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Incorporating MacUser



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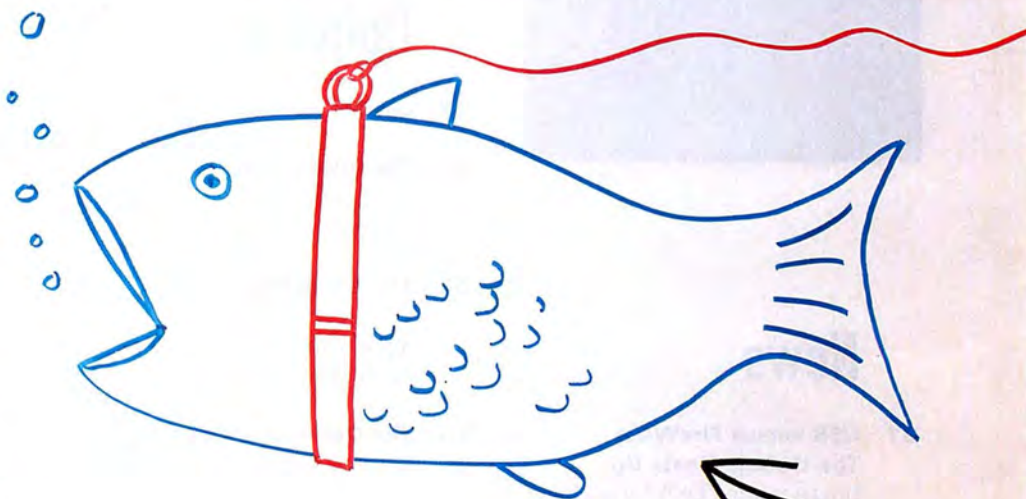
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★★★★½ Mitsubishi Diamond Pro 900u;
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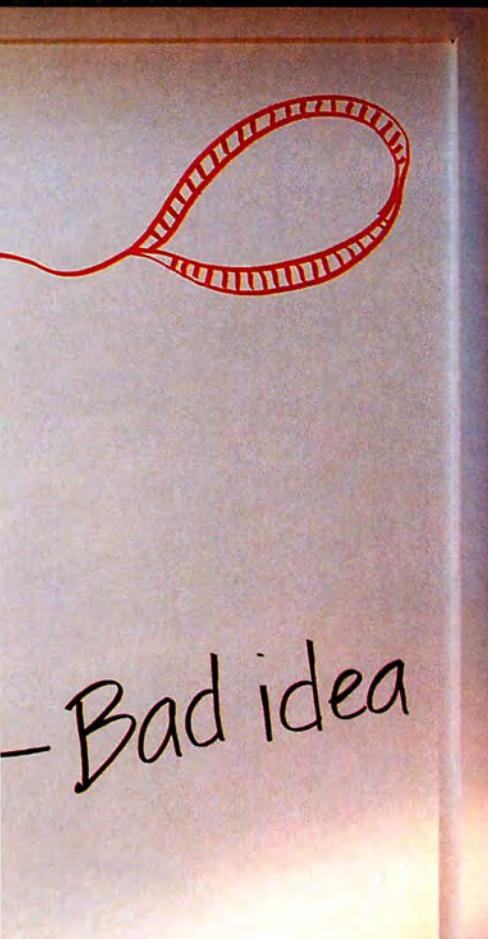
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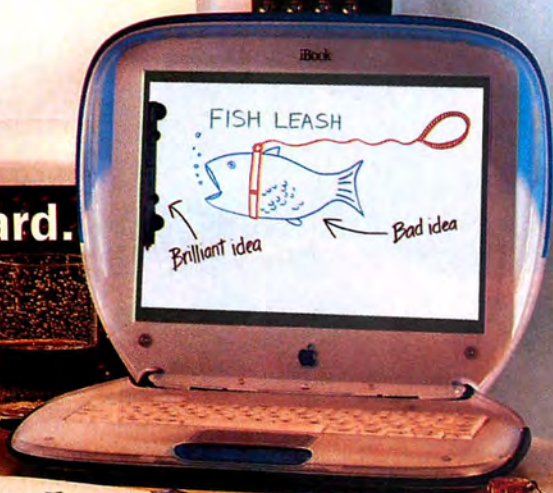
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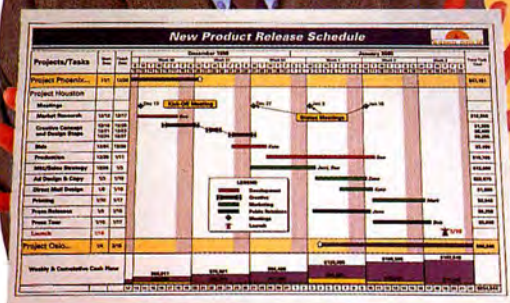
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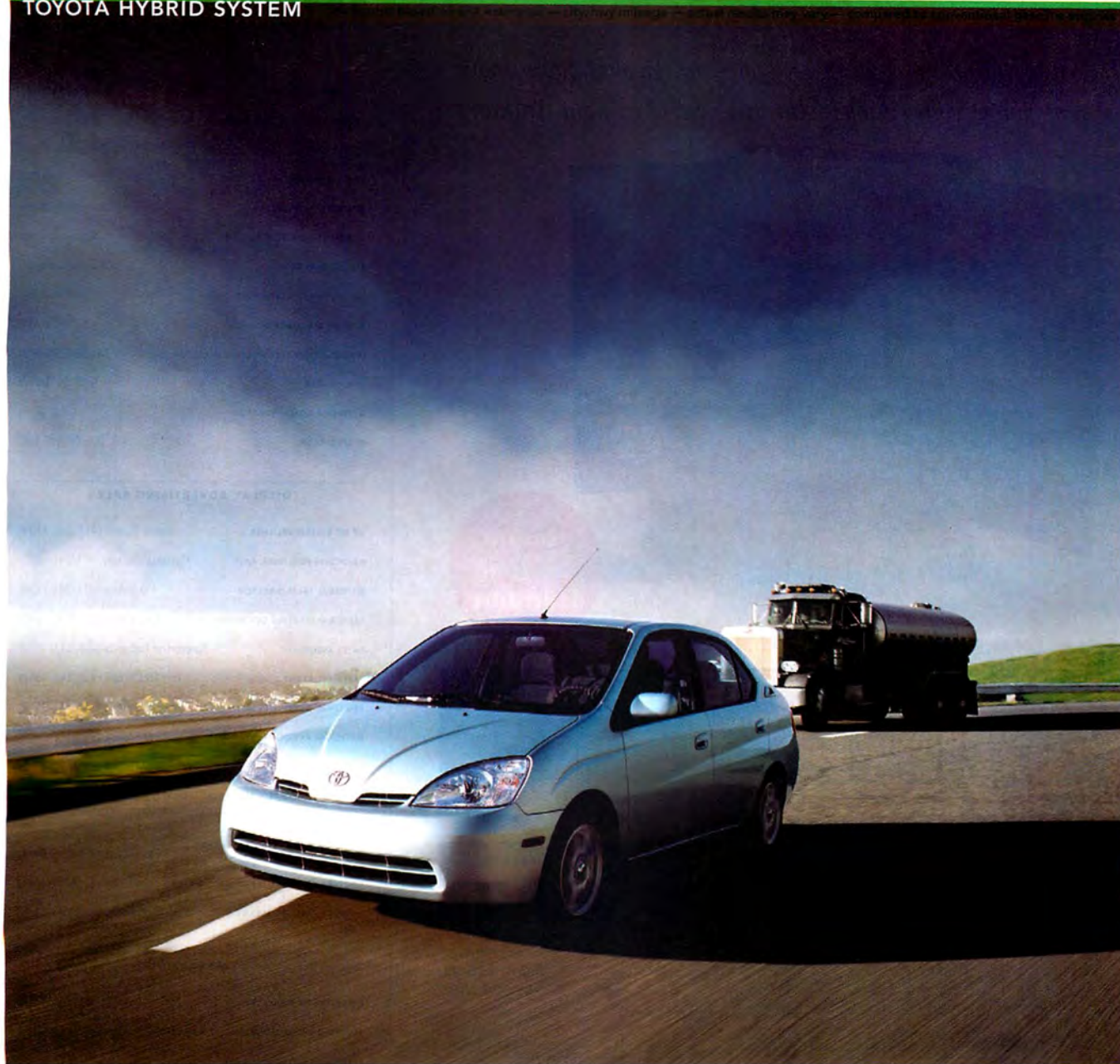


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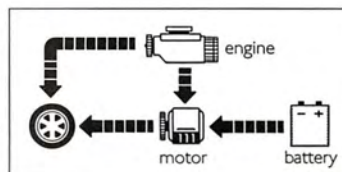
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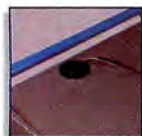
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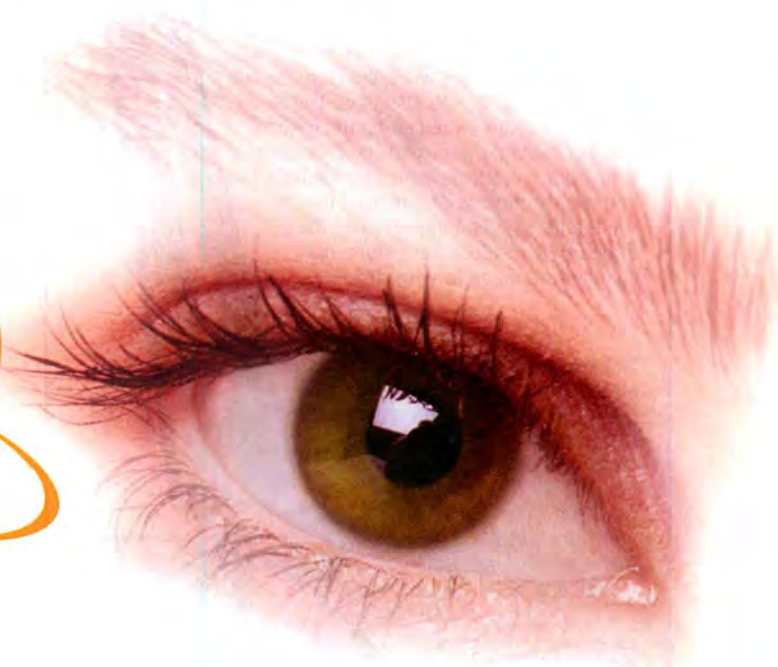
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The secret lives of Mac users and Microsoft products*

confession[#]

023

 *"I used to think, 'If I have to be the lone holdout and try to use something other than Excel, then so be it.' Then I realized I may be a rebel, but I've also got a job to do."*

*Mac fanatics portrayed are fictitious, but based on real-life raves of Microsoft Excel users.



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AUGUST 2000

Letters

Burn, Baby, Burn

I THOUGHT YOUR FEATURE ON DVD-RAM drives was great ("Hold Everything," May 2000). But I wasn't clear on one thing. The writer claims that if you've been using a CD-R or CD-RW drive to burn discs or make music CDs, you won't find the mechanics of DVD-RAM so foreign.

Does this mean I can use DVD-RAM drives to make audio CDs?

DALBELLO
Toronto, Ontario, Canada

Unfortunately, although DVD-RAM and CD-RW drives burn data in a similar way, you can't burn your own music CDs with DVD-RAM drives. You can store audio on DVD-RAM discs, but only in data form—your music will not play back. Burning audio discs on the DVD-RAM media is impossible since they don't conform to Red Book Audio encoding standards.—Kelly Lunsford

The MP3 Underbelly

WHAT SORT OF FANTASY WORLD IS *Macworld* living in? In "The Macworld Web Searcher's Companion" (May 2000), I read that "most people are using MP3 programs just to rip their CD collections to their hard disks," followed by a description of how struggling artists use MP3 technology to distribute their songs.

This may be *Macworld's* dream of MP3 technology's ideal use, but the reality is illegal exchange of copyrighted material.

BRIAN C. HALL
Notre Dame, Indiana

For coverage of the darker side of MP3s, check out our story "Steal This Song" elsewhere in this issue.—Ed.



Rocket in My Pocket

I'VE USED A ROCKET eBook FOR almost six months, and I have to disagree with your review of the NuvoMedia Rocket eBook Pro (*Reviews*, May 2000).

The reviewer's main objections were to the Rocket eBook's weight and its "bottom-heavy" curved shape. But it weighs about the same as a regular hardcover book, and I have no problem holding it, even with my tiny hands. My mom, who has arthritis, doesn't either, and she certainly enjoys the nicely lighted screen and the larger fonts.

If the reviewer had experimented a bit longer than two hours or read the directions, he would have discovered that the Rocket eBook can rotate to suit the reader, so that the heavy bottom actually resembles the spine of a hardcover, fitting the reader's hand just like a book. If the Rocket eBook were completely flat, as the reviewer would seem to prefer, the

reading experience would be more like reading a tablet than a real book. I would find that tiring.

The inflated price of electronic books is a problem if you just want electronic reprints from traditional publishers, but there are other options. Companies that publish only to electronic formats offer good, reasonably priced e-books that don't fit the neat niches of paper publishing. Free books in the public domain are another option.

MARILYNN BYERLY
High Point, North Carolina

THE ROCKET eBook PRO'S \$269 price tag seems like quite a fee for a device designed to display electronic books. For years now, I have been able to carry around several electronic novels on my Palm III. With any Palm OS-based handheld and third-party shareware, you can have a Palm and an e-book in one device. Compared to loading novels on a PDA or just buying a paperback, the Rocket eBook seems like a bulkier, more expensive way to catch up on reading.

PHILIP MCCULLOCH
Tucson, Arizona

Wrong Turn in GPS Review

I LOOK FORWARD TO READING YOUR reviews each month to help me make educated buying decisions. But after reading your review of the DeLorme Earthmate GPS (Global Positioning System) receiver (*Reviews*, May 2000), I will take reviews in your magazine with a grain of salt.

It appears to me that *Macworld* sent Ben Long out into the streets of San
continues

Francisco to try this product without much knowledge about the needs of people who spend a good part of their lives on the road. I have used a GPS receiver with Street Atlas 6.0, and it is a good product that gets a bad rap from this reviewer.

Long's comment that receivers can be off by as much as a city block shows his lack of experience on the road. If this system can get me within a block of my desired destination in a strange city, that will more than please me. As it is, on many occasions I have found that Street Atlas 6.0 put me right in front of the address—not a block away.

Long's suggestion that users invest in a good road atlas again shows his lack of experience. A road atlas will not tell you which way to turn at the next intersection or, for that matter, in which direction you are actually traveling. And it is much easier to drive while following the arrow on the Street Atlas window than it is to drive while tracing your progress on a map or atlas.

CHARLES CLEMMER
Staunton, Virginia

Bombs Away

AT MY PLACE OF WORK, I AM FORCED to use Lotus Notes, and I've used both versions 4.6 and 5 on the Mac (see *Reviews*, May 2000, for a review of version 5). I'd rather rely on a tin can and string.

But this brings up one benefit of the Notes client. I once read a posting on some software developer site about an application that would deliberately attempt to crash other programs. Developers used it as a tool for making applications more bomb-resistant. This, I believe, is one of Notes' more significant features: if another application can run while Notes is running, you can categorize it as bomb-proof.

CHRISTOPHER DAVIS
Baldwinsville, New York

Stand Up and Be Counted

THANK YOU FOR YOUR ARTICLE discussing all the recent good news—and bad news—for Mac gamers ("Careful What You Wish For," *The Game Room*, May 2000). Like many iMac owners, I

also own a PC. I buy Mac-PC games whenever possible, particularly since the dual-platform version is often cheaper than the Mac-only version.

I do think sales of Mac games are somewhat underreported. Stores invariably ring up combination Mac-PC games as PC sales. When I fill out the registration card, often it doesn't ask whether I'm using a Mac or a PC. These sales thus look to all the world like PC sales—despite the fact that I'm actually playing the game on my iMac.

DANIEL GONNEAU
Astoria, New York

To Partition or Not to Partition

MY NEW G4 HAS A WHOPPING 27GB hard disk, and I presumed that partitioning was a good idea. I rang Apple to ask for advice on how many partitions to make. To my surprise, the company said this wasn't necessary. I know the size of blocks is no longer a problem with the new method of formatting. However, I thought dividing up the disk would speed performance. Everyone I ask tells me something different. Can you help?

PHILLIP PULFREY
Montreux, Switzerland

A partitioned drive may run slightly faster because the file directory is smaller, but you'd scarcely detect this difference on modern drives.—Ed.

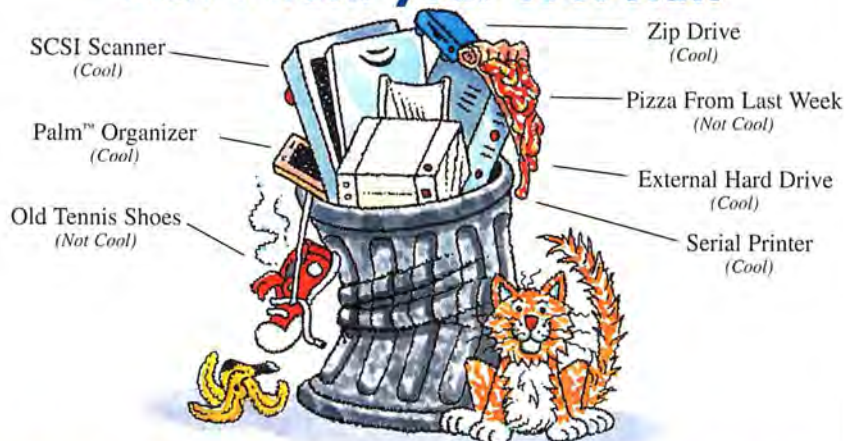
DV Blues

OUR OFFICE WAS CONSIDERING THE purchase of a digital video camera. Your April 2000 issue arrived in the mailbox just in time to help us make up our minds ("Camcorder Casting Call"). The Sony DCR-TRV10 was our final choice—partly due to the fact that you made it an Editors' Choice.

Imagine our dismay when we discovered that the memory stick reader that ships with the DCR-TRV10 will only interface with a serial port and Windows software. Your reviewer mentioned that the memory stick needs a special reader. He did not mention that the shipped version is not Macintosh-compatible.

Sony would not exchange the serial device for a new USB reader or a PCMCIA reader for my PowerBook. But the

Upgrading to a G3/G4? Don't trash your cool stuff



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company did finally sell us those items at a discount.

Macworld should have caught and mentioned this problem.

THOMAS JORDAN
Batavia, Illinois

Sony now sells the MS AC-US1 Memory Stick USB reader for about \$70.—Ed.

You're the Top, Mr. Pogue!

I KNOW YOU CAN'T ANSWER ALL your mail. Just take note somewhere that whatever you're paying David Pogue can't possibly be enough. I had a bad case of Mac sickness this morning, but his latest column healed me ("Secrets of the Software License Agreement," *The Desktop Critic*, May 2000). I'm sending him love telepathically.

BEV ANDERSON
San Francisco, California

I JUST READ YOUR ARTICLE ON license agreements and how nobody reads them. Well, Apple has issued one for attendees of the Apple Worldwide Developers Conference 2000. Here is a little tidbit: "You also agree that you will not use these products for any purposes prohibited by United States law, including, without limitation, the development, design, manufacture or production of nuclear missiles, or chemical or biological weapons."

Curses, I was really hoping to design something special with OS X. There goes my life's purpose.

NICHOLAS STRAKER
Phoenix, Arizona

Letters should be sent to *Letters*, Macworld, 301 Howard St., 16th Fl., San Francisco, CA 94105; via fax, 415/442-0766; or electronically, to letters@macworld.com. Include a return address and day-time phone number. Due to the high volume of mail received, we can't respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of *Macworld*.

CORRECTIONS

The review of *Details 3.0.1* (Reviews, May 2000) referred to AEC's project-management software as *SureTrack*. The correct name of the program is *FastTrack Schedule*. Primavera Systems produces *SureTrack*. **m**



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NEMETSCHKEK
NORTH AMERICA

The Vision Thing

by Andrew Gore

Memo to the CEO

SPEEDMARK'S REBIRTH HERALDS THE RETURN OF MEANINGFUL MAC BENCHMARKS

DEAR COLIN:
Read your note re: the status of *Macworld* benchmarks. Frankly, I've been a bit reluctant to respond because, as the old joke begins, I've got some good news and some bad news.

First, the bad news. As you know, *Macworld* has been using MacBench as our baseline Mac testing tool, primarily because it quickly delivers accurate, repeatable results. That our readers can also get a copy of MacBench and test their own Macs' speed is an added benefit.

MacBench was great in a world where multiple vendors all sold variations of one Mac platform. Unfortunately, we no longer live in that world.

MacBench Broke

Late last year, the arrival of the PowerPC G4 broke MacBench—the tool's internal algorithms were not designed to take the Velocity Engine into account, so test values returned looked exactly like the G3's (without the Velocity Engine, the G4 is basically a G3). So we studied what it would take to get MacBench to the point where its results would be relevant for all Macs. Here's what we found:

A complete rewrite of the CPU test and all CPU-dependent tests would be required to support the G4. As part of the update, we'd have to decide how sensitive the new test should be to the Velocity Engine. After all, not all Mac applications are currently Velocity Engine savvy—and some key applications will never be able to take advantage of the G4 subprocessor.

Multiprocessing is also a challenge for MacBench—a single-processor test. This hasn't been a problem because multiprocessing Macs have never been a major factor on the platform. It's clear now that will change this year. The challenge, then, is creating a CPU test that can gauge discrete G3 and G4 speeds and multiple G4

speeds—all on not one but two operating systems, Mac OS 9.X and Mac OS X.

On top of all this, if we go to the trouble to do a ground-up rewrite of MacBench, could we get it to deliver test results that make sense relative not only to other MacBench numbers, but also to a user's experience?

After many conversations with Apple, and much research and debate in the Lab, our answer was an emphatic no.

Experience the Difference

Then, it came to us. Speedmark, first developed four years ago, had been *Macworld*'s suite of application-based tests

tasks, it's processor and OS independent. To the degree that the applications and tasks it includes work with the Velocity Engine, Mac OS X, or multiple G4s, Speedmark will deliver an accurate number—both relative to other Speedmark numbers and to the experience of the user.

Real-World Testing

With this in mind, we've decided to drop further development of MacBench. Instead, we've developed a new version of Speedmark with an up-to-date suite of application and OS tasks that can accurately profile the performance of any Macintosh (complemented by the appropriate individual application tests). Accordingly, we will standardize all system testing on Speedmark 2.0 as of the August 2000 issue.

With Speedmark 2.0, *Macworld* enters a new era of real-world benchmarks, where the results in print reflect real user experiences.

After all, how important is processor clock rate in measuring system performance? There are lots of reasons why a PowerPC clocked at a slower speed than an Intel chip runs faster: OS architecture, logic board design, I/O speed. A fast hard drive will affect the perceived

speed of most computers much more than a 50MHz delta in clock rate. Now we'll have a way of factoring all these issues into a single number. And that will be the most useful benchmark for our readers.

The only thing remaining is to figure out how to explain this to our readers. An ad campaign? Expert testimonials? A "Try Speedmark" pavilion at Macworld Expo? I suppose I could always just publish this memo in the magazine.

But that would be too easy, right? **m**
Benchmark Andy's column. Send your comments to visionthing@macworld.com.



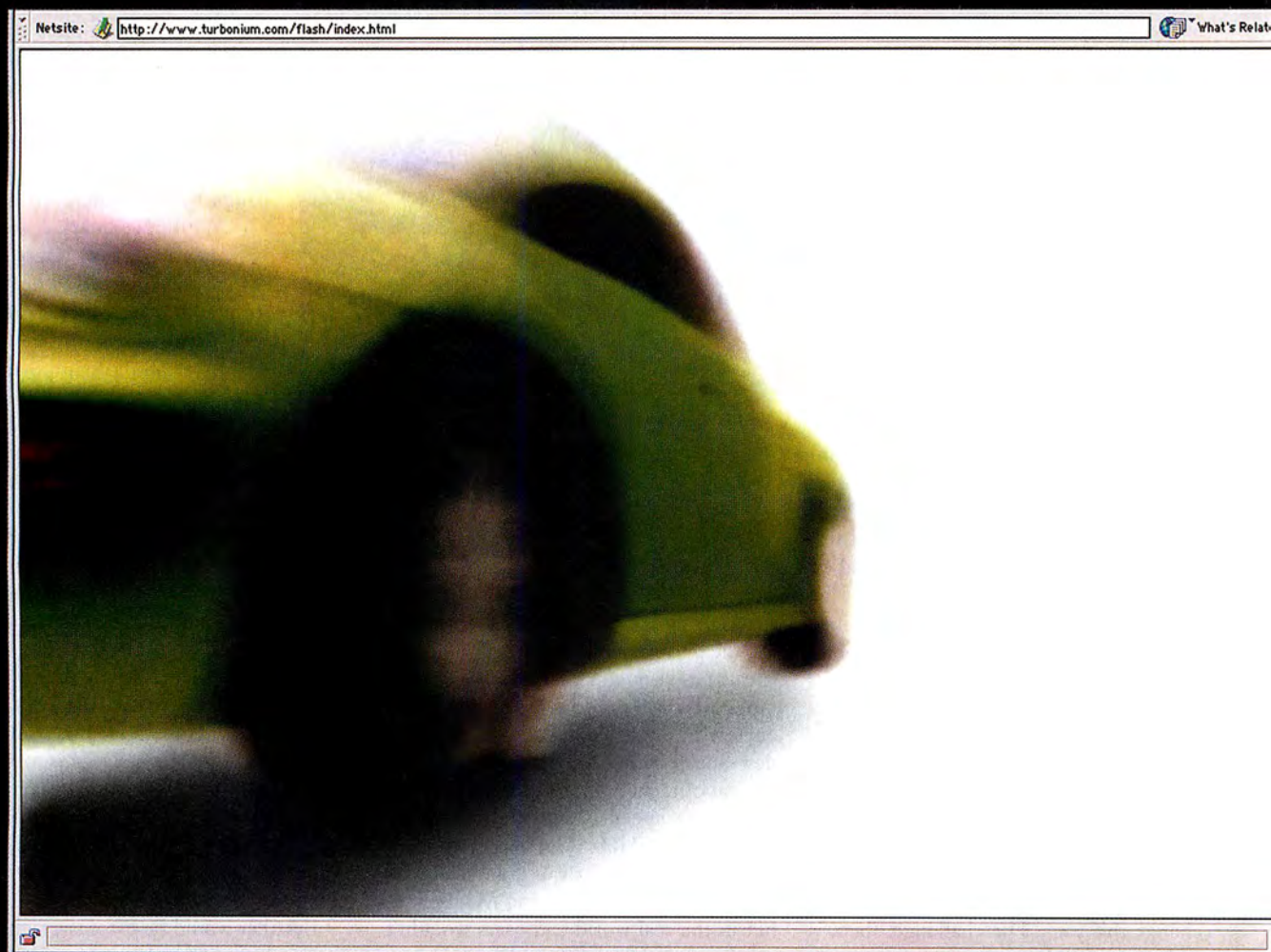
that delivered a single number representing the performance of a system. Because it was based on applications, the results more accurately reflected a user's experience with a particular Mac model—the new Speedmark 2.0 tests things all users care about, including network, Finder, and game speeds. Yes, the difference between a 350MHz iMac and a 400MHz iMac won't look nearly as dramatic using Speedmark as it does using MacBench, but in the real world end users wouldn't see that dramatic a difference either.

And, because it's based on common

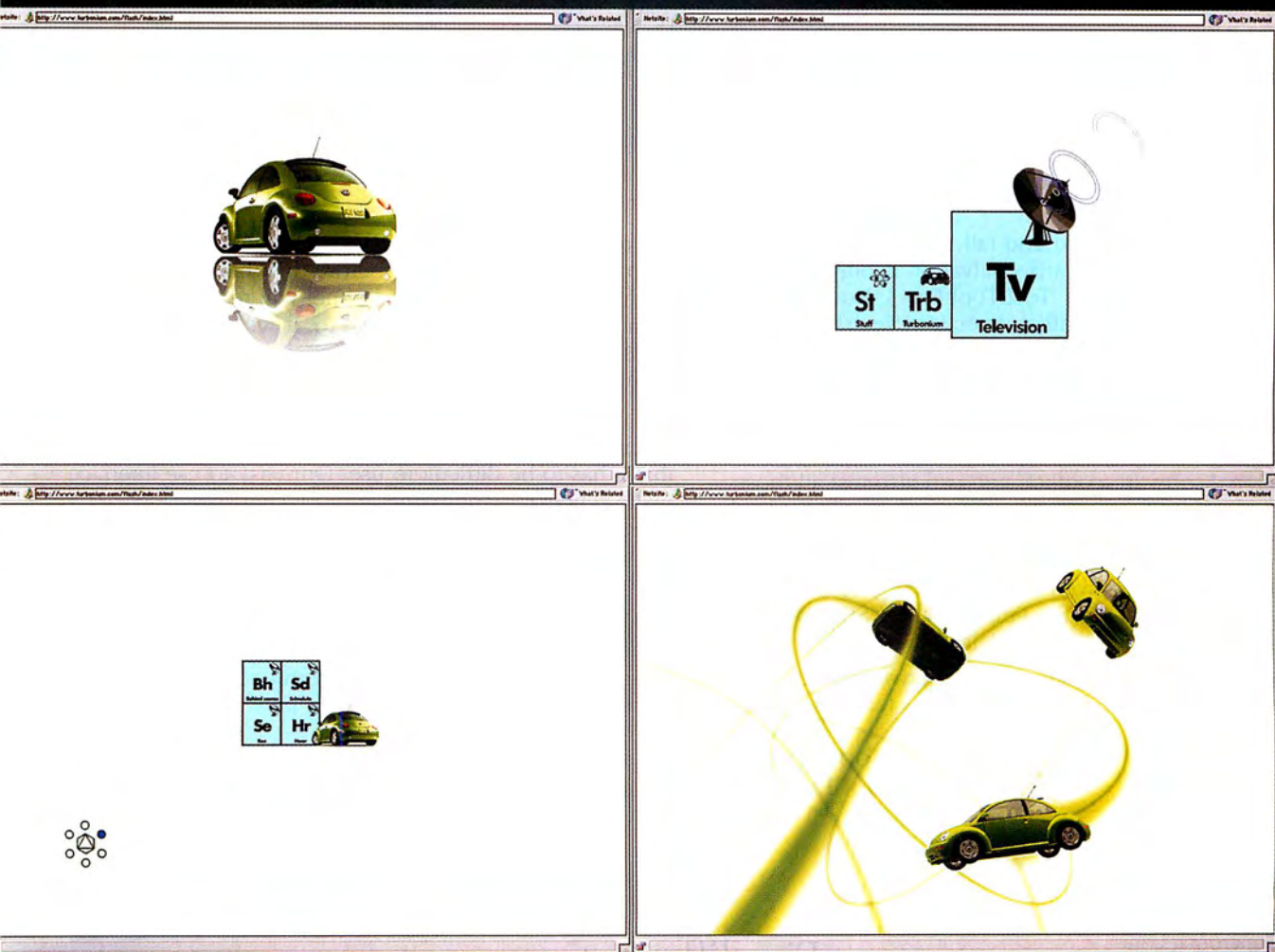
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improve the performance of your Macintosh as well as help circumvent problems before they happen. The TechTool Protection control panel will regularly check your system so you don't have to. It will also back up critical directory data, so if something goes wrong, you'll be up and running in no time flat.

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industry

USB 2.0 vs. FireWire: The Debate Heats Up

INTEL PUSHES USB FOR
HIGH-SPEED CONSUMER
PERIPHERALS

by Frith Breitzer and Andrew Gore

Politics and technology shouldn't mix—but in Silicon Valley, they often do. Take Intel's quest to establish its own standard for plug-and-play peripheral connectivity. It created USB (Universal Serial Bus), a reliable if somewhat poky port for keyboards, mice, printers, and scanners. Then along came FireWire, an Apple-developed standard for high-speed peripherals and media devices such as hard drives, printers, and digital video cameras.

Call it connector envy or a sincere effort to improve its existing standard, but Intel is now developing USB 2.0, a high-speed version of its widely used serial connector.

Who Wants to Go Faster? Intel claims that the increased speed will spur development of high-performance peripherals—everything from high-resolution videoconferencing cameras to more-advanced printers and scanners. Of course, FireWire already does that. What's more, FireWire—also known as iLink in Sony products or IEEE 1394 in



Windows-based computers—offers those connections in a variety of devices.

FireWire can reach theoretical speeds of 400 Mbps, even though there are no peripherals capable of testing that limit. And the specification will go up to 800 Mbps and 1,600 Mbps in the future. It offers the possibility of peer-to-peer connections, meaning that your DV camera can talk directly to your TV, stereo, and external hard drive without a computer.

USB Set Free? Despite the fact that FireWire is fast and is here now, Intel is pushing USB 2.0 as the *real* connection standard for both low- and high-speed devices on consumer PCs. The company promises speeds as fast as 480 Mbps from a flood of USB 2.0 peripherals that should hit the market in the next year or so.

Why is Intel pushing USB 2.0? It all comes down to the issue of cost.

"Intel in general is very

supportive of [FireWire] as a connection to consumer electronics," says Jason Ziller, the company's technology initiatives manager. "But today the additional cost of adding FireWire to the chip set has not been worth it."

According to Intel, USB 2.0 will be less expensive to include on computer logic boards than FireWire, which comes with a hefty licensing fee. But avoiding the Apple tariff may not be enough to

continues

make USB 2.0 cheaper. To support older USB 1.1 devices on a new 2.0 system, the cards and hubs must support both speeds, which will result in a more complicated chip set. The same obstacles that make high-speed signals expensive in FireWire may also apply to USB 2.0. Still, if USB 2.0 is built into many PCs—and with Intel involved, that seems likely—its cost should drop quickly.

Then there's another small matter to consider: Intel, simply because it makes most of the computer logic boards in the world, can force the adoption of USB 2.0 by including it on all reference designs and by leaving out FireWire.

Publicly, Apple has been tight-lipped about the USB-FireWire debate. But privately, company executives are not impressed with USB 2.0. That makes Apple's public silence even more curious: if FireWire is a better choice for high-performance peripherals than even a souped-up version of USB, why not come out and say so?

The hype surrounding USB 2.0 may also be about Intel's pride. "Intel doesn't want to do it the FireWire way because it didn't invent FireWire," says Mike Mihalik, vice president of engineering at storage-device and peripherals maker LaCie. "What they're trying to do is control the technology. Intel can't do anything to alter the 1394 interface... [FireWire] was designed so that one day you could forget the computer altogether."

Intel says there's a place for both technologies, with USB dominating the consumer computer market while FireWire thrives in consumer electronics. "[FireWire] is far from seeing its doomsday," observes Intel spokesman David Dickstein.

multimedia

Now Playing Everywhere: iMovie

APPLE RELEASES FREE VIDEO SOFTWARE

by Philip Michaels

For Robert Cohen, the emergence of digital video has been a godsend. A software designer by day, Cohen enjoys making movies in his spare time—and digital video has made his hobby a whole lot easier.

"Years ago I used to work with film, and I found that it got very cumbersome to shoot blind, develop the film, then edit manually," the 53-year-old resident of Portland, Oregon, says. "Now I can mix production and postproduction, changing the shooting halfway through if the editing or composition gives me a better idea."

The one drawback for Cohen? Powerful but affordable editing programs have been hard to come by. "Moviemaking is a hobby for me, and not something I can afford to pay the price for Final Cut or a similar application to do," he says.

But now Cohen has joined many other Mac users in taking advantage of Apple's

(800/692-7753, www.apple.com) decision to release its iMovie video-editing software as a free download. More than 150,000 people downloaded iMovie the first week it was available.

Rated R for Restricted iMovie, which promises video assembly easy enough for everyday users, originally came bundled with the iMac DV. That left Power Mac and PowerBook owners with few video-editing options outside of low-end programs such as Strata's \$249 VideoShop or high-priced packages like Apple's \$999 Final Cut Pro.

Digital video has gained greater attention from Apple in recent months (see "Is Apple Going Hollywood?" *News*, July 2000). The company believes that desktop video will prove every bit as important to its fortunes as desktop publishing was more than a decade ago. "iMovie has taken that sphere of what you can use your computer for and blown it up to include more," says Jon Bass, group product manager of video applications for Apple.

Apple says the iMovie download will work on any Power Mac G4 or PowerBook with built-in FireWire, QuickTime 4.1, and Mac OS 9.0.4. But what Apple says its software requires and what that software will actually run on are not always the same thing.

G3 or Not G3? Indeed, Mac users on troubleshooting Web sites such as Macfixit.com and Macintouch.com have reported some success in getting iMovie up and running on both beige and blue-and-white G3s using operating systems as old as OS 8.5. "There are no technical reasons why users of G3s wouldn't be completely happy with iMovie," Bass says.

A few have even managed to install and run iMovie on



A Little Elphin Magic?

IF BIG THINGS COME IN SMALL PACKAGES, THEN Canon (800/652-2666, www.powershot.com) must be hoping for a hit of Lilliputian proportions with its PowerShot S100 Digital Elph camera. Modeled after the company's popular Elph line of traditional film cameras, this digital version packs 2.1 megapixels into a tiny device that fits in the palm of your hand. The digital Elph sports a 2x optical zoom lens, a 4x digital zoom, and a 1.5-inch LCD monitor. But one sizable problem for the 3.4-inch-long camera could be its small CCD, which even Canon's 2.1-megapixel PowerShot S10 dwarfs. That could give the \$599 Elph difficulty in producing sharp images. Still, Canon expects big things from its latest Elph, especially among consumers who earlier gave digital cameras short shrift.—FRITH BREITZER

Product WATCH

pre-G3 Macs with upgraded G3 processors and FireWire PCI cards. That doesn't guarantee iMovie will work on older Macs. Some users who've ignored Apple's system requirements report problems with speed and stability. Still, giving the software a try could be worthwhile if you're an amateur director eager to make your first DV masterpiece. Best of all, you won't have to risk a dime on untested software.

printing

Here Today, Still Here Tomorrow

EPSON UNVEILS LONG-
LASTING PRINTER INKS

by Frith Breitner

Pictures of an event shouldn't fade long before your memories do. But print out a photo of your cousin's wedding on a desktop ink-jet printer, and chances are not much of the image may remain after a year.

Conventional photographs last around 15 years before beginning to fade, and photos developed on special archival paper can last a generation. Most images from ink-jet printers, though, start fading within anywhere from six months to five years.

That's no big deal to many consumers, who can just print out another copy of their digital image files. But for professional digital photographers, this problem can hit them squarely in the pocketbook. And if digital prints are quicker to fade, then digital cameras are less likely to win wider acceptance.



Inks for the Ages Epson (800/873-7766, www.epson.com) thinks it has a solution in the form of longer-lasting inks—and studies from Wilhelm Imaging Research, which has a strategic partnership with the company, suggest that Epson may be on the right track.

The research firm, which tested the new inks for Epson's Stylus Photo 870, 875DC, and 1270 printers, estimates that images produced with the inks can last from 6 to 26 years, depending on the paper used. Conventional "heirloom" photographs last longer, but the Epson prints were acceptable for consumer use and held up well compared with snapshots on traditional film. The 870, 875DC, and 1270 printers cost \$299, \$399, and \$499, respectively.

Epson will target professional digital photographers with two new large-format printers. Special archival inks developed for the \$4,495 Stylus Pro 7500 and the \$8,995 Stylus Pro 9500 can last more than 100 years without fading if you use special papers, Epson says. (Add a Fiery RIP, and the prices rise to \$9,495 for the 7500 and \$13,995 for the 9500.) Both printers will ship in August.

For fine-art and portrait photographers who want

print longevity at a lower price, Epson has developed the Stylus Photo 2000P. It can handle media (including photo-paper rolls) as wide as 13 inches, and it uses a new type of pigment ink to produce glossy, durable prints that reportedly can last 200 years on certain paper types. The printer retails for around \$899 and should ship by early July.

systems

OS X Gets Closer to Reality

EVOLVING OS TO ARRIVE

AS PUBLIC BETA

by Philip Michaels

For Avie Tevanian, Apple's senior vice president of software engineering, it's a light at the end of the tunnel. For CEO Steve Jobs, it's "clearly the most important thing we're doing at Apple." It's Mac OS X, the long-awaited upgrade to Macintosh Operating System.

Apple is planning to release a beta version of OS X to the public this summer.

continues

Object of Affection Talk about slashing prices. Apple (800/692-7753, www.apple.com) has reduced the cost of its **WebObjects** application server software to \$699—and that includes development tools and an unlimited usage license for one server. The previous price? A mere \$50,000. WebObjects 5, which will include Java support, is scheduled for release later this year.

Rough and Ready If you like digital cameras but want one that can survive a 3-foot drop, Kodak (800/235-6325, www.kodak.com) has the device for you. The **DC5000** comes with 2-megapixel resolution and a 2x optical zoom. You can use the weather-resistant camera even if you're wearing gloves. The \$699 DC5000 should ship by the end of June. For more-genteel photographers, Kodak offers the \$899 **DC4800**. The 3.1-megapixel digital camera sports a spiffy titanium-alloy body and will ship in August.

