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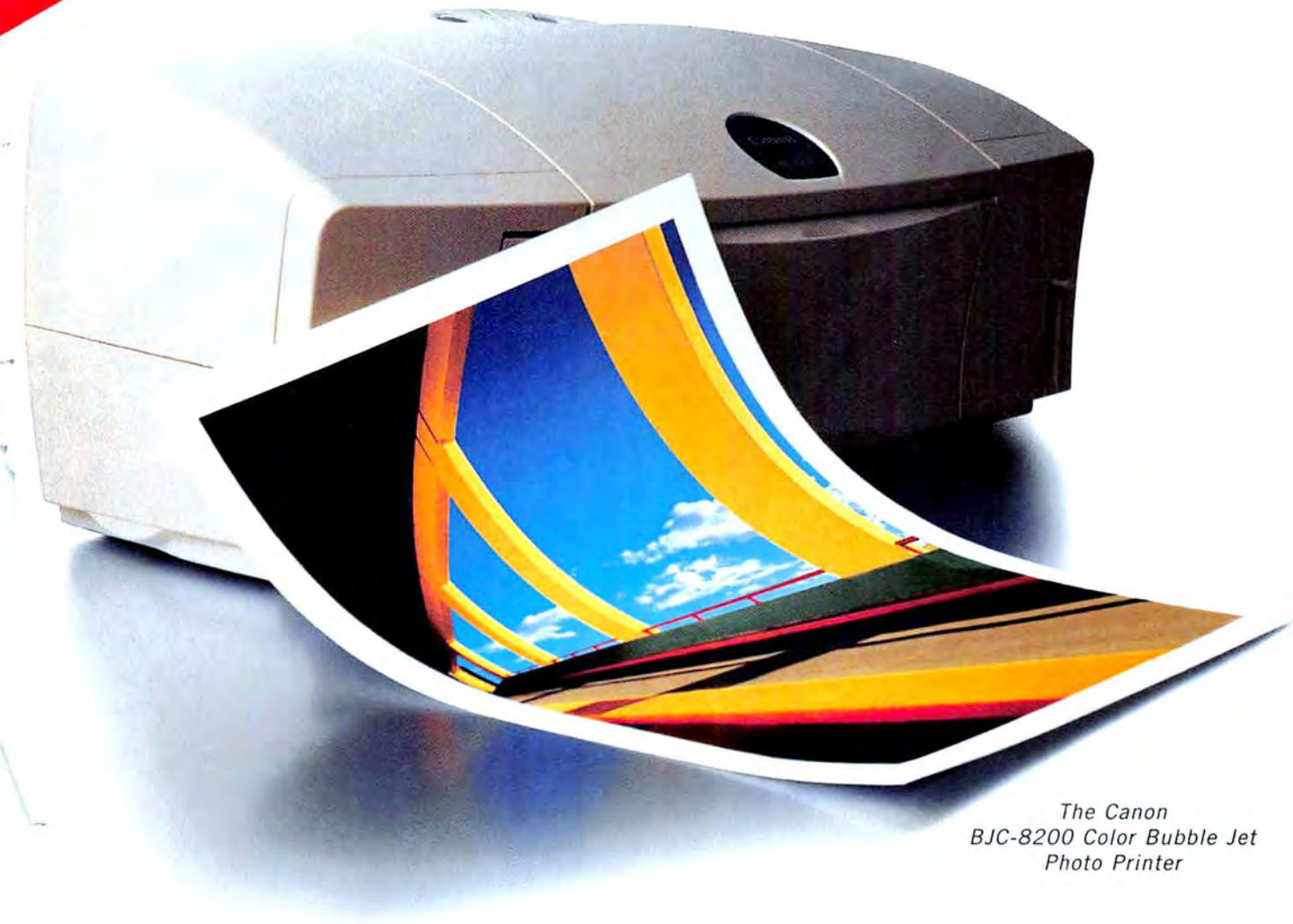

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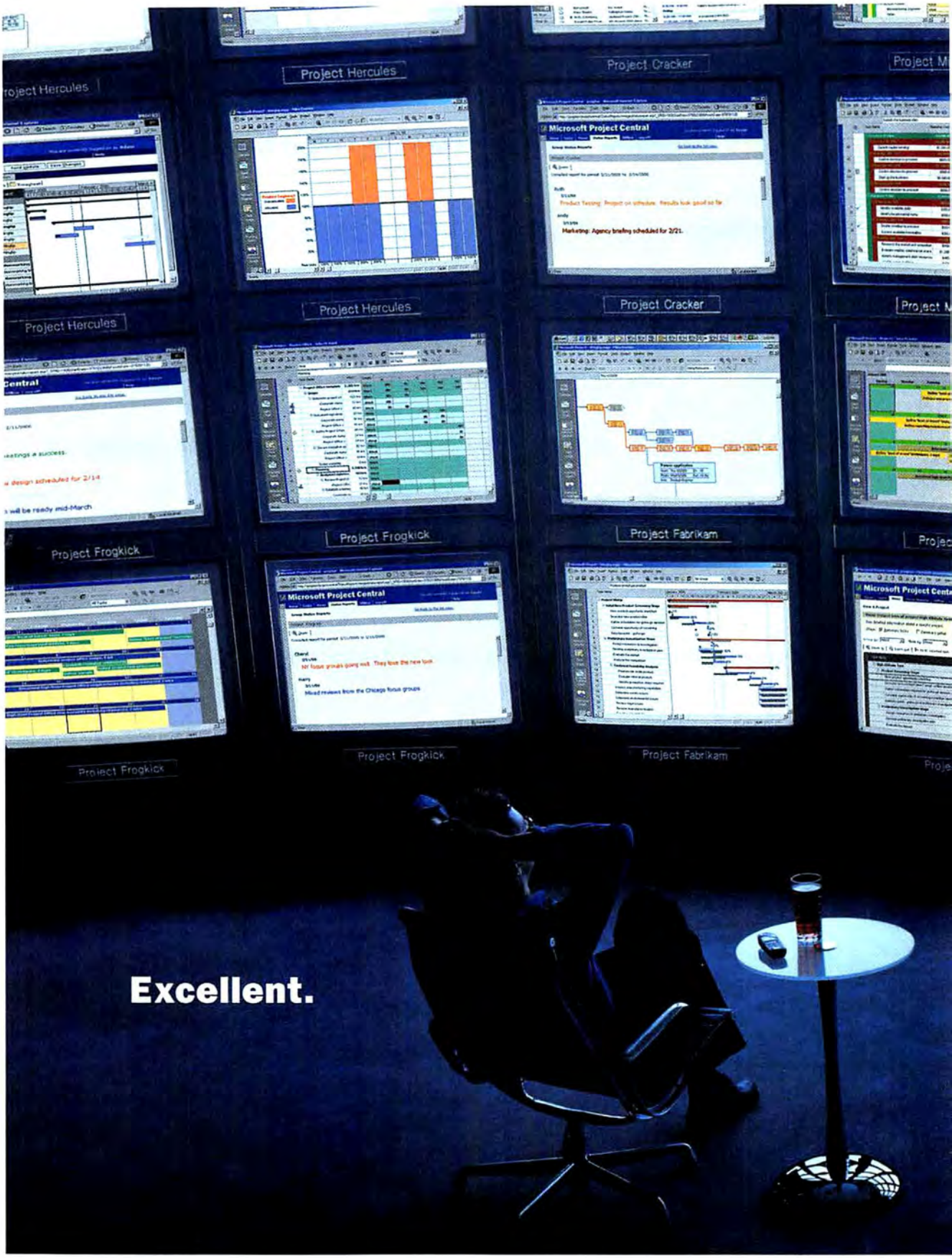

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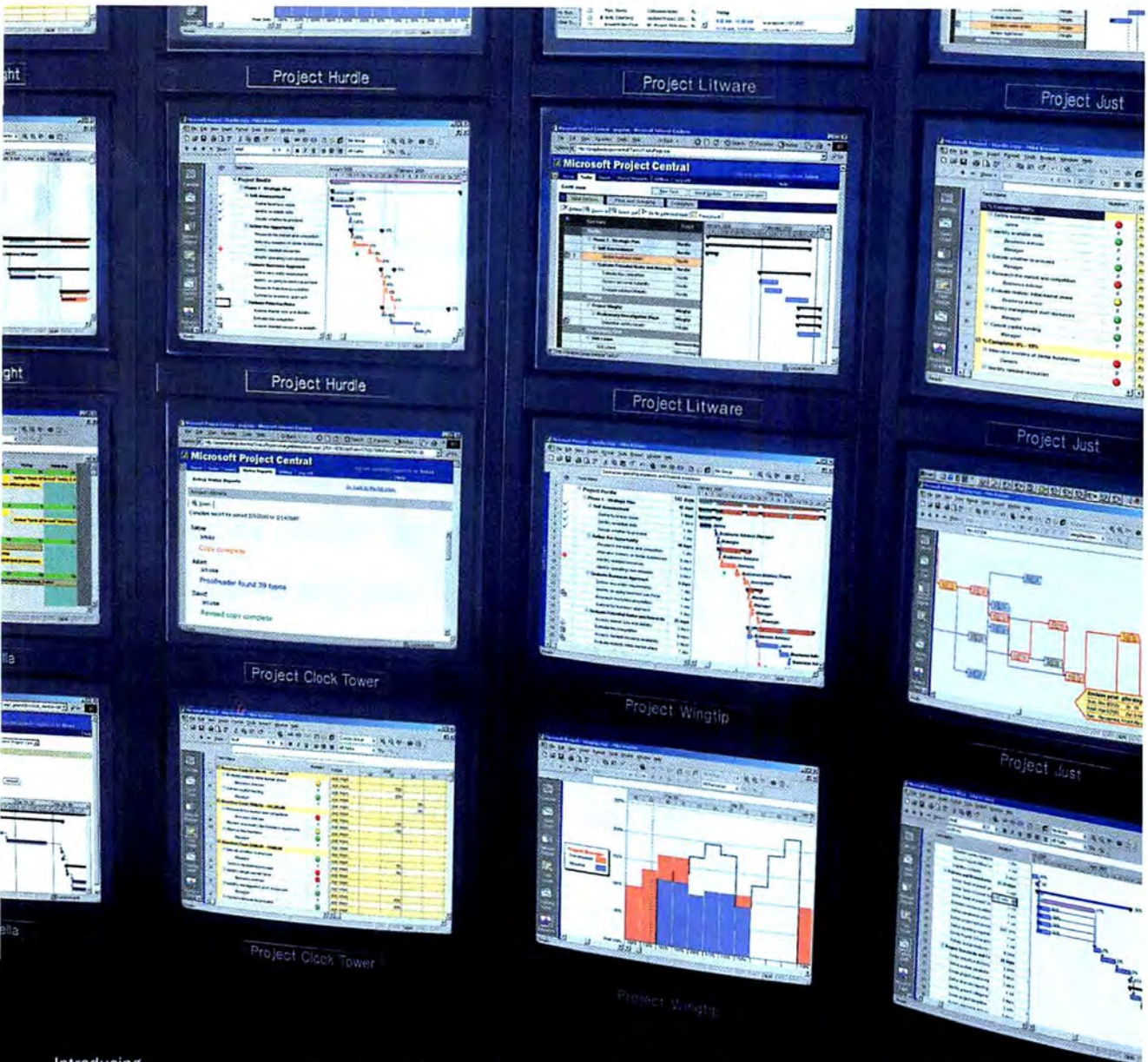

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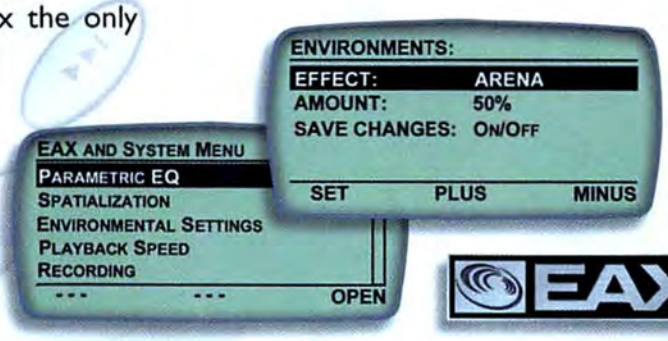

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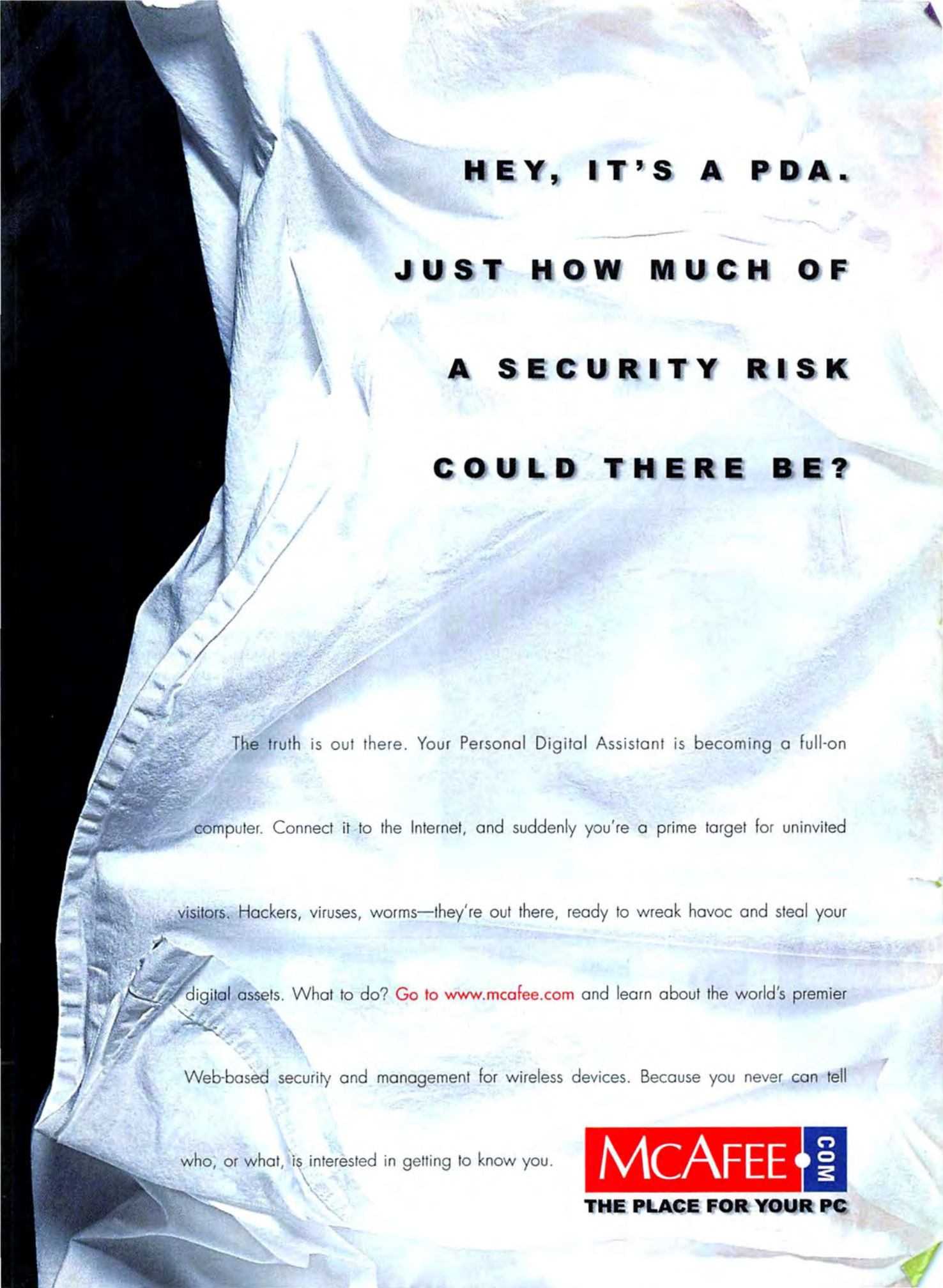
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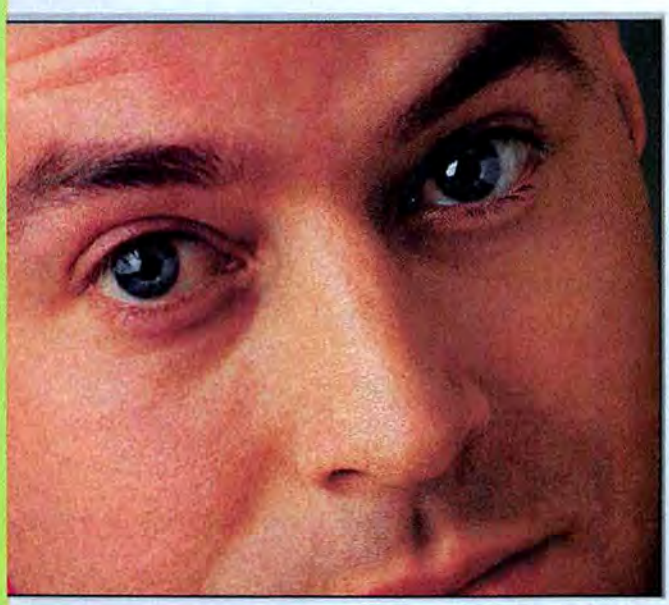

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119 THE PC AND BEYOND

Tomorrow's forecast: Holographic pictures on your head-mounted display and stock fluctuations on your two-way wrist PC. Meanwhile, new-wave desktops of today abandon regulation khaki for a parade of unconventional colors and designs. We check out the tricks and treats in store for PC users who think outside the box.

135

120 SLIM & SEXY

TODAY'S PCs From the inside out, PCs are shedding their staid old image. You can say bye-bye to beige-box blahs—but do you want to? We test the mold-breakers: legacy-free models with bold new looks, and simple Internet appliances.

135 2010: A PC ODYSSEY

FUTURE PCs Ten years from now, will you have a PC? If so, what will it look like, and how will it work? We asked research-lab experts where the PC is going—and got surprising answers.

FEATURES

148 THE ULTIMATE WIRELESS BUYERS GUIDE

WIRELESS Telephony options, from wireless phones to calling plans to service providers, abound. You can even go online by cell phone. But which choice is best for you? We uncover the coolest phones and the best deals to help you make the call.

167 HASSLE-FREE BACKUPS

HOW-TO If you don't have a backup plan to cope with a hard drive disaster, you're living dangerously. Our survey will help you devise the right strategy, whether it involves a tape drive, a CD-RW or DVD-RAM drive, or an online backup service.

181 GOING...GOING...GOTCHA!

ONLINE AUCTIONS The Web's anonymity makes using an auction site riskier than going to an old-fashioned brick-and-mortar auction house. Here's a rogue's gallery of tricks and scams, plus tips for safe buying and selling.

Additional material available online at www.pcworld.com

TOP OF THE NEWS

58 **NEW TOOLS FOR SMART BUYERS**
New programs and services instantly find top consumer and B2B bargains—and leave older shopping bots clanking in their wake.

63 **LOW-COST INK JETS GET TO WORK**
You've seen performance this good before, but never at such affordable prices.

66 **BEYOND 1 GIG: THE LATEST CPUs**
AMD and Intel take their duel into the stratosphere with 1.1- and 1.13-GHz chips.

68 **WINDOWS AFTER 2000 AND ME**
We scrutinize a pre-beta of next year's OS. Does it portend a harmonic convergence?

72 **ONLINE GAMBLING SHOWDOWN**
Congress takes a strong interest in the Internet's unregulated, untaxed gambling sites.

NEW PRODUCTS

92 Eizo FlexScan L330, Philips 150P, and Sony SDM-N50PS flat-panel monitors; AAA Map'n'Go; Intel InBusiness Small Office Network; Intuit Quicken 2001 Deluxe and Microsoft Money 2001 Deluxe; RaveMP 2300; Philips MMS205 speakers; and more.

HERE'S HOW

224 **WINDOWS TIPS**
Slob-proof backup procedures; print documents from the Start menu.

228 **ANSWER LINE**
Delete files safely, and recover them easily; password-protect folders.

235 **INTERNET TIPS**
All about Windows Media Audio (is it better than MP3?); bookmark transfers.

238 **WORD PROCESSING**
Browse in a twinkling, type with your mouse, explore a hidden toolbar.

240 **HARDWARE TIPS**
Make room for data: Use Win 98's Disk Cleanup, shrink cluster size.

244 **UPGRADE GUIDE**
Install RAM modules, step-by-step.

RESOURCES

16 **HOW TO CONTACT PC WORLD**

21 **COMING UP**

247 **MAIL-ORDER SHOPPING GUIDE**

251 **PC WORLD MARKETPLACE**

270 **ADVERTISER INDEX**

58

244

92

198

TOP 100

198 **THE QUICK AND THE LIGHT**
Power to the peregrinating people: 6-pound laptops with PIII-650 speed.

200 **TOP 10 POWER PCs**

204 **TOP 10 MIDRANGE PCs**

208 **TOP 10 BUDGET PCs**

212 **TOP 15 NOTEBOOK PCs**

214 **TOP 15 HOME PCs**

217 **TOP 10 COLOR LASER PRINTERS**

219 **TOP 10 21- AND 22-INCH MONITORS**

221 **TOP 10 GRAPHICS BOARDS**

223 **TOP 10 CD-RW DRIVES**

DEPARTMENTS

21 **UP FRONT**

27 **LETTERS**

35 **CONSUMER WATCH**
Software that works only if you register it.

43 **ON YOUR SIDE**
How do you restore a preinstalled app?

45 **WEB SAVVY**
Harry McCracken explores virtual drives.

51 **HOME OFFICE**
Webcam enthusiast Steve Bass gives new meaning to the phrase "Watch the birdie."

55 **BUGS AND FIXES**
Trouble with e-mail programs; Windows 2000 Service Pack 1.

272 **FULL DISCLOSURE**
Buzzards, go home—reports of the PC's death are greatly exaggerated.

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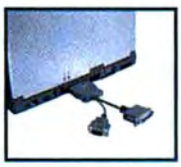

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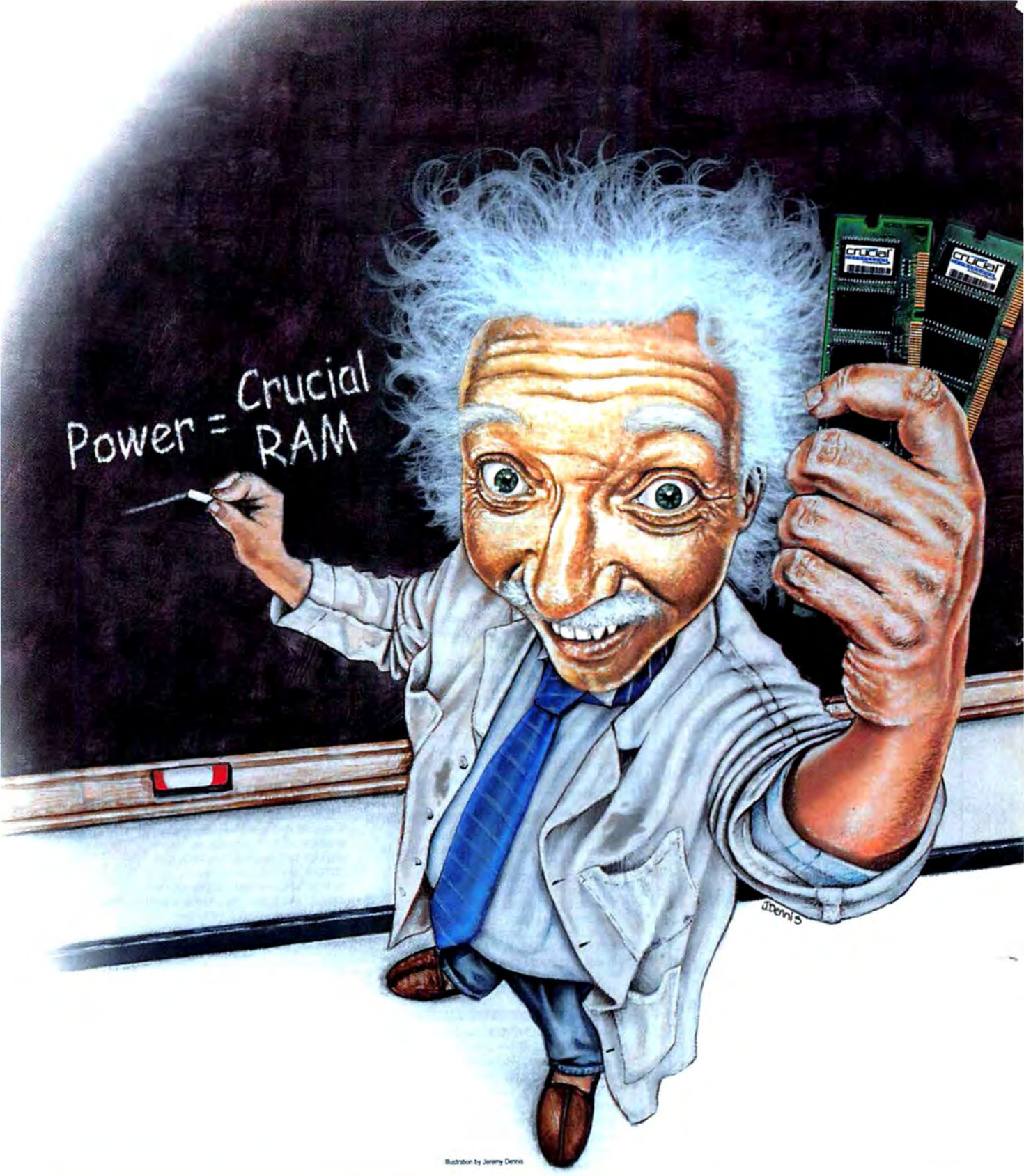

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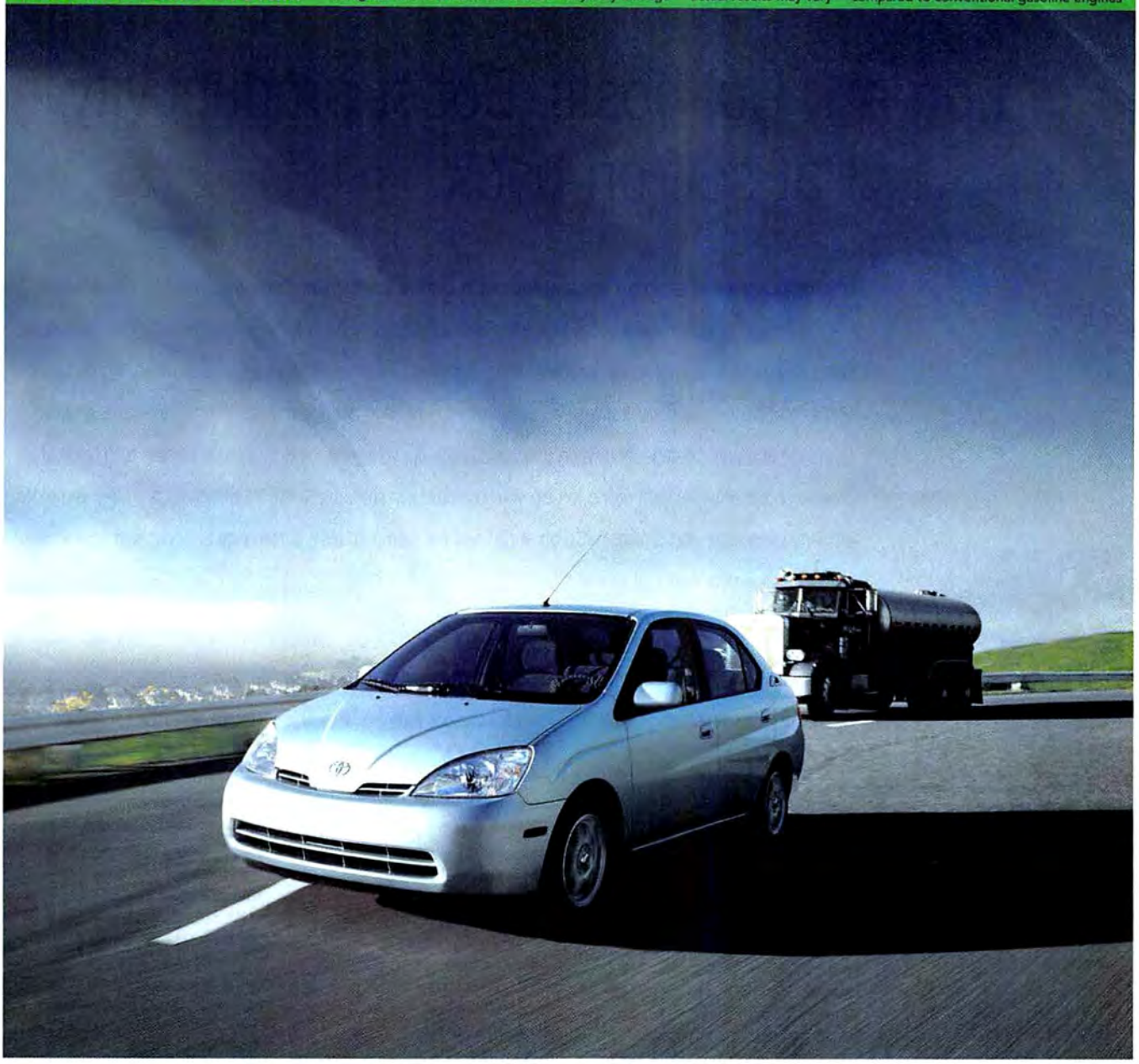

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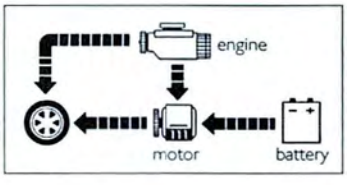

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- 64MB SDRAM (expandable to 512MB)
- 14.1" TFT (1024 x 768) display
- 8MB video memory
- 24X Max CD-ROM drive[3]
- Integrated Mini/PCI 56K V.90 modem[5]
- Weighs just 5.9 pounds
- Microsoft Windows 98 2nd Edition
- 1-year worldwide limited warranty[4]

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- 8X DVD-ROM drive[7]
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AWARDS[2]

NeoServer 150 — WinList
WinMag.com, April 2000

Armada E500 — WinList
WinMag.com, March 2000

Deskpro EP — Best of the Best
WinMag.com, September 1999

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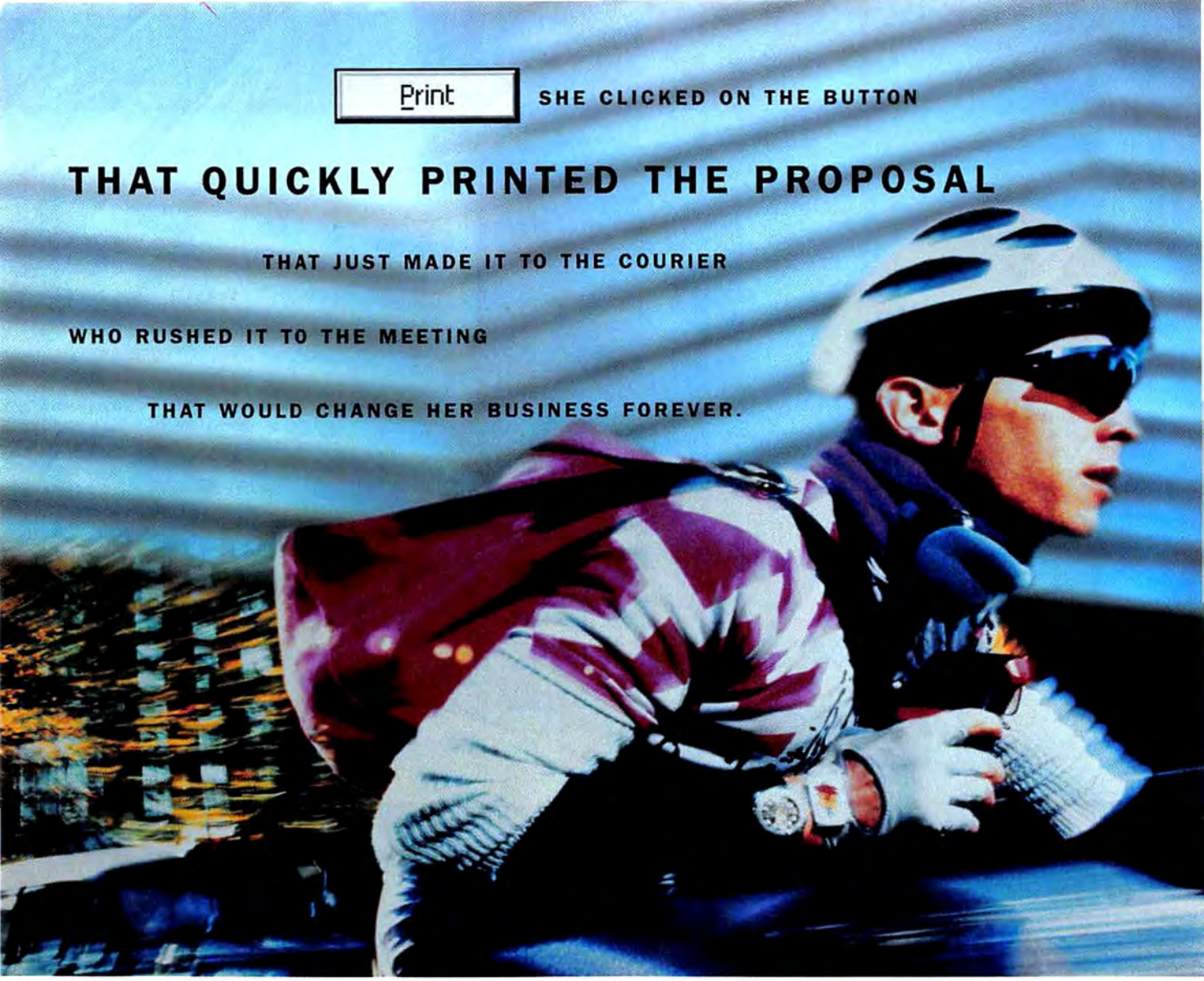

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What's the Proper Look for a PC?

IT'S HARD TO GO to a trade show or vendor meeting these days without hearing PC makers brag about a product's *form factor.* "This one's got a great form factor," they'll say of a sleek new machine. Or, "We expect this model's form factor to give it a market edge."

So what does "form factor" mean? Essentially, it's just jargon for what a PC looks like—size, color, styling, footprint, and so forth. And frankly, when I first started hearing about "form factor," the concept seemed a little repugnant. You don't buy a PC for what it looks like, but for what it does. Why should you care whether it comes in a plain-vanilla box or in a slender silver tower with black wings, a mesh top, and graceful curvaceous sides? The answer is, you shouldn't. And that's why nearly three out of four *PC World* readers say they pay no attention to shape and color when choosing a new machine.

Who's to say the PC won't shed its boxy heritage and assume a variety of forms, just like automobiles?

NOT BOXED IN ANYMORE

BUT THE MORE I LOOKED at some of the odd new form factors, the less odd they seemed. To see for yourself, check out "Slim & Sexy," the excellent story by Dan Littman that is part of this month's cover package, "The PC and Beyond" (page 119). Littman surveys eight new-wave machines. And while none of them can match the versatility and affordability of the standard desktop, each has its strong points. For example, you can see the likely next step in desktop evolution in elegant models like Sony's VAIO Slimtop L640 and IBM's NetVista S40, which pack respectable storage and processing power into slender, stylish frames. Even far-out models like the Qbe Cirrus from Aqcess have virtues. The Cirrus resembles a Palm on steroids but houses a 12GB hard drive and a removable drive bay underneath its 13.3-inch touch-screen LCD. It's easy to imagine the Cirrus, or something like it, as a replacement for the ubiquitous paper notepad many of us carry around all day. Whether or not these particular models succeed, it's a safe bet they'll inspire even more experimentation in months to come.

So what should a PC look like? They didn't always look like they do today. The first personal computers in the mid-1970s were basically hobby kits. They were followed in the late '70s and early '80s by a wild profusion of styles, ranging from the cereal-box–size Apple II to all-in-one designs reminiscent of dumb terminals. (Remember the Osborne and Kaypro, both of which vaguely resembled a modern boom box?)

The modern look emerged around the time the first IBM PC was introduced in 1981. Why did the company choose beige? I've always assumed it was because this bland and inoffensive color was already the shade of choice for most office machinery—and that was the market PC manufacturers were trying to crack.

FORM, FUNCTION, OR BOTH

BUT NOTHING SAYS personal computers *have* to look like that. Consider the automobile, another product that transformed society when it attained wide use. Henry Ford's popular Model T came in your choice of exciting colors: black, black, or black. But by the early 1930s, automobiles were available in many colors and shapes—some determined by function (streamlined contours to reduce wind resistance, for example) but others purely frivolous.

Today, personal transportation could mean a sensible family sedan, a sporty two-seater, or a hulking SUV. People seem to accept that vehicle styles evolve just as women's hemlines go up or down, and men's neckties grow fatter or slimmer—or vanish entirely, as in the modern casual office. Who's to say the PC won't go the same route, shedding its boxy heritage to blossom in a variety of forms that suit specific needs? Maybe we should be thankful it's still mainly desktops that are getting the face-lift. Imagine trying to figure out what fashion statement to make with your wrist computer or LCD glasses (see "2010: A PC Odyssey" on page 135), items we may have to deal with in a few years!

That's it for this month. As always, feel free to send me your thoughts or comments at eddir@pcworld.com.

COMING UP IN NOVEMBER

Choosing the Best ISP: We look at 16 top national and regional service providers and rate performance, reliability, and features.
Turn Specs Into Speed: CPUs don't tell the whole story: Learn how to combine the right parts to achieve optimum performance.
Top 10 Cheap-Date Ink Jets: Find out which printers eat less consumables and will save you the most money over the long haul.
Speak for Yourself: Free Internet calling is all the buzz, but don't ditch your pricey phone company yet. We talk turkey about value.
E-Training Report Card: Should you enroll in that online course? We check out major training sites and list their pros and cons.

Kevin McKean is editorial director of PC World. ■

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*Free with select models.

YOUR TAKE ON: Online auctions ◆ Speedy connections ◆ Warranties

BALANCE ON THE BEST

IN YOUR COMPARISON of EBay and Yahoo for online auctions ["Best of the Web," August], I was appalled by your comment that "EBay's buyers and sellers are a mostly honorable lot"—without also saying as much for those who use Yahoo Auctions. This seems slanted.

I, like many others, make a living selling on Yahoo Auctions. Yes, EBay has the reputation of being the biggest and best auction site, yet it has its problems also. I like Yahoo and will remain there, as will others who enjoy its ease and freedom.

Pandora Mckinnon, via the Internet

COMPARING Yahoo Mail and Hotmail, you incorrectly state that Yahoo Mail does not scan e-mail attachments for viruses. In fact, it does. Instead of McAfee VirusScan (which Hotmail uses), it employs Norton AntiVirus.

Brent London, via the Internet

Editor's response: We were not denigrating users of Yahoo Auctions. There are risks with any auction site. For more on this subject, see "Going...Going...Gotcha!" in this issue. Yahoo Mail added Norton AntiVirus after we went to press. **–Harry McCracken**

IN DEFENSE OF CABLE MODEMS

YOUR ARTICLE "High-Speed Survival Guide" [August] was too one-sided in favoring DSL over cable modems. I tried for six months to get DSL, but our phone company could not say when it would be available. Time Warner's Road Runner service had a cable-modem installation technician at my house in less than a week. I have used Road Runner now for three months, and it has been very fast and reliable.

Software engineers tell me they recommend fiber optic lines (which cable modems use) over copper wire (DSL). Copper wire is last year's technology. Fiber optic lines are the wave of the future, because they have almost infinite capacity.

Gene Townsend
San Antonio, Texas

AN ALTERNATIVE TO EXTENDED WARRANTIES

I TOO AM skeptical of extended warranties [*Consumer Watch*, August].

Recently I bought my first laptop. Before paying $300 up front for a three-year warranty extension with dubious coverage, I called my highly trusted insurance agent. My hunch paid off: For a paltry $50 per year, she offered coverage on my laptop with terms that far exceeded those of the extension, including theft, data recovery, virus repair, accessories, and software. Furthermore, I can pay year by year, reducing or dropping coverage as the ▶

HOT BUTTON

'PC Repair Undercover': Why Can't Stores Do the Job?

I LOVED YOUR article "PC Repair Undercover" [August]! Your findings match my own experiences with the ineffective–and sometimes dishonest–PC repair people flooding the business today. As a computer programmer and repairman since 1980, I feel it's high time for the government to step in with consumer protections for PC repair similar to those for automotive work.

D. B. Lewis, Astoria, Oregon

SPEAKING AS an IS manager, I think you may have missed a larger industry problem—namely PC makers' lack of diagnostic and repair tools and other technical support for PC merchants. In contrast, any auto dealer's repair shop has many such tools. Car manufacturers build in diagnostic ports and provide dealers with detailed manuals, allowing trained staff to find answers quickly.

Clif Graves, Augusta, Maine

YOUR ARTICLE IS right on the money. As vice president of an independent PC company, I see daily how little skill there actually is among the "professionals" in our field. Many don't know much more about PCs than the end users, and they are devoid of customer service skills as well. I only wish we had been visited secretly by your staff–the problem was *not* hard to diagnose, and you would have scored one more victory for the independents. Keep it up!

Sky Brower
Little Rock, Arkansas

AS A TECH myself, I have repaired and built my fair share of systems. A damaged IDE cable is not something that the average user would experience because they would not have opened their PC's case in the first place. If your reporters said that they had recently installed a new hard drive or some other component, I believe that your success rate on repairs would have been *much* higher.

Think of it this way: One day your car won't start. The repair shop's mechanics check the battery and starter and put in new spark plugs. Nothing happens. Then they try replacing some more-expensive parts (fuel pump, ignition coil). That doesn't work either. Only after charging you for the above repairs do they come across two vital wires that were mysteriously cut and that were the root of the problem.

Moral: Don't throw techs red herrings and expect stellar results.

Justin Heideman, via the Internet

Editor's response: IDE cables do fail; a good technician should check them before recommending costly repairs. We cut the wires because it was the most reliable way to disable a cable in a way that wouldn't be immediately obvious. **–Harry McCracken**

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Charlie Warfield, Jr., Naperville, Illinois

MICROSOFT INNOVATION

RIGHT ON, Stephen Manes ["Saluting 25 Years of Microsoft 'Innovation'," *Full Disclosure*, August]! I can remember the "good old days" when marketing a program that had known bugs was unthinkable and not tolerated. How did we allow ourselves to get so dependent on bloated, buggy software from Microsoft? I'm afraid some of the blame is ours for not demanding first-class performance and stability, inviting still poorer software.

Gene Schneider, via the Internet

CAN MANES REALLY believe the computer business and the use of personal computers would be anywhere near what it is today without Microsoft? If the company had not come into existence, *PC World* would be a small trade magazine and Manes would be attacking someone else.

Dick Schauer, via the Internet

PC World *welcomes your letters to the editor. Send e-mail to letters@pcworld.com.* ■

CORRECTIONS AND CLARIFICATIONS

CLARIFICATION: September's *New Products* review of Canon's PowerShot S100 Digital Elph camera should have noted that the S100 is designed for systems with USB ports running Windows 98 or 2000.

"Fantastic Flatbeds" (August) should have said that Umax does not charge a fee for tech support, though calls are not toll-free.

July's "Windows 2000: The First 100 Days" (*Top of the News*) said Iomega's parallel port Zip drives wouldn't work under the new OS without updated Iomega software. The drives work if users follow this procedure: Right-click *My Computer*, click *Properties*, and, from the Hardware tab, select *Device Manager*. Expand *Ports*, double-click *Printer Port (LPT1)*, and click the *Port Settings* tab. Click *Enable Legacy Plug and Play detection* and restart. For more information, go to support.microsoft.com/support/kb/articles/Q232/4/50.ASP. Find Iomega drivers and software at www.iomega.com/software/drivers.html.

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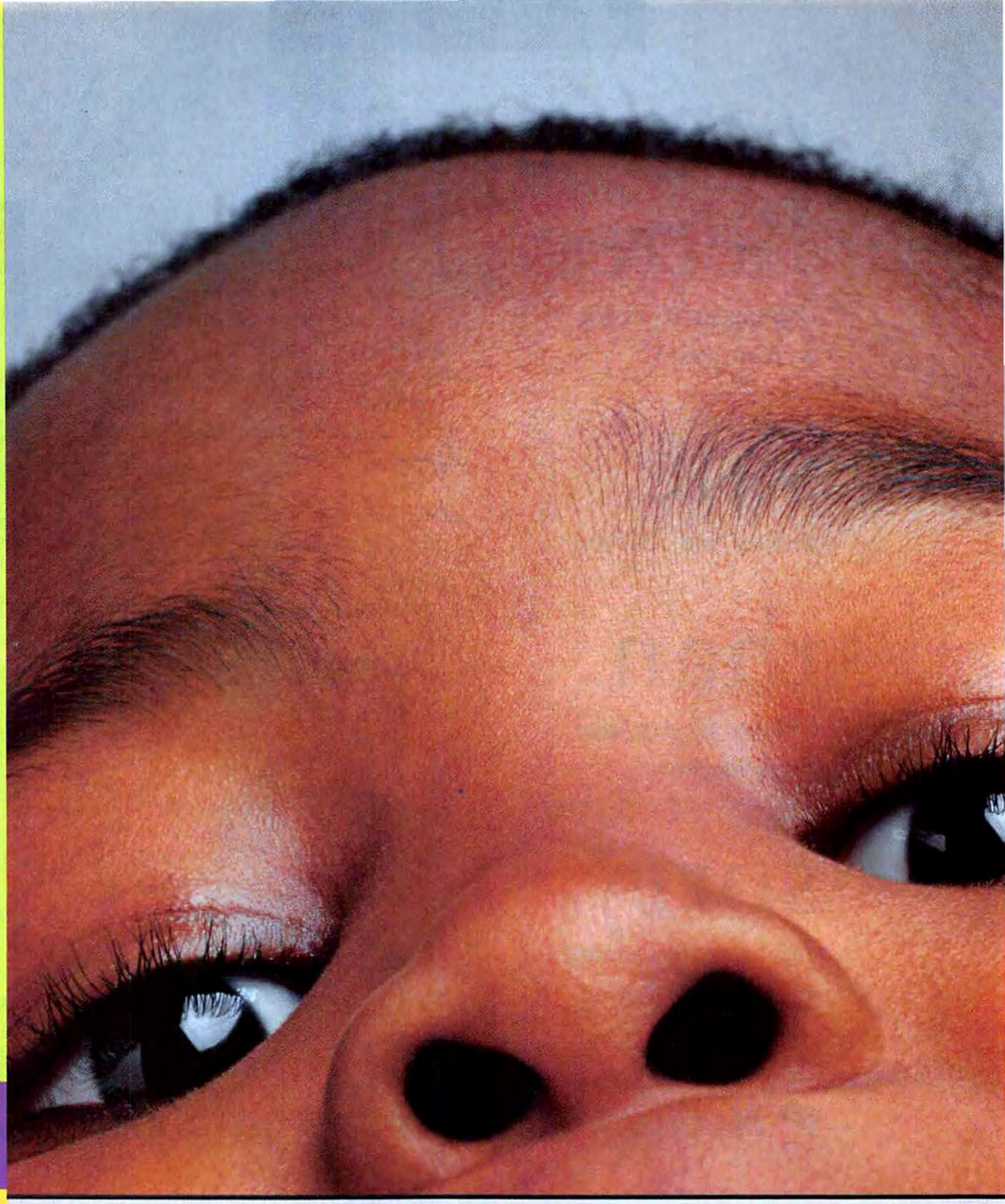

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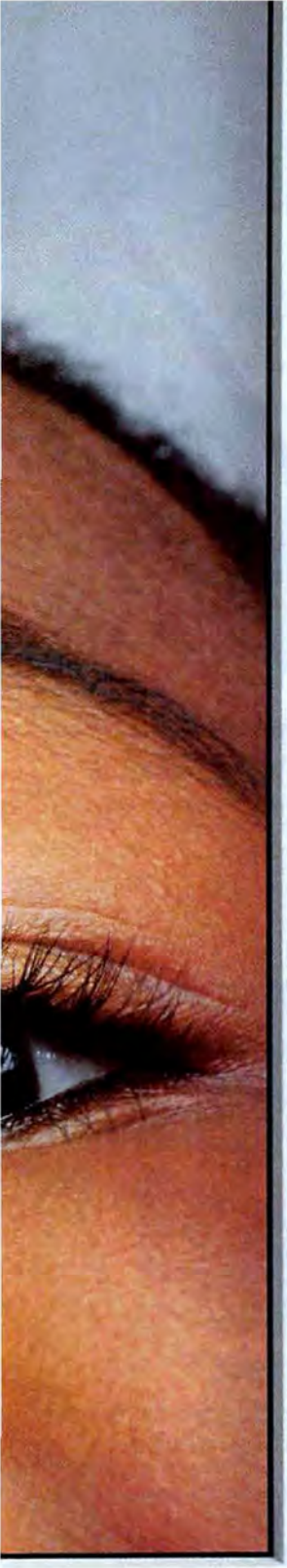

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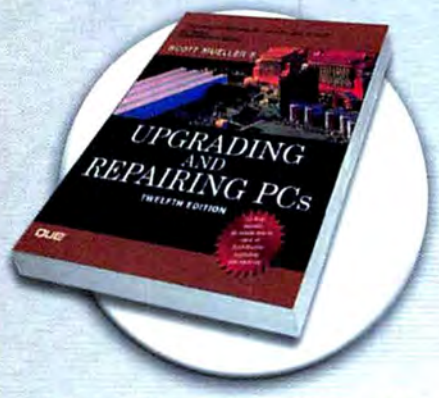

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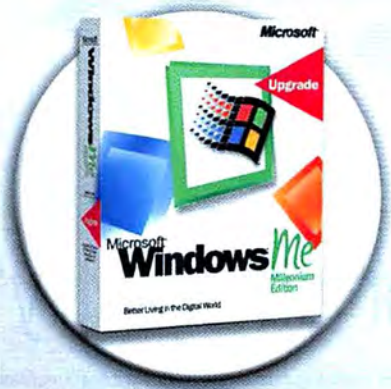

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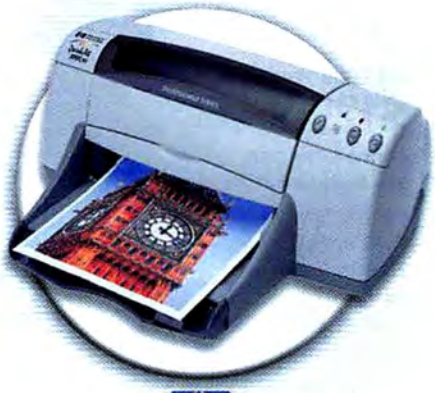

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Register Your Software—or Else!

