YOU ALWAYS CREATE SIMILAR TYPES of documents—memos, letters, fax cover sheets, contracts—create stationery for them. A stationery document is electronically preprinted with whatever text, graphics, and formatting information you use in a certain kind of document—just as a piece of company stationery is preprinted with a name and address. Stationery for a letter might contain your return address. Stationery for a newsletter might contain the publication name, placeholder text for the headlines and table of contents, and formatting settings for multi-column pages.

Using a stationery document is easy; you just open it and start writing. Couldn’t you simply open an old newsletter or memo and replace its contents? Yes, but you might accidentally choose Save instead of Save As, thereby losing the old document. By contrast, your word processor will open an untitled copy of the stationery document so you can’t accidentally change the original.

How to: Word and WordPerfect

Create the text and graphics and/or specify the desired margin and formatting settings, and then choose Save As from the File menu. In Word, choose the Stationery option from the Save File As Type pop-up menu. In WordPerfect, choose WordPerfect Stationery from the Format pop-up menu. Type a name and then click on Save.

Cut Keystrokes with Glossaries

CHANCES ARE YOU FREQUENTLY USE certain terms or sections of text—a return address, a closing for a letter, scientific terms, contract clauses. Instead of typing them over and over again, store them as entries in a Word glossary file. A glossary entry can contain any amount of text, from a sentence.
single character to an entire document, including graphics. You can insert a glossary entry into text with a few keystrokes. A single glossary file can contain as many entries as will fit on disk. You can also create any number of glossary files and switch between them. You might create separate glossaries for separate jobs—one for letters, one for contracts, one for technical manuals.

How to: Word

Type the text to be stored, then select it and choose Glossary from the Edit menu. In the Glossary dialog box, type a short name for the entry and then click on Define. To insert a glossary entry in your document, press $delet$. type the entry’s name, and then press return. (Or, choose the Glossary command, select the entry, and then click on Insert.) To add a glossary entry to the Work menu, choose Glossary, press $option$-equal sign, and then click on the entry’s name. To save or open a glossary file, choose Save or Open from the Glossary dialog box. See page 249 of the Word 5 User’s Guide for more details. (These functions work in Word 4.0 also.)

How to: WordPerfect

WordPerfect lacks a glossary feature, but you can obtain the same keystroke-saving benefits by creating a macro—a series of keystrokes and/or menu choices that you record and save for later playback.

Automate Formatting with Styles

If you frequently switch between text formats within a document, you ought to be using styles. (A style is a set of text formats—font, size, type style, line spacing, and so on—that you can apply in one fell swoop; a style sheet is a collection of styles for a given document.) For example, say you always format reports to have double-spaced 14-point Helvetica Bold headings and single-spaced 10-point Times body text. If you define styles for the headings and body text, you can format these elements with a single mouse click or keystroke—no traveling from menu to menu and threading through dialog boxes. Besides saving time, styles help ensure consistent formatting. This can be especially valuable for projects involving numerous writers: you can create a stationery document containing the styles used in a project, and then give each writer a copy.

Styles have additional advantages. If you change a style’s description—perhaps switching from 10-point Times body text to 12-point Palatino—your program will reformat all text formatted under that style. This lets you experiment with different formatting options without a lot of manual reformatting. Another plus: Word and WordPerfect styles are supported by publishing programs such as Aldus PageMaker and QuarkXPress. You can import a Word or WordPerfect document into either of these programs and retain the original style definitions and formatting.

How to: Word

Format some text as desired. Display the ruler (choose Ruler from the View menu). With the blinking insertion point within the text, click once to select the desired text. With the blinking insertion point within the text, choose New from the Layout menu’s Styles submenu. Type a name for the style and then click on Define. You can then apply the style to a different paragraph by selecting the paragraph and choosing the style from the ruler’s pop-up.

How to: WordPerfect

Format some text as desired. With the blinking insertion point within the text, click once to select the desired text. With the blinking insertion point within the text, choose New from the Layout menu’s Styles submenu. Type a name for the style and then click on New. To apply the style to another paragraph, place the insertion point within the paragraph and then choose the style’s name from the pop-up menu.
Put Word to Work  Word’s Work menu can hold the names of items you use frequently. To add a keyboard shortcut to a Work menu command, press 3-option-plus sign using the plus sign on the numeric keypad. The pointer turns into a 3 symbol. Choose the command to which you want to add a shortcut, and then type the key combination you want to assign to that command. Consider using control-key sequences to avoid having to replace a built-in 3-key sequence. The control key is indicated in menus by the caret symbol (^).

Both Word and WordPerfect also let you link styles together so you can automatically switch from one style to the next when you press return (or, in WordPerfect, enter). For instance, if you link your heading style to the body text style, the program automatically switches to the body text style after you type a heading.

Both programs also let you base one style on another. If, for example, you’re creating two styles that use the same line-spacing settings but different fonts, you can base the second style on the first. If you want to change line-spacing settings later on, you need alter only the first style. For details on these options, see page 189 in the Word 5 User’s Guide, and page 426 in the WordPerfect 2.1 Reference.

Tailoring Keyboard Shortcuts and Menus  Let’s look at some ways to customize your word processor itself, starting with its keyboard shortcuts and menus. Word lets you change its keyboard shortcuts and even reorganize commands within its menus. If you never use any of the footnoting and indexing commands, for example, you can remove them to tidy up your menus.

Better still, you can add commands that correspond to options within Word’s dialog boxes. For example, Word’s Table Layout command lets you change the arrangement of rows, columns, and cells in tables created with Word’s table editor. But when you’re performing major surgery on a table, choosing Table Layout over and over again gets old quickly. The solution: Add the Table Layout dialog to your menus.

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* Chart measures sequential reads (SN1032) using MacInteSher with a 2GB Fast SCSI-2 hard drive. 3.5 MB/sec. test was run on the Macintosh Quadra native SCSI port.
tion you clicked on lacks a corresponding command. To restore the normal pointer, press period or the esc key.) You can also use the Commands dialog box to add or remove commands and to switch between settings files, which store command settings (see “Command Performance”).