An Imperfect Solution In a move that shouldn't surprise anyone, Corel (800/772-6735, www.corel.com) has announced that it will no longer develop **WordPerfect** for the Mac. Instead, the company will put its Mac resources into graphics programs (including **CorelDraw**) and the products it recently bought from MetaCreations—**Painter**, **Bryce**, **Kai's Power Tools**, and **KPT Vector Effects**. Corel last updated WordPerfect in 1996.—EDITED BY FRITH BREITNER

Developers also have in hand OS X's fourth preview version, which contains several changes from the test version Apple has previously shown in public.

Ready, Set, Wait Apple calls the latest preview version "developer complete," meaning that software makers now have what they need to create applications that use OS X's Carbon and Cocoa APIs. "There are no more reasons you shouldn't be developing [for OS X]," Jobs told attendees at Apple's Worldwide Developers Conference in May.

But lost in the excitement over that piece of news is the fact that the company has delayed OS X's launch yet again. Jobs announced in January that a finished version would be ready this summer and that Apple would install the operating system on all Macs starting in January 2001. Now Apple doesn't expect completion of the final version of OS X before the end of 2000.

Aqua for the Rest of Us Still, the new developer preview is significant for the changes Apple has made to the Aqua interface. Previous versions of Aqua took a radical departure from Mac OS, but the latest edition of OS X contains several features that Mac users should find familiar.

Developer Preview 4 includes a more Mac-like Finder instead of the Next-style browser that appeared in earlier versions. Also, users can hide the browser tool bar and drag files onto the desktop. This edition restores the Mac OS 9 styles—dropped from previous versions of OS X—and the menu bar now displays the name of the application to which the active window belongs.

The Dock—the area at



**A Pixel's Worth
a Thousand Words**

FROM ITS WOOD CASING TO ITS CARDBOARD BACK, the 8-by-10-inch Ceiva picture frame doesn't look much different from any other. But this version from Ceiva Logic (310/887-6799, www.ceiva.com), with a flat-panel LCD, is a bit more high-tech. The \$249 Ceiva plugs into your phone line and downloads pictures sent to your personal Web-based photo album. Ceiva's simple interface has only two buttons—one to control the screen's brightness, and one that lets you set the ten pictures stored on the frame to stay in a fixed display or to rotate. All you have to do is sit back and cringe at those shots of Aunt Tillie at last summer's family reunion.—PHILIP MICHAELS

the bottom of the screen that offers a quick way to access applications, files, and windows—has undergone some tweaks as well. It now stores applications on the left side; files and windows go on the right. You can drag items out of the Dock to remove them, and you can store Web-site URLs there.

OS X also boasts tighter integration between Open GL and Quartz. For example, you can now use Quartz to create a 2-D image that can link with a 3-D Open GL image in a separate window. Modify the 2-D image, and the 3-D window instantly updates.

"We're creating a new OS and a new generation of applications," Jobs said.

online

Opera Sings Wireless Tune

SLIM BROWSER HITS
MAC PLATFORM SOON

by Lisa Schmeiser

Browser groupies and serious Webheads have sung the praises of Opera for two years—provided they've had a PC or Unix machine on which to run the small, speedy browser. Mac users can soon judge

for themselves, with not one but *two* ways to put the browser to good use.

Opera (www.opera.com) plans to release its first Mac browser this year, probably by the time you read this. The Norwegian company has also inked deals to make Opera the default browser on handheld devices under development by Psion and Ericsson.

Wireless World Opera seems like a natural fit for handhelds. At a time when the size of a browser such as Microsoft's Internet Explorer averages 5MB, Opera takes up only 2MB of a machine's hard drive. Besides its trim size, Opera boasts the most rigorous Web-standard compliance among browsers. It also offers full support for Wireless Markup Language, the markup component of Wireless Application Protocol (WAP). WAP is a set of technical specifications aimed at letting handheld users tap into a broad, universal set of services. Opera recognizes and complies with the standard, so users can do things like easily access WAP-enabled wireless networks.

Opera's support for these standards should come in handy with the Ericsson and Psion devices. Because those handhelds will include Opera—and because it supports a protocol that many wireless networks use—the slim browser is poised to become a key player in the growing market for mobile-computing software.

Opera CEO Jon von Tetzchner says the company is concentrating not on dominating a specific market, but rather on making a good browser. "Our focus is always the browser," he says. "And our goal is to make surfing the Web on any device more efficient, more fun, and more productive."

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Reviews

19-Inch Flat-Screen Displays

MONITORS OFFER PREMIUM
QUALITY, LOW PRICE

TEMPTED BY THE HIGH RESOLUTION of Apple's 21-inch Studio Display but lack the cash or desk space? Consider a more affordable and compact 19-inch monitor. The de facto standard for Windows PCs, the 19-inch display is equally at home on a Mac system. But the ten models we evaluated are no garden-variety displays; with their flat CRTs, they offer accurate color and reduced glare. The best news: you can have one for less than the price of Apple's 16-inch Studio Display.

It's about Control

What do you give up when you don't buy an Apple-branded display? Besides stylish plastics, you lose the ability to adjust the display via the Monitors control panel. And although all the models we reviewed have built-in controls that offer every imaginable adjustment, some of them are less than intuitive. With the Hitachi and Viewsonic mod-

To Our Readers

Macworld will no longer be using MacBench, as it does not adequately represent current applications or the way our readers use their Macs. We will be using Speedmark 2.0, a suite of common, everyday tasks. For more information about Speedmark 2.0, visit www.macworld.com/speedmark.



els, for example, you have to pay close attention to whether you're selecting a control or changing a setting for a selected control, and we found Sony's novel DisplayMouse confusing to use. The other displays had more intuitive controls; those on the Hewlett-Packard, Samsung, and NEC models were the easiest for us to navigate and use.

One advantage of these displays is full compatibility with Windows computers. If you use a Mac and a PC and need a single monitor for both, consider the Mitsubishi Diamond Pro 900u, which offers dual upstream USB ports—a unique feature that earned this display a Macworld Editors' Choice Award in 1998.

The True Test

To assess overall image quality, Macworld Lab assembled a jury of typical Mac users and asked them to rate each monitor's performance with both color and grayscale Adobe Photoshop images and a Microsoft Excel spreadsheet. We set all displays to 1,152 by 870 pixels and millions of colors (24 bits).

With the color scan, the jury scrutinized each monitor's sharpness, brightness, contrast, detail, overall color cast, color saturation, and color accuracy. Our testers found that all the displays produced excellent results, with the exception of the Hitachi CM771, NEC FE950, and Sony Multiscan G400. The NEC and Sony

REAL PRODUCTS
REAL RATINGS

Reviews you can trust: Macworld rates only final shipping products, not prototypes. What we review is what you can actually buy.

OUTSTANDING: ★★★★★ VERY GOOD: ★★★★ GOOD: ★★★ FLAWED: ★★ UNACCEPTABLE: ★

models exhibited a noticeable color cast, while the Hitachi had pronounced moiré distortion in the corners. Princeton's AGF900 was the leader, with the sharpest and most natural-looking image overall.

The Hewlett-Packard P910 did an excellent job of displaying our gray-scale images. The other monitors also performed well, although slight color casts on the NEC and the Sony Multiscan E400 earned them only fair scores, and the Hitachi scored poorly due to its moiré distortion.

In all cases, you can make adjustments to fix the color cast—and even the Hitachi's moiré problems—if you're willing to invest the time it takes to coax every ounce of performance from your display. However, adjustments can't help a monitor that inherently lacks sharpness. In our final and most telling test, we looked at a typical spreadsheet document and assessed each monitor's overall sharpness and text readability. The Diamond Pro 900u performed a tad better than the other displays that had excellent sharpness: the Hewlett-Packard P910, the Viewsonic PF795, and the Diamond Plus 91. The others received fair ratings, except for the Hitachi CM771, whose grainy phosphor pattern was readily apparent.

The Sony and Mitsubishi models have manuals with extensive Mac setup information. Mitsubishi includes a universal



Image Is Everything

	Sharpness	Color Quality	Gray Scale
Hewlett-Packard P910	Excellent	Excellent	Excellent
Hitachi CM771	Poor	Fair	Poor
Mitsubishi Diamond Plus 91	Excellent	Excellent	Excellent
Mitsubishi Diamond Pro 900u	Excellent	Excellent	Excellent
NEC FE950	Fair	Fair	Fair
Princeton AGF900	Fair	Excellent	Excellent
Samsung SyncMaster 900 IFT	Fair	Excellent	Excellent
Sony Multiscan E400	Fair	Excellent	Fair
Sony Multiscan G400	Fair	Fair	Excellent
Viewsonic PF795	Excellent	Excellent	Excellent

Behind Our Tests

Macworld Lab conducted subjective tests ranking quality as excellent, fair, or poor. We tested each monitor using a Power Macintosh 9500/132 with Mac OS 9, 64MB of RAM, and an iXMicro graphics accelerator card.—Macworld Lab testing supervised by Ulysses Bravo

Mac adapter with the Diamond Pro 900u (it's optional with the Diamond Plus 91). Sony includes a Mac adapter with both models we tested, and NEC will provide a Mac cable when you call a special toll-free number. The other manufacturers leave it up to you and your dealer to source the correct adapter for your model.

Macworld's Buying Advice

If you spend most of your time editing images, consider the Hewlett-Packard P910 or Princeton AGF900—these mod-

els performed best with gray-scale and color images, respectively. If you work with a mixture of images and text, the Hewlett-Packard, both of the Mitsubishi models, and the Viewsonic PF795 are all worthy candidates. If you're price-sensitive but still want a strong performer that's easy to configure, take a look at Samsung's SyncMaster 900 IFT. And although the Mitsubishi Diamond Pro 900u is expensive, you just can't beat its performance, features, and out-of-the-box Mac compatibility.—JEFF PITTELKAU

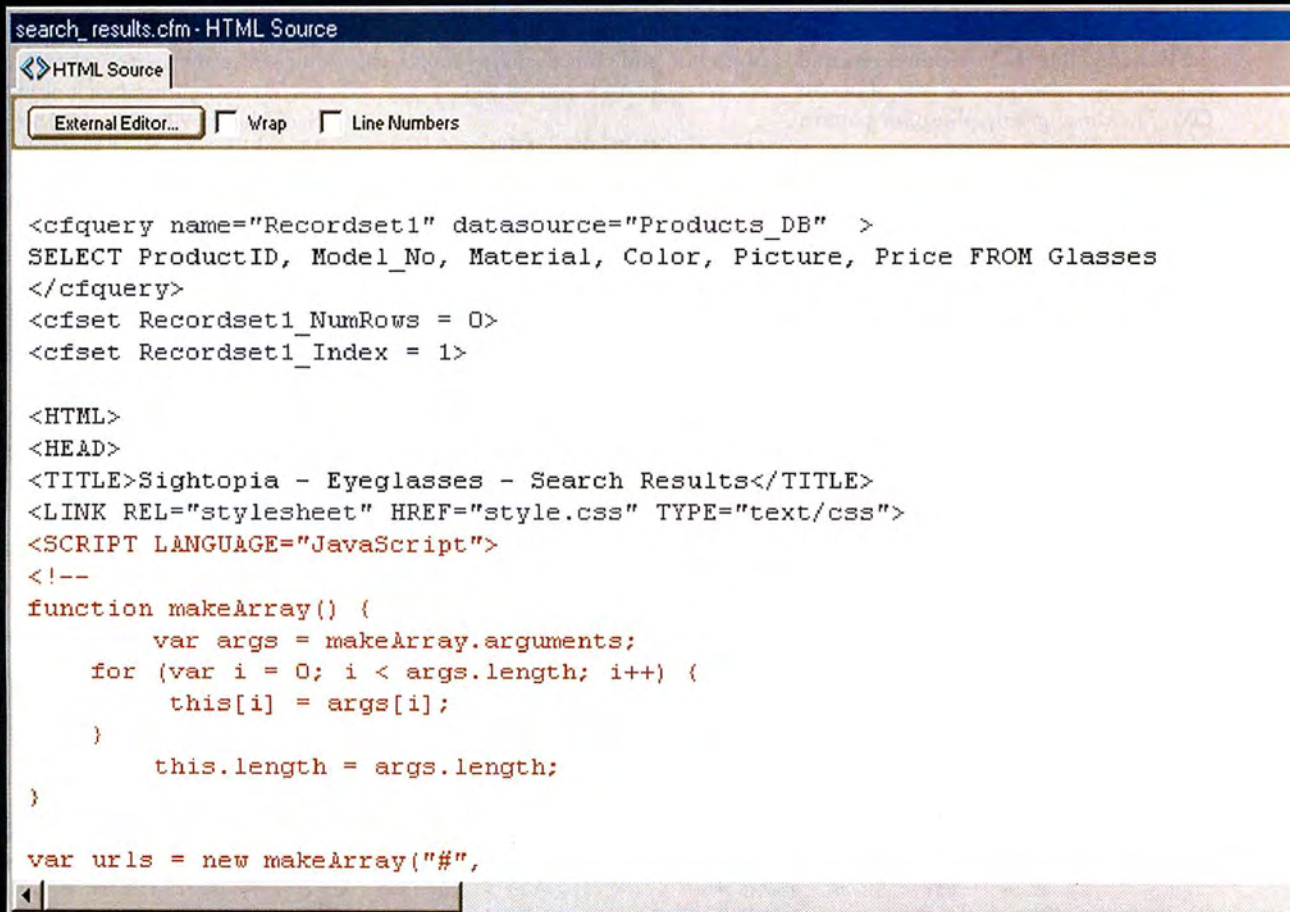
19-Inch Flat-Screen CRT Displays Compared

Company	Product	Mouse Rating	List Price	Contact	Dot Pitch (mm)	Maximum Resolution	Comments
Hewlett-Packard	P910	★★★★½	\$737	800/752-0900 www.hp.com	0.24–0.25	1,600 × 1,200	Excellent image quality and intuitive on-screen menus; first-year on-site service; expensive.
Hitachi	CM771	★★★½	\$479	800/448-2244 www.hitachidisplays.com	0.21–0.22	1,600 × 1,280	Low cost; the lowest-performing model in our roundup; confusing controls.
Mitsubishi	Diamond Plus 91	★★★★	\$479	800/843-2515 www.mitsubishi-display.com	0.25–0.27	1,600 × 1,200	Excellent image quality and reasonably intuitive on-screen controls.
Mitsubishi	Diamond Pro 900u	★★★★½	\$659	800/843-2515 www.mitsubishi-display.com	0.25–0.27	1,600 × 1,200	Excellent image quality and reasonably intuitive on-screen controls; dual upstream USB connections.
NEC	FE950	★★★½	\$499	800/284-4484 www.nectech.com	0.25–0.27	1,792 × 1,344	Only fair image quality but very intuitive controls.
Princeton	AGF900	★★★★	\$539	800/747-6249 www.princetongraphics.com	0.25–0.27	1,600 × 1,200	Very good image quality; reasonably intuitive controls.
Samsung	SyncMaster 900 IFT	★★★★	\$499	800/637-1337 www.samsungmonitor.com	0.2	1,600 × 1,200	Very good image quality and on-screen controls.
Sony	Multiscan E400	★★★½	\$479	888/315-7669 www.ita.sel.sony.com	0.24–0.25	1,800 × 1,440	Very good image quality but confusing Display/Mouse control.
Sony	Multiscan G400	★★★½	\$659	888/315-7669 www.ita.sel.sony.com	0.24–0.25	1,800 × 1,440 1,600 × 1,200	Very good image quality but confusing Display/Mouse control; supports higher refresh rates than E400.
Viewsonic	PF795	★★★½	\$625	800/888-8583 www.viewsonic.com	0.25–0.27	1,920 × 1,440	Excellent image quality but less-than-intuitive controls.

You are a master of code.

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But that project you just got was due yesterday.



```
search_results.cfm - HTML Source
HTML Source
External Editor... [ ] Wrap [ ] Line Numbers

<cfquery name="Recordset1" datasource="Products_DB" >
SELECT ProductID, Model_No, Material, Color, Picture, Price FROM Glasses
</cfquery>
<cfset Recordset1_NumRows = 0>
<cfset Recordset1_Index = 1>

<HTML>
<HEAD>
<TITLE>Sightopia - Eyeglasses - Search Results</TITLE>
<LINK REL="stylesheet" HREF="style.css" TYPE="text/css">
<SCRIPT LANGUAGE="JavaScript">
<!--
function makeArray() {
    var args = makeArray.arguments;
    for (var i = 0; i < args.length; i++) {
        this[i] = args[i];
    }
    this.length = args.length;
}

var urls = new makeArray("#",
```


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- recommendations
- search frames
- fitting room

search results

picture	description	select	price
	Model: CK 723 Colors: Black, Blue, Brown, Green, Tortise, Red	<input type="checkbox"/>	\$130 buy
	Model: CK 726 Colors: Black, Blue, Brown, Green, Tortise, Red	<input type="checkbox"/>	\$124 buy
	Model: CK 634 Colors: Black, Brown, Green, Tortise	<input type="checkbox"/>	\$145 buy

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iMovie

FREE, FRIENDLY DV-EDITING SOFTWARE

WANT TO TEST THE WATERS of digital-video (DV) production? Need to create simple videos for business presentations or personal Web sites?

Apple has a program for you, and it's free. iMovie is the video-editing software that Apple bundles with the iMac DV and iMac DV Special Edition, which contain FireWire ports that can connect to DV-format camcorders. The combination of FireWire and iMovie makes it easy and downright fun to bring high-quality digital video into the Mac, edit it, then record it back to tape.

Initially, the only way to get iMovie was to buy one of the iMac DV models. But reports soon surfaced that iMovie also ran on other Macs, including blue-and-white G3s as well as G4s—all of which have FireWire ports. Owners of these Macs begged Apple to bundle iMovie with the Mac OS or at least sell it separately. Apple responded to the ruckus by making iMovie free for the downloading. Was Apple's generosity inspired in part by Microsoft, which has announced plans to include an iMovie-like program with its forthcoming Windows Millennium Edition? Who cares? What counts is that iMovie is blissfully simple, surprisingly capable, and absolutely free.

Big Download, Bigger Exaggeration

iMovie 1.0.2 weighs in at nearly 20MB. If you want to avoid the lengthy download, you can order an iMovie CD-ROM for \$20; it includes tutorial footage the download version lacks. That footage aside, the downloadable iMovie is identical to the version bundled with the iMac DV.

iMovie's system requirements call for a Power Mac G4 or FireWire-equipped PowerBook running Mac OS 9.0.4 and QuickTime 4.1 or later. Actually, iMovie also runs beautifully on blue-and-white Power Mac G3s and under Mac OS 8.6. I tried iMovie on an older (Revision B) iMac and it worked fine, although its installer crashed when the iMac's screen resolution was set to 640 by 480 pixels (the installer didn't have a problem at higher resolutions). Many users have even reported running iMovie on beige Power

Macs containing G3 upgrade cards and third-party FireWire cards.

Camcorder compatibility is another story, however. One of the beauties of FireWire is that it enables *device control*—iMovie controls your DV camcorder as you press the on-screen play, rewind, and stop buttons. But this works only if you're using an iMovie-compatible camcorder or video deck (see Apple's list of iMovie-compatible hardware at www.apple.com/imovie/gear). Stray from this group and you risk problems such as an inability to record a completed project back to tape.

No Manual Needed

iMovie's online help is great, but you probably won't refer to it often—iMovie is that easy to use. (For some insights into the program's subtleties, see "Home-Movie Magic," April 2000.)

iMovie divides the screen into several regions (see "On the Set"). A *monitor* region displays video from a FireWire-connected camcorder and shows a preview of your epic. To its right is the *shelf*, which holds movie clips as well as still images (iMovie imports PICT, JPEG, GIF, Windows BMP, and Photoshop image formats).

Below the shelf are four buttons. Depending on the button you click, a tool palette slides out that enables you to add visual transitions between scenes, create titles that can be superimposed over a scene or over black, import music from audio CDs, or add sound effects from iMovie's small library of effects.

Across the bottom of the screen is iMovie's timeline-like *clip viewer*, where you do most of your editing. To add a freshly captured scene to a movie, drag it from the shelf into the clip viewer. To add a transition between two scenes, drag the transition icon to the clip viewer, and the two scenes separate to make room for it. It's all so straightforward that you'll be making movies in minutes.

When you've finished, you can record



On the Set iMovie's clean, easy-to-use interface boasts all the features you need to make digital videos.

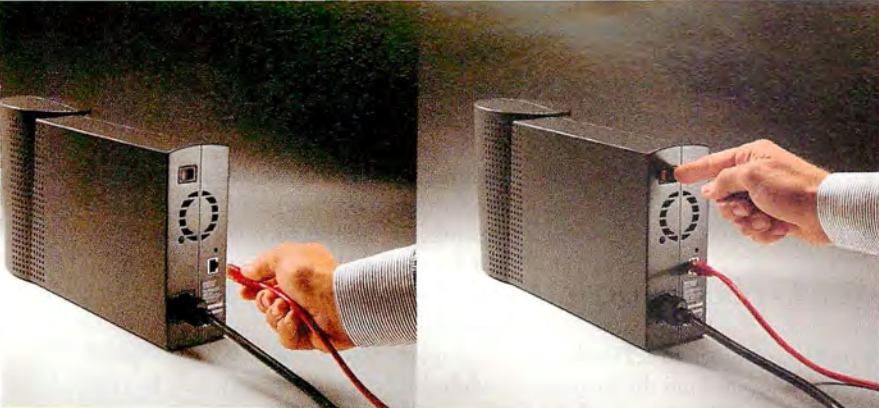
your movie back to digital videotape via FireWire, with iMovie controlling the camcorder. You can also export to a standalone QuickTime movie that you can post on a Web site, include in a PowerPoint presentation, or burn to a CD.

Although iMovie excels at simple editing, it falls flat at more advanced tasks. Its audio features are weak—you can't separate the audio and video of a scene so you can cut away to a second shot while the first shot's audio continues to play. Nor can you precisely adjust volume levels so that, say, background music fades slightly when narration begins. iMovie also lacks the range of effects found in programs such as Adobe Premiere and Apple's Final Cut Pro—you can't pan across a still image, composite one video clip within another, or create slow-motion effects.

Macworld's Buying Advice

iMovie's lack of glitzy special effects isn't significant, given the program's intended audience and applications. But its weak audio features do make many common video-production techniques cumbersome or downright impossible. In the end, though, criticizing iMovie for these shortcomings is like criticizing the toy surprise inside a box of Cracker Jack. iMovie is splendid software, and it's free. Go download it now.—JIM HEID

RATING: ★★★★★ **PROS:** Extremely easy to use; runs on wide range of Macs. **CONS:** Limited audio and effects features. **COMPANY:** Apple Computer (800/692-7753, www.apple.com). **LIST PRICE:** Free (CD-ROM version, \$20).



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InDesign 1.5

MAJOR UPGRADE FOR PROMISING PAGE-LAYOUT PROGRAM

WHEN ADOBE FIRST SHIPPED InDesign 1.0, the page-layout program felt premature—as if the company needed to get something out the door but had only a square table with three legs. Sure, it was usable, but at what cost in the time and energy of users? Fortunately, Adobe mobilized its forces, stayed focused, and took advantage of InDesign's modular structure to release version 1.5 only six months later, solving many of the first version's most glaring errors and omis-

sions. InDesign 1.5 is a table with four legs now, though it still wobbles something fierce every now and again.

sions. InDesign 1.5 is a table with four legs now, though it still wobbles something fierce every now and again. created in Illustrator or FreeHand: the only way to run text around the shapes of such graphics is to either create a frame based on an image preview or drag the images into InDesign. The latter solution is less than ideal, as it transforms your single image into a collection of objects.

InDesign 1.5 can also use the alpha channel or path information to create a clipping path for a placed graphic. However, unlike QuarkXPress, InDesign makes you convert clipping paths into *frames* (boxes), so it's still infuriatingly easy to move an image while leaving its clipping path behind. Adobe needs to rethink its entire concept for working with frames and clipping paths in InDesign.

Other new features include an eyedropper for sampling and applying colors, vertical justification for text frames, and new control characters that indent text or send it to new positions. Adobe has also resolved one of version 1.0's most glaring deficiencies: whereas InDesign formerly required a separate (and expensive) program to trap files, the new version's impressive native trapping feature can trap to its own objects as well as to placed raster graphics (though not to placed EPS images).

Still MIA

Despite all these new features, InDesign needs many more before we'll consider it a killer app. It still lacks long-document features such as table-of-contents generation, indexing, and style and page-number synchronization between documents. You can't yet combine spot and process colors, as you can in QuarkXPress. Page-Maker users who switch to InDesign won't find a Story Editor feature. And unbelievably, InDesign still has two separate keyboard shortcuts for accessing the Grabber Hand: the option key when you're inside a text block, and the spacebar when you're not.

You should ignore Adobe's minimum hardware requirements; most users report that they need a G3 or a G4 with at least 128MB of RAM to use InDesign with any

degree of efficiency. In addition, because the program opens so many files as part of its plug-in architecture, some users have had to upgrade to Mac OS 9 to avoid error messages warning them that they have too many files open. Finally, watch how your Mac OS RAM usage expands while InDesign is running—an increase from 40MB to 70MB is not uncommon.

Even when your system meets these requirements, InDesign can run surprisingly slowly. Just a few graphics on the page can slow down screen redraw; you may find that even a text-only chapter gets terribly bogged down. And InDesign can take forever to spool a short document to a laser printer.

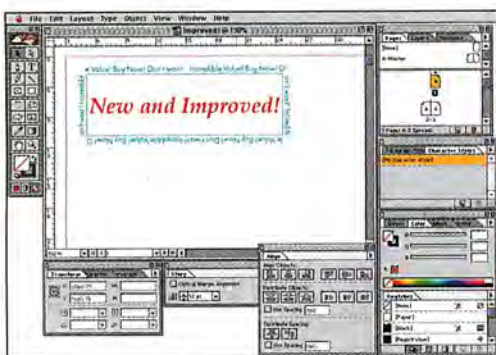
Upgrade Revolt

One of the most interesting aspects of InDesign 1.5 isn't a feature or a performance enhancement, but its upgrade policy. When Adobe first announced an upgrade price of \$99, existing users had a quick and loud reaction. Adobe backed down and offered the upgrade free to anyone who had paid full price for InDesign 1.0; for everyone else, it changed the upgrade price to a much fairer \$30. Within a week after Adobe posted the new upgrade policy, the revolt was over. (InDesign 1.5 is not backward-compatible, so if one person in a workgroup decides to upgrade, everyone else should follow suit.)

Macworld's Buying Advice

It's astonishing that Adobe managed to release such a significant upgrade in such a short time. Added to InDesign's already superb typography, master-page innovations, native export to PDF, multiple levels of undo, and familiar Adobe interface, the new features make version 1.5 completely suitable for short or single-page documents. We never felt comfortable recommending InDesign 1.0 to desktop-publishing pros, but with this new version InDesign finally begins to merit comparison with QuarkXPress.

—DAVID BLATNER AND SANDEE COHEN



Palettes in the Midst InDesign 1.5's redesigned interface lets you center text vertically and place it along the outside edge of the frame.

sions. InDesign 1.5 is a table with four legs now, though it still wobbles something fierce every now and again.

Amazing Turnaround

Adobe paid attention to users and reviewers when it came to fixing some of the most glaring deficiencies of InDesign 1.0 (see *Reviews*, December 1999). Version 1.5 improves on the crippled path-editing tools—you can now select and modify more than one point at a time on a path (or even points on different paths). And InDesign 1.5 boasts text-on-a-path features that not only match QuarkXPress's but far exceed those in Adobe Illustrator.

Adobe has also slightly improved InDesign's frustrating text-runaround features. Instead of relying solely on physical frames for controlling text wrap, InDesign 1.5 can recognize embedded paths and alpha channels in bitmapped images. Unfortunately, InDesign is still brain-dead when it comes to EPS files

RATING: ★★★ **PROS:** Improved path manipulation and text-on-a-path features; native trapping; innovative typography options. **CONS:** Onerous hardware requirements; slow performance; no long-document features. **COMPANY:** Adobe Systems (800/833-6687, www.adobe.com). **LIST PRICE:** \$699.

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500MHz G3 Upgrade Cards

TOP-OF-THE-G3-LINE PROCESSOR UPGRADES

APPLÉ HAS MOVED ON—FROM beige to blue to the latest graphite-and-white G4 systems—but you and your older Power Mac G3 may not be prepared to follow. If a new Power Mac G4, or even a G4 processor upgrade for your beige or blue-and-white Power Mac G3, would bust your budget, consider a less-expensive G3 upgrade. Macworld Lab tested four 500MHz G3 accelerators—Newer Technology's Maxpowr G3-G3, PowerLogix's PowerForce G3, Sonnet Technologies' Encore G3, and XLR8's Mach Carrier G3—and found that, once again, our test results favored the Newer accelerator by a very slight margin.

All of the cards except for XLR8's Mach Carrier G3 install in the Zero Insertion Force (ZIF) sockets of the desktop and minitower beige Power Mac G3, all-in-one G3, and blue-and-white Power Mac G3. Although we received XLR8's 500MHz G3 processor bundled with the CarrierZIF Upgrade Adapter, you can get the processor-only Mach Speed G3z for \$50 less.

Installation is a simple affair with all four cards. The Newer, PowerLogix, and XLR8 upgrades come with some kind of driver and control panel for configuring their backside-cache speed. The Sonnet upgrade doesn't require additional software, but you also can't configure it. After

installing the software for those upgrades that require it, you simply swap the old processor for the new one. Newer's and Sonnet's manuals offer the clearest instructions for installing the card.

There's very little real-world difference between these upgrades. Each of the four accelerators runs at 500MHz and carries a 1MB backside cache, so it's not surprising that they all yielded similar results. The Newer upgrade produced the best scores, with the PowerLogix and XLR8 cards close on its heels. The Sonnet accelerator consistently lagged behind the other three. All four significantly outperformed a 350MHz blue-and-white Power Mac G3.

Those who wish to overclock the processors will find the difference between upgrades most apparent. XLR8 provides extensive charts for setting jumpers and switches to increase processor speed. The PowerLogix card sports a dial for this purpose but offers fewer settings. Newer provides no information for overclocking its upgrades via the four DIP switches, while Sonnet actually prevents you from changing the processor speed.

Macworld's Buying Advice

Given its relatively low price and slightly better performance, we favor Newer Technology's Maxpowr G3-G3. The PowerLogix PowerForce G3 performs nearly as

well but is a bit more expensive. If XLR8 offered its highly configurable 500MHz Mach Carrier G3 (or Mach Speed G3z) upgrade at a lower price, it would be worth a look. The Sonnet Encore G3, although it's the easiest to install and the least expensive, is our last pick due to its slow speed and lack of software and hardware configuration options.—CHRISTOPHER BREEN

Encore G3

RATING: ★★★ **PROS:** Least expensive; completely plug-and-play. **CONS:** Slower than its rivals; not configurable. **COMPANY:** Sonnet Technologies (800/786-6260, www.sonnettech.com). **COMPANY'S ESTIMATED PRICE:** \$500.

Mach Carrier G3

RATING: ★★★½ **PROS:** Fast; configurable. **CONS:** Expensive. **COMPANY:** XLR8 (770/564-5682, www.xlr8.com). **COMPANY'S ESTIMATED PRICE:** \$779.

Maxpowr G3-G3

RATING: ★★★½ **PROS:** Fast; competitively priced. **CONS:** Difficult to overclock. **COMPANY:** Newer Technology (316/943-0222, www.newertech.com). **COMPANY'S ESTIMATED PRICE:** \$549.

PowerForce G3

RATING: ★★★½ **PROS:** Fast. **CONS:** Expensive. **COMPANY:** PowerLogix (877/849-2504, www.powerlogix.com). **COMPANY'S ESTIMATED PRICE:** \$590.



Upgrades Give G3s a Speed Boost

Best results in red. Reference systems in *italics*. Speedmark 2.0 scores are relative to those of a 350MHz iMac, which is assigned a score of 100. Adobe Photoshop results are in seconds. SoundJam results are in minutes:seconds. Quake III results are in frames per second.

	SPEEDMARK 2.0	QUAKE III	PHOTOSHOP 5.5			SOUNDJAM
			Gaussian Blur	Unsharp Mask	RGB to CMYK	MP3 Encode
Newer Technology Maxpowr G3-G3	142	33.2	30.9	31.2	26.9	2:32
PowerLogix PowerForce G3	139	33.0	32.3	31.5	27.1	2:33
Sonnet Technologies Encore G3	138	33.0	33.6	33.4	28.2	2:37
XLR8 Mach Carrier G3	138	33.2	33.3	31.9	27.5	2:31
Apple Power Macintosh G3/350	119	31.3	36.7	35.9	34.8	3:41

Longer bars are better. Shorter bars are better.

Behind Our Tests

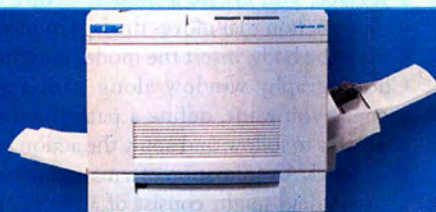
We tested each upgrade card in a Power Macintosh G3/350 with Mac OS 9, 128MB of RAM, a default system disk cache of 4MB, and virtual memory disabled. We set displays to 1,024 by 768 and 24-bit color. We performed Photoshop tests with a 50MB file; we set Photoshop's memory partition to 80MB and Photoshop History to Minimum. We tested MP3 encoding with an audio-CD track that was 9 minutes and 25 seconds in length and converted it using a default setting of 128 Kbps in SoundJam 2.2. We tested Quake III at a resolution of 640 by 480 pixels, with graphics set to Normal. SpeedMark is a suite of common tasks (see www.macworld.com/speedmark).—Macworld Lab testing supervised by Ulysses Bravo



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Animation Master Millennium

INEXPENSIVE 3-D CHARACTER ANIMATOR

MODELING AND ANIMATING organic creatures and objects is a difficult task no matter what program you use, but Animation Master Millennium makes it easier by providing 3-D tools that do more than just rotate logos and shapes. The latest incarnation of Hash's venerable 3-D modeling, animation, and rendering tool offers a powerful combination of features and options traditionally found only in more-expensive programs.

Use the Patch

Animation Master models are made up of patches, a major advance in 3-D technology. Models defined with patches take up less memory and disk space than traditional polygon-based models, and you can scale and deform them more easily

flexibility of patch modeling makes small tweaks—or even adding limbs—much simpler tasks in Animation Master than in many other modelers.

One disadvantage of the patch system is that you won't find enormous libraries of models in the Animation Master format. You can import DXF-format models from other programs, but this may require so much additional work that you'll find it faster to build models from scratch in Animation Master.

Bones! Action! Render!

As its name implies, Animation Master excels at creating not only organic shapes but also ones you can animate. Once you've created a model, you can define animations as reusable actions. Each action has its own timeline, with keyframes that store changes from the original model's position and structure. To create both muscular and skeletal movement, you can either move the model's control points or use linked bone structures. The CD-ROM includes a model of a standard human skeleton for creating bone structures.

You can apply skeletal and muscular actions to other models, and the pose feature makes it easy to reuse actions. When you define a pose, that definition stores the modifications to the model elements. Attach a pose to a model during animation, and a slider bar lets you control how much of the pose to apply at that particular time.

A second level of animation takes place in the Choreography window, where you position models in relation to each other and then apply and combine actions and poses. To make a character walk across a surface, you create a model, define a walking action that moves the legs in relation to the body, insert the model into the Choreography window along with any scenery you want, define a path for the character to follow, and apply the action to the model. An animation of a man walking across a field might consist of a model, a path drawn in the Choreography window, and a walking action. One of Animation

Master's strengths is its ability to combine building blocks of objects and simple actions to create complex creatures. With a few mouse clicks, you can make a walking and talking character by combining two actions in a choreographed setting. The actions are separate, so you can stop the walking action at any point but still have the lips in motion.

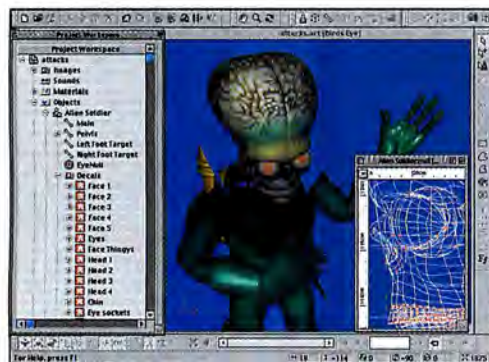
Another nice touch is the ability to add sound to the animation timeline. Because Animation Master lets you synchronize action and audio, you don't need a digital video editor to add sound to movies rendered in Animation Master, nor do you have to make several renderings to synchronize a prerecorded sound. Scrubbing the timeline in Animation Master works just as in a video-editing program, defining how sound and image are synchronized. With the Dope Sheet feature, you type in text to match the audio track, and Animation Master breaks the words into phonemes—an invaluable aid for the lip-syncing process.

We did run into a couple of annoyances. You must have the cross-platform CD-ROM in the drive each time the program starts up. Also, the user interface needs polishing—it's very tricky to control docking of floating palettes, we found unselected control points small and difficult to see, and the program has subtly different methods for drawing the splines for models and those for animation paths.

Macworld's Buying Advice

Animation Master Millennium's wealth of features makes it robust but adds to its complexity: you'll need artistic talent and ample learning time to turn your office into the next Disney or Pixar studio. If your goal is to use animated 3-D characters to tell a story, though, Animation Master makes the task about as easy and affordable as it gets.—DARREL PLANT

RATING: ★★★ **PROS:** Powerful; inexpensive; can build and reuse libraries of animations. **CONS:** Intense learning curve; often temperamental interface. **COMPANY:** Hash (360/750-0042, www.hash.com). **LIST PRICE:** \$299.

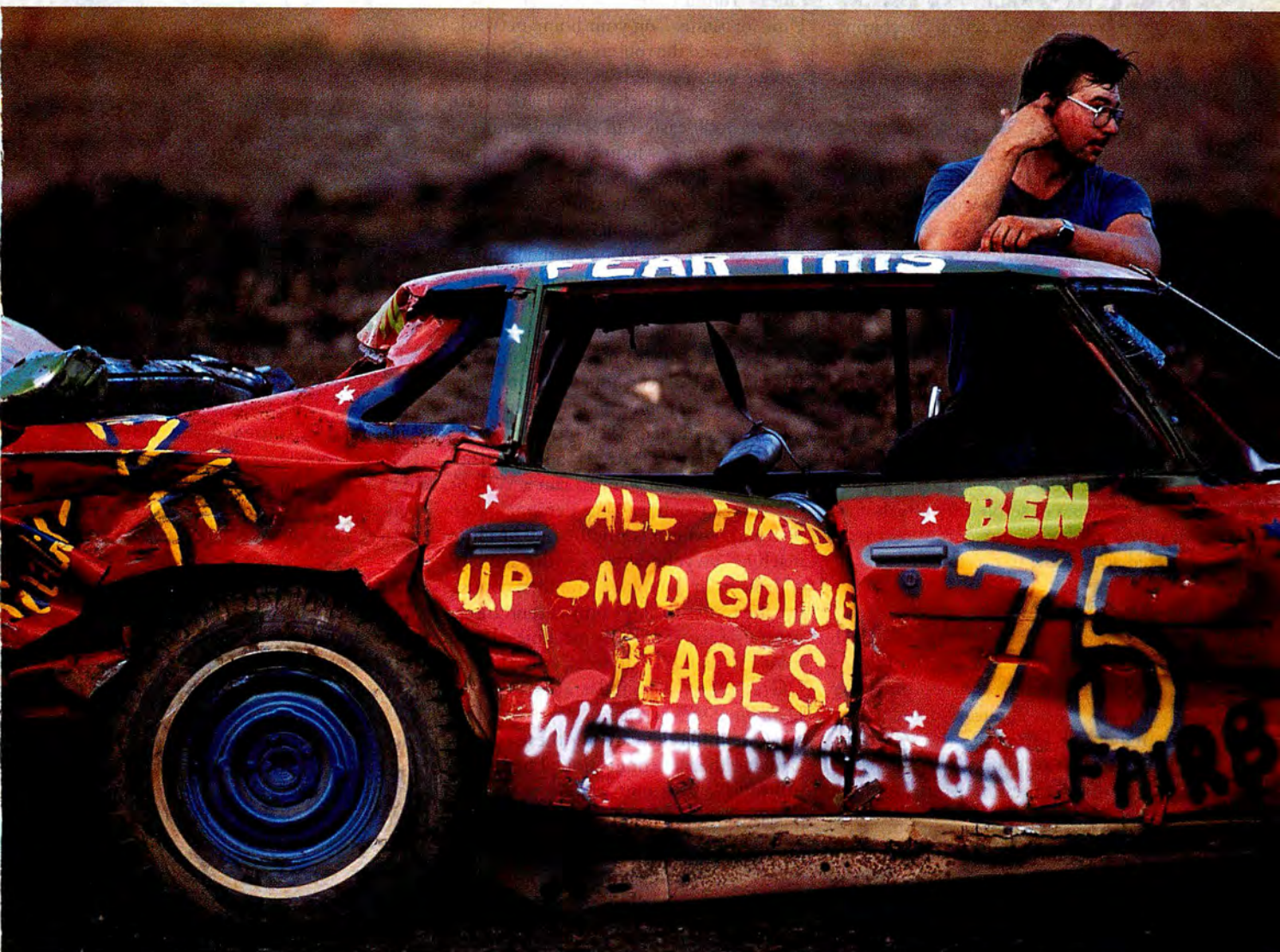


Hash Attacks In Animation Master Millennium, you can model in both wire-frame and preview modes. The larger window shows a posed model; the smaller window shows a side detail of the model's face in wire-frame mode.

because *equations* describe the curves rather than just a series of straight lines between vertices.