If you don't fill out the registration forms, your expensive programs may stop working.

ILLUSTRATION: GORDON STUDER

STILL CONTEMPLATING an upgrade to Office 2000? Here's something to think about: You won't be able to disregard the annoying digital suggestion to register the product. Beginning this spring, Microsoft added the Registration Wizard to copies of Office 2000 sold in the United States and Canada. And this wizard has clout. If you ignore it, your software will quit working after the 50th use.

I rarely register software. My job requires me to install so much that registering it all would eat up far too much time. And on the rare occasions when I have registered, I've promptly gotten hammered with junk mail. Some of the deluge consists of software upgrade announcements, but I also get showered with ads for other products. So I was annoyed when my copy of Intuit's QuickBooks informed me that it would go on strike if I didn't register. And now, as I ponder upgrading to Office 2000, the Registration Wizard rears its hairy head.

Intuit has always insisted on registration, a company spokesperson says. QuickBooks handles users' critical financial data, so the company may need to supply updates to users. In the past, Intuit has contacted users to give them late QuickBooks changes dealing with Y2K issues and reflecting amendments to payroll tax laws. Okay, I can see that. I want my taxes to be right, and I'd rather not doubt my financial software.

Some software registration is less critical, though. Getting the latest update to Word, for example, hardly qualifies as necessary to my existence. But Microsoft has another reason for requiring registration for Office: It wants to prevent software piracy.

BATTLING SOFTWARE THIEVES

THE ENTIRE SOFTWARE industry has gone on a rampage against pirated software recently, and it's easy to see why. The Business Software Alliance estimates that $12 billion was lost worldwide in 1999 to unlicensed, illegally reproduced software. As Bill Gates might say, $12 billion here, $12 billion there—pretty soon you're talking real money.

"There are a lot of good reasons for mandatory registration," says Anne Kelley, a senior corporate attorney for Microsoft. "Registration gets [consumers] upgrades, warranty protection, and tech support. So there is a consumer benefit to mandatory registration. But at the same time, we want to make it clear that it is really not okay to make extra copies of software."

And the Registration Wizard makes that point crystal clear. The software license permits users who have a desktop and a laptop to register the same program for both. However, the program creates a unique identification code based on your hardware—so you can reload the program on your computer if your hard disk dies, but you can't load the software on a third PC or pass it along to someone else.

Mandatory registration is a mixed bag for people like me who hate to give out personal information. Some companies, including Intuit, insist that you provide your name and ▶

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address. Microsoft and some others, fortunately, do not. The Registration Wizard requires you to enter the software's 16-digit ID code and the country you live in. Of course, if you don't give out any contact information, you won't receive update announcements about Office 2000. But you'll get to keep using your software, and that's nice, isn't it?

That's why I got hot under the collar when I heard about mandatory registration. Is Microsoft seriously willing to disable a piece of software I just paid almost $250 for, if I refuse to register it? Yep. There's no way around it. If you don't register, Office 2000 will stop working.

On the plus side, you can get it working again by registering. Whether you call in your registration, send an e-mail, or snail-mail a little registration card, Microsoft will assign you a code to get the program back up and running.

NOT JUST MICROSOFT

NOW IF MANDATORY registration strikes you as another conspiracy by the Evil Empire, consider something before you start a chain e-mail or go shopping for another office suite: Microsoft is not alone. There's Intuit, of course, and Autodesk; and Adobe requires users to insert a dongle (a kind of hardware key) into a port to use After Effects. Other companies impose similar requirements.

The Registration Wizard is there to prevent legitimate buyers from making copies of the software for friends or coworkers. But the software industry faces a second, more organized form of theft: counterfeiting. To address that problem, Microsoft has gone high-tech in the CD pressing arena. The Office 2000 CD has an edge-to-edge hologram, a high-tech process that Microsoft owns the sole license for. The company hopes that the edge-to-edge hologram will give prospective buyers an easy way to distinguish genuine software from fakes.

The Office 2000 upgrade also marked the debut of a new certificate of authenticity for software that comes preinstalled on a computer. The certificate will be plastered on the side of the machine—if you buy from a legitimate reseller. ▶

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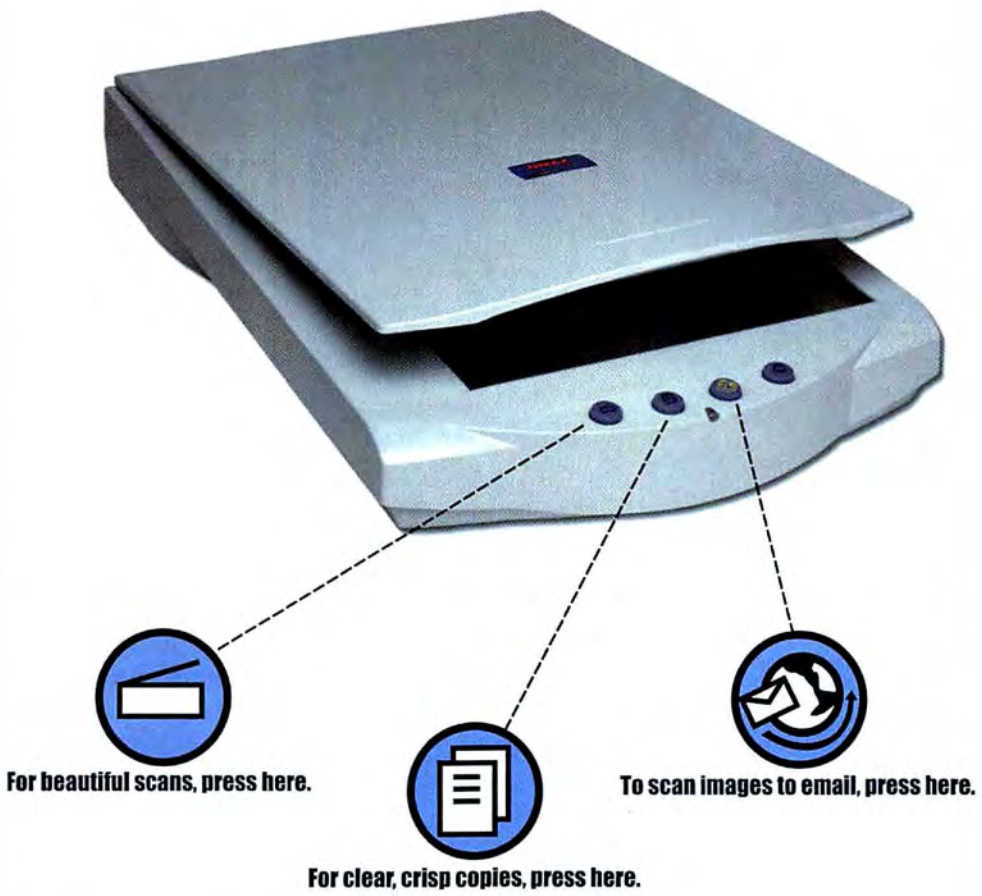

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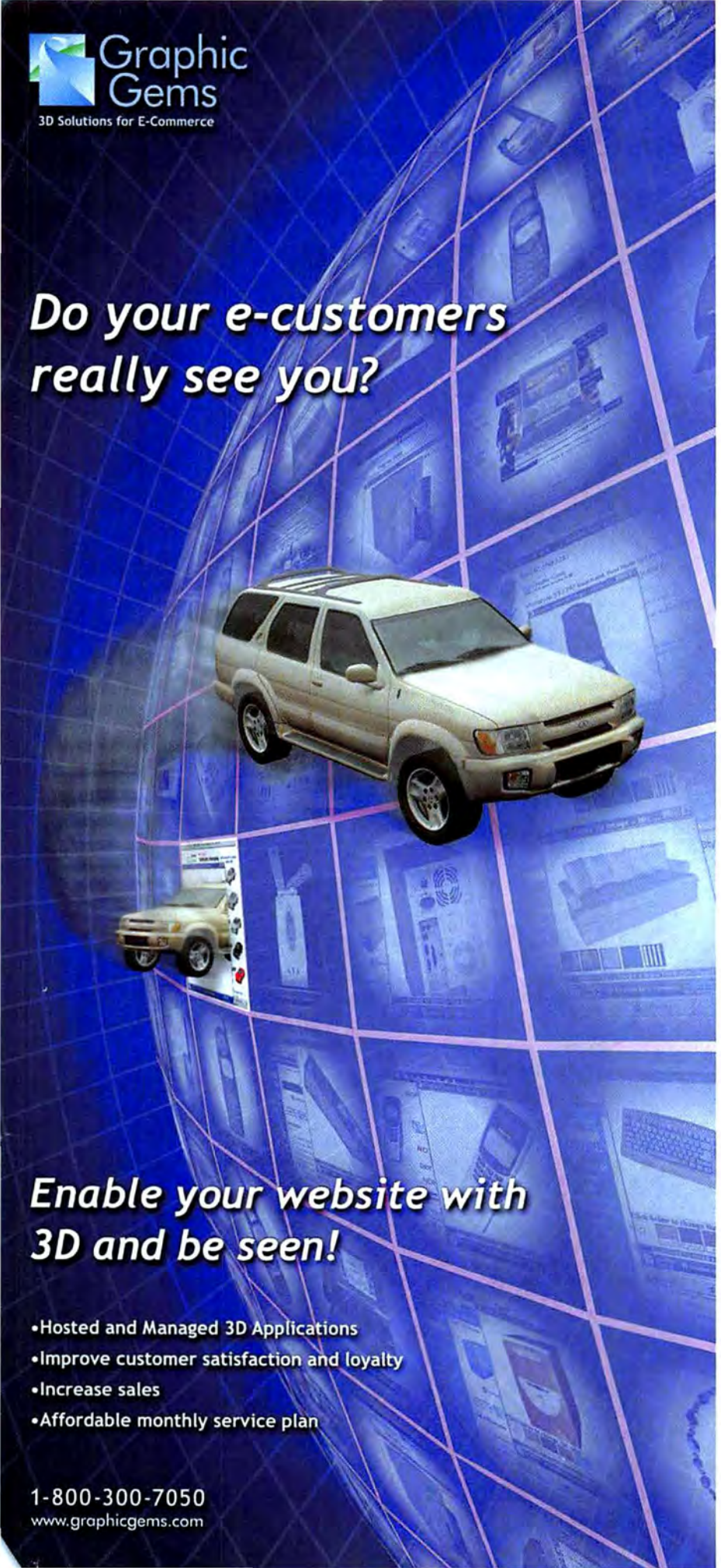


Industry executives make some forceful arguments about why everyone should care about software piracy. The country that loses the highest dollar amount to piracy and counterfeiting is the United States. "This costs 109,000 jobs—mostly in high-tech fields—in the U.S. every year," argues Microsoft's Kelley.

For two years, Microsoft has been buying software over the Net and examining it to determine whether it's legitimate. So far, more than 90 percent of the software the company has purchased from Net auctions and other secondary channels on the Internet has been counterfeit. Much of the stuff has other shortcomings, too: It's incomplete, riddled with viruses, or otherwise not what the buyers paid for. Kelley, the BSA, and recent news reports say that the money you spend on illicit software supports a crime network involved in other, more violent crime. Many counterfeiters, investigators say, have ties to Asian crime gangs involved in drug smuggling, illegal gambling, and prostitution. For more about this issue, see "Is Your Software Stolen?" (www.pcworld.com/dec98/piracy).

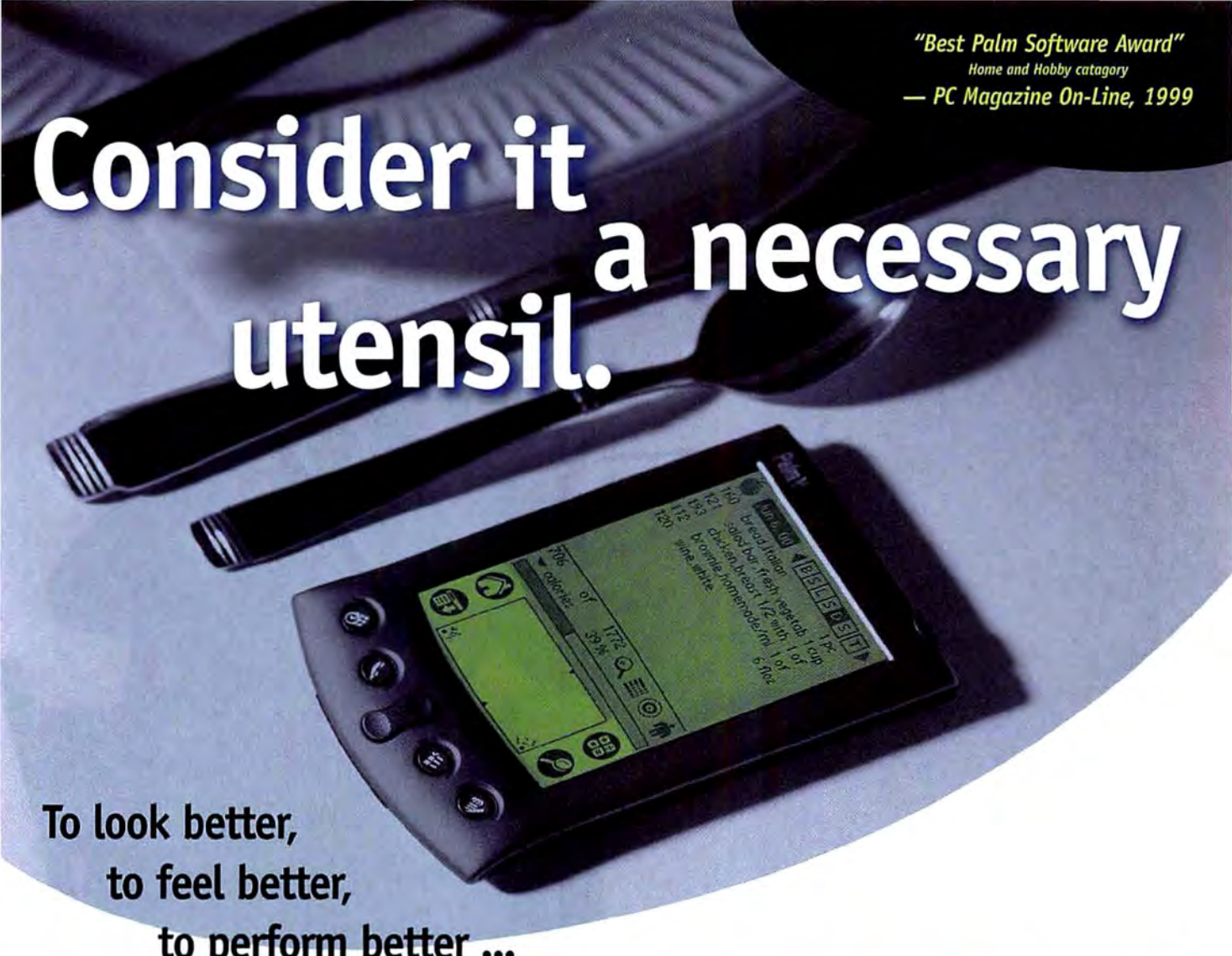
SHADES OF NAPSTER

SURE, SOFTWARE executives have a vested interest in making piracy seem as dire as possible. But I have to agree with Microsoft's Kelley that the issue of intellectual property rights is only going to heat up as people continue to store and digitally deliver more art and other stuff we value. (The Napster brouhaha is a prime example of this.)

So while I can't get too upset about piracy costing rich guy Bill Gates a few bucks, I am willing to register my software—as long as the vendor doesn't send me any junk mail afterward.

After all, I put up with those magnetic doohickeys stores attach to new clothes and CDs to keep me from stealing them. I lock my door when I leave my house or car. So why should I expect Microsoft—or any other software company—to rely on the honesty of strangers?

Christina Wood is a PC World *contributing editor.* ■



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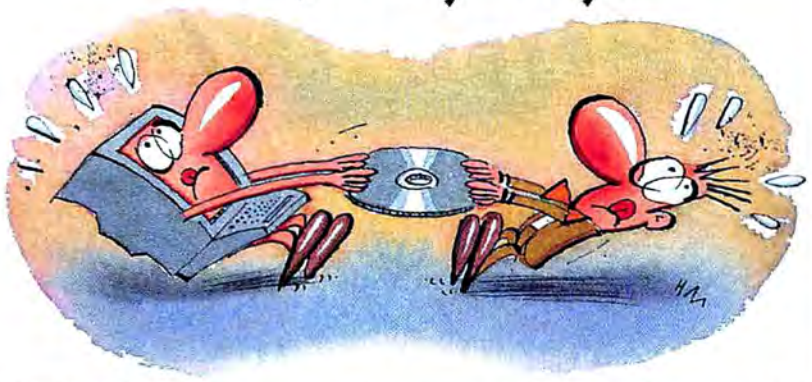
Whose Software Is It, Anyway?



WHEN YOU BUY a new PC, chances are it'll come with preinstalled software—typically, some flavor of Windows, a Web browser (guess which one), and a productivity suite such as Microsoft Works. Instead of providing backup discs for each application, though, many PC vendors now include the computer's operating system, drivers, and applications on only a single restore disc (which restores a system to its original, factory-installed configuration). Ready-to-run programs may be convenient, but if you encounter problems, you face the prospect of reinstalling every application—an arduous process.

Such was the case with Nicholas Giordano of Melrose, Massachusetts. He wanted to reinstall only Windows on his new Compaq Presario to remedy printer problems. But the company advised him to run the restore CD and reinstall all the software he'd added to his system. "This is a lot of work, and if I had a separate CD copy of Windows 98, it wouldn't be necessary," he says. "Can Microsoft send me a copy of the software?"

Unfortunately, it won't. Microsoft sells Compaq the right only to install Windows on systems Compaq sells. This restriction is intended to prevent piracy, although both companies also cite it as a way for manufacturers to create a "self-healing" PC by providing a single restore disc.

Self-healing may sound good, but as Giordano discovered, it might not be the best solution if you've added more than a few applications to your PC. Ask your vendor if separate copies of Windows and any bundled applications—not just a restore disc—are included in the purchase.

ILLUSTRATION: HAL MAYFORTH; ICONS: JEFFREY PELO

Heads Up...

Losing Access to Axis: *On Your Side* has received several complaints about Axis Systems from customers unable to contact the company's tech support. Axis spokesperson Willy Hsu acknowledges the problems, citing an unusually high number of support calls in recent weeks. "We are adding support staff as quickly as we can to try to catch up," Hsu says... **Smart and Friendly Goes Down and Out:** Optical storage vendor Smart and Friendly has shut its doors. It filed for bankruptcy and liquidated its assets in May. At press time, the company's Web site was still taking orders through its online store, but phone lines had been disconnected. For fee-based support, call 800/592-9448... **CyberMax Cuts Back Phone Support:** At press time, PC vendor CyberMax (whose systems have frequently appeared in our Top 10s), had scaled back its toll-free, around-the-clock tech support to about 8.5 hours on weekdays only. CyberMax attributes this change to a recent restructuring.

LETTER OF THE MONTH

IN DECEMBER 1999, I bought 3Com's U.S. Robotics 56K Voice Faxmodem Pro with serial and USB ports. When I couldn't get the USB connection to work, I called 3Com and was told there was a problem between its USB driver and Windows 98 SE. I was also told a fix was upcoming. But as of early July, there's still no fix, and I need my serial port for another device. When I asked for a refund or an exchange for a comparable internal modem, 3Com told me its policy is no exchanges or refunds.

Joe McCraw, Bradenton, Florida

***On Your Side* responds:** We contacted 3Com on McCraw's behalf, and company representative Connie Nguyen confirmed that the firm's USB drivers did not previously support the 56K Voice Faxmodem Pro under Windows 98 SE. 3Com now provides USB drivers that support Windows 98 and 98 SE; those drivers are available at consumer.3com.com. Nguyen also clarified that the company honors exchanges for dissatisfied customers. Since 3Com did not have a comparable internal modem for McCraw, the company gave him a refund instead. ■

GOTTEN A RAW DEAL?

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Online Storage: The Next Generation

SO HELP ME, I *like* floppy disks. Technologically, they're primordial. But they're also cheap, intuitive, and almost universally compatible. And puny though their 1.44MB capacity may be these days, they can hold more than a few spreadsheets, text files, or even digital photos. That's why the much-maligned floppy has remained my favorite way to shuttle files from computer to computer.

Last year, I thought that might change. Free virtual drive services such as I-drive (www.i-drive.com) and Xdrive (www.xdrive.com) had hit the scene. Signing up for one of them netted you a Web-based, password-protected "drive" with 20 or more megabytes of space, accessible from any Internet-connected PC. Unfortunately, these services' initial incarnations were so slow and ungainly that I let my accounts languish for months.

Recently, though, the early contenders have received sweeping makeovers, and new rivals continue to pop up. It seemed time to give virtual drive services a second chance. So I revisited I-drive and Xdrive to see what was new, and signed up for accounts at two relative latecomers, My Docs Online (www.mydocsonline.com) and Driveway (www.driveway.com).

Have virtual drives changed for the better? Absolutely. The best are now easier to use, more powerful, and generally handier for moving documents between your work and home PCs and for zapping files to distant friends and colleagues. Driveway's my current favorite, mostly because of its straightforward look and feel. Still, even the new, improved world of online storage isn't free of technical snafus and half-baked features.

FORAGING FOR STORAGE

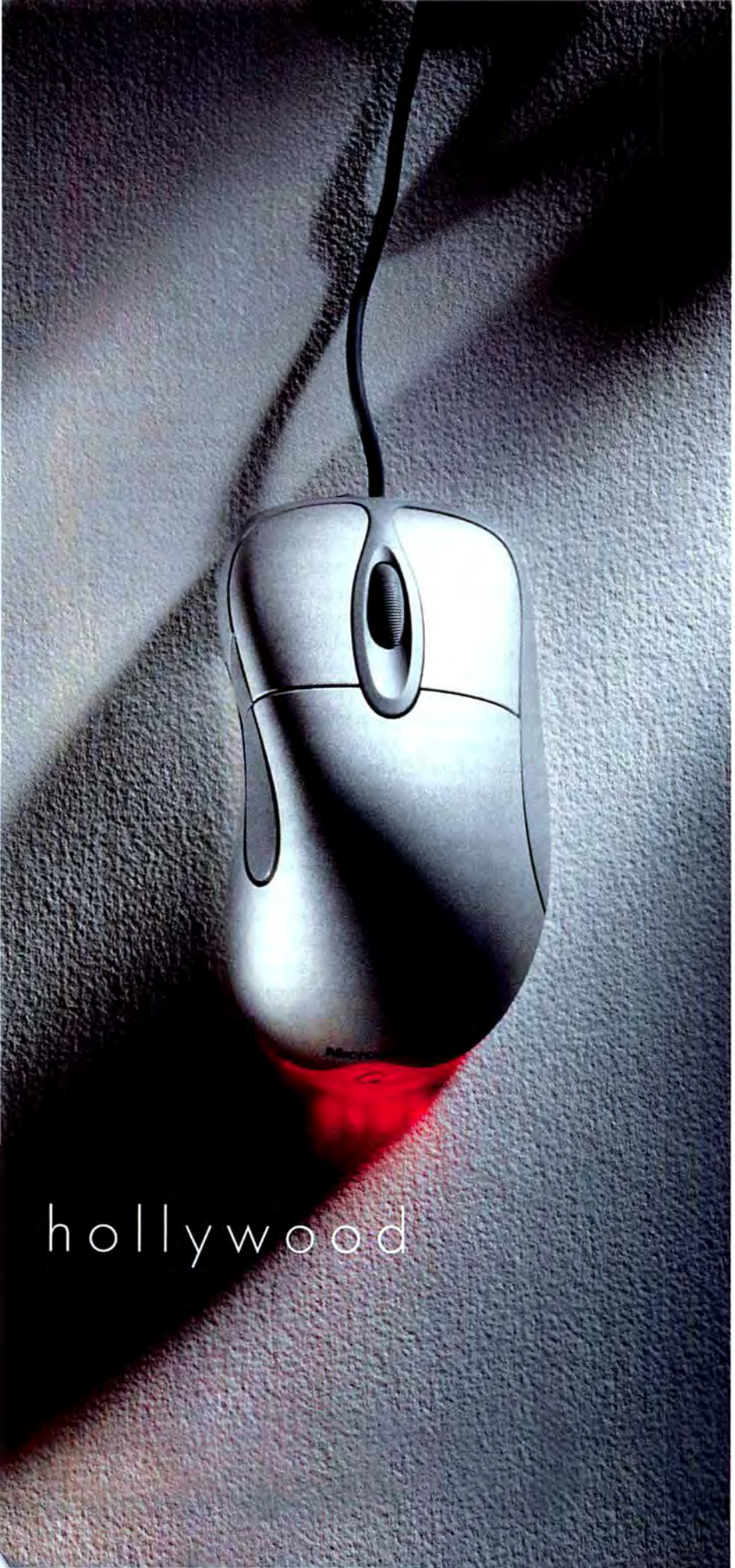
WITH VIRTUAL DRIVES, the word *virtual* might as well be a code name for *slow and small.* Performance, of course, hinges on the speed of your Net connection—a cable modem or DSL line provides maximum oomph. Nor will capacity rival that of your hard disk: The services offer anywhere from 20MB (My Docs Online) to 50MB (I-drive) for your files. If you need more room, though, you can probably get it. Every service except I-drive lets you increase your quota to at least 100MB, either by paying a monthly fee or as a reward for "good deeds" such as getting buddies to register.

Though Web browsers do lots of things well, heavy-duty file management still isn't one of them. The browser-based interfaces offered by these services are okay for moving a file or two at a time, but they're underpowered for wrangling droves of documents or whole directories. That's why all the services offer some kind of desktop integration that makes your virtual drive act more like a real one. ▶

ILLUSTRATION: HARRY CAMPBELL; ICONS: JEFFREY PELO

New on the Net...

Free ISP Shakeout: In August, I looked at free ISPs Freewwweb and WorldSpy. Their relatively unobtrusive on-screen ads made them more tempting than other no-cost services, but I decided that I wasn't about to ditch my for-pay provider (see www.pcworld.com/aug2000/web_savvy). Good thing I didn't—both services have called it quits. Before they ceased operations, the ISPs turned their customers over to Juno, a competitor with more in-your-face ads... **PlanetAll Gone:** Speaking of Web services going bye-bye, Amazon.com recently sent me an e-mail declaring that it was "pleased to announce" the integration of certain features from its PlanetAll online information manager into Amazon itself...and that PlanetAll was being shuttered. Pleased? As a PlanetAll member, I'm glum. And anyone who relied on PlanetAll's now-defunct address book (once touted as the "Last You'll Ever Need") is out of luck... **Musical Muse:** Tired of your old tunes? Head to MuBu.com, select your favorite genre (from gospel to arena rock), listen to a few sound clips, and rate them. The site will recommend artists and CDs to match your style—and in my case, it scored. The only catch: This multimedia-rich site requires three browser plug-ins... **Check Out WebCheck:** Little floating applets that search the Web are everywhere; WebCheck (www.webtop.com) is yet another, but it includes some unique twists. You can drag text from any application into WebCheck's search window; in return, you'll get related Web sites, news stories, and corporate alerts. The more words WebCheck has to work with, the more relevant the results—you can even feed it a whole Word document if you like. Google (www.google.com) remains my favorite search engine, but the free WebCheck download is worth a try.



WEB SAVVY

Xdrive's integration goes the furthest: After you download and install the service's 1.3MB desktop utility, your Xdrive space shows up as a drive in Windows. File management becomes a snap with Windows Explorer, and you can even reach your Xdrive from any Open or Save dialog box in any Windows application. But while this utility is slick and effective, it's incompatible with Windows 2000, my operating system of choice. A Win 2000 version is in the works, but it isn't due for several months.

For the time being, I'll make do with Web Folders, which is a similar feature offered by Driveway, I-drive, and My Docs Online. Web Folders aren't for Microsoft-phobes, however: They work only if you

GIMME FIVE

Sites for Gadget Junkies

WIRELESS PHONES, PDAs, and digital cameras are useful, sure. But they're also great technology toys. And the Web is chock-full of nifty sites that can help you buy and use all sorts of cool tools.

1. ConsumerReview.com: The real people who evaluate gadgets and other consumer products here are noticeably more incisive than their counterparts at rival sites such as Deja.com.

2. The Imaging Resource (www.imaging-resource.com): Everything you ever wanted to know about digital cameras and then some, including reviews, specs, and sample photos galore.

3. Tucows PDA (pda.tucows.com): Tucows' palmtop software portal brims with software downloads, product reviews, and daily news bulletins for Palm, Windows CE, and Psion fans—and even Newton diehards.

4. EdgeReview (www.edgereview.com): An aptly named destination with news and reviews about wafer-thin MP3 players, $400 remote controls, and other cutting-edge gizmos.

5. WirelessAdvisor.com: This site for wireless phone advice features articles, a glossary, and lively message forums that compensate for the spotty links to service providers.

FYI

IS WEB SHOPPING a dying fad? Probably not, but a new survey says that the percentage of Net users who have made a recent online purchase is down slightly from last year.

SOURCE: GREENFIELD ONLINE

have Internet Explorer 5.0 or above installed on your PC. And even then, your virtual drive shows up only within My Computer, Windows Explorer, and Microsoft Office 2000.

FEATURES, FEATURES

THE FIRST WAVE of virtual drives suffered from a severe case of clone-itis: Features scarcely differed from service to service. With the new generation, that has changed. For example, every service now has a different approach to file sharing. I-drive works especially well if you want to disperse files to the Web at large. However, if you want to grant password-protected access to a few people, Driveway's implementation is the best of the bunch. (When our office's wide area network was misbehaving recently, I used it to deposit files where a coworker across the country could get to them.)

Both Driveway and I-drive double as Web scrapbooks—you can snag any Web page on the fly and store it for future reference. I-Drive also has Playlists and Photo Albums, which let you organize and enjoy MP3 music clips and photos. Granted, these features are fairly spartan right now. But they point the way toward a future in which virtual drives are as much activity centers as way stations for files in transit.

Then there's My Docs Online's wireless phone features, which let you use a Web-enabled phone to send files from your virtual drive to any e-mail address. Why most people would *want* that capability is unclear, though. (To be fair, quandaries of this sort are all too typical with Web services that dabble in wireless access.) And at least with my phone and wireless service, the process of establishing an Internet connection of any sort is so byzantine and flaky, it took me 15 minutes to log in and send a single file. ▶

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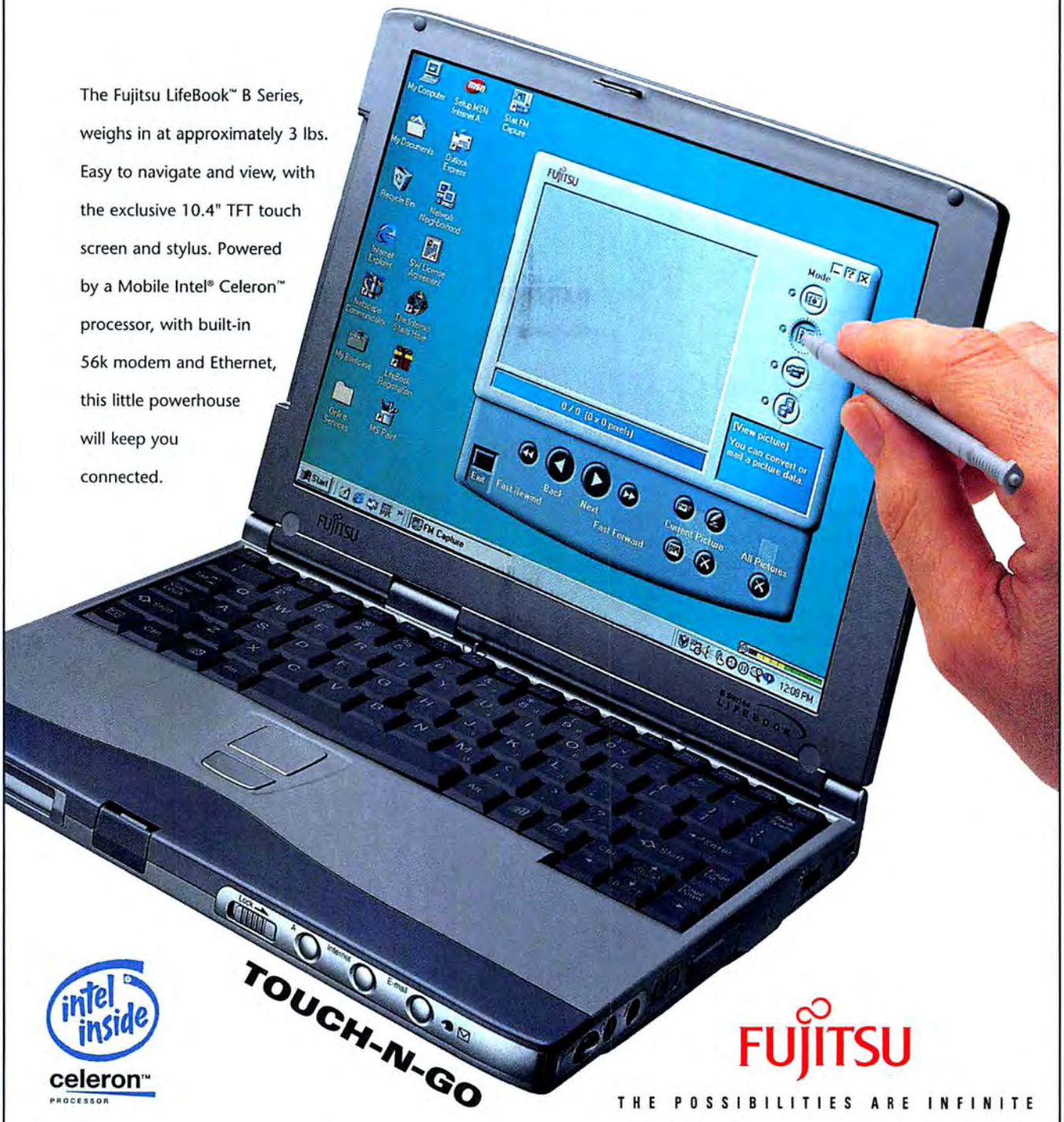

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ON THE FRITZ

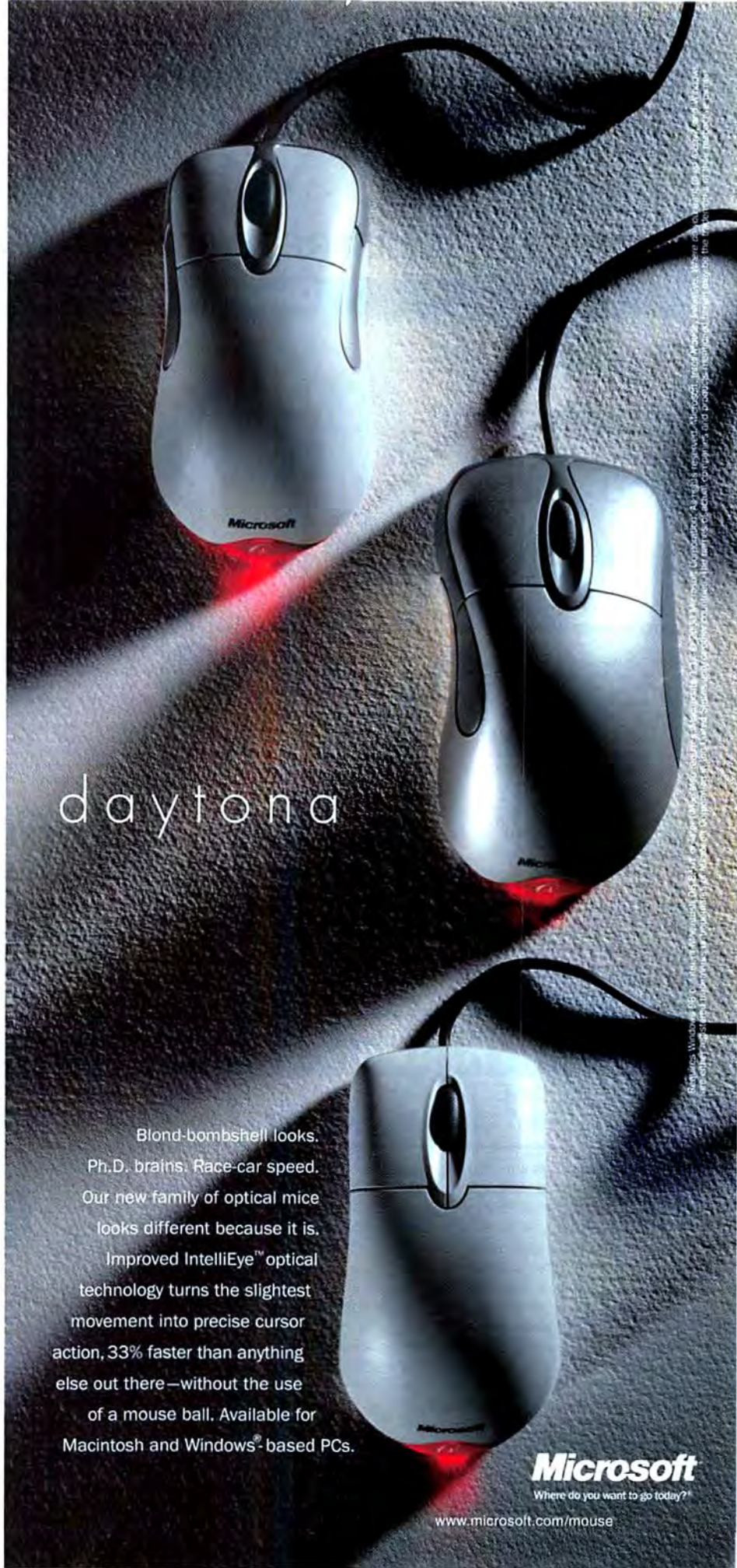
IF YOU ASK ME, the one overarching feature every virtual drive service should be shooting for is rock-solid reliability. Judging from my experiences, there is substantial room for improvement. One fine day, for example, I found myself locked out of my I-drive account. Had I forgotten my account name or password? Nope. The drive remained incommunicado a day later, so I e-mailed I-drive's tech support department. The automated response I received referred vaguely to "service performance issues" and asked me to try again. So I did—repeatedly—and another day elapsed before I could get in. Even then, the photo album refused at times to display thumbnail images. (I-drive blames these glitches on unexpectedly heavy demand for the service.)

During another weekend, Xdrive suddenly became almost impenetrably sluggish: It took me a minute and a half to log in to my account, and once I was in, icons moseyed onto the screen one by one, as if the computer were running in slow motion. Not until Monday morning did the service behave like its old, relatively peppy self again.

At least I didn't have any of my vital files socked away at Internet FileZone. A predecessor of Driveway, the service was shut down recently, forcing its customers to rescue their files and deposit them elsewhere. And you can bet that FileZone won't be the last virtual drive service to perish. To paraphrase what Pogo said about life itself—and despite what Web start-ups may tell you—most free Internet services ain't nohow permanent.

The lesson here: Technical hiccups and other nasty surprises are an ugly fact of life on the Web. So treat virtual drives accordingly. Don't store your only copy of an irreplaceable (or even semi-important) file in one; and always have an alternative means of moving files on hand for emergencies. My strategy? Driveway hasn't failed me yet, but I'm keeping a stash of blank floppies tucked away just in case. You can't be too careful.

Contact PC World *executive editor Harry McCracken at websavvy@pcworld.com.* ■



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Steve's Big Webcam Adventure

WHERE WAS Marlin Perkins and his *Wild Kingdom* TV show when I needed him? Here I was with a scrub jay pecking at my head while I scrambled through my backyard flora, trying to attach a camera to a pole.

See, my wife had discovered the bird's nest and its four eggs in our camellia bush, and I was setting up a Webcam. (No chuckling, please. Bringing technology to nature is tough work.) Actually, the nest was a great excuse to buy a camera that can do all sorts of gee-whiz stuff—for business (videoconferencing, home-brewed security) and for fun (use your imagination).

First, the fun stuff. I decided to capture the action in the bird's nest using X10's ScanCam, a wireless color camera. The ScanCam is about the size of a golf ball, but it includes a lens with variable focus, a microphone, and a built-in transmitter. It's powered by an AC adapter (an optional battery pack costs about $20, but its charge lasts only 4 hours).

I set up the camera over the nest and tested the transmitter. I was able to beam a 2.4-GHz signal through a window and three walls into my office—about 80 feet. The receiver, which looks like a small answering machine, sat on my desk near the PC. I then connected the receiver to the input port on my PC's ATI video card. (Alternatively, you can use X10's optional $70 video-to-USB converter cable to make the connection.) In less than 10 minutes, I successfully installed the camera's drivers and had a picture of the jay sitting on its nest. The receiver has a traditional coaxial cable connector to split the signal and put the picture on my television if I want.

The nest was **a great excuse to buy a camera** that can do all sorts of **gee-whiz stuff.**

For those who don't want to bother with wireless technology, there's Logitech's QuickCam Web (about $80). It connects to your PC via the USB port and produces a decent image. And for storing your images, the Spotlife.com service offers 15MB of free online space; it also provides 4 hours of live streaming per month for up to 25 simultaneous viewers.

For a review of two somewhat pricier Webcams, check out "Web Cameras That Offer More" (*New Products*, April, www.pcworld.com/apr2000/webcams).

Gotcha
$70; Prescient Systems, www.gotchanow.com

QuickCam Web
$80 street; Logitech, 888/863-8312, www.logitech.com

ScanCam camera
$99, video-to-USB cable $70; X10 Wireless Technology, 800/675-3044, www.x10.com

Webcam32
$25; Surveyor, 805/784-9000, www.surveyor.com

ON THE SOFTWARE SIDE

IF YOU WANT to convert a standard video camera into a Webcam, you'll need software. I looked at lots of commercial Webcam software packages and was surprised to find that X10's freeware does a comparatively good job. It permits you to view images on screen, store them to disk, or send them to your Web site.

Webcam32, a $25 Webcam shareware program, let me broadcast the jay's nest live over the Internet with a high-speed DSL line. With a slower connection, I could take snapshots at fixed intervals and upload them via FTP to my Web site. (Webcam32 also supports AVI capture, image captions, sound broadcasting, and live chat.) Check out my AVIs of the jay's nest at www.pibmug.org/jaycam.html or on FileWorld.

DO-IT-YOURSELF SECURITY

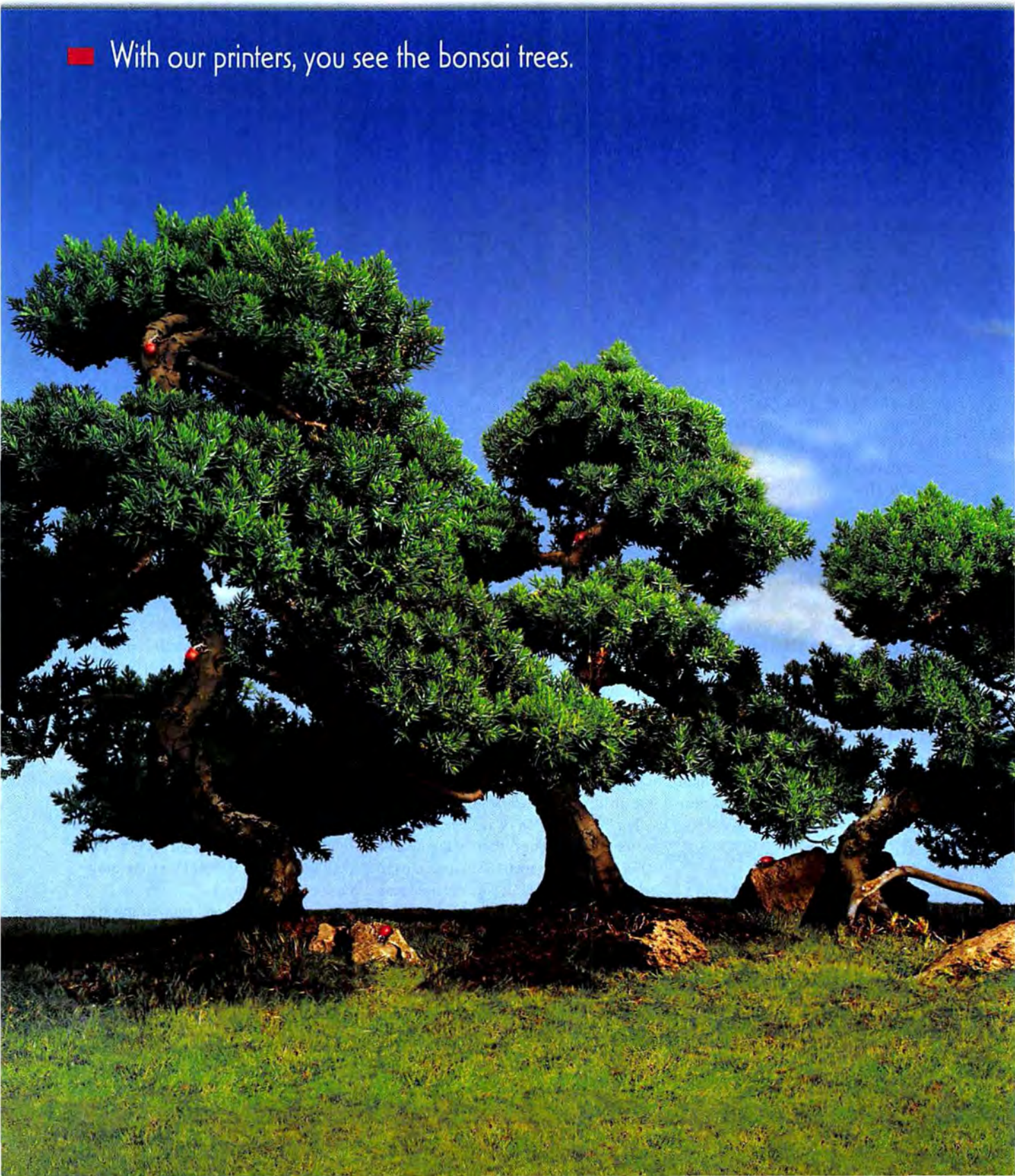
WHEN I'M NOT home I use Gotcha, a $70 video surveillance program that records detected motion to a time-stamped video file. I can change the level of detection sensitivity and mask areas of the image I want Gotcha to ignore, such as traffic viewed through a window. Gotcha can also page, phone, or e-mail me when motion is detected, record as many gigabytes of full motion video as my PC can hold (or transmit it live), or bark like a dog. And then there's Gotcha's spousal-alert feature: Any time I play solitaire, I aim the camera at the doorway. Whenever my wife walks in, Gotcha's Lookout mode minimizes the on-screen application. (You can also use X10's ScanCam as a rudimentary security system in your home or office when you're away by sending images to yourself via e-mail at regular intervals or whenever the ScanCam detects motion.)

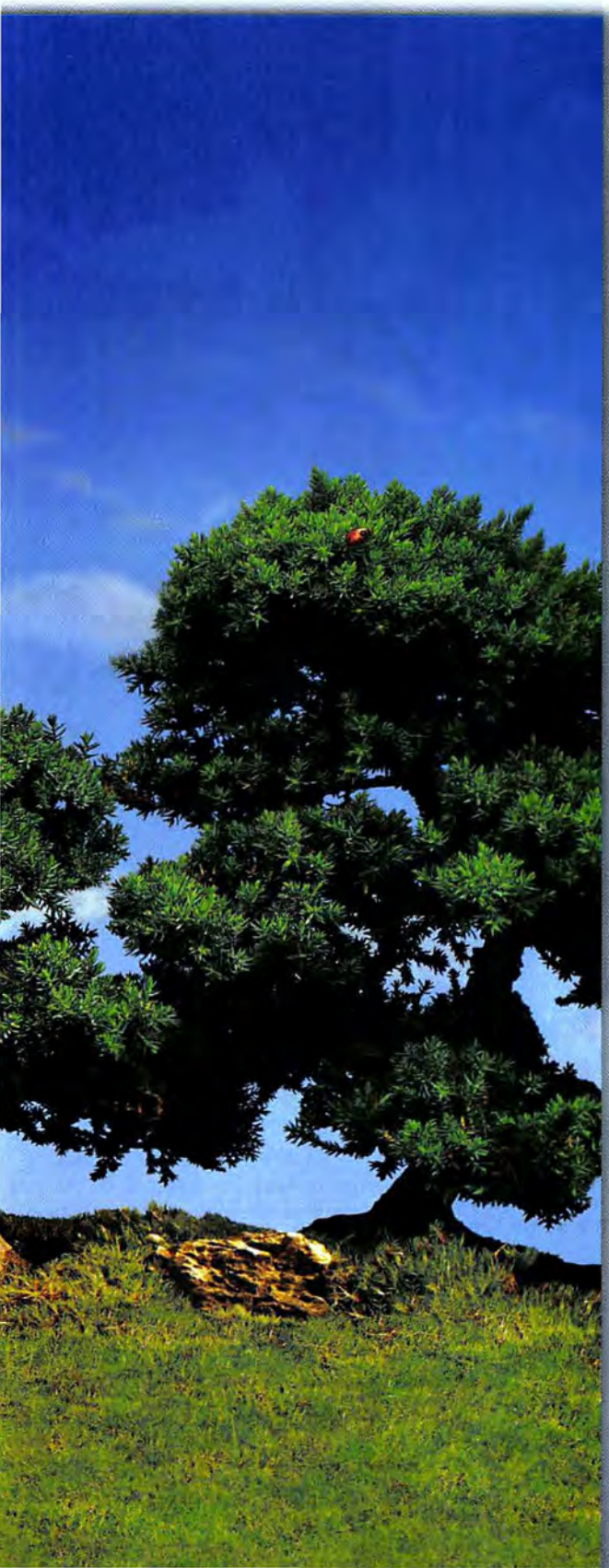
Now I can only hope word of my success with the scrub jays will reach the good folks at Mutual of Omaha.

online *Find the files mentioned here at www.fileworld.com. Contributing Editor Steve Bass is president of the Pasadena IBM Users Group. Write him at steve_bass@pcworld.com.* ■

ILLUSTRATION: GREG CLARKE

■ With ordinary printers, you see the trees.