How to: WordPerfect Choose Keyboards from the Preferences submenu (File menu) to display the Keyboard Management dialog box. Use the Type pop-up menu to specify how you want to modify the keyboard; for example, choose Characters to change a keyboard character, Commands to assign or remove a keyboard shortcut, or Styles to assign a shortcut to a style. Then select a character, menu command, or style or macro name and use the Assign or Remove button to add or remove a keyboard shortcut (see “Modifying WordPerfect Keyboards”).

WordPerfect keyboard settings are stored in a keyboard template. You can create as many keyboard templates as you like and switch between them using the Keyboard Management dialog box.

Macros: Writing on Autopilot

If you frequently perform the same sequence of steps, consider recording those steps in a macro for later playback. Macros can perform simple jobs, such as inserting often-used text or automatically changing all double hyphens (--) to typesetter’s em dashes (—). But a macro can also perform a sequence of events—opening a document, searching for and replacing some text, saving the document, and then printing it. You can even create macros that display dialog boxes and then make decisions based on your response. For example, you could create a form letter whose contents vary depending on whether a client’s account is paid up or past due.

continues

A LOT FASTER.
GETTING STARTED

Modifying WordPerfect Keyboards

WordPerfect's Keyboard Management dialog box changes with the option you choose from the Type pop-up menu. Top: The Characters option lets you move characters to different positions on the keyboard; here, option-T is assigned to the trademark symbol. Bottom: The Commands option lets you assign shortcuts to menu commands. Here, option-F9 is assigned to the Center Current Page command.

How to: Word

Word 5's macro language, called WordBASIC, is scheduled to be available by the middle of this year. Unlike the macro features in WordPerfect and most other programs, WordBASIC will not provide a record mode that watches over your shoulder and records your keystrokes and command choices; instead, you will have to create macros manually by typing commands into a window. But the language will be powerful; advanced users will be able to write macros that do such tasks as display dialog boxes prompting for information, link Word documents to Microsoft Excel spreadsheets, and much more.

How to: WordPerfect

To record a macro, choose Record from the Macro menu. Type a name for the macro and then click on New. Next, perform the steps you want to record. If you need to scroll while recording, use the keyboard's scrolling keys, not the mouse. When you've finished recording, choose Stop Recording from the Macro menu. You can also pause recording by choosing Pause from the Macro menu's Options submenu; choose Resume to continue recording.) When asked to save changes, click on Yes. Unless you say otherwise, WordPerfect stores macros in your private library; this file, located in the System Folder, can hold macros, styles, keyboard templates, and more. Items in the private library are available in any open document. If you want a macro (or a style, keyboard template, or other item) to be available only when a certain document is open, save it in that document.

Fine-Tuning Memory and Disk Requirements

FREE MEMORY AND DISK SPACE ARE often in short supply. If you're willing to forego some speed and features, you can dramatically reduce your program's appetite for kilobytes.

To reduce any program's memory requirements, select its icon at the Finder and choose Get Info from the File menu. In the Get Info window, specify how much memory you want to give the program by typing the value in the Current Size box. (In system versions prior to 7.0, this box reads Application Memory Size.) Reducing disk space requirements means doing without. Remove files corresponding to features that you don't use, remove sample or tutorial documents you don't need, and expunge any unneeded converters, which enable the program to swap documents with other programs.

How to: Word

Word runs in as little as 512K of memory, although performance suffers and the grammar checker doesn't work. You may also encounter low-memory messages during a lengthy search-and-replace operation or when compiling an index or table of contents. For saving disk space, Word 5's modular design makes pruning the program easy: simply drag any modules and converters you don't want out of the Word Commands folder (located in the Word folder). The grammar checker is one candidate for the Trash: it and its accompanying file use nearly a megabyte of disk space.

How to: WordPerfect

WordPerfect runs in 800K of memory, but just like Word, it slows down. To save disk space, delete file converters you do not need by dragging them out of the Conversions folder. To access the Conversions folder, you open the System Folder, then the Preferences folder, and then the WordPerfect folder.

Customizing a word processor is one of those jobs that takes some time at first but pays off in the long run. As you create dictionaries, styles, and stationery; tweak menus and keyboard shortcuts; and write macros; you'll tailor your program to your writing habits. You'll create a word processor that feels just right.

See Where to Buy for contact information.

Contributing editor JIM HEID looks at a different aspect of Mac fundamentals each month. His latest books are Macworld Guide to Microsoft Word 5 and Macworld Complete Mac Handbook, both published by IDG Books Worldwide.
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Some Killer Tips to Crank Up Deneba’s Latest Rev

You’re probably good and tired of hearing Canvas 3.0 called the Swiss Army Knife of graphics programs. But that is a good analogy for a program that can open every Macintosh graphics-file format from MacPaint to EPS, and even a few IBM-file formats.

In an attempt to crowbar a reasonable interface onto all this power, Deneba Software has added some interesting twists to the standard Mac interface. You’ll find not only hierarchical submenus, but even sub-submenus. Sometimes clicking on a tool palette icon makes a second palette pop out . . . and sometimes clicking on an icon on that palette makes a third palette pop out. Good thing you can tear off the minipalettes and leave them open on the screen (if your monitor is big enough).

In other words, Canvas is a great program to mine for option-key tricks, special-effects nuggets, and other hidden secrets. Some of these tips are from graphics guru Deke McClelland, who went so far as to write Canvas 3: The Book (Peachpit Press, 1991). Others are from Deneba’s resident artist, Dave Rumfelt, who has nested tool palettes running in his veins. (It’s his work that adorns the Canvas 3.0 ads you may have seen, including that zowie racing-car cross section.)

Picking Apart Palettes

One basic concept before we start with the heavy-duty tips: let’s demystify those bizarre color-palette icons on the left side of the screen once and for all. There are four of them, and it’s no small feat figuring them out.

Pen Pat and Fill Pat—the top two palettes, which combine into one palette when you tear one of them off—refer to the outline and inside of shapes, respectively. Canvas uses the Pen Pattern for lines: straight lines, the perimeters of circles, the outlines of polygons, and so on. The Fill Pattern is what goes inside the shapes. (The Fill Pattern is irrelevant when you draw lines.)

There are also Fore Color and Back Color, both on the bottom left palette. These terms refer to the dark and light portions of the patterns you choose from the Pen Pattern and Fill Pattern palettes. For example, in the brick pattern, the bricks’ outline is black (Fore) and the bricks themselves are white (Back). The palettes let you change from black and white to color.