Modeling in Animation Master closely resembles drawing in Adobe Illustrator or Macromedia FreeHand, making it easier for artists to handle the transition to the third dimension. To create a patch, you click on a series of points in the 3-D space; the program then draws a spline curve through those points. Animation Master offers standard lathe and extrusion tools, but you can also join splines by dragging a control point on top of another point and pressing a button; three or four points in an enclosed shape make up a patch. The

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Broadband Internet Routers

HARDWARE ROUTERS SPEED UP AND NETWORK YOUR HOME COMPUTERS

WITH CABLE AND DSL Internet connections becoming less expensive and more widely available, users are ditching dial-up modems and second phone lines in favor of these high-bandwidth DSL alternatives. Until recently, connecting multiple computers to such hardware meant paying higher monthly ISP fees. Enter broadband routers: these devices let multiple computers (PCs or Macs) share a single cable or DSL Internet connection, and can network your home computers to boot.

Macworld Lab tested six broadband routers ranging from \$149 to \$399: the Hawking Technologies PN9225, Linksys EtherFast, Macsense XRouter and XRouter Pro, Netgear RT311, and MaxGate UGate-3000. The routers present varying degrees of setup difficulty, but all of them will have your computers networked and online in no time.

Configuration Considerations

All the routers except the Netgear RT311 offer simple Web-based configuration. (The Netgear unit requires that you download a Telnet application and use its command-line interface; the company says the RT311 should allow Web-based configuration by the time you read this.) You can configure the routers over the Web using any browser-equipped com-

puter—running the Mac OS, Windows, Unix, or Linux—on your home network.

We tested the routers over a DSL connection with a static IP address and found the Linksys EtherFast and MaxGate UGate-3000 easiest to set up, requiring only a few minutes to install the hardware, connect our Macs to the router, and get online. The hardest to configure was the Hawking PN9225, which requires you to first configure your Mac with the IP information from your ISP, then hook up the router and configure it. With the other routers, you simply set the configuration in the TCP/IP control panel to Configure Using DHCP Server. Your Mac configures itself to use the router, and you then set up the router with your Web browser.

If you have a static IP address from your ISP and you want to run a Web or file server (such as Mac Personal Web Sharing), you can configure one or more machines on your network with a static IP address from the router. You then configure the router to allow only certain Internet traffic access to those machines. If you have a dynamic IP address, consider the UGate-3000: it includes a year of free Dynamic DNS service.

One difference among these routers is their Ethernet connection. The Hawking and Netgear units require a hub but will work at 10 or 100 Mbps, so they can connect to a network of either speed.



The Linksys EtherFast (top) and the Macsense XRouter Pro.

The Linksys EtherFast and Macsense XRouter Pro have built-in four-port 10/100 switches; the UGate-3000 sports a built-in four-port 10/100 hub. The Macsense XRouter offers only four 10BaseT ports—which is fine for sharing an Internet connection but could make for slow transfers of large files between locally networked machines.

Macworld's Buying Advice

You can find inexpensive software routers (for example, Sustainable Softworks' \$89 IPNetRouter; see *Reviews*, January 2000). However, they require that you dedicate one machine to running the software, and they won't speed up your network. If you want a faster network *and* a shared Internet connection, the Linksys EtherFast and Macsense XRouter Pro are your best choices.—BRETT LARSON

Broadband Internet Routers Compared

Company	Product	Mouse Rating	Company's Estimated Price	Contact	Comments
Hawking Technologies	PN9225	★★½	\$149	888/662-8828 www.hawkingtech.com	Small footprint and inexpensive, but difficult setup.
Linksys	EtherFast	★★★★½	\$199	800/546-5797 www.linksys.com	Easy setup and good price.
Macsense	XRouter	★★★½	\$200	800/642-8860 www.macsense.com	Easy setup but slow file transfers.
	XRouter Pro	★★★★	\$250	800/642-8860 www.macsense.com	Easy setup.
MaxGate	UGate-3000	★★★	\$399	800/284-8985 www.maxgate.net	Simple setup but a bit pricey.
Netgear	RT311	★★★	\$199	888/638-4327 www.netgear.com	Easy to add to existing network, but command-line configuration interface is confusing.



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America Online 5.0

MAC UPGRADE'S MINOR TWEAKS OFFER MIXED BAG

WITH ITS UBIQUITOUS TV commercials and the free software that arrives unbidden in your mailbox, America Online has always promised one thing: simplicity. Install the software, log on to AOL, and soon you're firing off e-mail like an old pro. Knock the service all you want, but for the 2 million-plus Mac users who subscribe to AOL, that simplicity is a big draw.

With AOL 5.0, the latest version of the ISP's software for the Mac, simplicity is still a factor. Indeed, the most impressive additions in AOL 5.0 are tweaks that make it easier to navigate the growing online community. But the upgrade focuses on the additional services—from a personal calendar to a digital photo album—that make AOL an online destination. And all too often, simplicity gets lost in the shuffle.

No Mac Makeover

The latest version offers few major changes; the high-profile additions, such as My Calendar, My Places, and You've Got Pictures, have already appeared in AOL's Windows software or on the company's Web site. And although the new Mac-only features are nice, they're hardly stuff that will change the way you use AOL.

Still, some of the changes in AOL 5.0 are quite useful. Mac users can now attach files to their e-mail messages by dragging and dropping them into the Attachments window (now AOL just needs to master the art of making attached files consistently readable); the new Download Manager simplifies locating files; and the You've Got Pictures feature lets you drop off film for development at a participating retailer and have the prints e-mailed back. Also, you can now create up to seven screen names and switch between them easily without logging off.

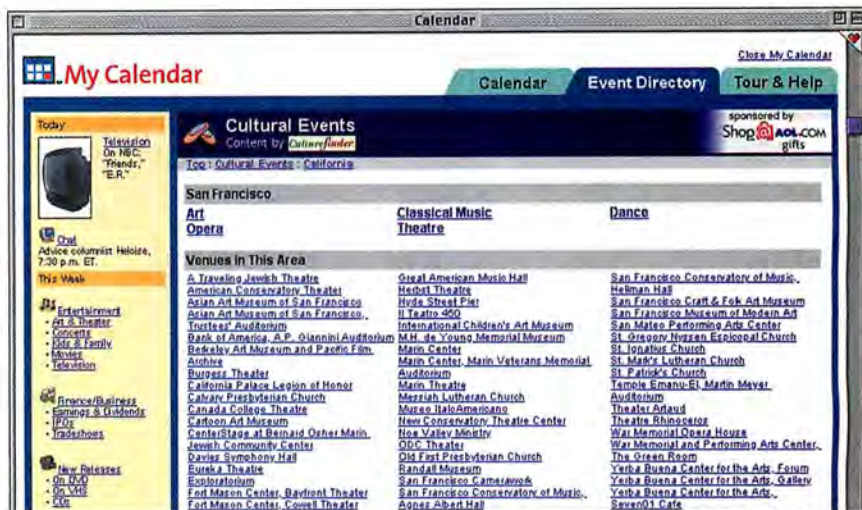
The problem is, many of these convenient features don't go far enough. For instance, My Places lets you pick five links to include on your Welcome screen. Unfortunately, you can only choose AOL channels; you can't program in a favorite URL or a frequently visited Web site.

The search button in AOL's main tool bar scours AOL features and the Internet, but produces vague results. When we typed in "Macintosh," for example, we got four AOL categories and a host of Web pages. But the top ten results included an IBM press release for ViaVoice and a

tial, but as AOL's service is already known for sluggishness, My Calendar can turn into a huge time sink.

Apart from drag-and-drop capability, the Mac-specific features failed to excite us. Mac users can now view animated GIF files and listen to embedded sounds in e-mail from other Mac-using AOL members—not exactly a cutting-edge feature. New speech-synthesis, file-storage, and sorting features are equally bland.

Downloading the AOL 5.0 upgrade takes some time—28 minutes to nearly 2



Too Busy Searching for local events in AOL's My Calendar feature is like trying to find a needle in a haystack.

home page for a Mac repair service in Oregon—not exactly useful.

My Calendar, My Nightmare

Other new AOL 5.0 features need more than a little refinement. My Calendar stands out as one of the biggest misfires. AOL touts it as an online organizer that lets members track appointments and special events online. A search feature lets users add local concerts, shows, and sporting events to My Calendar—a nice idea, but the calendar features of PDAs and other online services are much less frustrating to use. Look for San Francisco events, for example, and you'll get only a listing of venues, not the actual events they're offering. This is a time-consuming way to search, and you get few listings for outlying cities.

Adding events is almost as maddening. For instance, My Calendar lets you mark when your favorite TV shows air, but entering just one episode of a program took us five clicks. If you want weekly reminders for the show, that's an extra click. That may seem inconsequen-

hours, depending on the speed of your modem. Installation on a hard disk via CD-ROM is much faster, but the bottom line is that upgrading to AOL 5.0 may not be worth the effort.

Macworld's Buying Advice

There's not much in AOL 5.0 to impress Mac subscribers. Most of the new features either don't go far enough or sacrifice simplicity for useless bells and whistles. AOL users who are happy with version 3.0 or 4.0 have little reason to upgrade, and Mac users new to AOL should be aware that the service's famed ease of use gets lost amid the clutter of version 5.0.

—PHILIP MICHAELS

RATING: ★★½ **PROS:** Adds convenient new features; brings feature parity with Windows version. **CONS:** No major new features; My Calendar is cumbersome; Mac-specific tools are unexciting. **COMPANY:** America Online (800/827-6364, www.aol.com). **LIST PRICE:** Free (monthly service fee varies; unlimited use is \$21.95 per month).

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DIAMOND

Now Up-to-Date & Contact 3.9

RESURRECTED PIM IS STILL A WINNER

BACK IN THE MID-1990s, NOW Software's Now Contact and Now Up-to-Date had bested the majority of their PIM counterparts in features and user loyalty. Suddenly, those programs became unwitting passengers on the product-acquisition roller coaster: Qualcomm bought Now Software and then immediately lost interest in the products it had acquired. As a result, the QuickContact and QuickDay features, which provided contact and schedule information in the menu bar, broke in Mac OS 8.5 and never got fixed. Worse, Palm Pilot users were left with the execrable Now Synchronize (see *Reviews*, August 1997). With the release of Now Up-to-Date & Contact 3.9 by new owner


they show their age—for example, listings of long-dead e-mail programs appear in Contact's preferences. The networking features are fortunately still robust: you can share calendars and contact files with other users through a central server, and changes you make to your client files go automatically to the server and to other users' files. Power On now includes the contact and calendar servers with the base product, along with Now Web Publisher, which lets you publish calendar files on the Web.

The sole new feature in version 3.9 is synchronization with Palm OS devices, and it's a winner. We tested the new conduits with an old Palm Pilot Professional, a Palm IIIx, and a Handspring Visor Deluxe and found that they did an excellent job of synchronizing data. The Handspring was especially quick at HotSyncing, thanks to its USB cradle. Now Up-to-Date & Contact sometimes contains data that doesn't translate directly to the Palm, but Power On provides intelligent workarounds.

Macworld's Buying Advice

If you've stuck with your old versions of Now Up-to-Date and Now Contact because they were the best (or only) multiuser PIMs, you can breathe a sigh of relief.

Back from the brink of doom, the package works well with modern Macs and is once again in active development. Palm synchronization finally works correctly, to the joy of handheld users; if you use a Palm OS device, version 3.9 is a must-have upgrade. If you're still using one of the Now Software versions, it makes sense to upgrade and regain full functionality with newer versions of the Mac OS. But if you've already upgraded to 3.8 and you don't use a handheld, wait for version 4.0.—TOM NEGRINO

RATING:  **PROS:** Updated for modern versions of Mac OS; good Palm synchronization. **CONS:** Programs show their age; package does not handle memos for Palm devices. **COMPANY:** Power On Software (800/344-9160, www.poweronsoftware.com). **LIST PRICE:** \$100.

FaxElite 5.0

RELIABLE NETWORKED FAXING

FAXING FROM YOUR COMPUTER is straightforward if you're a single user; since all new Macs come with a lite version of Smith Micro's FaxSTF software, you just add a fax modem and you're in business. It would be impractical and wasteful to outfit an entire office with fax modems and individually dedicated phone lines, but until now the only Mac-based products for network faxing were outdated and unsupported. That's why the U.S. debut of Glenwarne Limited's FaxElite networked fax software is such a welcome development; with FaxElite, companies can easily and economically bring faxing to every user's desktop.

FaxElite 5.0 includes client and server components. You must buy one server pack and then pick a client pack for as many users as you need. (The single-user version doesn't require the server pack.) You choose one Mac with a fax modem to host the server—you don't have to dedicate it to the task. (The server Mac can also be a client.) We set up both the server and the clients quickly and easily, and sent our first test fax just minutes after installation.

The client software consists of the fax printer driver, which appears in the Chooser, and three applications: FaxStatus displays the server's fax queue and lets you change and delete queued items; FaxViewer lets you view, print, and delete faxes; and FastFax lets you send quickie text faxes. FaxElite lacks OCR (optical character recognition) capability, but you can export received faxes as TIFFs, which any OCR product can read.

FaxElite uses the familiar method of holding down certain keys to print documents to fax rather than to a printer. From the printing dialog box, you can add cover pages, control the fax's resolution, add attachments, and preview the fax before sending.

Installed on a 604e-based Umax clone that was also running AppleShare IP and other server software, FaxElite's server software performed very well. Faxes spooled smoothly from the clients to the server, where they queued up for sending. Because FaxElite renders outgoing faxes on the server, all the fonts in the document must be in the server's System Folder, or you'll get unpredictable font



Data Channel The Conduit Settings window lets you specify the data flow between Now Up-to-Date & Contact 3.9 and your Palm device.

Power On Software, the ride has come full circle—the products aren't substantially different, but Power On has updated them to work with today's Mac OS and to support Palm devices.

Longtime users will be pleased to see that QuickContact and QuickDay (actually rewritten in version 3.8) now work with Mac OS 8.5 and later versions. For the most part they work well; from the menu bar, you can access or add frequently used contact information and the day's appointments and events. QuickContact falls short in telephone dialing features, however—it can't use the internal modems in iMacs or G3 or G4 tower machines. Power On has promised to address this problem in a future release.

The main applications remain virtually unchanged from version 3.8; Power On has yet to update the programs to the current Mac look-and-feel. In some areas



Facile Facsimiles FaxElite 5.0's fax dialog box exemplifies the program's clean, uncluttered interface.

substitution. An incoming fax triggers the server to notify the fax administrator, who checks the fax and forwards it to the correct recipient over the network. Alternatively, you can have the server automatically archive or print incoming faxes for distribution by sneakernet. Network faxing requires AppleTalk over Ethernet; Glenwarne says a future version will add TCP/IP networking.

FaxElite comes with plug-ins that allow automated faxing through several database programs, including FileMaker Pro. And FaxElite's extensive AppleScript support makes it easy to create AppleScript droplets, onto which you drag and drop documents for delivery to the people you fax most often.

This is such a well-thought-out product that coming up against its shortcomings is a bit jarring. For example, you can't annotate received faxes, there's no Windows client, FaxElite won't accept a phone calling card for billing, and the program logs outgoing faxes but not incoming ones. Most annoying is the lack of *smart dialing*, which drops the area code for local numbers in your fax phone book.

Macworld's Buying Advice

For companies that want to enable users to share a fax modem, FaxElite 5.0 is the only Mac product still in active development. The program isn't inexpensive, but its cost is much more justifiable than the expense of equipping users with dedicated modems and phone lines. If you want networked faxing from the Mac, FaxElite is worth a look.—TOM NEGRINO

RATING: ★★★½ **PROS:** Networked faxing; good AppleScript and database support. **CONS:** No fax annotation, smart dialing, or Windows client; mediocre fax logging. **COMPANY:** Glenwarne Limited (sales@faxelite.com; www.faxelite.com). **LIST PRICE:** Single-user version, \$90; server pack, \$99; multiuser client packs, \$229 for 3 users to \$1,599 for 50 users.

News and Stock Tickers

INTELLINEWS AND MACTICKER BRING NEWS AND STOCK QUOTES TO YOUR DESKTOP

THE IDEA OF RELYING ON A DAILY newspaper to bring you the day's events seems almost quaint, particularly when you can access up-to-the-minute information via the Internet. The hitch is that gathering a wide range of information from the Internet, bouncing from one Web site to the next, takes time. But thanks to two new products from Aladdin Systems, your bouncing days may be over.

IntelliNews 2.0.1 and MacTicker 1.6.2 bring information to your Web-connected

that lead to headlines, sports scores, weather information, a user-configurable list of stocks, and an index of Mac-related Web sites (known as *stations*). You can also add your own stations to the list. When you double-click on a headline, IntelliNews launches your default browser and displays the Web page containing the story. Double-clicking on one of the stations brings its headlines into a window within IntelliNews.

As useful as IntelliNews is, it's missing a search function. IntelliNews would also benefit from a sort feature that filtered news by source, for example, or configured the Sports window to display only baseball information.

Similarly, although MacTicker is a fine source of nearly current financial market information—providing details on the day's opening price, lows and highs (both daily and 52-week), and earnings and dividends shares—it lacks a portfolio feature where you can enter information such as your stock's purchase price and the number of shares you own. Otherwise, MacTicker is well laid out, displaying financial information in easy-to-read boxes and a scrolling ticker.



Tick Talk You can easily view market details using MacTicker 1.6.

Mac. As its name implies, IntelliNews focuses on news—including technical, financial, world, U.S., science, health, entertainment, sports, and Mac-related stories, along with weather information and stock quotes. MacTicker skips the news but provides far more comprehensive stock information than IntelliNews and also tracks mutual funds and indexes.

Both IntelliNews and MacTicker let you control the frequency of updates (you can also refresh data manually with the push of a button). Although IntelliNews refreshes headlines no more than every 15 minutes, you can set it to refresh stock information every 15 seconds and sports scores every minute. You can configure MacTicker to update stock prices and indexes every minute and mutual fund information every 15 minutes. In both programs, the sources used generally delay stock quotes 15 to 20 minutes.

IntelliNews' friendly interface offers a rectangular window containing buttons

Macworld's Buying Advice

Although both IntelliNews 2.0.1 and MacTicker 1.6.2 provide information you could find free on the Web, those resources won't deliver it in a neat package right to your desktop. If you're a news junkie or dedicated follower of finance, IntelliNews and MacTicker may be just the ticket for you.—CHRISTOPHER BREEN

IntelliNews 2.0.1

RATING: ★★★ **PROS:** Easy to use; solid set of news resources. **CONS:** No find or sort feature. **COMPANY:** Aladdin Systems (800/732-8881, www.aladdinsys.com). **LIST PRICE:** \$20.

MacTicker 1.6.2

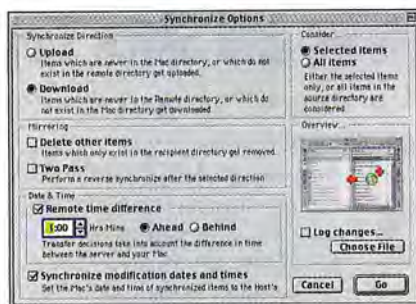
RATING: ★★★½ **PROS:** Provides ample market information. **CONS:** No portfolio feature. **COMPANY:** Aladdin Systems (800/732-8881, www.aladdinsys.com). **LIST PRICE:** \$30.

FTP Client Pro 3.0

FILE-TRANSFER TOOL SYNCHRONIZES OVER THE INTERNET

ALMOST NOBODY SIMPLY TRANSFERS files between computers in the same building anymore—today's users move files over the Internet, between computers that may not even be located in the same country. File Transfer Protocol is a platform-independent method for copying files around the world, but its quirky behavior makes it tedious to use for such routine chores as uploading Web-site content or updating files. The latest release of Vicomsoft's FTP Client Pro, which has always had an elegant interface, adds features such as file synchronization to make these chores painless.

FTP Client Pro 3.02 offers a Finder-like view of files on remote systems, with drag-and-drop support for both downloading and uploading. You can customize the view to display the particular attributes that interest you—file name, type, size, date changed, and so on—and set up remote and local file-system views side by side for easy comparison. The utility uses suffix mapping and its Smart Translation feature, which examines the contents of files during down-



Synching Up Vicomsoft's FTP Client Pro 3.02 gives you a lot of control over synchronizing files with a remote system.

load, to automate file-transfer conversions; it supports Windows, mainframe, AS/400, and many other proprietary server types. If a transfer gets interrupted midstream, the program can pick up where it left off once it reestablishes a connection.

New in this release is a sophisticated synchronization feature that lets you copy changed files from a local directory to a remote one and vice versa. The synchronization process properly avoids expanding compressed files, and it copies modification dates from the most current system rather than setting them to the current date, features other file-synchronization utilities lack. It also takes into account time differ-

ences with the remote location and can operate in a two-pass mode to propagate changes in one directory to the other.

A Persistent Download option makes the utility keep trying to download a file from a busy server while you do other work in the foreground. The 3.02 release also supports a number of new server types and offers improved compatibility with existing servers. Other enhancements include a streamlined interface, audio alerts for completed and failed downloads, support for MacBinary III, direct URL parsing, and the ability to make FTP Client Pro your browser's preferred FTP download tool.

Macworld's Buying Advice FTP Client Pro 3.02's slick interface and handy new features make it a must-have utility for anyone moving files over the Internet. Even if all Vicomsoft had done with the new release was add a few features, FTP Client Pro would be at the top of its class. But the company made one other change sure to please users: it cut the price by almost half.—MEL BECKMAN

RATING: ★★★★★ **PROS:** Drag-and-drop interface; suffix mapping; automatic translation; folder synchronization. **CONS:** None. **COMPANY:** Vicomsoft (800/818-4266, www.vicomsoft.com). **LIST PRICE:** \$30.

Cinema 4D XL 6.0

MORE FEATURES FOR 3-D PROS

WITH THE RELEASE OF MAXON Computer's Cinema 4D XL 6.0, 3-D professionals have reason to be excited. This powerful modeling, rendering, and animation package has undergone a thorough upgrade; it's now packed with hundreds of new features and has a substantially redesigned interface. It's not perfect, but Cinema 4D is an excellent tonic for Mac 3-D pros envying their Windows-using counterparts, who have several tools at their disposal.

Cinema 4D's interface redesign is extensive. Gone are the old tool palettes, replaced by fully customizable tool bars running across the top of the screen and down the left side. You can create your own tool bars, stack them, and cycle through them with simple mouse moves or keyboard commands. You can even assign every item on the menu or tool bar a keyboard equivalent through a simple palette.

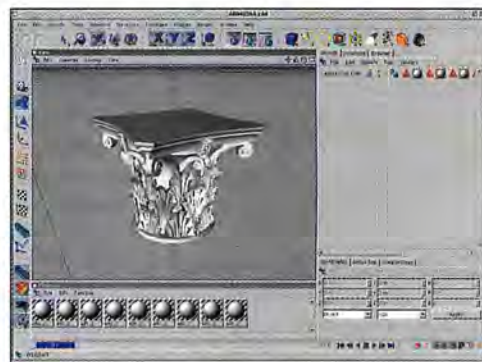
Although the new customization features are welcome, we found the sprawling tool bars a poor substitute for a well-designed floating palette. And despite the interface improvements, Cinema 4D doesn't

feel entirely Mac-like. For example, its menu bar, which appears directly below the standard Mac menu bar, is disorienting, ugly, and a waste of screen space. The nonstandard interface, combined with Cinema 4D's poorly written manuals, means that new users will have a tough time learning the program.

But what Cinema 4D lacks in interface savvy it more than makes up for with a mind-boggling set of tools. Foremost among the modeling tools are more than 50 parametric primitives ranging from simple cubes, cones, and cylinders to capsules, toroids, fractal landscapes, and platonic solids. The primitives are a great starting point for modeling, and the modifiable parameters—such as height and radius for the cone primitive—let you adjust their shape.

Cinema 4D also offers improved spline tools; a full assortment of B-spline curves; and excellent NURBS controls, particle effects, and deformation tools. Other upgraded features include outstanding volumetric lighting, full F-curve support for animation scripting, and powerful sound-mixing tools. Like previous versions, Cinema 4D XL 6.0 has incredible rendering speed, even for full ray tracing.

Macworld's Buying Advice Interface



Changing Face Cinema 4D XL 6.0 sports an entirely new, customizable, and somewhat cumbersome interface.

problems notwithstanding, Cinema 4D XL 6.0 is a good choice for animators working in broadcast or Web media. Current users should definitely upgrade, and high-end 3-D pros who haven't tried it should give this program a very close look.—BEN LONG

RATING: ★★★★★ **PROS:** Huge assortment of new modeling, texturing, lighting, and animation tools; speedy performance. **CONS:** Cumbersome, nonstandard interface; weak manuals. **COMPANY:** Maxon Computer (877/226-4628; www.maxoncomputer.com). **LIST PRICE:** \$2,195.

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USB Web Cameras

VIDEO AND STILL IMAGES ON THE CHEAP

ADDING A VIDEO CAMERA TO your USB Mac for Internet videoconferencing and quick image snapping is quite easy—and with the USB interface's cross-platform compatibility, you have more Mac video cameras to choose from than ever. Macworld Lab looked at two recent contenders, 3Com's HomeConnect USB and iRez's Kritter USB. Both offer the painless setup we've come to expect from USB devices, but they're quite different when it comes to image quality.

Initial setup is simple: just install the included drivers (or download them, in the case of the HomeConnect) and the capture software. Restart your Mac, plug in your USB camera, and you're ready to start filming.

Once the cameras were set up, we noticed qualitative differences. The Kritter's video was superior to the HomeConnect's—smooth, with no dropped frames—but the image was dark, like a bad videotape copy. However, changing its settings to capture smooth video at various levels, from 16-bit grayscale to millions of colors, was easy.

The HomeConnect excelled in overall image quality, but the prerelease Mac soft-



HomeConnect USB (left) and Kritter USB

ware we downloaded from 3Com's Web site (the camera comes with Windows software only) was buggy, and we had a devil of a time making movies with it. Although we tried many of the included compression settings, the video always looked jerky and suffered from dropped frames. If you're willing to buy different video-capture or videoconferencing software and download just the HomeConnect's drivers, you'll get better video and still images. We had good results using the HomeConnect in conjunction with the \$199 Sorenson Broadcaster, the \$100 ClearPhonePPC, the \$15 BTv 3.2.6, and the \$149 SiteCam 5.0. (The Kritter is also compatible with all of these packages, but they don't yield better output than the camera's own software.)

The HomeConnect's still-image quality was significantly better than the Kritter's, even when the camera was set to capture and display 640 by 480 pixels. And even after we made several adjustments to the Kritter, its images still didn't look as sharp. It also tended to warp images at the corners, giving them a fish-eye appearance.

Macworld's Buying Advice If you need to make quick movies for sending to friends and family by e-mail, the Kritter USB is an acceptable choice. If full-motion video is not a major issue, the HomeConnect USB offers better still-image quality.—BRETT LARSON

HomeConnect USB

RATING: ★★★ **PROS:** Great still-image quality. **CONS:** Mac software must be downloaded and is buggy; requires other cam software for better performance. **COMPANY:** 3Com (800/638-3266, www.3com.com). **LIST PRICE:** \$190.

Kritter USB

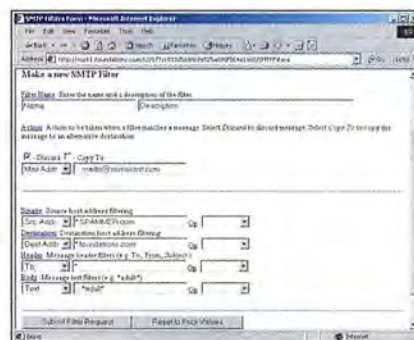
RATING: ★★½ **PROS:** Smooth video; software included; inexpensive. **CONS:** Poor image quality; lots of noise. **COMPANY:** iRez (480/922-0044, www.irez.com). **LIST PRICE:** \$130.

NetTen 1.4

MAIL SERVER DELIVERS UNIX POWER

TENON INTERSYSTEMS SPECIALIZES in wrapping friendly Mac interfaces around powerful Unix applications. With NetTen 1.4, Tenon seeks to provide an industrial-strength, standards-based mail server for the Mac. NetTen incorporates widely used Unix applications—PostOffice for mail and BIND for DNS—into a single Mac program that hides the Unix environment from the administrator. The result is a unique combination of features and flexibility—and a management experience that the Macintosh faithful may find slightly uncomfortable.

NetTen is easy to install, taking less than 5 minutes, and has simple hardware demands (a Power Mac with 15MB of RAM and 50MB of disk space). Configuring the mail and DNS services is fairly straightforward, with NetTen's Web interface allowing remote administration from any browser-equipped computer. The management pages could use a more polished interface, and they require too many mouse-clicks, though the Web forms do offer the benefit of hypertext links to topics in the



Hold the Spam NetTen 1.4's sophisticated filters stop spam from reaching users.

online documentation. Administrators who really appreciate the bare-bones approach can perform much of the mail administration via e-mail, bypassing the Web interface entirely.

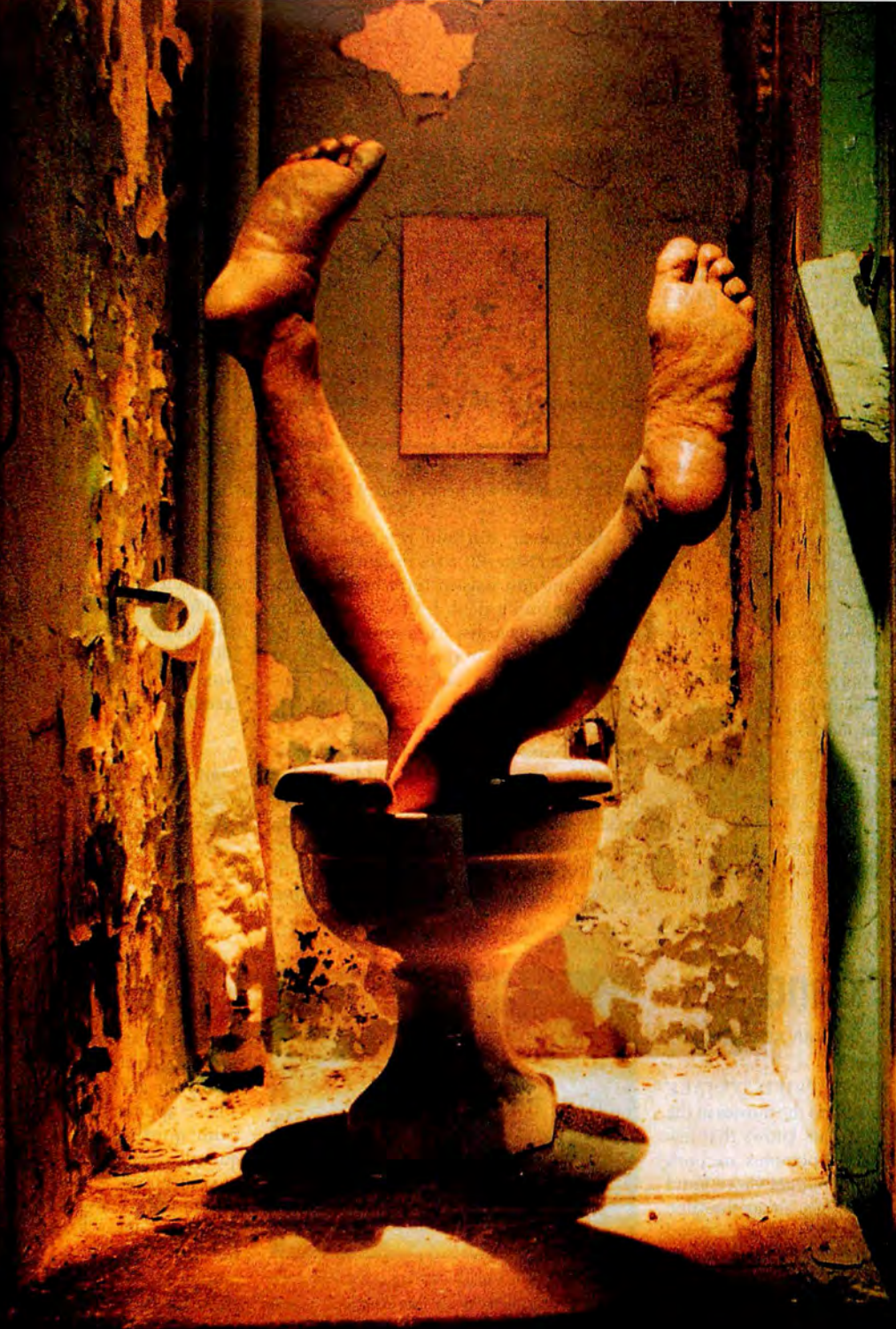
NetTen performed solidly during testing, providing reliable SMTP, POP, IMAP version 4, and DNS services to Mac and Windows clients. The server supports multiple mail domains, and you can configure each account to receive mail for multiple addresses. Users can manage their own mail accounts via the Web, and administrators can limit mailbox size to avoid overflowing in-boxes. To thwart spammers, NetTen offers relay restrictions, source-address fil-

tering, content filtering, and dynamic checks against the Mail Abuse Prevention System's list of known spammers.

For all its Unix power, NetTen is still missing a few relatively minor features. It doesn't provide any LDAP access to its mail directory or autoconfiguration of mail clients—features Qualcomm's \$249 Eudora Internet Mail Server offers. NetTen's DNS doesn't support Dynamic DNS registration or service locator records, and it has no way to view or force an update of a secondary zone. It also lacks the DNS analysis tools and WebStar plug-ins found in Men and Mice's QuickDNS Pro.

Macworld's Buying Advice Administrators looking for sophisticated spam blocking, account aliasing, and DNS services will find NetTen 1.4 a reasonable value. Those looking for just a mail server—and a 100 percent Mac experience—might consider the less-expensive Eudora Internet Mail Server.—JEFF DAVIS

RATING: ★★★★ **PROS:** Strong spam filtering; multiple addresses per account; users can manage their own accounts. **CONS:** Bare-bones Web interface; limited DNS management tools. **COMPANY:** Tenon Intersystems (800/662-2410, www.tenon.com). **LIST PRICE:** \$495.



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EndNote 4.0

SOLID UPDATE TO RESEARCH TOOL

ENDNOTE USERS WHO WORRIED about the fate of their favorite bibliography manager when Niles Software was acquired last year can rest easy. ISI ResearchSoft has released EndNote 4.0 with a host of new features that make for a solid, if pricey, upgrade.

The roster of changes includes several welcome additions to the Library window. You can specify which fields to display, adjust column widths by dragging, and click on any column heading to sort the references on that field. The Library window also includes a collapsible preview panel that lets you see how references will appear in the final bibliography (see "In Style"). Finally, this version at last grants our oft-repeated wish for a horizontal scroll bar.

ISI has also beefed up EndNote's search functions. For example, you can save and reload complex search criteria and restrict searches to the first author listed. EndNote 4.0 retains its predecessor's ability to query Z39.50-compliant databases over the Internet or institutional intranets, but it also ships with connection files for more databases (217 in all).

Year	Title	Author	Page
1992	Neuropathologic changes in the hippocampus of the rat after kainic acid-induced seizures	28	140-15
1994	Thyroid nodules: clinical effect of ultrasound-guided fine-needle aspiration biopsy	22	523-2
1995	Concurrent hyperthyroidism: assessment with ultrasound	16	1117-7
1995	Primary thyroid lymphoma: resolution with PT, CT, and hist	19	282-8
1995	Thyroid nodules: re-evaluation with ultrasound	23	179-84
1997	Subacute thyroiditis in the thyroid gland: ultrasonographic findings and clinical course	25	278-81
1998	Deformation of thyroid gland volume by a newly developed ultrasound technique	54	81-7
1999	A patient with primary hyperparathyroidism associated with ultrasonically monitored hyper	9	483-8
1997	Thyroid nodules: resolution with US-guided core biopsy with an automated biopsy gun	282	814-7
1999	Low frequency (1700 kHz) breast in gel: relationship with ultrasonographic findings and other data	155	2018-2
1995	Softening thyroid nodules: Comparison between palpation and ultrasonography	41	378-84
1999	Comprehensive ultrasonographic thyroid measurements in two cases of Schöten's syndrome	9	483-8
1999	Measurement of thyroid size by ultrasonography, palpation and scintigraphy	2	327-34
1994	Long scale ultrasonography in the diagnosis of thyroid swellings	68	581-4
1995	Comparison of radiolabelled and ultrasound scans of the thyroid	119	244-50
1996	A clinical evaluation of grey-scale ultrasonography	119	129
1997	Evolution of (125I) sodium iodide	147	641-52
1999	The (125I) study of (125I) sodium iodide: current applications and future directions	175	432-37

In Style EndNote 4.0's preview panel displays formatted references based on the currently selected bibliographic style.

Whenever you add references to a library, EndNote 4.0 saves the authors, keywords, and journals in term lists. As you enter text into a field, EndNote scans the appropriate term list for a unique matching entry and fills in the rest of the text for you. This feature saves keystrokes and minimizes errors when you have to enter references manually.

EndNote's new Style Manager window makes it easier to add new bibliographic styles or edit existing ones, and you can specify which styles you want to appear in the Style menu. We also appreciate EndNote's new formatting options—for example, you can specify font and style settings

for individual authors. Visible symbols now represent formatting characters, including tabs and carriage returns, so you can specify precisely how you want the bibliography to appear in your document. EndNote 4.0 also supports hanging indents in bibliography layouts. (We did run into a snag when we imported two of our old definitions, however.)

Macworld's Buying Advice

It's gratifying to see ISI continue to improve EndNote's interface and add to its feature set, but the \$100 upgrade price (\$80 for the downloadable version) is a bit steep. By comparison, a fully functional version of Research Software Design's Papyrus 8.0, which lacks some of EndNote's bells and whistles, costs only \$89 (see *Reviews*, April 2000). Upgrade cost aside, however, EndNote 4.0 is a solid update to an already excellent research tool.—FRANKLIN TESSLER

RATING: ★★★★★ **PROS:** Customizable Library window; autocompletion of entries; preview panel. **CONS:** Expensive upgrade. **COMPANY:** ISI ResearchSoft (510/559-8592, www.isiresearchsoft.com). **LIST PRICE:** \$299.

Ferazel's Wand

ENGAGING RUN-AND-JUMP ADVENTURE

ANYONE WHO'S TRIED TO TAKE an eight-year-old to the movies in the last couple of years knows that few films at the local octoplex are both appropriate for younger viewers and entertaining for adults. One can say the same of computer games: those targeting teens and adults often overflow with violence and devilish complexity, while diversions designed for children are often too saccharine for mature tastes. Ferazel's Wand, a side-scrolling run-and-jump adventure from Ambrosia Software, strikes a pleasing compromise that should make players of all ages happy.

You control Ferazel, the last of the free Habnabits, on a quest to destroy the evil Manditraki race, led by Queen Xichra. To defeat this insectoid horde you must leap, clamber, and fight your way through 23 levels of landscape. Along the way you'll battle a host of enemies, including poisonous spiders, evil goblins, and spine-flinging armadillos. In the lower levels your main weapon is a fireball spell; you pick up more exotic weapons as you progress.

Veteran gamers will see a striking similarity to such classics as Bröderbund's Prince



Put 'em Up! This sword-wielding goblin is just one of the foes your character will face in Ferazel's Wand.

of Persia and Delta Tao's Dark Castle—especially if they've encountered Prince of Persia's spike pits and Dark Castle's venomous bats. One difference is that Ferazel's Wand doesn't require the split-second timing that these earlier games demand. When propelling Ferazel from a ledge to a nearby vertical wall, for example, your fingers don't get tangled up in the effort to issue several keyboard commands in perfect succession. The game is very forgiving when it comes to executing commands.