YOU'VE GOT TO SEE IT IN EPSON COLOR.

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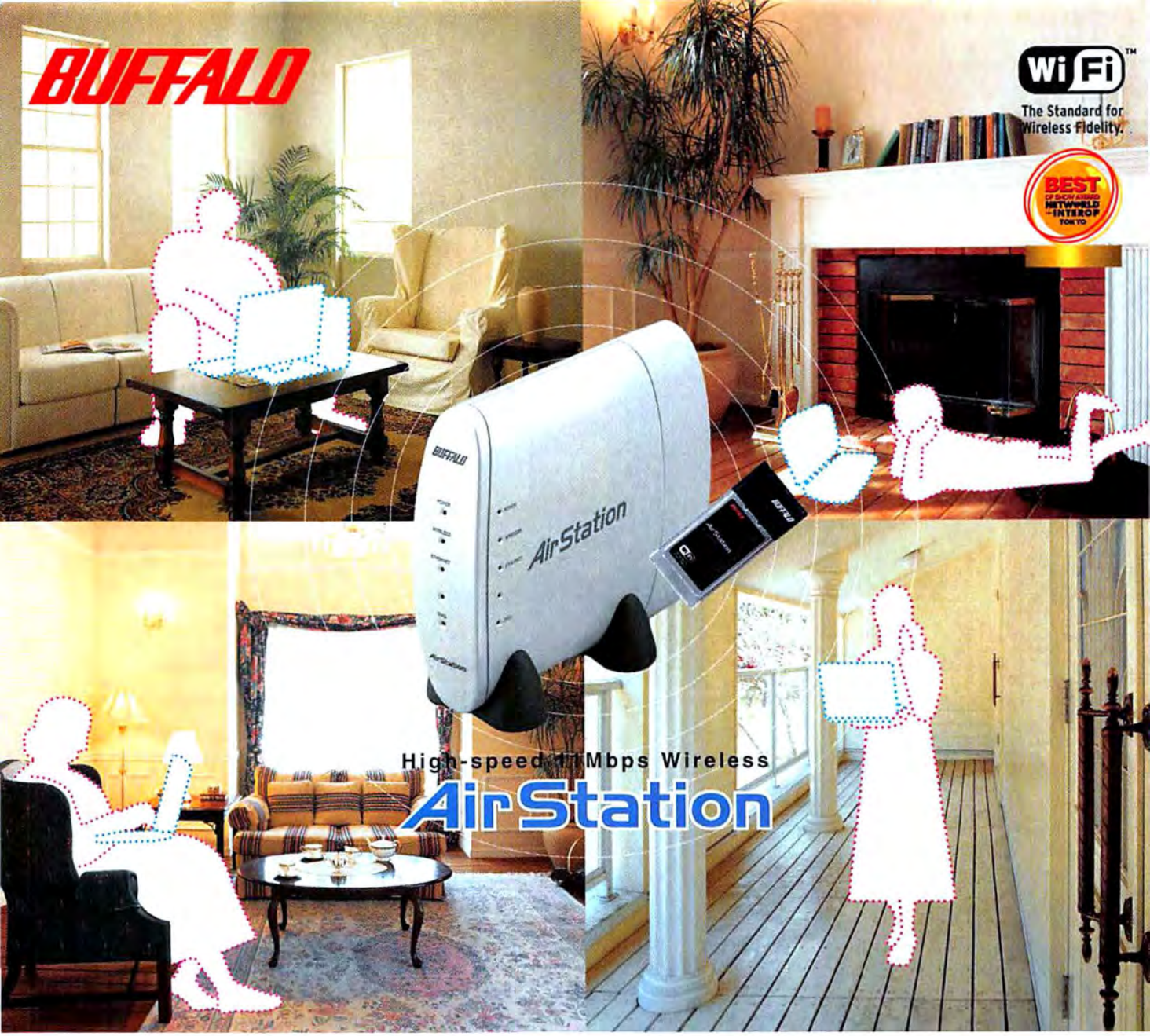

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Microsoft Outlook security woes ◆ IE cookie combat ◆ Palm IIIc goes pink

Is Your E-Mail Safe From Intruders?

LOTUS NOTES USERS, watch your backs. In yet another security scare, experts found a flaw in Lotus Notes that would allow a devious imposter to have access to your e-mail box. The interloper could not only send e-mail in your name but authorize others to access your Notes databases. At press time, Lotus was still working on the problem (for updates, check www.lotus.com/security). For a closer look at the weakness, visit www.pcworld.com/oct2000/sabotage.

Meanwhile, Microsoft hasn't been immune to security threats either. The latest problems affect Outlook and Outlook Express. The most serious bug could give an e-mail virus exceptionally easy access to your PC. Two other security breaches could let a hacker read your e-mail—or other files on your PC—remotely. You won't even know if someone's doing it.

VIRUS UNLEASHED: NO CLICKS REQUIRED

WITH VIRUSES LIKE "I Love You" and Melissa, recipients had to open file attachments before the attackers could do their damage. The flaw in Outlook and Outlook Express is even more dangerous because you don't have to click on an attachment—or even read the e-mail—to activate the nasty code. After you free it by checking your e-mail, the virus might crash your e-mail program, give the hacker access to your files, or even reformat your hard disk. Outlook Express versions 4.0 through 5.01, as well as Outlook 97 through Outlook 2000, are vulnerable.

The other bugs give hackers access to your computer through an HTML e-mail—an e-mail that contains a Web graphic in the body of the message. Most such messages are harmless. One security hole, however, would allow a snoop to read over your shoulder; this problem affects Outlook Express only. Another trick would enable hackers to look at certain types of files on your computer. This second flaw involves both Outlook and Outlook Express, versions 4.0 through 5.1. Microsoft fixes all three security problems with its patch at www.microsoft.com/windows/ie/download/critical/patch9.htm. For installation help, visit www.microsoft.com/technet/security/bulletin/MS00-046.asp.

ICON: JEFFREY PELO

IE CHOMPS COOKIES

NEAR THE TOP of my list of sneaky Internet practices are third-party cookies. Unlike regular cookies—the byte-size data files that Web sites place on your hard drive to identify you the next time you visit—third-party cookies are usually created by invasive advertisers. These cookies enable advertising networks such as DoubleClick to compile detailed profiles of your online behavior.

Microsoft is working on a patch for Internet Explorer 5.5 that will ask for your permission before it lets third-party sites plant such cookies. By the time you read this, the fix should be available at www.microsoft.com/windows/ie. Once the patch is in place, each time a third party tries to place a cookie, a dialog box will appear, asking for your permission. For the lowdown on how cookies operate, check out www.pcworld.com/apr00/cookies.

online *You can find files from this article at www.fileworld.com/magazine. Stuart J. Johnston is a journalist and tech columnist based in Bellevue, Washington.* ■

IN BRIEF

Hack Attack on Office 2000

MICROSOFT HAS released a fix that addresses security vulnerabilities with Excel 2000, PowerPoint 2000 (from the Office 2000 family), and PowerPoint 97. Excel 2000 and PowerPoint 2000 users can get the patch at officeupdate.microsoft.com/2000/downloaddetails/Addinsec.htm; PowerPoint 97 users can obtain the fix at officeupdate.microsoft.com/downloaddetails/PPt97sec.htm.

Pink Palm Problem

SOME PALM IIIc owners may feel they're seeing the world through a rose-colored display. Palm reports that a manufacturing problem with the screen's bulb causes the pinkish tint. To request a replacement, contact Palm Customer Care at 888/956-7256 or hop to www.palm.com/support/repair.html.

Microsoft Ships Windows 2000 Service Pack 1

FIRST, THE GOOD NEWS: Windows 2000 SP1 fixes several dozen bugs, including one that can damage Word or Excel files when you save them in a Web format. You can get the download at www.microsoft.com/windows2000/downloads/recommended/sp1/default.asp. The bad news: SP1 poses problems with two popular firewall programs—Zone Labs' ZoneAlarm and Network ICE's BlackICE Defender. Both companies have raced to fix the problem that SP1 causes. To get the update for ZoneAlarm, go to www.zonelabs.com/download_patch.htm; for the BlackICE Defender patch, visit www.networkice.com/html/blackice_defender_update.html.

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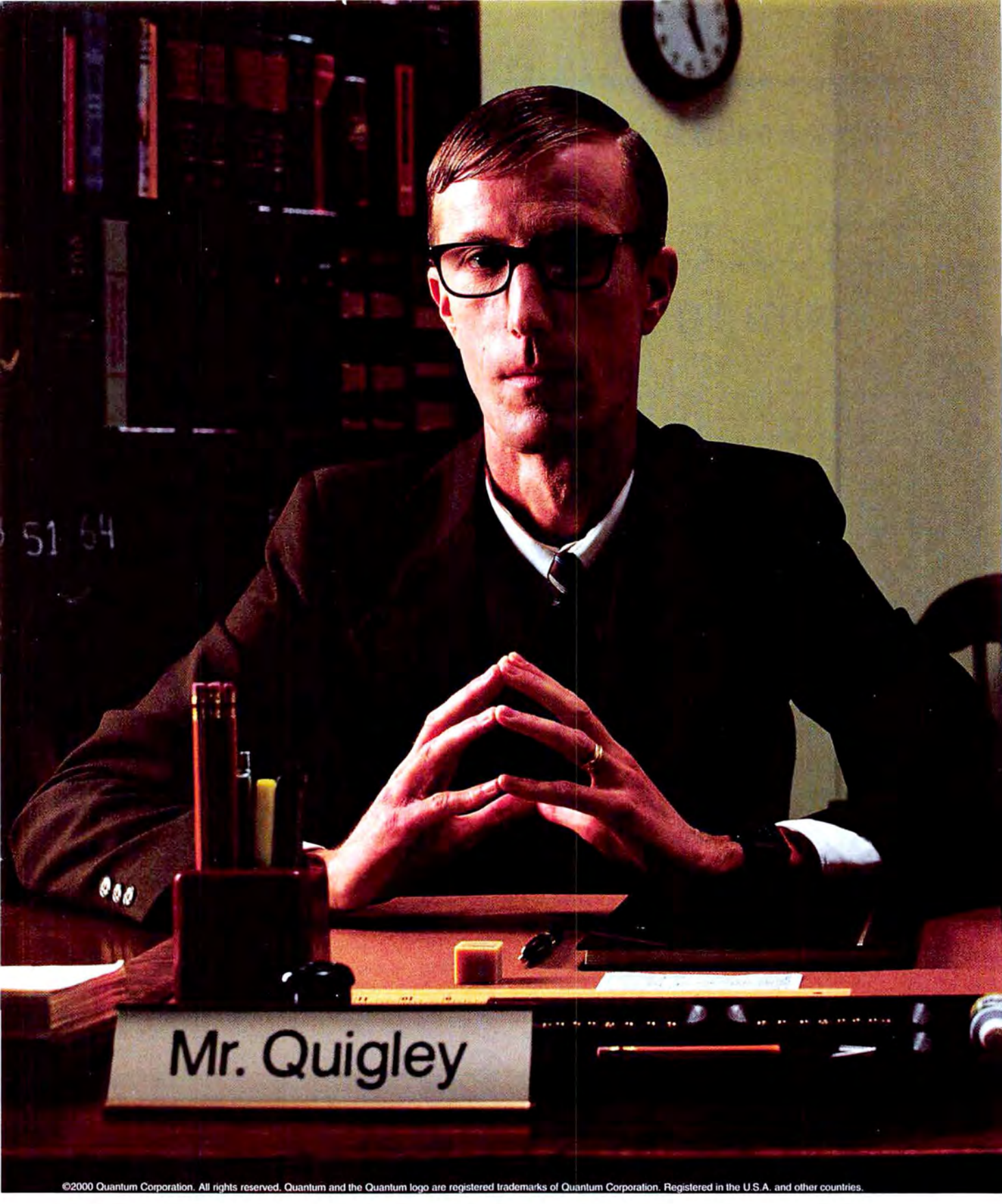

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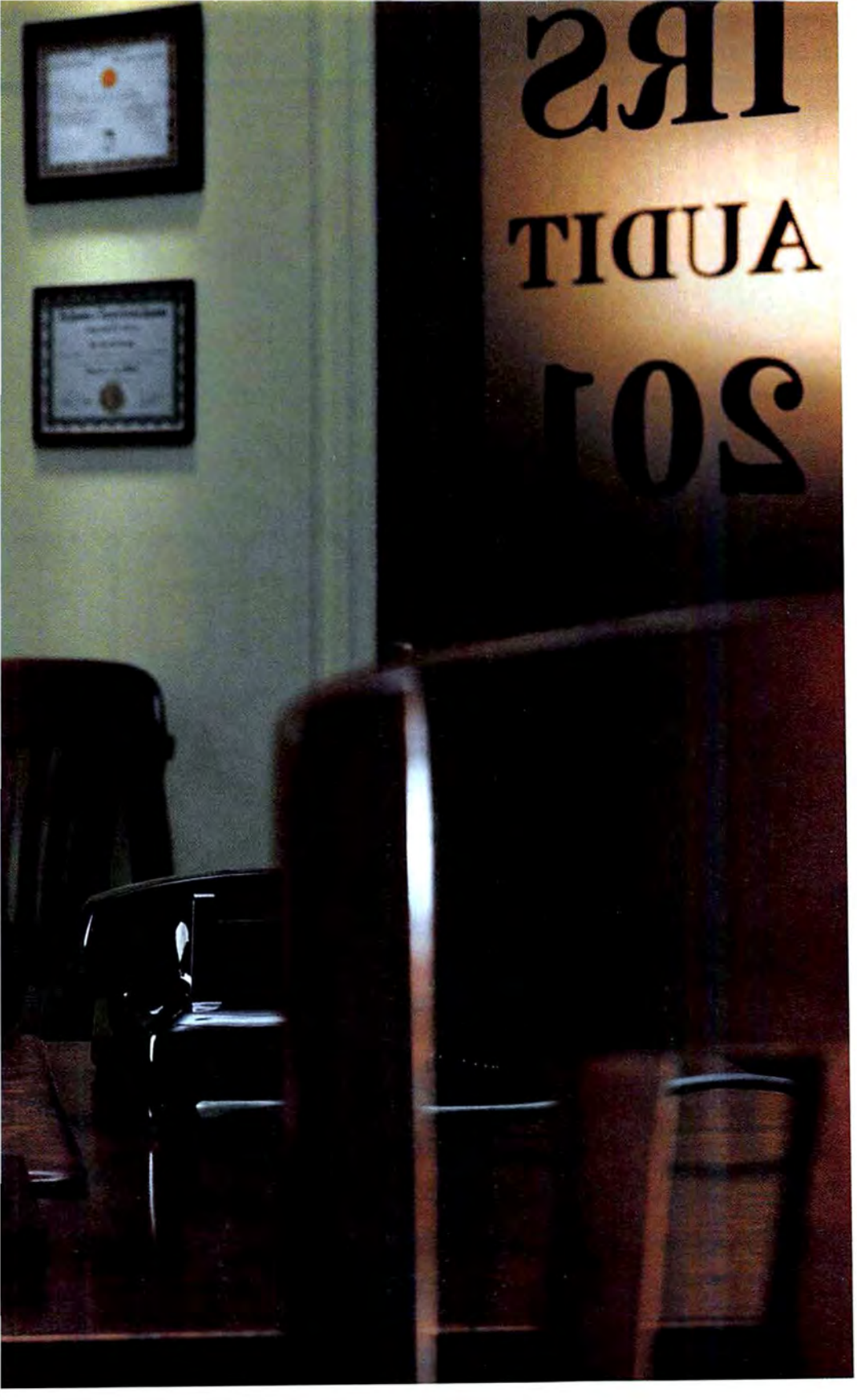

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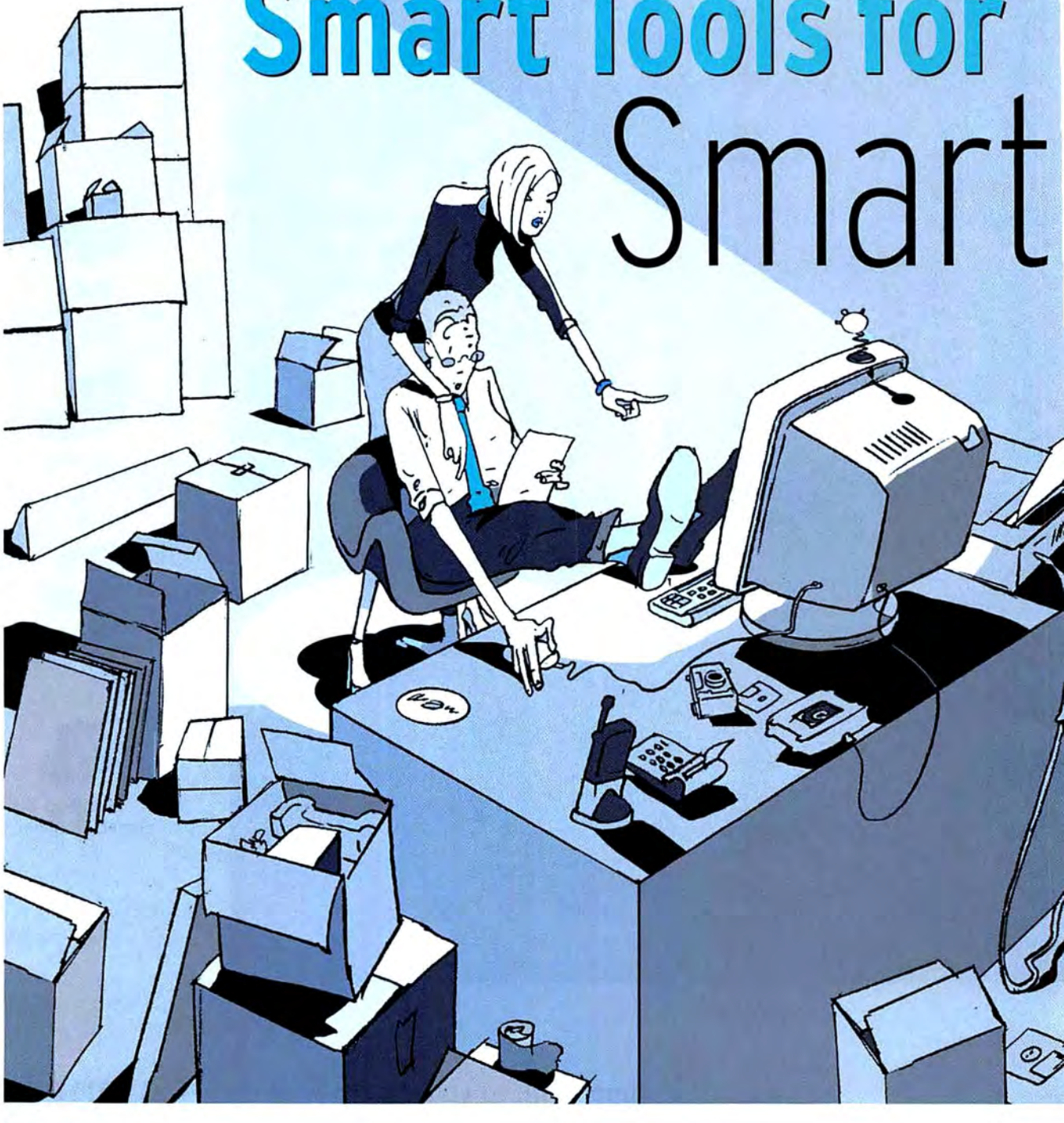
Stand-up
comedy routines

If it's important to you, save it with us. Quantum.

TOP OF THE NEWS

Smart Tools for Smart



◆ By Carla Thornton

Buyers

New software tries to make bargain hunting hassle-free. New services let you pay by credit card anonymously. But do these new tools work?

OF COURSE you buy stuff online. You love the convenience. And you'd like it even more if you could easily get what you wanted at the best price—without clicking constantly from one e-tailer to another to compare prices, shipping charges, and so on. Another thing you'd like: not having to hand out your credit or debit card number all over the Internet.

Fortunately, help is at hand. New desktop tools promise to handle the comparison shopping chores for you—automatically or with a single mouse click. New payment services let you buy anonymously, without sacrificing the convenience of a credit card. Still other technologies help you experience noncomputer products more accurately before plunking down your hard-earned dollars.

Are these new shopping aids and services as useful as they're cracked up to be? We looked at several and found that their helpfulness varied. As with many other new technologies, some kinks remain to be worked out. For example, 3D shopping sites don't work well over dial-up connections. Shopping bots are only as good as their databases. And there are still times when brick-and-mortar trumps cyberspace (see "When Good Deals Go Bad," page 62). Still, the best of these new tools could make Web shopping more satisfying and convenient than it already is.

Let's Find a Deal

AS E-TAILERS focus on the bottom line, bargains are getting tougher to find. Luckily, tools for tracking them down at online stores are becoming more sophisticated, too.

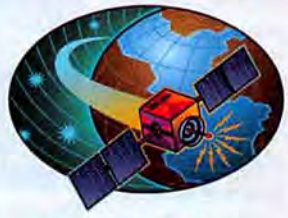
The original generation of shopping bots—MySimon.com, Evenbetter.com (now part of DealTime.com), Mygeek.com, and some others—required shoppers to launch a browser and type in the name of a product, after which the Web site returned a list of sites that sold the product, along with the price each charged. The newer bots—including Clickthebutton, Dash.com, IChoose, and RUSure—are desktop applications that you download, install, and run in the background. When you peruse an item at your favorite Web store, these deal finders alert you to lower prices elsewhere. To put them to the test, we shopped at Amazon.com for a scanner, software, a DVD movie, and a book.

BETTER BOTS

THOUGH NOT the flashiest of the bunch, Clickthebutton was our favorite. Its 2-minute download time is among the fastest, it doesn't ask you to supply personal information, it searches some 400 stores, and overall it saved us the most money. For instance, it found a DVD version of *The Thomas Crown Affair* for just $14.48 at Sam Goody versus $17.49 at Amazon. Savings were even more dramatic on the Epson Perfection 1200U scanner: $177.15 at Buy.com, compared to $232.94 at Amazon. Clickthebutton.com lists BizRate's rating for each merchant; its prices reflect taxes, and it shows separate totals for different shipping options.

In most cases, Clickthebutton delivers its search results automatically in a pop-up window while the product is visible on screen. We were required to type the name of the scanner into the desktop application, however.

RUSure hunted down the Per- ▶



Product Pipeline

➤ **Little Shop of Photos:** Adobe has announced Photoshop 6, which is expected to retail for $609 (upgrade, $199) and should ship late in the third quarter of this year. New features include integrated vector-drawing support, on-screen text editing, and layer clipping paths. The program also offers better support for high-color-bit scanned images.

➤ **MSN Web Companion Debut:** Compaq is shipping the first Microsoft Network Web Companion, a petite e-mail and Web browsing device. Part of Compaq's IPaq line, the $599 unit sports an LCD screen and a wireless keyboard. To use the device you must also sign up for MSN Internet access at $22 per month. Microsoft will give you a variable rebate on the hardware (up to $400 with four years of MSN).

Tidbytes

➤ **New Look for Encarta.com:** To go along with the recently released Encarta Reference Suite 2001, Microsoft has revamped its Encarta Web site. Complementing its array of Encarta Language Learning products, the site now offers a language section with access to lessons. There's also a homework section with links to kids' resources, access to paid continuing ed classes, and more. The site's scheduled launch date was September 5th. ▶

online GET UP-TO-THE-MINUTE NEWS, including hot game demos, the latest reviews, and productivity shareware, at PCWorld.com. Point your browser to www.pcworld.com/pcwtoday.

ILLUSTRATION, ISTVAN BANYAI; ICONS, RIGHT: JEFFREY PELO

fection 1200U at Avnetdirect.com for $187.74, only $10.59 more than Clickthebutton's bottom-dollar price. But it told us Amazon's price for the DVD movie was the lowest available. RUSure takes about 20 minutes to download, and it takes some time to search 700-plus sites for the product. The shopping bot performs price comparisons for 131 of those sites. When you open a product page at an Internet store, RUSure asks "Are you sure?" in a funky synthesized voice and displays its search results in ticker-tape style as they arrive. Like Clickthebutton, RUSure lets you search for an item manually.

SUPERSAVER: Clickthebutton.com searches 400 stores; it found the best prices for the products in our shopping test.

IChoose works with large, popular retailers that have agreed to offer its users small discounts, coupons, or some other special deal, like free shipping. If a discount at an IChoose store brings its price below the one you're considering, the blue icon IChoose installs in your system tray flashes; you click on it to check the offer. As with RUSure, you needn't lift a finger once the program is installed. We liked the way IChoose fills out order forms using information you provide on setup, too. But IChoose found no prices lower than Amazon's for any item on our shopping list.

Dash.com's DashBar runs across the bottom of your screen as you browse, delivering weather information and search-engine access as well as a list of its 125 partner sites. As you look at products, the bar occasionally flashes a message about a related site's discount—but it's up to you to investigate the details. In its quest for our book, *My Parrot, My Friend*, Dash.com alerted us to a Barnes & Noble offer that cut $1 off the $20 price—far above the $7.95 Clickthebutton and RUSure found at Allbooks4less.com.

All four new bots work with Internet Explorer 4.0 or later; Navigator and AOL support is spottier. We noticed no drag in our system's performance.

Paying in Private

STILL FEEL uncomfortable about sharing your credit card number online? PrivateBuy, a new service from Ecount, allows you to shop in complete privacy at any online retailer that will accept MasterCard and will ship goods to a nonbilling address.

You supply your credit card number, name, and other information at sign-up. PrivateBuy then gives you a 16-digit MasterCard account number, an alias, and a fictitious billing address that's tied to the account. When you shop online using this number, the Web site has no clue as to the true identity of the buyer. Slick.

E-TAIL DETAILS

YOU PAY $4 each time you add money to your PrivateBuy account, which can hold up to $1000 at a time. Ecount says that it keeps your credit card and other ID information on a secure server offline.

Achex and E-cash, free services slated to launch this fall, debit your checking account to pay for Internet purchases. Achex lets e-tailers receive funds directly from any checking account that accepts direct deposits. The first time you visit an e-merchant that accepts Achex payments, you sign up, entering your name, address, bank name and routing number, and two pieces of information for authenticating your identity into a secure form that only Achex sees.

Business Buying From B2Bs: Who Qualifies?

BUSINESS-TO-BUSINESS e-commerce is all the rage. But how big must a business be to shop at a B2B? Even if you are the sole employee of your small company, you may be welcome at some of these sites. In many cases, all you need is a credit card.

Business-to-business sites for shoppers who might otherwise head to Staples or Office Depot include group-sales merchants such as Mercata (www.mercata.com) and MobShop (www.mobshop.com). At these sites, prices drop as small-scale buyers pool their orders to create one large purchase. With Works.com, an online buying service for small and medium-size businesses, you can apply for a credit card on the spot (if you don't already have one) to shop for computer, office, and other business supplies.

Even the smallest business can use B2B portals, such as Microsoft's Bcentral (www.bcentral.com), to get virtual services. A newer competitor, AllBusiness.com, offers to help you hire recruiters, seek funding, and secure legal or other consulting services.

Of course, some B2B sites want to traffic only with big fish. Terms like "Fortune 500 clients" on a home page generally indicate that the site isn't interested in your one-person show. But the "business-to-business" label itself shouldn't scare you off: Do a little more research, and you may find that your small business is plenty big for B2B.

—Gaea Zhou

ILLUSTRATION: ISTVAN BANYAI

TURN ON: A SharperImage.com CD player is displayed in 3D.

After that, you just select the Achex payment option and enter your user ID, password, and memo information (if any) to include on a viewable, printable electronic receipt that looks like a check. Shoppers can track their account activity via an electronic register at www.achex.com. As of mid-August, Webvan, 1-800 Flowers, Peapod, and 17 other merchants had signed up to accept Achex payments.

E-cash users must download funds from a linked account at a participating bank into a "wallet" application on their PCs. The money takes the form of certified digital currency, bearing serial numbers but not the individual's checking account number, which ensures anonymity. When you buy something, the wallet app transfers the payment due to a participating merchant's "cash register" application. E-cash's U.S. partners had not been announced at press time.

Internetcash is aimed primarily at cash-only customers and at security-conscious shoppers who frequent such specialty stores as the Sunglass Hut and Overstock.com. You can purchase Internetcash in $10, $20, $50, or $100 debit cards at designated brick-and-mortar stores. To activate a card, you go to the Internetcash site and enter a 20-character ID located under a scratch-off label on the card. Afterward, you can shop at any of the 120 record, clothing, game, and other sites that accept Internetcash. So far, the cards are available in only nine states. But you can fund an account with a credit card—say, if you want to give Internetcash as a gift.

Color matching, 3D graphics, and other enhancements already give shoppers a better idea of what they're buying.

Deals Getting Real

THE LONG-prophesied day when shoppers will routinely be able to stroll through 3D showrooms to examine merchandise is still mostly a dream. But color matching, 3D graphics, and a range of other enhancements currently available on a handful of sites are able to give shoppers a better idea of what they're buying.

Ever ordered a teal sweater online, only to receive a navy blue one in the mail? E-Color's True Internet Color utility seeks to fix this. Blindsgalore.com, Bloomingdales.com, VenusSwimwear.com, and several other sites already use the new technology.

To set up E-Color, you go through a onetime process of adjusting your monitor's brightness and working with color charts to determine how your monitor and graphics card process color. This generates a cookie with display profile information used by E-Color's server to adjust the color in True Internet Color Web pages. Results are uneven: In our tests, a lime-green T-shirt from Bloomingdales.com did not accurately match the color of the image displayed on the Web site, with or without True Internet Color.

Home furnishings merchandiser MyMaison.com takes a lower-tech approach. Shoppers who purchase a $20 color fan containing all 1757 Pantone shades can look up the tint of an item according to the number listed on the Web site. The system matched colors well in our test, but casual shoppers are unlikely to want to bother buying the fan.

TURN, TURN, TURN

OTHER E-TAILERS are starting to deploy 3D tools that let you zoom in on an image, rotate it, and use other special effects to get a closer, more complete look at the goods. ▶

Site to See: Securityfocus.com

ALWAYS-ON Net connections and omnipresent e-mail have made all PC users nervous about keeping their data safe. Enter www.securityfocus.com. This multiplatform portal offers news on the latest security and virus threats, and has recently added a virus section with protection tips and more. You'll also find topical articles, mailing lists, and forums, plus product data (with user reviews) and vendor updates. Its navigation bar can be hard to read, but all the security info you could need is here.

Top PC World Downloads

1 Motherboard Monitor
1.2MB, 14,169 downloads
Displays temperature and fan data collected by your BIOS, and alerts you to trouble.

2 Blue Angel Theme
1.82MB, 9565 downloads
Blue Angels' high-flying aerobatics for your screen.

3 Memory Cleaner
40KB, 8659 downloads
Releases memory tied up by closed applications.

4 Liquid Desktop Screensaver
460KB, 8342 downloads
Mesmerizing screen saver.

5 Clean System Directory
72KB, 7100 downloads
Improves system performance by removing unused DLL files.

Download files can be found on www.pcworld.com/fileworld/top5.

By the end of this year, Yahoo will have converted thousands of the 5 million items on its shopping portal into photo-realistic 3D objects that you can view from the front, side, and back by clicking on left and right arrows.

Other Web stores are using photography combined with computer-generated models to create 3D objects that are a bit less realistic but more interactive. At SharperImage.com, you can use your mouse to rotate, flip, and view the site's lie-detecting telephone, its ionic pet brush, and 19 other yuppie must-haves. You can even "turn on" mechanical devices by clicking their on-off button with your mouse. To do this, you'll need one or more plug-ins such as Macromedia's Shockwave and 3D Dreams' Spike. Unfortunately, this technology didn't work on some of the computers we tried to test it on.

Don't like buying something based on a fuzzy thumbnail photo? By adopting MGI Software's Zoom Server, a few apparel and furnishings merchandisers—including JCPenney.com, Ninewest.com, and Neimanmarcus.com—let you perform super-high-resolution zooms on purses, shoes, bedspreads, and other products. It's well worth waiting a few seconds between zooms to see texture and detail down to the weave of a straw bag or the wood grain in a rolltop desk.

Shoppers who can't face the dressing room mirror can try clothes on virtually using a 3D model at Landsend.com, Just-4meplus.com, and other sites. But this technology needs further tweaking. When we imposed Dolly Parton proportions (a 23-inch waist and 53-inch bust) on a model, her appearance didn't change much from when we supplied less drastic measurements.

SMELLS LIKE...

WHETHER YOU'RE ready or not, smellable, touchable products may be coming soon to an online store near you. Oakland-based DigiScents says its ISmell digitizer will reach stores by next year. About the size of a bookshelf speaker, this USB peripheral will receive signals from DigiScents-enabled Web sites to emit different fragrances, depending on the product selected. The device, which hasn't been priced yet, creates the scents by blowing air over 100 tiny heated vials of oil. Procter & Gamble is testing the technology for possible use with some of the products on its site.

Another breakthrough on the horizon: Someday, before you purchase a four-pack of Charmin at Webvan, you may be able to sneak in a squeeze. By mid-December, a mouse that uses a variant of the Immersion technology introduced in Logitech's WingMan Force Feedback mouse for 3D games should arrive, allowing you to "feel" a sweater's buttons and the texture of a nubby towel on sites supporting the technology.

These tools for online shoppers are still in their infancy. But as the technologies mature and more sites adopt them, more people will likely gravitate toward their monitors to find clothes, cars, food, and even houses. Going online to buy may seem as natural someday as piling into a car for a trip to your neighborhood mall.

When Good Deals Go Bad

CUSTOMER SERVICE REPS who ignore e-mail. Electronic shopping carts that won't display sales tax or shipping charges until you plug in your credit card number. Vendors that balk at shipping to an address different from the one where your credit card bill goes. Shopping on the Web introduces unique frustrations while at the same time recycling others already familiar to mail-order fans.

Where's My Order?

BIZRATE.COM, a site that researches and rates e-commerce merchants, says that last year 30 percent of all online orders arrived late—or never. Delivery problems and the failure of some online sellers to honor promotional offers are the top complaints at UGetHeard.com, a customer loyalty site visited by 200,000 people a month.

Still, an informal PCWorld.com survey finds that most respondents are happy with their Web purchasing experiences. Most of the respondents' complaints relate to late-arriving shipments, incorrectly filled orders, or fine-print terms that seriously altered purchase costs.

PC World reader Richard Todd of Salinas, California, says he almost had to pay $36 in shipping fees on a $44.49 Petopia order because he didn't read a disclaimer saying that a free shipping offer didn't apply to purchases weighing over 30 pounds. Petopia waived the shipping charges after Todd complained, thereby ensuring his future business.

The Web still rules when it comes to selection, but it's more important than ever to read the fine print before you buy.

Other commonsense tips to avoid or respond to problems:

- Improve Web shopping for everyone by rating a site if it offers this option through services such as BizRate.com.
- Think twice before shopping online (or via mail order, for that matter) if you're on a deadline. Better to pay a few more bucks to get that cheese knife on time from a neighborhood store than to give your boss a birthday gift two weeks late.
- Complain to the e-tailer via e-mail and telephone. Sometimes that's all it takes.
- Got ripped off at an auction site? Consider an arbitration service at sites such as UGetHeard.com or Squaredeal.com.
- If all else fails, file a complaint with the Better Business Bureau in the city where the online store is headquartered (find the info you need at bbb.org) or with the Federal Trade Commission (ftc.gov, 877/382-4357).

ILLUSTRATION: ISTVAN BANYAI

New Ink Jets Offer Big-Ticket Quality at Low Prices

U P D A T E

OVER THE past few years, the ink jet market has undergone a revolution. Prices have dropped at breakneck speed: midrange ink jet printers that cost $400 or more a few years ago now sell for less than $200, and entry-level ink jets retail for as little as $50. Even at the high end of the market, new ink jets packed with the latest technology usually debut at less than $1000, and vendors aren't shy about slashing prices on older models.

And while prices drop, the technology flies high. When they debuted, ink jets used three colors; recent models use two cartridges holding up to seven colors, adding subtlety and depth to color prints. Average resolutions—the number of ink dots a printer can lay down in a given area—have jumped from 300 dots per inch a few years ago to 2400 dpi today—which is more than most people need for many applications.

"The print-quality battle is over, and everybody won," says Larry Jamieson, a senior analyst with Lyra Research.

We looked at four of the latest products of the revolution: Hewlett-Packard's DeskJet 990C and Epson's Stylus Color 980 tackle the upper end of the market, while Lexmark offers bargains with its Z42 and Z12 Color Jetprinters.

BUSINESS ANGLE

RECENTLY, ink jets have made inroads into large businesses, and new products are poised to sweeten their appeal. HP has launched its Business Inkjet line, including models with built-in print servers, remote management software, and PostScript and network protocol support—features older ink jets lacked.

Small-business and home-office folks may be attracted to the new HPs, too. These units range in price from $499 for the 2200 to $999 for the 2250TN. According to HP, the new printers can serve up to 10,000 pages a month, print as many as 15 text pages per minute, and cost as little as 2.2 cents per black-and-white page to operate. Unlike most other ink jets, HP's new printers use separate printheads and ink cartridges, making them cheaper to maintain. (Models were not available for testing in time for this article.)

NEW PRINTERS ON THE BLOCK: Hewlett-Packard's $399 DeskJet 990C (left) and Lexmark's $149 Z42 Color Jetprinter.

Affordable Photo Quality

TODAY'S CHAMP, the Epson 980 (right) offers much richer colors, sharper edges, and smoother images than the older Canon unit, a Best Buy in December 1998. And it costs what the Canon used to.

CANON BJC-5000

EPSON STYLUS COLOR 980

Epson's new Stylus Color 980 offers the best print quality of the ink jets we tested. Our sample print photo was clear and sharp, with excellent color saturation and fine detail, and the 980 costs just $249 ($199 after mail-in rebate). You also get an impressive maximum resolution of 2880 by 720—higher than many users need, since most scanners and digital cameras can't deliver that much resolution. The Epson delivered only half of its rated text output speed—we timed it at 6.6 ppm on our tests—but it remains an excellent buy for consumers and small-business users who need affordable photo-quality prints.

Another high-end ink jet, the $399 HP DeskJet 990C, made very good color prints but couldn't quite match the Epson in price or color print quality—our prints from the 990C were a bit muted, with more visible individual dots. The printer does come with special color-layering features designed to mimic the continuous tone qualities of traditional photos. Surprisingly, the HP was slower than the Epson, too, delivering just 4.7 pages of text per minute on our tests. Though HP traditionally appeals to business users, the 990C probably isn't the right printer for a fast-paced office environment.

LEXMARK'S THE SPOT

AMONG lower-priced printers, the Lexmark Z42 stands out: With a $149 street price and up to 2400 by 1200 resolution, it thoroughly outperforms older models that cost twice as much. The rock-bottom–priced Lexmark Z12 produces prints that don't look nearly as good as those from the Z42—but it's hard to badmouth an ink jet that offers decent color output for just $59. Both models are acceptable for consumers who need an inexpensive ink jet, but not for professionals or business users who need photo-quality prints. Though slower than the others here, the Z42 managed creditable output speeds of 4.5 pages of text per minute; in contrast, the Z12 crawled along at just 2.4 ppm. ▶

PHOTOGRAPH: KEVIN CANDLAND

Newcomers Sprint Past Former Printer Champ

INK JET PRINTER	Street price	Tested speed (plain text/ full-page graphics)	Vendor's rated speed (mono-chrome/color)	Top resolution (dpi)	Standard resolution (dpi)	Paper input capacity (sheets)
Epson Stylus Color 980 800/873-7766 www.epson.com	$249	6.6 ppm/2 ppm	13 ppm/10.5 ppm	2880 by 720	720 by 720	100
HP DeskJet 990Cse 888/752-0900 www.hp.com	$399	4.7 ppm/0.8 ppm	17 ppm/13 ppm	2400 by 1200	600 by 600	150
Lexmark Z12 800/539-6275 www.lexmark.com	$59	2.4 ppm/0.4 ppm	6 ppm/3 ppm	1200 by 1200	600 by 600	100
Lexmark Z42 800/539-6275 www.lexmark.com	$149	4.5 ppm/0.5 ppm	10 ppm/5 ppm	2400 by 1200	600 by 600	100
Canon BJC-5000[1] *800/652-2666 www.ccsi.canon.com*	*$249*	*2.3 ppm/0.6 ppm*	*7.5 ppm/3 ppm*	*1440 by 720*	*720 by 720*	*130*

TEST PC WORLD CENTER **HOW WE TEST** Tests are timed from the issuing of the print command until the last sheet is out of the unit. Test documents include ten pages of text; a two-page newsletter; a five-page plain spreadsheet; a two-page spreadsheet with color chart; an HTML page printed from the Web; a five-page color presentation; and one gray-scale and two color photos. [1]A Best Buy in December 1998 *Top 10 Printers* chart.

Even at their best—using fresh ink cartridges and printing on high-quality, glossy photo paper—none of these four units could win a side-by-side comparison test against a real photograph. But the Epson and HP models do come awfully close, and in both cases a casual observer probably wouldn't notice the difference. The text quality of all four printers was good.

REMAINING DOWNSIDES

INK JET technology still lags behind lasers in some key areas. As our tests show, most ink jets can't match vendor-rated speeds in the real world (for in-depth results, see "The Paper Chase," in June *Top of the News*, www.pcworld.com/jun00/printspeed). This is a minor nuisance for people who print a page or two at a time, but it's a serious problem for businesses that print hundreds of pages a day or require several employees to share a single printer.

Ink jet printers are also expensive to operate. Hardware prices continue to drop, but prices for cartridges and other supplies remain relatively high. According to e-commerce information services provider One-Channel.net, ink jet printer prices fell 21 percent between January and June 2000—but ink cartridge prices rose 21 percent, from an average of $19 to an average of $23. Glossy, heavyweight photo paper, which is essential for producing high-quality color prints, is expensive too, selling for a dollar or more per sheet. The reason is no secret: Ink jet vendors make a healthy profit on cartridges and other accessories, and they'd like things to stay that way.

Ink jets face a third challenge: Their prints don't age well. Most ink jets still use dye-based inks that fade quickly and smear easily. Some photo-quality ink jet prints start to fade after just a few months, and few last more than two or three years. New varieties of photo paper that resist water and light damage should help, and ink jet vendors are working to produce longer-lived inks—Epson's $899 Stylus Photo 2000P, for example, uses pigment-based inks that may last decades. These new technologies have not yet undergone thorough testing, so the question remains whether any vendor has found the right formula for image longevity.

TIME TO BUY?

THE GROWING popularity of digital cameras, e-commerce, and photo-sharing Web sites has increased our appetite for color printing. No matter how long you wait, a better model inevitably lurks around the corner. If you're looking for a workgroup printer, lasers retain the advantage for now because of their speed, low per-page cost, and mechanical reliability. Early next year, however, you should see true photo-quality ink jet printers for under $200. And we expect speed and quality to keep improving as the ink jet revolution rolls on. But as our tests show, you'll pay less than you think for great quality today—it might just be time to retire that old bundled ink jet.

—Matthew McKenzie ▶

PRINT QUALITY SAMPLES

Best Quality Yet From Today's Ink Jet Printers

EPSON STYLUS COLOR 980
Epson leads the pack with outstanding photo-quality output in both paper types.

HP DESKJET 990C
The HP's color quality isn't as sharp or rich as the Epson's, but it comes close.

LEXMARK Z42
The Z42 has fairly good color output, but you can easily spot individual dots.

LEXMARK Z12
The Z12 delivers only passable color quality, but its bargain price can't be beat.

WORK WITH ME

GIVE ME STRAIGHT ANSWERS TO MY QUESTIONS – FAST

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[1]Requires Internet access account, available separately. [2]The "Buy Today, Ship Today" program applies to select IBM products only (designated on the IBM Web site at *www.pc.ibm.com/us/offers/buytoday*); it does not apply to non-listed systems, accessories, options or other products. Orders under the program must be placed by phone at 1-888-ShopIBM or via the Web at *ibm.com/shop* Orders under the program must be properly completed by 3:00 p.m. Eastern Time. Orders completed after 3:00 p.m. or on weekends ship the next business day. An order is considered properly completed when IBM has approved the customer's method of payment, including any necessary credit authorizations. Orders subject to product availability. Delivery date and costs will vary depending on delivery method chosen. Shipments may be delayed due to business closings or delays based on the weather or other circumstances beyond our control. IBM reserves the right to modify or withdraw this offer at any time, without notice. [3]For terms and conditions or copies of IBM's Statement of Limited Warranty, call 1-800-772-2227 in the U.S. and in Canada 1-800-426-2255. Limited warranty includes International Warranty Service in those countries where this product is offered. Telephone support may be subject to additional charges. [4]SuccessLease is offered and administered in the US and Canada by third-party providers of business financing approved by IBM Global Financing. Featured monthly lease payments are based on a 36-month term with prespecified purchase option at the end of lease, to qualified business customers only, installing in the US. A documentation fee and first month's payment due at lease signing. Any taxes are additional. Other lease terms and structures are available. Offer may be withdrawn or changed without notice. SuccessLease is an IBM trademark. All products ship with an operating system, except servers. IBM reserves the right to alter/withdraw offerings at any time, without notice. SuccessLease and all IBM product names are registered trademarks or trademarks of International Business Machines Corporation. Intel, the Intel Inside logo and Pentium are registered trademarks of Intel Corporation. Microsoft and Windows are registered trademarks of Microsoft Corporation. Other company, product and service names may be trademarks or service marks of others. ©2000 IBM Corp. All rights reserved.

First Gigahertz-Plus PCs Arrive: Intel and AMD Race On

U P D A T E

IT HAS BEEN a banner year for CPUs, and it's not over yet. Intel and AMD have blown past the 1-GHz milestone each company reached earlier this year. The latest speedsters: AMD's 1.1-GHz Athlon and Intel's 1.13-GHz Pentium III.

In our tests, both chips powered top-of-the-line processing that will come in handy for digital video editing and multimedia creation, hard-core 3D gaming, or complex scientific and mathematical modeling.

SHORT SUPPLY

LIMITED AVAILABILITY is the only major downside to these newcomers, a problem with all new high-end processors recently. The 1.13-GHz Pentium III will be available only in limited quantities initially, with the supply increasing toward the end of the year. The 1.1-GHz Athlon should be available in quantity at launch.

Want to save a little money? Consider a 1-GHz machine or even an 800-MHz system. A 1-GHz system can be had for $400 to $500 less than a comparable topline PC. Switch to an 800-MHz CPU in a similarly configured machine, and the savings increase by $300 at least, but you'll sacrifice about 12 to 15 percent of the performance you would have gotten from the top systems.

DELL'S NEW Dimension XPS B Series with Intel's 1.13-GHz Pentium III.

We tested a reference system from AMD equipped with a new 1.1-GHz chip, 128MB of PC100 SDRAM, a 34GB hard disk, and a graphics card bearing NVidia's GeForce2 GTS chip with 32MB of DDR SDRAM. The 1.13-GHz Pentium III CPU was mounted in a $3799 Dell Dimension XPS B loaded with 128MB of PC800 RDRAM, a 45GB hard disk, both a DVD-ROM drive and an 8X/4X/32X CD-RW drive, an NVidia-GeForce2-GTS–based graphics card with 64MB of DDR SDRAM, a modem, 10/100 ethernet, and a 19-inch monitor.

The Dell system edged out AMD's reference PC on our PC WorldBench 2000 test suite with a score of 175, the highest we've seen by a Windows 98 system. AMD wasn't far behind, however, scoring 171 on our benchmark; you wouldn't notice any difference while using typical business applications. Still, these scores are less than 10 percent higher than those racked up by 1-GHz units. Noticeable speed gains occur only if you trade up from an 800-MHz or 600-MHz PC; on our tests, these typically score 12 to 22 percent lower than PCs with the new chips. (PC WorldBench 2000 is a system-level test.)

NEXT UP

BY YEAR'S END, Intel will up the ante again in the two-handed CPU poker game by releasing its Pentium 4, the latest revision in the Pentium line. The Pentium 4 is expected to debut at 1.4 GHz or faster. AMD's next-generation Athlon processor, code-named Mustang, is also on the horizon. Aimed primarily at the workstation market, Mustang is also likely to debut at speeds well beyond 1 GHz and carry up to 1MB of Level 2 cache.

By the time you read this, Compaq and Gateway should be marketing 1.1-GHz Athlons priced several hundred dollars lower than comparably configured Pentium systems—a great deal if you're among the PC users who need the highest level of performance.