Memory Management

Canvas’s modular construction means you can leave out pieces that you won’t need; each tool you omit saves RAM and loading time. To select which features will load, hold down the spacebar just after you double-click on the Canvas program icon. The Tool Picker will appear with a list of features, each of which you can toggle on or off. Here are a few you can jettison for starters.

If you’re a Mac-only user, turn off the IBM file-format filters—CGM I/O, DXF I/O, IGES I/O. If Canvas is your only graphics program, turn off the other file-format filters: Canvas 1.0 I/O, Canvas 2.0 I/O, Illustrator I/O, MacDraw I/O, MacPaint I/O, StartupScreen I/O, UltraPaint I/O. If you continue...
you’re running in black and white, turn off the color tools: Dropper, Pantone Colors, RGB Color Manager, Separations. If you won’t be needing text in this session, turn off the specialized text handlers: Bézier Text, Search & Replace, Spelling, Text Ruler, Text Utilities. If you’re not using System 7, turn off the System 7 features: Balloon Help, System 7.0 Options. And if you’re not drafting, turn off the special drafting tools: Dimensioning, Hatch Patterns.

**Arrow-Minded**

You may be frustrated by the fact that Canvas keeps taking your tools away from you. After you draw anything, Canvas automatically switches to the arrow tool. To switch back to the draw tool you just used, press the option key. And if Canvas’s automatic arrow-selection feature is really getting you down, turn it off altogether. Choose Preferences from the File menu, click on the icon for General preferences, and check the box marked Retain Selected Tool.

**Rules for Rulers**

Sometimes it’s important that your artwork be printed at a precise size. If this is the case, don’t trust the on-screen rulers—yet.

First, choose Rulers from the Layout menu. In the dialog box that appears, use the Printer pop-up menu to specify whether you’ll be using an ImageWriter- or LaserWriter-class printer. Now your documents should print at an accurate size. If you don’t choose a printer, your printed drawing might be as much as 4 percent too big or too small.

And speaking of rulers—don’t miss those slick rip-off rulers. Once you’ve got rulers displayed on the screen, hold down the option key, click on a ruler, and drag. A copy of the ruler peels off, so that you can place it anywhere in your drawing. To get rid of it, just drag it out of the workspace.

**Adding Guidelines**

You can add nonprinting guidelines to a Canvas drawing just as you can in PageMaker, QuarkXPress, or other programs—by clicking on a ruler and dragging a guideline into the drawing area. That’s pretty standard. What’s more unusual is that once you’ve got some objects touching a guide, you can move the guide and the objects all move along with it—provided you press the option key.

**Layers for Speed**

Like any graphics program, Canvas starts to bog down when you create lots of objects. There are four things you can do to keep its speed reasonable.

- Do as much work as possible in black-and-white mode.
- If you’re finished with some elements of the drawing, send them to invisible layers. Select the elements (group them if you want). Choose Arrange from the Object menu, then from the Arrange pop-up menu choose Send to Layer, and then pick a layer from the submenu that appears. You can make that layer invisible by choosing Layer Specs from the Layout menu and deselecting the Visible check box.
- Stop those redraws. Any time Canvas starts to redraw the screen picture, you’re not...
Creating Text Outlines

1. To create wild text effects—and logos aplenty—start by selecting a text block. From the Object menu, choose Create Beziers (Filled or Hollow).

2. Ungroup the result. Double-click on any character's outline to edit it by dragging handles.

3. Press enter to finish editing.

committed to waiting till it's finished. (For really complex drawings, one redrawing of the screen can be a several-minute proposition.) If all you want to do is use a menu, scroll again, or work on part of the drawing that's already been redrawn, press #-period (.) to interrupt the redraw. If you've stopped the screen when it's only partially drawn, press #-k to redraw the whole thing.

- For maximum speed, choose Views from the Display menu, and choose Wire Frame from its submenu. (Or press #-1.) It's like working in Adobe Illustrator; confusing, because you can't really tell how objects overlap, but fast.

Setting Objects Aside

If you're in a complex tangle of objects, and some are getting in your way, here's a quick way to toss them aside momentarily: group them, then press #-right arrow, say, three times; each time, the selected group jumps 10 pixels (screen dots) to the right. Now that they're out of the way, you can work on the remaining objects unencumbered.

When you're ready to put the object group back in place, select it and press #-left arrow the same number of times as you pressed the right arrow. Not only does the group jump back precisely to its original position, but even its position in the front-to-back lineup remains intact. For added variety, you can use the other arrow keys, too. And if you press the option key instead of #, the selected object jumps 50 pixels at a time instead of 10.

Multiple Objects at Your Command

Every now and then, you have to add dozens of identical objects to a drawing, like the leaves on a tree.

To do this quickly, draw one leaf, select it, and add it to the MacObject menu by choosing Add Macro from the Macro menu. Give it a name (like Leaf). Now choose it from the same menu. Place the cursor on your drawing, hold down #, and start clicking away. You leave a leaf with each click.

Undocumented Centering Feature

Select something. Using the Zoom Manager (the palette of zoom in/zoom out amounts), choose the same zoom level you already have. For example, if you're at double size (2:1), choose 2:1. The drawing shifts to place the selected object in the middle of the screen.

Aligning Objects

You can use the align tool to distribute tasks—provided you set them up beforehand using the menu command. In other words, one click on the align tool aligns the selected objects according to your most recent settings in the Alignment Specifications dialog box. See Where to Buy for contact information.

Contributing editor DAVID POGUE is a Macintosh music, graphics, and animation nut. He teaches magic, Mac, and music in New York.

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SyQuest

All MacLand Removable Hard Drives come with our own installation and reference manual, DiskMaster Plus™ formatting utility software, cables, and a one-year warranty.