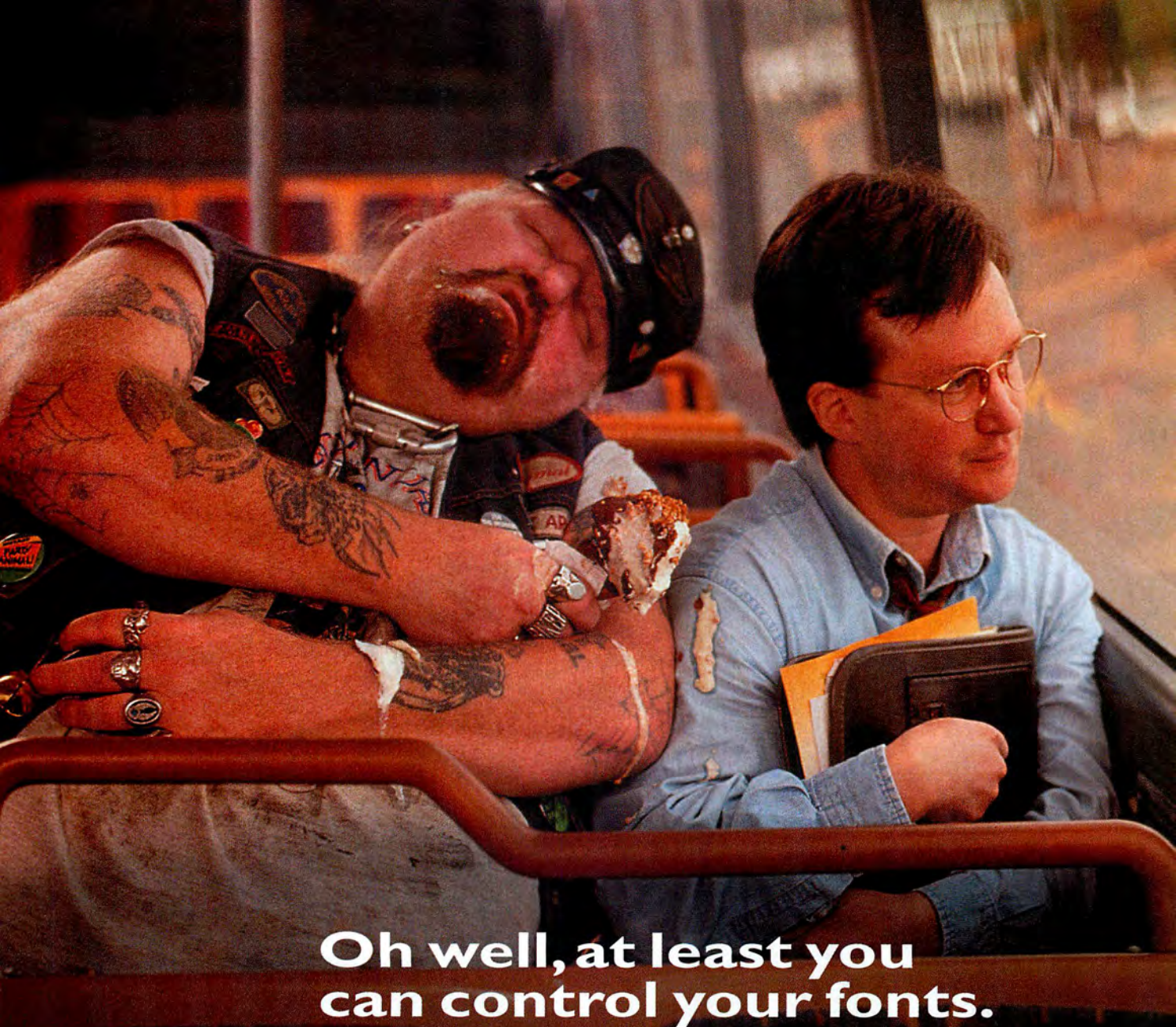
But Ferazel's Wand is no walk in the park. Although the first few levels are relatively easy, things get tricky a third of the way into the game—particularly when envi-

ronmental conditions such as high winds and slippery ice demand more precise control of your character. (Don't worry, it's not too tricky for younger kids or even clumsy adults.) Adding to the challenge, you can save your game only in certain locations. These appear often enough to keep you from quitting in frustration, but infrequently enough to require careful planning of your moves.

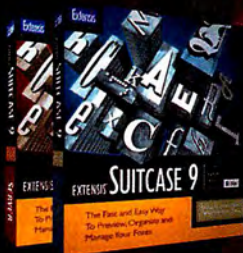
Those accustomed to the lush graphics of many modern Mac games may find that Ferazel's Wand looks a bit cartoonish. Its graphics style has both good and bad points: although older users will wonder if they're playing a little kids' game, the absence of gruesome detail may convince adults to let their children play it.

Macworld's Buying Advice Ferazel's Wand is a fun adventure that harkens back to some of the finest Mac games. What it lacks in graphical refinement it more than makes up for in compelling and challenging game play.—CHRISTOPHER BREEN

RATING: ★★★★★ **PROS:** Challenging and well-balanced game play; controls are not too finicky. **CONS:** Somewhat cartoonish graphics. **COMPANY:** Ambrosia Software (800/231-1816, www.ambrosiasw.com). **LIST PRICE:** \$30.



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The Game Room

Now It's Our Turn

FOUR WAYS WE CAN ENSURE THAT GREAT GAMES KEEP COMING TO THE MAC

by Christopher Breen

We Breens are slow to boil. When crossed, we tend to lightly simmer—sending up a single errant bubble that only hints at the greater heat within. But there are times when we, like the famed Popeye clan before us, have taken all we can stand and we can't stand no more. In these rare moments, nothing short of a flak jacket, dental shield, and garland of garlic draped casually around the neck provides protection from our wrath—which may help explain the following:

I was at the home of an acquaintance who shares my enthusiasm for computer gaming. We were hovering over his G4, and as usual, I was listening to his latest diatribe. You see, he's a loquacious sort and was just beginning the second movement of a fairly fruity rant regarding Apple, game developers, and what he considered their less-than-wholehearted support for Mac gaming. When I could get a word in edgewise, I explained that I'd certainly done my part by addressing these issues in this column—Apple *could* offer Macs with more-robust 3-D hardware acceleration, bundle games with new Macs, help developers defray the cost of promoting games by entering into comarketing agreements, and seed upcoming hardware to game developers so they'd have the opportunity to test their products with Apple's latest and greatest gear. And PC game developers eyeing the Mac market should be interested to know that Mac users want games that (a) include all the features found in the PC version, (b) support and reflect the Mac's interface, and (c) don't suck. But that didn't seem to be enough for him.

"Well, you're not getting through to

them," he railed. "They just don't [expletive deleted] get it!"

Then he did something that turned up the Breen burner from Warm to Broil.

As he issued this verdict, he pulled out a CD-R plainly marked with these words in blue, Sharpie fine point: *Unreal Tournament*. He turned and stopped in mid—"So, howabout we go online and kick some . . ." when he noticed that my face had changed from its usual cheery-



pink Irish hue to a full, hearty burgundy.

"You pompous ass!" I screamed.

"Wha . . . ?"

"You have the nerve to slam Apple and game developers about 'not getting it' and then blithely shove a pirated game into your Mac?! You hypocrite!"

"Hey, what's the big deal? So I pirate a few games. You should see all the games [name withheld to protect a PC pal of ours] has!"

If my brain hadn't shut down at that point in order to avoid bursting from its

casing, I might have suggested that we, as Mac gamers, are in a different situation from our pal Name Withheld. For PC game developers, creating games for Windows boxes is a necessity, but making or licensing games for the Mac is a choice—*these folks don't need us*. Apple and PC game developers can walk on water and raise the dead, and it won't mean squat if we, the Mac gamers, don't make our own effort to turn the Mac into a game-friendly platform as well.

Now that I've calmed down, I'd like to gently offer Four Ways We Can Make a Difference.

Way One: Pungle Up

The primary reason they don't port their games to the Mac, PC game developers say, is that Mac games don't sell in numbers vast enough to justify the cost. Therefore our first mission is to increase the number of units sold by paying for the games we play. When we play games that we have no intention of purchasing, we give PC game developers one more reason to say "Nah, I don't think so" when the subject of licensing their best stuff for the Mac comes up around the watercooler.

I'm not about to climb on a soapbox and issue a stern lecture on the evils of piracy. I don't know a single person in the computer business who hasn't, at one time or another, used a piece of software they didn't pay for—and that includes yours truly. This Way has nothing to do with piracy being wrong *continues*



Pay Up If you want to see more games like *The Sims* (right)—or titles such as Shiny Entertainment's *Messiah*—brought to the Mac, you must do your part and make Mac gaming more popular and lucrative.



or evil, and everything to do with piracy being counterproductive and short-sighted. It comes down to this: if we don't pay for more games today, we may not have new games tomorrow.

But Mac game piracy won't go away just because some Pollyanna in *Macworld* says it should, so let's strive for a compromise. If you happen to be running a less-than-kosher copy of a game that you enjoy, buy a copy of the real thing. If the game stinks, trash it and move on with only a mildly cloudy conscience. (Note: to avoid risking your immortal soul for a lousy game, download the game demo. The demo usually gives you a clear idea of whether a game is worth its price.)

And because games aren't cheap, let's consider this: if you can't afford to buy a game—and by that I mean you receive an allowance of \$7.49 a week, and out of that measly sum you buy your clothes and food and pay off the school bully—try to get the game by dropping broad hints around your birthday and any convenient holiday.

Way Two: Buy Right

Although not commonly found, some games ship with the Mac and PC versions on the same disc. These hybrid discs can be identified by a box that boasts both Mac and Windows compatibility. In large stores that sell lots of PC software and very little Mac software, these games are invariably found in the PC games section. When we purchase such a game, that sale is chalked up as a PC sale rather than a Mac sale.

As I mentioned, the number of Mac units sold makes a difference. In order for the accounting to more clearly reflect

that a hybrid game was purchased by a Mac user, buy games from a Mac-only dealer whenever possible. If that's impossible, try online and catalog sources that cater to Mac users.

Way Three: Spread the Word

There is a finite number of us—meaning Mac gamers, not pontificating pundits—in the world, and even if each and every one of us buys a copy of our favorite game from a Mac dealer, the resulting sales figures are going to pale in comparison with those for a game that sells only fair to middlin' on the PC. In order for us to get more and better games, we must create more Mac gamers.

If the drug and tobacco cultures have taught us anything, it's that the "first one's free" strategy is an effective way to introduce a potential customer to your product. For us this means finding someone—let's call that person Our Next Victim—who's open to the idea of gaming. Offer to install the demo of a game you think that person will enjoy on his or her Mac. Try to copy the demo from a CD or across a network rather than downloading it—you're not going to impress Our Next Victim by tying up his or her dial-up connection for eight hours to download a massive demo. Show off the highlights of the game for a minute or two, and then let Our Next Victim give it a whirl. Start with a game that can be easily grasped and that offers a measure of success right away. Traditional and arcade games are a good place to start, particularly for older players. And avoid games that will offend Our Next Victim—your grandmother is unlikely to fall in love with

the guts-scattering goodness that is *Quake III Arena* and *Unreal Tournament* on the first go-round.

Way Four: Make Your Wishes Known

Keep your eyes open for cool PC games that you'd like to see on the Mac. I check in with my PC pals to see what they're playing and flip through PC gaming magazines to find out what's hot. If I see a game that looks like it might fit nicely on the Mac, I'll drop a note to the game developer and politely suggest that I and many of my Mac buddies would buy several dozen copies of the game if only it were available in Mac-flavored form. Lob a message into one of the comp.sys.mac.games newsgroups to see what other Mac players have heard about particular PC games, and if there seems to be a positive consensus about a game, suggest banding together as a group to petition a company for a Mac port.

A Word Before I Leave

Ultimately, the success or failure of any product—whether it's gas-guzzling sport utility vehicles that tip over in a gentle breeze or another Robert Ulrich miniseries—depends on whether enough customers are willing to lay down enough dough to obtain their heart's desire. Mac games are no different. If we want more and better games for our Macs, it's time we put our money—and our best evangelical efforts—where our mouths are. **m**

Contributing Editor CHRISTOPHER BREEN has been writing about the Mac and technology since the latter days of the Reagan administration.

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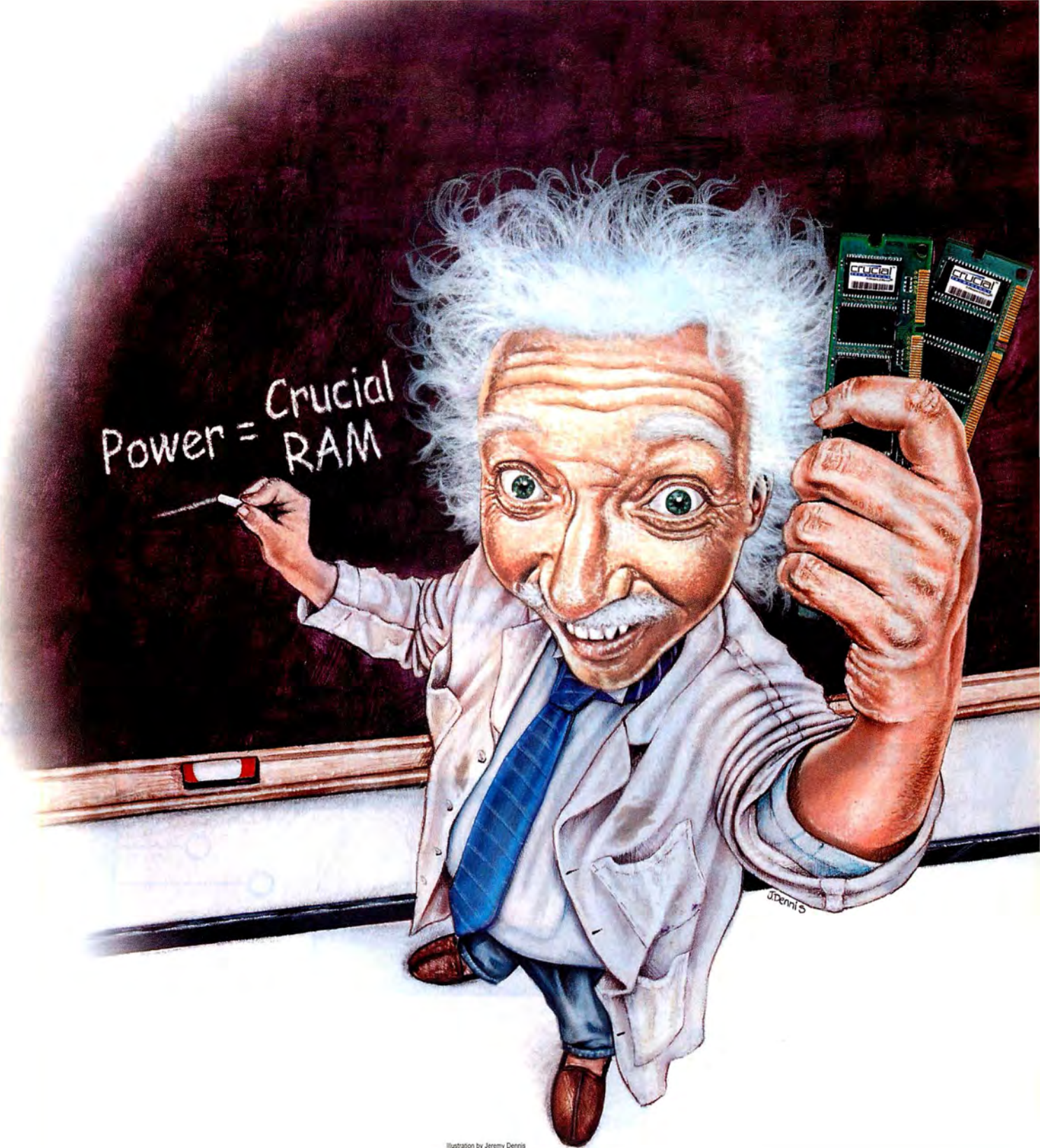
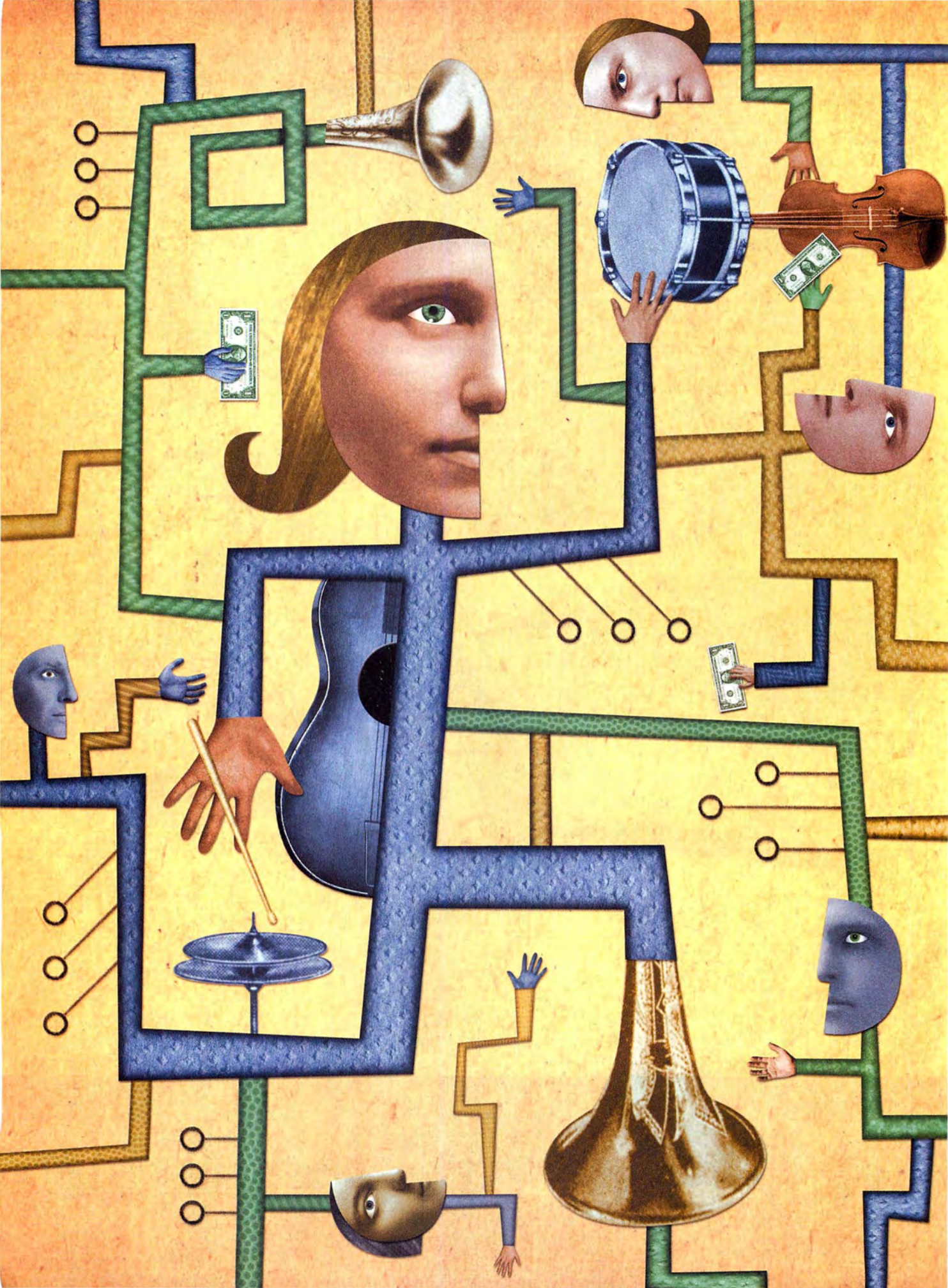


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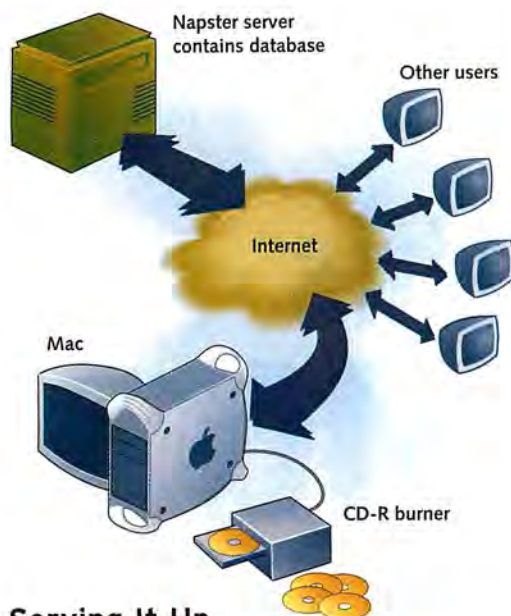
Will Napster change the way
we buy—or don't buy—music forever?

steal this song

TONIGHT'S THE NIGHT. After months of indecision you've decided to offer your hand in matrimony to that special someone. You've purchased the ring and chosen the ideal spot to pop the question—the only remaining detail is selecting the perfect song to accompany your proposal. After scanning your record collection for Chad and Jeremy's *The Ark*—"Painted Dayglow Smile" is "your song"—you remember you loaned the record to your brother-in-law last week. What to do?

Illustration
by Joyce
Hesselberth

How Napster Works: The Pirate's Toolbox



Serving It Up

NAPSTER, the popular file-sharing service for swapping MP3s online, operates with the help of a centralized server that maintains a database of all the MP3 files that users with Napster clients make available to other Napster users. Here's how it works:

1. Long John Silver installs a copy of a Napster client—Macster is one such for Macintosh, although Napster is working on a Mac client as we go to press—and establishes a free account with Napster.
2. Although Macster doesn't currently support this capability, a PC-packing Long John can place MP3 files he's willing to share with others in a particular folder. When John logs on to the Napster server, the server software adds a list of these files to its database.
3. When John initiates a search—based on song title or artist—Napster's server scans the database and returns a list of computers where a song can be found.
4. Once John picks a computer to download the song from, a network link is established between his computer and the one that contains the song he's after, and the song is copied from the remote computer to John's hard drive.
5. With the MP3 file secure on John's hard drive, he can then play it with an MP3 player such as SoundJam MP, Audion, or QuickTime.
6. If John wishes to take his tunes with him when he travels the high seas, he can download them to a portable MP3 player such as the Rio 500, or convert the files into AIFF files and then turn them into audio CDs with the help of a CD-R writer.

Simply fire up your Mac, launch a copy of a program called Macster, type *Chad and Jeremy* into the Artist search field, and cross your fingers. Sure enough, you discover that "Painted Dayglow Smile" is available for download from three different computers. With a double-click, the song is delivered to your Mac in a matter of minutes—at no cost and just in time for its strains to be heard as your beloved crosses the threshold.

As romantic as this scenario seems, there's one minor catch: your actions may be illegal—illegal enough, in fact, that if the recording industry has its way, Internet services such as Napster (www.napster.com) that allow people to swap songs online could be shut down in short order. (See the sidebar "The Long Arm of the (Copyright) Law" for an analysis of the legal issues involved.)

This seemingly innocent act of trading music online has sparked a remarkable controversy that has pitted fans against bands, artists against the recording industry, and the recording industry against an Internet start-up. Yet if this trend continues, it's likely to change the way artists and their representatives make money and how you lay your hands on everything from music to software to movies.

The Way We Were

Most people still get their hands on music the old-fashioned way—by trooping down to their local retailer and buying it. Web-savvy folks might purchase CDs online, but it's fundamentally the same concept—paying for the right to use tangible media. But a number of factors are conspiring to change this model.

Means to an End The first, and most notorious, factor is programs such as Napster and Gnutella (<http://gnutella.wego.com>)—programs that allow you to download MP3 files from other people's hard drives without paying a penny to the artist or entertainment industry. (See the illustration "Serving It Up" to see how it all works.) With a Napster client such as Macster (or the Mac-compatible Furi client for Gnutella) and a broadband Internet connection, Mac users can download an album's worth of MP3 files in less than an hour. This leads us to the second factor: high-speed Internet access.

Fast Enough for You Downloading a file of a few megabytes used to take hours. With broadband connections such as DSL and cable modem—featuring download rates more than ten times faster than those of 56-Kbps modems—becoming more commonplace, however, you can now download multimegabyte media files in just minutes.

Cut Down to Size But even with high-speed Internet access, the trend to download large digital media files would be stymied without file compression. MP3, the most widespread audio-compression technology today (see "MP3 to Go," February 2000), allows you to compact a 3-minute, 31MB audio file into a 3MB song while maintaining a high level of quality.

Holding On Although the recording industry would likely be loath to admit it, its reluctance to embrace online access to the material it controls plays a significant part in this digital drama. Even though most people would agree that artists and their representatives should be compensated for their work, many feel, for example, that there has to be a better way to obtain one song than paying as much as \$18 to purchase an entire album on CD—prices which, according to the FTC, are artificially inflated. Were music more easily obtained online—and at a lower price—people might be more motivated to pay for content instead of pirating it.

While the ways, means, and motive are in place, they have

The Long Arm of the (Copyright) Law

THE WEB-SITE NOTICES GO SOMETHING LIKE THIS: "We respect copyright law and expect our users to do the same. You agree you will not use our service to infringe intellectual property rights of others." The chance that the average Web user knows whether she's infringing someone's copyright, however, is another story—it's a complex balancing act, especially when a site leads her directly to copyrighted work to download.

What Is Copyright, Anyway? The federal Copyright Act is the primary copyright law in the United States. Under most circumstances, copyright owners—the musicians or songwriters who created something or the record companies and music publishers that bought the rights from them—may prevent others from copying, distributing, and displaying or performing (playing) their work for the public. (See "Stay on the Right Side of Copyright Laws" elsewhere in this issue.)

What does this mean to you? When you download music or offer your MP3 files for others to copy over the Internet (through Napster, for example), you're copying and distributing *songs* (owned by the writers or music publishers) and *sound recordings* (owned by the record companies)—that's two copyrighted works for each recording. If you don't have permission from the true copyright owners, you're probably breaking the law. If they want to come after you, start counting your money—legal fees and damages could cost you more than \$150,000. (Most penalties are civil and not criminal, so there's not much fear of being thrown in jail.)

Watch Your Step In general, you'll be safe downloading from a site that owns the music—such as a record company's or musicians' site that offers only their own recordings—or buying from big online retailers such as Amazon and CDNow. When sites or services such as Napster offer other artists' music, be wary.

Although sharing music with friends is considered to be personal use and is legal, sharing it with the public through big file-

swapping sites means you're probably infringing copyright. If you draw attention to yourself by sharing thousands of files, copyright owners may come after you. You leave digital fingerprints on the Internet, namely IP and e-mail addresses, and your actions can be traced. But so far, the representatives of copyright holders, such as the RIAA, have targeted the people who *make* the tools that let you swap MP3s, rather than the people who *use* those tools.

Fair Game There are a few legal routes for online service providers such as search engines and portal sites to take. Most avoid prosecution from copyright infringement under the provisions of the Digital Millennium Copyright Act of 1998 (DMCA).

Online service providers are allowed, by this law, to refer or link users to copyrighted work or simply store it for users (such as hosting Web sites with MP3 files), among other things—as long as they meet certain conditions. They can do so—and this is

critical—without fear of copyright infringement.

The DMCA generally defines online service providers as those who provide online services or Internet access. But to protect themselves from lawsuits, they have to follow rules such as terminating accounts of subscribers who are repeat copyright infringers.

Avoid Temptation Those who enjoy the challenge of coming up with new technology to get around online copyright protections should be careful. The DMCA prohibits anyone, including service providers, from interfering with the technology used to identify or protect copyrighted works (digital watermarks, for example).

What does this mean for Napster and similar technologies that may come later? Their future is uncertain, but if people continue developing technologies and learn to work with copyright owners, the Internet will offer more quality music that costs much less than traditional CDs. Now that's innovation. —SUSAN P. BUTLER



Is It Legal? Most of the music available via Napster is illegally posted. But some bands (such as Phish, used in this example) allow fans to record their concerts and trade those recordings freely. This still doesn't make their albums fair game, however. Here's a quick look at what can be legal and illegal in a single Macster search.

Live-album track
(not legal to download)

Live-concert track
(legal to download)

"Bootleg" track
(legal to download)

Studio-album track
(not legal to download)

Name	Size	Bit Rate	Length	User	Line Speed
Phish (Live) - FreeBird.mp3	3.5 MB	128 kbps	3:50 minutes	17rixie	Unknown
Phish - (Lawn Boy) 09 - Bouncing Around The Room.mp3	3.6 MB	128 kbps	3:57 minutes	schillspeare	T1
Phish - (Slip Stich and Pass) 08 - Hello My Baby.mp3	1.2 MB	128 kbps	1:24 minutes	kilm9999	Unknown
Phish - 02 - You Enjoy Myself.mp3	12.2 MB	174 kbps	9:41 minutes	brainy7765	DSL
Phish - 05 Moms Dance.mp3	11.8 MB	128 kbps	12:45 minutes	paulds316	Unknown
Phish - 1997-08-11 -- set1 (03) Water In The Sky.mp3	4.7 MB	160 kbps	4:06 minutes	nickholton	Cable
Phish - Bouncin Round The Room.mp3	3.7 MB	128 kbps	4:08 minutes	Cecilia20	Cable
Phish - Brian and Robert (Live) 8-9-98.mp3	3.5 MB	128 kbps	3:51 minutes	nickholton	Cable
Phish - Cities (Bootleg).mp3	9.5 MB	128 kbps	10:17 minutes	BladeDanger	Cable
Phish - Down with Disease.mp3	3.7 MB	128 kbps	4:07 minutes	MJMAHONEY	Cable
Phish - Farmhouse - Heavy Things.mp3	6.9 MB	256 kbps	3:48 minutes	absolutpds	Unknown



point

LARS ULRICH, DRUMMER FOR METALLICA, IS AGAINST NAPSTER

(See www.macworld.com/2000/05/12/metallica.html for the complete interview.)

Q. What made you file suit against Napster? **A.** This Napster thing came completely out of nowhere. We were recording a song for the *Mission: Impossible 2* soundtrack, and we got word that there were five or six versions, works in progress, playing on radio stations—and we weren't even finished with it. We found out our song was being traded on Napster, and we had to put our foot down. The Internet in general is not the issue; the issue is who dictates what goes on with your work.

Q. Do you think the Internet is a realistic way for new bands to get known? **A.** There's only so much attention each band could get on the Internet. The role of a record company is to promote and publicize one band over another.

If somebody in a garage down the street from me wants to make their music available over the Internet, that's their choice.

Q. In your suit, you've asked for huge financial compensation from Napster. Has Napster really had any effect on your bottom line? **A.** We've sold about a thousand gazillion records and we're glad that we're set for life. The stuff that's being lost on the Internet, it's pocket change—it's meaningless. But where is it going to be in five years? This is something that could really be out of control.

We're paying more money to our lawyer—\$500 an hour—than we're losing on the Internet. If people think this is about greed, then they should think again.

Q. What do you think of the bands—Limp Bizkit, the Offspring, Public Enemy—that have come out in favor of Napster? **A.** If they're saying, "Napster's my friend," I think they're shortsighted and they're ignorant to the big, big picture. I



think they will find themselves on the short end when the tide starts turning. They're trying to make this Metallica versus the fans. But it's really Metallica versus Napster.

Q. Even if you take out Napster, there's Gnutella and plenty of other sites that are hopping on the free-music bandwagon. What difference is your suit really going to make? **A.** If you can knock a provider out of business, then you can send a message to the others. Somebody is spending a lot of money hoping Napster will be an IPO or will be bought out by AOL. The people who work for Napster are bringing home paychecks—they aren't working for free.

If free-music providers can get with the legislative community, I'm sure something can be worked out that would be OK for everyone. I think Congress will be holding big hearings that will make the 6 o'clock news—and there'll be this f****r from Metallica telling these Internet companies what they should do.

little to do with the furor surrounding this subject. We know the technology works, but what we haven't agreed on is whether using it is legal or morally justifiable—and if there's some middle ground that will satisfy everyone involved.

Whipping Post

Currently, Napster Inc., based in San Mateo, California, is the lightning rod for this controversy. Although an outfit called MP3.com was the first to be taken to court for allegedly storing MP3 files illegally on its servers, Napster has generated the bulk of the press. Here's why:

It's in the Way That You Use It As we stated, Napster created software that allowed people with a Napster client program—Macster is one of the most popular for the Mac—to download MP3s from another person's hard drive. (See the sidebar "How Napster Works: The Pirate's Toolbox" for more information.) You do this by launching the program, signing up for a free account, searching for an artist or song title by name—

then downloading files that match your search. PC users can designate a folder on their drive for MP3 files they want to share—they just drop the MP3s into the folder and identify the location of the folder on the hard drive. The Mac software currently available doesn't allow users to share their files—although Napster says it's working on Mac software that will let you share files as well as play MP3s from within the program.

When someone shares files on his or her drive, the Napster client sends a list of those files to Napster's central server. That list is incorporated into a huge database of song titles and artists—no actual MP3 files are stored on the server, just a directory of the MP3 files that Napster users are offering for download.

You Can't Always Get What You Want

This process may sound innocent enough, but Napster's popularity has put a few burrs under the saddles of two groups—those who maintain computer networks at colleges and universities and representatives of the music industry.

CHUCK D, FRONT MAN FOR PUBLIC ENEMY, SUPPORTS NAPSTER

(See www.macworld.com/2000/05/12/chuckd.html for the complete interview.)

Q. Tell me why you support Napster. **A.** Napster's the radio of the 21st century. I just think it develops a whole new paradigm, and there's no legitimate proof it cuts into the traditional market for music. The industry has always prided itself on driving on the enthusiasm of the audience. Now they're having to fight against the enthusiasm of the audience.

Q. What do you think of Metallica and the other big acts that have filed suit against Napster? **A.** Metallica shouldn't be getting into that lawyer or accountant mentality. I think most of the people who download Metallica music online are fans who are also buying their music in the stores.

Q. How is free music on the Web going to change the music business? **A.** You're going to see the global distribution of music, which is something the music industry promised but never could deliver. I think you're going to see people sell-

ing music for a lot cheaper—and not a certain set price for music. Downloadable music is the biggest musical phenomenon since the Beatles, and the music industry is slow to come to grips with that.

You have more music on the outside of the industry than on the inside, so fans will find a lot more music. There will be more money in the pot than ever before and there will be millions of hands in it. Artists are going to have to work a lot harder and not expect things to fall in their laps. Fat and happy rock 'n' rollers are only a select few who are supported by the four major labels, and the power of those four hands will be diluted by the power of a lot more hands.

Q. Do you have any problem with a company like Napster making money off your music and not giving you a cut? **A.** I don't have any problem with that. I've signed with major labels and I haven't had any control over the money. At least this way, I know I can take advantage of the exposure.

Q. If everyone's giving your music away, how are you going to survive as an artist? **A.** There's a multibillion-dollar market for rap around the planet. I set up five major concert tours on the Web in the last two years. The day of the lazy artist is over, and I know how to make out. I have five studios. I have interests, so this all works out for me.



counterpoint



Campus Life Napster is extremely popular among people who tend to listen to lots of music and have access to high-bandwidth network connections—namely, college students. Because a large number of these students use Napster and transfer huge files back and forth across the Internet via campus networks, these networks can become clogged by an activity that some school administration officials maintain is recreational—and therefore unnecessary. For this reason, Napster has been banned on some college campuses.

Battle of the Bands Unlike files on MP3 Web sites such as the Internet Underground Music Archive (www.iuma.com), which carries files from artists who want their music downloaded, the majority of files found via Napster are pirated—commercial songs that have been posted in violation of copyright laws.

While some artists, such as Limp Bizkit, the Offspring, Public Enemy's Chuck D (see our interview with Chuck D elsewhere in this feature), and many independent bands, support having their music freely distributed, others—and the music industry

at large—don't. For example, Metallica filed suit against Yale and Indiana University, in addition to Napster, alleging copyright infringement and racketeering. Once Yale and Indiana University banned Napster, the institutions were dropped from the lawsuit. (See our interview with Metallica's Lars Ulrich.)

The members of Metallica were concerned enough about the alleged music piracy that they tracked down more than 300,000 users who had posted or copied their music, and provided those names to Napster along with the demand that Napster discontinue these users' accounts.

The Recording Industry Association of America (RIAA) (www.riaa.com), an industry group that represents major record labels, also filed suit against Napster. As we went to press, a judge had decided not to dismiss the lawsuit against Napster, leaving open the possibility of a trial.

Although Napster claims it has no control over the files that users make available—the software displays a request that you post only legal MP3 files when you first install the client—the

Metallica and RIAA suits maintain that because Napster retains a database of those MP3 files found on computers running Napster clients, the company knows that audio files are being pirated and is facilitating that piracy. Naturally, Napster disagrees.

Who Are You? How does this affect you? It might put Napster out of business, and if you're a devoted Napster user, this is certainly sad news. But Metallica's actions could bring the controversy closer to home. The fact that Metallica was able to obtain the screen names of these users should concern those who post and download files on Napster. Should the recording industry wish to get personal and go after individuals—and you engage in this kind of file trading—it's possible that you'll be taken to task for your actions.

It's All Too Much Napster isn't the RIAA's only target. MP3.com offers a service called My.MP3.com that allows you to listen to any music you own over the Internet from any computer. To register as the owner of a particular audio CD, you simply sign on to MP3.com and insert the CD in your computer's CD-ROM or DVD-ROM drive. The RIAA sued MP3.com, and in April, a U.S. District Court judge ruled that MP3.com violated copyright law with this action. At press time, MP3.com had removed all songs owned by the five largest record distributors in the United States.

Regardless of how specific legal issues are resolved—or whether Napster will have ceased to exist by the time you read these words—the battle over sharing files on the Internet has just begun. Though Napster and My.MP3.com, with their centralized servers, may be vulnerable to prosecution, those seeking to shut down Internet file sharing are likely to have a harder time targeting peer-to-peer technologies such as Gnutella.

The Direct Route Unlike Napster, Gnutella allows users to share files between individual computers without going through a central server. Instead, when a Gnutella user performs a search, the Gnutella software, rather than querying a database held on a central server, directly polls computers on a Gnutella network and returns a list of accessible files. Users then select the files they want, initiate a download request, and the files are transferred directly from one computer to another.

With no company hosting a central server, groups like the RIAA will have to target users who offer pirated music or software, rather than a specific company that facilitates that piracy. Obviously there are far too many people sharing these kinds of files to sue them all, but the RIAA may choose to make an example of large-scale pirates.

It Takes All Kinds . . . of Media Particularly troublesome to the entertainment and software industries is that unlike Napster, Gnutella also supports a variety of media formats, meaning that people can transfer not only music files but also video, pictures, and software. Users with enough bandwidth, patience, and hard-drive space will be able to download the latest feature films and copies of Microsoft Office—without paying for them.

Fixing a Hole

While prosecution of those who pirate copyrighted material may be a short-term solution, preventive measures may make Internet file sharing irrelevant. Specifically, the music industry is looking at ways to protect media—both online and in physical form—so that it cannot be copied.

DVD Is Not Free A company called Macrovision (www.macrovision.com), for example, has created a copy-protection scheme for DVD-Video—if you try to copy a DVD to VHS tape or a computer's hard drive, the video signal is scrambled, making the video unwatchable. This comes after the discovery that DeCCS, a utility originally intended to allow Linux users to view DVD movies, was being used to copy movies onto hard drives.

Such schemes, however, wouldn't work without some cooperation among entertainment and technology companies, and that cooperation came in the form of the Secure Digital Music Initiative—a coordinated effort by the entertainment and technology industries to copy-protect media. But the plan doesn't stop with just CDs, DVDs, and other digital recording media. Companies are working on ways to protect online media from being pirated as well.

Controlled Distribution Liquid Audio (www.liquidaudio.com) has created its own system for controlling online distribution of music. A song encoded with the company's Liquifier Pro software is encrypted in such a way that only the authorized listener can play it. Also, the software embeds an inaudible digital watermark into each song, allowing ownership tracking.

In-Store Appearance This isn't to say that the music industry is relying only on copy protection. There's already a move to plant music kiosks in record stores—places where you can burn music files onto your



own CDs or download MP3 files to portable players such as Diamond Multimedia's (www.riohome.com) Rio 500. While this makes buying exactly the music you want easier, it doesn't address the fact that it's far more convenient to download music and media from the Web than to hop in your car to visit the local record mart. Napster and Gnutella have demonstrated that there's a huge demand for online access to media; it's now up to the recording industry to determine how to provide this kind of service while still making a profit. (Some record labels have announced plans to make albums and singles available for purchase and download online, at least on a trial basis.)

The Last Word

Where will this all lead? Moving copyrighted files across the Internet is both easy to do and easy to get away with—but it won't be for long. Though the RIAA and Metallica aren't likely to start getting people who download an MP3 or two tossed into the pokey, they will take steps other than prosecution to protect their rights and work. This means that stricter copy-protection schemes will be introduced in the near future. Yet this too is a short-term solution; though copy-protection measures will surely reduce piracy, savvy people will find a way to skirt them. With this in mind, the entertainment industry must eventually bow to the realities of this new wired world, shift its current distribution model, and seek alternative means of compensation—with actions such as advertising on online distribution centers, offering “bonus” material that can be purchased only online, and streaming “pay to play” content on demand. **m**

When not engaged in journalistic pursuits, Contributing Editor CHRISTOPHER BREEN is a musician in the San Francisco Bay Area.