—Anush Yegyazarian

GIGAHERTZ-PLUS CPUs TEST REPORT

Chips Run Faster Than Ever, but Not by Much

SYSTEM	CPU	RAM (MB/type)	Level 2 cache (KB)	PC WorldBench 2000 score (Faster)
AMD reference PC	Athlon-1100	128MB PC100 SDRAM	256	171
Dell Dimension XPS B	Pentium III-1133	128MB PC800 RDRAM	256	175
One system	Athlon-1000	256MB PC100 SDRAM	256	169
One system	Athlon-1000 [1]	128MB PC100 SDRAM	512	155
Average of two systems	Pentium III-1000	128MB PC800 RDRAM	256	164
Average of three systems	Athlon-800 [1]	128MB PC100 SDRAM	512	145
Average of three systems	Pentium III-800EB	128MB PC133 SDRAM	256	153
Average of two systems	Pentium III-600EB	128MB PC100 SDRAM	256	136

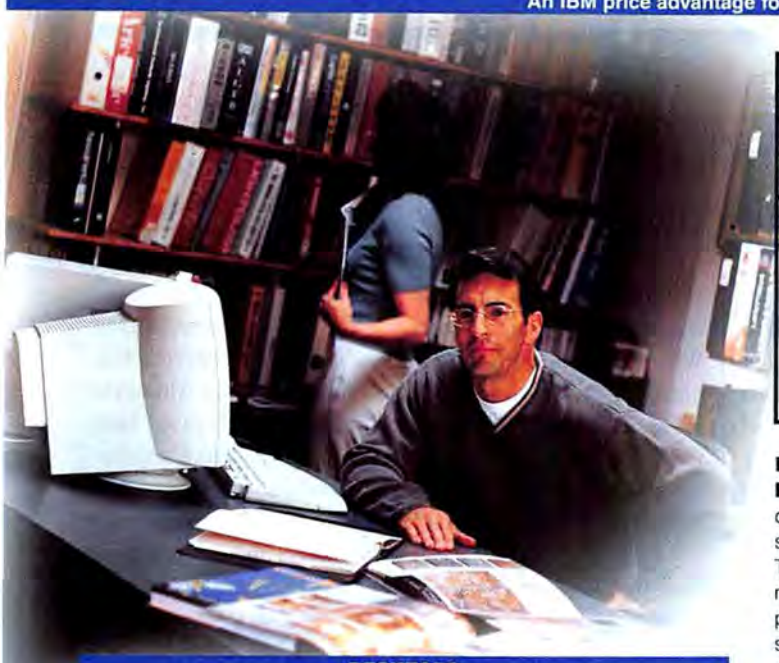
TEST PC WORLD CENTER **HOW WE TEST** All systems are tested with PC WorldBench 2000, PC World's application-based benchmark. A higher PC WorldBench 2000 score is better. Data based on testing conducted by the PC World Test Center. All rights reserved. [1] With external, half-speed L2 cache memory. **Number highlighted in red represents best score.**

• Dimension XPS B

List price: $3799, Dell Computer, 800/388-8542; www.dell.com

PHOTOGRAPH: KEVIN CANDLAND

An IBM price advantage for small business



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Sneak Peek at Whistler—Microsoft's Next-Generation Windows

FIRST LOOK

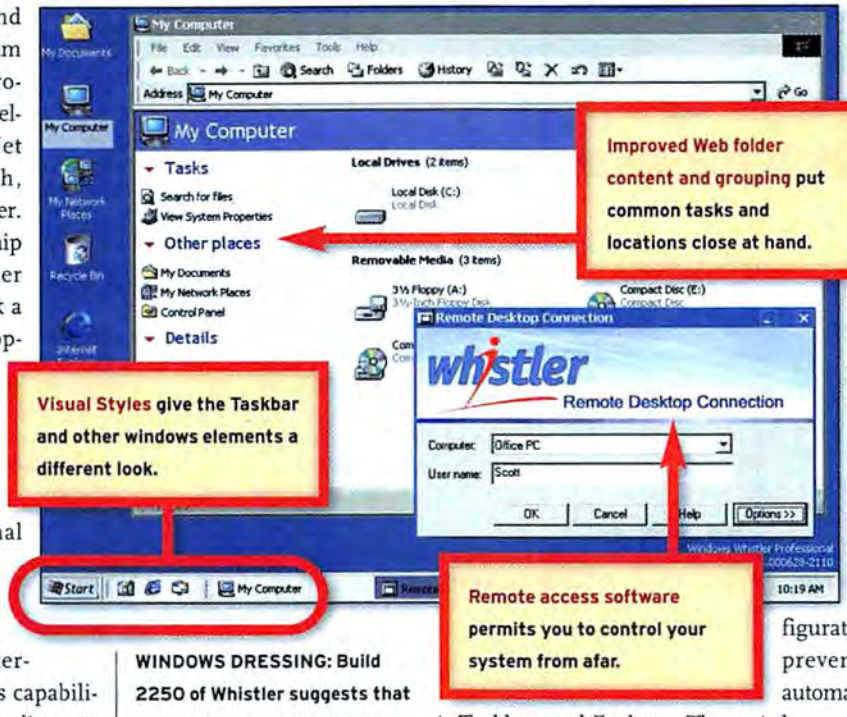
THE FUTURE of Windows is .Net—Microsoft's initiative for simplifying interaction with computers and related devices, and keeping them connected via the Internet. With Windows 2000 and Windows Millennium out the door, Microsoft is well into development on the .Net successor to both, code-named Whistler.

Whistler won't ship for at least another year. But we snuck a peek over a developer's shoulder at Build 2250, a prebeta version.

What we saw, although subject to change in the final product, suggests a Windows with a richer, more configurable user interface, remote access capabilities, and the ability to listen to your voice commands and read your handwriting. The new operating system will also incorporate some of the .Net technologies that Microsoft demonstrated earlier this year. These features, which will allow you to access information on multiple devices wherever you go, aren't apparent yet—in part because many of them require server support that hasn't materialized at this early stage. On the other hand, you can already interact with Whistler from a Pocket PC—to check e-mail, for example, or to download a file.

Whistler is likely to appear in a professional edition for business desktops, as well as in various server editions. And since it is slated to grab the consumer OS baton from Windows Me, there may be a home edition as well.

The first changes we noticed in Whistler were in the user interface—the Start menu, Taskbar, and Explorer. These changes are predominantly cosmetic but could help novice users while reducing the number of clicks veteran users expend on common tasks.



WINDOWS DRESSING: Build 2250 of Whistler suggests that an interface makeover is afoot.

START IT UP

MICROSOFT'S .NET press conference previewed a customizable, browserlike interface that unites e-mail, application launching, and various file browsing tasks. Whistler Build 2250 contains a hidden, still-buggy first stab at a concept called the Start Page—basically Active Desktop revisited. This could eventually become the primary way users interact with their computers and the Internet, but Microsoft will have to create a killer Start Page if it wants to render the Start menu, Taskbar, and Explorer obsolete.

More-substantive changes include another currently hidden feature—an alternate Start menu mode called Start Panel, which collects popular commands and links from disparate Start submenus into one multicolumn menu window. The Taskbar gets one or two tweaks as well. A 'Clean up notification area' setting hides seldom-used icons in the system tray, and you can configure specific icons to remain hidden always (or never). Once you have arranged your Taskbar and its individual toolbars the way you want them, you can lock the configuration into place, thereby preventing Windows from automatically resizing the toolbars as current versions do.

Want a different look on your desktop? Various preset Visual Styles—collections of colors, frame sizes, and backgrounds—promise a change of scenery in a few clicks. Windows 9x and 2000 let you vary window frame sizes, colors, and fonts, and then save the settings as a Scheme. Whistler splits these Schemes into color settings, and window and font settings (called Visual Styles). This lets you apply a desktop look and a color scheme independently—a small but useful improvement. Build 2250 includes ▶

Whistler Build 2250

WHAT'S UP with Whistler? Here is the short list of new features:

- **Handwriting and voice recognition capabilities could spur tablet PC development.**
- **Personal remote-control client and server combine to make telecommuting easier.**
- **Start Panel and enhanced Web folder content simplify online navigation.**
- **Visual Styles and Themes support a simplified desktop customization process.**

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only one Visual Style—called Professional (see illustration)—but it gives Whistler a fresh look without degrading screen legibility.

Like earlier Windows OSs, Whistler supports Themes—collections of Schemes, custom icons, and desktop backgrounds. Many Windows 95 and 98 users will remember these from the Microsoft Plus add-on packs. It appears that the final release of Whistler will include Themes, though they're disabled in Build 2250.

EXPLORER ADJUSTMENTS

THE TWEAKING carries over into Explorer. The most obvious alteration is enhanced Web content, which appears in folders in Web View mode. Just as the Start Panel does, the beefed-up Web content puts common tasks and links closer at hand, including commands for creating or copying folders, and renaming or deleting files. All of the links are context-sensitive; for example, the My Pictures folder has zoom, rotate, and slide-show buttons.

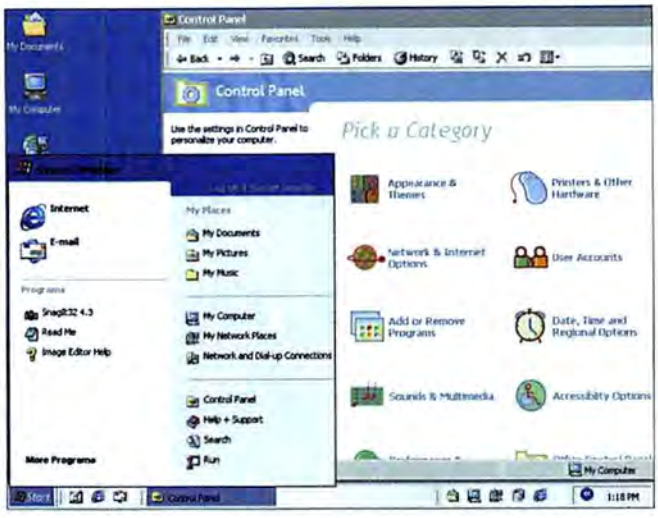
The value of some of the other changes is debatable. Build 2250's Explorer lets you group folder contents, but this makes sense only under certain circumstances. In the My Computer folder, for example, grouping separates a PC's drives into removable and nonremovable sections. Elsewhere, grouping simply alphabetizes by file name, a space-consuming exercise that forces you to do more scrolling to view folder contents. A new view for folder contents, Tiles, resembles but replaces the older Windows OSs' seldom-used Small Icons view. In Tiles view, the item's name and file type appear on multiple lines to the right of the icon, displaying slightly more information about the folder items, but occupying more window space.

DIAL IN, TAKE OVER

IF YOU rely on computers daily, you might well have a desktop PC at work, a laptop for business travel, and one or more home computers. Whistler Build 2250 includes Remote Control client and server software for connecting to a computer over a LAN, dial-up, or VPN connection. So while you work at home, you can retrieve files from or launch applications on your office computer, and view the interface on your local machine—either in a window or in full-screen mode. Though they aren't as full-featured as third-party remote control utilities like LapLink.com's LapLink, Whistler's tools might suffice for users in need of the basics.

> An early version of the next Windows has interface updates, speech and handwriting recognition, and remote access tools.

In testing Whistler's server using Windows 2000's terminal server client, I was able to connect to and take control of the Whistler machine without problems. Only one user at a time can log on, either remotely or locally, but you can access files and shared printers from a third system without logging on. The remote user's session ends as soon as another person logs on to the machine—so if Junior sits down for a quick round of Quake III just when you're in the midst of juggling spreadsheets from the office, you're doomed.



WINDOWS GETS a fresh Start with Whistler's optional Start Panel.

As with other Whistler innovations, there's nothing terribly new here. The whole thing runs using Windows Terminal Services, a multiuser remote control system that Microsoft licensed from Citrix a few years back and tacked onto Windows 2000 Server. Although the corporate version of Terminal Services was too expensive to catch on in a big way, this personal version could become very popular with telecommuters, travelers, and late-night workaholics.

COMING ATTRACTIONS

MICROSOFT promises that many of Windows Me's innovations (see "All About Me," September *Top of the News*, www.pcworld.com/sep2000/millennium) will show up in Whistler, but most are missing from Build 2250. Though Windows Movie Maker probably won't end up in the Windows.Net Professional product, business users could benefit from Win Me's networking wizard, Windows Media Player 7, and the System Restore rollback utility—all MIA in Build 2250.

Those features may show up in Whistler Beta 1, due later this fall, as may two other interesting no-shows: speech and handwriting recognition. Build 2250's Control Panel contains an applet labeled Speech v5.0 that bears grayed-out Vocabulary Builder and Vocabulary Editor buttons. Speech recognition seems completely disabled in this build. However, system-level support for speech recognition could finally make talking to your computer commonplace. (Cubicle-farm denizens may want to start campaigning now for an office with a door.)

Likewise, handwriting recognition is a disabled text-input option in Build 2250. But if it resembles the brilliant handwriting recognition software in the Pocket PC operating system at all, Windows.Net could inspire a new generation of high-powered, handheld tablet PCs.

–Scott Spanbauer ▶

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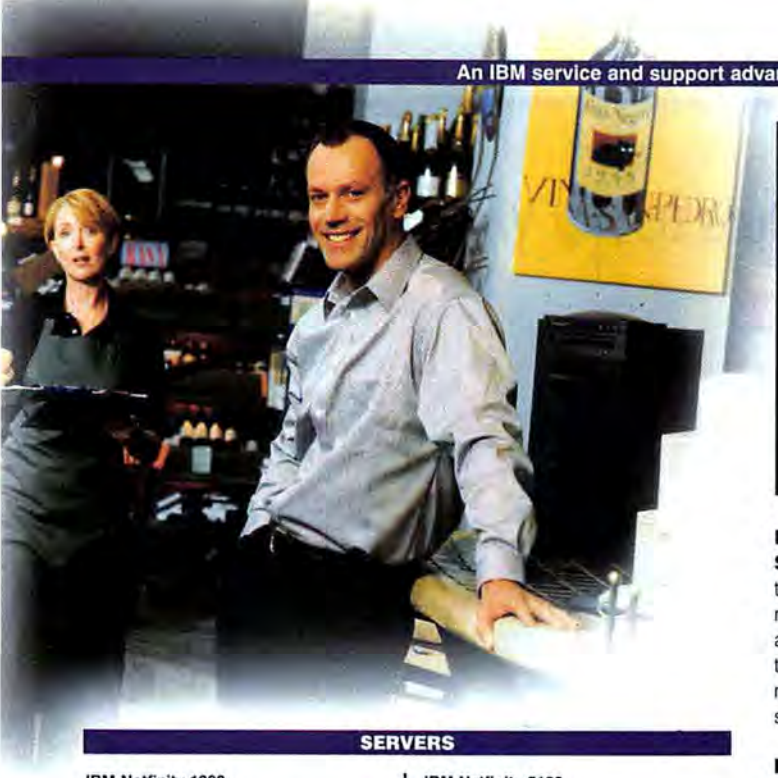

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Online Gambling: Luck Runs Out for Virtual Casinos?

POLICY

ODDS ARE that Congress will move this fall on a bill to shut down gambling on the Internet—an increasingly popular online pastime whose legality is already murky, at best.

Supporters of the bill include an unlikely coalition of antigambling forces and brick-and-mortar casino interests that backers claim would protect U.S. citizens from the dangers of untaxed, unregulated online betting—including such threats as addiction, crime, and moral decline.

An equally unusual coalition of opponents—the American Civil Liberties Union, online gambling advocates, and an outspoken law professor—argue that the bill won't work. Some suggest the feds will try to use it as a springboard for greater restrictions on unpopular or controversial sites.

As proposed by U.S. Representative Bob Goodlatte (R-Virginia), the Internet Gambling Prohibition Act will give U.S. law enforcement agencies, when armed with a court order, the ability to force Internet service providers to remove gambling sites from their servers, or to block user access to such sites appearing on other servers. The bill also deals out prison sentences of up to four years and fines as high as $20,000 to convicted gambling-site operators. The bill would leave punishment of individual gamblers to the states.

Narrowly defeated in July, the bill is expected to come up for another House vote in September. A similar bill passed the U.S. Senate last fall.

"We have 700 illegal, out-of-control, unregulated cyber casinos online that are sucking money out of the country," Goodlatte says. Most of these virtual casinos avoid the tangled web of U.S. state and federal gambling laws by setting up shop offshore in locales such as Antigua and Romania.

Opposed to the bill is Tom W. Bell, a visiting professor at the University of San Diego School of Law and adjunct scholar at the libertarian Cato Institute. He believes the Net's flexible nature makes the bill unenforceable and a potential burden on ISPs. Worse, when the legislation fails to accomplish its goals, Bell says, U.S. agencies are likely to ask for broader powers to take on gambling sites—which could then compromise Web surfers' rights and privacy. "This [bill] is the camel's nose in the tent," warns the Internet law expert.

The ACLU sees the legislation as unenforceable, too, and Associate Director Barry Steinhardt calls it a trend toward controlling victimless Internet activities.

Internet gambling is a popular target for government regulators, Bell adds, because it's perceived as somewhat sleazy. As a result, killing it off is unlikely to stir up much of a public outcry. "We have to head off regulation of unpopular industries, such as Internet gambling, to protect the popular ones," he says.

Internet wagering may be more popular than Bell thinks. About 5 million Americans have tried online gambling or played an online lottery, according to a survey conducted by the nonprofit Pew Internet & American Life Project (see "Ready to Roll the Dice?").

Financial firm Bear, Stearns & Company estimates worldwide Internet gambling revenues for 1999 at $1.2 billion, and projects that the figure will reach $3 billion by 2002.

A TAXING PROBLEM

REAL-WORLD casinos oppose Internet gambling because the sites evade government scrutiny, says Wally Chalmers, vice president of the American Gaming Association. To the contrary, Albert Angel, vice chairman of the nonprofit Interactive Gaming Council, says that most Internet gambling sites are legitimate and are licensed in the country in which they reside.

Goodlatte points out that online gambling concerns collect millions of dollars in untaxed revenues, and he says the proposed legislation is about more than protecting citizens from the evils of gambling.

It is, he says, "an effort to clean up a serious problem that exists on the Internet."

—Tom Mainelli ■

Ready to Roll the Dice?

WANT TO TRY YOUR LUCK ONLINE? Before you click, consider this: In the United States, offline gambling is illegal, except in states that closely regulate it. Current laws didn't anticipate the Internet, so the legality of online wagering is arguable. Getting busted is unlikely, but you can improve your odds of remaining aboveboard by playing online for fun, not money.

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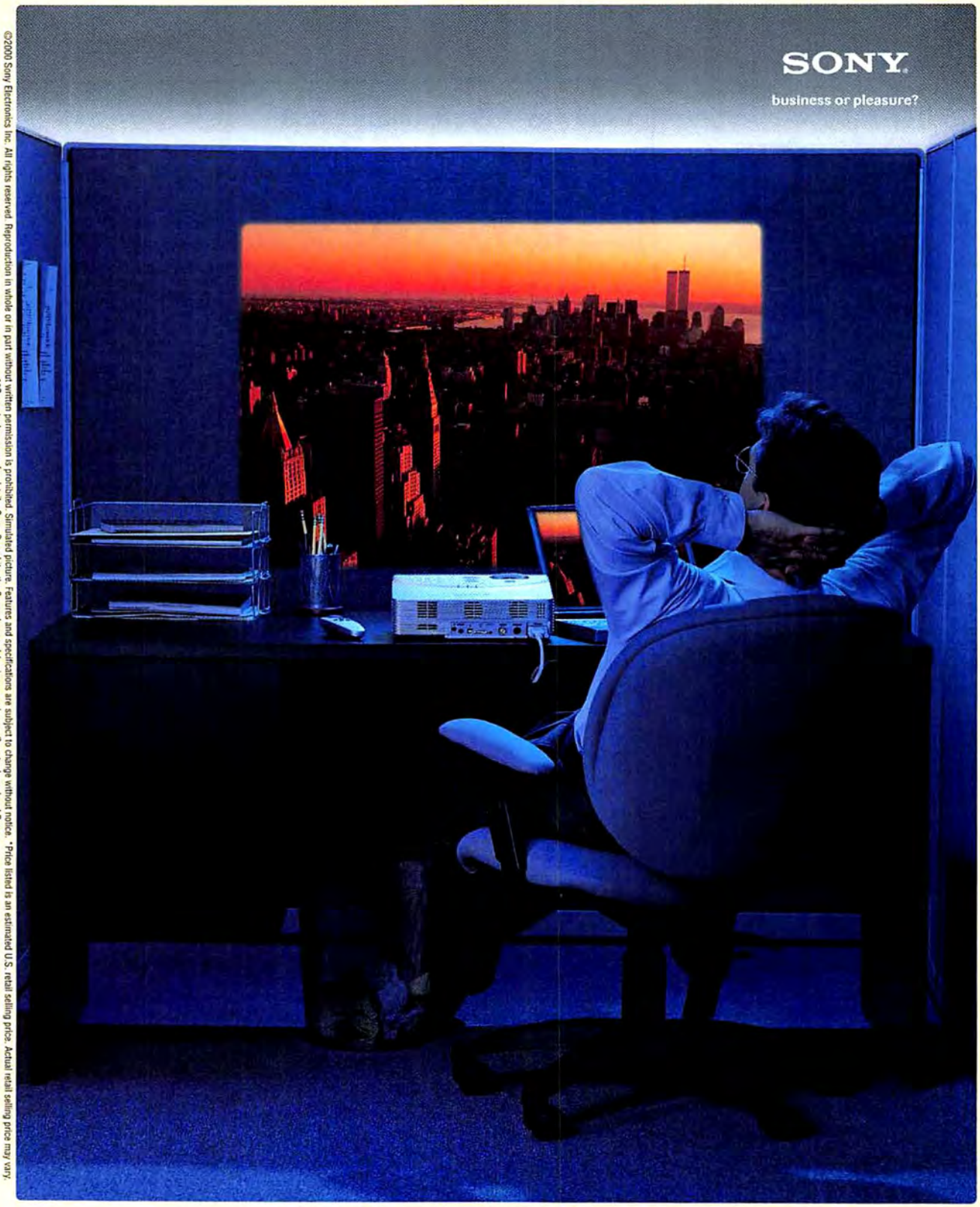

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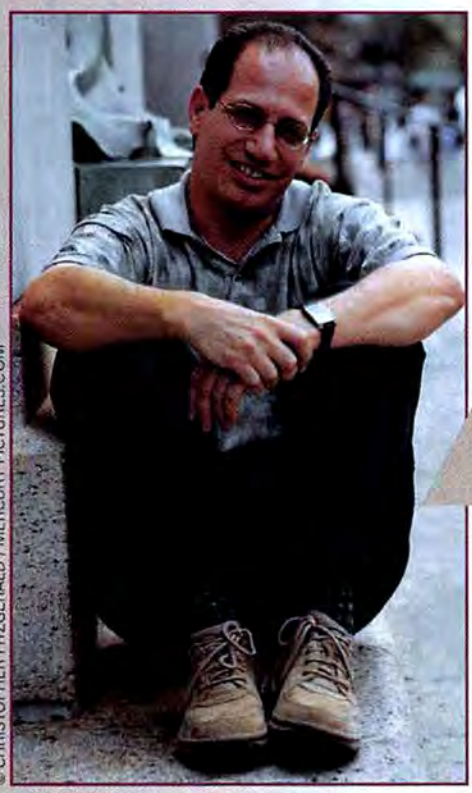

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TODAY'S TECHNOLOGY HAS ENABLED THE RICHEST-EVER COMPUTING EXPERIENCE FOR MOBILE PROFESSIONALS

Above, Mike Spataro, global manager of Shandwick Interactive

At the June 2000 PC Expo in New York City, a mobile computing accessories vendor displayed a vintage advertisement in their booth. The faded poster showed a 1930s-era traveling businessman typing on a venerable Remington portable in a Pullman railroad car. The tag line exclaims, "Me? I've got work to do!"

That businessman was literally on the fast track - 60 years ago. Today's traveling professionals, an estimated 30 million U.S. workers by year's end, exist in Internet time, traveling and communicating at the speed of thought.

Mike Spataro, global manager for Shandwick Interactive, based in Boston ("and a dozen other locations simultaneously," he quips), recalls a time when staying in touch required huge biceps.

"When I started working about 20 years ago, it was difficult to be efficient or productive. To work on the road, I had to lug a 16-pound, so-called portable typewriter around. Today, I use my lightweight Hewlett Packard Omnibook 900 to remotely exchange graphic and multimedia files with our corporate network and with clients in the United States. With my laptop and cell phone, I'm connected to the everyone in the world."

In August, Spataro returned from a five-day business trip to London, Milan, Madrid, and Munich. While abroad, he relied on Nextel's international wireless service for his Motorola cell phone

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"The nice thing about this new, totally connected mobile world is that it doesn't have to be 100 percent work. I'm also much closer to my family and friends. And it's nice to hear from them in the middle of the day—when you're getting hammered by clients."

—Mike Spataro, global manager, Shandwick Interactive

and UUnet's remote access connectivity for the HP Omnibook. Spataro says the quality of his voice and data connections is so flawless that he does not change his voice mail or e-mail messages while he's away. "With this gear, my clients don't know I'm out of town. To them, it's like I'm still in Boston."

STAYING CONNECTED

Communication is the stock in trade of the information age. Industrial psychologists remind us that while most people prefer to receive positive information, they prefer any information over silence. What's more, the way they get information is no longer as important as it once was. Whether you are communicating in person, via e-mail, or by voice mail, the important thing is to get your message across.

Fortunately for wireless users like Spataro, vendors now offer a variety of affordable high-speed solutions. One, from Novatel, overcomes the sluggish transfer speed that long marked wireless data transfers. Novatel's credit card-sized Merlin Wireless PC Card for Metricom's high-speed Ricochet Wireless Mobile Access Network provides 128Kbps data exchanges. Metricom's Ricochet network offers Internet access, private intranets, local-area networks, e-mail, and other online services at the highest wireless data throughput available.

Novatel's Merlin Wireless PC Card for Metricom's high-speed Ricochet Wireless Mobile Access Network

MORE ARROWS IN YOUR QUIVER

By any measurement, modern mobile technology is the quintessential enabling tool found in every mobile worker's toolbag. The adoption numbers bear that out. New York-based Jupiter Communications predicts 12 million Internet-enabled handheld computers will be in use by 2003, up from 5.2 million last year. They predict a cataclysmic explosion in browser-enabled mobile phones, from 1.1 million last year to a phenomenal 79.4 million units in 2003.

Faster speeds are coming just in time to replace older overburdened technology. CDPD (Cellular Digital

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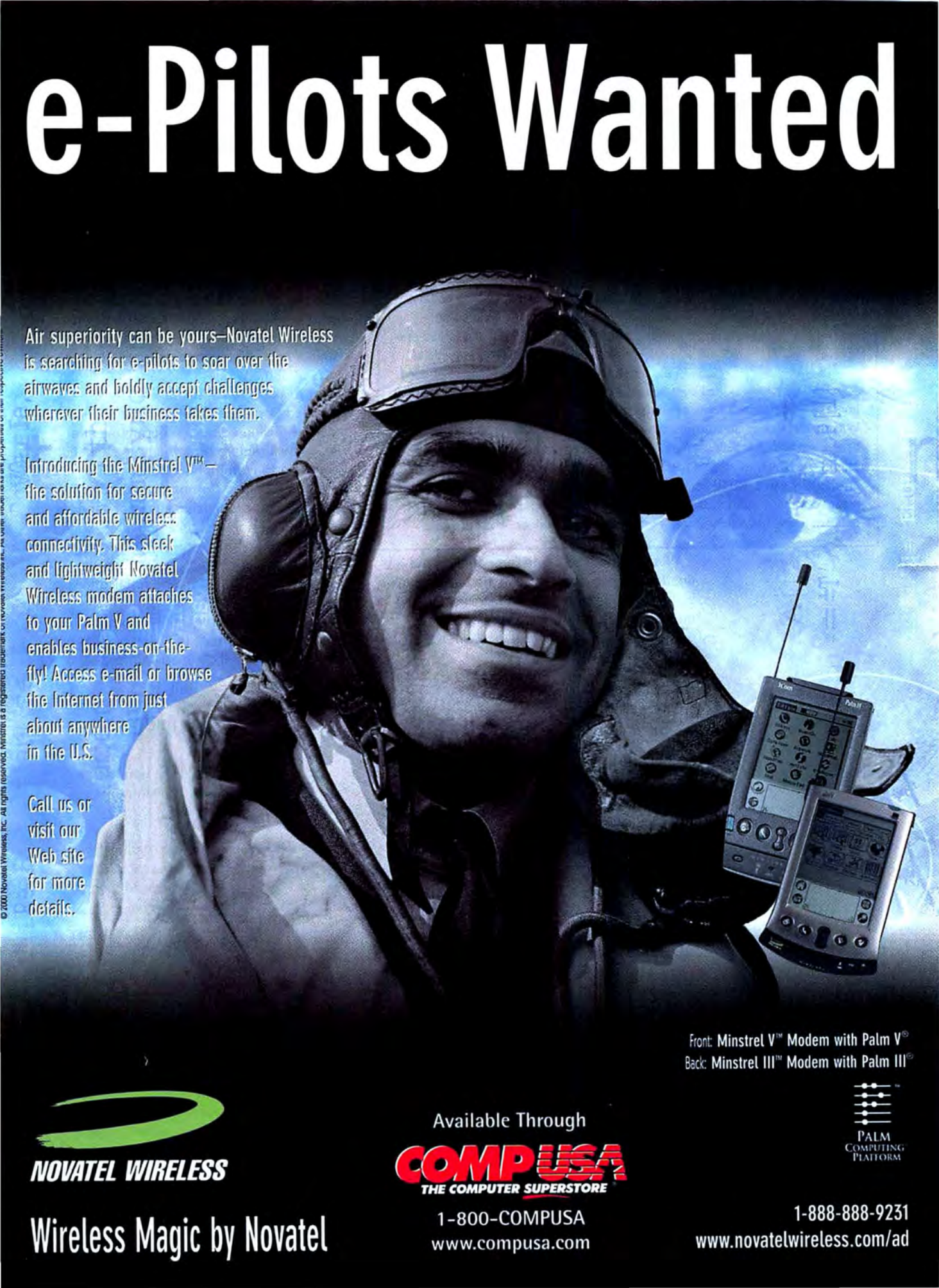

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Front: Minstrel V™ Modem with Palm V®
Back: Minstrel III™ Modem with Palm III®

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Packet Data) transmission tops out at 19.2Kbps, and CDMA (Code Division Multiple Access) cellular technology can transfer data at only 13Kbps—neither of which is fast enough for Web surfing.

Featuring excellent image quality, crystal clarity and vivid color, InFocus's new LP340 and LP350 projectors will easily meet the needs of the most discriminating performance-minded and cost-conscious professional presenters. Equally at home in a conference room or on the road, these two stylish units from Wilsonville, Ore. innovator InFocus offer 1024 x 768 XGA resolution, 2000-hour lamp half-life, 1300 lumens and a 400:1 contrast ratio with intense brightness. Other advanced features such as digital connectivity, home-theatre quality video, HDTV compatibility and CableWizard technology make it clear why these sub-seven-pound packages continue InFocus's tradition of delivering award-winning excellence at affordable prices. 1-888-InFocus

Web surfing is just one force fueling the need for wireless speed. The increasing availability of high-bandwidth DSL and cable-modem access to the desktop has users demanding similar performance when they connect remotely.

SPEED LIVES

The increasing demand for bandwidth from traveling professionals and remote staffers, combined with the reality that cable modems or DSL are not available in all areas, has given rise to Fixed Wireless service. "Fixed Wireless" describes a variety of audio wave-based technologies that share a common characteristic: they all use a base station to send and receive data using radio waves within a carefully defined geographic area. Users attach a wireless modem to their laptop or desktop to connect.

Unified Communications, the latest and most promising enhanced communication service, will require broadband to succeed. According to Framingham, Mass.-based IDC Research, "Unified Communications" describes comprehensive suites of services that combine non-real-time activities (such as message exchange), with real-time communications (such as call delivery and connectivity, live call management, and notification options).

While the market for Unified Communications is currently small, (IDC estimates it had fewer than two million users in the United

The Travelers' Tip Sheet

There's no sense in reinventing the wheel when you can learn from the hard-won lessons of others. Here's a list of time- and money-saving tips from Danny Shapiro, senior director of Redwood City, Calif.-based Startups.com.

Danny Shapiro

✓ Create a Web-based interface into your e-mail system, so that no matter where you are, you can get your e-mail. If your ISP doesn't offer this service, look into Mailstart.com, a free Web-based access provider.

✓ Before you leave for a business trip to a place you've not been before, visit Mapquest.com or Business-trip.com. Sure, you could rely on the generic maps you get from the the car rental agency, but you'd be better served with detailed turn-by-turn directions.

✓ Similarly, check the weather at Weather.com or click on the weather button at any major portal. Make sure you stand out because of your business acumen, not because you arrive for the meeting frozen, overheated or drenched.

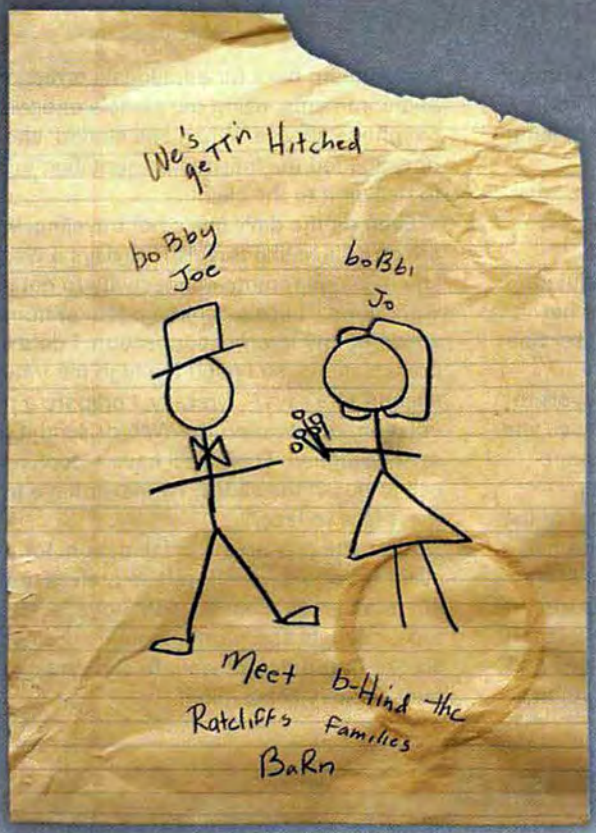
✓ Schedule exercise time both on the road and as part of your regular work routine. It will reduce stress, maybe some weight, and will energize you.

✓ Always! use the hands-free option when talking on a cell phone when driving.

✓ When traveling, pack a few of your favorite music CDs for the plane ride. Make sure the car you rent has a CD player.

And this tip from Theresa Nozick, vice president of market research at Culver City, Calif.-based Mobile Insights.

✓ When you're gazing at the sales counter deciding what mobile equipment to buy, think about who else needs access to your information. How well can the device you are considering share information with your desktop and with your colleagues?



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States in 1999), they predict the total number of U.S. subscribers will reach 28.4 million by year-end 2004, a meteoric 71.4 percent annual growth rate.

IF THIS IS TUESDAY

One of the "Palm-Sized" U3 digital projectors from PLUS Corp.

Maria Burud, senior vice president of Marlboro, Mass.-based Infinium Software, spends most of her days living out of a suitcase. She lives in Chicago, works in Marlboro, and regularly travels to the company's Hyannis, Mass., and Lisle, Ill., offices. And in her spare time, she travels to meet clients.

Since she's on the go 70 percent of the time, she has learned how to maximize her chances of staying connected. Before she boarded a plane for a recent business trip, she downloaded a presentation from a colleague into her Sony Vaio. She reviewed and annotated the slides during the flight, then e-mailed them back for additional corrections and comments, using the plane's onboard Skyphone service. When she landed, she downloaded the finished presentation in time to deliver it to the client.

Even on the days she's not traveling, which are rare since she travels four days a week, she relies on remote connectivity to get her work done. "I use a cable modem at home to speed up my Internet connection. I do a lot of presentations, so I need the high file-transfer speed," she says. "Typically, I prepare a presentation, put it up on the Web or send it to my colleagues. Then we'll have a conference call to polish the slides. We never have to meet face to face."

After she prepares a presentation, for a client or for a trade show, she prefers to present it in person. Loaded with luggage, laptops, gadgets and gizmos, mobile professionals like Burud do not want to carry an extra ounce if they can avoid it.

Extended Systems Extends Your Reach

Finding a lightweight, portable device to conveniently and securely store your data solves one part of a two-part problem. You still need a way to exchange that data with your colleagues and with your desktop computer.

"Management of mobile workers' devices is high on the list of concerns for IT administrators," says Theresa Nozick, vice president of market research at Culver City, Calif.-based Mobile Insights. "At the same time," she adds, "these devices are so integral to productivity and to connectivity that no one can afford to be without them."

Two of the leading data-management and synchronization products, XTNDConnect Server and XTNDConnect PC, come from Boise, Idaho-based Extended Systems. Extended Systems' high-performance XTNDConnect Server supports multiple applications and devices, making it a valuable tool for IT managers who need a one-size-fits-all solution to integrate a variety of handheld devices into the enterprise. And because it is cross-platform (supporting Windows, Palm Computing and EPOC mobile devices, unlike many of its competitors), the application also includes tools such as backup/restore, installation, configuration and reporting capabilities to securely integrate and support handheld devices in a corporate environment.

XTNDConnect Server

XTNDConnect PC, a fast, flexible, and easy-to-use tool, makes synchronizing contacts, calendars, tasks and e-mail between popular devices easier. XTNDConnect PC links devices from Palm Computing, Windows Pocket PC and Handheld PC, and Casio Pocket Viewer with productivity applications such as Microsoft's Outlook, Lotus Organizer, Lotus Notes, ACT!, GoldMine, and NetManage Ecco Pro.

Michael Birau, director of IT services at Hafele America in Archdale, N.C., a distributor of furniture products for manufacturers, is integrating XTNDConnect PC into their 120-person sales force. "It is performing well for us. It is easy to use and enables all of our staff who use the Palm to stay current," he says. And in today's mobile computing environment, staying current can be the crucial difference.

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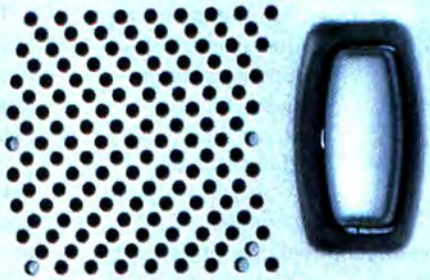

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PJ853 LiteBird LCD projector from ViewSonic

Projector vendors heard those pleas and responded with ever lighter and brighter projectors. One of the leaders in manufacturing state-of-the-art compact, microportable projectors is Allendale, N.J.-based PLUS Corp. Its one-of-a-kind "Palm-Sized" U3 digital projector series all feature an incredibly small 7-inch by 9-inch footprint and a 1.9-inch thin configuration. They weigh in at a just 2.9 pounds and still deliver 800 ANSI lumens of brightness and razor-sharp XGA (1024 x 768) resolution.

For delivering presentations in large rooms, Anaheim, Calif.-based Sony introduced two new three-panel LCD projectors, the VPL-CX10 and VPL-CS10, that generate 1200 and 1000 ANSI lumen brightness, respectively.

The VPL-CX10 from Sony

The VPL-CX10 uses three, high-clarity, 0.9-inch LCD panels and Micro Lens Array to deliver a true XGA (1024 x 768) resolution. The VPL-CS10 produces SXGA (800 x 600) resolution. Sony's three-panel LCD display technology reproduces exceptionally vivid colors and crisp flicker-free images. The compact, lightweight units (7 lbs., 11 oz.) are designed for flexible and multi-purpose use with ceiling-mounted, tabletop and rear projection capabilities, and with a retractable carrying handle for mobile use. ❄

Toyota Leads the Green Machine Scene

As a computer user, you're used to seeing innovation fuel the growth of ever-more efficient technology. Now, get ready for a quantum leap in transportation technology that will transform the automotive world the way the PC rocked the business world: gas-electric hybrid vehicles.

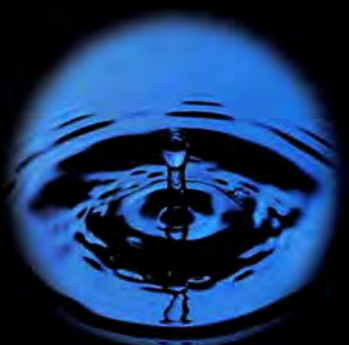
With the pioneering introduction of its Prius gas-electric hybrid here in the United States, Toyota has taken the high road in providing an affordable, environmentally conscious transportation alternative to conventionally powered automobiles.

Toyota's world-of-tomorrow vehicle uses an ingenious combination of a four-cylinder gas engine and a revolutionary electric drive system. Their Advanced Control System automatically sends electric or gas engine power to the wheels, depending on driving conditions and speed. The hybrid propulsion system can power this compact speedster to a sustainable 100mph and still reduce emissions up to 90 percent, compared to the average car today.

Just as Prius's no-compromises performance will easily meet your expectations, so will its long list of safety and style features. Prius boasts room for five passengers, CFC-free automatic climate control, dual air bags, deluxe AM/FM ETR/Cassette with four speakers, and a roomy trunk to carry your gear when you travel. A central instrument display includes a digital speedometer, fuel gauge, shift-lever indicator and odometer with twin tripmeters, and warning lights.

Prius's new-technology batteries, once a major problem with earlier electric vehicles, are guaranteed for eight years or 100,000 miles. Additionally, Toyota will offer a three-year/36K-mile roadside assistance and scheduled maintenance program for Prius owners. Don't worry about parking near an outlet; the Prius never needs to be plugged in. Toyota's hybrid system automatically recharges the batteries whenever they run low.

In addition to the Prius's revolutionary technology and aerodynamic appearance, it has an enviable three-year history of success in Japan, where 35,000 vehicles are on the road helping Toyota to transform innovative ideas into everyday products.



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the impact of
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presentations.

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Optoma

Project the power of brilliance and brightness through digital light.

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A TEXAS INSTRUMENTS TECHNOLOGY

Optoma projectors feature DLP™ technology

With Digital Light Processing™ imaging technology by Texas Instruments, you'll captivate audiences with brilliant colors and incredible clarity, even in ambient light. From portable and large-screen projectors to high-definition home entertainment and digital cinema, leading manufacturers look to DLP™ technology for the best in digital projection. When purchasing projection systems, accept nothing less than the 100% digital image from DLP™ technology. Demand Visual Excellence.

www.dlp.com/optoma

Texas Instruments

EzPro 710
FEATURES

- Sleek Tower Design Reduces Heat, Keystoning, and Hot-Spots.
- Upright Form With Reduced Footprint Saves Valuable Space.
- Ultra Lightweight and Extremely Portable.
- Plug-n-Play Connectivity.

EzPro 710

Standing Tall Above The Crowd.

- Astounding Data & Video Image Quality.
- Ultra-Bright 800 ANSI Lumens (typical).
- Aspect Ratio 4:3, 16:9.
- State-of-the-art DLP™ Technology.

SLEEK TOWER DESIGN Optoma's innovative tower design allows the EzPro710 to stand well above the crowd of ordinary flat projectors. Greater exposed surface area means heat dissipates more rapidly, for better performance and longer lamp life. Image "*keystoning*" and "*hot spots*", which result when flat projectors are angled up toward the screen, are minimized. True perpendicular projection angle ensures consistent image quality from top-to-bottom and side-to-side. Single-cable connectivity and Auto-Sync features make setup fast, easy and flawless every time.

UNEQUALED PERFORMANCE DLP™ technology ensures consistent brightness and photographic, true-to-life colors. 800 ANSI lumens (typical), native XGA (1024x768) resolution and a long-life UHP lamp handle your most demanding presentation needs. With its remote control you can easily manage your presentation from anywhere in the room, using the EzPro710's excellent data, outstanding video and room-filling audio to deliver your message in the most powerful way imaginable.

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A TEXAS INSTRUMENTS TECHNOLOGY

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Website:	www.optoma.com
Email:	info@optoma.com

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WHEN LESS MEANS MORE

"Everybody lives by selling something," said *Treasure Island* author Robert Louis Stevenson. Sometimes what you sell is ideas; sometimes it is a product or service. If your path to success requires you to give presentations, Optoma has good news for you.

Optoma Technology Inc.'s (formerly CTX Opto) new EzPro 710 projector delivers dazzling colors plus crisp images and still weighs in at a mere five pounds. Literally a standout, Milpitas, Calif.-based Optoma's vertical form factor 710 delivers true XGA, (1024 x 768 addressable pixels), 800 ANSI lumens in a tower-style form factor that rises above the crowd. Its vertical form factor provides two significant benefits. First, its small footprint enables you to stand the unit on a crowded tabletop. Second, the tall design dissipates heat faster than flat models, resulting in longer bulb life and fewer heat-stressed components.

Optoma Technology's EzPro 710 projector

Trainers, educators and presenters give high marks to projectors like this one that offer fast configuration for NTSC, NTSC 4.43, PAL, PAL-M, PAL-N, and SECAM. In addition, the EzPro 710 provides advanced features such as electronic keystone correction to make sure that your images look the way you want them to. The 710 also uses Texas Instruments' innovative Digital Light Processing (DLP) technology to deliver a rich palette of 16.7 million colors that will help you to present your products, or to convey your ideas, in their best light.

Besides, after sweating and fretting over the details of your presentation, you want presentation hardware that will grab and hold the audience's attention. Why relegate your message to anything less than the best projectors available. So if you like your projectors tall, cool and illuminating, think Optoma.

FREE BAG

You know us for our monitors. You'll love us for our projectors.

Introducing the LiteBird PJ853 Projector from ViewSonic.®
From the company with the #1 best selling monitors and flat panel displays in the USA* comes another brilliant Visual Technology™ innovation. The LiteBird PJ853 Projector from ViewSonic. At only 5.2 pounds, the LiteBird's lightweight design makes it easy to travel. Yet its state-of-the-art power gives you stunning, ultra-crisp images no matter where you're presenting.

You're not just buying the projector. You're buying the company.
As with every ViewSonic product, the LiteBird™ comes with an outstanding three-year limited warranty** and 24/7 technical support. It's no wonder ViewSonic has won over 600 industry awards. For more information, click on www.ViewSonic-projectors.com. Or call **800-888-8583 ext. 8644** to find your local dealer. The LiteBird Projector from ViewSonic. Start seeing us in a whole new light.

Your next presentation is in the bag.

For a limited time, when you purchase or rent a LiteBird PJ853 projector, you'll get a free executive carrying case. It's perfect for easy projector storage and travel. You can visit **www.ViewSonic-projectors.com** or participating dealers for details. Offer is good while supplies last.This could be your chance to really look brilliant.

(800) 888-8583 ext. 8644 • www.ViewSonic-projectors.com • Specifications subject to change without notice. Copyright © ViewSonic Corporation 2000 • *ViewSonic ranks as United States' #1 best selling flat panel display by Display Search (Q2 '00) and the leading non-captive monitor brand by Stanford Resources, Inc. (Monitrak Q1 '00). **3 year limited warranty on parts and labor. Ninety day warranty on lamp. All rights reserved.

The Visual Technology™ Company

ViewSonic®

On-line Resources for Mobile Professionals

No matter what problem or question you have, chances are that someone, somewhere can help you find a solution. Here are a few Web sites that provide down-to-earth advice, much of it the result of the real-world, front-line experiences of mobile professionals and professional presenters.

Mobileinfo.com, a one-stop Web shop for mobile computing and wireless networking information, is a treasure-trove of information. The site is operated by consultants who search the Web and select relevant information, then organize it into specific categories. They provide multi-network, platform-independent, multi-vendor product, and multi-discipline information. What's more, they deliver "just the facts" by carefully removing unnecessary adjectives and puff-speak. The site's managing editor and publisher, Chander Dhawan, has authored two books on mobile computing and is a leading expert on the topic. Highly recommended.

To interact with other mobile professionals, visit **Deja.com**'s USENET discussion service, which provides the largest archive of discussion forums about mobile-computing topics on the Internet. After a free registration, you can search hundreds of forums related to mobile technology, or post messages to other mobile professionals to ask for, or offer, advice. Just remember that the advice you receive is usually well-meaning and accurate—but not always. Highly recommended, but with a caution advisory.

SolveIT.com provides an unbiased source of information to help solve a variety of enterprise-class mobile computing and IT issues. This easy-to-navigate site provides users with fast access to manufacturers, distributors, consultants, industry experts and cutting-edge industry news with no advertising or banners. With free registration, you can browse solutions, hardware, software, education, collaborate with peers and experts, or participate in user forums.

Biztravel.com helps travelers make reservations and travel plans. From this intelligently organized site, you can easily make airline reservations, book car rentals, and reserve hotel rooms. The site also provides air-travel tips, money-saving tips, and packing and safety tips, as well as specific city information, weather reports and current news in the travel industry that may affect your travel plans. Membership is free.

Visit **PlanetIT.com**'s Mobile Computing homepage and you can browse hundreds of the latest articles on all aspects of computing, with a clearly delineated section on mobile computing. This section is organized by topic and includes communications, Internet, PDA's and handheld PC's, peripherals, portables, support and Windows. Members-only areas include Ask the Expert, Best of the Web, e-mail newsletters, downloads and round-table discussions.

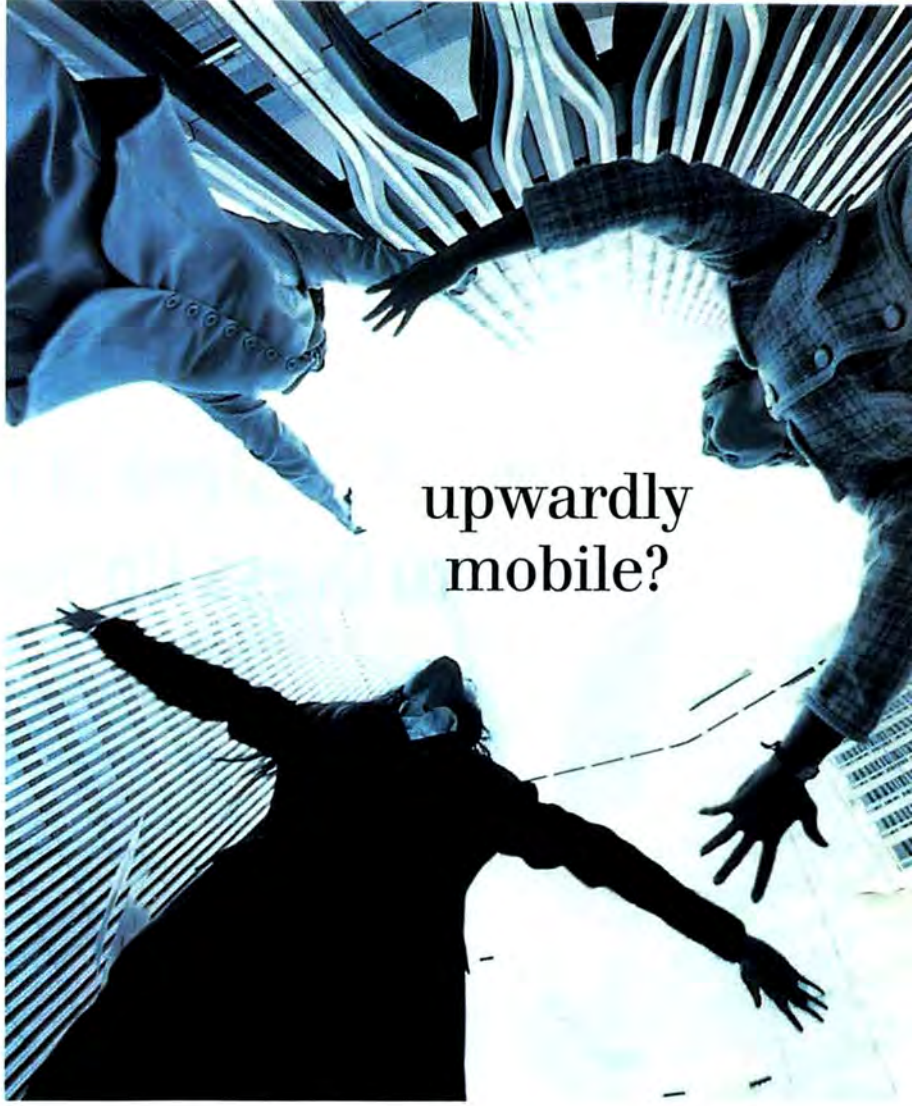
Business-trip.com is a Web site for road warriors, with news, reviews, tips, and links for business travelers. Internet travel resources include airlines, hotels, car rentals, mapping/directions and weather reports. The site gives city-specific links to restaurants and hotels, as well as links to product downloads, and a section devoted to Palm Pilot users.