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QMS-PS® 410

$1,549

NEC Model 95

$1,549

Microtek 24-Bit Color Scanner

600zs w/Photoshop 2.0 ....... $1349

MEMORY

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Circle 40 on reader service card
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### Deskwriter

- **With cable**: $399.00
- **With cable**: $699.00

### Business

- **U MAX 6300**: $1,265.00

### Utilities

- **Norton Utilities**: $79.00
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- **OmniPage**: $489.00

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- **Sprint1200 Fax Modem**: $195.00
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- 600 MB 5.25" 16ms
- 1.2 Gig 5.25" 15ms (MacWorld's Fastest Gig)
- 2.06 Gig 5.25" 11.5ms (5,400RPM & Fast SCSI)

**Hitachi Drives**

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- 44MB Removable
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**BUSINESS**

- 71: Attain Software
- 104: Core Corporation
- 240: Computer Associates
- 17: Frame
- 248: Marshallsoft, Inc.

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- 85: Design CAD
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**BOARDS**

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- 284-285: Thirdwave

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- 22: Catto Manufacturing
- 20: Kensington Micro万平方米, Ltd.

**MISCELLANEOUS**

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- 20: DGR Technologies
- 38: Hunt Manufacturing
- 56: Kensington Microwave Ltd.
- 70: Nohad

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- 235: Strata

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- 158-257: Insignia Solutions
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<td>1799</td>
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<tr>
<td>1.2G</td>
<td>2299</td>
<td>2499</td>
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<th>TriAm</th>
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<td>240mb</td>
<td>213mb</td>
<td>Compression</td>
<td>16 gray w/ST CI.</td>
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<td>$599</td>
<td>$1899</td>
<td>Monitors</td>
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<th>TriAm</th>
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<td>256 gray w/Lapis card for SE/30, LC, Mac II's</td>
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<th>SyQuest</th>
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<tr>
<td>88mb</td>
<td></td>
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| WREN | $1949 |

| 1.2gb  | |

| 330 | 1349  | 1449 |
| 425 | 1499  | 1599 |
| 600 | 1399  | 1549 |
| 630 | 1699  | 1799 |
| 1.2G| 1949  | 2099 |

Prices and Specifications Subject to Change Without Notice

<table>
<thead>
<tr>
<th>TriAm</th>
<th>$799</th>
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</table>

Dual-Page Monitors

| Sampo | $799 |

Monochrome w/Lapis card for SE, SE/30, NuBus Mac II's

| Sampo | $799 |

Monochrome with Lapis card for SE, SE/30, NuBus Mac II's

**Terms and Conditions:**
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- Disk-for-Disk Replacement Warranty
- Quantum, Maxtor, Syquest, and ARDAT Drives carry a two-year "parts & labor" disk-for-disk replacement warranty. WREN, Teac, WangDAT drives and Syquest Cartridges carry a one-year "parts & labor" disk-for-disk replacement warranty.

**Customer Support:**
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$1,499

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- Push button SCSI selector switch, placed away from the power supply switch, so that it's easy for you to engage it without accidentally turning the drive off
- External circuit breaker switch, so that minor surges don't damage your drive
- Removable filter for fan, so that you can clean it yourself easily & prolong your drive's life
- Ferrite ring inside, so that you have a less noisy drive with a minimum of magnetic interference
- Security latch, so that you can chain and secure your drive
- 3-foot double-shielded SCSI cable, so that you can place the drive on another work surface, if you wish to
- Index external drives come with all these benefits...AND MORE! (see below)

INDEX ELITE HARD DRIVES
Index Elite drives combine a Quantum mechanism (the best!) with FWB Lite driver/formatting software (the best!) for optimum performance. Index Elite drives also include FREE! BRU Pro backup utility (another winner!) and 25 Mb of the very latest, System 7 savvy shareware.

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Int'l (52Mb)</th>
<th>Ext'l (105Mb)</th>
<th>Ext'l (240Mb)</th>
<th>Ext'l (425Mb)</th>
<th>Ext'l (765Mb)</th>
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<tbody>
<tr>
<td>52 Mb, 12 ms</td>
<td>$299</td>
<td>$389</td>
<td>$429</td>
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<td>105 Mb, 12 ms</td>
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<td>$1437</td>
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<tr>
<td>425 Mb, 12 ms</td>
<td>$1437</td>
<td>$1529</td>
<td></td>
<td></td>
<td></td>
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</table>

Good driver/formatting software and 10 Mb of shareware ship with all Index Economy drives.

INDEX ECONOMY HARD DRIVES

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Int'l (52Mb)</th>
<th>Ext'l (105Mb)</th>
<th>Ext'l (240Mb)</th>
<th>Ext'l (425Mb)</th>
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<tbody>
<tr>
<td>52 Mb, 12 ms</td>
<td>$259</td>
<td>$349</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105 Mb, 12 ms</td>
<td>$389</td>
<td>$489</td>
<td></td>
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<tr>
<td>240 Mb, 12 ms</td>
<td>$699</td>
<td>$789</td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 Mb, 12 ms</td>
<td>$1397</td>
<td>$1489</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All Index drives come preformatted, supports partitioning, password protection, and are A UX and System 7 compatible. You get all necessary cables & brackets FREE.

INDEX COLOR MONITOR SYSTEMS

Index 20" Ikegami CT20 Trinitron Systems
These are the genuine, top-of-the-line CT20 Ikegami monitors.

<table>
<thead>
<tr>
<th>Model</th>
<th>8-bit non-upgradeable</th>
<th>8-bit upgradeable</th>
<th>24-bit XLM</th>
<th>24-bit XL</th>
<th>Price</th>
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<tr>
<td>CT20</td>
<td>$2497</td>
<td>$2997</td>
<td>$3497</td>
<td>$3797</td>
<td>$2997</td>
</tr>
</tbody>
</table>

Index 20" Sony GDM 1936 Multiscan Systems

<table>
<thead>
<tr>
<th>Model</th>
<th>8-bit non-upgradeable</th>
<th>8-bit upgradeable</th>
<th>24-bit XLM</th>
<th>24-bit XL</th>
<th>Price</th>
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<tbody>
<tr>
<td>GDM 1936</td>
<td>$2997</td>
<td>$3497</td>
<td>$3497</td>
<td>$3797</td>
<td>$2997</td>
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</table>

MONITORS

- Apple 13" RGB Trinitron ....................... $729
- Seiko 14" Trinitron ......................... $629
- Sony 16" Trinitron (Multiscan) .............. $1297
- Ikegami 20" CT20 Trinitron .................. $1897
- Sony 20" GDM 1936 Trinitron .................. $2497