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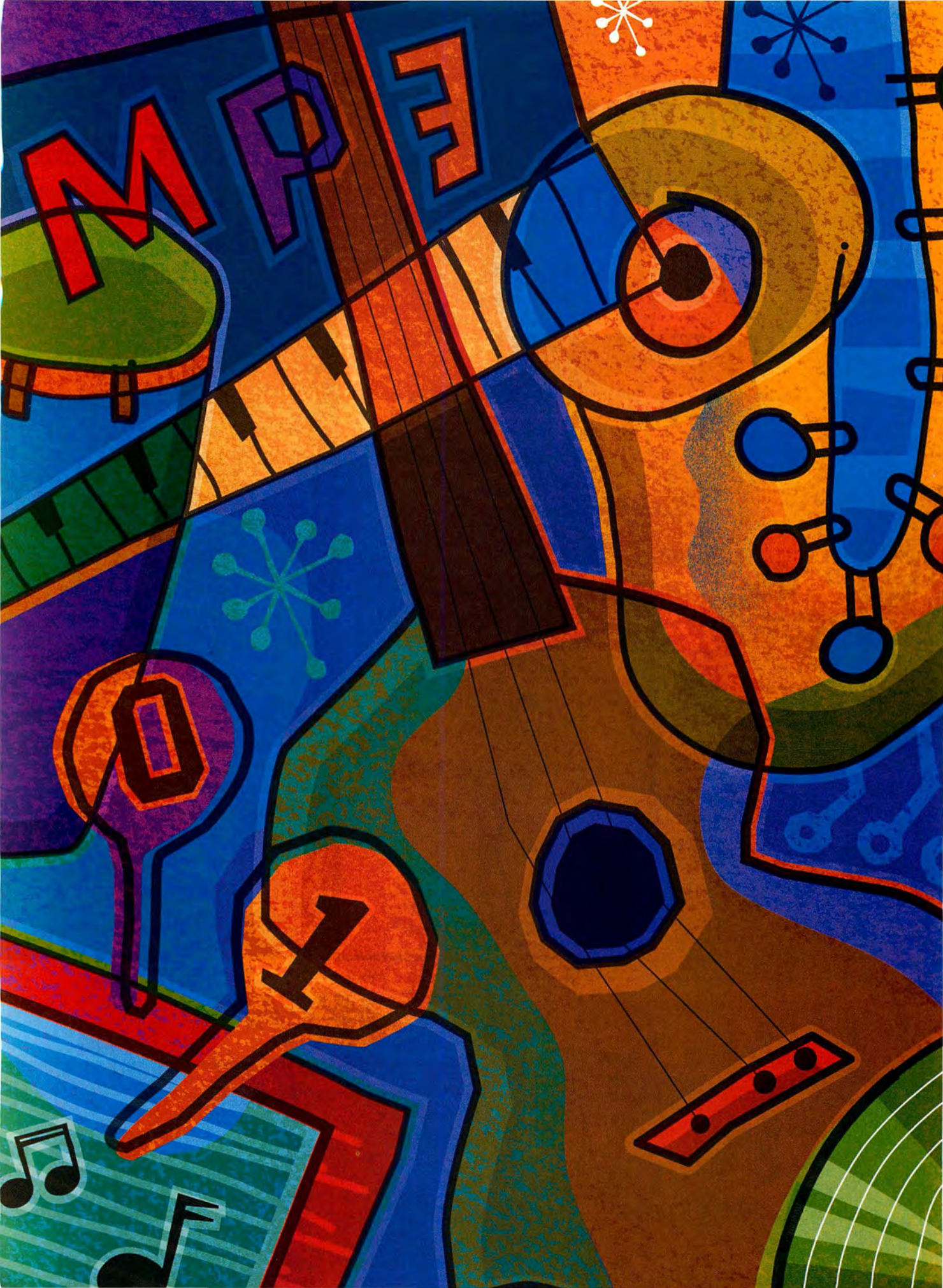
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ILLUSTRATIONS BY JEFFREY PELO

MAKE ■ SOME NOISE

Turn Your Mac into a Recording Studio (WITHOUT GOING BROKE)

You're finishing up a song and tapping your feet as volume meters dance in tempo with the beat. Reaching over to the mixing console, you tweak the volume levels of the piano track. That's better. You rewind your multitrack recording deck, press the record button, and add a few chords from an '80s-vintage analog synthesizer. Nice. Now there's just one more thing: you patch in a reverberation-effects unit to give the vocal that rich concert-hall sound. Perfect. You're ready to burn a CD and encode your efforts as MP3 files to post on the Web.

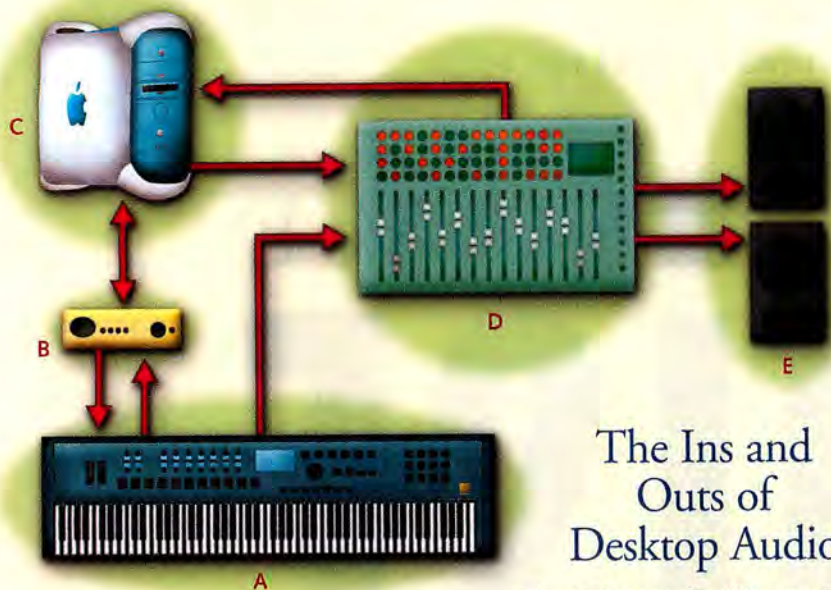
Think you're in the control room of a million-dollar recording studio? No—you're sitting in front of your trusty Mac.

The volume meters and mixing console

are on screen, and you're turning knobs and pressing buttons with your mouse. The multitrack deck and vintage synthesizer are actually pieces of software, and so is the reverb-effects unit. In fact, aside from a music keyboard, a special musical interface, and a pair of speakers, everything in this setup is a piece of software. Welcome to the virtual recording studio.

Outfitting even a modest studio used to mean spending thousands of dollars for recording decks, effects processors, music synthesizers, and other hardware devices. But thanks to the fast processor in the Power Mac G3 and G4, these days the Mac itself can handle most of what once required dedicated hardware. With

BY JIM HEID



The Ins and Outs of Desktop Audio

The MIDI controller (A)—usually a pianolike keyboard, but guitar, wind, and drum controllers also exist—transmits and receives note data through MIDI I/O jacks, connected to the MIDI interface (B). This connects to your Mac (C), usually via the USB port (see “Music in the Key of USB,” March 2000). You can attach the MIDI controller’s audio output to the audio input of a mixer (D), which allows you to turn multiple audio inputs (vocals, MIDI, instruments) into one or two outputs. To hear and record what you are creating, connect the mixer back to the Mac’s mike jack and the Mac’s speaker jack to one of the mixer’s inputs. Then connect the mixer to speakers, a stereo system, or a pair of monitors designed for close-range audio work (E).

the latest audio software, it’s easier and less expensive than ever to set up a professional-quality home recording studio—or to add versatile, economical audio tools to your existing pro studio.

To find the best music-production tools, I spent several noisy weeks testing more than a dozen software packages. I also created some MP3 audio files to help you hear the best features in action. (Go to www.macworld.com/samples.html to hear my musical creations.)

So Happy Together

A virtual recording studio has many of the same components as a traditional studio, but it runs within the Mac’s friendly confines. Here’s what you’ll need to turn your Mac into a high-tech studio.

Jump in Line A *sequencer* program, the most essential component of the virtual studio, turns the Mac into a multi-track recording deck. You can build complex arrangements by recording new tracks while existing ones play back. You can also use editing features to fix flubbed notes, transpose keys, and much more.

Sequencers offer huge advantages over conventional tape recording, starting with undo features no razor blade can approach. You also have instantaneous access to any point in a recording—no rewind or fast-forward delays.

Best of all, sequencers provide *non-destructive* processing: they don’t permanently apply your edits and effects to the audio tracks you’ve recorded unless that’s what you want. Nondestructive editing gives you infinite freedom to experiment with sounds and effects, and it’s made possible by the speed of today’s computers.

Sound Off But a sequencer is nothing without sounds. With *software synthesizers*, the Mac can mimic anything from a vintage analog synthesizer to a grand piano to a cello. You generally play a software synth using an external music keyboard plugged into the Mac via some variety of MIDI (Musical Instrument Digital Interface) hardware device for connecting electronic musical instruments to each other and to computers (see the illustration “The Ins and Outs of Desktop Audio”). Do you *have* to own a MIDI key-

board? No, you can create music by entering notes manually in a sequencer program. But it isn’t exactly efficient—more akin to typing a letter via hunt-and-peck with the mouse and the Mac’s Key Caps instead of simply using your keyboard.

Some software synthesizers are designed for creating dance and rhythm *loops*—repeating series of bass and drum lines. These programs can help you create infectious dance grooves that would make even Alan Greenspan get up and shake that thang.

Software synths are a great way to expand your studio’s sound palette. They cost hundreds or even thousands of dollars less than hardware synthesizers, and if you have a PowerBook or an iBook, they’re a lot more portable.

Cause and Effect Once you have your sounds, *effects plug-ins* let you add audio effects such as auditorium-like reverberation. These software effects are comparable in quality to those of dedicated effects hardware, which can be much more expensive. Effects plug-ins work within your sequencer program, and—as I’ll explain shortly—several different plug-in formats exist. Your choice of a sequencer may very well depend on the plug-ins you want to use.

All You Need Is . . .

Handling huge audio files, generating real-time effects, and simultaneously communicating with external MIDI gear demands a fast computer with a fast hard drive and plenty of RAM. Still, you don’t have to break (or even rob) the bank to set up a desktop recording studio.

Power Inside An iMac will take you a long way, and even an elderly 604-based Power Mac will run the sequencers I tested. But if you’re planning to use software synthesizers and real-time effects plug-ins, you’ll want a G3 or better with at least 128MB of memory. That’s because software synths can gobble up 50MB or more of RAM when you have lots of sounds installed. I used a 400MHz blue-and-white G3 with 128MB of RAM for my testing.

I also used Mac OS 8.6 because Apple was still tweaking Mac OS 9 to address some audio-related issues. The company was resolving these problems as I finished this article, but they underscore two important points: first, verify compatibility with your Mac model and system software before buying any audio software;

second, avoid updating the system software until you're sure your audio tools will run with the latest Mac OS.

Also, if my experience was any indication, getting a system to work properly can be a challenge. You'll download update patches frequently as vendors release bug fixes. You'll also become pals with the Mac's Extension Manager control panel, because audio programs can bicker with one another and with other software. This is the bleeding edge, and hemorrhages happen.

Room to Grow You'll also need plenty of hard drive space, because CD-quality stereo files gobble about 10MB per minute. The hard drives that ship in today's iMacs and G4s are big and fast enough to record and play back several simultaneous audio tracks. But the more tracks you want to play at a time, the faster the hard drive you need. That's because each track is stored as a separate file, and playing back multiple tracks requires the hard drive to access each of those files in real time. Some audio professionals use a second, high-speed SCSI drive to store audio tracks (although an additional fast IDE drive would also do the trick), keeping their programs and System Folder on the Mac's built-in hard drive. In either case, optimizing your drive (or drives) regularly will result in quicker access to your tracks.

Radio Radio All Power Macs are capable of stereo recording and playback, so to actually *hear* your efforts, all you need is a set of amplified speakers or some headphones. But for recording, an inexpensive *mixer*—a device that takes multiple audio inputs and merges them into one or two audio outputs—will greatly streamline your audio connections by providing multiple jacks into which you can plug microphones and instruments (see “The Ins and Outs of Desktop Audio”). You can also invest in third-party hardware that improves on the Mac's built-in sound circuitry (see the sidebar “Beyond Miniplugs: Audio Hardware Options”).

Savvy Sequencers

I tested three popular audio/MIDI sequencers: Emagic's \$799 Logic Audio Platinum 4.1, Mark of the Unicorn's \$795 Digital Performer 2.7, and Steinberg's \$799 Cubase VST/24 4.1. (For more information on all the software I tested, see the table “Magical Musical Software.”) There's a fourth powerhouse sequencer—Opcode Systems' \$100 Stu-

dio Vision Pro—but its future remains hazy as Opcode rides out a rough transition to new ownership, and its customers meanwhile endure poor technical support and a dearth of upgrades. Studio Vision Pro is a fine program, but I won't recommend it until the company's future comes into sharper focus. (If you're new to music on the Mac, check out Christopher Breen's roundup of inexpensive sequencers, such as Steinberg's Cubasis and Mark of the Unicorn's FreeStyle, at www.macworld.com/sequencers.html.)

Which sequencer is best? Forests fall and battles rage over that question. The easy answer: they're all awesome. But because all three have very similar features and include some effects plug-ins, I based my choice on how the sequencer works. Digital Performer's elegant look-and-feel makes it my favorite; Mark of the Unicorn has sweated the design details to create a program that looks beautiful and is a pleasure to use (see “Auditioning Sequencers”). Even Digital Performer's manuals and online help are superior—by contrast, Cubase doesn't come with any printed material other than a “Getting Started” manual.

Plug Me In The third-party effects

plug-ins and software synthesizers you want to run may influence your choice of a sequencer. Cubase, Logic Audio, and Studio Vision Pro support VST (Virtual Studio Technology), a standard developed by Steinberg. Digital Performer doesn't support VST; instead, it provides its own standard, called MAS (MOTU Audio System).

Third-party VST plug-ins outnumber MAS plug-ins, but most major developers now support both standards, and many also support the plug-in formats high-end audio hardware such as Digidesign's Pro Tools use. What's more, two available MAS plug-ins let you run VST plug-ins within Digital Performer: AudioEase's \$30 VST Wrapper for MAS 1.01 and Cycling74's \$74 Pluggo 2.0.8. My experience with both was mixed—I was able to run many VST effects within Digital Performer, but VST software synthesizers sometimes misbehaved or required workarounds.

Bottom line: don't count on a VST adapter, particularly for software synthesizers. Even though Digital Performer's design and interface are superior, you may prefer Logic Audio or Cubase if your projects demand a VST-format plug-in.



Auditioning Sequencers Mark of the Unicorn's Digital Performer provides a complete environment for recording, editing, and mixing both audio and MIDI tracks. The Transport window (A) offers tape deck-style functions; the Performance window (B) shows how much CPU capacity you're using; the Markers

window (C) lets you set markers for fast access to specific portions of tunes; the Tracks window (D) helps you create MIDI and audio tracks, assign instruments, and manage tracks; the Audio Waveform window (E) lets you edit audio tracks; and the Mixing Board (F) allows adjustment of tracks with sliders and knobs.

Plucky Plug-Ins

Effects plug-ins, which tap into a sequencer to modify the sound of the audio tracks you record or import, are usually sold in bundles of about four to six effects. You'll now find software equivalents for all mainstream hardware effects devices, including reverb for adding room reverberation; compressors

and limiters, which add punch to vocal tracks; equalizers for boosting or lowering certain frequencies; and flangers and phase shifters, used to add rich, swirling textures to instrumental tracks.

Smooth Sounds You can also find offbeat plug-ins that don't necessarily have parallels in the hardware world. Waves' MondoMod (part of the \$450

Pro-FX Plus bundle) creates stereo effects ranging from a gentle vibrato to a rotating Leslie speaker to a 45-rpm record played off-center. And AudioEase's \$199 Rocket Science Bundle 1.0.2 includes both Roger, a plug-in that adds speechlike vowel sounds to audio tracks, and Orbit, which lets you move sound within a three-dimensional space. Then

MAGICAL MUSICAL SOFTWARE

Company	Product	Mouse Rating	List Price	Contact	Free Trial Version	Comments
SEQUENCERS						
Emagic	Logic Audio Platinum 4.1	★★★★	\$799	530/477-1051, www.emagic.de	○	Powerful but difficult to learn; very good bundled effects.
Mark of the Unicorn	Digital Performer 2.7	★★★★½	\$795	617/576-2760, www.motu.com	○	Best mix of power and ease of use; doesn't support VST plug-ins.
Steinberg	Cubase VST/24 4.1	★★★★	\$799	818/678-5100, www.steinberg.net	●	Powerful but cumbersome; best VST compatibility; no printed manuals.
SOFTWARE SYNTHESIZERS						
BitHeadz	Unity DS-1 2.0	★★★★½	\$449	831/465-9898, www.bitheadz.com	●	Ambitious software sampler with many expansion sounds available.
	Retro AS-1 2.0.1	★★½	\$259		●	Powerful analog-synth simulator; tested version was finicky.
Koblo	Stella9000 2.5	★★★★	\$189*	[45] 87 30 14 30, www.koblo.com		Rich sound; extremely flexible design; cool and simple user interface.
Native Instruments	Dynamo 1.0	★★★★	\$199	800/665-0030, www.nativeinstruments.com	●	25 rich-sounding software synths in a single package.
Steinberg	Model-E 1.0	★★★★	\$199	818/678-5100, www.steinberg.net	○	Rich retro sounds and a great interface; supports VST plug-ins only.
	Pro-Five 1.0	★★★★	\$199**		●	Amazing re-creation of the vintage Prophet 5 analog synth; supports VST plug-ins only.
	ReBirth RB-338 2.0.1	★★★★	\$199***		●	Best bass-and-drum rhythm machine; works with all major sequencers.
EFFECTS PLUG-INS						
Arboretum	Ionizer 1.3	★★★★	\$499	800/700-7390, www.arboretum.com	●	Excellent noise reduction and equalization.
AudioEase	Rocket Science Bundle 1.0.2	★★★★½	\$199	[31] 30 24 33 606, www.audioease.com	●	Three fun, offbeat plug-ins; for MAS only.
	VST Wrapper for MAS 1.01	★★★	\$30		●	Economical way to run VST plug-ins under MAS, but Pluggo gives better results.
Cycling74	Pluggo 2.0.8	★★★★	\$74	415/621-5743, www.cycling74.com	●	A winner with 74 great plug-ins; can run VST plug-ins under MAS.
DUY Research	DUY Everpack 1.2	★★★★½	\$499	[34] 932 174 510, www.duy.com	●	High-quality reverb; tube simulator adds warmth, especially to vocals.
TCIWorks	TCINative Bundle 2.0	★★★★½	\$499	805/373-1828, www.tcworks.de	●	Superb reverb, equalization, compression, and more.
Waves	Native Power Pack	★★★★½	\$500	800/264-0109, www.waves.com	●	A classic plug-in bundle with great reverb, compression, and equalization.
	Native Power Pack II	★★★★	\$500		●	Warm, analog-like equalization and compression; MaxxBass adds bass emphasis.
	Pro-FX Plus	★★★★	\$450		●	Turns solo vocals into multipart harmonies, adds rich chorusing effects, and more.

● = yes, ○ = no. *Also available as part of the \$460 Studio9000 bundle, which includes several additional software synths. **Also available from the developer, Native Instruments.

***Also available from the developer, Propellerhead Software (www.propellerhead.com), for \$179.

there's the amazing Pluggo, which creates everything from reverb to robotic speech. Its low price belies its quality and usefulness—it's got something for just about any project, and its ability to run VST plug-ins within Digital Performer (albeit imperfectly) is a bonus.

As I've previously mentioned, all the sequencers come with some plug-ins that provide basic reverb, compression, and other sound-processing functions. But in terms of audio quality, these bundled plug-ins fall short of the third-party effects I tested. If you're after the best possible sound quality, check out the \$499 TC|Native Bundle 2.0, from TC|Works, or the \$500 Native Power Pack, from Waves. I'm partial to the TC|Native Bundle's interface, but both products provide superb reverb effects, powerful equalization plug-ins (which enable you to adjust specific frequency ranges—to boost bass and high frequencies, for example), and more.

Almost all of the plug-ins I tested are available in downloadable trial versions, so you can audition them yourself to find out how they work with your tunes.

Snappy Synthesizers

If you're like most musicians, you're always on the prowl for new sounds—and software synthesizers deliver them. Instead of paying \$1,000 or more for additional keyboards or sound modules (sound-producing circuitry you can attach to MIDI keyboards), for a few hundred dollars you can get a more flexible instrument. Once you've installed a software synthesizer, its name appears in your sequencer alongside your actual MIDI instruments, and you play it using the keys on your MIDI keyboard (see "MIDI Magic"). When everything is purring, it's easy to forget that some of your instruments are actually just programs running on a Mac.

Dramatic Pause Alas, everything doesn't always purr. A software synthesizer can bring an otherwise fast Mac to its knees. One potential problem is *latency*—noticeable delays between when you press a key and when you actually hear its note. Generating high-quality sounds in real time is a processor-intensive job requiring almost as many calculations as Bill Gates's home-improvement spreadsheet. Slower, pre-G3 Macs are particularly vulnerable to latency, but even a G3 can suffer from it

if you're running effects plug-ins at the same time (or are otherwise overtaxing the system).

And just as system extensions can bicker, software synthesizers (generally running as plug-ins within sequencers) can also conflict with one another or with other plug-ins, requiring you to pull one or more plug-ins from the sequencer's plug-ins folder until your sequencer runs smoothly.

Old-time Sound

I loved every software synthesizer I tested, so picking winners wasn't easy. But Kablo's \$189

Stella9000 2.5, which combines rich retro sounds with an easy-to-use interface, is hard to beat. Visit Kablo's site to download the free Vibra1000; it does only one note at a time (no chords), but gives you an idea of what a good synthesizer has to offer.

Dance to the Music If dance music is your specialty, check out Propellerhead Software's \$199 ReBirth RB-338 2.0.1. Distributed by Steinberg, ReBirth faithfully re-creates the sounds of Roland's revered but long-discontinued TB-303 Bass Line bass synthesizer and TR-808 Rhythm Composer drum machine (see "Boot Up and Get Down"). ReBirth is great for creating addictive dance beats that you can trigger from a sequencer or export to audio files for importing into a sampler or sequencer.

Sample Me Another noteworthy program is BitHeadz' \$449 Unity DS-1



Boot Up and Get Down Popular among musicians who create dance music, Propellerhead Software's ReBirth digitally re-creates two classic drum and bass synthesizers from Roland Corporation. In one cool-looking window, you get two TB-303 bass synthesizers (A and B), a TR-808 drum machine (C), and a TR-909 drum machine (D). You make dance tunes by creating note and rhythm patterns and then switching between them using the Pattern buttons along the left edge of the window, simultaneously twiddling each section's knobs to change the sound's characteristics.

2.0. Technically speaking, this is a software *sampler* (that is, rather than synthesizing sound, it plays back recorded samples). You can expand its palette by sampling your own sounds or buying sample libraries such as BitHeadz' \$199 Black & Whites, which adds dozens of great piano and electric-piano samples (see *Reviews*, July 2000). BitHeadz also makes a software synthesizer, the \$259 Retro AS-1 2.0.1.

During my testing, BitHeadz released major updates to Unity DS-1 and Retro AS-1—alas, both had problems. I had trouble getting them to run reliably, particularly with Digital Performer, and if the message headers on the BitHeadz e-mail discussion list are any indication, I'm not alone. If you're interested in these very promising programs, you might want to download the trial versions to see if they behave with your system.



MIDI Magic Software synth Pro-Five 1.0, a Native Instruments product distributed by Steinberg, re-creates the Sequential Circuits Prophet 5, a classic analog synthesizer popular in '70s and '80s music. Like the orig-

inal, Pro-Five provides two tone-generating oscillators (A) and a filter section (B), which modifies the synth's sound with harmonics and resonant sounds. And you can change sounds by twiddling its knobs.

BEYOND MINIPLUGS AUDIO HARDWARE OPTIONS

EVEN THOUGH THE MAC'S BUILT-IN AUDIO CIRCUITRY

sounds great, for audio professionals it falls short. For starters, it's limited to a maximum sampling rate of 44.1kHz and a sampling resolution of 16 bits. (*Sampling rate* refers to how many digital "snapshots" of a sound a device takes per second; generally, the higher the sampling rate, the better the ability to capture high-frequency sounds. *Sampling resolution* refers to how many bits describe each sample—more bits per sample result in a more accurate representation of the original sound.)

The 44.1kHz, 16-bit standard for compact discs sounds excellent. But to get the very best quality, pro-level audio gear typically uses a sampling rate of at least 48kHz and a sampling resolution of 24 bits.

Another limitation of the Mac is that it lacks digital audio inputs and outputs. To get your final efforts out of a Mac and onto digital audiotape (DAT) for subsequent mastering—the final process of preparing audio tracks for mass duplication—you'll need to connect your Mac's speaker jack to the DAT recorder's audio-input jacks. This forces your music through additional digital-to-analog and analog-to-digital conversions, which introduce very small (but perceptible) amounts of distortion. To prevent this degradation, it's always better to keep an audio signal in the digital domain when transferring it between devices.

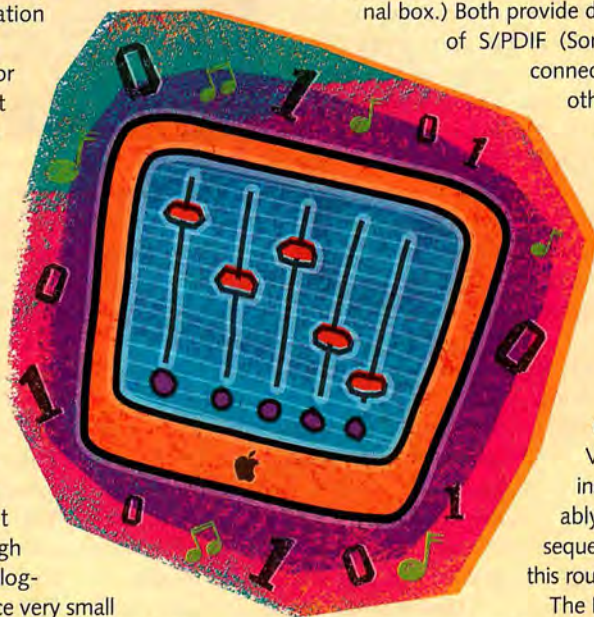
The Hardware Way Although audio hardware that overcomes these limitations has been available for years, it has tended to be expensive. No longer. I tested two sub-\$1,000 products: the \$995 Digi 001, from Digidesign (800/333-2137, www.digi001.com), and the \$849 SoloEX, from SeaSound (415/485-3900,

www.seasound.com). Both offer pro-quality sound, have multiple audio inputs (eliminating the need for an external mixer), and act as MIDI interfaces.

Each of these products consists of a PCI expansion card that provides higher-quality audio circuitry than the Mac's, and an external box for connecting music keyboards, microphones, and other noisemaking devices. (PCI-only digital sound cards cost less, but you'll lose most of the connections you'd get with the external box.) Both provide digital inputs and outputs in the form of S/PDIF (Sony/Philips Digital Interface Format) connectors, common on DAT recorders and other digital gear.

Both also include software. The Digi 001 comes with Pro Tools LE, a scaled-down version of the Pro Tools software that accompanies Digidesign's high-end computer audio gear. Like the sequencers I tested, Pro Tools LE provides MIDI and digital audio recording, playback, and editing. The SoloEX includes Steinberg's Cubasis, a "lite" version of Cubase VST that doesn't support effects plugins or software synthesizers. You'll probably want to invest in one of the sequencers reviewed here if you're going this route.

The Digi 001 and SoloEX are terrific products, packing features that not long ago cost a lot more. The SoloEX has the edge, though, because its hardware is more flexible, providing inputs for musical instruments such as electric guitars and basses. (To use these with the Digi 001, you must connect a separate preamplifier.) The SoloEX's breakout box is also packed with knobs for adjusting levels, and it sports a large volume meter. By comparison, the Digi 001's box is much more spartan.



Macworld's Buying Advice

All these products are good, pro-strength tools. My top picks are Mark of the Unicorn's Digital Performer, a powerful, easy-to-use sequencer; TC|Works' TC|Native Bundle and Waves' Native Power Pack for great mainstream effects; Cycling74's Pluggo for unique effects and great value; and the Stella9000 and ReBirth RB-338 software synthesizers from Koblo and Propellerhead, respectively.

So what's ahead for desktop audio? More capabilities, for starters. As processor speeds continue to climb, look for increasingly versatile software synthesizers and effects plug-ins. BitHeadz has already

added support for the G4's Velocity Engine to boost to 128 the number of simultaneous voices in its Retro AS-1 and Unity DS-1.

Also look for the Internet to play a larger role in music production. Rocket Network (www.rocketnetwork.com) is setting up Internet recording studios—virtual studios where musicians can collaborate remotely. No, you won't jam in real time with musicians worldwide. Rather, Rocket Network's servers keep track of a project's MIDI sequences and audio files; when you sign in to a virtual studio, your copy of the project updates to the latest version. The Cubase VST and Logic Audio sequencers already support the service.

The best thing about the new generation of audio software is that it's for everybody. If you're a newbie, these tools can open new doors to creative expression, making it possible to realize the music you hear in your head—or at least have fun trying. And professional musicians and audio engineers will love these economical alternatives to expensive studio gear—and studio time. **m**

Contributing Editor JIM HEID (www.heidsite.com) grew up in his father's recording studio. He's been using and writing about Mac sound tools since the first MacRecorder appeared in 1985 and has produced audio for CDs, CD-ROMs, FM radio, and the Web.

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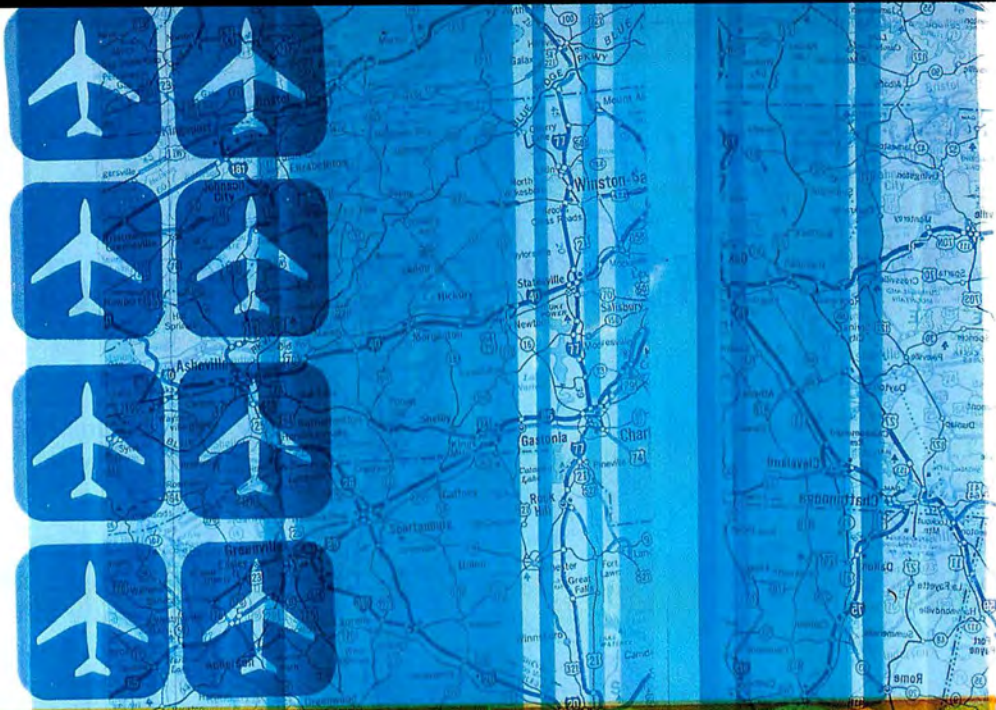
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→ Travel freely between the Mac and Windows worlds with our cross-platform guide.

YOUR **PC** PASSPORT

GONE ARE THE DARK DAYS when Windows' forays into Mac territory seemed unstoppable. Apple has reclaimed its strongholds and attracted new populations, but the sheer prevalence of Windows-based PCs means you'll probably need to cross the border occasionally. An important client may require Windows files, or Dad, a longtime PC user, may not be able to open the e-mail you send him. It could be that the software you need doesn't run on Macs, so you have to emulate a PC. And when emulation isn't enough and you must buy a PC, you can at least save money and desk space by sharing your Mac peripherals with the other system.

THIS GUIDE GIVES YOU the essential tools and strategies to thrive in today's cross-platform world. For the products we examine in depth, you'll find contact information in the table "Cross-Platform Travel Kit," while quick mentions of related products include price and contact details.

by **ADAM C. ENGST**

● Photographs by NOLA LOPEZ

Convert That File

THE REPORT IS DUE TOMORROW, and you need the text from Bob in the branch office. But when Bob, who has Windows, sends the report as an e-mail attachment, you realize you're facing a long night. The file has a blank icon,

double-clicking on it does nothing, and none of your programs recognize the format. When you send back the attachment, Bob says he can open and read it, so the problem isn't file corruption. How can you bridge this inability to communicate before your deadline hits?

Not Your Type One communication gap between platforms is caused by differences in how the operating systems identify file types and originating

companies that produce cross-platform versions of their software. Microsoft, Adobe, Quark, and Macromedia all use the same file formats for the Mac and Windows versions of most of their products.

These cross-platform applications handle files from the other platform best when the versions are roughly comparable. For example, try to open an Adobe PageMaker 5 for Windows file in PageMaker 6 for Mac, and you're out of luck. But you can usually open a Microsoft Word 98 for Windows file in Word 98 for Mac. Fonts may cause cross-platform problems, but that's a separate issue. (For more on font differences, see the online sidebar "Font of Wisdom" at www.macworld.com/2000/08/features.)

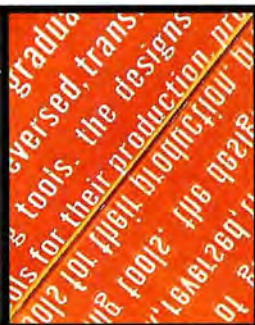
Employ a Translator When you can't use a cross-platform application, rely instead on translators. Most productivity applications, including AppleWorks and Nisus Writer, can both save and open documents in a variety of common formats. If you want to send your accountant an AppleWorks spreadsheet, use Save As within AppleWorks and choose a format your accountant can likely open, such as Microsoft Excel 4.0. Just beware that this lowest-common-denominator approach may not retain some version-specific features of your documents.

If you need to convert files for Windows users frequently, or if the translators built into your application don't cut the mustard, get a copy of DataViz's MacLinkPlus Deluxe 11 (\$100), which offers bidirectional translation of a wide variety of file formats. The Document Converter feature is ideal when you need to convert a batch of files simultaneously. It often does a better job than built-in translators with some specialized features, such as styles in word processing documents.

Generic Formats Sometimes full cross-platform

TIP

Windows can't identify files without three-character extensions. Add extensions manually or use AKA, from Miramar Systems.



applications. Windows files require three- or four-character extensions at the end of file names to provide this information—for example, .doc for Microsoft Word documents. (For more information, see the sidebar "File Typecasting.")

All programs involved in transferring files between Macs and PCs rely on an extension-mapping database that says, for instance, any Mac file of type TEXT should have a .txt extension in Windows. You can simplify the process by adding the appropriate file-name extensions yourself (see the File Exchange control panel for a list).

If you need to share a large number of files that lack extensions and your transfer utility won't add them, check out Miramar Systems' \$20 AKA utility. Despite its clumsy port from Windows, AKA batch-processes entire folders full of files at once, adding extensions and replacing any characters that are illegal in Windows names (such as question marks and commas).

Cross-Platform Applications The simplest approach to bridging the language gap between Macs and Windows is to stick with major applications from

File Typecasting

TO GAIN A BETTER UNDERSTANDING of why you may run into file conversion problems across platforms, take a look at the different ways the Mac and Windows operating systems identify file types and originating applications.

Windows files need three-letter extensions at the end of file names to identify both the file type and the originating application. The .doc extension tells the Windows OS that the file is a Microsoft Word document.



The Mac interface buries the file type and creator information in the file as two four-letter codes. The type code identifies the expenses file as TEXT. The creator code links it to an application—in this case, Microsoft Word.



operability isn't a requirement. For example, when you're designing a company's business cards, your clients don't need to open your Adobe Illustrator or Macromedia Freehand files and manipulate them—they want only to see what the design looks like. In cases such as this, try formats most applications can view regardless of platform.

Everyone with a Web browser can view GIF and JPEG images, and most programs can save in or export these formats. When you need higher resolutions than GIFs and JPEGs can provide, Adobe Acrobat's Portable Document Format (PDF) is a good choice. A PDF file preserves the typefaces, graphics, and layout of the original file. Anyone on a

Mac or a PC can view or print out (but not modify) PDF files with the free Acrobat Reader.

There are several ways to create PDF files. Some applications have built-in PDF export. Adobe also provides a Web-based PDF converter (<http://cpdf1.adobe.com>) that allows three free conversions. James Walker's \$20 shareware PrintToPDF printer driver (www.jwwalker.com/pages/pdf.html) handles less-complex documents. For the full range of creation and modification features, you'll need the \$249 Adobe Acrobat package (www.adobe.com/products/acrobat, 888/724-4508). The package includes Distiller, Capture, and Catalog, in addition to Acrobat.

Transfer That File

AFTER CONVERTING FILES, the next task is to get them across the platform border. There are a variety of ways to move files around the office and the world, and which one makes the most sense depends on your individual situation.

Follow our examples and see which option best matches your needs.

Use the Internet You're a freelance writer, churning out articles for any magazine that will pay. You could send your work on disks, but that's slow, and overnight delivery gets expensive. The best approach for individuals working on their own is to transfer files via the Internet, mostly through e-mail. (FTP is another inexpensive solution for transfer-

(also called MIME) format. If that doesn't work, switch to Base64, then to UUencode. If the recipient uses America Online, stick with Base64. Attachment format settings are in your e-mail program's outgoing message windows or Preferences menu.

- When attachments from Windows users get mangled in transmission, ask the sender to try the MIME format, then UUencode.

- To send multiple files, compress them in a single archive. If you create StuffIt archives, the Mac standard, make sure your recipient has the free Aladdin Expander for Windows (www.aladdinsys.com, 831/761-6200). You can also create Zip archives, the standard in Windows, using Aladdin's \$20 shareware DropZip or Tom Brown's \$15 shareware ZipIt (www.maczipit.com).

- Download a free copy of Aladdin's StuffIt Expander to decode whatever compression or encoding format you receive. If you find even StuffIt Expander failing you on a regular basis, DataViz's MacLink Plus may be a better option.

Stick with Disks The Internet might be everywhere, but sometimes only disks will do. For example, your desktop publishing files may be so large that they'd take hours to transmit to a client for approval or to a service bureau for printing, so sending them on disk is your best option. Here, too, cross-platform problems can crop up.

Mac users can read and write data on disks formatted for Windows, so sending Mac files on Windows-formatted Zip and Jaz disks, SyQuest cartridges, and Orb disks is relatively trouble-free. However, recordable CDs can cause problems, even when you set them up in the cross-platform ISO 9660 format. Use file names longer than the creaky DOS standard of eight letters, then a dot, then three letters, and the CD-burning process may truncate those names and end up breaking links between files on the CD-R. If you've got the popular Toast app from Adaptec (\$89, www.adaptec.com, 800/442-7274), you can preserve your file names by choosing Allow Macintosh Names from the Settings menu.

A few people are turning to DVD-RAM disks

TIP

To avoid cross-platform e-mail problems, encode attachments using the AppleDouble format or Base64.



ring files over the Internet, but many people don't know how to use it effectively, and storing confidential files on a public FTP server can be problematic.)