Professional presenters will find an encyclopedic assortment of articles, trade show news, discussion groups, and links to professional organizations listed at **Presentations.com**. The Web site of *Presentations Magazine*, this professionally designed, true-to-its-name site offers task-specific content that will save you time, money, aggravation—and even your voice. Recent articles include "Tricks to Speak all Day without Growing Hoarse," "What are They Thinking?" and "A Little Anarchy Goes a Long Way." Here too, you will see reviews and sources for presentation equipment. Not so incidentally, one of the more exciting new products comes from Walnut City, Calif.-based ViewSonic: the recently released PJ853 LiteBird, ViewSonic's lightest and most portable LCD projector. Delivering a room-brightening 800 lumens, the ultra-portable device weighs just 5.2 pounds and stands less than three inches tall, making it especially well-suited for mobile sales and training professionals.

Pcworld.com is an excellent resource for mobile computing information, as are other dedicated sites such as **Mobilecomputing.com**, **Pencomputing.com**, and **Mobileinsights.com**. All these sites offer a wide variety of helpful articles. Collectively, they feature the latest industry news and product reviews, and you can browse current or archived articles on an array of industry-related topics.

There may be more than safety in numbers—there may be job security, too. **Cmma.net**, the site of the Communication Media Managers Association, enables you to stay connected, virtually at least, with other professionals. You can use their site to keep abreast of salary averages and job opportunities, as well as to build your personal network of communications media managers who understand what you do and can help you to do it better.

Is your company



It *is* a mobile world. To succeed, companies need powerful solutions that can transform information into business value – anytime and anywhere. XTNDConnect Server software from Extended Systems does just that.

Data synchronization and management features allow easy integration of mobile devices, regardless of platform, into your enterprise environment. Users synchronize data to Microsoft Exchange, Lotus Domino or any ODBC-compliant database. And IT managers maintain strict control of devices using an array of sophisticated management tools.

Upward mobility has its advantages. Move up to XTNDConnect Server and make the most of a mobile world.

Who is upwardly mobile? See on our Web site at:
extendedsystems.com/go/pcw

Extended Systems®
Beyond Connected™

NEW PRODUCTS

Powerful, Sleek LCD Monitors to Dress Up Your Desk

THE PHILIPS 150P won't use up much of your desktop space.

EXCELLENT IMAGE quality for under $1000: Eizo's FlexScan L330.

PHOTOGRAPHS: KEVIN CANDLAND

MONITORS YOU CAN GET a lot of office pizzazz and power in one purchase with a sleek flat-panel monitor. Take a trio of 15-inchers just out from Philips, Eizo Nanao, and Sony. In my tests, these handsome LCD monitors delivered terrifically crisp text in Web pages, word processing documents, and spreadsheets.

The $999 **Philips 150P** LCD—which measures a mere 6.5 inches deep (including the base)—occupies a fraction of the space that comparable CRT monitors require, and it weighs just 11.9 pounds. The 150P accepts DVI-D digital or analog input. You can also hook two PCs to it and easily switch between the two via an on-screen menu. In addition, this LCD sports built-in stereo speakers and a microphone that can be used for videoconferencing.

Overall, the 150P performed well in image tests, but color graphics appeared somewhat dark and splotchy—it performs better with text-based documents and Web pages. Characters in word processing documents and spreadsheets looked crisp, and Web pages bright and highly legible. Images—particularly spreadsheets—did appear slightly bowed at the center when viewed straight on.

I was very impressed by the $949 **Eizo FlexScan L330**. This unit proves that you don't have to spend a fortune for a high-quality flat-panel monitor. Letters and icons in word processing documents were clear and easy to read, and its colors in my graphics tests looked deep, rich, and uniformly bright. Housed in a chic black or beige case that measures 6.7 inches deep, the FlexScan L330 would dress up any office.

This analog-only LCD has two knocks against it. At 12.3 pounds, it's relatively heavy, and its viewing angle isn't as wide as that of the Philips 150P. If you look at its images at an angle rather than straight on, they're not as sharp.

STYLE REDEFINED

IF PRICE IS NO object and space-saving style is of the essence, look no further than the **Sony SDM-N50PS**. At $1500, this 15-inch LCD panel is the most expensive of the three, but it takes the honors for svelte design. Only 0.5 inch thick and weighing just 3.8 pounds including its tiny base, this flat panel resembles a large notebook screen. The SDM-N50PS is wall-mount-

Eizo FlexScan L330

PRO: Good all-around LCD; affordable price; uniformly bright colors.
CON: Analog-only capability; relatively heavy for a flat panel.
VALUE: First-rate graphics and text display for all-purpose office use.
Street price: $949
Eizo Nanao Technologies
800/800-5202
www.eizo.com

Philips 150P

PRO: Crisp text display, good viewing angles; only 6.5 inches deep.
CON: Images appear slightly bowed at center when viewed straight on.
VALUE: Excellent text display for reasonable flat-panel cost.
Street price: $999
Philips Consumer Electronics
877/835-1838
www.pcstuff.philips.com

Sony SDM-N50PS

PRO: Thin design saves desk space; sharp text; multitasking functions.
CON: Some obvious shadowing in corners, colors look washed out.
VALUE: Fabulous style; good text display; flexible positioning capability.
Street price: $1500
Sony
800/352-7669
www.sony.com/displays

CONTENTS

92 Eizo FlexScan L330, Philips 150P, Sony SDM-N50PS flat-panel monitors
93 DeLorme AAA Map'n'Go 6
94 Intel's InBusiness Small Office Network; FileWare FileSync 2.18
96 Intuit Quicken 2001 Deluxe, Microsoft Money 2001 Deluxe
98 Norton SystemWorks 2001; Internet Cleanup utility
100 Palm M100 PDA; Seiko SmartPad accessory for Palms
104 OriNoco wireless network; Epson Stylus Photo 2000P
108 APS Back-UPS Pro 500 USB, Tripp Lite SmartPro 450RT, power supply devices; Canon CanoScan N1220U
110 Sensory Science MP3 players; Philips MMS205 speakers

able and sits like a picture frame on its "photostand"—a base that can tilt through a range from 20 degrees to 40 degrees. As a result, the panel is removable and can be easily rotated from landscape (horizontal) to portrait (vertical) orientation. Though the photostand adds flair, the screen can be knocked over all too easily.

The SDM-N50PS connects to your computer via an included hardware device that houses all of the monitor's circuitry. For multitaskers, this 7-by-7-inch box connects two computer systems at once. To switch between the two, simply push a side control button.

THE ULTRASLIM, ultrasleek Sony SDM-N50PS.

In my tests, the Sony SDM-N50PS produced crisp, sharp letters in word processing documents and spreadsheets, but its color display was disappointing. Detail showed well in test graphics, but their colors appeared dull, even after I adjusted the monitor's on-screen brightness, contrast, and RGB controls. Consequently, this is not a monitor for a graphics professional.

Whether they grace your home, office, or reception area, these attractive LCD monitors will save space and provide a touch of design flair, as well as a clear look at work on display. For general business use, consider either the Philips or the Eizo Nanao unit. But for pure style, I think Sony beats them both.

—Katharine Dvorak

Trip Planning Made Easy With Map'n'Go 6

SOFTWARE

SURE, YOU CAN find long-distance driving directions online. But what about pinpointing points of interest or tourist traps along the way? DeLorme's newest update of its **AAA Map'n'Go** software makes easy work of finding thousands of hotels and restaurants—along with the requisite point-to-point driving directions, destination information, and basic mapping at street level for 240 urban centers.

AAA Map'n'Go 6 has data culled from the most recent collection of AAA recommendations, covering more than 66,000 places to eat, stay, and sightsee in the United States, Canada, and Mexico. The software also encompasses 1 million miles of roads, with detailed maps of more than 240 urban locations. In my tests of the shipping version, the software performed admirably, finding quick routes to destinations and recommending worthy points of interest. One exception: Not all rural addresses showed up.

Compatible with Microsoft Windows 9*x*, NT, and 2000, the latest Map'n'Go packs its wealth of information in a single CD-ROM. At startup, a cartoonlike interface launches—it resembles a car's dashboard. This interface includes an illustration that highlights the program's most often used features. When you make a selection, the interface changes to look more like an ordinary Windows application.

I did have to poke around a bit before I found the text-box screens that allowed me to start trip planning. After you enter start and destination points, the software highlights the route for you on a map that you can print or download to a Palm or Windows CE handheld device. Though the program's mapping information is detailed for roads, highways, and those 240 metro areas, it isn't designed as a street-level guide for other areas. For that, you'll need a separate software package.

Map'n'Go's on-screen help function explains each step of the process, complete with illustrations and buttons to launch the necessary commands. I found the printed manual, however, disappointing and weak on detail.

The software's hotel and restaurant recommendations are excellent—short and well researched. To find them, right-click on the relevant spot on your map and then choose a radius (10, 20, or 50 miles) within which you would like to find information.

Priced at $30 ($25 on the company's Web site), AAA Map'n'Go 6 is a steal, with its winning combination of accurate route mapping and aggregated travel resources. The program provides a good balance that most online mapping and destination sources just don't achieve.

—Paul Heltzel ▶

DeLorme AAA Map'n'Go 6

PRO: Excellent tool for making the most of any long-distance car trip.
CON: Not all rural areas included.
VALUE: Don't leave home without using it to plan your trip.
Street price: $30, $25 at company Web site
DeLorme
800/452-5931
www.delorme.com/mapngo

online FOR MORE PRODUCT news and the latest announcements, check out the PC World Daily News Service at www.pcworld.com/news.

Link PCs Easily With Intel's Network Server

BUSINESS NETWORKS

YOUR BUSINESS started with one or two PCs—now your employee and computer counts are taking off. You need to share files, an Internet connection, and a printer, but you don't have an IT department to tackle the problem.

Intel's new **InBusiness Small Office Network** package may be just what you need. It enables a Windows-based workgroup to share a printer; files; and an inexpensive dial-up, cable modem, or DSL account. The high-end version includes a server computer (licensed for up to 25 clients), a network hub, two network cards, software CDs, installation instructions, and assorted cables. In our tests, we found it extremely easy to use.

The server computer on the $2149 shipping model I tested looks like a conventional tower PC gussied up with postmodern styling and an LCD status display. And it's crowned with a large indicator light that everyone in the office can see, showing whether the server is online. The server runs a special version of Windows NT Server 4.0 called Microsoft Windows for Express Networks, set up with a firewall, proxy server, file server, and print spooler.

INTEL'S NEW small-office network package includes firewall capability.

The internal configuration includes an Intel 533-MHz Celeron with 64MB of RAM, two 13GB hard disks (one mounted in a removable carrier), two 10/100 ethernet network interfaces, and a 56-kbps modem. There is no monitor, keyboard, or mouse involved. (Intel also makes a $1499 version, for 56-kbps connections only, with 64MB of RAM, a 500-MHz Celeron processor, and no backup hard disk.)

Setup involves connecting everything and running several installation programs from a CD-ROM. Depending on the type of Internet connection you have, you must enter telephone numbers, IP numbers, DNS server addresses, and the like. You'll also perform connection tests and set up printers and security policies during this sequence.

Each client PC undergoes a similar installation procedure. After rebooting, each computer contacts the appliance to configure itself; then it can browse the Internet. In their Windows Network Neighborhood, users will see a server named Expressnetwork, displaying the printer and a shared "Document" folder.

The basic installation process enables only browsing. To do more, run the Computer Setup Wizard and select *Use Shared Internet Connection*. This installs a program called the Microsoft Proxy Client, which is necessary to route protocols such as e-mail, FTP, and AOL through the preconfigured firewall.

EASY TO USE—MOSTLY

I RAN INTO a few minor problems—typical for installing a network server, and all easily solved by downloading an update from Intel's Web site. The entire process, including troubleshooting, took me about 4 hours. Ongoing administration will require some diligence. The hard disk is removable, making off-site storage for safety very easy. Also, you can use the dial-up modem as a backup connection to the Internet when your DSL or cable modem connection fails. The InBusiness network's firewall is simple to use. It also functions as a shared cache to minimize redundant traffic.

The package has some weaknesses. Its network hub operates only at 10 mbps, while the network interfaces can go ten times faster. There is no simple way to recover an accidentally deleted file. And if your equipment includes a Macintosh or Linux computer, InBusiness can't support it.

Overall, however, the InBusiness Small Office Network creates an easy-to-use, familiar interface to files, printing, and Internet services for your business needs.

—Jamie Fenton ▶

InBusiness Small Office Network

PRO: Easy to set up; good backup features on high-end version.
CON: Windows only, slow hub.
VALUE: An economical alternative to a professionally managed Windows NT Server installation.
List price: $2149 or $1499, depending on features
Intel
800/538-3373
www.intel.com/network/smallbiz

QUICK TAKES

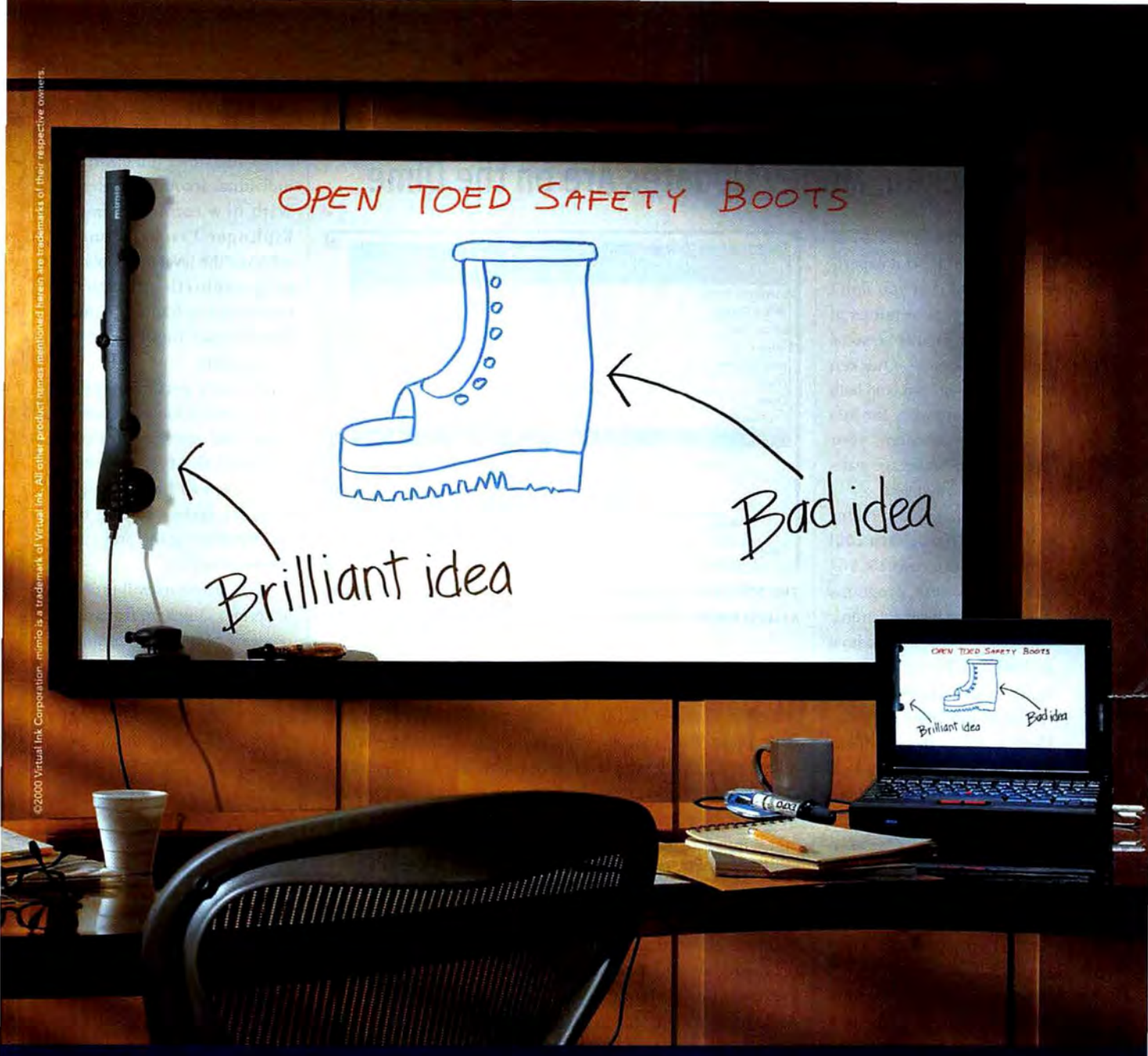
Syncing Made Easy

FILEWARE'S $15 **FileSync** has long been one of the best low-cost synchronization utilities on the market. Its newest revision, version 2.18, continues to provide an easy, intuitive way to keep files located in separate folders up-to-date—whether they're on a single machine or on networked computers.

Suppose you have a folder with documents on your PC and a folder with identically named files on another system that you have network access to, including over the Internet. You want the files in both folders to be the most up-to-date versions. FileSync simplifies the synchronization process by comparing files in two different folders and tagging the more up-to-date one in each case. It can also make comparisons by file size.

Once the files are tagged, you can decide whether to overwrite older files. The entire process is fast, accurate, and easy to understand. Though the software is sold as a synchronization tool, I use FileSync as a way to back up files to networked machines, and I find it much cleaner to use than most backup software. FileWare; www.fileware.com.

—Ramon G. McLeod



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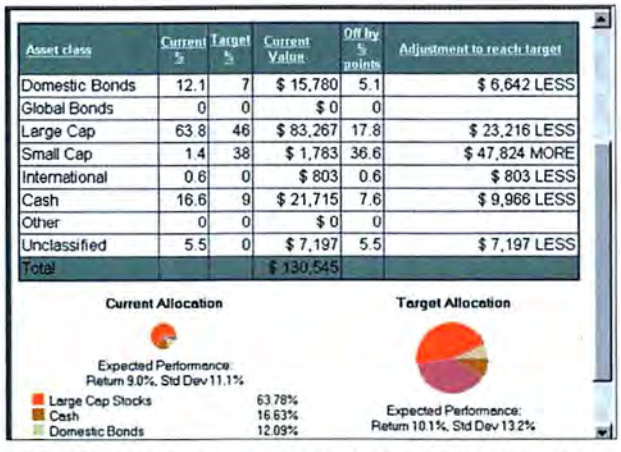
Quicken, Money Updates Are on the Dime

PERSONAL FINANCE

ARE YOU A financial expert? Probably not, but you don't need to be. New versions of the two most popular personal finance packages—Quicken and Money—are out, and both have quick answers for just about any problem your checkbook or brokerage statement can throw at you.

We looked at beta versions of Intuit's $60 **Quicken 2001 Deluxe** and Microsoft's $65 **Money 2001 Deluxe**, programs that graduated from electronic checkbook elementary school so long ago that there isn't much financial know-how left to add to the latest editions. (Both come in new standard and business versions as well, and rebates are available.) Both Quicken and Money unveil some new tools for exercises like portfolio asset allocation and capital gains tax estimation. These might be scary concepts, but they shouldn't be if you have a Quicken or Money wizard to guide you. The programs provide the right tool at the right time and automatically download needed quotes, tables, and other financial data from their robust Web sites.



Asset class	Current %	Target %	Current Value	Off by % points	Adjustment to reach target
Domestic Bonds	12.1	7	$ 15,780	5.1	$ 6,642 LESS
Global Bonds	0	0	$ 0	0	
Large Cap	63.8	46	$ 83,267	17.8	$ 23,216 LESS
Small Cap	1.4	38	$ 1,783	36.6	$ 47,824 MORE
International	0.6	0	$ 803	0.6	$ 803 LESS
Cash	16.6	9	$ 21,715	7.6	$ 9,966 LESS
Other	0	0	$ 0	0	
Unclassified	5.5	0	$ 7,197	5.5	$ 7,197 LESS
Total			$ 130,545		

THE STEP-BY-STEP asset allocation guide in Intuit's Quicken 2001 is a robust tool for helping you rebalance your portfolio.

Both programs let you keep exact duplicates of your investment portfolios, bank records, and reminders on their Web sites for anytime, anywhere management. Investors will appreciate the new capital gains tax estimators in both programs, designed to help avoid nasty year-end surprises. And Quicken even steps you through the process of offsetting gains with losses. Both packages have portfolio asset allocators to help you find the right mix of investments to optimize return while minimizing risk. I think Quicken does a better job of helping you rebalance your portfolio.

IMPROVED BASICS

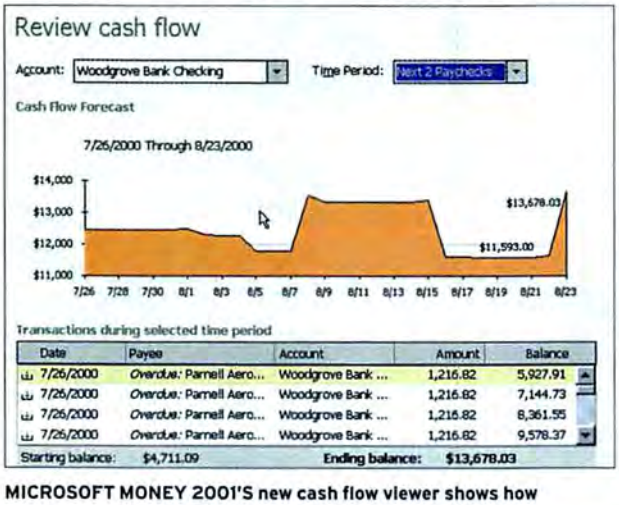
MOST PEOPLE who use money management software spend the bulk of their time in their checkbook registers, and both programs introduce several prosaic but key usability improvements in core areas like banking and bill paying. Quicken alerts you when you miss a regular bill payment even if you haven't scheduled it; and it's better at pinpointing errors when your bank statement doesn't match your account register.

Money's new cash-flow viewer predicts whether your usual income sources will cover your scheduled bills. It beats Quicken at establishing money management priorities for you and at sprinkling in ad hoc financial advice from the setup interview right down to individual account registers. With new connections to Kiplinger Taxcut, Money achieves the level of tax-planning sophistication that Quicken has had for some time through Intuit's TurboTax program.

Quicken's portfolio layout and investing tools are more robust, but less friendly than they could be. Money is better at holding your hand through everyday tasks—setting up and monitoring the progress of your priorities.

Active investors will probably prefer Quicken; financial novices, Money. But almost everyone needs one or the other. Where else are you going to learn this stuff?

—Mike Hogan ▶



MICROSOFT MONEY 2001'S new cash flow viewer shows how recurring spending matches up with your regular income.

Microsoft Money 2001 Deluxe

PRO: New setup interview clarifies financial priorities; advice and status reports help you meet them.

CON: Experienced users may find handholding obtrusive.

VALUE: Changes yield advanced money management for everyone.

List price: $65 (Deluxe + Business, $85; Standard, $35; rebates are available).

Microsoft
800/426-9400
www.microsoft.com

Quicken 2001 Deluxe

PRO: Combines portfolio rebalancer, capital gains tax estimator, 401K manager, and other useful tools.

CON: Daunting array of financial tools may overwhelm the timid.

VALUE: A good set of basic money management tools.

List price: $60 (Home & Business, $80; Basic, $30; rebates available).

Intuit
800/446-8848
www.quicken2001.com

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ISO 14001

Norton SystemWorks Gets a Face-Lift

UTILITIES

DESPITE COMPETITORS such as McAfee Office and Ontrack SystemSuite nipping hungrily at its heels, Symantec's Norton SystemWorks remains the master utility suite—and with good reason.

Though not revolutionary, **SystemWorks 2001** offers such useful additions as support for Windows NT and 2000, and it further streamlines the package's interface. The utility also retains the effective optimization, monitoring, and diagnostic tools that we have come to expect.

One Button Checkup, a useful new feature, runs a full system check that finds and fixes problems ranging from fragmented drives to outdated virus definitions to Registry conflicts. All of these tests were available before, but you had to perform each individually.

One Button Checkup is unique among Windows utility suites. Its fast, easy-to-access system check (usually 1 minute or so) not only ferrets out many common problems (it looks for missing program files, bad shortcuts, and drive fragmentation), it also identifies more-esoteric troubles (such as Registry irregularities) that can cause annoying or erratic behavior and may otherwise be difficult to track down. When you click on the Start Fix button after the checkup's done, One Button automatically attempts to remedy all the problems it found.

FAST FIX: One Button Checkup, a new feature in Norton SystemWorks 2001, makes it easy to find and fix common problems.

In some cases, though, you will need to muster bigger guns to eradicate major gremlins. In my testing, One Button Checkup's automatic fix couldn't repair a thorny Registry problem on one of my systems. However, it suggested that I run the more comprehensive WinDoctor, and that did the trick.

The standard package includes Norton Utilities, AntiVirus, and CleanSweep. The Professional version adds Norton Ghost 2001 Personal Edition (for creating drive images) and WinFax 10 Basic Edition. The basic features remain virtually identical to those in SystemWorks 2000.

The features are easy to access via the well-integrated interface; all of them functioned smoothly on my test PCs (a Pentium II-333 and a PIII-600, each with 128MB of RAM). But as with previous versions, continuously running components such as System Doctor can take a bite out of PC performance, especially on systems slower than a Pentium II-333. More memory mitigates this effect.

SystemWorks 2001 lacks one feature available in prior versions: Norton CrashGuard, a utility meant to help your PC recover from Windows crashes. A Symantec spokesperson said "user research" prompted the feature's removal. In fact, we received numerous complaints from *PC World* readers who told us that the CrashGuard utility caused more problems than it fixed.

The company claims to have made a number of improvements "under the hood," some of which were not available in the preproduction version I tested. For example, AntiVirus is supposed to perform dramatically faster scans. And according to Symantec, a new Security Analyzer feature will link you to a site where you can evaluate your PC's risk of virus infection and its susceptibility to hackers and other perils. (It is not a firewall, however.)

SystemWorks 2001's essential tool set should amply satisfy new users. Unless you regularly use SystemWorks' tuning and scanning features and would benefit from the One Button Checkup, you may want to skip the basic version's $40 upgrade. Small businesses attracted by the faxing capability in the new Pro package may find the $70 upgrade worthwhile.

—Stan Miastkowski

Norton SystemWorks 2001

PRO: One Button Checkup feature, improved interface.

CON: Some components continue to adversely affect PC performance.

VALUE: Still the most comprehensive, best integrated utility suite.

List price: standard version $60 ($40 upgrade); Professional Edition $100 ($70 upgrade)

Symantec
800/441-7234
www.symantec.com

QUICK TAKES

Cover Your Tracks

IF YOU FEEL that it's nobody's business where you go on the Internet, Ontrack's Internet Cleanup offers to cover your tracks. The $25 utility, which runs on any version of Windows and supports all the major Web browsers, lets you wipe out cache files, history files, cookies, ActiveX controls, and plug-ins. You can choose manual or automatic cleansing, specify cookies you want to keep, and use a secure erase to overwrite data. Unfortunately, Internet Cleanup doesn't erase the Windows recent-document list, so anyone can see what files you opened while you were browsing. In addition, I found that when I used it with "smart" Recycle Bin utilities (such as as the one in Norton Utilities), files deleted by Internet Cleanup were still available for review. However, that didn't happen with Windows' standard Recycle Bin. Ontrack; 800/872-259; www.ontrack.com

—Stan Miastkowski

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Palm's M100 Won't Stretch Your Pocketbook

THE $149 Palm M100 PDA.

PDA

A COLLEAGUE took one look at my prerelease version of Palm's newest pocket organizer and exclaimed: "That's like a Palm—only smaller."

Palm M100

PRO: Slightly smaller Palm provides same productivity as other models at a bargain price.

CON: Not upgradable; memory limited to 2MB; protective door occasionally gets in the way.

VALUE: The price makes this Palm a great buy.

List price: $149

Palm

800/881-7256

www.palm.com

Well, yes and no. The **Palm M100** actually has almost the same dimensions as the 4.5-inch-long, 3-inch-wide Palm V; and at 5 ounces, it weighs just as much. So why does it *look* smaller? The device's subtle hourglass shape—which makes it particularly comfortable to hold—no doubt deceives the eye. The resulting smaller screen does not, however: It's about 25 percent shorter and a little more than 10 percent narrower than those in other Palm models. Surprisingly, however, the tighter screen didn't hamper my productivity. The M100's bargain list price of $149 did make the size reduction an easy burden to bear.

When the M100's wrap-around swivel cover is closed, you can press on the exposed panel button to see date and time through a window on the hard-shell cover. Also new: A Note Pad app that lets you jot and doodle in your own handwriting on the entire screen (as well as on the dedicated Graffiti handwriting entry area).

The M100 costs about the same as Handspring's Visor and Palm's own IIIe but lacks the Visor's expansion capability and the IIIe's desktop synching cradle. Memory is limited to 2MB and can't be upgraded, but that's still enough to keep 5000 addresses, to-do items, appointments, and memos. The unit's protective door can be a nuisance sometimes, but it is removable.

Overall, the M100 is a welcome, entry-level Palm for anyone who wants a compact PDA—and ideal for those users whose clarion call is "give me the simple life."

—Michael S. Lasky

PHOTOGRAPH: KEVIN CANDLAND

Seiko's SmartPad a Bit Short on Smarts

PALM ACCESSORY

THE SEIKO **SmartPad** sounds great: a device that enables Palm users to write notes with pen and paper, and then relay these—via an infrared connection—to the Palm for viewing, organizing, and storing.

No doubt, using the Graffiti handwriting program on a Palm can be a drag; even after you master it, you can't enter text as quickly as most people write with pen and paper. Graffiti doesn't accept doodles or drawings; the SmartPad can. Allowing users to beam pen and paper jottings to the Palm in real time seems like a natural step. For those who need a drawing capability, the SmartPad could be useful, and it's the first device to help move graphics or handwritten notes from the Palm into your PC. Alas, well-intended as it is, the SmartPad is saddled with too many conceptual and practical problems.

THE SEIKO SMARTPAD allows you to beam the notes and drawings you created on a regular pad of paper into a Palm device.

Its 1.5-inch-thick, 7.25-by-10.5-inch portfolio defeats the Palm's purpose, forcing you to carry a large case, not just a shirt-pocket–size device. You can use any 5-by-8-inch paper pad, but you must place it on the embedded SmartPad sensor in the portfolio for information to transfer—and for me, this was uncomfortable.

You have to zoom up to 4X to read your handwriting on the Palm with any clarity. That level of magnification forces you to continually scroll back and forth and up and down.

The only way to e-mail files directly from your Palm or PC SmartPad is by using Microsoft Outlook. Otherwise you must transfer the file as a GIF to your PC and then add it as an attachment.

The SmartPad costs $199. Come on, guys, you can buy a Palm for less than that.

—Michael S. Lasky ▶

SmartPad

PRO: Transfers handwritten notes in real time to a Palm.

CON: Just about everything else.

VALUE: A well-intentioned product that ultimately misses the point of pocket organizers.

List price: $199

Seiko Instruments USA

800/688-0817

www.seikosmart.com

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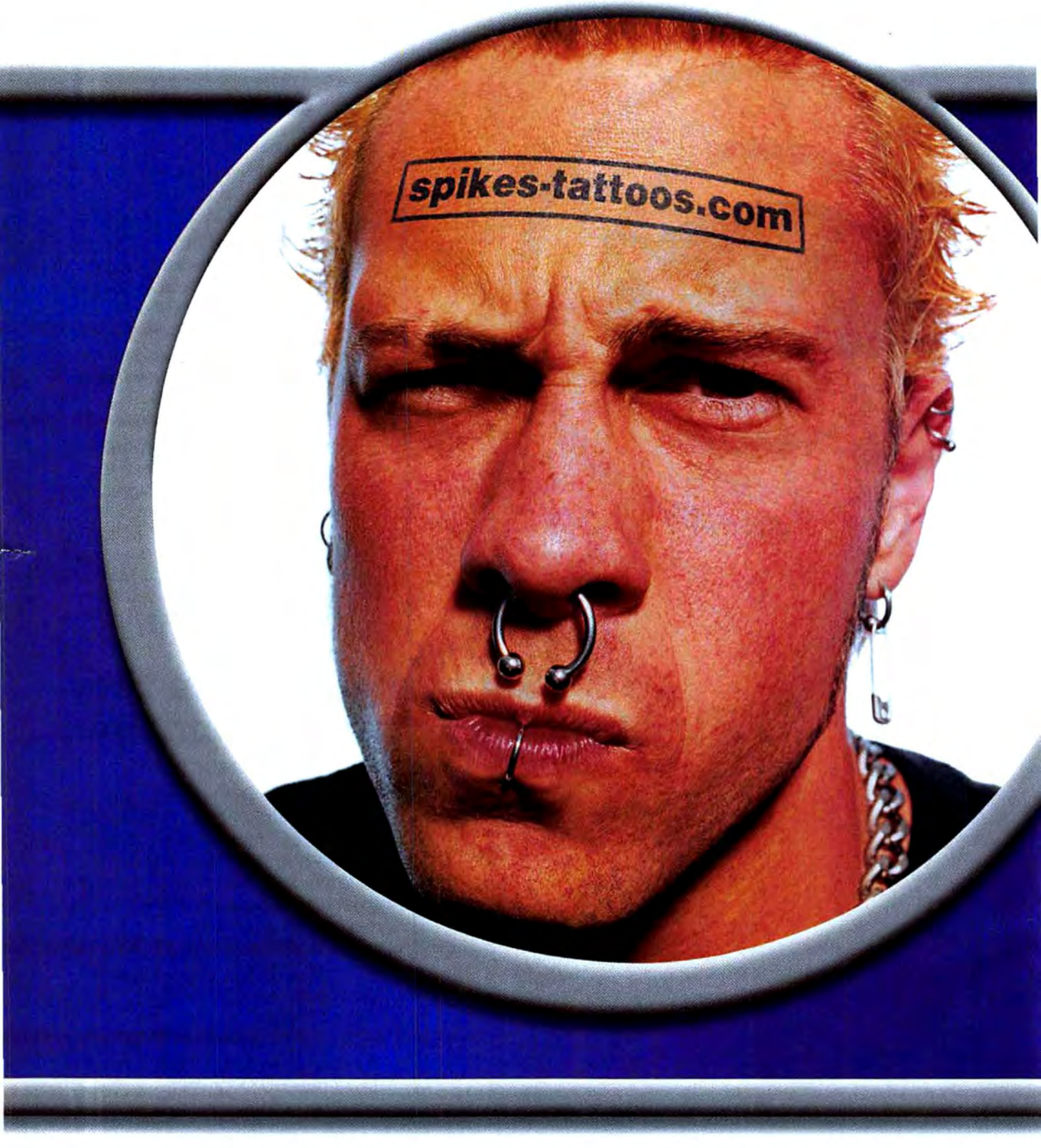

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Fast Wireless Networking—If You Can Use It

WIRELESS NETWORK

LUCENT Technologies' **OriNoco** wireless networking system lets home- and small-office users share files and a single Internet hookup at the zippy 11-mbps speed of the 802.11b standard—once they get it up and running. In my tests with preproduction hardware, that wasn't always easy.

Each system on the network must be outfitted with a $179 OriNoco Type II PC Card (formerly sold under the WaveLAN brand). It's basically a small radio that sends data to and receives data from a futuristic-looking residential gateway, the $349 OriNoco RG-1000. (A starter kit consisting of the gateway and one PC Card costs $449.) Each desktop PC that doesn't have a PC Card reader also needs a $69 adapter—an ISA or PCI card with a slot for the PC Card. The PCI adapter works only with systems that support the recent PCI 2.2 standard; all others must use the ISA card.

Unfortunately, I couldn't get OriNoco to work on my 1995-vintage Micron Pentium-133 desktop with Windows 98 because I didn't have the two system IRQ addresses that are required (a common problem with older systems). I had no trouble installing the PCI PC Card adapter on my seven-month-old Micron PIII-667, but it couldn't see the PC Card itself until I figured out (with no help from the documentation) that the labeled side of the card should face the floor, and that I should then hit the Refresh button in the Device Manager window. The card slid into the PC's slot either way; fortunately that wasn't the case with the slots on two notebooks, which I tested without problems.

You configure the RG-1000 through a simple desktop application that must be installed on at least one PC on the network. OriNoco supports single phone lines, cable hookups, and certain types of DSL service (but not, for example, the increasingly popular PPPOE protocol).

Once set up, OriNoco flows: I transferred a 13MB file in less than 3 minutes, compared with about 10 minutes for my previous 1.6-mbps wireless Proxim Symphony setup. However, OriNoco PC Cards cost $40 more than Symphony PC cards, and the PC Card–adapter combination required by desktops costs more than twice what a Symphony add-in card does. Also, don't expect a speed rush with DSL or cable, each of which tops out at about 1.5 mbps.

OriNoco's greatest appeal may be to people who already have an 802.11b PC Card for their laptop at work. But before you bring it home, make sure the system will work on your other computers.

—Yardena Arar

OriNoco

PRO: Fast 802.11B wireless networking, especially for file transfers.

CON: IRQ needs may exclude older systems; doesn't support PPPOE DSL hookups; pricey.

VALUE: Worthwhile for people who already have 802.11B equipment.

Street price: RG-1000 gateway $349; PC Card $179; ISA or PCI PC Card adapter $69

Lucent Technologies
800/928-3526
www.lucent.com/orinoco

Lab-Quality Color Photo Printing on Demand

PRINTER

LOOKING FOR A printer with image quality so good you'll never again need to trudge to a photo lab for color prints or enlargements? The $899 **Stylus Photo 2000P** from Epson doesn't just produce lab-quality output: Epson says prints created with a breakthrough pigmented six-color ink technology could last up to 200 years. Designed to generate images suitable for presentation and resale, this printer should interest professionals and photography enthusiasts who want to move away from commercial photo processing.

In my tests of this shipping model, prints made on Epson's Premium Semigloss paper stock rivaled photos developed by a photo lab. Scanned photos printed on the printer looked as good as the originals or even better. Color-image output was rich and clear, with realistic colors and accurate flesh tones. Epson doesn't recommend the unit for black-and-white photos.

The Stylus Photo 2000P can handle paper sizes from 3.5 by 3.5 inches to 13 by 44 inches; Epson itself sells a wide range of custom resin-coated photographic papers and fine-art media.

Print speeds are relatively fast; in my tests, an 8-by-10-inch print took between 4 and 6 minutes, depending on the settings I selected. The printer uses two cartridges—one for black ($33), and one for the five other colors ($38).

This printer isn't appropriate for churning out text or routine business graphics, but it raises the bar for ink jet printing of photographs.

—David F. Farkas ▶

THE EPSON Stylus Photo 2000P printer.

Stylus Photo 2000P

PRO: Incredible color prints rival output from a photo lab.

CON: Doesn't handle black-and-white images well; expensive.

VALUE: Best for serious photo enthusiasts and professionals.

Street price: $899

Epson America
800/463-7766
www.epson.com

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invent

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Microtek ScanMaker X12USL
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Superb Data Protection for Office or Home

POWER SUPPLY

SO YOUR computer dodged this summer's power fluctuations and brownouts without using a UPS device? Wise up. Demands on the nation's power grid are only going to increase; prepare for the worst.

An uninterruptible power supply guards your equipment against power surges, gives you extra time to complete work when power fails, and safely shuts down your computer when its own battery is exhausted.

I looked at two shipping models—the **Tripp Lite SmartPro 450RT** and APC's **Back-UPS Pro 500 USB**. Aimed at different users, each could save your day by saving your data.

At $299, the stylish SmartPro 450RT is pricey but versatile. At 1.75 inches thick, 17 inches wide, and 11 inches deep, it targets users in large businesses. It can be placed under a monitor, mounted on the wall, set upright as a tower, or held in a 19-inch rack. It communicates via the serial port, so it works with a company's legacy systems.

The 450RT's PowerAlert software, while a bit arcane, is powerful and offers remote LAN monitoring. In my tests, the UPS ran my 300-MHz Celeron PC and its 17-inch monitor for a whopping 18 minutes, 40 seconds after I cut off power.

This package includes four battery-backed, surge-protected outlets but no RJ-11 modem surge suppression, which is rarely needed in a networked business environment. The 450RT's batteries are easy to replace using the unit's removable front panel.

The second UPS I tested, the $179 Back-UPS Pro 500 USB, now comes with a chic translucent case. This 9.4-inch-high, 5-inch-wide, 7.9-inch-deep UPS has an unusual back-slanted top to reduce cable clutter and offers four battery-backed, surge-protected outlets. You also get three additional outlets with surge protection only, and two surge-protected RJ-11 telephone jacks. It's an excellent UPS for home or office use.

The APC's elegantly simple power management extensions integrate directly into Windows' Control Panel and communicate with the UPS via USB. After power loss, the Back-UPS Pro 500 USB ran my system for an outstanding 18 minutes, 22 seconds.

—Jon L. Jacobi

Back-UPS Pro 500 USB

PRO: Stylish, clever design reduces cable clutter; good battery life.
CON: Pricey.
VALUE: Classiest home-use UPS.
List price: $179
American Power Conversion
800/877-4080
www.apcc.com

Tripp Lite SmartPro 450RT

PRO: Versatile mounting, LAN monitoring software, great battery life.
CON: Not perfect for home use.
VALUE: Great protection for your business environment.
List price: $299
Tripp Lite
773/869-1234
www.tripplite.com

Canon's New Go-Anywhere Portable Scanner

SCANNER

IF YOU NEED portability or just a stylish scanner to tuck into a tight space, Canon's sharp, skinny **CanoScan N1220U** warrants a look.

This scanner clearly focuses on ease of use and design. It works standing upright or lying flat, and at 3.3 pounds it can be moved easily. It uses a single cable for both its USB connection and its power supply. Installation involved plugging in one cable and following a superb quick-start guide.

This shipping unit is the first 1200-by-2400-dpi (optical resolution) scanner I've seen that uses the newer and less-expensive contact image sensor technology instead of CCD.

STYLISH AND LIGHTWEIGHT, the Canon CanoScan N1220U scanner could make a great addition to a home or small office.

In my tests, the scanning proved hassle-free and lightning quick. The intuitive interface guides users through readily understandable preview and scan choices. On four separate tests, the $199 N1220U performed twice as fast as comparable scanners that *PC World* has reviewed, and the scan quality was generally pleasing. Text looked sharp, but black-and-white graphics were noticeably distorted. Color scans produced accurate on-screen hues at a Web-quality 75 dpi and at the maximum optical resolution.

So where's the rub? The N1220U lacks such add-on options as an automatic document feeder and a transparency adapter. Also, it doesn't appear sturdy enough to support high-volume use in a corporate setting, and it can't accommodate 35mm slides. Still, for a small or home office, this scanner is worth considering, especially for color use.

—Kalai Murugesan ▶

CanoScan N1220U

PRO: Lightweight; easy to install.
CON: No optional accessories.
VALUE: Slim, reasonably priced scanner for small or home offices.
List price: $199
Canon
800/652-2666
www.ccsi.canon.com

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New MP3 Players Expand Music Memories

MP3 PLAYERS

IF THE MEMORY limitations of today's MP3 players frustrate you, you're not alone. I looked at shipping units of two players from Sensory Science: The **RaveMP 2300** and its tiny sibling, the **RaveMP 2200**.

The RaveMP 2300, which costs $299, is the first unit to include a built-in Iomega Clik drive. That means you can create albums of up to 40MB and store each of them on inexpensive Clik disks ($10 to $15 apiece; two disks are included with the drive).

On the other hand, the 2300 is heavier than the $279 RaveMP 2200 and twice as big. The 2200 features an FM radio, 64MB of memory, and a Smart Media card slot. Smart Media cards remain pricey—32MB of storage space will cost you about $75. The 2200 is powered by a single, easily replaceable AA battery.

Both players connect to your PC via USB cable, and they include their own software for uploading files. However, the Clik drive transfers music nearly four times faster. Though both support voice recordings, the larger MP3 player also lets you import your Microsoft Outlook phonebook directory and store other data files on a disk—handy for backing up important files. I also was impressed that the 2300's antiskip buffer permitted music to play smoothly and without interruption, despite its Clik disk, no matter how hard I jostled it around.

The 2300 incorporates some dubious design choices: The door of its drive should be sturdier, and the lithium ion battery may be recharged, but it cannot be removed. Another glitch: The 2300 can recognize only Windows Media files that have been encoded with Microsoft's digital rights management disabled.

I give points to the 2300, which looks like a slim, high-end Walkman from Sony, for its versatility. But if you don't mind continually uploading your music to the player, the edge then goes to the sleek, pocket-size 2200 for slightly fuller sound quality. Earbud headphones are also included with the 2200.

—Melissa J. Perenson

THE TINY RaveMP 2200.

RaveMP 2200

PRO: Small enough to fit in a jeans pocket; excellent sound; powered by a single AA battery.

CON: Smart Media cards are pricey.

VALUE: Goes anywhere, stylishly.

List price: $279

RaveMP 2300

PRO: Creates inexpensive albums using Iomega Clik disks; doubles as a data backup device.

CON: Battery isn't removable.

VALUE: Like swapping around your own mixes? This is the one to get.

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I'VE NEVER BEEN a fan of entry-level speakers, but the price of the **Philips MMS205** speaker system intrigued me. Could a four-speaker system that cost only $80 sound good? My test indicates that the quality of such speakers has improved—but you still get what you pay for.

The MMS205 is a solid first-time system for fans of 3D sound. Four tiny 2.5-inch satellites and a front-firing subwoofer pumped out crisp highs and solid lows. Stereo effects were great, too, as the satellites' small size simplified finding the right speaker position. But most sets of no-frills speakers have a catch—here, for example, there's a gaping hole in the midrange response. Music and audio effects on this shipping unit sounded noticeably weaker than on my four-year-old Altec Lansing speaker set, though much crisper.

A handy wired remote contains a volume control for the rear-channel speakers, as well as a button to activate a hardware feature that adds 3D effects to 2D recordings. The set lacks mounting brackets or stands for the rear speakers, but you can mount the tiny satellites where you wish, using a simple screw positioned at the proper depth.

Spend a bit more money to move up, and notice the difference. But if you want to try 3D sound on a budget, the MMS205 is a good choice.

—Eric Dahl ■

THE MMS205 3D speaker system from Philips is a solid entry-level system.

Philips MMS205 speaker system

PRO: Inexpensive

CON: Weak midrange response.

VALUE: Low-cost 3D sound.

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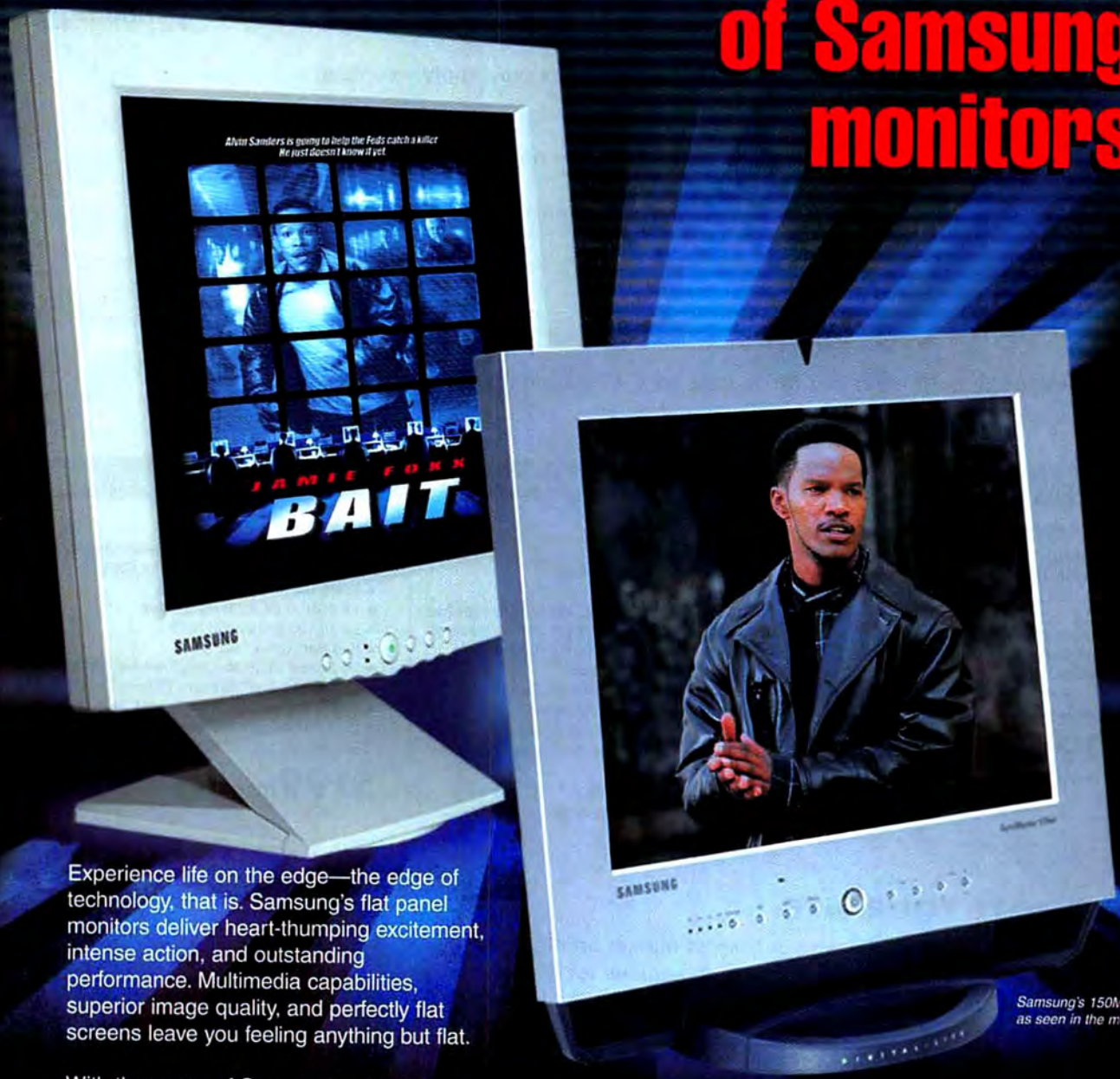

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THE PC and Beyond

WHAT'S NEW TODAY AND WHAT'S COMING NEXT

■ **Slim & Sexy** 120
We test new-wave desktops.