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- 2 GB DAT tape, 60m $29
- 2 GB DAT tape, 90m $39
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- 3.5' 128 Mb Optical disk $69
- 650 Mb Sony Optical drive w/1 cartridge $2897
- 3.5' 650 Mb Optical disk $149

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- 4 Mb Index Gold™ SIMM, 70/80ns $139
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- PowerBook 4 Mb (140,170) $375
- PowerBook 6 Mb (140,170) $595
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- Mac LC Index Gold™ MathMate $79
- Accelerate math-intensive operations on your LC by up to 39% with a 68882/16 MHz math co-processor and get a 15% overall CPU improvement. FREE! Benchmark software included.
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Quadra VRAM

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Macintosh LC 440 Call
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Macintosh Classic II 480 $1379
Macintosh Quadra 700 $4389
Macintosh Quadra 900 $5375
Macintosh PowerBook 100 2/20 $1949
Macintosh PowerBook 100 2/40 $2592
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Prominet 10 Pack $18
QuickMail 10 User 285
Shvia Ehrateg / FacePath 256/256
Shvia Nibblng's Webbridge $399

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Global Village Full Fax Send & Receive $215
Practical Peripherals $164
Practical Peripherals MacFax $225
Sprint Modem Modem $225
US Robotics Courier 300/50 $65
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ZOOM2400B Send/Receive Fax $175

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20/24-bit Color System $2473
SE/30 8-bit Color Card $569

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GCC EPSON $1246
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**Storage Systems**

**Removable Media**

<table>
<thead>
<tr>
<th>Media</th>
<th>80 MB Tape for Teac</th>
<th>150 MB Tape for Teac</th>
<th>SyQuest 45 or 88 MB cartridge</th>
<th>DAT Cassette 60 or 80 meter</th>
<th>Optical cartridge (512 kb/sector)</th>
<th>Optical cartridge (1MB/sector)</th>
<th>Optical cartridge for Tahi</th>
<th>Optical cartridge 128 MB</th>
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<tr>
<td>Price</td>
<td>$17.00</td>
<td>$24.00</td>
<td>$68.00 / $115.00</td>
<td>$120 MB</td>
<td>$240 MB</td>
<td>$520 MB</td>
<td>$600 MB</td>
<td>$128 MB</td>
</tr>
</tbody>
</table>

**DAT Drives**

- OptiDisk 600: $2895.00
- OptiDisk 1000: $3985.00
- 45 SX (SyQuest) w/cartridge: $475.00
- 68 SX (SyQuest) w/cartridge: $689.00
- DATdrive 280: $1385.00
- DATdrive 580: $1656.00

**Disk Drives**

<table>
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<tr>
<th>Size</th>
<th>Internal Price</th>
<th>External Price</th>
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<tr>
<td>1700 MB</td>
<td>$3289.00</td>
<td>$3389.00</td>
</tr>
</tbody>
</table>

**Memory Upgrades**

Third Wave manufactures a complete line of memory products for all Macs: 1, 2, 4, 8MB SIMMs, 16MB SIMMs, and 1MB SIMMs for the Quadra 700.

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Quadra Compatible!
E-Machines ColorPage T16 16-inch display. Works with the Macintosh Quadra built in video! Displays 832x624 resolution at 72dpi. The T-16 judged best 3 years running by MacUser Magazine.

$7,739.

Please Call For Price

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E-Machines ColorPage T16 16-inch display. Works with the Macintosh Quadra built in video! Displays 832x624 resolution at 72dpi. The T-16 judged best 3 years running by MacUser Magazine.

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Futura MX .................................. $1399
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ColorLink SXT .................................. $1050
E-Machines TXs1 and T196i .......... $949
E-Machines TXSE308 ................. $949
Options
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Futura EX to Futura SX Upgrade ... $350

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<table>
<thead>
<tr>
<th>Feature</th>
<th>RailGun 030Pro</th>
<th>Mobius 030</th>
<th>Macintosh IICI</th>
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<tbody>
<tr>
<td>Base Price</td>
<td>$999</td>
<td>$1295</td>
<td>$3299</td>
</tr>
<tr>
<td>CPU Support</td>
<td>SE, Classic, &amp; Plus</td>
<td>SE &amp; Classic</td>
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</tr>
<tr>
<td>Processor</td>
<td>25 MHz 68030</td>
<td>25 MHz 68030</td>
<td>25 MHz 68030</td>
</tr>
<tr>
<td>Math FPU</td>
<td>68882 Included</td>
<td>$130 Extra</td>
<td>Included</td>
</tr>
<tr>
<td>PMMU</td>
<td>Built into 68030</td>
<td>$200 Extra</td>
<td>Included</td>
</tr>
<tr>
<td>Video Path</td>
<td>32-bit Video</td>
<td>16-bit Video</td>
<td>32-bit Video</td>
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<tr>
<td>Monitor</td>
<td>19&quot; 1152 x 876</td>
<td>19&quot; 1024 x 768</td>
<td>$800-$1500 Extra</td>
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<tr>
<td>Video Support</td>
<td>All 3rd Parties</td>
<td>Only Mobius</td>
<td>All 3rd Parties</td>
</tr>
<tr>
<td>Total Price</td>
<td>Still $999</td>
<td>$1625</td>
<td>$4099</td>
</tr>
</tbody>
</table>

Now that you know what we've got, ask Mobius about their features. Then ask them about their price. Then call us for the RailGun 030Pro System — the only system that makes sense.