Although you may find sending and receiving e-mail attachments a frustrating experience, you can eliminate most cross-platform problems by following these rules:

- Make sure that file names sport the appropriate Windows extensions.
- Encode attachments using the AppleDouble

Cross-Platform Travel Kit

Company	Product	Mouse Rating	List Price	Contact	OS Support
NETWORKING					
Apple Computer	AppleShare IP 6.3.1—Windows file sharing (10 clients)	★★★★½	\$510	408/996-1010 www.apple.com	Mac
Microsoft	Windows 2000 Server Services for Macintosh (5 clients)	★★★★	\$999	425/882-8080 www.microsoft.com	Windows 2000
	Windows NT 4.0 Server Services for Macintosh (5 clients)	★★★★	\$809	425/882-8080 www.microsoft.com	Windows NT
Miramar Systems	PC MacLAN for Windows 95/98 7.2 (1 user)	★★★★½	\$199	800/862-2526 www.miramarsys.com	Windows 95/98
	PC MacLAN for Windows NT/2000 8.0 (1 user)	★★★★½	\$199	800/862-2526 www.miramarsys.com	Windows NT/2000
Thursby Software Systems	Dave 2.5.1 (1 user)	★★★★½	\$149	817/478-5070 www.thursby.com	Mac
	TSSTalk for Windows 95/98 1.0 (1 user)	★★★	\$149	817/478-5070 www.thursby.com	Windows 95/98
	TSSTalk for Windows NT 1.0 (1 user)	★★½	\$169	817/478-5070 www.thursby.com	Windows NT
REMOTE CONTROL					
AT&T Research Laboratories Cambridge	VNC 3.3.3	★★★★	Free	44 1223 343000 www.uk.research.att.com	Mac, Windows 95/98/NT/2000
Netopia	Timbuktu Pro 2000 (twin-pack)	★★★★	\$190	510/814-5100 www.netopia.com	Mac, Windows 95/98/NT/2000
FILE CONVERSION UTILITIES					
DataViz	Conversions Plus 5.0 (1 user)	★★★★	\$100	203/268-0030 www.dataviz.com	Windows 95/98/NT/2000
	MacLink Plus Deluxe 11	★★★★	\$100	203/268-0030 www.dataviz.com	Mac
Miramar Systems	AKA 1.0	★★★★½	\$20	800/862-2526 www.miramarsys.com	Mac
DISK UTILITIES					
Apple Computer	File Exchange (in Mac OS 9)	N/A**	N/A**	408/996-1010 www.apple.com	Mac
DataViz	MacOpener 2000	★★★★½	\$60	203/268-0030 www.dataviz.com	Windows 95/98/NT/2000
Mediafour	MacDrive 2000	★★★★½	\$60	515/225-7409 www.mediafour.com	Windows 95/98/NT/2000
PC EMULATION					
Connectix	Virtual PC 3.0 with Windows 98	★★★★	\$179	650/571-5100 www.connectix.com	Windows 98
	Virtual PC 3.0 with Windows 2000	★★★★½	\$329	650/571-5100 www.connectix.com	Windows 2000
FWB	SoftWindows 98 5.1 with Windows 98	★★★★½	\$159	415/345-4300 www.fwb.com	Windows 98

* First word refers to server, second to client. ** N/A = not applicable. **Editors' Choice** appears in red.

for the heftiest jobs. Just make sure to format DVD-RAM disks using the cross-platform Universal Disk Format to reduce compatibility issues.

When PC users need to read and write to your Macintosh-formatted disks, tell them about MacDrive 2000, from Mediafour, or MacOpener 2000, from DataViz. Both cost \$60, handle almost any type of Macintosh disk, and map Macintosh file types and creators to Windows file-name extensions on-the-fly,

so the extensions disappear when you view the disks on a Mac again. MacDrive gets our nod because it supports copying Mac disks, extracting Mac files from MacBinary and BinHex encoded files, creating MacBinary files, and viewing the contents of Mac files' resource forks.

Lone Mac in a PC Network You land a great job with a Windows-based company that agrees to let you use your beloved Mac. Or maybe your company

Lets Macs Access Windows Volumes/Printers	Lets Windows Access Mac Volumes/Printers	Maintains Resource Forks
No/No	Yes/No	No
Yes/Yes	No/No	Yes
Yes/Yes	No/No	Yes
Yes/Yes	Yes/Yes	Yes/No*
Yes/Yes	Yes/Yes	Yes/No*
Yes/Yes	Yes/Yes	No/Yes*
No/No	Yes/Yes	No
No/No	Yes/Yes	No
No/No	No/No	N/A**
Yes/No	Yes/No	No
N/A**	N/A**	N/A**
N/A**	N/A**	N/A**
N/A**	N/A**	N/A**
N/A**	N/A**	Yes
N/A**	N/A**	Yes
N/A**	N/A**	Yes
N/A**	N/A**	N/A**
N/A**	N/A**	N/A**
N/A**	N/A**	N/A**

converts from Mac to Windows, with only your Mac left. You must share files with your Windows coworkers, and in most modern workplaces that means an Ethernet network. The trick is creating a setup that lets your Mac talk with all those PCs.

Two options make the most sense when you have one or two Macs hiding in a Windows-based network: the Services for Macintosh functions that come with Microsoft's Windows NT 4.0 Server (\$809) and

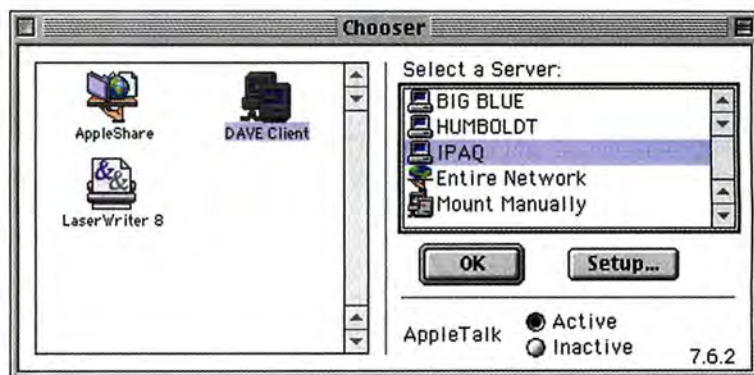
Windows 2000 Server (\$999), and Dave 2.5.1 (\$149), from Thursby Software Systems.

Choosing between these options is simple. If you already have Windows NT 4.0 Server or Windows 2000 Server running on your network, you can easily activate Services for Macintosh, which provides AppleShare services over AppleTalk or, for better performance, TCP/IP. For installation instructions, see the online sidebar "Install Services for the Macintosh" at www.macworld.com/2000/08/features.

But when that's not feasible, Dave is your best bet. This stealth solution lets a Mac masquerade as a PC network client, and it doesn't require putting more software on the server, so it's less likely to alienate potentially Mac-hostile network administrators.

Once you've installed Dave on a Mac (you don't need to make changes on any PC), the Macintosh can see shared resources on PCs, including folders and printers. You can create desktop printers for PC PostScript printers, make aliases to shared PC fold-

Dave in the Chooser
When running Dave, you access PC-shared resources through the Dave Client in the Chooser; this option isn't available in the Network Browser.



ers, and generally work with PC resources as though a Mac were hosting them. In addition, you can use the Dave Sharing control panel to give PC users access to shared folders and printers on your Mac. The main negatives are that you must access PC resources through the Dave client in the Chooser rather than through the Network Browser (see the screen shot "Dave in the Chooser"), and the PC terminology and protocols can prove confusing.

Both Dave and Services for Macintosh allow you to copy Macintosh files with resource forks, such as applications and fonts, to a PC and back again with no data loss.

Lone PC in a Mac Network You may find yourself in the opposite situation, where you need to integrate a PC in an otherwise all-Mac office. Both Dave and Windows 2000 Server enable file sharing (as an internal FTP server would), but you don't have to outfit multiple Macs with Dave or install and administer a dedicated Windows 2000 server for such minimal needs. Instead, look to the \$149 TSSTalk 1.0, from Thursby Software Systems; the \$199 PC Mac-LAN 7.2 or 8.0, from Miramar Systems; the \$510 AppleShare IP 6.3.1, from Apple; or the \$159 Timbuku Pro 2000, from Netopia.

TSSTalk (previously known as COPSTalk)

offers the most basic way to share files and printers with Macs, since it lets a Windows machine use Network Neighborhood to connect to your existing AppleShare servers and printers. Moreover, it doesn't allow Macs to access the PC running TSSTalk. To avoid sluggish behavior when you're browsing the AppleTalk zone, map shared folders to drive letters. Some caveats: at press time TSSTalk didn't work with Windows 2000, you can't use the Windows 95/98 version of TSSTalk with Symantec's Norton AntiVirus, and the program comes with a sparse extension-mapping database.

PC MacLAN 7.2 (Windows 95/98) and 8.0 (Windows NT/2000) are basically Dave in reverse. Enabling a PC to act as an AppleTalk network client, they also include their own file and print server that allows networked Macs to access files on the PC and its printers. PC MacLAN's directory listings are more readable than TSSTalk's and AppleShare IP's.

PC MacLAN's file server essentially ignores the built-in Windows interfaces for creating users and sharing folders. Its interface fits better into the mindset of most Macintosh users. Since its file server is a full-fledged AppleTalk-based AppleShare server, shared folders appear in the Mac's Network Browser. Thanks to its file and print server, PC MacLAN has significantly more power than both TSSTalk versions for only \$30 to \$50 more.

AppleShare IP starts at around \$500, so it's probably overkill if all you need is file sharing with a lone PC on a Macintosh network. But when you already have AppleShare IP or need enough of its full set of services (a print server and servers for FTP, the Web, and Internet e-mail) to warrant the purchase, you'll find setting up file access for a Windows PC simple—just check the Enable Windows File Sharing (SMB) check box in the Win-

dows tab when configuring file sharing, and make sure you have a shared folder and a user who can access that folder.

Netopia's Timbuktu Pro (which includes Timbuktu Pro 5.2 for the Mac and Timbuktu Pro 2000 for Windows) is primarily known as remote-control software—it lets you view and operate the PC in a window on your Mac—but it also sports speedy file-transfer capabilities. On the minus side, Timbuktu Pro doesn't offer printer sharing of any sort. Thanks to a clumsy interface for transferring



files (see the screen shot "Timbuktu Pro File Transfer Window"), Timbuktu Pro makes sense only if you need remote control and don't care much about printer sharing.

With the exception of PC MacLAN's file server, when you transfer files from a Mac to a PC, all four of these products copy *only* the Mac files' data fork, which stores the guts of most documents. That's seldom an issue with documents, but the process can actually destroy applications, along with other files that rely on their resource forks, such as fonts.

Timbuktu Pro File-Transfer Window

Timbuktu Pro's interface for transferring files between Macs and PCs is reminiscent of the clunky Font/DA Mover in the old Mac OS, but it lets you drag and drop into the window's two panes.

Run Windows on Your Mac

SOMETIMES YOU RUN INTO a cross-platform problem when you need to access capabilities that are unique to one platform or the other. For example, imagine you're in the construction business and you need to run a particular

Windows-only program for making project estimates. Everything else in your office is Mac-based—how can you add this single application to your workflow inexpensively?

You can choose one of several paths. Compatibility cards, which graft most of the guts of a PC into your Mac, were once an option, but rumor has it that the last remaining vendor, OrangeMicro, has recently discontinued them. Software emulators, a

less powerful alternative, use your Mac's memory and hard drive to simulate Windows so you can run Windows applications. Or you can buy a cheap PC, stuff it in a closet, and use remote-control software to direct it from your Mac.

Fake It Good Evaluating PC emulation programs is tricky, since they're most likely used with custom software that serves a specific task, and custom programs often act flaky even on real PCs. That said, here are our overall impressions of and insights into which programs work most smoothly on the Mac. (See the benchmark, "Testing the Boundaries," for performance numbers.)

We give the nod to Connectix's Virtual PC 3.0 (\$179 with Windows 98 and a whopping \$329 with Windows 2000), which offers the tightest integration with Mac OS. You can share Macintosh folders with the PC environment by dragging them to a Folders button on the Virtual PC window border, and in a unique and elegant twist, you can also copy files back

Testing the Boundaries

Best results in red. Reference systems in italics. All results are in seconds.

	Install Office 2000	Wordpad Scroll	File Transfer	File Copy
Connectix Virtual PC v3.0.3a with Windows 2000	631	32	322	93
Connectix Virtual PC v3.0.3a with Windows 98	293	50	356	95
SoftWindows 98 v5.1	310	36	315	81
Windows PC with Windows 2000	241	31	211	101
Windows PC with Windows 98	241	23	312	212

Shorter bars are better.

Behind Our Tests

We installed Windows 98 Second Edition and Windows 2000 on the test machines. The PC was a 366MHz Celeron with 64MB of RAM. The emulators tested was a Power Macintosh G3/400 with 128MB of RAM and Mac OS 9 installed.—Macworld Lab testing supervised by Jeff K. Millstead

and forth with a simple drag-and-drop move. Copying and pasting works transparently between Windows and Mac OS as well. Notable in the latest release of Virtual PC is support for a number of USB devices within Windows 98. And in the most recent minor update (3.0.3), Connectix added support for the Velocity Engine in the G4 chip, which might improve performance in certain situations.

Another software emulator, FWB's \$159 SoftWindows 98, offers most of the same folder-sharing and copy-and-paste Macintosh integration features. You can also easily copy images from the Windows environment to the Mac. In our testing, SoftWindows continually encouraged switching the monitor to 256 colors and proved somewhat clumasier to configure and use.

For serious use of any software emulator, we recommend a fast G3- or G4-based Mac with at least 96MB of physical RAM and 600MB of free hard-disk space.

Puppet PCs If your Mac lacks the oomph to emulate Windows at a reasonable speed, or your custom program simply doesn't run well in an emulator, you can couple an inexpensive PC with remote-control software, such as Netopia's Timbuktu Pro or VNC, from AT&T Research Laboratories Cambridge. This combination lets you view the PC in a window on your Macintosh (see "Control Windows from Afar"). Even if you don't share hardware between the machines (see "Sharing Hardware," else-

where in this feature), you'll still need a separate PC monitor, keyboard, and mouse—just in case. For example, if your PC runs into trouble, you might need to run ScanDisk on it before the remote-control software can take over. However, you can use cheap devices and stash the PC itself out of the way.

Netopia constantly improves Timbuktu Pro, for years the premier cross-platform remote-control software. You can transfer files back and forth, move the contents of the Clipboard between computers,

TIP

Need to run the occasional Windows application on your Mac? Connectix's Virtual PC 3.0 integrates tightly with Macintosh Operating System.



Control Windows from Afar When you need a PC but don't want it in your main work area, you can stash it away and use remote-control software to view the PC in a window on your Macintosh.

and save the remote desktop as a PICT file or actions on the remote desktop as a QuickTime movie.

On the downside, the jerky remote-control performance can make even a hopped-up PC feel slightly sluggish. Display quirks aren't uncommon, though few make the PC screen unreadable.

The free VNC fails to match up to Timbuktu Pro in many ways. It's more complex to configure, offers just remote-control and observation features (no file-transfer, chat, intercom, or screen-capture capabilities), and the Macintosh version seems like a perennial beta release. However, it's usable and free.

For yet another take on running Windows applications from afar, check out Java-based Personable.com (www.personable.com). Pay a monthly fee, and you can access a virtual Windows 2000 desktop within Internet Explorer 4.0 and higher. The available programs are limited, and system performance may take a hit over a slower Internet connection. But if Personable.com polishes its service and offers more applications, it might become a useful way to avoid buying either a PC or emulation software.



Sharing Hardware

YOU CAN SHARE QUITE A BIT OF HARDWARE between Macs and Windows computers these days, either swapping devices from one machine to another or connecting devices to multiple computers simultaneously via switch boxes.

Printers You've got a perfectly good LaserWriter for your Mac—why bother buying a new printer just for a PC? Very little about a printer is platform-specific, other than its interface—how it connects to the computer—and the driver it requires. Most high-end laser printers rely on PostScript (and therefore work with standard drivers included in both Mac and Windows) and are accessible via Ethernet.

TIP

You can find Mac drivers for many printers that shipped with only a Windows driver at www.infowave.com.



Sharing inexpensive ink-jet printers presents more of a challenge, since they generally require custom drivers and connect via serial (old-style Macintosh), parallel (old-style PC), or USB ports—or some combination thereof. To find Mac drivers for PC-based printers, check out Infowave's PowerPrint products (www.infowave.com, 800/463-6928).

Most products that share files between Macs and PCs on a network (including Dave, PC MacLAN, and TSSTalk) also share PostScript printers. Infowave offers PowerPrint for Networks, which comes with a small hardware print server. For low-end printers on computers not connected to a net-

Tale of Two Systems
Dr. Bott's MoniSwitch USB is handy when you're sharing your Mac's monitor, keyboard, and mouse with a PC box.



work, spend around \$50 on cables and a switch box from a company such as Belkin (www.belkin.com, 800/223-5546), and your Mac and PC can access the same device. Some printers with both a serial port for the Mac and a parallel port for the PC can detect incoming print jobs on both without a switch box.

Monitors When you don't need to look at the PC often, consider sharing a single monitor between it and your Mac to save money and a lot of desk space. As long as the monitor is multisync—that is, it can operate at a variety of resolutions—this should be easy. If you bought your Mac in the last several years, you may need an adapter for the two-row 15-pin connector some older monitors use. You can often get an adapter free from the monitor manufacturer if you call and request one. Most monitors today, along with current Macs, use a three-row, 15-pin, VGA-style connector—standard issue in the PC world.

You'll also need a monitor switch box, such as Dr. Bott's \$139 MoniSwitchUSB (www.drbot.com, 503/452-8101). It's more expensive than simple serial or USB switch boxes, but it lets two computers share a keyboard and mouse.

Keyboard and Mouse With Apple's adoption of USB in place of ADB for input devices, sharing keyboards and pointing devices has become easier, and it's a great way to avoid cluttering your desk, plus you can use your favorite Macintosh trackball. Most devices should work at a basic level in both directions, but using devices designed for Windows systems is a little trickier. For more information, see the online sidebar "Cross-Platform Input Devices" at www.macworld.com/2000/08/features.

Modems and Serial Devices As long as you're sharing devices to save money, why not share an external modem or Palm cradle too? To share either of these devices, you'll need appropriate serial cables for the Mac and the PC, plus a cheap switch box to eliminate annoying cable swapping. For modem sharing, you may also need drivers on the PC side or modem scripts on the Mac side—visit the modem manufacturer's tech-support site for details.

The situation is more confusing for other serial devices. Unlike Palm Computing's cradles for Palm handhelds, most PC devices don't have Macintosh versions of their software, even if you can connect a serial cable to them. When in doubt, contact the manufacturer for compatibility information.

The Last Word Thanks to Apple's robust health, Mac users no longer have to fear the wholesale invasion of Windows systems. Ever-improving software and standard cross-platform hardware and file formats such as USB and HTML make communication between the two platforms easier than ever. The iron curtain between Macs and Windows has opened. **m**

ADAM C. ENGST is the publisher of the e-mail newsletter *TidBits* and coauthor of the cross-platform translation dictionary *Crossing Platforms: A Macintosh/Windows Phrasebook* (O'Reilly & Associates, 1999).

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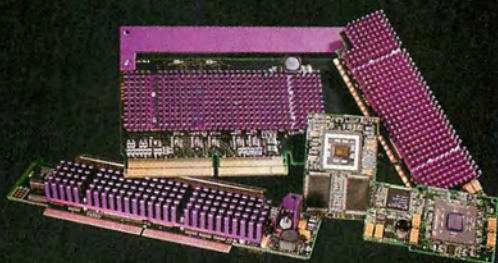
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July 19-21, Booth # 1707



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Secrets

Internet Explorer 5 Shortcuts

TIPS TO SPEED UP YOUR INTERNET SURFING

by Ted Landau

By definition, surfing the Web means never staying in one place for very long. The people behind Microsoft's Internet Explorer (IE) 5 clearly recognize that if you're not jumping from one page to the next, you're racing from one end of the page to the other. That's why IE 5 comes packed with an assortment of ways to make your Web navigation faster and more convenient.

Getting Around

Want to go directly to the bottom of a long Web page? Just press the ⌘ key and the down-arrow key, and you're there. If the page doesn't have a "back to the top" link, ⌘ and the up arrow take you right back.

For the ultimate in page navigation, press ⌘ and then click and hold down your mouse button. The cursor icon will turn into a hand. Now, as you move the mouse, the page goes up, down, or from side to side in sync with the cursor.

To move backward or forward through previously visited pages, press ⌘ in combination with the left- or right-arrow key. (Or you can use delete and shift-delete; they work the same way.) If you have several windows open, use IE 5's Cycle Through Windows command—⌘-tilde (~) is the shortcut—to bring the window you want to the front.

Climbing the Web Ladder

Suppose you have a long URL (such as [www.macgizmo.com/support/faqs/](http://www.macgizmo.com/support/faqs/problems/refunds.html)

[problems/refunds.html](http://www.macgizmo.com/support/faqs/problems/refunds.html)) in IE's Address box. The information you need isn't on this page, so you decide to move up a few levels in the Web site's hierarchy (to, say, www.macgizmo.com/support) in the hope that this page will contain a link to what you're seeking. With IE 5, you can quickly jump to a higher level without ever touching your mouse.

First, if it isn't already selected, press option-tab to highlight the URL in the Address box, and then press the right-arrow key once to bring your cursor to the end of the URL. Now, while holding down the control key, press the left arrow. Each time you do this, you'll

highlight another segment of the URL. When you've highlighted the portion you want to eradicate, press delete. Finally, press return and you'll be whisked to the selected page.

If you're willing to use your mouse, there's an even better alternative: press ⌘ and click on the title text in the header of any IE window. The result is similar to what happens when you do this with Finder windows—you'll get a pop-up menu that lists all the URLs for hierarchical levels back to the home page (see "Move On Up"). Select a URL from the list to go directly to that page.

continues





Move On Up Go directly to a higher level of a Web address by using Internet Explorer's Address bar pop-up menu.

Looking for Links?

Trying to find a particular link on a page filled with them? No problem. Just click anywhere on the page and start pressing the tab key, and IE will cycle through every link on the page. If a Web page consists of a form filled with text boxes, you can use option-tab to jump from box to box. The browser's Keyboard Accessibility Preferences setting lets you toggle between functions that use the tab key and those that use option-tab. (For the scoop on another new option in IE's Preferences, see "Make a New Resolution.")

Toolbar Tricks

You can keep a collection of your most frequently visited sites in IE's Favorites bar, located just below the Address bar. To add a site to the list, locate any text (on any Web page) that contains the desired link and drag the text to the

Favorites bar. To add the current URL in the Address box, drag the @ symbol to the left of the address. To rearrange the order of the links, just drag a URL where you want it to go. To delete an

item, control-click on it and select Delete from the contextual menu that appears.

The venerable Button bar (which displays icons or text links for actions such as Back, Forward, and Print) now lets you arrange and delete items. You can also add items here by selecting Customize Toolbars from the View menu.

If IE's Toolbars are taking up too much of your screen, you can hide them by selecting Collapse Toolbars from the View menu (or by pressing ⌘-B). With the Toolbars collapsed, you can still enter a URL in the Address box: simply press ⌘-L, and the box will reappear; press escape, and it's gone again.

Internet Explorer as Psychic

Start typing a URL in IE 5's Address box. As you type, the program generates a menu displaying Web addresses that match what you have typed thus far,

updated with each new letter you add. At any point, you can slide your cursor down the menu and select a URL; there's no need to finish typing it. (Internet Explorer 4.5 has a similar feature, but it just gives you its single best guess rather than a menu of them.) If for some reason this feature doesn't work, make sure you haven't disabled Address AutoComplete in Preferences.

Easier Pickings

Suppose you want to save just a paragraph of text from a Web page—for example, a single news item on a crowded page. With previous versions of Internet Explorer, your only options were to save the entire page or to copy and paste the selection. With IE 5, you can highlight the portion of text you want and drag it to the Finder's desktop. Faster and more convenient than copying and pasting, this method also saves the original formatting (font, style, size, and color). You can even drag a selection directly into another application such as AppleWorks to use in a document of your own. **m**

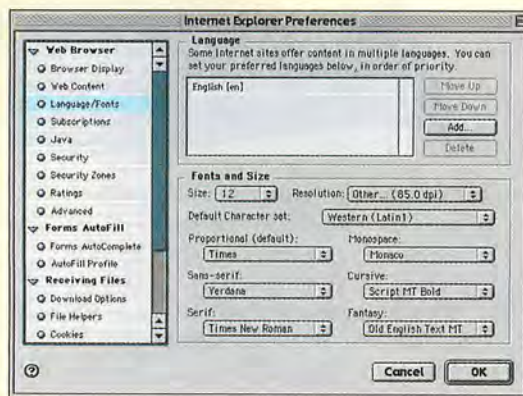
Contributing Editor TED LANDAU uses Internet Explorer 5 to navigate his MacFixIt Web site (www.macfixit.com).

Make a New Resolution

THE FONTS AND SIZE SECTION of Internet Explorer 5's Preferences dialog box contains another new feature that Mac users will appreciate. Figuring out exactly what the Resolution option does and why it's useful can be a bit tricky, though, so here's the scoop.

Many Web designers use **FONT FACE** tags to assign text size on a relative scale, indicated by numbers 1 through 7, with 3 being the default. Previous versions of IE for the Mac had a default of 12-point type, which meant that text specified by the designer as **FONT FACE=3** showed up in the user's browser as 12-point type by default. However, because the Windows browser default has been 16 point, Web-page type that looks fine on Windows displays may appear too small on Mac screens.

The default size for the Macintosh version of IE 5 is now also 16 point. You may like the larger default; if not, go to the Size



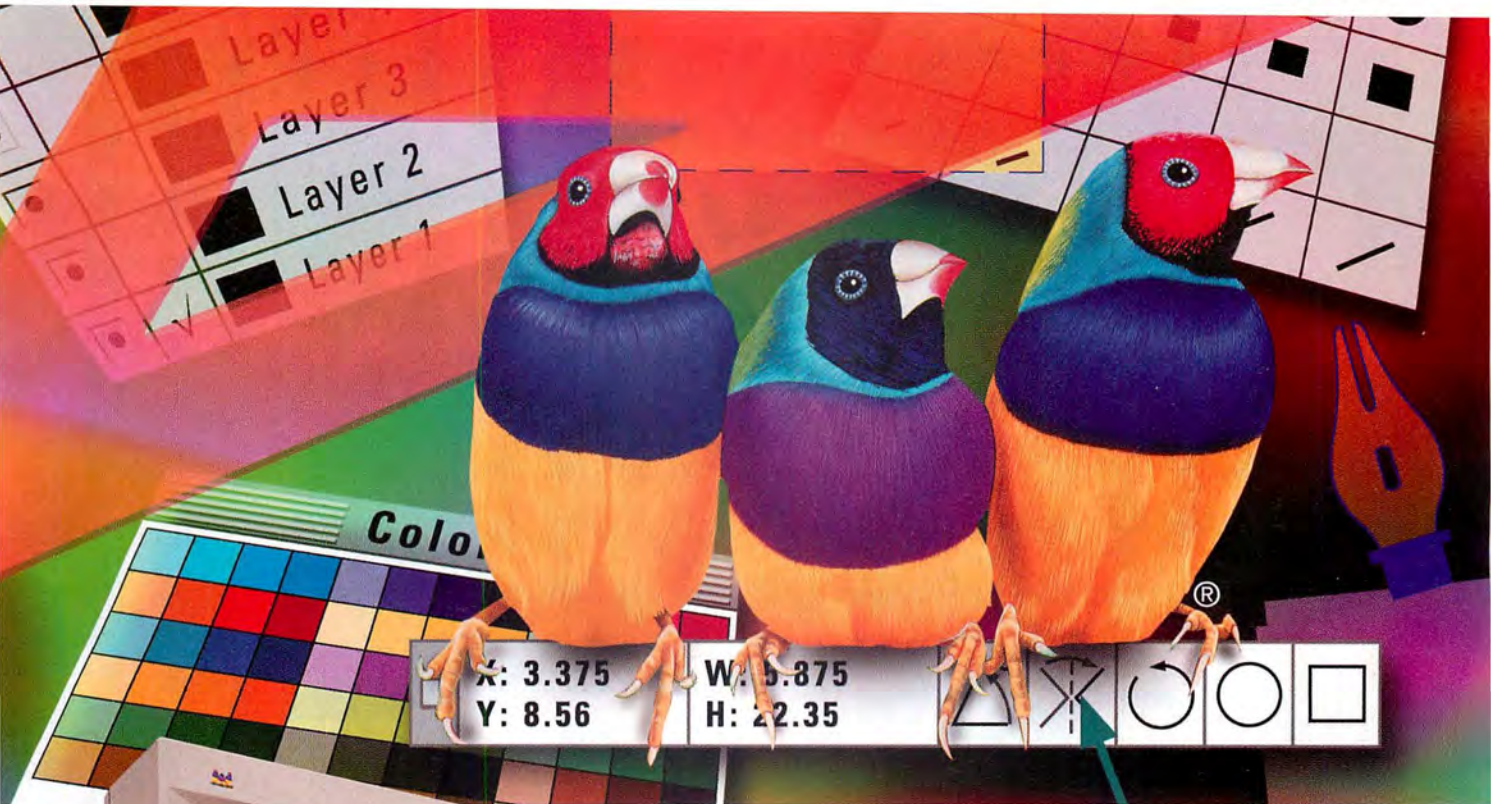
The Right Look Select the browser's default font size and resolution from IE 5's Fonts and Size Preferences.

pop-up menu in Preferences to change it. If you go back to the 12-point default but occasionally want to increase the type size of a Web page, you can do so without altering the Size setting in Preferences: just press ⌘-plus (+) for larger type or ⌘-minus (-) for smaller type.

For the best text appearance overall, Microsoft recommends setting Internet Explorer's Resolution option to match the resolution of your display. Most monitors today stray from the Mac's traditional 72 dpi—resolutions in the 80s are now common. Use the Resolution setting's

Other option to determine which resolution you should use; changing to the recommended setting should make the text size display as the Web designer intended. The setting will mainly affect text to which the designer has assigned an absolute rather than a relative font size.

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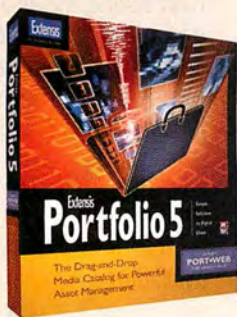
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Tips, Tricks, and Shortcuts

by Lon Poole

People complain that AirPort can't connect with America Online, but Paul Lorah of Lansdale, Pennsylvania, found an easy workaround. Simply get an ordinary dial-up PPP account with an ISP in your area, and connect your AirPort via this account. Set up AOL to connect through your ISP using TCP/IP instead of dialing an AOL access phone number. Offset the cost of the ISP account by signing up for AOL's Bring Your Own Access plan (AOL keyword BYOA), which costs only \$9.95, \$12 a month less than the regular plan. Using TCP/IP and BYOA also lets you get to AOL through a DSL or cable modem connected to an AirPort base station or your computer.

Speedier Disk Images

Q I like the idea of using self-mounting disk images in place of floppy disks and installation CDs (*Quick Tips*, April 2000), but how can I make them skip the time-consuming checksum verification process, which checks for a corrupt disk image?

MARCUS DARDEN
via the Internet

A. If you're confident that your disk image isn't corrupt, skipping the verification process is a good idea; there are a couple of ways to do it. First, there's the free method: Turn off the Disk Copy utility's Verify Checksum option, or turn on the Except DiskScripts/DiskSets option (Edit: Preferences). Then, instead of double-clicking a self-mounting disk-image file to mount it, drag it to the Disk Copy application's icon—it will skip the verification process.

This approach has drawbacks. It takes extra time to open Disk Copy and still more time to quit it manually (unless

you're willing to leave it open and occupying RAM). Moreover, this trick doesn't work with the combination of Disk Copy 6.3.X and the type of self-mounting disk images that display a licensing agreement before mounting the disk image. Most Apple-distributed images are of this type.

For the fastest mounting, there's a second method: create self-mounting disk images using the \$30 ShrinkWrap program from Aladdin Systems (www.aladdinsys.com). ShrinkWrap's self-

But if you already have a page open in Help Viewer (which you access from the Finder's Help menu), you have to retrace your steps painstakingly from the starting help page to get to exactly the same page in your browser. The AppleScript shown in "Get Help from Your Browser" alleviates the tedium.

To make the script available from a menu while you're using the Help Viewer program, install the OSA Menu software from the CD Extras folder on the Mac OS installation CD. Then enter the script in the Script Editor program. When you save the script, set the Format option to Compiled Script and put the file in a folder called Help Viewer Scripts (create this if necessary) inside the Scripts folder within the System Folder.

NEIL MAYHEW
Calgary, Alberta, Canada

If you don't want to install OSA Menu, you can put the script in the Apple menu instead. In this case, save the script (in Script Editor's Save dialog box) with the Format option set to Classic Applet or Application and the Never Show Start-up Screen option turned on.

Finally, put the script file in the Apple Menu Items folder.—L.P.



mounting disk images skip checksum verification. The program can also convert existing Disk Copy files into ShrinkWrap files, which skip the licensing agreement and verification steps.

View Help Pages in Your Browser

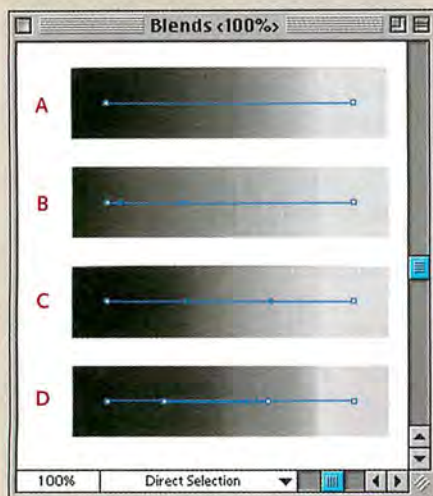
TIP The benefits of opening Mac OS help pages in your Web browser instead of in the usual Apple Help Viewer program are no secret (they're revealed in *Secrets*, March 2000).

iMovie Audio-Track Swapping

TIP Although Apple's iMovie software doesn't allow you to replace one clip's audio track with another's (as noted in "Home-Movie Magic," April 2000), you can accomplish this by turning the replacement audio track into an AIFF sound file and importing it into *continues*

Better Blends in Illustrator 8

THE BLEND TOOL AND MAKE BLEND command in Illustrator 8 normally produce a uniform progression from one object to another. Color and shape change at a constant rate over the distance between the objects (A). Derek Mah of Calgary, Alberta, Canada, discovered that it's easy to control a blend's rate of change by manipulating the direction points of its *spine*. Illustrator generates the spine—an invisible, centered path—when you create a blend. You can edit the spine just as you would any other Illustrator path.



To see the spine, either switch to Artwork mode (⌘-Y) or click the center of the blend with the Direct Selection tool. Then select the Convert Direction Point tool and drag out a direction point control handle at each end of the spine (B). Move these control handles along the spine to adjust its rate of change (C). This is similar to how you would control blend speed in a gradient mesh.

If you impose extreme acceleration or deceleration on the blend, you can prevent visible banding by increasing the number of blend steps in the Blend Options dialog box (choose Object: Blend Options).

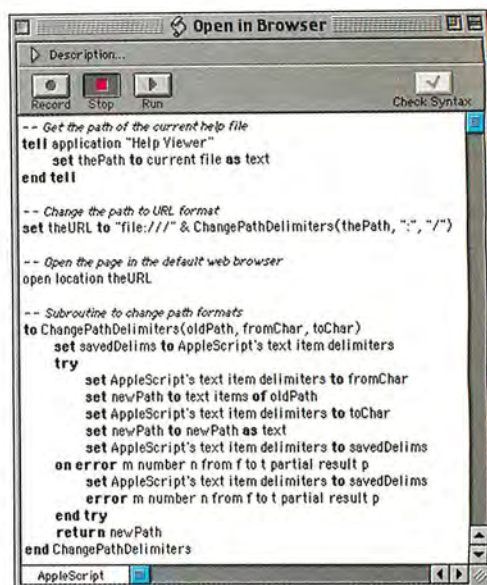
You can vary the blend's acceleration and deceleration even more by adding intermediate anchor points along the spine with the Add Anchor Point tool (D). These points divide the blend into segments you can control individually by dragging their direction-point control handles. However, the intermediate points don't provide control over the position of particular blend steps. For example, a point added between the spine endpoints does not designate the location of the halfway step in the blend progression.

iMovie. With the help of QuickTime Pro, it's easy. To replace the audio in Clip 1 with the audio from Clip 2, do the following:

1. In iMovie, put Clip 2 in the Clip Viewer at the bottom of the screen.
2. Choose File: Export Movie. In the Export Movie dialog box, set the Export To option to QuickTime and set the Format option to produce the sound quality you want. For best quality, choose the CD-ROM Movie, Large setting or choose Expert and make audio settings for no compression, 44.1kHz, 16-bit stereo. Select the lowest image settings, since you won't be using the video portion of the movie. This will reduce the file size and speed up exporting.
3. Open the exported movie in QuickTime Player and choose File: Export. (You'll see this menu command only if you've upgraded to QuickTime Pro.) In the dialog box that appears, set the Export option to Sound To AIFF and set the Use option to the sound quality you want. Save the file. (You can now put the QuickTime movie in the Trash to recover the disk space it used.)
4. In iMovie, choose File: Import File, select the newly created AIFF sound file, and click Import. This places the AIFF clip in iMovie's music track.
5. Drag Clip 1 to the Clip Viewer. Click the audio viewer tab and mute Clip 1's audio track. Finally, drag the AIFF clip directly below Clip 1. You will now hear the audio from Clip 2 when you view Clip 1.

You can move AIFF clips to any position on the music track (a wonderful way to provide audio for still images), copy and paste them, and crop them, all independent of the video. You can create an echo effect by turning a clip's audio track into an AIFF sound file and importing this file to a position offset a few frames from the original clip. In this case, don't mute the original clip.

PATRICK HOULIHAN
Arkadelphia, Arkansas



Get Help from Your Browser This AppleScript uses your default Web browser to open whichever help page you have currently displayed in the Apple Help Viewer program. The script works correctly in Mac OS 8.6 through 9 but doesn't work in Mac OS 8.5.1 or earlier.

Rounding Numbers in Excel

The spreadsheet formula you offered for rounding numbers to a given number of significant digits (*QuickTips*, June 2000) works only for positive numbers. The general formula for all numbers, including 0, is `IF(cell<>>0,ROUND(cell,(n-1)-INT(LOG(ABS(cell))))),0`.

Replace *cell* with the actual cell address and *n* with the desired number of significant digits.

HOWARD FAIRMAN
Springfield, Vermont

LON POOLE answers readers' questions and selects reader-submitted tips for this monthly column. He is a coauthor, with John Rizzo, of *The Little Network Book* (Peachpit Press, 1999).

All shareware and freeware mentioned in *QuickTips* is available from the Macworld Online software library (www.macdownload.com).

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Make the Most of FreeHand 9

LET FREEHAND'S NEW FEATURES SAVE YOU TIME AND TROUBLE

by Olav Martin Kvern

Because of its sophisticated and powerful illustration tools, people commonly lump Macromedia FreeHand in with other professional drawing programs. But while the majority of FreeHand users are professional illustrators, the program's scope far surpasses that of a conventional drawing package. With its tools for page layout, Web graphics, and animation, FreeHand is difficult to pigeonhole.

Version 9 expands the application's abilities even more, offering new features for each of FreeHand's personalities (see *Reviews*, July 2000). Some of these additions are eye-catching and take the program in a new direction; others offer solid enhancements to everyday tools and promise to transform FreeHand from a workhorse to a racehorse.

Here's a look at the most impressive additions to FreeHand 9 and some tips on putting them to work for you.

Perspective Grids

One of the most notable new features in FreeHand 9 is the perspective grid. For years, graphic designers have needed a way to get simple 3-D graphics into their drawing programs. For example, you may want to create a realistic depiction of a room or show what your flat design will look like wrapped around a product box. Before FreeHand 9, you had to either turn to complicated 3-D rendering programs, such as KPT Bryce, or manually redraw the graphics—a tedious and time-consuming chore. And time is exactly what most designers don't have.

FreeHand's new perspective grids give you the power to create and edit simple 3-D effects without breaking the bank or missing your deadline. Like traditional perspective drawing, FreeHand's perspective grids rely on the concept of



vanishing point—the place where, due to quirks of visual perception, receding parallel lines meet. FreeHand simulates this illusion of distance by creating vertical and horizontal grids whose grid lines likewise converge on a single, editable vanishing point.

When creating a new perspective grid, you can select up to three vanishing points depending on the effect you want to produce. A grid with a single vanishing point contains only a horizontal and a vertical plane receding into the distance. Select a second vanishing point to add an additional wall, producing the illusion that you are staring at the corner of a building. The third vanishing point appears at the top of the grid, turning the building into a pyramid. You can adjust each plane's perspective by dragging the grid's vanishing point or

outer edges—even extending them onto the pasteboard.

Once you've defined the grid, you can use the Perspective tool to snap single or grouped objects to its planes. FreeHand adjusts the images, shrinking or expanding them as you move them around the grid. And since the objects remain editable, you can always detach them from the perspective and return to the original graphic. (For instructions on using FreeHand's improved perspective grids, see the sidebar "Putting FreeHand in Perspective").

A document can have multiple perspective grids, although you can only view one at a time. You can also hide the grids completely when you need to work on unrelated areas of the page.

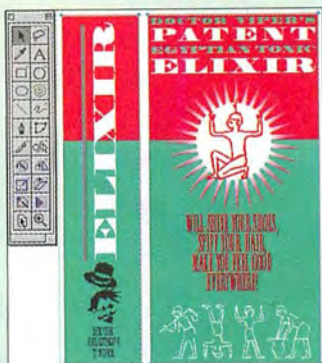
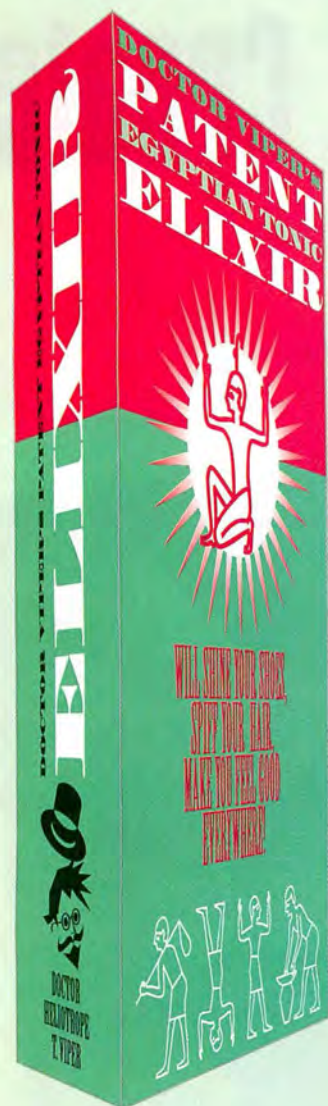
FreeHand's perspective grids do have several limitations. For one, you can't

continues

PUTTING FREEHAND IN PERSPECTIVE

IMAGINE THAT YOU'VE USED FREEHAND TO create a package design for one of your clients—a somewhat eccentric vaudeville performer who is branching out into a new line of medical products. You've sent out the package for printing when the client asks for

a perspective rendering he can use in advertising materials. Thanks to FreeHand 9, with a few quick clicks of the new Perspective tool you can convert the client's existing flat FreeHand artwork into a reasonably good 3-D drawing.