■ **2010: A PC Odyssey** 135
You ain't seen nothin' yet.

New looks, new technologies, new rivals—the PC is morphing before our eyes. Need a road map? This special report is here to help. Also in this issue, "The Ultimate Wireless Buyers Guide" (page 148) rates the latest pocketable computing devices: smart phones, PDAs, and more. And in *Full Disclosure* (page 272), Stephen Manes concludes that PCs aren't down for the count just yet. ▷

PHOTO ILLUSTRATIONS BY MIR LADA

Slim & Sexy

NEW-WAVE PCs AND NET APPLIANCES LOOK GREAT AND WON'T BUST YOUR BUDGET. BUT OUR HANDS-ON TESTS SHOW WHETHER THEY CAN REALLY TAKE THE HEAT.

BY DAN LITTMAN

CONSIDER the ancestral Galápagos finch. As Darwin first noted, that species has evolved into numerous forms, each adapted to a particular environmental niche while retaining its essential finchness. Likewise, the standard beige-box computer is evolving. One branch of the PC family tree is sprouting funky colors and legacy-free designs that shed older slots and ports, limit expandability, and embrace new, unusual shapes. Another branch is budding with Internet appliances—products whose limited functions make them easier to use. Will the average beige-box PC end up on the endangered species list as a result?

In our quest to map the current computing family, we examined five systems that use legacy-free designs, two interesting-looking Internet appliances, and one hybrid of both. Legacy-free PCs—which have exchanged parallel and serial ports and the ISA bus for USB—may appeal particularly to big businesses, where IT managers are eager to use new technology but don't want employees messing with company systems. Net appliances, on the other hand, target new users, who appreciate simplicity. We tested these new PCs and appliances to see how they fare against beige-box units in looks, function, and speed. Despite the hoopla, we found that they wouldn't inspire us to abandon our plain old computers.

The number of legacy-free PCs and Internet appliances is increasing, but not everyone welcomes them with open arms. In an online survey of 460 *PC World* readers, we found that 82 percent had recently purchased a beige box with legacy parts, and that 49 percent wouldn't even consider using an Internet appliance. (For highlights of our reader survey, ▶

PHOTO ILLUSTRATIONS BY MIR LADA

see "Style and Pizzazz Go Only So Far," page 123.)

Bright, flashy industrial designs—ushered in by Apple's iMac two years ago—may already be passé. For example, Dell recently discontinued making its curvaceous WebPC, which fizzled with consumers. Our survey respondents agree with Dell's decision: 72 percent don't think the shape of a PC matters, and about 74 percent feel the same way about a PC's color. Even so, companies such as Acer told us they planned to release colorful systems in 2001.

Christopher Painter-Wakefield, a software developer who also provides hardware support at Duke University, considers fancy styling nothing special. "Designers give the computer a swooshy front end, or some asymmetric holes on the monitor...but it's kind of like false fronts on old Western houses—everyone knows it's just one story behind there."

WHAT'S UNDER THE HOOD?

THE REAL BREAKTHROUGH with legacy-free PCs lies not with odd-shaped boxes and pop-art styling, but with the technology itself. Computer vendors are promoting legacy-free products for a good reason: They want to save money and promote new technologies like USB by junking the ISA bus, serial and parallel ports, their controllers, and a lot of ancient code. But there's a catch: Older printers, modems, video cards, and other add-ons would have to go because they would be accessible only via older ports. As Eric Klein, a senior analyst at the Yankee Group, puts it, "Legacy-free [design] is about...a huge cost savings for the manufacturers."

That said, manufacturers aren't the only ones who stand to benefit from legacy-free PCs. Peter Glaskowsky, senior editor of *The Microprocessor Report* and senior analyst at Cahners MicroDesign Resources, believes that for home users, legacy-free PCs "will be more reliable, easier to use, and have more features." Until the number of products grows and they've been in use for a while, however, whether Glaskowsky is right remains to be seen.

The biggest beneficiaries of legacy-free technology may be IT managers. Says Klein, "Legacy-free [technology] is more easily administered, is less trouble...[and] takes a lot of unnecessary stuff away." For someone managing a horde of corporate systems, that may sound mighty fine.

The five legacy-free PCs we saw seem designed to entice IT buyers with security features and built-in ethernet. But would they use legacy-free systems? Sean Albright, who works in the MIS department of the Catholic Archdiocese of Philadelphia, says managing ordinary beige boxes is hard enough. "Mostly the cases are easy to work with," he says of legacy-free units, "but once you're inside, the hard drives and floppy drives are tough to get at."

Another drawback: Because they lack expansion slots, many legacy-free PCs cannot be upgraded easily. That doesn't please Painter-Wakefield: "I don't see the real advantage of it, [when you] don't know what you're buying [and] you get a box you're not supposed to tinker with. It's not like computers keep up with the times, and I want to be able to upgrade."

Glaskowsky echoes Painter-Wakefield's concerns about these locked-box units. "IT managers don't want to feel they've bought a machine that can become obsolete. They may not upgrade the machine, but they want the option to do so."

SHEDDING OLD TRAITS

SO WHAT ARE THESE SYSTEMS that manufacturers hope will catch on with IT buyers? All are smaller or more stylish than traditional beige boxes, all include some corporate features, and all lack some

SNAZZY STYLING: From the top, Compaq's IPaq Legacy Free, HP's EVectra (shown here on its side), and Micron's ClientPro Cf.

THE COOL QBE Cirrus by Aqcess: Style is pricey.

older technology. But having a PC that's higher on the evolutionary tree costs: Each is pricier than we'd expect, given its processor class and features.

Of the five systems we looked at, three could be called legacy-light—they have more USB ports, but older ports remain. Micron's ClientPro Cf and HP's EVectra have extra USB ports and built-in ethernet.

The ClientPro Cf comes with other corporate features, including a CD-ROM of network-management software and a Unisys service contract. In contrast, the EVectra offers security: A pro can set the USB, serial, and parallel ports to prevent users from attaching or removing peripherals, and the hard drive pops out for safekeeping or locks in place with a removable key.

The EVectra and the ClientPro Cf also differ in looks: The ClientPro Cf case resembles a horizontal beige box, only smaller (4 inches high, 11 inches wide, and 13 inches deep). The EVectra's sober beige and black minitower occupies even less space—it's 9 inches high, 11 inches deep, and 3.5 inches wide—and can be mounted under a desk or on a wall.

Both systems turned in PC WorldBench 2000 numbers consistent with what we'd expect of their processors and RAM. The ClientPro Cf parlayed a PIII-650 processor and 128MB of RAM into a PC WorldBench 2000 score of 158, while the EVectra—with a PIII-600EB and 128MB of RAM—earned a score of 146. (As we went to press, HP told us the EVectra would no longer be available with a PIII-600EB. It will instead come with a PIII-733.) Micron charges $1299 for the ClientPro Cf with a 15GB hard drive, a CD-ROM drive, and a 17-inch CRT monitor. The EVectra costs about $1000 and comes with an 8GB hard drive and a CD-ROM drive, but it doesn't include a monitor.

Our third legacy-light model, Sony's PIII-700 VAIO Slimtop PCV-L640, straddles the line between home and business. The keyboard has a row of launch buttons for Web browsing or reading e-mail. Besides PS/2, parallel, and USB ports, the PC has two IEEE 1394 (FireWire) ports, useful for high-speed digital video transfers.

The Slimtop's thin, rectangular system unit and 15-inch LCD monitor come encased in flashy purple. Inconveniently, you can't hook this monitor up to any other computer, but an ordinary mon- ▶

Style & Pizzazz Go Only So Far

The boxy beige PC will not go the way of the dinosaur any time soon, if the results of our exclusive online reader survey are any indication. A large majority of our 460 respondents say they've recently purchased a traditional PC with legacy ports rather than a legacy-free system. And while some users cite footprint, design, and color scheme as factors to consider when choosing a system, most remain satisfied with the standard PC case—as large, beige, and blocky as it is. As for Internet appliances, don't throw away your full-service computer just yet. Roughly half of our respondents balked at the idea of using a Net appliance at all. Others would consider using an appliance, but only as a supplement to a fully functional PC. The list at right shows some highlights of our results.

–Kalpana Narayanamurthi

- **82%** purchased a traditional PC with legacy components [1]
- **11%** purchased a legacy-free PC [1]
- **72%** said the shape of the PC does not matter [2]
- **26%** said color is a consideration when purchasing a PC [2]
- **70%** said the size of the computer's footprint is not an issue when purchasing a PC [2]
- **64%** would not pay a premium for a PC with an unusual shape or color [2]
- **49%** would not use an Internet appliance [2]
- **44%** would consider using an Internet appliance in addition to a PC [2]
- **36%** would not use software supplied over the Internet through vendors known as application service providers [2]
- **25%** would be very likely or extremely likely to use software supplied through application service providers [2]
- **56%** of nontraditional-PC owners were very satisfied with their purchase [1]
- **41%** would consider purchasing a legacy-free PC [3]

[1] *Refers to survey participants who were personally involved in the purchase of a PC in the past 12 months.*
[2] *Refers to participants who were personally involved in the purchase of a PC in the past 12 months or who intend to purchase a PC within the next 12 months.*
[3] *Refers to participants who are likely to be involved in the purchase of a PC in the next 12 months.*

itor port allows you to attach another display to the Slimtop. On our PC WorldBench 2000 tests, it earned a score of 141, consistent with its processor class. The Slimtop L640, with a CD-RW drive, 128MB of RAM, and a 30GB hard drive, costs $2599. That's no bargain, but the PC's small footprint and LCD work for space-strapped offices.

The remaining two units we looked at, IBM's NetVista S40 and Compaq's IPaq Legacy Free, are fully post-legacy PCs. The NetVista, for example, lacks PS/2, serial, and parallel ports and a floppy drive; instead, it sports three USB ports in the back and two on the front. (Inside, there's only one available PCI slot, imposing severe limits on your upgrade options.)

The NetVista shuns beige casing in favor of cool, dignified black. Its $1099 price covers 128MB of RAM and a 13GB hard drive but no monitor; our test unit's sleek 15-inch LCD costs $1049 extra. (More reasonably priced CRTs are also available.) If you need removable media, the $49 S Cradle option holds any one of numerous USB drives, including floppy, CD-RW, and Zip. The versatile NetVista would be useful either at home or on a network (via its built-in ethernet). IBM couldn't deliver a shipping unit to us in time for testing, but our preproduction unit's PC WorldBench 2000 score of 172 compares favorably to the performance of other PIII-866 PCs we've tested.

Like IBM, Compaq has climbed onto this branch with its $1173 IPaq Legacy Free. The IPaq has a funky, bulbous case with no flat surfaces; it resembles a silver book squeezed between two black bookends. The system contains five USB ports and no parallel or serial ports. A multipurpose drive bay allows you to swap out the installed SuperDisk drive for a CD-ROM or DVD-ROM drive, or to add a 6GB hard drive (on top of its internal 10GB drive). Built-in ethernet makes the system easy to network. The IPaq has a PIII-733 processor and 128MB of RAM, too, so we expected it to perform better than it did. It fared about as well as recently tested 650-MHz systems, with a PC WorldBench 2000 score of 156.

APPLIANCES VERSUS PCs

INTERNET APPLIANCES such as the Netpliance I-opener have moved further from their origins than legacy-free PCs. They lack hard and floppy drives as well as parallel and serial ports, and most don't ▶

ASPs Explained

To be more than one-trick ponies, Internet appliances require as radical a departure in software design as in hardware. Appliances lack hard drives and floppy drives for storing any software or data, so appliance users must run programs and store files on the Internet. A new kind of software resource, called an application service provider, has emerged to fill the gap.

ASPs come in a hundred variations—everything from a simple online calendar to a business accounting program like NetLedger. The ASP model could appeal to laptop-toting road crews who don't want to lug heavy drives, or to IT staff who would like to off-load routine system management. But no one knows when—or if—users will accept ASPs. Here are three hurdles the services must surmount:

ONLINE STORAGE It might feel creepy to leave personal or business files in cyberspace. Working with an ASP probably offers better security than carrying around a theft-vulnerable laptop or leaving your office PC unguarded every night and weekend, but you must be prepared to put your trust somewhere other than in your PC.

COST With shrink-wrapped software, you pay for the initial purchase and you buy occasional upgrades if you want them. So far, no settled pricing model has evolved for online software. Will you pay by the month? By CPU cycles on the host? By promising to read a certain number of advertisements? Take your pick.

INSTANT UPGRADES When an ASP upgrades its software, that's the program you get the next time you log on. It's an efficient way to distribute new features—indeed, many companies today run their client-server databases that way—but it also short-circuits your company's ability to evaluate new software before deploying it. On top of that, you may have to learn new features or navigation tools unexpectedly.

The pressure is on ASPs to solve these and other problems. Yet with a market that could include every PC, appliance, and handheld in the land, it's no surprise that all the heavyweights are working the ASP angle: Microsoft, Sun Microsystems, Oracle, IBM, Hewlett-Packard, Apple, Novell, and AT&T are among the companies positioning themselves for a piece of the action. But Roger Kay, an analyst with International Data Corporation, cautions that potential customers should take the long view: "ASPs will arise over time as the tools and bandwidth to support them become more ubiquitous. Some types of ASPs can be used now; others will take five years or more for realization."

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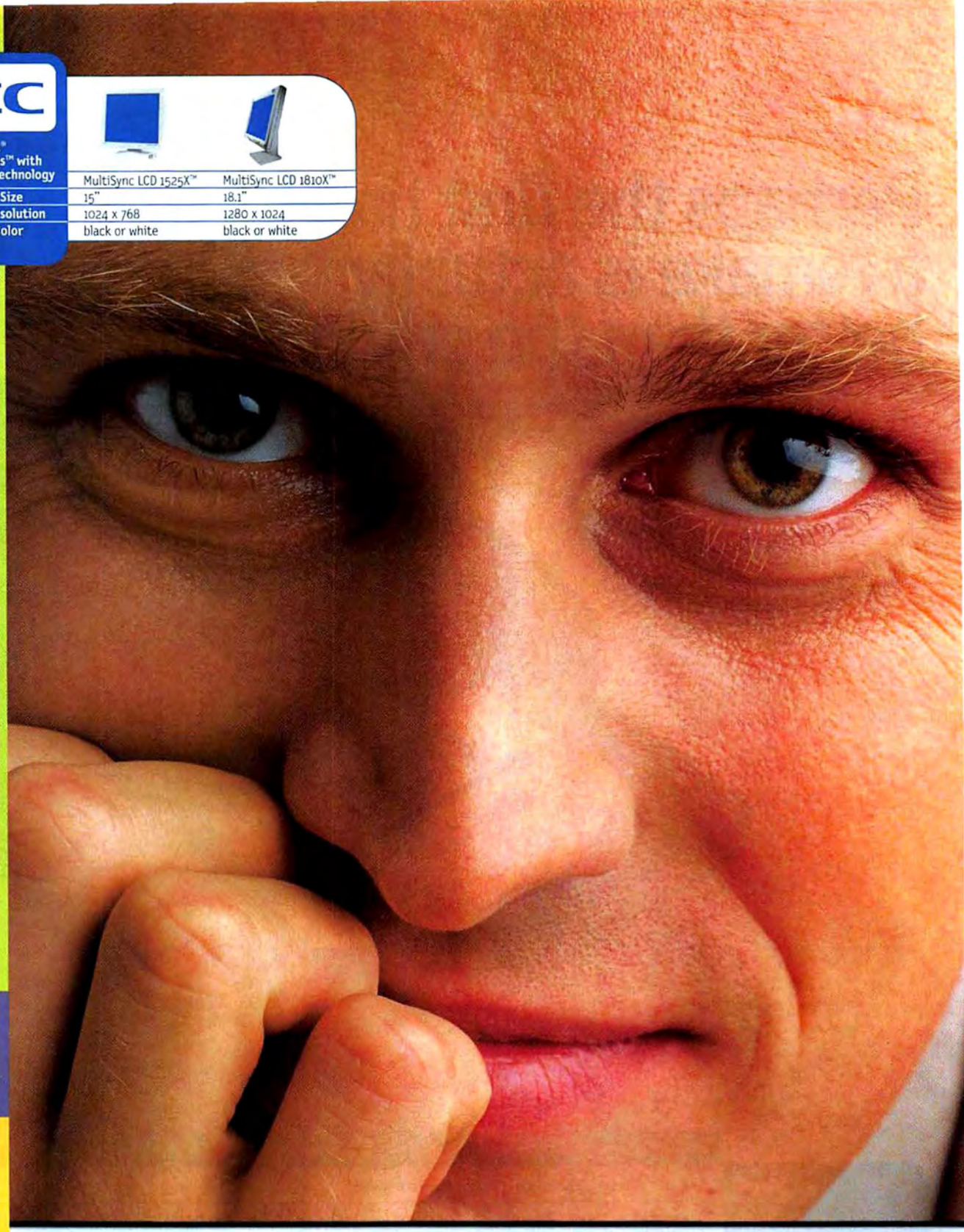
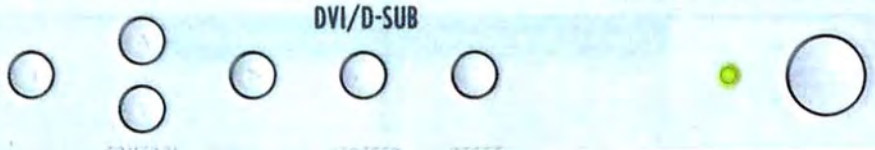


MultiSync LCD1525



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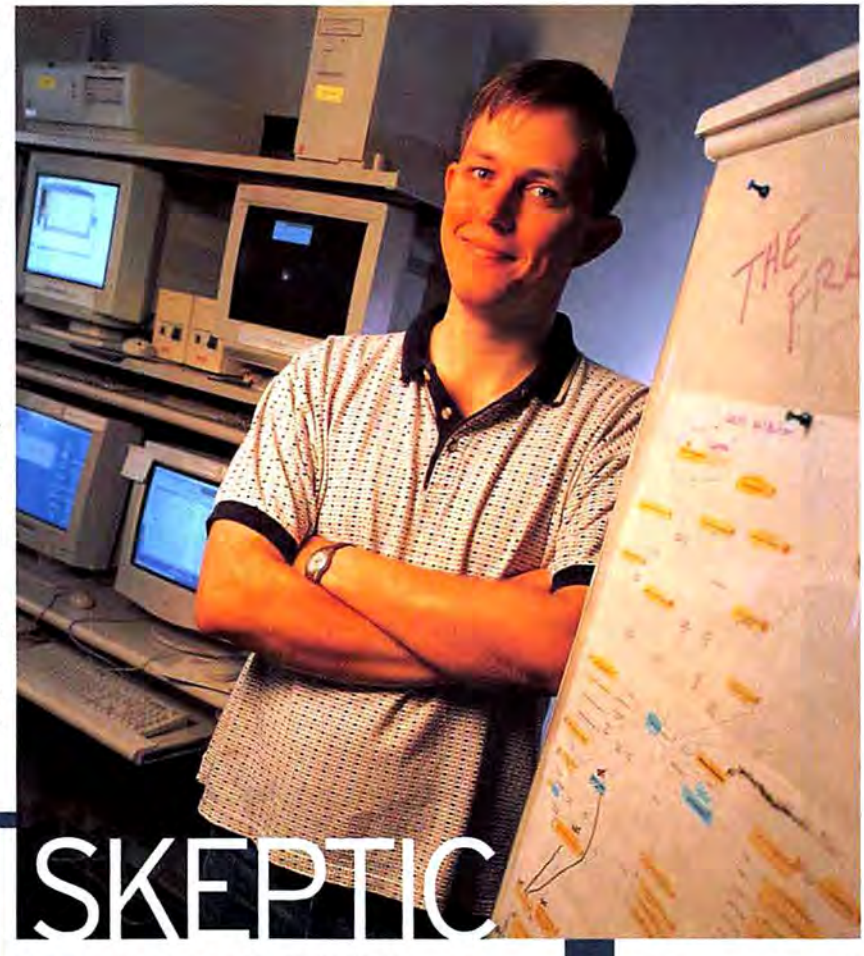
run Windows. As a result, appliances rely on application service providers, which let you use programs such as word processors online (see "ASPs Explained," page 124). The devices tend to be small. Most cost under $300, plus monthly ISP charges, making them ideal for beginners or as PC supplements. However, if an appliance was your only computing device, its limited features could frustrate you.

According to the Yankee Group's Eric Klein, "[They]...open the door to a class of customer who never would have considered spending $1000 for a PC, because [instead of imposing a high up-front cost] it's a monthly recurring charge."

MicroDesign Resources' Peter Glaskowsky believes that Internet appliances' lack of a hard drive can actually be a benefit. "It's secure," he says. "You don't have to worry about leaving personal data on the machine, because it can't hold any."



SKEPTIC

Christopher Painter-Wakefield, a software developer in Durham, North Carolina, compares fancy PC styling to "false fronts on old Western houses—everyone knows it's just one story behind there."

PC MUTATIONS

THE I-OPENER NET appliance was one of the first to hit the market—and in many ways it remains a model for the rest, combining simplicity and a low price. For $399 plus $22 a month for Internet access, the I-opener is essentially an 8-by-6-inch color LCD plus a keyboard. A mouse costs $20 extra—and you'll want one, because using keyboard knobs to navigate is a pain. As soon as you plug in the power and phone cords, the I-opener logs on to Netpliance's servers and checks for e-mail. If you leave the device plugged in with the monitor powered off, it will periodically download new messages. Writing and addressing e-mail is equally easy, and the unit even supports a printer.

The I-opener has limitations, however. It includes a Web browser, but like most Internet appliances, it offers no way to install new software or copy files. Its e-mail doesn't support attachments. Finally, you can't use just any ISP: By purchasing the I-opener, you buy into Netpliance.

Cidco's MailStation moves even further from its beige-box origins: E-mail is about all it does. The MailStation resembles a big calculator with its 6-by-2.5-inch gray LCD screen built into an 8-by-6-inch slab, and it comes with a cramped keyboard. Though Cidco plans to support downloading of headlines from Yahoo (a feature that didn't work on our unit), the MailStation doesn't let you browse the Web.

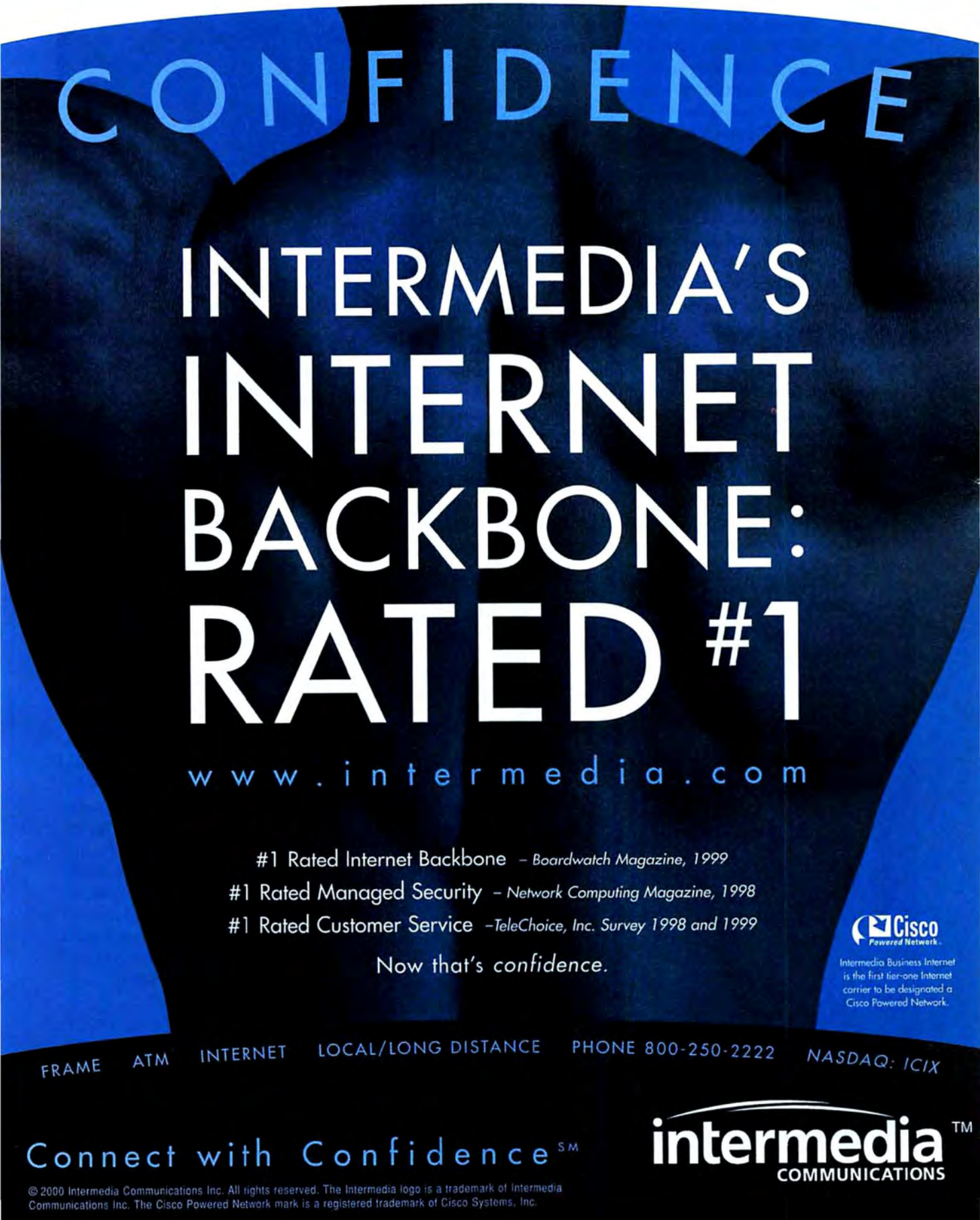
The MailStation costs $100, plus $100 a year for an ISP account that, as with Netpliance, becomes your sole ISP. It runs on either AC or batteries, so you can compose e-mail offline, and it's small enough to carry around (though the screen is unprotected). But it comes with a skimpy 384KB of memory—so you can't store e-mail when the buffer fills up. Instead, you must either delete messages or print them. (The MailStation works with any printer that supports DOS, but that excludes many common ink jets; the device can also send e-mail to fax machines.)

Neither a legacy-free PC nor strictly an appliance, the last product we looked at runs Windows but doesn't look like a PC—and it costs more than you may be willing to pay for style. A portable but elegant blue slab, the Qbe Cirrus from Aqcess is most comparable to a notebook because it can operate on battery power, has a removable drive bay that comes with a CD-ROM drive (it can also hold a CD-RW or DVD-ROM drive), and runs Windows 98. But the model we tested, which contains a PII-400 processor with a 12GB hard drive and 128MB of memory, costs $2999—steep for a 400-MHz notebook today.

What do you get for the extra money, besides the kind of looks you'd draw by pulling up to the office in a Maserati? For starters, the Qbe's face is a 13.3-inch touch-screen LCD monitor that can switch between landscape and portrait modes with one poke of the stylus. It also has a smallish keyboard and a three-button mouse; or you can use the built-in ▶

PHOTOGRAPH: CHARLES HARRIS

Boardwatch Magazine captured 4,512,463 measurements from 30 backbone providers to find out who's best.
Guess who came out on top?



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handwriting recognition as if the Qbe were a giant Palm device. Flashy features abound: The Qbe includes voice-recognition capability and a pop-up video camera that supports face recognition for security or videoconferencing (we didn't test these features).

Connectivity is a Qbe specialty. Along its edges you'll find two PC Card slots, an ethernet port, a modem jack, IEEE 1394 and USB ports, and an infrared port. A port replicator, the Porticle, attaches to the back and supports the slab like an easel.

On the downside, the Qbe is heavy (7.4 pounds) and lacks a screen cover. Wires inconveniently protrude from the edges when peripherals are plugged in, and the Porticle doesn't swivel. Finally, despite its stiff price, the Qbe Cirrus delivered only average performance for its processor class among notebooks, earning a PC WorldBench 2000 score of 95.

The Qbe is pricey if you are looking for a portable computer to take with you on business trips. But it makes more sense if you spend a lot of time walking around at work because with the Qbe you can input easily with one hand—something you can't do with a notebook.

THE WHITE Netpliance I-opener (and its "pizza" key, inset) offers more screen than the simple black MailStation from Cidco.

NEW BRANCHES

AS WE WENT to press, we learned of several new legacy-light systems and Internet appliances that we couldn't get our hands on in time to test.

Acer's Veriton FP1 and Veriton FP2 legacy-light PCs, scheduled to ship this fall, retain serial and parallel ports to go with their four USB ports, but they shake up traditional PC design. The keyboard and mouse communicate via radio, and the LCD monitor attaches to the unit on a swiveling neck, reducing the number of wires poking out. FP1 prices start at $1899, FP2 prices at $1999.

Meanwhile, the New Internet Computer Company offers the New Internet Computer. Unlike other Net appliances, it includes a CD-ROM drive and lets you choose almost any ISP. The NIC costs $199 (with no monitor) and includes a 56-kbps modem and an ethernet port.

These offerings don't break new ground, but they remind us that legacy-free PCs and appliances continue to proliferate.

FLOWERING TREES

AFTER EXAMINING legacy-free PCs, Internet appliances, and a hybrid, we understand their appeal. Some are inexpensive, most are easy to use, and they all seem to work within their limitations. But it's easy to get caught up in their coolness without thinking about what you need.

Our survey respondents reminded us that shape and color aren't vital. The lesson to be learned from the rise of legacy-free computers and appliances is that we want cheaper, simpler, more-reliable systems. But if these machines happen to complement the office furniture, so much the better. After all, even evolutionary trees need some flowers now and then.

Dan Littman is a contributing editor for PC World, *and Kalpana Narayanamurthi is an associate editor.* ■

SONY'S VAIO Slimtop PCV-L640 looks like a pale twin to IBM's black NetVista S40.

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PC WORLD MAGAZINE'S PRODUCT OF THE YEAR.

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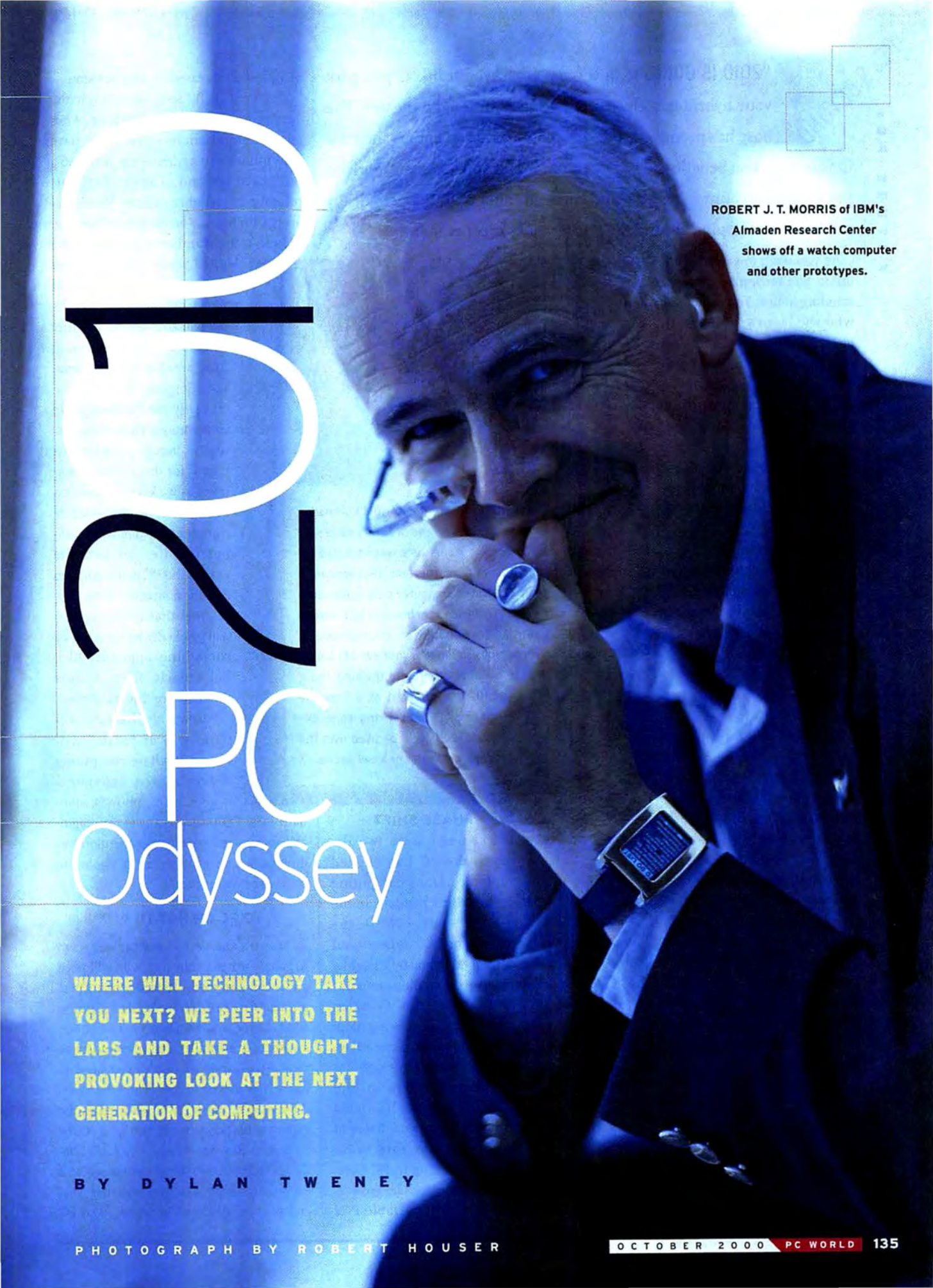
2010: A PC Odyssey

WHERE WILL TECHNOLOGY TAKE YOU NEXT? WE PEER INTO THE LABS AND TAKE A THOUGHT-PROVOKING LOOK AT THE NEXT GENERATION OF COMPUTING.

BY DYLAN TWENEY



ROBERT J. T. MORRIS of IBM's Almaden Research Center shows off a watch computer and other prototypes.

PHOTOGRAPH BY ROBERT HOUSER

"2010 IS GOING to be a great year," you think as you park your hybrid gas/electric car at the multimedia theater. The boss has promised you a promotion and a generous increase in your retention benefits package, as a reward for your excellent work on the Freeble account in 2009—and come to think of it, the genetically modified landscaping around the theater looks greener than ever.

As you walk toward the box office, you recognize someone standing in line. You can't recall who she is, so you discreetly click a button on your wristwatch to call up a display embedded in your glasses. A tiny LCD projects a menu into your right eye. Using your watch, you select Identify from the menu. The camera in your glasses snaps a picture of the mystery woman and wirelessly transmits it to the credit card–size computer in your jacket pocket. The machine identifies the person as Eve McSweeney of McSweeney Sprocket Distributors, whom you met at a trade show last month.

"Hello, Eve; it's good to see you again," you say as you step up to the ticket line.

Sound far-fetched? All of these technologies already exist in embryonic form—as lab prototypes, in-progress standards, or nascent products. By 2010, they might be workaday business tools. But would that spell the end of the personal computer as we know it?

Don't bet on it. Once you return to your office of the future, you may take that card computer out of your pocket and plug it into the PC Card slot of your desktop workstation—a beige computer running Microsoft Windows 2009. (Okay, it will probably sport a large, superflat LCD screen and have fewer cables coming out of it.) The two computers will synchronize their data files, including an audio recording and a text transcript of your conversation with Eve. You'll refer to this transcript later when you compose a follow-up message to her.

Robert J. T. Morris, director of IBM's Almaden Research Center, is pictured on the previous page—and shown in detail here are items he's wearing: **(1) Eyepiece computer** lets you see the text displayed on a would-be screen. **(2) Watch computer** puts a miniature PDA on your wrist; the device sports a tiny LCD screen where you can read text or look at graphic images. **(3) Silver earpiece** pipes sound into your ear. **(4) Light-up ring** fills you in on what others are thinking about you; IBM describes it as a "reverse mood ring." **(5) Silver ring** works like a mouse—and could be used with the eyepiece computer or a cell phone.

PHASE SHIFT

FOR MORE THAN two decades, the PC has reigned supreme among computing devices. But change is in the wind these days. While the market for PC hardware and peripherals grew by a healthy 12.7 percent in 1999, according to market research firm PC Data, sales of desktop computers and servers are growing more slowly than in previous years. Steve Baker, vice president of technology research for PC Data, says most PC market growth involves portable machines, handheld devices, and new peripherals. Sales of Palm PDAs, for example, rose by 80 percent in 1999, according to PC Data; digital camera sales, meanwhile, grew by 67 percent, and sales of portable PCs of all kinds increased by 26.5 percent.

That's not all. By 2005, according to the Yankee Group research company, wireless communications services will have 1.26 billion subscribers—up from 469 million at the end of 1999. Feel surrounded by cell phones now? Wait until every fifth human on the planet has one. By 2003, the number of people in the United States who can access the Internet from digital phones and other wireless devices will surpass the number who surf using traditional PCs, predicts International Data Corporation.

Clearly the PC faces more competition. There's no consensus, though, on what that means for the personal computer as we know it. Most experts believe that—while computers (and how we compute) will evolve over the years—the PC is not going to disappear anytime soon. Others feel that the computer will gradually be replaced by something appliance-like, but nobody offers a clear timetable for this transition.

Perhaps the likeliest scenario is a disparate environment where computing devices of every description—appliances, phones, standard PCs, PDAs, and gadgets unimaginable today—compete for our attention and dollars. Whatever happens, it's going to be a wired, wired world.

TO PC OR NOT TO PC?

AS HANDHELD devices and phones seem to gain features by the day, who will need a PC? Not everybody. In Japan, many people use tiny cell phones called *keitai* to send short e-mail messages to one another. *Keitai* are smaller and more portable than PCs—and you don't even need to know how to type to use them effectively.

Rich Gold, manager of research in the experimental documents group at Xerox Palo Alto Research Center (PARC), believes that the personal computer will eventually be replaced by easy-to-use, special-purpose devices like *keitai*. "The PC

PHOTOGRAPHS: ROBERT HOUSER; ILLUSTRATION: MIR LADA

will go away," predicts Gold, "but computing will not." He believes that computing will be embedded in a vast array of different devices, (like Xerox PARC's Tilty Table; see photo on page 138). Gold believes that tomorrow's computers, like today's telephones and TVs, will become unobtrusive appliances.

Not everyone agrees with Gold, though. PC Data's Baker believes that PCs will remain indispensable general-purpose computing devices for e-mail, spreadsheets, word processing, photographs, games, and Web access. Of course, says Baker, there will be myriad complementary ways to access the Internet and use technology.

PCs may also become command centers—central access points for controlling other devices in an office or home, Baker predicts. For instance, you might use a PC to find out when the next episode of *Who Wants to Be a Billionaire?* airs and instruct your TV to record the show.

EVOLUTION AT WORK

IN PART, THE PC is a victim of its own success. Now that nearly 60 percent of U.S. households own at least one PC, traditional PC makers don't have an open horizon for marketplace expansion.

Naturally, technology companies are seeking ways to get you to buy more than one personal computer. Next-generation PCs will come in various shapes, sizes, and colors, and they'll run a broader array of CPUs (from such manufacturers as Motorola, AMD, and Transmeta) and operating systems (like Linux, BeOS, and Palm OS).

It's not clear which computers will use which operating system—and it probably won't matter anyway. The OSs on these futuristic devices will probably be about as significant to you as the OS on your cell phone is now. Experts are reluctant to predict which devices will enjoy the ▶

Promises, Promises: Five Technolgies in Waiting

Technology companies are forever announcing that they've found the way to Pleasantville. But longtime PC users know that's far down the road from Vaporville. Think of all the tempting, cutting-edge technology ideas announced in the past two years. Many have yet to appear in a single product. Where are they now?

USB 2 For several years, all new PCs have sported USB ports for connecting multiple peripherals to the PC and to each other with little fuss. But with today's products, data transfers take a long time. In May 1999, Intel and others in the USB standards group announced a zippier version, USB 2, and said that products using the technology would ship by mid-2000. The schedule now calls for the first products to arrive in late 2000 and most to ship in 2001.

BLUETOOTH Trivia test: This wireless technology is named after (*a*) an IBM researcher who favors cobalt blue Popsicles, (*b*) a Caribbean buccaneer, or (*c*) a 10th-century Danish king whose first name was Harald. The answer is *c*, and his namesake is progressing well. Announced in 1998, the Bluetooth specification is now final. The technology lets PCs, peripherals, cell phones, and PDAs communicate wirelessly within a 30-foot range, without a line-of-sight requirement. Palm, for example, expects to offer a gizmo that will add Bluetooth capability to Palm PDAs late this year. The big wave of Bluetooth printers, scanners, cameras, and phones should reach shore in 2001.

UNIVERSAL PLUG AND PLAY UPnP is such a grand idea that it may never occur, according to IDC analyst Roger Kay. "PC makers were so embarrassed by Plug and Play the first time around." The new set of protocols would let peripherals and Internet appliances talk without requiring any human configuration—with or without a PC. Intel (which is more optimistic about the idea than IDC is) expects the first UPnP products to ship in the fourth quarter of 2000.

TRANSMETA MICROPROCESSORS Silicon Valley insiders stalked Transmeta in 1999 like a pack of 13-year-old girls chasing the Backstreet Boys. Transmeta operated under a complete veil of secrecy until January 2000, when it announced low-power microprocessors designed to power both Windows PCs and nontraditional devices such as Webpads. The company predicted Transmeta-based notebooks would ship this year; IBM is the only company that has confirmed it will ship one in the United States, using the Crusoe chip in the tiny ThinkPad 240 this fall.

EASY PC Go ahead and chuckle at the name of this initiative, which was announced by Microsoft and Intel in Spring 1999. Their idea: Encourage vendors to follow guidelines for simpler PCs. The goals? A 15-minute setup, easy expansion, and more attention to style. Some PCs—including IBM's NetVista—that implement some of these ideas are shipping now. Intel calls the project a "multiyear initiative." That's an understatement.

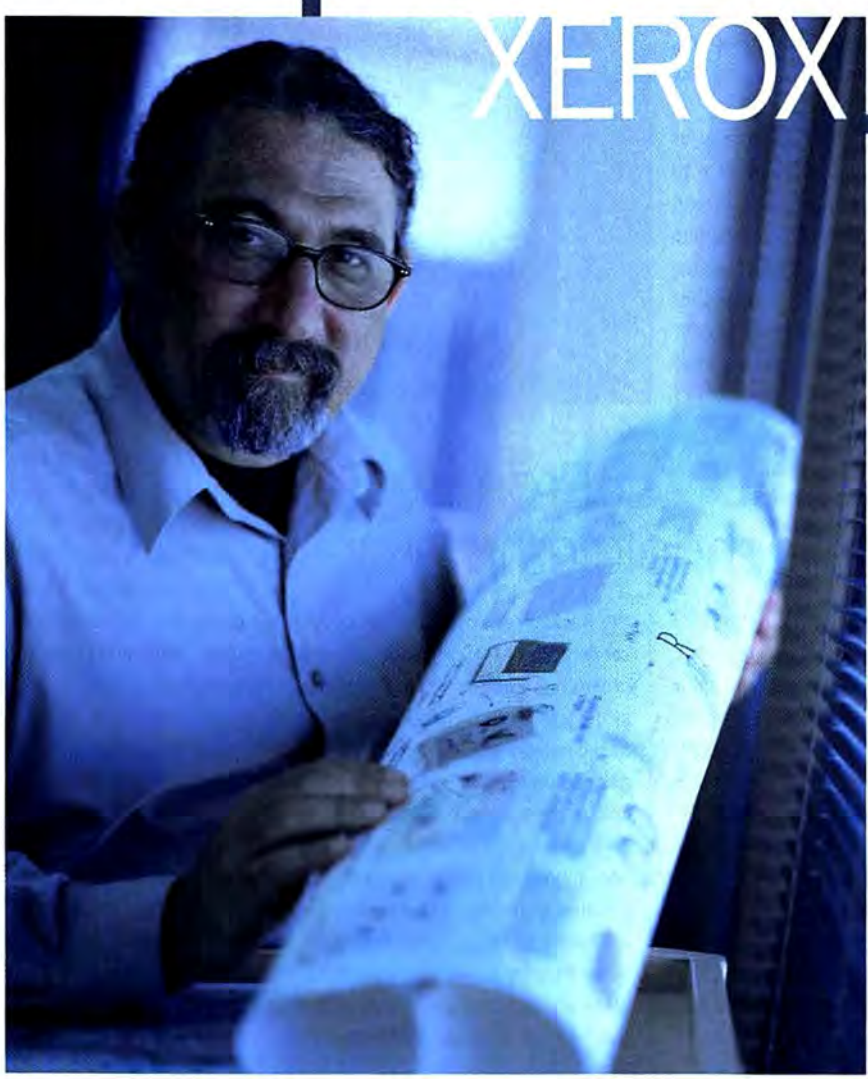
—Laurianne McLaughlin

greatest success over the next decade, but they do agree on some general observations.

First, rather than handling a multitude of options, such devices will likely have highly simplified, special-purpose interfaces that highlight one or two functions. Such products should be a lot easier to use than today's PCs, and the goal should be to make using them enjoyable, believes Robert J. T. Morris, director of IBM's Almaden Research Center in San Jose, California. "Computing has got to become a pleasurable and delightful part of our experience," asserts Morris.

As people increasingly depend on Web applications, a local machine's OS becomes less relevant. When you can access your files and applications from a browser no matter where you are, will you care what OS the browser uses?

"I think I can safely say that in 10 years the operating system won't matter," says Dave Winer, founder of Userland Software, a developer of Web-based applications based in Burlingame, California. "As time goes forward, it will become apparent that there is one virtual computer on the planet, and we're all users of it," says Winer. This, of course, would be a huge change from today's situation, where Windows is such an important part of our experience. That said, even Microsoft seems to be veering in this new direction with its announcement of .Net—a suite of services designed to allow PCs to access data and apps on Web servers.



Rich Gold, manager of research in the experimental documents group at Xerox Palo Alto Research Center, displays a large printout of a small section of content from the Tilty Table. The Table itself (not shown) provides a 3-by-3-foot surface that lets you scroll around giant documents by tilting the table.

PHOTOGRAPH: ROBERT HOUSER

THE PC LEGACY

STILL, IT MAY BE difficult to escape the ubiquitous desktop computer—especially at the office. In 2010, your successors may be using that spreadsheet you're building in Excel right now. Sure, they might be looking at it on a 20-inch flat-panel LCD screen, and using spoken commands to navigate it, but behind the newfangled interface, it may be the same old file.

"The need for a general-purpose platform like a personal computer in the workspace will never go away," says Mark T. Smith, manager of the appliance platforms department at Hewlett-Packard Laboratories in Palo Alto, California. "We're always going to be using those, at least for the foreseeable future, because they're a cost-effective way to do a lot of different things."

Yet already, the office PC is interconnected to many other devices. You might use a PC to update your contacts, but access them on a Palm or a Web-based address book. Expect this trend to continue, with the PC spawning a host of satellite devices for special business purposes. As such devices proliferate, many of them will communicate wirelessly, perhaps using the emerging Bluetooth standard. (For more about Bluetooth, see "Promises, Promises" on page 137.)

The growth of satellite devices will raise a corresponding need for synchronization tools to ensure that the data is consistent on all platforms and that disparate applications can communicate easily and effectively. "You can have connectivity, but until you have a commonness of purpose and until you have a coherence between data, it's not useful," says IBM's Morris.

In fact, the most significant technology revolutions of the next five to ten years are likely to owe more to the standardization of these communications protocols than to technical innovation, according to Alan Cooper, the founder and president of Cooper Interaction Design, a customer experience strategy firm in Palo Alto, ▶

hey kids

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2. **Kick and scream.**

California. Cooper believes that the computer breakthroughs of coming decades will depend on communications standards that enable new and existing technologies to interconnect and work in concert.

FUTURAMA

THAT'S NOT TO SAY technical innovation won't occur. In fact, a host of new computing and interface devices are likely to hit the market in the coming decade. Some will be dead-end experiments rejected by an unappreciative public. But others will become the Palm Pilots or Napsters of their day. Here's a sampling of technologies we'll see in the coming ten years:

Wearable Computing: Researchers at MIT have been experimenting with—and donning—so-called wearable-computing devices since 1993. Such devices are worn on the body and can be operated while the user's hands are busy with other tasks.

One component of many wearable computers is a head-mounted display: a tiny LCD projection system that beams information into your eyes. First-generation versions of these displays tended to be large and bulky. More recently, the USER group at IBM's Almaden Research Center has been working with a very small head-mounted display embedded in transparent plastic, so that it doesn't obstruct the user's eye contact with others.

Head-mounted displays for specialized purposes should reach the market within five years, but when (and whether) widespread adoption will occur is anyone's guess. Would you wear a head-mounted display to your next business lunch? Or on a date? We didn't think so.

MIT and IBM have done research into other kinds of wearable computing, such as computerized rings, watches, and ▶

PHOTO ILLUSTRATION: MIR LADA

Flashback to the Future

Here at PC World, we have seen the future—repeatedly. In fact, we've been predicting the shape of PCs to come since 1983, armed with the best guesses of researchers, analysts, and other technology gurus. Herewith, a reality check on some of our past prognostications.

1983 PREMIERE ISSUE Prediction: "By taking advantage of the increased capabilities of the 16-bit machines...[combined with] a related boom in communications technology...it's easy to see how the [PC] will lead to unparalleled levels of personal freedom and power." **Reality:** Power? Sure. But freedom? Today most of us can't live without our PCs.