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## SYSTEMS

<table>
<thead>
<tr>
<th>Model</th>
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<tbody>
<tr>
<td>Mac LC 4/40</td>
<td>1570</td>
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<tr>
<td>Mac IIfx - 4 meg</td>
<td>4179</td>
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<tr>
<td>Mac IIci - 5 meg</td>
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<tr>
<td>Mac IIci - 5/105 (Quantum)</td>
<td>3049</td>
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<tr>
<td>Mac IIci 3/40</td>
<td>1959</td>
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<tr>
<td>Mac IIci 5/80</td>
<td>2549</td>
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<tr>
<td>Extended Keyboard</td>
<td>170</td>
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<tr>
<td>Mac Quadra 700 - 4 meg</td>
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<tr>
<td>Mac Quadra 700 - 4/105</td>
<td>4799</td>
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<tr>
<td>Mac Quadra 700 - 4/20</td>
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<tr>
<td>Mac Quadra 900 - 4 meg</td>
<td>5675</td>
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<td>Mac Quadra 900 - 4/20</td>
<td>6385</td>
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<tr>
<td>Mac Powerbook 140/2/20</td>
<td>2223</td>
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<tr>
<td>Mac Powerbook 140/2/40</td>
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<tr>
<td>Mac Powerbook 140/4/20</td>
<td>2749</td>
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<tr>
<td>Mac Powerbook 170</td>
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## MONITORS

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<table>
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<tr>
<td>Apple 13&quot; Highres</td>
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<td>Seiko</td>
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<td>Seiko CM-1445</td>
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## PRINTERS

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<tr>
<td>HP Deskwriter</td>
<td>355</td>
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<tr>
<td>HP Deskwriter Color</td>
<td>655</td>
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<tr>
<td>HP IiSf for Mac</td>
<td>1519</td>
</tr>
<tr>
<td>HP IiSf for Mac</td>
<td>1719</td>
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<tr>
<td>HP III for Mac</td>
<td>2319</td>
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<tr>
<td>HP IiSf for Mac</td>
<td>4519</td>
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<tr>
<td>HP Deskwriter Ink Cartridge</td>
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<td>AppleTalk Connectors</td>
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<td>Color Printers</td>
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<td>NEC PS 40</td>
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## SCANNERS

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<tr>
<td>Logitech ScanMan 32</td>
<td>2999</td>
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<tr>
<td>Microtek 6002S w/Photoshop</td>
<td>1299</td>
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<tr>
<td>Microtek 1850S Slide Scanser</td>
<td>1759</td>
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<tr>
<td>Umax UC-630 w/Photoshop</td>
<td>1399</td>
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<td>Caere Typist</td>
<td>4899</td>
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## DRIVES

### (cont.)

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<th>Model</th>
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<tr>
<td>Quantum 105 Pro</td>
<td>469</td>
<td>369</td>
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<tr>
<td>Quantum 210 Pro</td>
<td>835</td>
<td>710</td>
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<tr>
<td>Quantum 240 Pro</td>
<td>909</td>
<td>789</td>
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<tr>
<td>Maxtor 120</td>
<td>519</td>
<td>399</td>
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<td>Maxtor 213</td>
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<td>Maxtor 340</td>
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<td>Maxtor 180 meg</td>
<td>1800</td>
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<td>Seagate 1.2 gigabyte</td>
<td>2269</td>
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<td>Syquest 44MB</td>
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<td>Syquest 88MB</td>
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<tr>
<td>Internal Drive Kit</td>
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<tr>
<td>Syquest 44MB cart.</td>
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<tr>
<td>Road Runner 80 meg for Powerbook</td>
<td>670</td>
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## SOFTWARE

<table>
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<tr>
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<tbody>
<tr>
<td>Microsoft Word</td>
<td>269</td>
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<tr>
<td>Microsoft Excel</td>
<td>309</td>
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<tr>
<td>Aldus Pagemaker</td>
<td>497</td>
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<tr>
<td>Caere Omnigraph</td>
<td>499</td>
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<td>Adobe Photoshop 2.0</td>
<td>515</td>
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<tr>
<td>Quark Express</td>
<td>579</td>
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## PRINTERS

### (cont.)

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>Microtek TrueLaser</td>
<td>1299</td>
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<tr>
<td>TI Microlaser PS35</td>
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<td>TI Microlaser PS17</td>
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<td>QMS PS410</td>
<td>1549</td>
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<td>NEC Model 95</td>
<td>1439</td>
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<tr>
<td>Apple Stylewriter</td>
<td>Call</td>
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<tr>
<td>Apple Laserwriter III</td>
<td>2799</td>
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## MODEMS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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</thead>
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<tr>
<td>Zoom</td>
<td>1799</td>
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<tr>
<td>Modem MX 2400S w/SENDfax</td>
<td>1999</td>
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<tr>
<td>v.32 Turbo w/4.2bis</td>
<td>2199</td>
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<tr>
<td>w/MNP software</td>
<td>2999</td>
</tr>
<tr>
<td>Dove Fax Modern 9624</td>
<td>3199</td>
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<tr>
<td>Dove Fax Modern 0624 Plus With Voicemail</td>
<td>4299</td>
</tr>
<tr>
<td>PSI for Powerbook 140 &amp; 170 internal 9600/2400</td>
<td>2799</td>
</tr>
</tbody>
</table>
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**Printers**

**PROMOS**

**Mac Systems**

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<table>
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<th>Capacity</th>
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<td>385 MB</td>
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<td>760 MB</td>
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<td>1.2 Gig</td>
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<td>1.5 Gig</td>
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<tr>
<td>2 Gig</td>
<td>3.9 ms</td>
<td>$3399</td>
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Thirty-Day Money Back Guarantee!

SIMMs

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<tr>
<th>Size</th>
<th>4 Meg 80ns</th>
<th>1 Meg 80ns</th>
<th>2 Meg 80ns</th>
<th>6 Meg PowerBook Memory</th>
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<td>Price</td>
<td>$88</td>
<td>$30</td>
<td>$65</td>
<td>$369</td>
</tr>
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- Available with 68882 Math Coprocessor
- System 7 & A/UX Compatible

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<td>Ilci to Quadra 700</td>
<td>$1999</td>
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<tr>
<td>Ilcx to Quadra 700</td>
<td>$2499</td>
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<td>Mac II to IIx</td>
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<td>Mac IIx to IIx</td>
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Blowout Parts & Stuff!