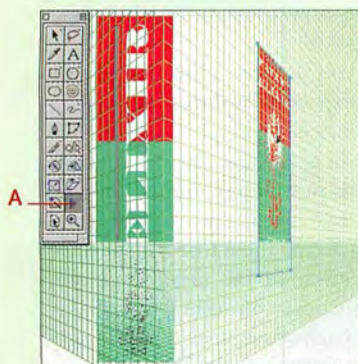


1 In your FreeHand document, arrange the artwork you want to convert to 3-D. Group individual elements on each panel so you have a single image for each side of the package. This keeps your designs intact when you move them to the perspective grid.

2 To set up your perspective grid, open the Define Grids dialog box from the Perspective Grid submenu under the View menu. For a simple box rendering showing only a front and side panel, choose two vanishing points. Set the Grid Cell Size field to a value that's an even divisor of the package's width or height—this makes aligning the objects on the perspective grid much easier.

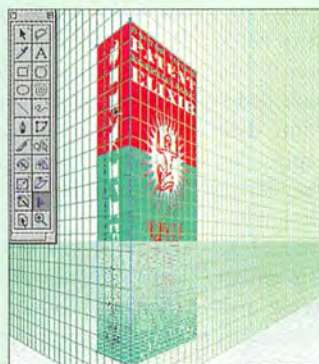


3 Next, display the perspective grid by choosing Show from the Perspective Grid submenu. If the perspective isn't right, you can adjust the grids by clicking and dragging the vanishing points—or the horizon—out onto the pasteboard.



the front panel of the box onto the right "wall" of the perspective grid (the plane of the grid extending from the vanishing point on the right). Likewise, pressing the left- or up-arrow key projects the object onto the left "wall" or "ceiling" plane.

Tip: Sometimes objects attached to the grid appear backward—to reflect an object you've attached to a grid, select the object with the Perspective tool and then press the spacebar.



To adjust the angle of a grid without dislodging its contents, hold down the shift key as you drag the grid into a new position.

Tip: To release an object from the distortion applied by the perspective grid, select the object and choose Remove Perspective from the Perspective Grid submenu of the View menu. To release the object from the confines of the grid while maintaining its distortion, select Release With Perspective.

5 Repeat this process for the side panel of the box. To snap the two panels together, use the Perspective tool to move the objects to the intersection of the left and right grids. As you drag, FreeHand adjusts the perspective distortion of the object.

attach an imported image to the perspective grid. This is a problem if you need to use a client's bitmapped logo in your design. To get around this problem, trace the images using FreeHand 9's improved Autotrace tool, which now incorporates a magic-wand tool for selecting continuous areas of color. Then attach the resulting paths to the perspective grid.

Attaching an object pasted inside a clipping path also can be a headache. To add perspective to these objects without permanently losing their paths, you must first remove them from their paths by choosing Cut Contents from the Edit menu; then apply them to the perspective grid. Once the object has the correct perspective, you can use the Release With Perspective command (located in the Perspective Grid submenu under the View menu) to detach the object from the perspective grid while retaining the illusion of perspective. You can then paste the object back inside its original path.

The perspective grid has no effect on tiled fills, custom fills, or PostScript fills. If your artwork uses these types, you'll have to come up with another solution for 3-D rendering.

Live Envelopes

Like the perspective grid, FreeHand's live envelope feature aims to make manipulating images a quick and easy process. An envelope is a method of distorting an object (or a group of objects) so it appears that you've bent or stretched the plane on which it rests. This creates an effect similar to a fun-house mirror. When applying an envelope, FreeHand creates an *envelope grid*—a kind of bounding box you can manipulate using standard points and control handles. As you stretch and distort the grid, the shape of the underlying object changes as well. (For tips on using the envelopes tool, see the sidebar "Pushing the Envelope.")

The envelope feature itself isn't the big news in FreeHand 9; previous releases of the program included a primitive version. The main difference is that now envelopes are live, and you can manipulate them directly within the work space. In previous versions, applying an envelope changed the shape of the original path. This meant that the only way to adjust the original object was to start over or undo all of the envelope

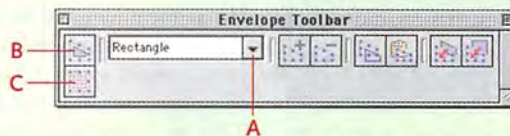
continues

PUSHING THE ENVELOPE

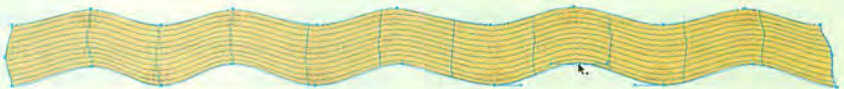
YOUR CLIENT ASKS YOU TO CREATE SOME GRAPHICS SHOWING HIS NAME PRINTED on ribbons. This project isn't as simple as it first seems. When you're simulating the appearance of text on fabric, you can't count on having a flat plane. Fabric stretches, bends, and wrinkles—and so must the text. It's a perfect job for FreeHand's improved Envelope feature.



- 1 First create the basic design of your ribbon. Make sure the design has enough points that you can reshape it later. To distribute new points evenly around the object, open the Xtras menu and select Add Points from the Distort submenu. If you add other details to your ribbon, group the paths before applying the envelope.

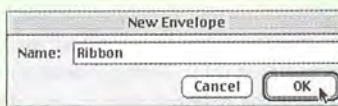


- 2 Open the Envelope Toolbar (found under Toolbars in the Window menu). Select your ribbon and choose the Rectangle envelope from the list of envelope presets on the Envelope Toolbar's pop-up menu (A). Click on the Create button (B) to apply the envelope. This applies a distortion grid over the ribbon. To view the grid, click on the Show Map button (C).



- 3 Before you begin reshaping the ribbon, add additional points, as you did in Step 1. This time, you're adding the points to the envelope. For precise control, make sure the envelope has the same number of points as the original object. You can now edit the envelope as you would any other path.

One interesting feature of FreeHand's envelopes is that you can turn them inside out by dragging one edge over or beyond the other, creating the illusion that you've twisted or folded the object.

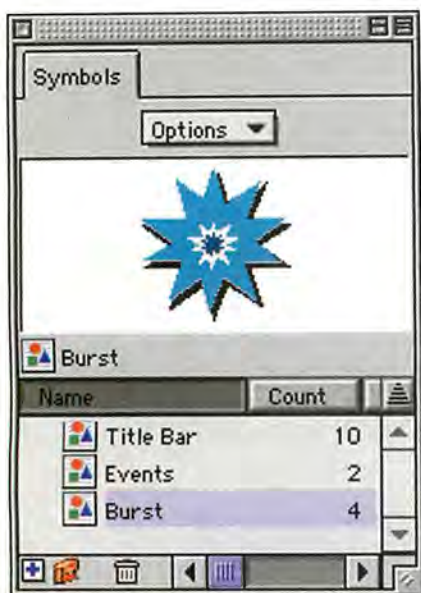


- 4 When you're done, click on the Save As Preset button in the Envelope Toolbar and name the new effect "Ribbon." You'll see the envelope at the top of the Envelope Preset pop-up menu.

DOCTOR HELIOTROPE T. VIPER

- 5 Position a text block above the ribbon. Select your new envelope from the Envelope Preset pop-up menu and click Apply. The text appears to curve around the ribbon.

DOCTOR HELIOTROPE T. VIPER



Slim Down By storing repetitive graphics in the Symbols palette, you can cut down on the document's file size and save time.

changes manually—along with any other changes you'd made in the meantime.

In FreeHand 9, applying an envelope changes only the *appearance* of the path, leaving the original object fully editable. If you decide an hour later that you are unhappy with the envelope, you can always return to the original shape of the path or change the settings to create a different effect. Even text remains editable after you've applied an envelope to it. Like perspective grids, however, live envelopes don't work with bitmapped images.

In addition to saving time and headaches, FreeHand's live envelope feature opens the door to a number of interesting creative possibilities—especially once you throw in the program's improved Flash export capabilities. For example, if you want to create a Web animation in which text subtly changes shape, you can export successive frames as you adjust the text's envelope.

Symbols

Because of its powerful productivity features, such as graphic find-and-replace and intelligent text-handling tools, FreeHand is the program of choice for many cartographers and technical illustrators. For this group, one new feature that really stands out is the addition of symbols.

Many Macromedia customers are already familiar with symbols—which are standard features in other Macromedia

programs such as Fireworks, Flash, and Director. Symbols are shapes you can use over and over again in your publications. They might be icons for state capitals in a map or for a specific nut or bolt in a mechanical assembly diagram. You *could* create duplicate graphics by copying and pasting, but symbols give you two advantages over that technique.

First, by turning repeated objects into symbols, you can place an unlimited number of *instances* of the symbols in the document without significantly adding to your size. This is because instances aren't duplicates of the symbol but are simply references to the original. So each instance you use saves space in your FreeHand document and on your hard drive.

Second, symbols save time. When you change a symbol, FreeHand updates all instances of it in the publication. This is faster than updating repeated graphics using FreeHand's graphic find-and-replace feature (as great as that is), and it's *much* faster than updating each graphic by hand.

The key to working with symbols in FreeHand is the Symbols palette, located in the Panels submenu of the Window menu (see the screen shot "Slim Down"). Creating a new symbol is as easy as dragging the object into the list area of the Symbols palette and dropping it. Then, to insert an instance of the symbol into your document, drag it out of the Symbols palette and drop it on the page. You can transform an instance just as you would any other object—moving, rotating, skewing, or reflecting it. These changes affect only the selected instance. You can also break the link between an instance and its symbol completely, converting the instance to a normal FreeHand object.

To update a symbol—and all of the instances based on it—simply drag a new object over the original item in the Symbols palette. You can even share your symbols with other designers or transfer them to another FreeHand document, by exporting them into a symbol library. To do this, choose Export from the Symbols palette's pop-up menu.

Page Tool

In addition to utilizing its illustration tools, many designers also rely on FreeHand as a page-layout program—especially for short jobs such as brochures. Unlike other drawing programs—Adobe Illustrator, for example—FreeHand can

create documents containing more than one page, and you can give the pages in a single document any size and orientation. The only real limit is the size of the pasteboard—a healthy 222 by 222 inches.

In the past, it was hard to ensure that your pages ended up in the correct order and location when you arranged them in the Document Inspector's tiny Page Preview window. The introduction of the Page tool changes all that. This tool allows you to move, flip, and rotate pages directly, rather than dragging a tiny thumbnail around in the Document Inspector. You can also use the Page tool to add, duplicate, remove, and resize pages quickly.

When you select a page with the Page tool, handles appear around the edges of the page, allowing you to manipulate it like any other object. To resize a page, for example, simply drag one of the corner handles. Or if you want to delete the page altogether, select the page and press the delete key.

To arrange multiple pages on the pasteboard, choose Fit All from the View menu. FreeHand zooms out to a view that displays all of the pages in the publication. This makes it very easy to position pages relative to each other. For greater accuracy in positioning pages on FreeHand's pasteboard, you can activate the Snap To Grid feature (in the View menu), which forces the page to snap to increments of the document grid. (To view the grid, choose Show from the Grid submenu of the View menu; to edit the spacing of the grid, choose Edit.) This makes it much easier to leave an exact distance between pages—which you sometimes need when you're printing imposed pages.

Final Word

FreeHand 9 is a different program for every user. Part of its strength lies in its diverse feature set. But whether you use FreeHand for creating Web animations or designing vacation brochures, chances are you'll find a tool in version 9 that can save you both time and trouble. You can download a trial version of FreeHand 9 from Macromedia's Web site (www.macromedia.com). **m**

OLAV MARTIN KVERN is an illustrator, graphic designer, software developer, and writer. He is the author of *Real World FreeHand* (Peachpit Press, 1998) and the forthcoming *Real World InDesign* (also from Peachpit).

Stay on the Right Side of Copyright Laws

KNOW WHETHER IT'S LEGAL TO USE ARTWORK SOMEONE ELSE CREATED

by Susan P. Butler

Let's face it: we can't all compose beautiful music, draw stunning illustrations, and make professional movies. Yet you may want to put together a project that includes these art forms and more—for instance, a Web site that plays music in the background, contains eye-catching GIFs on each page, and plays Flash animations on your navigation buttons. Rather than doing all of the artwork yourself, you may need to use someone else's creations to bring your project to fruition. The question is, How can you use the work legally and fairly?

Besides playing fair with the artist and the copyright owner by not stealing what belongs to them, you also want to avoid the stiff penalties imposed for breaking copyright laws. You could get hit up for as much as \$150,000 each time you copy, distribute (give away or sell), or display or perform publicly someone else's copyrighted work; this includes showing it on your Web site. The copyright owner may be able to collect from money you earn for the next 20 years.

Avoid the guilt, the civil liability, and the criminal penalties by finding out if a copyright protects a work. If so, then *clear the rights* (obtain permission) to use it. Here are some pointers on making sure you stay within the law.

Make a Detailed Plan

The first step in using someone else's work is to decide exactly *how* you want to use it. This will help you decide whether you need to clear the copyright and will also give you answers to typical copyright-owner questions.

First of all, how do you intend to use the work? For example, do you want to play an entire song over your movie's ending credits, or use just the chorus in a small scene?



If you're creating a Web site, do you want to link to another site? Although you probably have the right to link to a home page without permission, lawsuits are currently pending regarding the right to link to a page within another Web site ("deep linking"), bypassing the site's home-page advertisements. Also, you may or may not have the right to pull another site's copyrighted content into a frame on your own site, making it appear to be yours, without permission. The law isn't clear on these issues yet.

Here are some other questions that will prepare you for the process of using someone else's work: How do you plan to distribute the copyrighted work? Will you use it on the Internet? Will you make CD-ROMs, CDs, DATs, MP3 files, videos, or DVDs that include the work? In what countries will you make

these media available? For how long do you intend to use the work?

Do You Need Permission?

It's always safest to ask for permission before you make someone else's work a part of your own production. However, if a work isn't protected by copyright, you have the right to use it without asking.

Public Domain Copyright protects work for only a certain period of time. After that period expires, the work goes into the public domain, and anyone may use it without permission and without paying royalties or fees.

Figuring out the length of protection in the United States can be tricky. Federal copyright law has changed over the years. It used to require owners to register and provide notice of copyright;

continues

otherwise the work would fall into the public domain. These rules still apply to certain works created before 1978.

In the United States, copyright law protects works created on or after January 1, 1978, for the life of the author (creator), plus 70 years. For works created before that date, the duration of protection depends on such things as the date of creation, when the work was first published, whether it was registered, and if copies of it included a copyright notice.

As a general rule and based on my interpretation of copyright laws, I don't presume that anything is in the public domain in the United States unless it was created and sold to the American public before 1904. The U.S. Copyright Office's Web site (www.loc.gov/copyright) has additional information.

Never assume that just because a work is in the public domain in one country, it's in the public domain everywhere—copyright-protection periods

vary from country to country. In fact, some nations protect photographic works, sound recordings, and movies in a different manner than the United States protects them. For instance, the famous 1902 silent film *Le voyage dans la lune* (*A Trip to the Moon*), by Georges Méliès, is still protected in France.

Fair Use Even if a work is protected by copyright, you may still be able to use it without permission—if the way you use it qualifies legally as *fair use*.

Copyright law gives four general guidelines determining what constitutes fair use. First, if you're using a work for noncommercial purposes, it may qualify because you're not trying to profit from the creations of others. For instance, using a work for criticism, comment, news reporting, teaching, scholarship, or research purposes is often fair use, as it tends to foster freedom of speech.

The second guideline is that the less creative and original a work is, the more likely it is that you can use it without permission. (For detailed examples of what qualifies as original and creative work, see "Put Your Work under Lock and Key," *Create*, July 2000.)

Third, you may be able to use just a portion of a work, rather than the entire thing, without permission; this is often considered fair use (while copying an entire work usually isn't). Contrary to popular belief, there is no set number of musical notes you may copy without permission: if you can name that tune in five notes because they make up most of the chorus to a famous song—and therefore form a substantial part of that song—you might end up the target of a lawsuit that could drag on for five long years.

Finally, it's illegal to use a work if doing so will affect its value or the owner's potential market for that work (see the sidebar "Is *Macworld* Breaking the Law?"). Basically, it's unfair to compete with someone by using his or her own work. For instance, it wouldn't be fair for a nonprofit organization to sell CDs as a fund-raiser without



MUSIC-CD COVER COURTESY OF STEVE VAI AND EPIC RECORDS; ILLUSTRATION BY AARON BROWN

Is *Macworld* Breaking the Law?

THIS ILLUSTRATION from a music-CD cover is original enough to copyright. Therefore, does reproducing it in *Macworld* and distributing it all over the world constitute copyright infringement? Or is it fair use?

Let's consider the four fair-use guidelines detailed in the article. Although the CD cover image is more creative than a simple drawing and we're showing the entire work rather than a small corner of it, we're using it for *teaching* purposes. And, most important in this situation, we're not interfering with its value or restricting the copyright owner's market. I think it's fair use.

As a professional courtesy, however, we got permission from copyright owner Epic Records and musician Steve Vai to use the image. We also credit the artist, Aaron Brown. Although this isn't legally necessary, it's the right thing to do.

the artist's permission, since the fund-raiser would be competing for CD sales.

Courts weigh the answers to all of these questions before deciding whether someone is using a copyrighted work under the fair-use provision. A federal judge in California decided recently that an Internet search engine's thumbnail-size, low-resolution copies of copyrighted photographs on the Web fell under fair use partly because search engines are very important to the Web. (The case is on appeal.)

Permission on Demand

In some cases, a copyright owner has no choice but to grant you permission to use a work as long as you fulfill certain requirements. For instance, once the owner of a song permits someone to record and publicly release a recording of the song in the United States as, say, a CD or cassette (but not as part of a film), then the copyright owner must grant you a license to record your own version of the song if you get a "mechanical license" from the owner. You must comply with certain procedures to get the license, and you'll have to pay a royalty for each recording of the song that you distribute.

Copyright owners of sound recordings don't normally have the right to prevent others from playing the recording in a public venue (such as a nightclub or restaurant); only the owner of a song on the record has this right. The situation is different for *digital* performances of recordings, however, such as digital radio broadcasts on the Internet. Copyright owners of the sound recording can prevent you from publicly playing most of their recordings, unless you qualify under the law as a Webcaster. In that case, the copyright owners must grant a

license if you, as the Webcaster, fulfill certain requirements and pay a fee. If you're not a Webcaster, you'll need permission from both the song *and* the sound-recording owners to use their work on the Internet. (See the sidebar "Tracking Down the Owner" for help in finding copyright owners.)

The Final Judgment

If you think that copyright protects a work you want to use, and you don't want to risk making a mistake about fair use or aren't sure if the work falls into the public domain, then ask the copyright owner for permission (or simply notify the owner and pay a royalty or fee if the law permits). All too often, when a court ends up deciding the question of which parties

THE INTERNET is a great source for finding copyright owners. This table will help you figure out whom you need to contact and how to locate them on the Web.

Here are a few pointers for specific cases.

If you need permission to use sound recordings, such as a particular recorded version of a song, contact the record companies (also called record labels) because they normally own all or part of the sound-recording rights. Recording studios and record distributors rarely own these rights. Also contact the music publisher or songwriter for permission.

For rights to use video and film, contact the company whose name appears after the copyright symbol on the packaging or in the credits. The Directors Guild of America's Web site can help you, too.

Tracking Down the Owner

Copyright Sources

Type of Work	What You Need	Whom to Contact	Web Address
Music and sound recordings	License and fee-collection services allowing you to perform a song publicly	ASCAP, BMI, or SESAC	www.ascap.com www.bmi.com www.sesac.com
	Mechanical license to record songs	Harry Fox Agency	www.nmpa.org
	Permission to use a sound recording for any purpose; permission to use album cover artwork	The music publisher	Varies
	General information about music publishers	National Music Publishers' Association SongFile database	www.nmpa.org
	List of record companies (labels)	Billboard's International Buyer's Guide	www.billboard.com/store
Video and film	Help in finding film studios and entertainment organizations	Directors Guild of America	www.dga.org
Books and magazines	Rights to copy or distribute	The book or magazine publisher	Varies
Fine art and photographic works	Rights to copy or distribute	The photographer or artist	Varies
All media	Basic copyright information for the United States	U.S. Copyright Office	www.loc.gov/copyright
	Basic international copyright information	World Intellectual Property Organization	www.wipo.org

have the right to use a work, you'll pay tons of money for litigation.

To stay on the safe side, check with a copyright lawyer before using anything without permission. If you're using material that's copyrighted outside the United States, make sure the attorney is experienced in international transactions. The money you spend up front for legal advice could save you money, time, and emotional distress down the line. **m**

SUSAN P. BUTLER is a new-media and entertainment attorney in Northern California. She writes a monthly legal column for ZDNet's Small Business Channel and is currently completing *The E-business Legal Kit for Dummies* (IDG Books Worldwide), due out this fall.

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Create a Barrier-Free Web Site

OPENING SITES TO THE VISUALLY IMPAIRED WILL BENEFIT EVERYONE

by Jim Heid

For people with visual impairments, the Internet has the potential to broaden horizons and open doors to independence. Using new surfing technology, they can read newspapers and magazines without waiting days—or weeks—for Braille or audio versions and without depending on volunteer reading services. They can shop for music, groceries, and airline tickets. They can learn, bank, work, or just surf.

That's the Internet's *potential*. The reality is that many Web sites are cumbersome or impossible for blind users to navigate. Banner advertisements, multi-column layouts, poorly phrased hyperlinks, and unlabeled graphics can turn an elegant-looking site into a navigational nightmare.

Here's a look at the issues and the answers behind Internet accessibility. This article focuses mainly on the needs of users with severe visual impairments, because your design choices impact their experience most. For an overview of other accessibility issues, see the online sidebar, "Designing for Users with Other Impairments," at www.macworld.com/2000/08/create/access.html.

Growing Awareness

Fortunately, the need to improve Internet accessibility, not only for the blind but also for everyone with disabilities, is receiving a lot of attention, thanks in part to lawmakers. As part of an amendment to the Rehabilitation Act of 1973, the U.S. government recently passed regulations *requiring* that federal Web sites be accessible to people with disabilities by the end of the year. Meanwhile, the National Federation of the Blind has filed suit against America Online, charging that its system is inaccessible.

But addressing the needs of disabled



users isn't just a good cause—it's also good business. Consider this: an estimated 10 percent of Americans have a physical disability, and a 1998 federal study concluded that consumers with disabilities control more than \$175 billion in discretionary income. Open your site to this group, and you'll not only expand your audience—you may also win some extremely loyal customers.

Adding accessibility features will also help you prepare for the coming stampede of Web-enabled devices. Web-capable handheld computers, such as the Palm VII, are already available, and soon you'll be surfing from devices as diverse as cell phones and car dashboards. All of these devices lack the large displays needed to show off the fancy graphics and complicated layouts on today's sites. By making your site

navigable without graphics, you benefit sighted and blind customers alike.

The Sound of a Site

Just how do people with visual impairments access the Web? Most of them rely on *screen reader* software. Screen readers use voice synthesis to read aloud the contents of windows, menus, and other interface elements. The most popular screen reader is Henter-Joyce's (800/336-5658, www.hj.com) \$795 Jaws for Windows. For the Mac, Alva Access Group (510/451-2582, www.aagi.com) offers the \$695 outSpoken.

Screen readers help visually impaired users navigate a site by interpreting HTML tags, particularly those dealing with hyperlinks, Web forms, and graphics. Take the following HTML code, for *continues*

example: `Go to home page`.

Instead of reading out the entire link, the screen reader simply says, "Link: go to home page." Blind users can then press the tab key to jump from one link to the next. To get an idea of what a blind person might experience on both an accessible and a not-so-accessible site, see the sidebar "The Sound of Surfing."

Easy Ways to Improve Accessibility

Does making your site accessible mean eliminating glitzy graphics, rollovers, multimedia, Java applets, and all the

other eye candy that spices up (and sometimes clutters) today's sites? Absolutely not. Indeed, sighted users won't even notice most accessibility tricks.

The following tips are easy to implement, even on existing sites—and many also improve the surfing experience for sighted users.

Describe Your Graphics It's no news flash that graphics dominate today's sites. What with buttons, logos, and artwork, a single page can include a dozen or more images—many of them essential for navigation. By default, when a screen reader encounters one of these graphics, it reads

out the file name, often an unhelpful—if not downright incomprehensible—string of letters such as *Top2_rev.gif*.

You can tell screen readers to ignore these file names and provide valuable context for your graphics. Use the `<image>` tag's `alt` attribute to give a brief description of the images—for example, *XYZ Corporation Logo* for a company logo or *Link to the home page* for a graphical button. If, like many designers, you rely on transparent GIFs to control space in your layout, just use blank spaces for their `alt` descriptions—many screen readers will skip them entirely.

THE SOUND OF SURFING

LISTENING TO WEB SITES THROUGH A SCREEN READER SUCH AS Jaws is the best way to appreciate the challenges and issues that lie behind Web site accessibility. Here's a sampling of what you'd

hear on a visit to the high-traffic Web sites for the *New York Times* (www.nytimes.com) and public broadcasting giant WGBH (www.wgbh.org).



Hard Times at the Times

The *New York Times* on the Web immediately gets off on the wrong foot. The ad graphic in the upper left corner (A) has no alt text, so Jaws reads its link aloud—and because sites serve most ads dynamically from databases, these links are incomprehensible. In this instance, the Jaws surfing experience begins as follows: "Page has 131 links. Link graphic hst one-dash-side-dot-gif slash six-six-hundred-ninety-six-d-six. . . ." This numerological gibberish continues for several more seconds. Simply adding `alt="Advertisement"` to the `image` tag would have eliminated that agony.

Things improve only slightly from here. The site's designers also fail to specify alt text for the left-hand image map (B), so Jaws reads the links thus: "Image map link slash index. Image map link front slash index. Image map link day slash world. Image map link day slash national." And on and on.

Finally, the links for each of the main front-page articles (C) read simply "Go to article." A blind user surfing from link to link won't know which article each link designates.



Smooth Talker

The Web site for WGBH in Boston does it right—no surprise, given that WGBH is headquarters for the National Center for Accessible Media.

The first thing a Jaws user hears is "Page contains 39 links"—less overwhelming than The *New York Times* on the Web's 131 links. From there we hear "Link: D vertical bar. Link: text version and access instructions. Graphic: This week." (Thanks to an `alt` attribute, Jaws doesn't read the whole file name.) "Link: site map. . . ."

You'll notice that the text links at the very top of the page (A) enable a blind user to jump quickly to a text-only version of the site and get instructions about the site's structure and accessibility features. The `d` link (B) leads to a page containing a description of the home page graphics—how many there are, what they look like, and so on—making the site a bit more inclusive.

Concise, meaningful **alt** text is one of the most important accessibility features you can add. It will also improve your site for the many sighted Web users who speed up surfing by setting their browsers to skip images.

Label Your Image Maps Image maps are common navigation devices that divide a single image into several different links. There are two types of image maps: server-side maps, which rely on software that runs on the Web server to interpret where a user clicked, and client-side maps, which use HTML tags to denote each of the map's clickable hot spots directly within the Web page. Some screen readers can only interpret client-side maps.

In addition to providing client-side maps, it's essential that you use the **alt** attribute to create an informative text description for each clickable region—especially those used for navigation. Far too many sites—including Yahoo, Amazon, and The New York Times on the Web—forget this step, rendering their maps almost useless to a visually impaired user.

Write Meaningful Links Before reciting all the text on a page, some screen readers recite just the hyperlinks, enabling a user to jump elsewhere without having to listen to every word. But if you use the all-too-common *click here* for your hyperlinks, the user hears just “click here, click here, click here.” The solution is to write meaningful links that provide some context, such as *Learn about our products*. Read aloud your pages' hyperlinks as a test. Is the site still navigable?

Provide Text-Based Navigation If you use image maps or graphics for navigation, also provide a text-based navigation scheme, such as a row of links at the top or bottom of each Web page. Place a vertical bar (|) between links to set them apart. This helps some screen readers distinguish them.

A text-based site map, also a great idea, enables sighted and blind users alike to jump quickly to sections of interest.

Accessing Forms

Web forms, a prerequisite for almost every online shopping site, present their own accessibility issues because they rely on additional user-interface elements, such as text boxes for typed information, pop-up menus for choosing options, and Submit buttons for sending the form's contents. The way

you create and position these elements greatly influences how well a screen reader can interpret them.

Label Form Elements Properly To help visually impaired users navigate your forms, you need to provide a text label for *every* form element. For example, instead of just leaving four empty fields for a user's address, specify which part of the address to enter in each box. And always position the labels either directly above or directly to the left of the elements they describe. This way screen readers can state additional information about the element—for example, “edit: street address.”

If you use an image for your form's Submit button, don't forget to specify **alt** text. Otherwise, a screen reader will read the image as “button”—and if the page has multiple buttons, a blind user won't know which one does what.

Put the Most Likely Choice First When creating pop-up menus for navigation or for choosing values such as a country, consider creating a hierarchy, with the most likely choice as the default value and others below it in descending order of likelihood. This decreases the amount of scrolling users must do to get to the desired option.

Designing Your Site

You may want to use the following techniques when starting a new site or redesigning an existing one. The design choices you make at this phase have a huge impact on your site's accessibility—and on its adaptability for other types of browsing devices, such as mobile phones.

Simplify Tables Most designers use HTML tables to position items on a Web page. As a result, text doesn't always read logically across the screen. Jaws is smart enough to deconstruct tables properly, but most screen readers aren't—yielding nonsensical results.

If you use tables for layout—and let's face it, they remain the most browser-compatible layout technique—avoid nesting them. Also consider providing nontabular versions of the most important pages on your site. A simplified layout speeds up your site for everybody.

Don't Count on Flash Blind users can't access multimedia elements, such as Flash movies. Therefore, if you use Flash for navigation or to present content, you'll need to provide a non-Flash version of your site to make it accessible.

ACCESSIBILITY BOOKMARKS

ON THESE WEB SITES, YOU CAN LEARN more about accessibility issues, techniques, and tools.

www.w3.org/wai The World Wide Web Consortium's Web Accessibility Initiative is the horse's mouth for all Internet issues related to accessibility.

www.cast.org The Center for Applied Special Technology (CAST) is a great resource for Web developers. CAST's Bobby is a Web-based tool that will analyze any page and report on its accessibility.

www.ibm.com/able/ IBM's Web Accessibility Checklist is a succinct guide to accessibility techniques.

www.webable.com WebAble contains a database of hundreds of accessibility resources.

Test Your Sites

Those without vision impairments might have difficulty pinpointing accessibility trouble spots. You can use the free trial versions of both Jaws and outSpoken, available from the companies' Web sites, to check your designs for accessibility. The trial versions are fully functional but work for only 20 to 40 minutes before requiring a restart. You can test Jaws, the most popular screen reader, on a Mac using Connectix's (800/950-5880, www.connectix.com) \$179 Virtual PC 3.0.

If you've added accessibility features to your site, post a notice on the Usenet newsgroup alt.comp.blind-users. Invite its members to visit your site and provide feedback. You can also submit your Web site to www.cast.org/bobby, which tests it and sends a report on its accessibility.

As more stores and services move onto the Web, accessibility will become an increasingly heated issue. A little preparation and forethought now could save you serious headaches later and win you valuable new customers. **m**

A *Macworld* contributing editor since 1984, JIM HEID (www.heidsite.com) writes and lectures about all aspects of Web development. He thanks Tom Wlodkowski of the WGBH National Center for Accessible Media for his insights.

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Jacob K. Javits Convention Center, New York City

Early Discount Deadline:
June 19, 2000

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Title

Company

Street Address (Please Indicate Apt. #, Suite or Mail Stop)

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City State/Province Zip Code/Postal Code

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Fax Email Address

2. Registration Package Selection & Fees

Pre-Conference Workshops: July 18, 2000, Conference Programs & Workshops: July 18-21, 2000, Exposition: July 19-21, 2000. All Conference Sessions, Keynote Address and Vision Thing Live are on a first-come, first-served basis with the exception of the Pre-Conference Workshops.

(Write in your Workshop selection code)

	Early Discount by Jun 19	Regular Price after Jun 19
<input type="checkbox"/> Package 1: Super Pass	\$1,195	\$1,295
Includes: Pre-Conference Workshops, MACWORLD/Pro Conference Sessions, MACWORLD Users Conference Sessions, Lunch, Warm-up Rally, Keynote Address, Vision Thing Live, MacBeginnings Sessions, Exhibits		
<input type="checkbox"/> Package 2: MACWORLD/Pro Conference	\$845	\$895
Includes: MACWORLD/Pro Conference Sessions, MACWORLD Users Conference Sessions, Lunch, Warm-up Rally, Keynote Address, Vision Thing Live, MacBeginnings Sessions, Exhibits		
<input type="checkbox"/> Package 3: MACWORLD User I	\$195	\$245
Includes: MACWORLD Users Conference Sessions, Warm-up Rally, Keynote Address, Vision Thing Live, MacBeginnings Sessions, Exhibits		
<input type="checkbox"/> Package 4: MACWORLD User II	\$545	\$595
Includes: Pre-Conference Workshop, Lunch (Workshop Day ONLY), MACWORLD Users Conference Sessions, Warm-up Rally, Keynote Address, Vision Thing Live, MacBeginnings Sessions, Exhibits		
<input type="checkbox"/> Package 5: Workshop ONLY	\$395	\$445
Includes: Pre-Conference Workshop, Lunch (Workshop Day ONLY), Warm-up Rally, Keynote Address, Vision Thing Live, MacBeginnings Sessions, Exhibits		
<input type="checkbox"/> Package 6: Exhibits ONLY (July 19-21)	\$10	\$25
Includes: Exhibits and MacBeginnings Sessions ONLY. (Does NOT include admission to the Keynote Address, Warm-up Rally, Vision Thing Live)		

A-MW4

Register online with this **Priority Code** to get a FREE Expo Only Pass compliments of Mac Publishing in conjunction with MACWORLD Conference & Expo.

- ☐ Check here if you DO NOT wish to receive product information from third parties (exhibitors) via email.

Pre-Conference Workshop Key

Tuesday, July 18: 12:00 pm – 7:00 pm
Please refer to pages 6 – 8 for complete descriptions.

- WA: Practical Introduction to Mac Networking
WB: Desktop Publishing: The Big Picture
WC: Managing Shared Macintosh Computers with Apple Macintosh Manager
WD: The QuickTime Professionals Workshop
WE: How to be a Mac Power User
WF: Getting Started with Applescript
WG: JavaScript and Dynamic HTML Wizardry
WH: RealAudio & MP3 on the Mac; The State of the Art Macintosh Audio
WI: The Filemaker Workshop
WJ: Mac Efficiency 101
WK: Streaming Video Production Workshop
WL: Final Cut Pro
WM: Current Macintosh Administration Strategies
WN: Getting Started with Multimedia
WO: Web Animation Essentials, Tools and Techniques
WP: Working with PDF

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3. Attendee Profile (Must be filled out to process your registration)

For what purpose are you purchasing/evaluating products and services?

- ☐ 1. For My Company/Organization/Dept.
☐ 2. For Myself as a Consultant/
Sole Proprietor
☐ 3. For Myself as a Consumer

What is your industry?

- ☐ 4. Aerospace
☐ 5. Architecture/Construction/
Process Industries
☐ 6. Arts & Entertainment
☐ 7. Banking/Finance/Insurance/RE
☐ 8. Computer Reseller/VAR/VAD/Service
Consulting
☐ 9. Consulting
☐ 10. Education: K-12
☐ 11. Education: Higher Ed
☐ 12. Education: Other
☐ 13. Engineering/R&D
☐ 14. Gaming/Game Development
☐ 15. Graphic Design/Creative Services
☐ 16. Government/Military
☐ 17. Health/Medical Services

- ☐ 18. Independent Software Vendor
☐ 19. Legal Services
☐ 20. Manufacturing (Computer Industry)
☐ 21. Manufacturing (Non-computer Industry)
☐ 22. Marketing/Sales/PR/Communications
☐ 23. Multimedia
☐ 24. Non-profit Organization
☐ 25. Printing/Publishing
☐ 26. Publication/Association
☐ 27. System Integrator
☐ 28. Transportation/Utilities
☐ 29. Website Admin/Content Development
☐ 30. Other

What is your job function?

- ☐ 31. Art Director/Graphics/Design/Digital Art
☐ 32. Consultant
☐ 33. Controller/Treasurer/Accounting/CFO
☐ 34. CEO/President/Owner
☐ 35. IT Executive (CIO/CTO/VP)
☐ 36. Editorial/Writing
☐ 37. Educator/Teacher
☐ 38. Engineering/Scientific/R&D

- ☐ 39. Human Resources
☐ 40. Management/Department Head
☐ 41. Marketing/Sales/PR/Communications
☐ 42. Network Management
☐ 43. Professional (Lawyer, Doctor, etc.)
☐ 44. Programming/Analysis
☐ 45. Purchaser/Corporate Buyer
☐ 46. Software Developer
☐ 47. Training
☐ 48. Web Admin/Content Developer
☐ 49. Other

What is the size of your organization?

- ☐ 50. Under 50
☐ 51. 50-99
☐ 52. 100-499
☐ 53. 500-999
☐ 54. 1000 & Over

Which personal computers do you use?

- ☐ 55. Powerbook/Powerbook G3
☐ 56. PowerMac/PowerMac G3
☐ 57. iMac

- ☐ 58. iBook
☐ 59. PowerMac G4
☐ 60. iMac DV
☐ 61. Macintosh Workgroup Series
☐ 62. IBM PC or compatible desktop
☐ 63. IBM Laptop/Notebook
☐ 64. Other

What is your role in making purchases?

- ☐ 65. Final Decision Maker
☐ 66. Recommend Product or Vendor
☐ 67. Develop Specifications
☐ 68. No Role

What is your annual purchasing budget?

- ☐ 69. 0 – 25,000
☐ 70. 25 – 100,000
☐ 71. 100 – 500,000
☐ 72. 500 – 1,000,000
☐ 73. > 1,000,000

4. Payment Information (You will be charged for all registrations received including duplicates)

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- ☐ Check enclosed (make check payable to MACWORLD Conference & Expo)

- ☐ Master Card ☐ Visa ☐ American Express

Card Number

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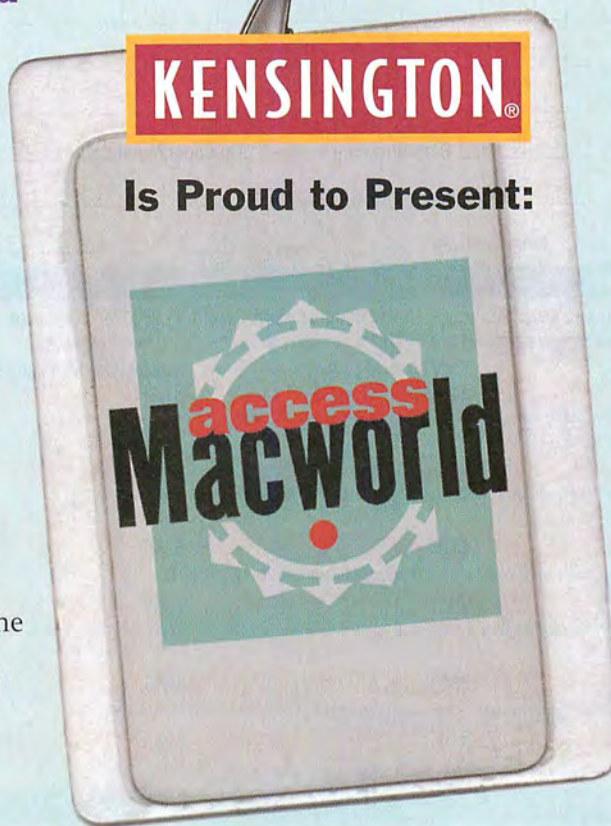
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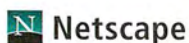
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Black ink cartridge, item #PR12203, only \$27.95.



Nikon CoolPix 990 Digital Camera



Only
\$949.95!

Item #IN8547

- 3.3 Megapixel resolution
- 3x Nikkor zoom lens
- MPEG movie mode

Adaptec PowerDomain 2930U Ultra SCSI Adapter

Ideal for Power Mac G3 & G4!