1983 Prediction: "The mouse will bask in the computer world limelight.... Like the joystick before it, though, the mouse will fade someday into familiarity." **Reality:** No kidding. (Note: In 1983, mouse prices ranged from $150 to $350.)

1984 Prediction: "Microsoft Windows should have a lasting effect on the entire personal computer industry." **Reality:** Yup.

1985 Prediction: "Once PCs have thoroughly infiltrated the homes and offices of the world, the robot may become the next big consumer item." **Reality:** So where's R2D2?

1987 Prediction: "By [2000], Integrated Services Digital Networks will have replaced the analog phone line in most businesses, if not the majority of homes." **Reality:** Analog lives; ISDN fizzled.

1987 Prediction: "The typical business PC at the turn of the century will be capable of manipulating gigabytes of data, running a score of processes at once, and using voice recognition...to manage everyday affairs." **Reality:** Like we said.

1988 Prediction: "In the future you'll have this little box containing all your files and programs.... [I]t's very likely that eventually people will always carry their data with them." **Reality:** No signs of the little boxes yet.

1994 Prediction: "It's morning in the year 1999. As you sit in the kitchen sipping coffee, you turn on the PCTV and receive a personalized electronic newspaper...plus video highlights of President Schwarzenegger's State of the Union Address." **Reality:** The My Yahoo service and its clones offer customized news, but few personal computers live in the kitchen; meanwhile, the Terminator remains a private citizen and has given no indication that he'll be back with a hat to throw into the ring.

1994 Prediction: "You'll have online access to vast amounts of information, whether it's stored in the local library, a specialized technical database, or the Library of Congress." **Reality:** Three words tell the story: World Wide Web.

1995 Prediction: "Within five years... batteries that last a year, just like watch batteries today, will power [personal digital assistants]." **Reality:** Gulp—the color displays of today's PDAs can deplete a battery in a few hours.

—Harry McCracken and Aoife McEvoy

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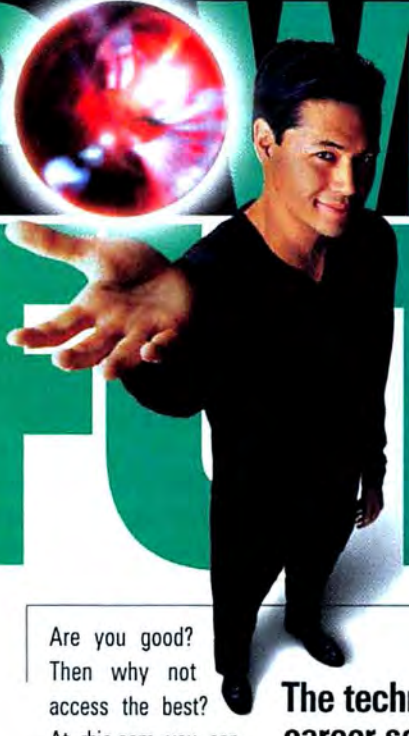

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an array of "digital accessories." As such products gain a place in their users' wardrobes, fashionable design will become ever more important to computer purchasers.

Context-Aware Computing: Both IBM and HP Labs have been experimenting with computers that pay attention to you, sensing where you are, what you're doing, and even what your vital signs are.

HP has developed an experimental platform called the BadgePad that may also include biometric voice recognition capabilities (so you can identify yourself by speaking to it), directional sensors, and temperature and humidity sensors. The BadgePad costs about $100 to produce and would be even cheaper in mass quantities. Products incorporating this kind of technology from an array of manufacturers could hit the market within a year.

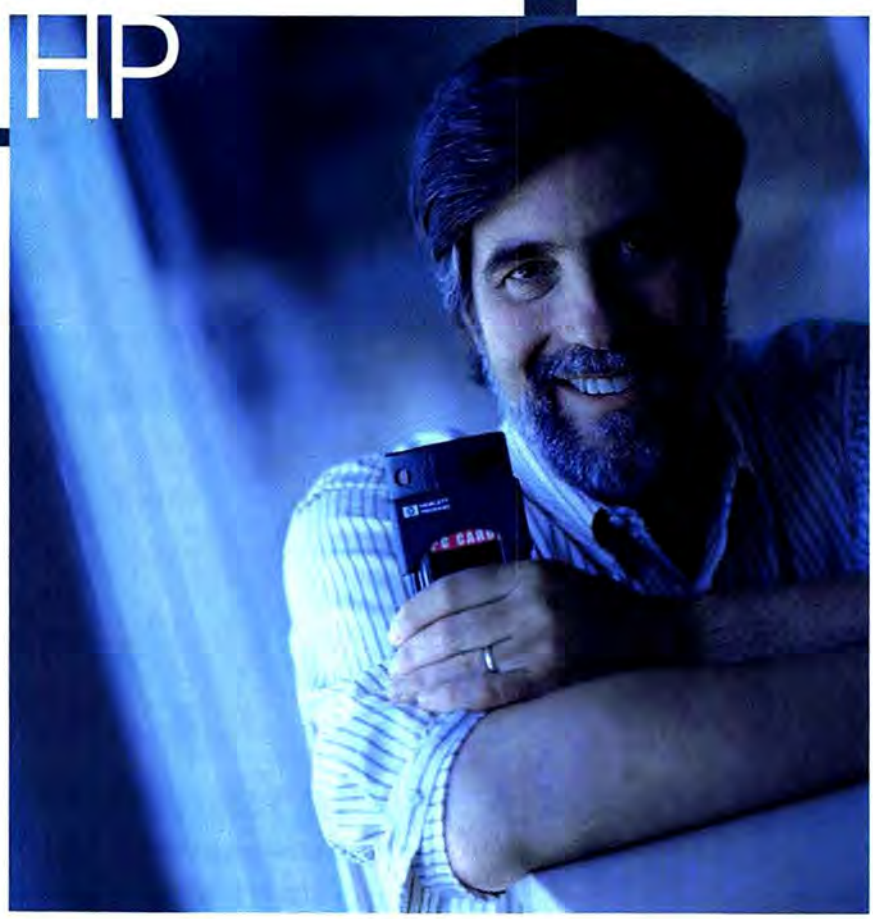
Do we really want computers to know so much about us? Maybe not, especially in a business context, says Cameron Miner, a lead engineer in IBM's design lab. But, he says, "when your computer is built in to your glasses or your watch, when it is actually participating in your social life, it will matter more."

For a further glimpse at the wearable devices that MIT is creating, visit www.pcworld.com/oct2000 /future_pcs.

Digital Ink and Audio: Imagine you're at a meeting, taking notes on a notepad that captures your handwriting, sketches, and doodles as "digital ink," and attaches those notes to your calendar entry for that meeting. Later, while reviewing your calendar, you may click an icon to call up the notes, and click any part of your notes to replay a digital audio recording of the corresponding part of that particular meeting.

Such a scenario, sketched by IBM's Morris, is not far-fetched—digital ink and audio technologies already exist. All that remains is for someone to integrate the package with your calendar and other personal data in a usable form. Morris says IBM is already working on such a product, based on technology IBM developed for the CrossPad digital ink platform.

Mark T. Smith, manager of the appliance platforms department at HP Labs, holds up the company's BadgePad prototype. By using biometrics, GPS-type technology, and other sensors, the device stays tuned to your behavior and your whereabouts.



PHOTOGRAPH: ROBERT HOUSER

BRAVE NEW WORLD?

DOES A NEW generation of special-purpose appliances portend that PCs will get easier to use? Maybe. Many of today's Windows apps sport a daunting array of menu items, with scores of buttons and toolbars, making it hard for untrained users to do even simple tasks. If the same feature-obsessed engineers who built today's desktop apps design next-generation appliances, it's possible that poor controls will cause even more information overload than we currently endure.

The bottom line, according to customer experience visionary Alan Cooper, is that designers of new products need to focus on customers and their needs. "The information revolution isn't about technology," says Cooper. "It's about how people talk to each other. It's about language."

IBM's Morris agrees that computing must become a more enjoyable activity—or else. "Our computers are not going to swamp us," Morris predicts. "The experience will be good, or we won't want it. And whoever figures out how to make it pleasurable will win in the marketplace."

So listen up, computer scientists and product designers. Computers in 2010 will almost certainly surround us even more than they do today—they'll be in our shirt pockets, our watches, and yes, our glasses. But whether our glasses are running Windows 2010 Special Edition 2, Linux, or some yet-to-be-invented operating system, one thing's for sure: Using them had better be pretty darn easy.

Dylan Tweney is a writer and content consultant based in San Mateo, California. Harry McCracken is an executive editor, Laurianne McLaughlin a senior editor, and Aoife McEvoy a senior associate editor for PC World. ■

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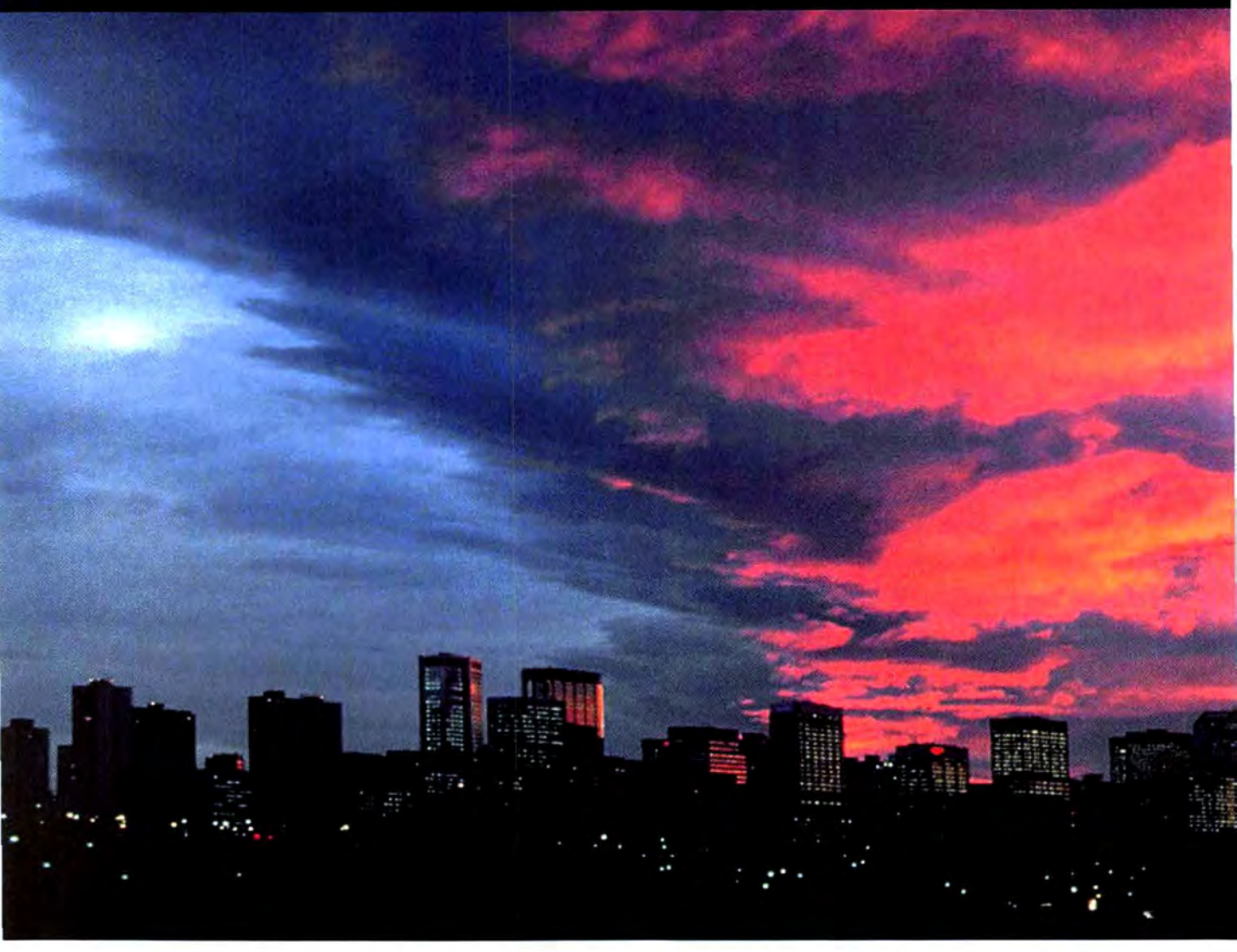

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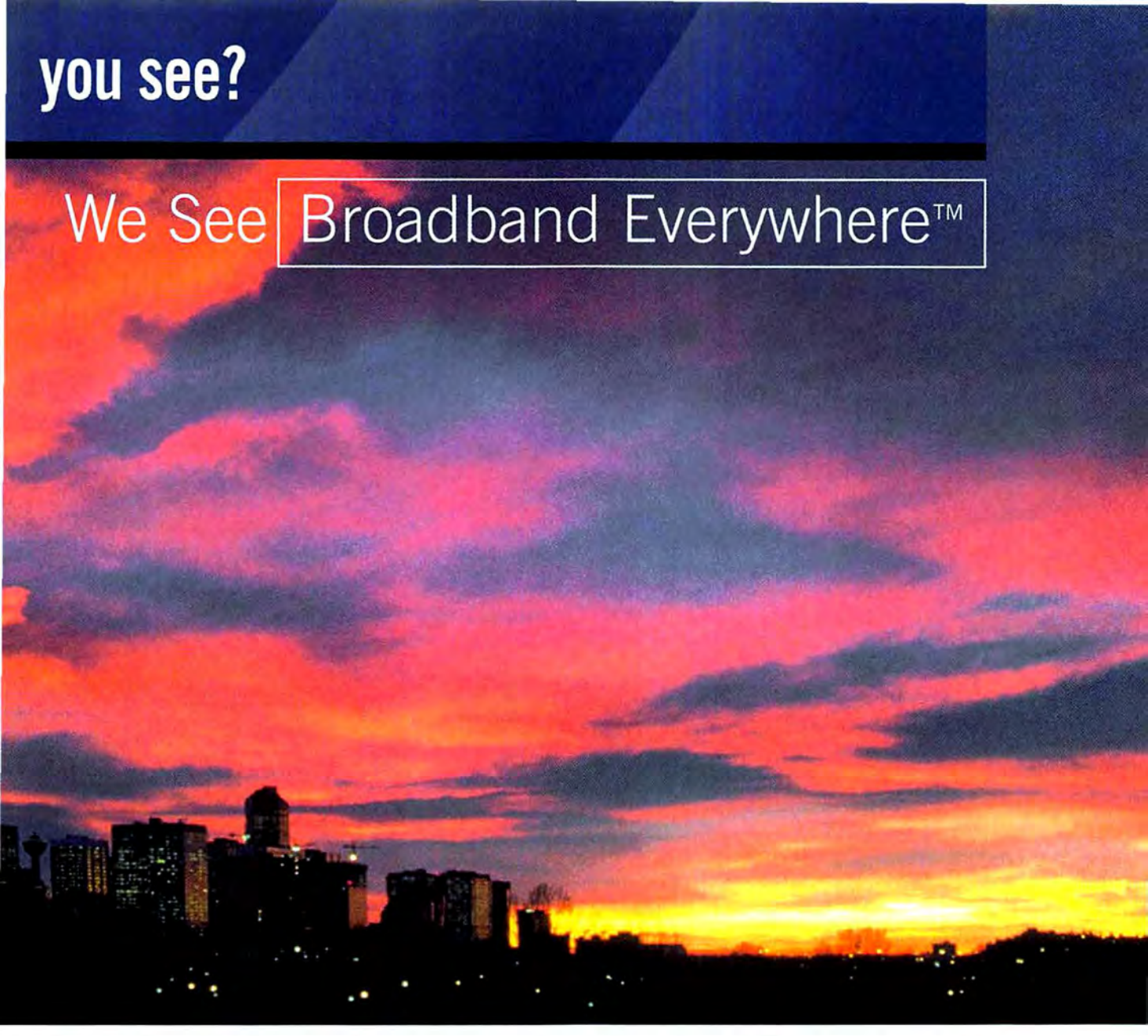

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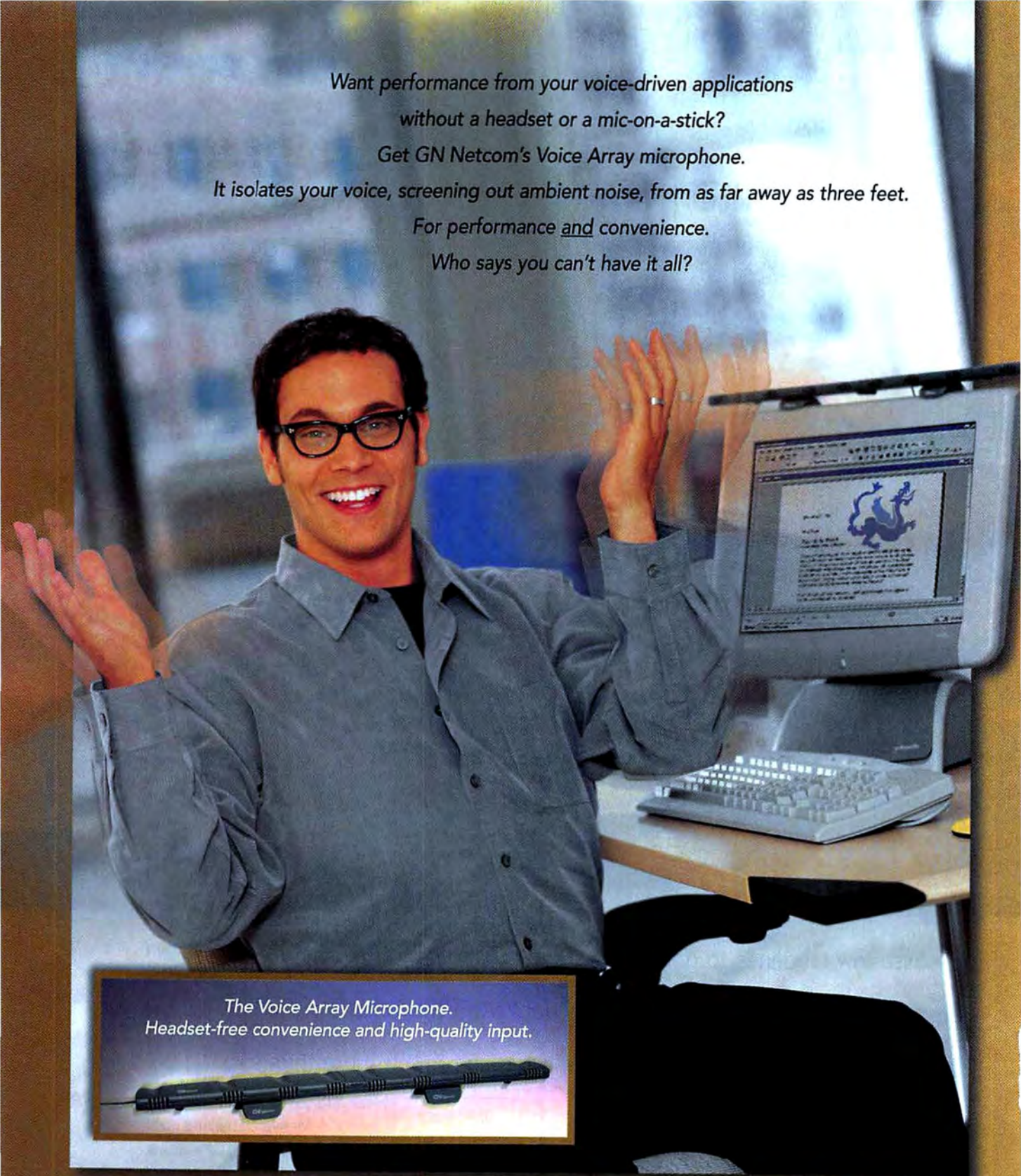

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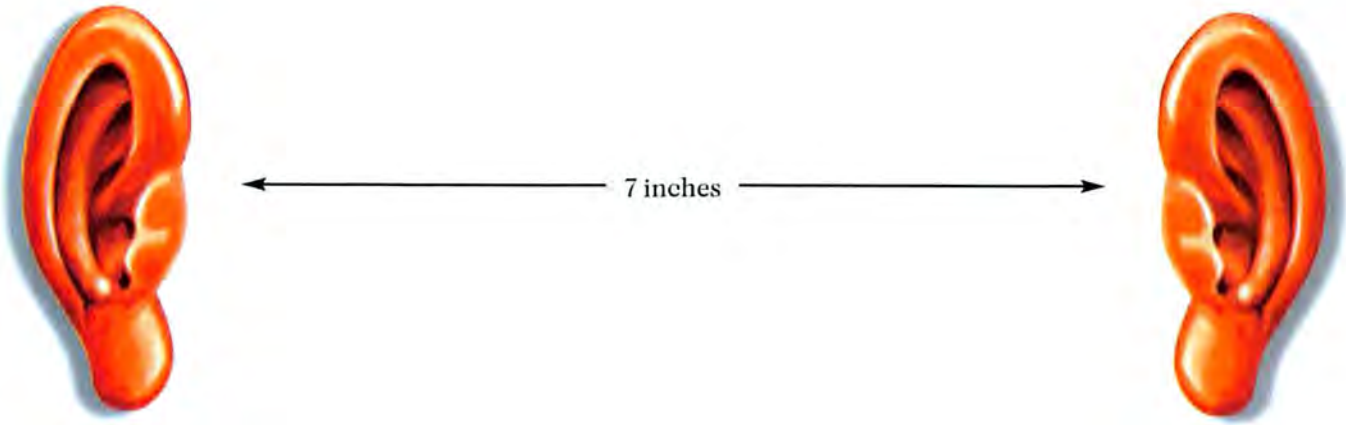

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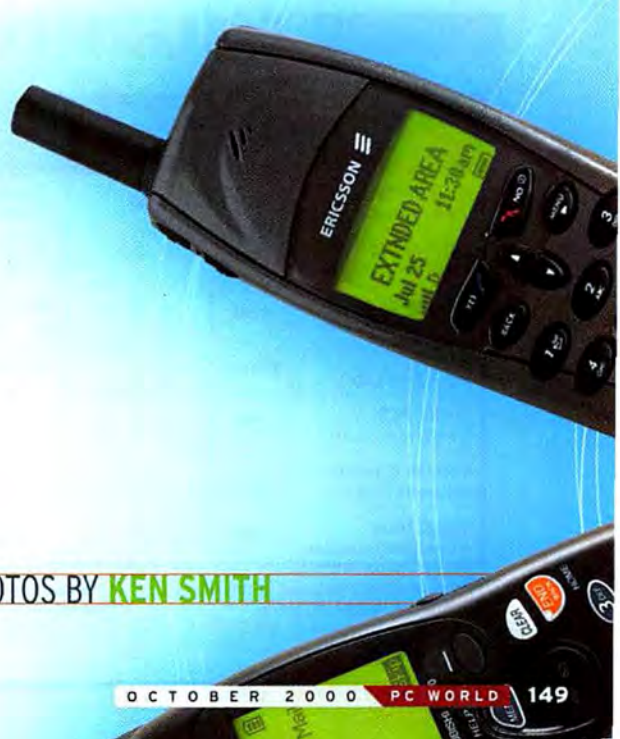
OKAY, YOU'VE LIVED THROUGH A YEAR or two—or three—of cell phone 1.0, and it hasn't been pretty. Your phone seems to have two options: loud, and off. People right next to you are having a great time on their tiny, powerful phones, but your walkie-talkie fades out unless you hold your head at an excruciatingly painful angle. Better call the chiropractor. ▶

BY **SCOTT SPANBAUER**

PHOTOS BY **KEN SMITH**



Or worse, you haven't yet joined the wireless crowd and you envy the folks who can call someone from anywhere without searching for that endangered species, the pay phone. But you've heard your friends' horror stories, and now you're daunted by the idea of choosing a provider, plan, and phone.

Like the PC, wireless communications is evolving at a shocking pace. Not only are today's phones smaller, almost all of them are digital, which yields clearer sound. Cell phones also increasingly incorporate text-messaging and personal organizer features usually found in pagers and PDAs. To top it all off, you can now use your phone to browse the Web (which is why you're reading a phone story in *PC World*).

SOME CITIES—LIKE LAS VEGAS—ARE JUST BAD PLACES FOR CELL PHONES

With all the service providers, calling plans, phones, and other wireless devices to choose from, it's hard to know where to start. We began by asking more than 1500 *PC World* readers about their wireless experiences. With those survey results in mind, we set out to create a guide to going wireless so you'll know what questions to ask when you're shopping for a cell phone. We looked at a sample of popular services and phones, and came up with some recommendations. Along the way, we encountered a few of the pitfalls that can make owning a cell phone a nightmare (see "Wireless Woes" on page 151). Finally, we test-drove five of the latest alternatives for wireless Internet—pagers and wireless-capable PDAs.

CHOOSING A PHONE SERVICE

THE MOST IMPORTANT ASPECT of cell phone ownership isn't the phone itself, but the company that provides your wireless service. Service providers offer different coverage both in your local area and nationwide, separate price plans with varying terms, and different underlying technologies that determine which phones you can use. It's a confusing marketplace to wade through, but our survey provided us with a starting point.

Our respondents told us what may seem obvious—coverage is the most important feature of a wireless phone service. After all, what's the point of owning a cell phone if you can't get service where you need it? Unfortunately, how you find a provider with the coverage you need is much less obvious.

Most carriers provide detailed-looking maps—both regional and local—of their coverage areas. Along with the maps generally come disclaimers, however, stating that weather, landscape, and other factors could block reception within the company's areas of coverage. "My biggest problem is call reception," complains software engineer John Reeves of Keller, Texas. "Very often incoming calls never make it to my phone even though I'm in the service area," he adds, noting that occasionally his calls are dropped as well.

Your first coverage choice is between national providers and regional or local ones. Nationwide firms like AT&T, Sprint PCS, and Verizon Wireless offer coast-to-coast networks that can permit you to stay on your home service as you move from state to state. Regional providers, such as Qwest and Southwestern Bell, may cover only the states where the company provides local phone service. But that doesn't mean you're out of luck when you're outside your provider's network. Your phone may be able to *roam*, or operate as a guest on another company's digital or analog network. Roaming is better than not being able to talk at all, but it usually entails a surcharge of up to 75 cents a minute and long-distance fees of up to 50 cents a minute.

National providers, then, might seem to provide a better deal, but it's not always that simple. Even national firms usually charge

WIRELESS SERVICES FEATURES COMPARISON

PROVIDER	Network	Percentage of users extremely or very satisfied [1]	Cost per month				Internet access
			Voice mail	Numeric paging	Call waiting	Caller ID	
AT&T Wireless www.attws.com	TDMA	50	Depends on plan	Free	Free	Free	Basic service free; advanced features additional $7 or $15; connect time unlimited and separate from plan
Cellular One www.cellularone.com	CDMA	42	$5	Free	Free	Free	n/a
MCI WorldCom wireless.mci.com	CDMA	[2]	$4 to $8, depending on plan	Free	Free	Free or $5[3]	n/a
Nextel www.nextel.com	GSM/IDEN	[2]	$3	Free	Free	$3	$15 MSN Mobile (e-mail, paging, quotes), Amazon.com, news, weather; $20 plan adds Web browsing
Sprint PCS www.sprintpcs.com	CDMA	48	Free	Free	Free	Free	$10 or free depending on plan; includes 30 news updates or text messages; connect time subtracted from calling minutes
Verizon Wireless verizonwireless.com	CDMA	46	[4]	$8[5]	Free	Free	$7; includes e-mail access; news, weather, sports, entertainment, and personal finance sites; Web-based calendar and contacts
VoiceStream www.voicestream.com	GSM	[2]	Free	Free	Free	Free	n/a

[1] From *PC World*'s e-mail survey of 1540 readers.
[2] Too few survey responses to rate.
[3] Depending on plan; not available in some areas.
[4] Included free with digital plans.
[5] Included with regional and nationwide plans.

roaming fees on their basic and intermediate plans, which specify local or regional home calling areas, respectively. Inside your home calling area, all calls are considered local. Once you step outside that calling area, roaming and long-distance fees apply. If you travel frequently, consider a national provider and ask about a one-rate plan that turns the company's entire nationwide network into your home calling area. No matter where you go—even if you roam onto another vendor's network—you pay no roaming or long-distance fees. And one-rate plans aren't a luxury reserved for high-end customers. Verizon, for example, offers a plan with free roaming and long distance for $35 a month. No matter what your choice, be sure to find out what your roaming fees are so you'll know the cost of making that call on the road.

CHEAPER BY THE HUNDREDS

COST RAN A CLOSE SECOND TO COVERAGE in importance among our survey respondents. Fees for roaming aren't the only charges that can inflate your cell phone bill to alarming proportions, so it's important to choose a calling plan that reflects your calling habits. Over 60 percent of the readers we surveyed who have a cell phone use one of four nationwide carriers: AT&T, Cellular One, Sprint, or Verizon. We looked at plans from these and three other popular carriers—MCI WorldCom, Nextel, and VoiceStream—and found a dizzying array of choices. Every wireless provider we've ever heard of offers a variety of monthly calling plans that juggle a flat monthly rate, a number of included airtime minutes, and a per-minute fee that kicks in when you exceed that limit. In addition, fees for roaming and long distance vary from free to more than a dollar per minute.

Here's a wireless phone math quiz: Which is more expensive, a $20-per-month plan or a $60-per-month plan? Though it depends on how you use your phone, choosing the $60 plan could save you a lot of money. For example, AT&T offers a basic plan with 60 included minutes for $20 per month; each minute after the first 60 costs 40 cents. Talking long distance costs 15 cents a minute, and each roaming minute costs 60 cents. AT&T's $60 plan includes 300 minutes with no roaming or long-distance charges and a 35-cent charge per minute beyond the first 300. If you make only local calls, and don't use more than the allotted 60 minutes a month, the $20 plan might be a good fit. Exceed that limit and things start to get expensive. Simply making another hour's worth of calls will add $24 to your bill. Already, that $60 plan is starting to look better. If you're roaming for that second hour, the additional fee will be $36. Throw in long-distance charges and...well, you get the idea.

If that sounds frightening to you, you're not alone. Of the more than 1500 respondents to our survey, over 200 have refused to join the wireless herd, fearing high costs, hidden extra charges, and confusing service agreements. But the majority of those polled who already have a phone were happy with their monthly rate. One reason could be that about half of them signed up at intermediate rather than bargain levels, paying $25 to $49 per month. At these slightly higher monthly rates, the number ▶

WIRELESS WOES

TRY AS YOU MIGHT to sail smoothly through the cell phone seas, sometimes you can't avoid bad weather. It helps to know which things you can change, and which ones you must simply endure. Here are some of the more common problems and some tips on how you can avoid them.

SPOTTY COVERAGE

STEFAN CARMIEN, a system administrator in Boulder, Colorado, discovered that his office straddles the boundary of two cells, and that walking across the boundary will interrupt a call. "Sometimes when I get a call in the wrong part of the room," recounts Carmien, "I just lean toward the part that gets better reception and scream 'Call me back on my office number!'"

Dead spots are an inevitable part of wireless telephony, but when they're in your house, your office, or your route between the two, using a cell phone can seem pointless. Do some research before you sign a contract to find a provider that's got you covered where you most need it. Some providers let you sign up for a trial plan, which you can use to test their coverage. Ask your friends about their service in locations you frequent, or sign up for a trial plan before you go for a whole contract. A dual-band or tri-mode phone helps, too—most support the analog cellular transmitters which still cover more territory than digital technology does.

CONTRACTS AND BILLING

WHEN PAUL LOPEZ of Kansas City, Kansas, realized he wanted to switch to a digital phone, he found that his provider's two-year contract locked him in to the older technology. "I am the one paying the bill, and I should be able to decide what type of phone I use," he declares.

Backing out of a cell phone contract that doesn't work for you can be expensive—most companies charge $100 or more. The only advice we can offer is to be sure you like the service and the phone before you sign.

One technique is to buy the phone you like without service, and then buy a prepaid phone card to sample a particular service. If it doesn't work out, try another provider. The only catch is that the phone has to use the same cellular technology as the carrier. If you do sign a contract, get the shortest one you can. And make sure you know the renewal terms—some contracts lock you in for another year if you don't do anything.

When the bill arrives, check it carefully for errors and for calls you didn't make. "I had no problems until two years ago, when AT&T billing was apparently subcontracted to Larry, Moe, and Curly," reports San Antonio reader Bob Cole. "I'm keeping my fingers crossed that last month's correct billing was not a joke."

ILLUSTRATION: JOHN UELAND

of included minutes goes up—often dramatically—and the cost of additional minutes, long distance, and roaming goes down.

If you travel a lot, consider a one-rate plan. For a higher monthly fee you'll receive 300 or more free minutes, additional minutes for as little as a quarter, and free nationwide long distance and roaming. Even if you use only a portion of your included minutes, you could end up paying less per month than under the bargain plans. Of course, there's an exception to every rule. Sprint charges for roaming on all of its plans, which could make traveling and talking expensive, even if you sign up for one of the company's higher-volume plans.

If even $20 a month seems like too much to pay for service, you can economize even further by purchasing a prepaid phone package. Andrea L. Steck, a student who lives in Cincinnati, paid $99 for a Nokia 5160 phone and $50 worth of initial service. "It was crucial to have a phone, since I'm on campus at night," says Steck. Though unused minutes expire after 60 days and the service lacks voice mail, she says she can't complain. "I'm only spending an average of $10 a month," Steck says. "This is a fab plan that works just fine for me right now." If you go for a prepaid plan, check the terms carefully. With just about every plan, you'll end up paying more per minute in exchange for not having to pay a monthly fee, and some plans really sock it to you when you roam or call long distance. Finally, the minutes you purchase won't last forever—many companies treat unused time as expired after two or three months.

QUALITY OF SERVICE

NEXT, YOU'LL WANT TO consider a carrier's service quality before locking yourself into a contract. Unfortunately, wireless quality is tough to research. Problems are often hard to predict and even harder to resolve. Keith Zornes, a customer service and sales representative in Bothell, Washington, has given up expecting reliable wireless service while driving around the Seattle area. "My cell phone signal can go from full power to no power in about 60 seconds," he says. Zornes says his employer, a large utility company, complained to the wireless provider, which said it was installing additional cell towers to reduce dead areas. But nothing has changed, according to Zornes, and he remains puzzled by the inconsistent service. "You're on top of a hill one day and getting good reception," he says, "but the next day it's gone."

Switching to another provider might solve reception problems, or it might not. Online wireless reseller Decide.com shared with *PC World* the results of more than a year of wireless service testing it conducted in dozens of U.S. cities. Though the numbers don't reveal a consistent pattern of wireless reception quality, a few truths shine through. First, in a given area, one provider may be better than another, so switching to another service could remedy reception problems. Decide's testing in Seattle showed that US West and GTE (now a part of Verizon) made good calls around 80 percent of the time, while the good-call rate at AirTouch (also absorbed by Verizon) and AT&T came closer to 90 percent. Second, some cities—like Las Vegas—are just bad places to use a cell phone, regardless of the provider. For some reason, no provider in Las Vegas managed more than a 71 percent success rate. Third, even though a particular provider may not be great in many cities, it could provide the best quality where you live. Sprint, for example, fared poorly (around 79 percent) across most of the country, but in San Antonio and Austin, Texas, it ranked as one of the best.

Talk to friends and coworkers who use their cell phones in locations or along highways you frequent. Are there dead zones or cell boundaries that could interrupt service? Things may not be as bad as you think: Nearly 75 percent of the cell phone users we surveyed said they were happy with their phone's audio quality.

PAGING, MESSAGING, BROWSING

TALK MAY BE CHEAP, especially if you pick the right calling plan, but wireless phones are good for more than talk these days. Many act like pagers, displaying the phone numbers of calls that come in while the phone is turned off or busy. Some cell phones can send and receive text messages, retrieve voice mail, and perform familiar tricks of wired phones like call waiting and Caller ID.

Such features may be useful, but don't assume that they'll be included with your phone—some are dependent on the calling plan you choose. Often, services such as voice mail and numeric paging are includ- ▶

SURVEY SAYS...

PC WORLD surveyed more than 1500 readers and asked them questions about their wireless phones and service providers. Here are some highlights of the answers.

Among readers with cell phones:

86 percent do not have Web access. Of those who do have it, 55 percent say they never use it.

Almost half (48 percent) pay between $25 and $49 each month for their wireless service plan.

The most important features of a phone are battery life and cost, respondents say. The least important are Web access and personal organizer features.

The most important feature of a wireless service is coverage, the least important is the billing system.

60 percent primarily use the phone for personal calls, 30 percent for business calls, and 10 percent for emergencies.

Only 12 percent are extremely satisfied with the overall performance of their wireless service provider.

45 percent can access both digital and analog service.

Among *PC World* readers who don't have a wireless phone and don't plan to buy one in the next year:

71 percent are worried about the cost.

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ed without extra charge in higher-volume plans; in others, they can cost up to $10 per month more. Read the fine print carefully before signing on the dotted line.

Paging and messaging are all well and good, but what's really creating a buzz these days is the ability to browse the Web on your phone. Combine the right phone and service plan, and you too could be surfing the Web on your cell phone, using an application called a microbrowser. Currently, your provider will offer either Phone.com's microbrowser or one that uses the Wireless Application Protocol. There are some slight differences between the two technologies, but they provide essentially the same things: lists of commercial news, weather, sports, finance, and shopping sites formatted for your phone's tiny display and poky, 9.6 kbps download speed, and the ability to send e-mail through your provider or a third-party site like MSN, AOL, or Yahoo. ▶

WIRELESS ALTERNATIVES

THOUGH THE LATEST PHONES out there are getting more and more computerlike, they still tie you to a tiny screen and a dreadful input system. Fortunately, the latest pagers and PDAs are more powerful, just as mobile, and often better suited for surfing the Web.

PAGE ME

HARDLY A GLAMOROUS TECHNOLOGY, two-way alphanumeric pagers nevertheless do a simple job and do it well. Motorola and RIM have taken the pager to a new level with the $400 Timeport P930 and $499 BlackBerry RIM 957, respectively. Each enables you to exchange text messages with other pagers via radio waves, and to send and receive e-mail messages and even faxes. Each also contains contact software you can synchronize with your PC. Best of all, both devices contain miniature QWERTY keypads for entering text. You probably wouldn't use your phone's keypad to enter messages of more than a few sentences, but thumb-typing on one of these is kind of fun. Hunt-and-peck typists will feel right at home.

The Timeport P930's clamshell design is compact enough that you could pop the 6.7-ounce device into your pocket, though you'll probably prefer the included belt holster. You use a four-way navigation pad to scroll through menus, and the 16-line screen is sharp. Unfortunately, the P930 doesn't do enough for the money. The RIM 957 does everything the Timeport does, but adds a few more applications, such as a task manager and a calculator, plus a larger screen and access to the Web through one of three third-party services. As with the Timeport, text entry is via a QWERTY keypad, and you navigate the icon-based interface using a jog wheel on the side of the compact case. The 957 might fit into a suit pocket.

If your wireless needs tend more toward text than voice, one of these advanced pagers could make more sense than a cell phone. But watch out—they're not cheap. And as with a cell phone, you must subscribe to a monthly service. In Denver, nationwide coverage plans for the Timeport P930 range from $25 to $60, depending on message volume; nationwide plans for the RIM 957 start at $40 and go up to $74.

PDAs GET REAL

THOUGH PAGING TECHNOLOGY is convenient, at those prices you may want to consider a more versatile alternative. 3Com's $399 Palm VII carries the classic handheld PC in a wireless direction. Palm recently released a new version—the Palm VIIx—with more memory. The Palm VII incorporates a wireless modem that connects to 3Com's Palm.Net service. Like paging services, 3Com's wireless service is pricey. It also doesn't provide real Web surfing, but rather a Web-clipping service that retrieves snippets of data from services like ABC News, The Weather Channel, and E-trade. Basic service starts at $10 per month. An unlimited plan is $45 a month. Alternatively, Palm V users can add a $299 OmniSky modem and $40 monthly service for unlimited access.

This year, the Palm met up with a serious challenger: the Pocket PC. Running a new version of Microsoft's Windows for Pocket PCs, handhelds like HP's Jornada 545 and Compaq's IPAQ come with color screens, desktop synchronization software, a Web browser, a digital audio player, an e-book reader, and stripped-down but powerful versions of Microsoft's Word, Excel, and Outlook applications.

Though the systems have no built-in wireless technology, companies like Socket and Ricochet sell standard and wireless modems that fit the Pocket PC's compact flash slots.

PAGERS AND PDAs

MOTOROLA TIMEPORT ▲

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But before you rush out to get your phone browser, consider this: More than half of our survey respondents who already have a Web-capable wireless phone report that they never use their Web service. One reason is undoubtedly the quality of the browsing experience. Netscape it isn't. Surfing the Web on your phone is like pedaling a toy car down the freeway—it's a lot of work just to get to the next off-ramp, and you know that people with real cars are enjoying a lot more scenery. Opinions may change as the standard cell phone's screen size grows, navigation controls improve, and the content becomes a must-have for mobile folk instead of a stripped-down rehash of existing sites.

The wireless Web isn't cheap, either. Though AT&T's basic PocketNet service (which offers access to partner Web sites) is free, additional capabilities like e-mail and access to any URL cost as much as $15 a month. Nextel's wireless Web services are even costlier. When shopping for a service, find out whether the time you spend browsing comes out of your calling minutes or not. AT&T's PocketNet lets you browse without using talk time.

You've probably heard wireless service horror stories—rampant overcharging, missing bills, and so on—and maybe you even have a few of your own to tell. But while our survey respondents had their fair share of nightmare situations, they gave their current provider's customer service and technical support each an average of about 7 out of 10 points. More than a quarter had experienced billing errors such as late or missing bills, or incorrect or duplicate charges, but three quarters of those people reported that the problem was resolved to their satisfaction.

As with any human endeavor, accidents will happen. But there are a few things you can do to make things easier on yourself—and your customer service representative—when the steam starts shooting out of your ears.

First, look for a plan that offers long hours for customer service and technical support. Some, like VoiceStream, are available 24 hours a day. And itemized billing can preserve your sanity by showing each incoming and outgoing call. That way, you can compare the total number of minutes, or locate any mischarged calls before you even pick up the phone. Sandy Obenshain in Roanoke, Virginia, says she has to call her wireless provider almost every month, and has refined the process into a science: "Customer service reps try, but they don't always accomplish what they say they will do. I usually just start off by asking for a supervisor so I won't have to constantly repeat my problems." And rather than demand service improvements when dropped calls and static interrupt her communications, Obenshain came up with a more satisfying solution: requesting that additional minutes be credited to her plan.

BASIC PHONES

NOKIA 6160

ERICSSON R280LX

Nokia and Ericsson pack even their low-end phones with features: Ericsson's $99 R280LX can surf the Web; Nokia's phone plays games.

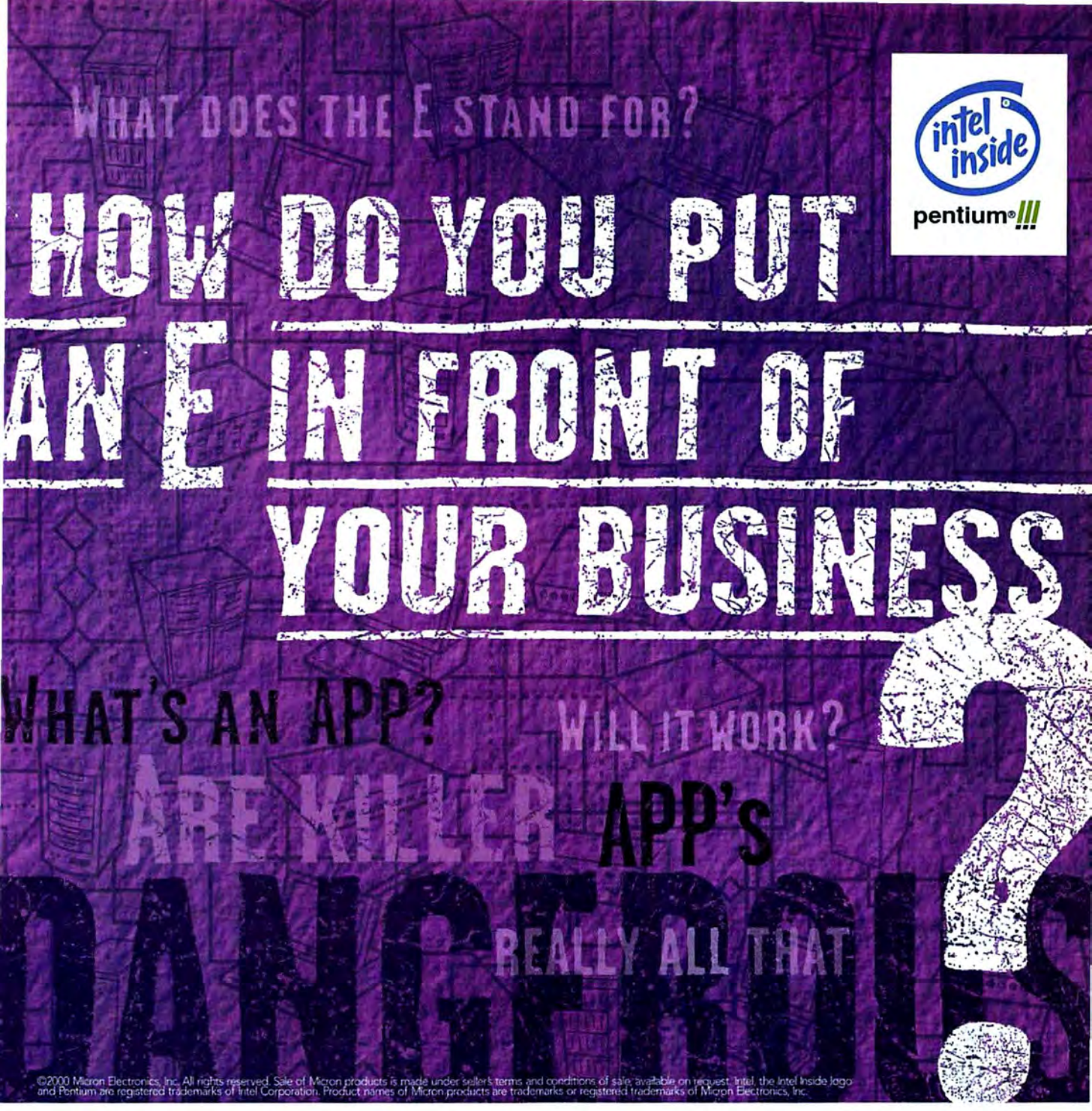
LET'S GO TO THE PHONES

ONCE YOU'VE CHOSEN a wireless provider, it's time to select a phone. Some carriers may make the pickings seem pretty slim, but you don't have to limit yourself to their offerings. As long as you choose a phone that's compatible with the provider's system and the messaging and wireless Web features you want to use, your provider should be able to activate it for you.

Here's where the acronyms start flying. Once upon a time (starting in the 1980s), all cell phones ran on an analog network. That network still exists as a backup, but modern cell phones have gone digital. Digital technology carries more users, offers better voice quality, and supports features like Caller ID, call waiting, voice mail, and of course, Internet access.

There are three different digital wireless standards: Global Standard for Mobile communication (GSM), Code Division Multiple Access (CDMA), and Time Division Multiple Access (TDMA). The last two can operate on two different frequency bands—800 MHz and 1900 MHz. GSM operates on one band in the United States and two others elsewhere in the world. Phones and wireless providers are either GSM, CDMA, or TDMA compatible, so you won't be using your GSM phone on AT&T's TDMA network anytime soon. Dual-band phones usually work with one band (800-MHz CDMA, for example) along with the more pervasive analog cellular network. So-called tri-mode phones work on both the 800-MHz and 1900-MHz bands and the analog band, making them more versatile roamers. If you have a tri-mode phone, you should be able to walk into a cell phone store and have it switched to a service with a matching acronym. TDMA and CDMA are the most popular networks in the U.S. GSM, popular in Europe and the rest of the world, is just starting to catch on here. Tri-mode GSM phones let you and your phone roam the globe.

Like computers, cell phones keep getting better all the time, and you may be able to get a newer, lighter phone for free or at a discount by signing a service contract. If the terms of the contract are agreeable and you like the phone being offered, great. But remember that just a few months of inflated fees may outweigh the money you save buying a bundled phone. A few of the phones we looked at—Ericsson's R280LX and Nokia's 8260 ▶



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and 7190—stood out as some of the best. Consider the elements below when you're making your own choice.

We asked *PC World* readers to rate the importance of several different factors when choosing a phone. By far the most important was battery life, with 50 percent of respondents who use a cell phone or plan to buy one in the next 12 months rating it "extremely important"—a 10 on our scale of 1 to 10.

EVEN BARGAIN UNITS COME WITH CALCULATORS, CALENDARS & GAMES

If long battery life is all you need, you don't have to pay a lot to get it. The two cheapest phones we looked at—Nokia's 6160 and Ericsson's R280LX—offered two of the longest talk times, according to vendor estimates (most vendors quote the best-case scenario). Each lets you talk for more than 3 hours or wait for calls on standby for more than 150 hours. Extra battery life comes with a trade-off, though. Neither of these will disappear comfortably into a pocket, like Motorola's Timeport 8167 or Nokia's 8260. Also, the battery life of GSM phones varies with proximity to transmission towers, according to Nokia.

Battery life isn't always directly related to size or weight. You can talk for an hour longer on the diminutive Nokia 8260 than on the much-larger Mitsubishi T250. Look for a removable battery to help get you through really long days. Most of the phones here offer talk time in the 2.5-to-3.5-hour range, and let you swap batteries. Many vendors offer optional higher-capacity batteries.

WHAT ARE YOU PAYING FOR?

OUR READERS SAID cost was a phone's second-most-important feature. In fact, 53 percent of those who use a cell phone or plan to buy one in the next 12 months rated it a 9 or 10. In general, you pay more for a smaller phone with more complex features, or a bigger screen. When phones were only for phone calls, an itty-bitty display was fine. But now even bargain units come with built-in calendars, calculators, and games, not to mention phone lists and complex settings interfaces. Navigating this software using the phone's keypad and often cryptic navigation keys is hard enough; having to do it through a tiny screen only makes things worse.

The Nokia 6160 and 8260 and the Ericsson R280LX each display only five lines of text, which means you'll have to do a little more squinting and scrolling than with other phones.