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<td>$199</td>
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<tr>
<td>IBM LocalTalk interface board......</td>
<td>99</td>
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<tr>
<td>(everybody needs at least one)</td>
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<tr>
<td>Samsung 19&quot; monitor &amp; bd.</td>
<td>599</td>
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<tr>
<td>Portrait Monitor (gray-scale).......</td>
<td>599</td>
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<td>LaserWriter II engine...............</td>
<td>1495</td>
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<td>Fujitsu 800K external floppy.......</td>
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<td>Classic II 2/40mb</td>
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<td>Classic II 4/120mb</td>
<td>$1499</td>
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<tr>
<td>Mac LC 4/40mb with 14&quot; color monitor</td>
<td>$1899</td>
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<td>Mac LC 4/120mb with 14&quot; color monitor</td>
<td>$2149</td>
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<td>PowerBook 140</td>
<td>$Call</td>
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<td>PowerBook 170</td>
<td>$Call</td>
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<td>Mac Illi 5/120mb</td>
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<td>H.P. Deskwriter</td>
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<td>Personal Laser LS</td>
<td>$899</td>
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<tr>
<td>Personal Laser NT</td>
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Seagate Cartridges & Tapes

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Fujitsu Cartridges & Tapes

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Quantum Cartridges & Tapes

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Pocket Portable & Transportable Drives

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Hard Disk Drives - Internal & External

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1981 CD- TECH. Porta-Drive 32mb/64k buffer, 1-year warranty, uses the Toshiba XM 300 mechanism. Multimedia HAM Disc and America the Beautiful are included FREE.

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1981 32mb/64k buffer, 1-year warranty, free EDUCORP CD-ROM drive.

1979 NEC CD-ROM 350ms/64K buffer, 2-year warranty, $99.99
1997 NEC CD-ROM 500ms/64k buffer, 2-year warranty, Type Gallery CD included FREE.

CD-ROM Titles

Education

1777 AmateursOnly $49.95
1640 Classics of the 19th $49.95
1590 Desert Storm $33.00
1691 FindIT Webster $69.95
1615 Joy for Everyone $29.99
1261 Learn & Speak Spanish $79.95
1204 Learn & Speak French $79.95
1772 Silly Noise House $49.95

Desktop Publishing

1399 DTP CD 2.0 $99.95
1587 Donatel Lingerie $129.95
1681 GraphTec Graphic Designs $99.95
1585 Ocean Imagery $99.00
1393 Photo CD $129.95
1720 Pre-SEPs v.1 $199.95
1697 Sky v.1 $99.95
1592 SwissSet CD $199.95
1815 Wrapskinne $99.95

Entertainment & Consumer

1771 Baseball’s Greatest Hits $69.95
1399 Cosmic Ocean $99.95
1300 EDUCORP Shareware 6.0 $199.00
1300 EDUCORP CD-ROM Sampler $99.95
1356 Exotic Japan $79.95
1356 GameRoom® over 750 games $49.95

800K disks as low as $4.99 each

Individual disks start at $6.99 each, buy 5 for $5.99 each, or buy 10 for more only $4.99 each.

4414 MacConcept A full working 3D graphics program.
2192 ResEdit/CICN Editor Edit and manipulate all resources, from icons and dialog boxes to menus.

5 Disk Sets $24.95 each

1706 System 7 Tools & Utilities Includes ResEdit 2.1, i4 Utilities, 18 TrueType fonts, and 90 color icons.
1706 True Type Fonts 40 TrueType Fonts for use with System 7.
1706 Color Games Puzzles, cards, and arcade games in full color!
1155 Best of Education

DTP Bundle - Save $400

Get Ocean Imagery, People at Leisure, International Graphics Library, and The Desktop Publishing CD 2.0 for only $199 when you purchase any CD-ROM drive or drive bundle in this ad. #1003

7 CDs with any drive purchase for $199.

Choose from any of the CD-ROM drives below and get the Illustrated Encyclopedia, Time Table of History, World Atlas, Shakespeare, Sherlock Holmes, Birds of America, and Mammals for just $199! Save over $70! #1599, $199.99

CD-ROM Drive Bundles

Choose from several neat bundles and save!

CD-ROM Drives and Titles

Create! Learn! Play! Watch! Hear! Over 200 titles in stock. Whether you’re a picture person, a word person, a sound person, or maybe you just want to have a little fun, you’re sure to nd something of interest.

You’ll meet or beat any advertised price on CD-ROM products!

Shareware as low as $4.99/Disk

800K disks packed with our finest Shareware.

5-Disk Sets $24.95 ea.

1-800-843-9497 EDUCORP ©

Call for your FREE catalog. EDUCORP Computer Services 7434 Trade St. • San Diego, CA 92121 Info: 619-536-9999 Fax: 619-536-2345

The Orchestra CD - "The young person's guide..." #1751, $55.00
Grooves CD 100 royalty-free music clips. #1565, $59
Circle 157 on reader service card

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Grooves CD 100 royalty-free music clips. #1565, $59
Circle 157 on reader service card

Eddy Award Winner!

People at Leisure CD $20 color photos. #1736, $149.95

Desktop Publishing

Int'l Graphics Library CD $20 color global images. #1361, $299

People in Business CD - $20 color photos. #1735, $149.95

Entertainment & Consumer

Spacelab’s Epic sci-fi adventure. #1583, $89.95

Exotica ROM 2.0 - 150 color images. #1927, $100

Educational CDs - Video & Tools for Multimedia

WrapShare One CD - Video footage #1659, $179.95

Digital Video Library CD 100 QuickTime movies #1701, $149.95

Video & Tools for Multimedia

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7 CDs with any drive purchase for $199.

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CD-ROM Drives and Titles

Create! Learn! Play! Watch! Hear! Over 200 titles in stock. Whether you’re a picture person, a word person, a sound person, or maybe you just want to have a little fun, you’re sure to nd something of interest.

You’ll meet or beat any advertised price on CD-ROM products!

Shareware as low as $4.99/Disk

800K disks packed with our finest Shareware.

5-Disk Sets $24.95 ea.