Only
\$99.95!

Item #DRI3165

- 20MB/sec. transfer rate
- Internal & external connectors

Adaptec

Phaser 850N Printer

Only
\$249.5!

Item #PR16084

- 14ppm color/1000 dpi
- Adobe PostScript Level 3
- 10/100Base-T
- ColorSync ready



Tektronix

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EPSON

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SAVE* \$70 when you buy them together!

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USB Floppy Drive

Available in 7 colors!

Only **\$84.95!**

Item #DR12164



Imation Mac Neon 3.5" Disk 10-pack, only \$5.90 (only 59¢ each), #MED0540



HP DeskJet 935c Color Printer

Only **\$199.95!**

Item #PR16225

• USB compatible only
• 9ppm blk; 7.5ppm clr • PhotoREt III technology
Black Ink Cartridge, only \$29.99, item #67208.



iMac USB Hubs



Graphite Hub Only
\$39.99! each

Item #VW57882

• Easily connect your USB peripherals to your iMac
• Other colors available, call for details

KEYSPAN

UMAX Astra 2100U Color Scanner



As low as **\$89.95!*** after rebate

Item #IN7925

UMAX

• 36-bit
• 600 x 1200 dpi optical resolution

*Price AFTER manufacturer's \$10 mail-in rebate. Before rebate: is \$99.95. Rebate coupon available at www.umax.com/rebate/umax, or call us at 1-800-390-0706 to request one. Offer expires 7/31/2000.

PAGE 4 OF 9

Cooler, Sleeker iMacs - Mixed

1 Apple iMac 350MHz Blueberry

Only **\$999!††**

Item #CPU1492 Lease It for \$29/mo.‡



- 350MHz PowerPC™ G3 processor
- 512K Backside Level 2 Cache
- 64MB of SDRAM (exp. to 512MB)
- 6.0GB Ultra ATA/66 Hard Drive



- 24x max. slot-loading CD-ROM
- Built-in 56K V.90 modem
- ATI RAGE 128 VR 2D/3D graphics accelerator with 8MB SDRAM (AGP 2X)
- Odyssey audio system from Harman Kardon
- 15" color display (13.8" viewable)
- 10/100Base-T Ethernet • 2 USB ports (12Mbps ea.)
- Support for AirPort 11Mbps wireless networking (antenna built-in; AirPort card optional)

2 Apple iMac DV 400MHz

Only **\$1299!** each



Lease It for \$38/mo.‡



Includes ALL the GREAT Features of the 350MHz Model - PLUS -

- 400MHz Processor • Slot-loading DVD drive
- Movie-making software • Two FireWire® ports
- 10.0GB Ultra ATA/66 Hard Drive

Blueberry:	Grape:	Strawberry:	Lime:	Tangerine:
Item #CPU1493	Item #CPU1494	Item #CPU1495	Item #CPU1496	Item #CPU1497

iDOCK 2 USB MULTIPOINT HUB



- Floppy drive
- Swivel Base
- 4 USB ports
- 2 Serial ports
- 1 ADB port

Only **\$259.99!**

Item #DEH4620

Includes 3.5 floppy drive!



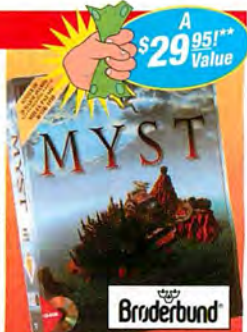
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*\$3.95 shipping and handling applies. Shipped in promotional packaging. Hurry! Offer good while supplies last.
†Value based on MacWAREHOUSE pricing as of this magazine printing.



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Only **\$49.95!**

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- Designed specifically for use with USB
- Fits the natural shape of your hand; ideal for right- or left-handed users • Manufacturer's 5-year warranty



KENSINGTON

HP DeskJet 970cse Printer



Only **\$399.95!**

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- 12ppm black • 10 ppm color
- PhotoRet III technology • USB compatible
- Black Ink Cartridge, only \$29.99, item #67208.



Sony Digital FD73 Mavica

Only **\$499.95!**

Ask for item #IN7834.

- 10x optical zoom • E-mail mode • 2.5" Color LCD • VGA resolution • Quick Access 2X Floppy Disk Drive • Picture effect • File copy/disk copy



740 Color Printer

after rebates, when
purchased with an iMac!

Ask for item #AAP1133

Sony • Canon • VST • Epson • Aladdin • Keyspan • Farallon • Microsoft • Intuit

3 different ways!

3 Apple iMac DV Special Edition

Only \$1499!



Item #CPU1498 Lease It for \$44/mo.*

- 400MHz PowerPC™ G3 processor
- 128MB of SDRAM (exp. to 512MB)
- ATI RAGE 128 VR 2D/3D graphics accelerator
- 13.0GB Ultra ATA/66 hard drive
- Slot-loading DVD-ROM drive
- Built-in 56K V.90 modem
- 15" color display (13.8" viewable)
- 512K Backside Level 2 Cache
- Harman Kardon Odyssey Audio System
- 10/100 BASE-T Ethernet
- Dual FireWire® ports
- Two 12Mbps USB ports
- Support for AirPort wireless networking (antenna built-in; AirPort card optional)
- Pre-installed iMovie software



Free!

after rebates, when purchased with an iMac! Ask for item #AAP1133.

EPSON Stylus 740 Printer

PLUS...

MacWAREHOUSE special offer!

Free!

64MB RAM Upgrade!
after rebate, when you purchase an iMac DV or an iMac DV Special Edition!
Ask for item numbers AAP1115 and INSTL10.
Installation fee required.

*Regular price: \$149.95-\$50 mfr's mail-in rebate=\$99.95. Receive additional \$99.95 mail-in rebate from MacWAREHOUSE with purchase of an iMac, Epson Stylus 740 Printer and iMac must appear on the same invoice. Rebate coupons available at www.warehouse.com/rebate/epson or call us at 1-800-390-0706 to request one. Free printer offer not valid on reconditioned iMac. Offer good while supplies last!

†Free 64MB RAM Upgrade AFTER MacWAREHOUSE \$100 mail-in rebate. Before rebate: \$129.95. Installation fee of \$29.95 required. Visit www.warehouse.com/rebate/macwarehouse for mail-in rebate coupon or call us at 1-800-390-0706 to request one. Offer not valid on purchase of 350MHz iMac, or any reconditioned iMac. MacWAREHOUSE reserves the right to terminate this offer at any time. Offer expires 7/15/2000.

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Includes:

- Word 98 • PowerPoint 98
- Excel 98 • Outlook Express.

Upgrade only

\$249.95!

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Microsoft Office 98 Full Version
BUS1150 \$419.95



EPSON STYLUS COLOR 740i PRINTER

- Blueberry cover standard
- 1440 x 720 dpi with smaller ink drops • 6ppm blk; 5ppm clr
- USB/Mac serial compatible

Only \$129.95!*

after \$50 rebate
Item #PR15063

*Price BEFORE manufacturer's \$50 mail-in rebate is \$179.95-\$50 rebate=\$129.95. Rebate coupon available at www.warehouse.com/rebate/epson/ or call us at 1-800-390-0706 to request one. Offer expires 7/31/2000.

Other color covers available for only \$14.95 each! Call for details.



Black Ink Cartridge: PA1582.....\$25.99

iomega 100MB USB Zip Drive



New Low Price!

Was \$129.95:
Now only
\$99.95!

Item #DR9464

Zip Disk sold separately.

iomega 100MB Zip Disks

as **\$8.99!** each,
low as in 20-pk.
20-pack (gray): only \$179.80, #BND3616.



EtherMac iMac iPrint Adapter with built-in PhoneNet!

Only
\$104.99!

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- Connects your iMac to LocalTalk printers and other Macs
- Easy plug-and-play installation
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Now only
\$1499.95!

Item #IN8176

- 12x Optical/48x Digital Zoom
- IEEE 1394 Terminal In & Out
- 2.5" LCD & Color Viewfinder

Canon

Quickbooks Pro 4.0

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\$179.95!

Item #FIN1007

- Timesheet functions
- Generates customizable estimates
- Automated job costing
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Intuit

Adobe LiveMotion



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\$289.95!

Item #COM1340

- Create professional web graphics and animation



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Apple • Newer Technology • SONY • Imation • 3Com US Robotics • Belkin

\$50 UPGRADE REBATE! Norton Utilities 5.0**Upgrade only \$49.95!**

Item #UT11546

- Prevents computer disasters
- Speeds recovery from emergencies

*Price BEFORE rebate is \$99.95. Rebate applies to owners of previous versions of Norton Utilities for Mac and Norton AntiVirus for Mac. Rebate coupon in box.

USB to Serial**Only \$59.99!**

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- Connect serial modems, digital cameras, graphic tablets, printers, and PDAs
- Supports either the Mac modem or printer port

**Palm VII Connected Organizer with Free Serial Kit****Only \$449!**

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Features Web Clipping to retrieve stock quotes, and other Internet* information.

*Internet access requires activation and a monthly Palm. Net service fee. Service provided by 3Com. See coverage maps for 260 Metropolitan areas at www.palm.net.

Olympus D-360L**1.3 MEGAPIXEL!****Only \$299.95!**

Item #IN8569

- 2x digital zoom • 8MB Smartmedia card included
- 1.3 Megapixel • 1.8" Ultra-bright color LCD

SupraExpress V.90 56K* Modem**Only \$78.99!**

Item #DMD3503



- 56K ITU Standard
- 230Kbps throughput
- Voicemail/Caller ID

*Capable of receiving data up to 56Kbps. Actual send and receive speeds may vary.

PAGE 6 OF 9

HP LaserJet Printers

As low as

\$789.95!

Black Toner Cartridge (2100): Item #PA1871, only \$89.99

HP LASERJET 4050N**Only \$1499.95!**

Lease It for \$43/mo.*

Item #PR14947

- Prints 17ppm
- 1200 dpi max. res.
- 100MHz RISC processor
- Ethernet 10/100Base-TX

Black Toner Cartridge (4050): Item #PR13025, only \$85.99

HP LASERJET 5000N**Only \$2079.95!**

Lease It for \$60/mo.*

Item #PR13443

- Prints 16ppm
- Up to 1200 dpi max. res.
- Prints sizes 3"x5" thru 11"x17"

Black Toner Cartridge (5000): Item #PR13742, only \$139.99

HP LASERJET 2100M

- Prints 10ppm
- 1200 dpi resolution
- HP PostScript Level 2
- LocalTalk connectivity

Item #PR14691



HP LaserJet 2100 shown.

HP LASERJET 8100N

- Prints 32ppm • 1200 dpi

Item #PR14315

Lease It for \$86/mo.*

\$2969.95

Black Toner Cartridge (8100): Item #PA1662, only \$178.99

HP COLOR LASERJET 8550N

- Prints 24ppm blk/6ppm color • 600 dpi

Item #PR16146

Lease It for \$164/mo.* **\$5759.95**

Black Toner Cartridge (8550): Item #PA1644, only \$109.99

MAC OS 9.0.4**Only \$99.95!**

Item #SYS1068

Features you'll love!

- Sherlock 2: Easily find people, news, and shopping on-line!
- Easy-to-use, functional interface
- Additional FireWire® and USB support
- Compatibility with popular search engines such as AltaVista, CNET, Excite, Infoseek, and Lycos
- Plug-ins that search popular sports, financials, and news sites such as CNN and ESPN
- Ability to search multiple shopping and e-commerce sites at the same time
- Built-in Open GL for accelerated 3-D graphics and an improved gaming experience

*Shipped in promotional packaging. While supplies last.

**Tools is a bonus to Macintosh® users running the Mac OS 9.0 or 9.0.4 operating system, and can be accessed at www.apple.com. See box for details.



PLUS... FREE SOFTWARE BUNDLE!
Including Spring Cleaning and many other software titles, with the purchase of Mac OS 9.0.4. Ask for item #AAA1043.

**SONY G500 21" MONITOR****SONY**

- 21" screen (19.8" viewable image size)
- .24 aperture grille
- 2048 x 1536 @ 75Hz with adapter

Only \$1179.95!

Item #MON1041

**IOmega 100MB ZIP DISKS**

FREE
Zip Storage Tower
when you buy any
Zip Disk 10-pack!
While supplies last.
Item #AA1780.

New Low Price!
\$8.99!
each, in 20-pack

Item #BND3616

- 100MB Zip Disk Gray (20-pack) BND3616 \$179.80
- 100MB Zip Disk Color (10-pack) BNS265 \$99.95

**TDK Allspeed CD-Rs****Only 85¢ each, in 150-pack spindle**

Ask for item #ME7492

- 74 min.
- 650MB

TDK**3Com U.S. Robotics 56K* V.90 FaxModem****Only \$99.99!**

Ask for item #DMD3448.

- Manufacturer's lifetime warranty
- *Capable of receiving data up to 56Kbps. Actual send and receive speeds may vary.

**Ink cartridges for Epson Stylus Color 740/740i/760/860/1160****4-pack+1 FREE****As \$18.99! each, in 4-pack**

Black: Item #PA2315 \$75.96
Color: Item #PA2317 \$75.96



FREE*
InkJet Cartridge
with the purchase of an
inkjet cartridge
4-pack.

WAREHOUSE.com up to 500MHz!

CALL FOR A
FREE
FULL-COLOR
CATALOG!



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500MHz PowerBook G3s!

- Up to 500MHz PowerPC G3 processor
- Up to 128MB PC100 SDRAM (expandable up to 512MB)
- DVD-ROM drive
- Up to 12.0GB Ultra ATA/66 hard drive
- 56K V.90 modem
- 1MB Backside Level 2 Cache
- 14.1" active-matrix display
- Support for optional AirPort card for wireless connection to your network or the Internet
- Two 400Mbps FireWire® ports
- Two 12Mbps USB ports

PowerBook G3/400MHz processor

- 64MB SDRAM • 6.0GB Ultra ATA/66 HD • DVD-ROM
- 2 FireWire® ports

Item #CPU1580 **\$2499**

Business Lease for \$73/mo.*

PowerBook G3/500MHz processor

- 128MB SDRAM • 12.0GB Ultra ATA/66 HD
- DVD-ROM • 2 FireWire® ports

Item #CPU1581 **\$3499**

Business Lease for \$102/mo.*

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FREE!
64MB RAM
UPGRADE!

after rebate, when you purchase
an Apple PowerBook!
Ask for item numbers #AAP1124
and INSTL10. Installation fee
required.

120MB USB SuperDisk Drive

Only
\$149.99!

Item #DRI3350



- Reads and writes 3.5" floppies
- USB & Hot-Swappable

120MB SuperDisk Media 10-pack, only \$99.90 (only \$9.99 ea.), #BND3239.

IMATION

Targus Universal Notebook & Printer Case

Only
\$69.95!

Item #AC28478



- Two individual padded compartments that measure 11"x 13"x 2.5"

PowerBook G3 Battery

As low as
\$139.95!

Item #ACC3728



- Lithium-Ion
- ACC3728 (fits new 1999/2000 models), only \$139.95
- ACC3307 (fits 1998 models) shown, only \$199.95

Farallon FastEther 10/100 Adapter

Only
\$45.99!

Item #DEC3194



- 10 times the bandwidth of 10Base-T Ethernet.
- Auto-negotiate to achieve maximum speed or backward compatibility with older devices.

Fast Ether TX 10/100 PCI Ethernet Card 5-Pack, only \$219.99, item #DEC3195.

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Add FireWire to your PowerBook G3!

Only
\$119!

Item #DRI3505



Fits in CardBus slot

SPECIAL EDITION iBOOK

- 366MHz PowerPC G3 processor
- 64MB SDRAM • 56K modem
- 6.0GB Ultra ATA/66 hard drive
- 24X max. variable CD-ROM
- Integrated ATI RAGE Mobility 2D/3D Graphics Controller with 2X AGP
- Supports AirPort™ wireless networking (Airport Card and Base sold separately)

Only
\$1799!

Lease it for \$52/mo.*

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64MB RAM!
after rebate. Installation fee
required. Ask for item
numbers #AAP1113 and
INSTL10.



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graphite
color!

300MHZ iBOOK G3

- 300MHz PowerPC G3 processor
- 64MB SDRAM • 56K modem
- 6.0GB Ultra ATA/66 hard drive
- 24X max. variable CD-ROM
- Integrated ATI RAGE Mobility 2D/3D Graphics Controller with 2X AGP
- Supports AirPort™ wireless networking (Airport Card and Base sold separately)

Only
\$1599!

Lease it for \$47/mo.*

Blueberry: #CPU1577 Tangerine: #CPU1578

FREE
64MB RAM!
after rebate. Installation fee required.
Ask for item numbers
#AAP1113 and
INSTL10.



Cool
graphite
color!

POWERBOOK G3 PC100 MEMORY

- New PC100 100MHz memory upgrades for 400MHz and 500MHz G3's

128MB PowerBook G3 Memory

\$249.95!

each

Item #CHP1065

Memory prices subject to change.



AIRPORT CARD & STATION

- Transmits up to 150 feet
- Speeds up to 11MB per second

AirPort Card for iBook, only

\$99!

Item #DEC4142

AirPort Base Station for iBook (shown) Item #DEB2777 \$299



Wireless
Internet
Access!

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Call by Midnight (E) for Overnight delivery!



NEW! Adobe Illustrator 9.0

Apple • 3Com • Global Village • Maxell • Mitsubishi • Iomega • Microtek

Olympus C-2020 Digital Camera

New Low Price!
Was \$899.95:
Now only
\$699.95!

Item #IN8346

- 2.1 Megapixel
- 3X optical zoom • 1600 x 1200 ppi resolution
- QuickTime movie mode (up to 60 seconds)

Olympus P330 Stylus Photo Printer, ask for item #PR14784, only \$399.95

OLYMPUS

4 "AA" NiMH Batteries, Remote, and 8MB Card Included!



64MB SmartMedia Cards

Only
\$159.95!

Item #MY12482

- Digital film for digital cameras
- Compatible with new digital cameras with SmartMedia slot



Microtek ScanMaker 4

Only
\$599.95!

Item #VW60199

- 36-bit color
- 600 x 1200 dpi
- Built-in transparency & slide bay
- 8.5" x 14" scanning area

Snaptrans templates included in Box!

MICROTEK



PowerUser 12X 80Min CD-Recordables



Only
59¢ ea.
(in 50-pack, only \$29.50)

POWER USER

Item #BN7717

Palm IIIc Connected Organizer

FREE Serial Kit Included!

Only
\$449!

Item #BND3825

- 8MB of memory
- Color Active-Matrix Display



PAGE 8 OF 9



Apple 350MHz iMac

Only **\$899!***

Item #RCPU1492

WHILE SUPPLIES LAST!

RECONDITIONED

Blueberry, shown.

- 350MHz PowerPC G3 processor
- 64MB SDRAM (512MB max.)
- 6.0GB Ultra ATA/66 HD
- 24X max. variable CD-ROM
- 56K modem
- 15" color monitor (13.8" viewable)
- 512K Backside Level 2 Cache
- 10/100 Base-T Ethernet
- Two USB ports



*Reconditioned system. Reconditioned computers may not include original application software. 90 day parts and labor warranty. All sales final. While supplies last. Free memory and printer offers do not apply.



Apple iMac 400MHz DV

Only **\$1149!*** ea.

- 400MHz • 64MB SDRAM • 10.0GB Ultra ATA/66 HD
- DVD-ROM • 56K modem • 15" monitor (13.8" viewable)
- Two Firewire Ports • iMovie Software
- Two USB Ports



Blueberry: #RCPU1493 Grape: #RCPU1494
Lime: #RCPU1496 Strawberry: #RCPU1495
Tangerine: #RCPU1497

Apple iMac DV Special Edition

- 400MHz • 128MB SDRAM • 13.0GB Ultra ATA/66HD
- DVD-ROM • 56K modem
- 15" monitor (13.8" viewable)
- iMovie Software

Graphite only
\$1299!*

Item #RCPU1498

*Reconditioned system. Reconditioned computers may not include original application software. 90 day parts and labor warranty. All sales final. While supplies last. Free memory and printer offers do not apply.

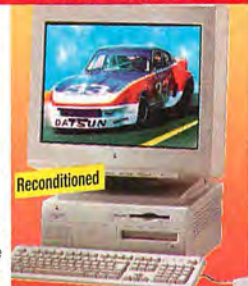
POWER MAC 7200/90MHZ

- 90MHz PowerPC 601 processor
- 16MB RAM • 500MB HD
- 4X max. variable CD-ROM
- 3 PCI Slots

Only
\$399!*

Item #RCPU1471

*Reconditioned system. Reconditioned computers may not include original application software. 90 day parts and labor warranty. All sales final. While supplies last. Monitor and keyboard not included. Free memory offer does not apply.



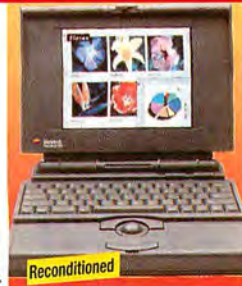
PowerBook 180C 33MHZ

- 33MHz 68030 Processor
- 14MB RAM • 160MB HD
- 14.4K modem • 8.4" Active Matrix color display

Only
\$399!*

Item #RCPU1273

*Reconditioned system. Reconditioned computers may not include original application software. 90 day parts and labor warranty. All sales final. While supplies last. Free memory offer does not apply.



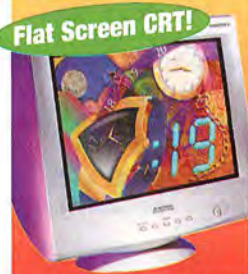
DIAMOND PRO 900u 19" MONITOR



- 1600 x 1200 @ 75Hz
- 18" viewable image size
- .25 aperture grille
- Manufacturer's 3-year warranty

Only
\$637.95!

Item #MON0765



VIEWSONIC P810 21" MONITOR



- 21" monitor (20" viewable image size)
- 1800 x 1440 @ 73Hz
- .25mm dot pitch

Only
\$809.95!

Item #MT3320



FREE* Jaz cartridge carry case with 3 pack purchase. #AA1753

Jaz 2.0GB Cartridges

Only **\$99.95!** each, in 3+ quantity

Ask for item #MED0508.

Quantity: 1-2 \$99.95 ea. 3+ \$99.95 ea.

*Limit 1 per customer. While supplies last. Ask for item #AA1753.



Epson ELP 5700i Laser Printer**

Only **\$349.95!***

Ask for item #PR15675.

*8ppm • Up to 1200 dpi • USB compatible only
Price BEFORE mfr's mail-in rebate is \$399.95 - \$50 rebate = \$349.95. Rebate coupon in box. Offer expires 6/30/2000.

**Optional blueberry or grape cover available. Redeem through mfr's mail-in coupon in box. Toner Cartridge, only \$89.95, item #PA2603



MacSense XRouter Cable/DSL Internet Sharing Hub

Only **\$194.99!**

Ask for item #DEB2557.

- Supports Mac, PC and Unix
- Built-in 4-port 10Base-T hub
- Connect up to 250 users using one ISP account and a cable/DSL modem



WAREHOUSE.com

Upgrade for as low as \$149^{95!}

Item #UPG1248

CALL FOR A **FREE**
FULL-COLOR
CATALOG!



Olympus • Epson • ATI • ViewSonic • Sony • Adobe • Macromedia

NEW VERSION! Adobe Illustrator 9.0

Upgrade only **\$149^{95!}**
Item #UPG1248

- Unlimited transparency capabilities
- Live object and layer effects
- Comprehensive layer management
- Superb integration with other Adobe programs

Illustrator 9.0 Full Version **\$389⁹⁵**
Item #GRA3325

Adobe Photoshop 5.5

Adobe Photoshop 5.5 Upgrade **\$179⁹⁵**
Item #UPG1049

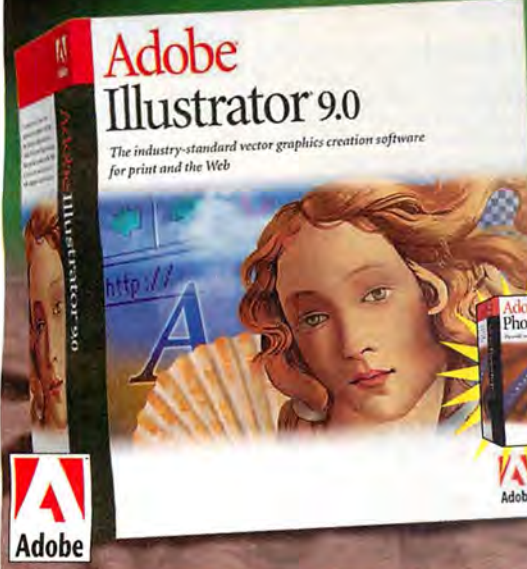
Adobe Photoshop 5.5 (Full Version) Item #GRA2951 **\$599⁹⁵**

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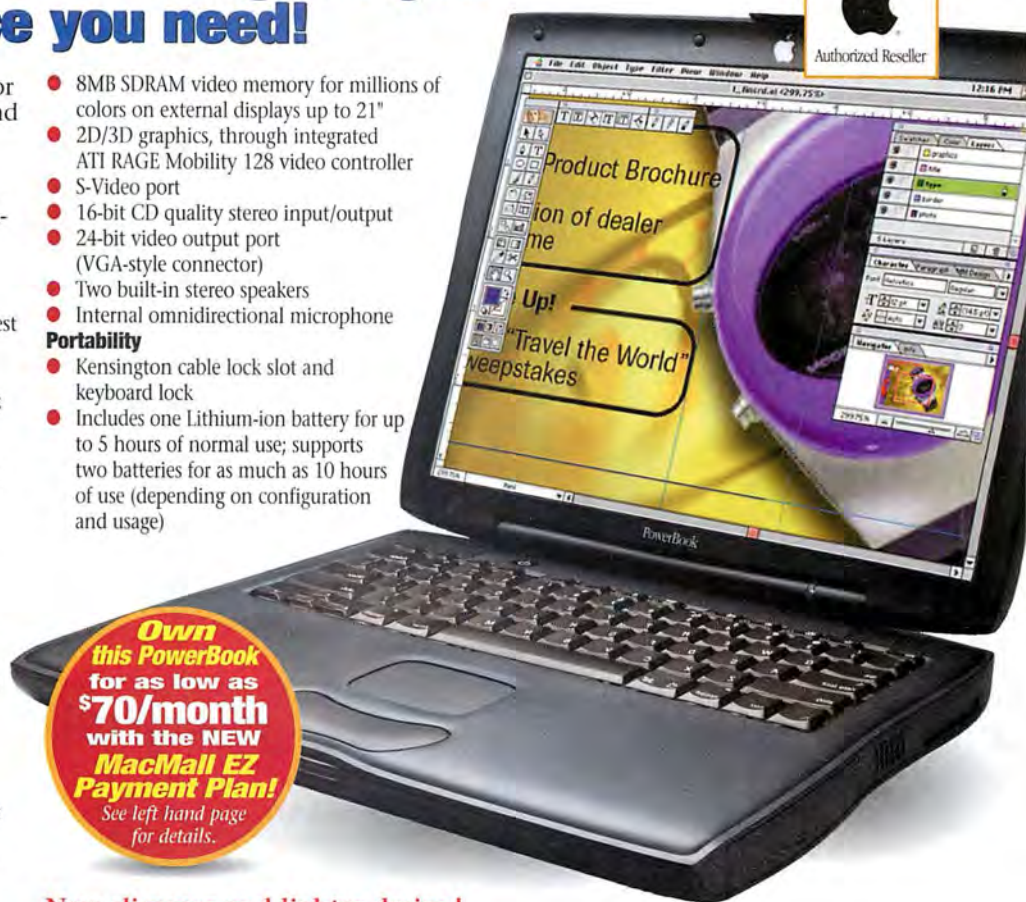
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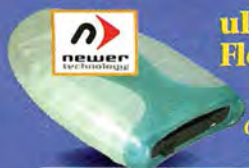
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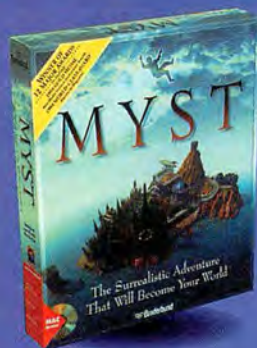
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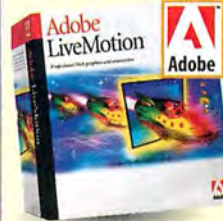
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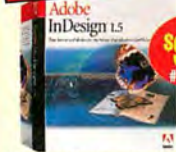
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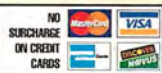
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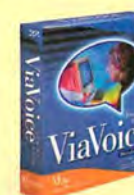
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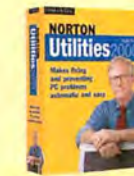
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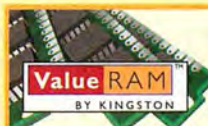
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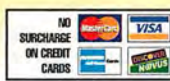
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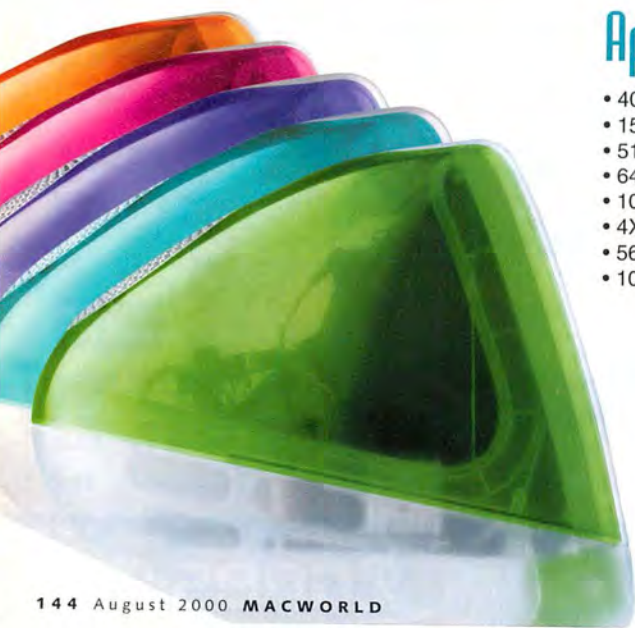
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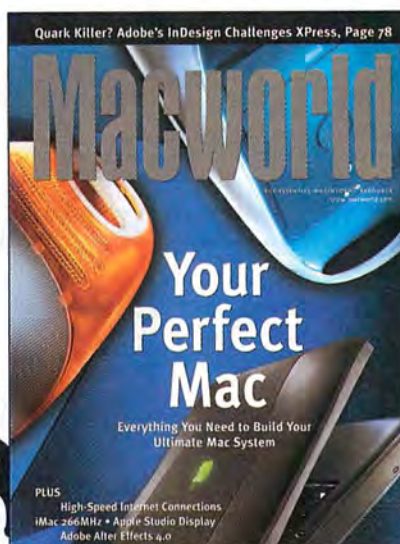
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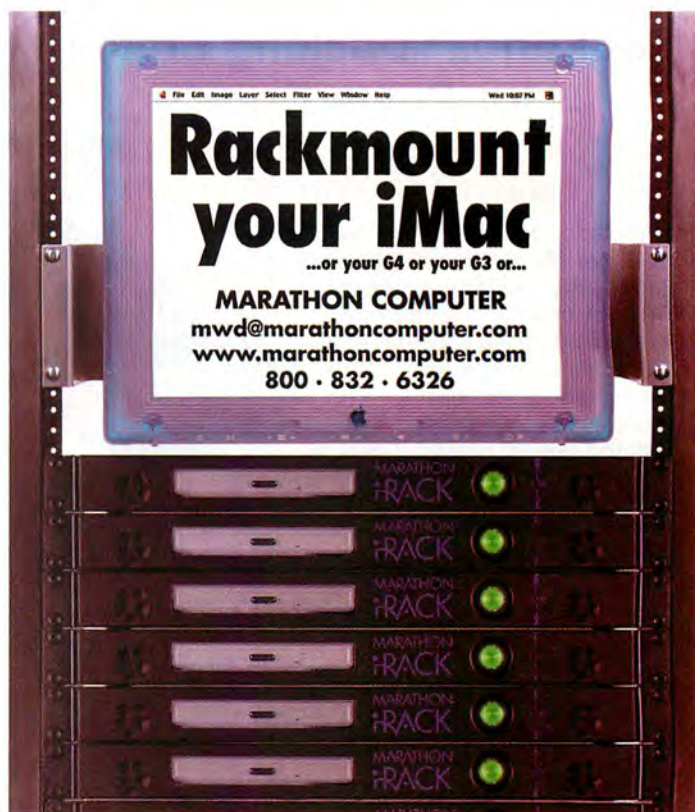
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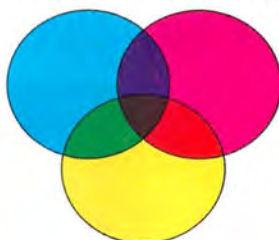
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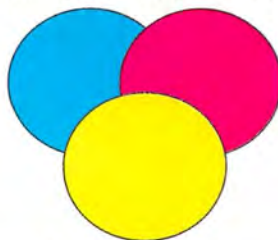
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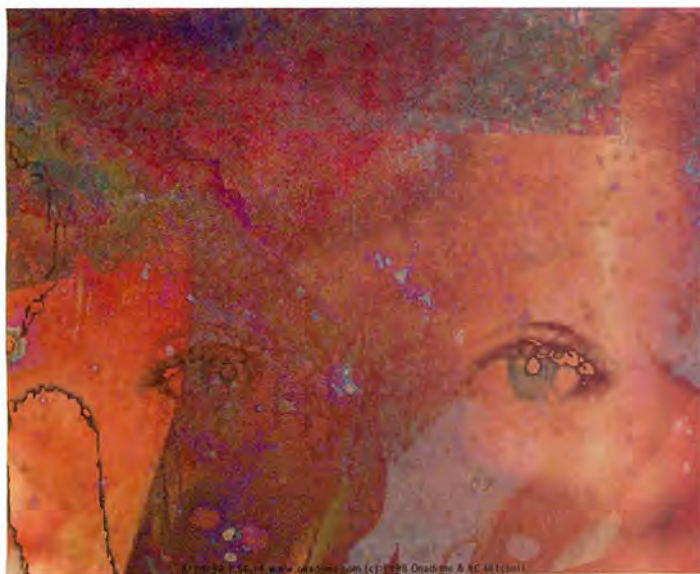
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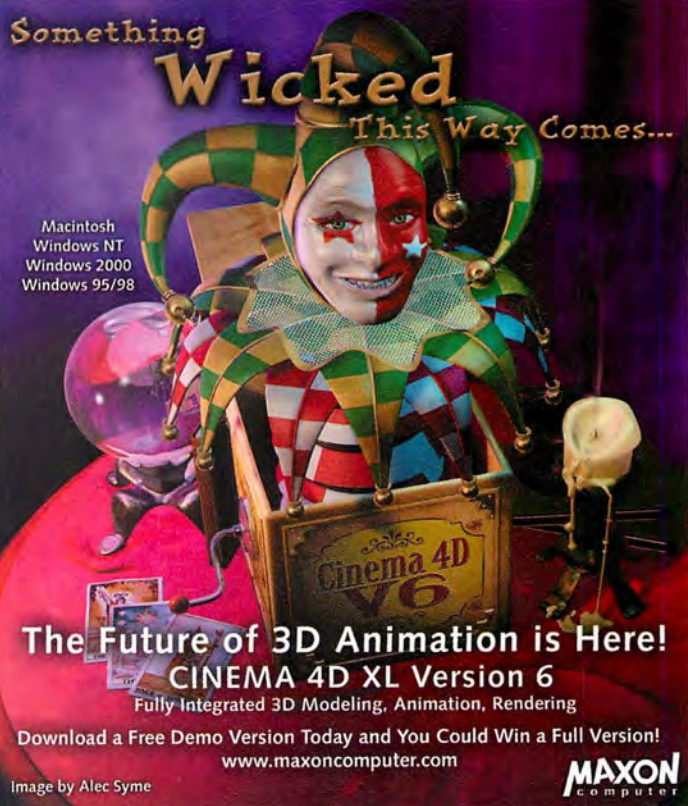


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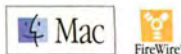


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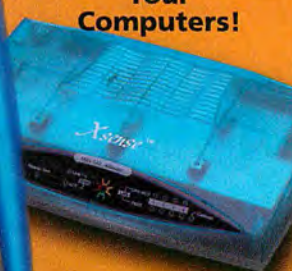
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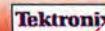
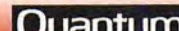
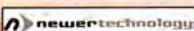
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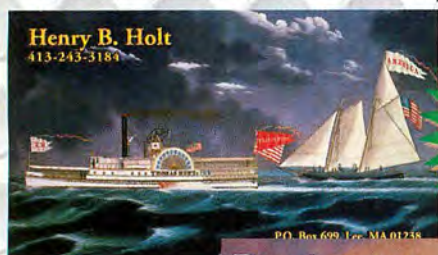
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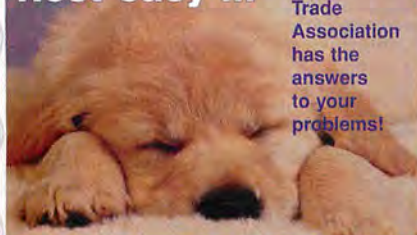


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The Desktop Critic

by David Pogue

The Dawn of a New Error

WHAT DO APPLE'S ERROR MESSAGES HAVE AGAINST PRONOUNS, ANYWAY?

UPON MARRYING A surgeon, I discovered a surprising characteristic of doctors: When writing professionally, they write exclusively in *passive voice*: "The patient was examined," not "I examined the patient"; "The wound was cleaned and dressed," not "We cleaned and dressed the wound"; and so on. It's as though 12 years of English class had never happened.

Imagine, then, the sense of irony I feel on realizing that exactly the same phenomenon haunts my other marriage—to the Mac. The otherwise elegant Mac OS is one giant, seething mass of awkward, passive-voice messages: "The document could not be printed"; "A folder cannot be replaced by a file"; and the immortal "The command could not be completed, because it could not be found."

Apple's problem: It's afraid to use *pronouns*. It doesn't want the computer, an inanimate object, to call itself "me" and you "you." Maybe avoiding "I" and "me" is Apple's way of ducking blame; maybe the programmers think that if they write "AppleTalk could not be opened" instead of "I couldn't open it," it won't occur to us that the computer caused its own problem.

Apple's writers twist themselves into knots trying to avoid pronouns, but there's simply no elegant way to do it. Sometimes they give up and just *omit* the I-word, resulting in a crude shorthand: "Could not update the settings." Unfortunately for them, God put pronouns on this earth for a reason; trying to write error messages that never refer to either you or the computer is like trying to write a novel without ever using the letter *e*.

It doesn't have to be this way. Plenty of error messages in other programs include pronouns with great success, and even manage to be entertaining. The

C Compiler in MPW (a Macintosh programming tool kit) gives you messages like this: "You can't modify a constant, float upstream, win an argument with the IRS, or satisfy this compiler." Or this: "Type in (cast) must be scalar; ANSI 3.3.4; page 39, lines 10-11. (I know you don't care, I'm just trying to annoy you.)" Or how about "This label is the target of a *goto* from outside of the block containing this label AND this block has an automatic variable with an initializer AND your window wasn't wide enough to read this whole error message."



Whoever wrote Eudora has a similar sense of humor. Its famous error messages include "That pesky MacTCP is acting up again" and "Memory is tight—Live Dangerously." Now, honestly, wouldn't you like the Mac OS a lot better if it exhibited that much personality? Not only would you not *mind* having encountered a glitch, you'd actually kind of *like* it.

Oh, all right, I know hell will freeze over before Apple writes funny error messages into the Mac OS. And Apple certainly does better than Microsoft, whose

error messages sometimes lie outright. (Double-click on the CD-ROM icon when you don't have a disk inserted, and you're told that "The device is not ready.")

But I know a way Apple could fix its error-message problem without soiling its shiny corporate shoes: adopt an error-message philosophy like that of Citibank. It's worth standing behind a total stranger at a Citibank cash machine just to read the messages, which sound like a particularly worshipful butler. "Hello—how may I serve you?" it says when you first sign in. When you sign off, it says, "Thank you.

It's always a pleasure to serve you." And if you get your password wrong, it takes the blame: "I'm sorry, I don't recognize that password"—not "That's not the right password, you idiot!"

Well, we *know* it's just an inanimate piece of software—but darn it, you walk away from that cash machine with a spring in your step. You feel good about yourself, having given that little machine a chance to take pride in a job well done. Apple thinks people love their Macs *now*? If it introduced pronouns and a little bit of humility into its error messages, people would not just love their Macs—they'd prostrate themselves in a religious frenzy.

Only one solution would make a better fit with Apple's artistic sensibility: to write all error messages in *haiku*. In 1996, Salon.com's contest to write haiku error messages showed us just how much better the world would be if error messages went along the lines of this one by reader David Dixon:

Three things are certain:

Death, taxes, and lost data.

Guess which has occurred. m

DAVID POGUE (www.davidpogue.com) is the author of *Mac OS 9: The Missing Manual* and *iMovie: The Missing Manual* (Pogue Press, 2000).

PETER HONEY

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