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Grooves CD 100 royalty-free music clips. #1565, $59
Circle 157 on reader service card
### Education Software

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

### Business Software

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- Microsoft Excel  
  Microsoft Corporation
- Microsoft Word  
  Microsoft Corporation
- Microsoft Office  
  Microsoft Corporation
- Quicken  
  Intuit
- Aldus PageMaker  
  Aldus Corporation
- Microsoft Works  
  Microsoft Corporation
- Aldus Persuasion  
  Aldus Corporation
- MacDraw Pro  
  Claris Corporation
- Adobe Illustrator  
  Adobe Systems
- MacDraw II  
  Claris Corporation
- WordPerfect Office  
  WordPerfect Corporation
- WordPerfect for the Macintosh  
  WordPerfect Corporation
- FileMaker Pro  
  Claris Corporation
- Aldus FreeHand  
  Aldus Corporation
- MacWrite II  
  Claris Corporation

### Entertainment Software

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- Tetris  
  Spectrum Holobyte
- Microsoft Flight Simulator  
  Microsoft Corporation
- SimCity  
  Maxis
- SimEarth  
  Maxis
- Falcon  
  Spectrum Holobyte

### Utility Software

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- After Dark  
  Berkeley Systems
- More After Dark  
  Berkeley Systems
- SAM  
  Symantec Corporation
- Virex  
  Microcom
- Adobe Type Manager  
  Adobe Systems

### Network/Data Communications

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- PhoneNet  
  Farallon Computing
- AppleShare  
  Apple Computer
- MacLink Plus  
  Hayes Microcomputer Products
- TOPS  
  Sitka Corporation

### Add-In Boards

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- Macintosh IIsi NuBus Adapter Card  
  Apple Computer
- Pivot  
  Radius
- Macintosh Display Card 8+24  
  Apple Computer
- Macintosh IIfx Logic Board Upgrade  
  Apple Computer
- MacOn+ 30I Ethernet Card  
  Asante Technologies

### The AmCoEx Index of Used Mac Prices

<table>
<thead>
<tr>
<th>Macintosh Model</th>
<th>RAM/ Hard Drive</th>
<th>Average Sale Price</th>
<th>Monthly Change</th>
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<tr>
<td>Mac Plus/1MB/none</td>
<td>$450</td>
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<td>Mac Plus/2MB/20MB</td>
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<td>Mac SE/2MB/20MB</td>
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<td>Mac SE/80/2MB/40MB</td>
<td>$1800</td>
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<td>Apple 12-inch B&amp;W display board</td>
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<td>LaserWriter NLT</td>
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Index provided by the American Computer Exchange of Atlanta, Georgia. It reflects sales during the week of March 20. Configurations include keyboard and exclude monitor and display board for noncompact models.

Source: Exclusive Audits & Surveys research from more than 250 Macintosh retailers and selected mail-order vendors. Covers sales during February 1992.
“Tim Says, If There’s A Better Value In Peripherals Than Mirror’s New 16-inch Color Display, Show Me...”

Mirror 16-inch Color Display
$899 for built-in video,
with 8-bit $1299, 16-bit $1499,
24-bit $1699.

Tim Garcia, President
Gateway Area Macintosh Users Group
St. Louis, Missouri
COLOR DISPLAYS

14-inch Color Display $399*
16-inch Color Display $399*
16-inch TFT/Video Display $419*
16-inch Trinitron* Display $1,199
20-inch ProView* Display $1,899

LASER PRINTERS

The MirrorImage Laser Printers feature PostScript Level 2, RISC processors, dual paper trays, 35 built-in Adobe fonts, three interface ports, a SCSI port for adding a font drive, and an installation videotape.

COLOR SCANNER

Mirror's top-rated 600 Color Scanner offers true 600 dpi scanning resolution, 24-bit color and a great price. Comes complete with Adobe Photoshop 2.0.

STORAGE

All Mirror drives feature rugged steel enclosures, high-grade power supplies, external push-button SCSI address switch, switched convenience outlets, and external termination.

- Members,
  Gateway Area Macintosh Users Group
  St. Louis, Missouri

MIRROR

1-800-654-5294
ORDER DIRECT

- New Product

Circle 125 on reader service card
Impressing the members of a Mac user group is never easy, and if that group happens to be from Missouri, the task is all the more difficult. So we were particularly pleased to have the members of Missouri's largest user group tell us they were impressed by Mirror Macintosh peripherals.

It's easy to see why Tim Garcia thinks the new Mirror 16-inch Color Display is so exciting. Never before could you get the productivity and convenience of a 16-inch display and Mirror quality at such an attractive price. At only $899*, the Mirror 16-inch Color Display is perfect for publishing, illustration and scanning. Plug it right into the video port on a Quadra or add one of our high performance video boards (available in 8-, 16-, or 24-bit models) and you've got a hard working system that won't break your budget.

Another addition to the Mirror product line that's bound to build a strong following is the Mirror 128 MB Optical Drive. It gives you 128 MB of fast, reliable storage on a rugged removable cartridge that fits in your pocket. Priced at only $1,449, the 128 MB Optical drive is perfect for storing large graphics, database files or backups. Additional cartridges are just $59.

Our exciting new laser printers, the MirrorImage "309 and the MirrorImage "415 give you more features, more functionality and higher performance than printers costing hundreds or thousands more. With state-of-the-art RISC processors, Adobe's PostScript 2, dual paper trays, SCSI port, three interface ports, and a very low cost-per-page for consumables, the MirrorImage Laser Printers can handle even complex jobs with ease.

Like all Mirror Products, the MirrorImage Printers include lifetime technical support and our 30-day, "love it or return it" guarantee.

*Reflects a 10% discount off list price.
How do you design the ultimate trackball?

With Turbo Mouse®, we start with a large, comfortable ball. A large-diameter ball means more surface area to work with. Greater cursor control. Less fatigue at end of day. It is the difference between driving a luxury sedan versus a compact.

For ultrasmooth movement, the ball rests on the highest quality bearings. For durability, everything is housed in heavy duty ABS Plastic.

Next, the special touches. Like custom software that adjusts both acceleration and double-click speed. Like a time-saving chording feature that performs one of seven useful commands. Like well positioned buttons with a light, responsive click.

Did we succeed in designing the ultimate trackball?

The readers of *Macworld* say we did. They voted us Best Input Device four years in a row. The readers of *Publish!* say we did. They voted us Number One three years in a row. The editors of *MacUser* say we did. They gave us the coveted Five Mice rating.

And the story doesn't end here. Recently, we introduced an exciting new input device — the Kensington NoteBook Keypad. This external keypad adds full keyboard performance (including 15 function keys) to Macintosh® PowerBook™ and other ADB compatible computers.

Turbo Mouse and NoteBook Keypad are both System 7 compatible. For more information about our complete line of accessories, ask your dealer or call 800-535-4242. Outside the U.S. 415-572-2700.