The $200 Mitsubishi T250's ten-line display makes it a good choice for the wireless Web surfer. Since most on-screen menus list more than four items, finding your way around on a smaller screen requires constant scrolling. Browsing with the T250 feels like observing the world through a porthole instead of a pinhole. Not perfect, but much, much more enjoyable, and probably worth the extra $100 the Mitsubishi T250 costs compared to the Ericsson R280LX.

Six- and seven-line screens like those offered on the Motorola Timeport P8167, Nokia 7190, and Kyocera PdQ Smartphone give you some much-needed breathing room, but be prepared to scroll around. The Timeport's tiny screen is slightly smaller than the Nokia 7190's, but it's nevertheless sharp, clear, and bright. Not all LCDs are created equal; before spending hundreds on a high-end phone, you should see the screen for yourself. For the ultimate experience in telephone browsing, nothing beats the NeoPoint 1000's bright, 11-line screen.

Just because a phone is cheap doesn't mean it's entirely devoid of features. If your service supports it, the Nokia 6160 lets you

WIRELESS PHONES FEATURES COMPARISON

	MANUFACTURER AND MODEL	Street price (8/2/00)	Wireless standard	Size (inches)	Weight (ounces)	Screen size (lines)	Ring types	Controls	Infrared
Basic	Ericsson R280LX*	$99	Tri-mode TDMA	5 x 2 x 1	6.1	5	Tone, song	Side volume key, voice-mail button	○
Basic	Nokia 6160	$199	Tri-mode TDMA	5.2 x 1.8 x 1.3	6	5	Tone, song, beep, silent	Scroll, menu/back, call/hang up	○
Intermediate	Mitsubishi T250	$200	Tri-mode TDMA	5.6 x 2.2 x 1	7.1	10	Tone, song, vibrate (requires optional vibrating battery)	Seven navigation buttons, four-way pad	○
Intermediate	Nokia 8260*	$250	Tri-mode TDMA	4 x 1.8 x 0.8	3.4	5	Tone, song, beep, silent, vibrate	Scroll, volume up/down, menu/back, call/hang up	○
Advanced	Kyocera PdQ Smartphone	$800	Dual-band CDMA	6.2 x 2.6 x 1.4	9.8	7	Ring, silent	Scroll up/down, two SoftMenu buttons, call/hang up, messaging, info	●
Advanced	Motorola Timeport P8167	$300	Dual-band CDMA	3.7 x 2.2 x 1	4.4	6	Tone, vibrate	Talk, end, volume up/down, voice mail, three additional menu buttons	○
Advanced	Nokia 7190*	$250 (estimated)	Dual-band GSM	4.8 x 2 x 1	4.9	6	Tone, song, beep, silent, vibrate (optional)	Scroll, volume up/down, menu/back, call/hang up	●
Advanced	NeoPoint 1000	$400	CDMA	5.5 x 2 x 1	6.4	11	Tone	Four buttons, four-way navigation pad	○

* Recommended ● Yes ○ No † Manufacturer estimates.

receive text messages and store them on your phone, and doubles as a standard numeric pager. A built-in calculator and four simple games are also included. Ericsson's R280LX offers a feature set almost identical to the Nokia's, with one big exception: You can browse the Internet with it.

SOMETHING A LITTLE SNAZZIER?

AFTER PRICE AND BATTERY LIFE, readers valued weight, appearance, and size. A small, light phone slips easily into a pocket so you can leave that belt clip and briefcase behind.

Nokia's 8260, though almost identical to the 6160 in features, does it all in a package that's an inch shorter, half an inch slimmer, and just half the weight. This isn't just a phone, it's a fashion statement. Along with Nokia's usual collection of annoying

INTERMEDIATE PHONES

NOKIA 8260 ▸

ring-tone songs, the 8260 adds a much-needed vibrating ringer alternative. (Motorola's Timeport also incorporates a vibrating ringer; other phones offer the feature through optional batteries.) Now while you're in a meeting or on a date, nobody has to know that you're ignoring your calls. The Timeport P8167 is just as tiny, but packs more features.

While the average weight of the other phones we tested was about 5.5 ounces, Kyocera's PdQ Smartphone tips the scales at

Additional features	Talk time (hr:min)	Standby time (hours)	Internet support
Can assign unique ring tones to known callers	4:00	160	CDPD packet data
Text messages, calendar, calculator, games, ring profiles, numeric paging	3:15	192	None
Headset jack	2:00	120	CDPD packet data
Can send messages as e-mail, page, or fax; calendar; calculator; games	3:20	192	None
Integrated Palm III computer, desktop cradle, synchronization software	2:30	40	PdQ browser (requires standard ISP dial-up account)
Headset jack	3:45	175	PDC 3.1 microbrowser
Voice dialing, two-way paging, PC synchronization	3:00 to 5:00	60	WAP
Voice command, contacts, calendar, to-do list, PC synchronization, predictive text entry	2:30	60	Circuit-Switched Data (CSD) ready, microbrowser ready

almost 10 ounces (and a weighty $800). In all fairness, this is not a phone, but a computer with a phone built in. The two devices coexist in the case and share the screen: When you fold the keypad down, exposing the entire screen, the display switches to that of a Palm III PDA. Fold the keypad back up into place, and the remaining exposed screen becomes the phone's again. A Palm with an integrated phone is definitely more convenient than carrying a separate phone and PDA. A PdQ the size of a Palm V for around $500 would probably sell like crazy.

When shopping for a phone, the more buttons and controls, the better. Though they may confuse you at first, your hands will

◂ MITSUBISHI T250

Nokia's 8260 packs a powerful phone into a package that could fit on your keychain, while Mitsubishi's T250 works great for Web browsing.

quickly remember what to push and when, and buttons with duplicate functions only increase the chances of getting the phone to do what you want. Mitsubishi's T250 takes button proliferation to an extreme, offering seven different buttons and a four-way rocker pad in addition to the keypad. Several of them call up specific features, letting you access voice mail, messaging, menus, and the Web with a single button.

Ericsson adds a voice-mail button to the R280LX so you can retrieve messages with one touch. Motorola packs an amazing number of controls into the Timeport—volume/scroll and menu select buttons on the side, more menu buttons marked with icons that correspond to on-screen menu choices marked with the same icons, and buttons that let you quickly jump to set ringer options, mute the phone, and display battery status.

Two phones—the Nokia 7190 and NeoPoint 1000—let you set up voice commands for dialing ("Telephone! Dial the Britney Spears Hotline!"), a feature that should appeal to people with car phones. The Nokia 7190's scrolling wheel seems to get you through on-screen menus faster and with less effort than clicking up and down with buttons—it's the same principle used by Microsoft's IntelliMouse. On the other end of the spectrum lies the Nokia 8260's tiny, recessed power button. You'll have a hard time finding it at first and a hard time using it after you do, especially if you keep your nails short.

WINGING YOUR WAY WEBWARD

THOUGH READERS MADE IT CLEAR that accessing the Internet from a phone left them cold, the technology has promise. Part of the problem may be that a cell phone is something you use while doing other things. Another deterrent to accessing the Net by phone is the laborious process required to enter text, something just about every review of Web phones laments. Typing using ▸

a keypad is a c-h-o-r-e (that's 2-2-2, 4-4, 6-6-6, 7-7-7, 3-3), but you can adjust fairly quickly. Until usable voice recognition and dictation become a reality (don't hold your breath), phone e-mail will certainly hone its adherents' writing skills to a terse precision ("Honey, traffic jam, feed kids, chill bubbly").

Clearly, browsing the Web via a phone requires as much attention as it does on a PC—if not more. But a phone could be the perfect way to scan overnight e-mail messages, check your portfolio, or read the news headlines while you're riding the train.

The quality of your Web experience depends on both your phone and your service provider. As capable as today's phones are, they're still not very well suited to browsing by URL. Typing in a Web address is a long and arduous task (you can save time by bookmarking your favorite sites). Most of the time, you'll end up using the portal your provider has set up.

Several of the phones we looked at were set up with AT&T's PocketNet service, which offers a seemingly endless collection of commercial sites customized for the phone's microbrowser. You can also send and receive e-mail through AT&T, Excite, or Yahoo, and manage contacts and appointments, all of which are also accessible from your PC on AT&T's Web site. Navigating PocketNet is a simple matter of scrolling down lists of sites and backing in and out of the choices using the SoftMenu buttons. And the choices go on and on: white and yellow pages, MapQuest, the Hollywood.com movie guide, an ATM finder, shopping (Barnes & Noble.com, EBay, FTD.com) finance (E-trade, CBS Marketwatch, Yahoo Finance), news (ABCNews.com, USAToday.com, the Wall Street Journal), sports, travel, weather, and more.

Sprint's browser and services are similar to AT&T's, though some of the sites differ—Amazon.com, Fidelity, and Bloomberg, for example. But one feature stands out: Sprint PCS Wireless Web is the only service that lets AOL's 20 million subscribers send and receive AOL mail from a telephone.

The Nokia 7190 is the only Web-enabled phone here that browses the Web using the Wireless Application Protocol. The WAP browser works much like browsers in other Web-enabled phones and provides essentially the same content, but our prototype phone (with GSM service through VoiceStream) listed lots of European news, weather, and sports along with names like CNN, MTV, and EBay. Presumably, VoiceStream will tailor its Web content to U.S. interests by the time the phone is available.

ADVANCED PHONES

MOTOROLA TIMEPORT P8167

NEOPOINT 1000

NOKIA 7190

KYOCERA PDQ SMARTPHONE

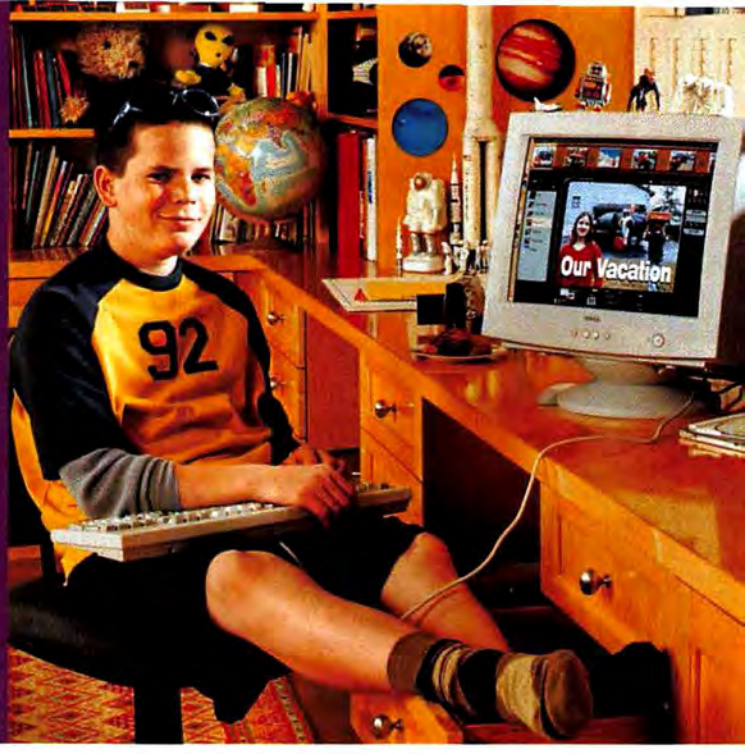
The Motorola Timeport P8167 fits Web access in your pocket. Nokia's 7190 includes a scroll-wheel for navigation—our favorite control—while the Neopoint 1000's 11-line screen is great for Web browsing. Kyocera's PdQ Smartphone packs a phone and Palm III in one device.

It may seem like a daunting task, but you can find a phone that actually works when and where you need it to, without going bankrupt. Be prepared to do plenty of homework to determine which providers offer decent coverage where you use the phone most, a monthly plan that matches your usage, and long-distance and roaming fees you can live with. Though there's often little you can do about the quality of service and customer support, check first with friends and associates for positive experiences.

Most people can find a phone to fit their needs for under $300, and you may be glad you spent a little more on a phone that won't peter out by lunchtime or hinder you with a subpar display. And don't knock surfing the Web by phone until you've tried it. Though it's not yet a great way to read a novel, you may find yourself phoning for e-mail and news alerts sooner than you think.

Scott Spanbauer is a contributing editor for PC World. ■

17 hours of our trip to Mt. Rushmore edited down to 4 thrilling minutes.



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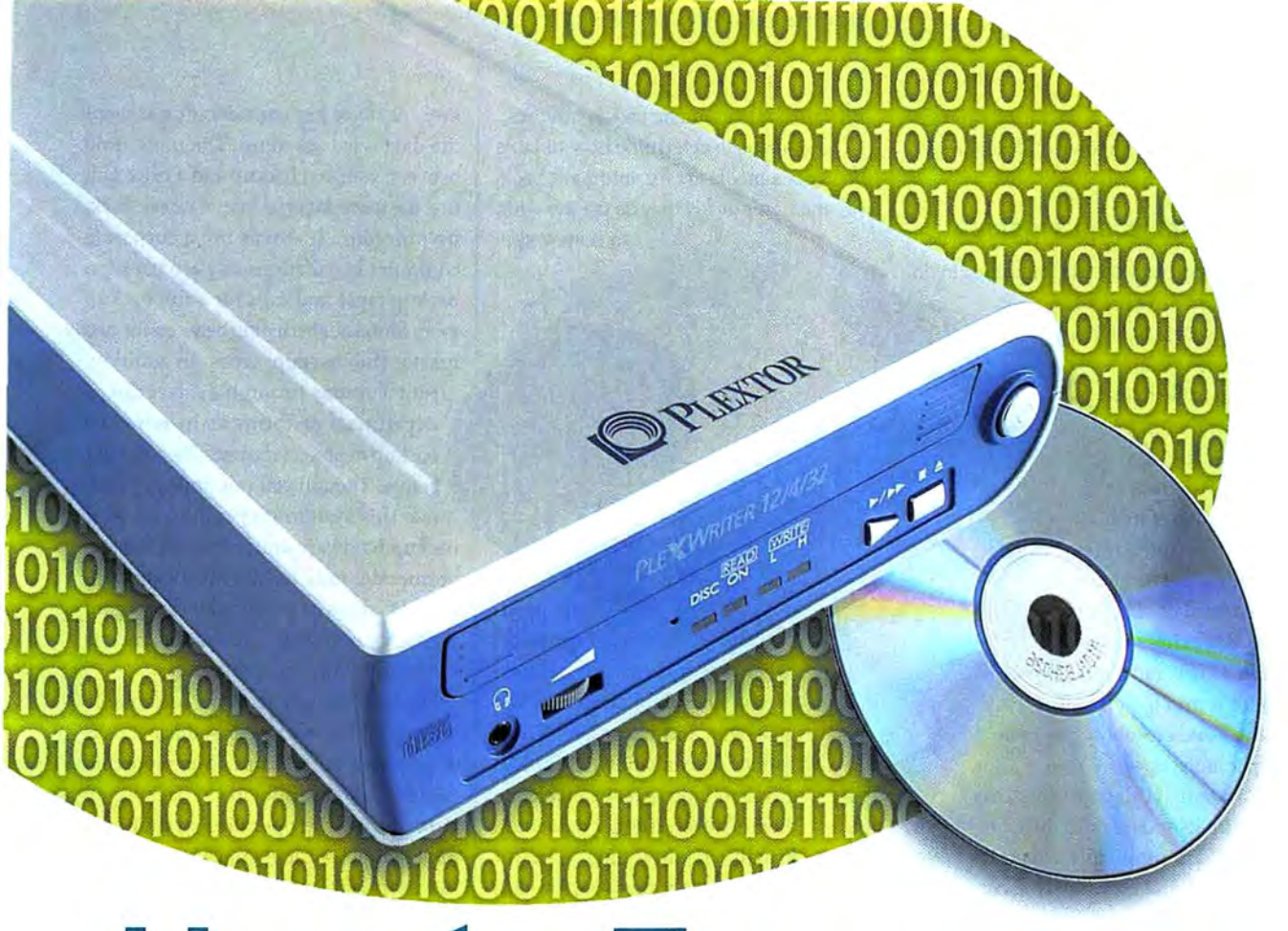

Hassle-Free Backups

Hard-drive capacities are bigger than ever. **Your data is more valuable than ever.** Thank goodness backing up is getting easier than ever. **Here's a disaster-avoidance game plan.**

BY STAN MIASTKOWSKI

CHANCES ARE YOU don't think much about your PC's hard drive, but what would you do without the precious data it holds? Your financial records, your appointment calendar, and maybe that multimegabyte, ticket-out-of-middle-management side project you've been working on for years—all stored as billions of magnetic, microscopic points on metal platters spinning at thousands of revolutions per minute. If anything goes wrong with this finely tuned electromechanical system, all your data can be gone in 60 nanoseconds. And despite decades of research and testing by thousands of talented engineers, things still go wrong.

So have you backed up your data today? If you don't regularly back up your computer, don't feel too bad—you have lots of company. And if you are one of the ▶

PHOTOGRAPHS BY KEN SMITH

forward-thinking few who back up regularly, you deserve a medal. If you aren't, you must like living dangerously.

BIGGER EQUALS RISKIER

OKAY, YOU HAVE a million things to do, and a hard drive hasn't failed on you in years. New hard disk drives are indeed more reliable than their counterparts of a decade ago, when PC users spent much of their maintenance time working on or replacing failed hard drives. Your data was as important then as it is now, but there's much more of it today—and probably many more applications as well.

QPS QUE DVD-RAM drive

Corporate IT departments may back up user data onto their networks automatically (usually overnight), but individuals in corporate departments may be responsible for backing up much or all of their own work. If your work PC crashes, don't expect any miracles from the IT folks.

If you're a power user, or if losing your business PC for even a few hours would cause big problems, the backup equation becomes more vital. You need to make reliable backups regularly, and you need an extra hard drive for quick swapping if the worst-case scenario occurs.

Today PC users have more backup alternatives than in the past, and new hardware and software make automating backups easier than ever. Whether you choose the reliability of Travan tape, the versatility of recordable optical media, or the convenience of online backups, there's an effective backup strategy that will meet your needs without taking up too much of your time.

We tested tape drives (the traditional backup peripherals), CD-RW drives, DVD-RAM drives, and Internet–based backup. We also looked at removable-media drives, network-attached drives, drive-mirroring controllers, drive-imaging software, and automatic backup utilities.

The goal was to determine how suitable the various media are for automatic backups and how quickly they do the job—not to review specific products. Tape backups remain the best choice for simplicity and value, but many people will prefer the versatility of CD-RW drives, as long as they can tolerate their relatively meager capacities. Finally, if slow data transfer speeds don't bother you, low-cost online storage may be your best choice.

BACKUP VS. BACKUP

BACKUP MEANS different things to different users. In its traditional sense, a "backup" is a copy of everything on your PC's hard drive, including the operating system, your applications, and your data. If your hard drive fails, you should be able to install a new drive easily, restore all your files, and quickly be up and running as if nothing happened.

A backup involves more than data, however. Another key consideration is *when* the data was backed up. The more time between your last backup and a drive failure, the more data you lose. A classic backup procedure (the type most corporate computer installations rely on) uses ten backup tapes and calls for a full backup every Monday, alternating between the two master (full backup) tapes. In addition, from Tuesday through Friday, the IT department performs an incremental backup to protect changes from the day before. Though you can probably automate this system (depending on your backup hardware and software), we recommend it only for the most conscientious PC users or people who can't afford even a little data loss, such as accountants or clerks tracking sales orders.

For most people, a more reasonable alternative to daily tape-based backups is once-a-week full backups. Even more conveniently, you can focus on backing up data but not the operating system and applications, which you can reinstall if necessary (although doing so can be a hassle). Backing up only documents and data files usually requires far less storage than a full backup, except when making heavy use of audio or video applications.

TESTING THE ALTERNATIVES

FOR TAPE DRIVES, we tested the external parallel port HP Colorado 20GB ($341) and the internal EIDE Seagate TapeStor 20GB ($259). Our CD-RW drive entries were the internal EIDE HP CD-Writer Plus 9310i ($249) and the external SCSI Plextor PlexWriter 12/4/32 ($499). In the DVD-RAM realm, we examined the external SCSI QPS Que drive ($645) and the internal SCSI Toshiba SD-W1111 drive ($344). Finally, for online backup, we tried SkyDesk's @Backup service ($99 per year for 100MB of storage space) and SafeGuard Interactive's service ($10 per month, with a limit of 1GB of transfers per day).

Our test computer was a 350-MHz Pentium II–based Quantex with 64MB of RAM and an 8GB hard drive. System soft-

Do I Really Need to Back Up?

SO YOU DON'T BACK UP? If you use your PC only for entertainment, Web surfing, e-mail, and chores such as letter writing and checkbook balancing, you can *probably* survive a catastrophic hard disk failure with no backup to recover with. (You'll scrape by if you at least keep printouts of important documents.)

The best preparation is to keep your original Windows and application CD-ROMs in one safe location, ready to reinstall. It's also handy to keep a list of your Internet service provider access numbers and settings, as well as a copy of your e-mail address book, on paper or on a floppy or other removable disk.

Still, setting everything up again will be more of a chore than backing up to begin with. If you do *any* serious work with your PC, a formal backup strategy is essential.

Getting Data From Dead Drives

WHEN THE DATA ON a hard drive is essential and no backup or hard copy exists it's time to call in the experts—companies that specialize in recovering data off damaged hard drives. It'll cost you, and there's no guarantee that your data can be fully reconstructed, but sometimes it's the only option.

Ontrack Data Recovery (a division of Ontrack Data International, which also makes such low-cost utility software as Easy Recovery and PowerDesk 4) and DriveSavers are leading drive-recovery companies. If your hard drive is still spinning, technicians from these companies can work on it over an online connection, but if the poor thing is as dead as a Norwegian Blue parrot (or sounds like marbles in a blender set to purée), you'll have to ship it to the company.

Greg Olson, Ontrack's director of worldwide data recovery, says costs vary widely, but $400 to $1200 is an average range for recovering up to 2GB of data. Costs may rise considerably if the drive is so badly damaged that the company has to disassemble it in a clean room, or if you need ultrafast turn-around.

Olson says that variable degrees of drive damage make it difficult to put a precise figure on how much data Ontrack can recover. In most cases, however, the company can retrieve almost all the data on a drive infected by a virus, and 50 percent to 90 percent on a drive damaged by a head crash (where a read/write head touches a drive platter and physically harms the platter surface). Ontrack also recovers data from drives exposed to fires or submerged in water.

Whether you should use a service such as Ontrack depends on the value of your lost data. If you really need it, you have little choice; on the other hand, you may find that the disaster-recovery features in Norton SystemWorks and other utility suites are the only tools you need to recover your data.

ware included Windows 98SE, Microsoft Office 2000, Adobe Photoshop 5.5, and Acrobat 4. The PC also contained two data folders: one 100MB and one 430MB. Only the tape drives could produce full, unattended backups of the entire 1.65GB of data on the test system's hard drive. We timed how long each of the eight solutions took to copy the 100MB and 430MB data folders to their media.

Our PC World Test Center results are shown in the chart at right. All six drives delivered respectable (and similar) backup times. The first iteration of the online backup was very slow, but for good reason (more about that later). The numbers tell only part of the backup story, however. You should also factor in the ease of use of each type of device and the cost of the media they require. Here's how the various backup media stack up.

TRIED AND TRUE: TAPE DRIVES

SOMETIMES, THE tried-and-true technology remains the best choice. For many users, tape drives—which have been around since the early days of computers—win out for both versatility and value. And they've evolved with other PC technologies. Drives that use the industry-standard Travan tape format dominate the desktop market because they're reliable, familiar, and relatively inexpensive. The 20GB devices we tested complement today's high-capacity hard drives.

The HP Colorado and Seagate TapeStor drives represent the current state of the art among drives of this capacity. And their price range ($250 to $350) makes them a good value for an essential peripheral—even considering that a 20GB tape costs about $40. Most users won't want to pay $400 for a classic backup set of ten tapes, but it's a good idea to have at least three or four tapes on hand to accommodate two full-backup sets plus incremental backups.

A 20GB tape actually has a 10GB capacity, but because data from your hard drive gets compressed during the backup process (at an average compression ratio of 2:1), they effectively hold 20GB of data.

Travan drives tend to be easy to install, especially parallel port models. Installing an internal EIDE model is trickier, but most people can complete the job in about an hour. In our tests, the EIDE TapeStor drive was about 20 percent faster than the parallel port Colorado drive.

The software bundled with tape drives lets you restore individual files or groups of files and schedule automated unat- ▶

TEST REPORT

Backup Showdown

Online Storage Is Cheap but S-l-o-o-o-w

	BACKUP OPTION	TASK TESTED: 100MB data folder backup	430MB data folder backup	Full 1.65GB HD backup
Travan tape drives	HP Colorado 20GB	5:47	13:44	50:04
	Seagate Travan TapeStor 20GB	4:28	11:07	43:23
CD-Rewritable drives	Plextor PlexWriter 12/4/32	3:36	23:10	21:38[1]
	HP CD-Writer Plus 9310i	3:30	15:56	n/a
DVD-RAM drives	QPS Que DVD-RAM	5:02	32:29	n/a
	Toshiba SD-W1111	3:57	20:49	n/a
Online services	SafeGuard Interactive Backup www.sgii.com	30:05	193:30	n/a
	@Backup www.backup.com	24:10	136:02	n/a

n/a = not applicable — Better — All times are in min:sec

TEST PC WORLD CENTER **HOW WE TEST** We tested eight different backup solutions: two Travan tape drives, two CD-Rewritable drives, two DVD-RAM drives, and two online backup services. All eight were tested backing up two data folders (one of 100MB and one of 430MB) and one complete hard drive of 1.65GB. (Only the Seagate TapeStor 20GB and HP Colorado 20GB Travan tape drives accommodated full, unattended backups of the test system's hard drive.) The tests were intended specifically to compare how fast the device or service copied files to their media or server, not to determine their overall usefulness for backup or other applications. [1] This time reflects use of disc-spanning software and CD-R media. The other results for this drive reflect use of CD-RW media.

tended backups. (You still have to change tapes manually, of course.) All the consumer-level drives we've seen include backup software, usually a variant of Veritas (formerly Seagate) Backup Exec, which has become a de facto standard.

Tape drive utilities usually include a disaster-recovery option to facilitate system restores after a hard-drive failure. In the not-too-distant past, a major limitation of tape drives was that restoring the data after a crash entailed reinstalling Windows and then the backup software before you could get the data back. Most current disaster-recovery utilities create one or more bootable floppy disks that access the tape drive directly. This allows you to get your PC working in no time flat. For more on backup software, see "Alternative Backup Solutions," below.

BACKUP BURNS: CD-RW DRIVES

IF YOU'RE backing up less than 620MB to 650MB of data—the capacity of a typical CD-ROM—then CD-RW drives are an excellent choice. It's possible to *span* larger backups over a number of discs, but swapping out media can be a time-consuming chore. Compression software allows a single disc's capacity to be expanded to more than a gigabyte; but the backup software may require media formatted for packet writing, which can limit capacity to less than a gigabyte.

Perhaps the greatest advantage of CD-RW drives is that they can do more than just back up files. They do a fine job of archival data storage and let you create custom music CDs. Moreover, they're available in various interfaces, including internal EIDE and SCSI, external SCSI, USB, and IEEE-1394 (FireWire). SCSI drives offer the highest performance (12X CD-R and 8X CD-RW drives are becoming more prevalent), but they cost $50 to $100 more than EIDE drives. A SCSI add-in card may come with the drive, but it usually costs another $75 to $100.

Installing an internal EIDE CD-RW drive is about as easy as adding an internal tape drive. A SCSI drive is a little bit more complicated to install, but the job doesn't take the know-how of a rocket scientist. Today's Plug and Play add-in cards and drives avoid the SCSI ID numbers and bus termination issues that used to bedevil the format. Add-in SCSI cards (Adaptec is the industry standard) and drives (especially the Plextor PlexWriter we tested) come with clear explanations and installation instructions. ▶

Alternative Backup Solutions

WE FORMALLY tested only the "big four" backup solutions, but a number of other hardware and software backup alternatives are also readily available.

Removable-Media Drives High-capacity removable-media drives such as Iomega's Jaz ($350; www.iomega.com) and Castlewood Systems' Orb ($219–$280; www.castlewood.com) offer a handy way to back up data files or entire smaller-capacity hard drives. Jaz cartridges hold 2GB of data and cost about $100 each, while Orb cartridges have a 2.2GB capacity and cost about $40 each. Both have backup software.

Drive-Imaging Software Drive-imaging software such as PowerQuest's Drive Image 3 ($70; www.powerquest.com) and Symantec's Norton Ghost ($65; www.symantec.com) create an exact software image of a drive, bit for bit. (You can't use them for individual file or folder backups.) You can store an image on another hard drive, on a removable-media drive, or on a CD-RW or DVD-RAM drive, but not on a tape drive. Because these utilities can compress data, you can store up to 4GB of data on a 2GB removable-media drive.

Alas, they don't do Windows. You must boot to DOS from floppy disks that the programs format to create *exact* drive images. And the programs don't run automatically.

Backup Software Though backup software accompanies most tape drives (and some other types of hardware), alternatives exist if your backup peripheral doesn't include software or if you want to use a different backup program. The industry standard is Veritas's Backup Exec Desktop edition ($65; www.veritas.com), which ships with most tape drives. Backup Exec also works with removable-media, CD-RW, and DVD-RAM drives, and it can even back up to a network or other hard drive. Dantz Retrospect Express ($48; www.dantz.com) works with all flavors of hardware and has several unique features, including the ability to copy only changed files when you do full backups. This makes it particularly fast. For people who seek low-cost alternative backup software, BEI UltraBac (www.ultrabac.com)—a company that specializes in high-end backup software for servers and networks—offers the interestingly named UB Safe—Not Sorry, a full-featured backup utility for standalone PCs. And the price is right: It's free for download from the company's Web site.

Continuous-Backup Utilities PowerQuest's DataKeeper ($50; www.powerquest.com) monitors files or folders that you specify and automatically backs them up to the destination of your choice whenever there is a change. You can back up to a hard drive, network drive, CD-RW, or removable-media drive, but not to a tape drive or CD-R.

Drive Mirroring Corporate servers often use Redundant Array of Independent Disks (RAID) technology to keep data secure by storing it on multiple drives. AMI's HyperDisk ($119; www.ami.com) add-in RAID PCI card lets you connect two additional pairs of IDE drives. Everything you write to one drive is copied automatically and instantly to the second drive—hence the name *mirroring*. If the first drive fails, the second takes over automatically. Ei Corporation's Data Disaster Recovery System ($150; www.eiware.com) is a drive-mirroring product with some unusual twists. It works from your EIDE controller instead of its own add-in card, and it comes with two removable drive bays to hold your existing drive and a second drive for mirroring. (Your PC must have two accessible 5.25-inch drive bays.) Software handles the mirroring, and you can carry off or lock your backup when you're away, thanks to the removable bay.

While drive mirroring effectively creates always-up-to-date backups in real time, it's not foolproof. Bugs in one drive will be mirrored in the other, and a catastrophic computer failure that destroys one drive could destroy the mirror also. (No, it's not likely—but Murphy's Law is not to be trifled with.)

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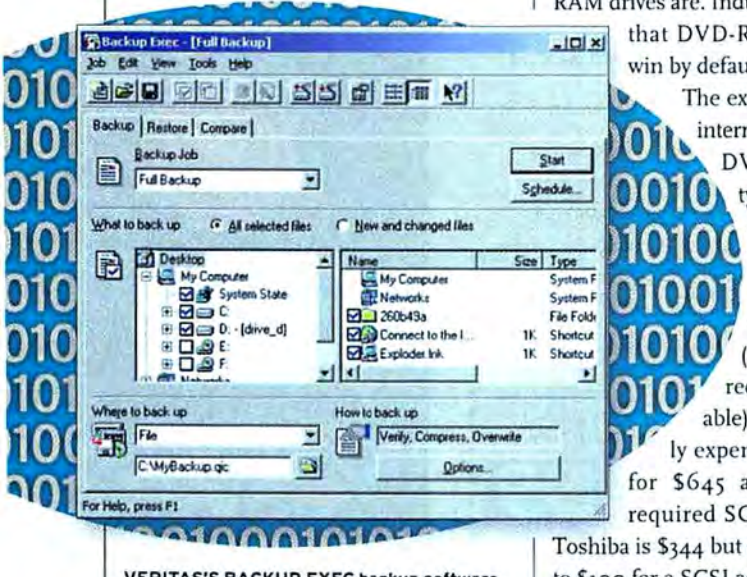
Media for CD-RW is inexpensive, widely available, and easy to share with other users. Typical costs are about $1 for a CD-R blank, and $3 to $5 for a CD-RW disc. You may use either type. CD-R disks are especially handy for long-term archival storage because you can write to them only once; CD-RW discs can be written to repeatedly, but using them for backup is considerably slower than writing to CD-R.

Some CD-RW drives come with special backup software. The PlexWriter, for example, includes CD-ResQ, a utility that creates a set of CD-R or CD-RW backup disks you can use to restore the drive image after a failure. If your PC can boot from a CD-ROM, that's all you need. If not, CD-ResQ creates a bootable floppy disk that accesses the CD-RW drive and then performs the restore.

We didn't see it on our test unit, but the HP CD-Writer Plus 9310i CD-RW drive comes with backup software; it also has Adaptec's Easy CD Creator, which comes bundled with most CD-RW drives, too. Easy CD Creator gives you an Explorer-like CD-R interface to generate a data disk by dragging and dropping files. (For our test with CD-RW media, we simply used Windows Explorer to drag and drop files between drives.)

Most stand-alone backup software works with CD-RW drives, so if you decide to go with one of these drives as your backup solution, you can specify complete or incremental backups (see "Alternative Backup Solutions," page 170). Other programs, including Plextor's CD-ResQ, create a bootable set of quick-restore CD-R discs.

There is one drawback: If your backup job is a large one, you'll be sitting stuck to your computer with a pile of blank CDs, inserting a new one every few minutes. This potential for interminable disk swapping makes CD-RW drives best for data-only backups rather than full-system backups.



VERITAS'S BACKUP EXEC backup software makes it easy to automate data backups to Travan tape, CD-RW, and other media.

DVD-RAM: IN THE WINGS?

AT LONG LAST, writable DVD drives have become widely available, with interesting implications for backup applications. A low-level standards battle has been brewing for some time between two competing technologies, dubbed DVD-RAM and DVD+RW. The DVD+RW standard—proposed by Sony, HP, Philips, and others—competes with the DVD Forum's DVD-RAM standard for the random-access, rewritable DVD drive market. (DVD+RW differs from DVD-RW, which is the DVD Forum standard for sequential writes on rewritable DVD and is used primarily by video content producers as a scratch pad during production.) At press time, DVD+RW drives were not available; DVD-RAM drives are. Industry sources suggest that DVD-RAM may therefore win by default.

The external QPS Que and internal Toshiba SD-W1111 DVD-RAM drives are typical of the models on the market. Currently, all DVD-RAM drives have SCSI interfaces (IEEE-1394 units have recently become available), and they're relatively expensive: The Que sells for $645 and comes with a required SCSI add-in card; the Toshiba is $344 but requires another $75 to $100 for a SCSI adapter.

DVD-RAM media has unique aspects. The 5.2GB capacity of Type 1 DVD-RAM

HP COLORADO 20GB

cartridges sounds impressive, but it's a dual-sided media. You record up to 2.6GB of data on one side, manually flip it over, and record another 2.6GB on the other side. Type 2 cartridges with a single 2.6GB recordable side are also available, but not all DVD-RAM drives can read them. Type 1 cartridges cost about $40; Type 2 cartridges about $25.

In our tests, DVD-RAM drives performed as quickly as CD-RW and tape backup. Unfortunately, the 2.6GB of storage space on each side of a Type 1 DVD cartridge is too small to handle many unattended, full backups, especially if your PC has a large-capacity hard drive. At the same time, CD-RW drives are more cost-effective for manual, partial backups.

Like CD-RW disks, DVD-RAM cartridges must be formatted (via a special utility that comes with the drive) before being used. The two DVD-RAM drives we tested lacked backup software (QPS now provides Dantz's Retrospect with its drives); so, for our performance test, we had to manually drag and drop folders from Windows Explorer to the DVD-RAM. Utility software such as Adaptec Easy CD Creator and Veritas Backup Exec Desktop work with DVD-RAM drives, but at present you can't create bootable disaster-recovery sets with DVD-RAM media. Installing a DVD-RAM drive is virtually identical to installing a SCSI CD-RW drive and requires no special software drivers.

DVD-RAM is a format in transition. Faster drives using new 4.7GB-per-side media should be on the market about the time you read this. The roomier media will come closer to matching typical hard drive capacities, but they will not be compatible with older (current) drives. ▶

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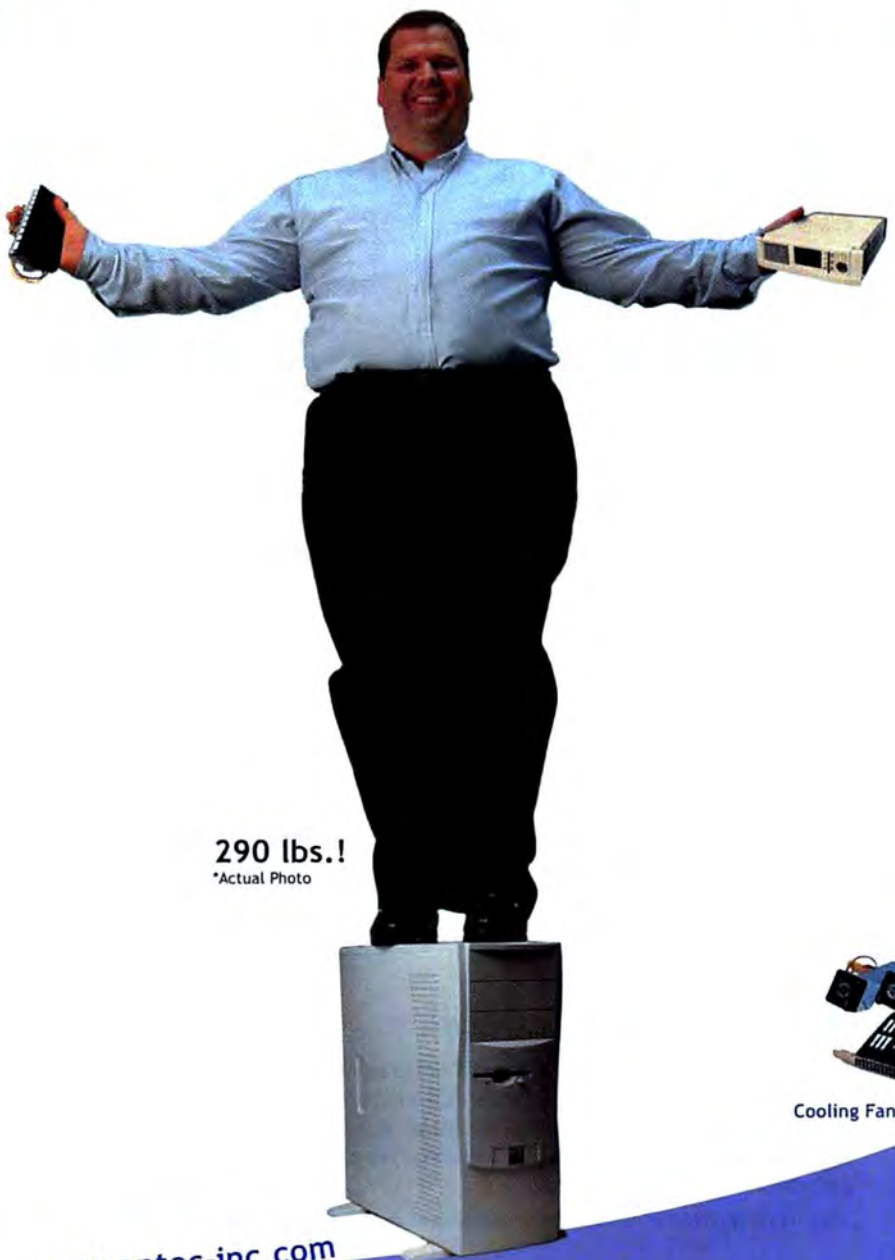
* Source: PC Data U.S. Distribution and Retail Hardware Reports, May 2000



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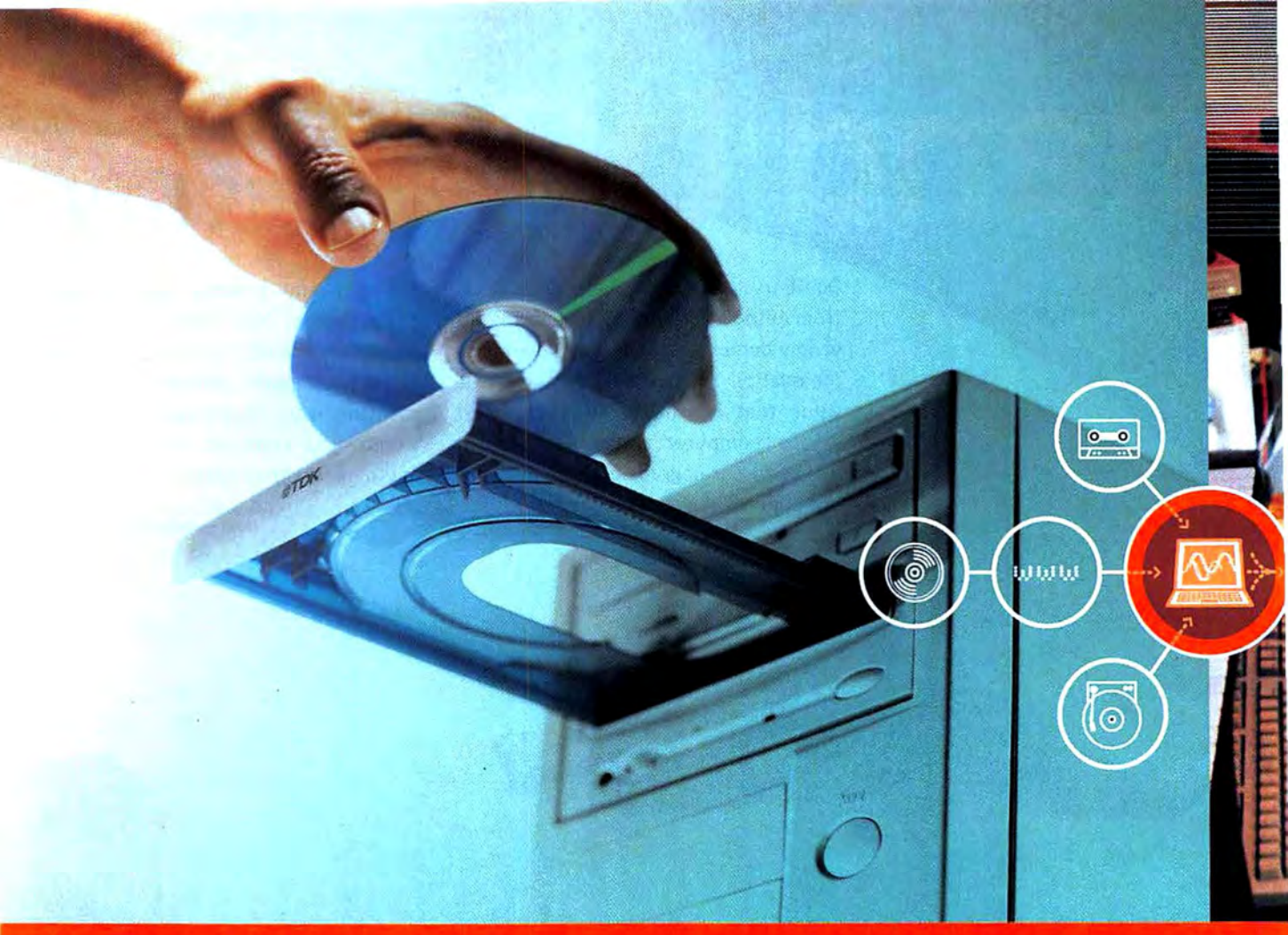

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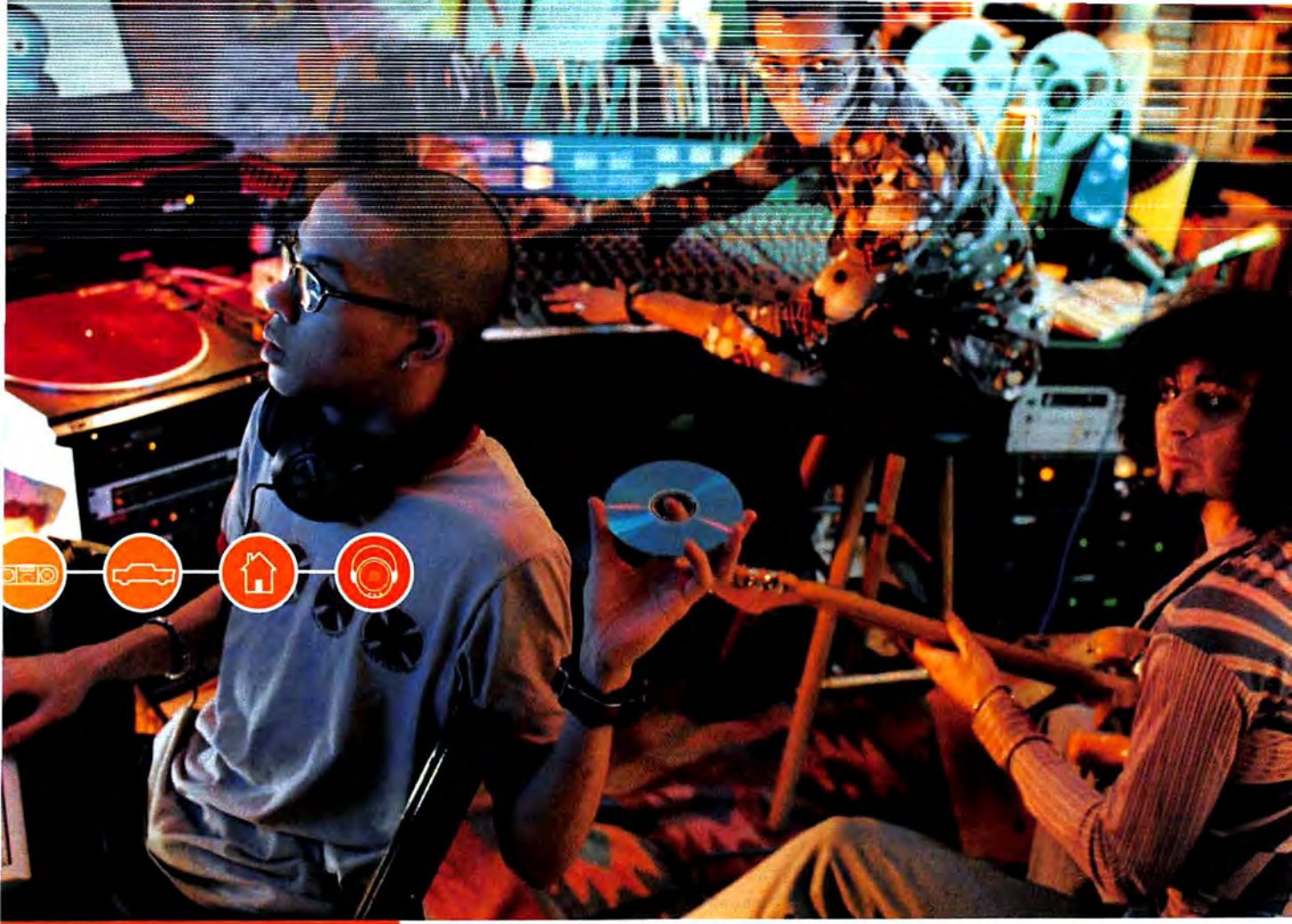

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DVD-RAM drives may be tempting, but we recommend waiting until the standards and the technology settle down.

INTERNET BACKUP ARRIVES

THE LAST BACKUP alternative we tested involves no special hardware or special media because it relies on the Internet. Automatic online backup has been available for several years, but its popularity has risen only recently, as more Web surfers get high-speed broadband access to the Internet via cable modems or DSL connections. (Backing up via 56-kbps modem is not practical.)

In many ways, online backup is the least painful and most effective backup method. You sign up for the service, choose what you want to back up, and download and install a utility that runs continuously in the background; then—at a time you specify—your system compresses, encrypts, and transmits your data to a secure computing center somewhere. You can access your data from any PC that has an Internet connection.

Online backup conforms to one little-mentioned rule of backing up: You should always store backup media away from your computer. You can maintain backup tapes, CD-Rs, or DVD-RAM cartridges all up to date and ready to restore, but if they're sitting near your PC and a fire, flood, or other natural disaster strikes, they'll probably get damaged, too—and then you're plain out of luck.

Online backup is relatively inexpensive up front. SkyDesk's @Backup has five options, ranging from $99 a year for 100MB of storage to $300 annually for 500MB of storage. SafeGuard Interactive charges $10 a month, with the proviso that you can move no more than 1GB of data per day in either direction (whether backing up or restoring).

Both services let you restore either your entire backup or individual files. @Backup also volunteers to sell you a CD-ROM of your data for $40, plus $6 for shipping.

So what's the downside? Speed. Don't even think about using an online backup service unless you have a broadband Internet connection or you want to back up a relatively small amount of data. The services aren't designed for full-disk backups.

We used the PC World Test Center's T1 line (roughly equivalent to a fast DSL connection) to work with the services, but backing up our 100MB data folder still took half an hour with SafeGuard Interactive, and 24 minutes with @Backup. Backing up the 430MB folder took even longer per megabyte: nearly 3.5 hours with SafeGuard Interactive service, and 2.5 hours with @Backup. That's ten and five times slower, respectively, than the other backup methods we tested. On top of that, online backup times will vary substantially depending on Internet traffic and other factors. The initial backup is the most time-consuming, however, and with subsequent backups, the services transfer only the file changes that have occurred since the previous backup.

Despite their limitations, we strongly endorse online backup services as one component of a sound backup strategy. They can't replace local backup onto tape or other removable media, but they're an excellent way to store important files where you know you can get to them, no matter what unpleasant disaster befalls.

THE BACKUP QUANDARY

OKAY, SO YOU agree that you need to get serious about backing up. But which method should you choose? Tape drives remain the best and easiest method for performing regular full backups, though CD-RW is a viable alternative for making handy application data backups. For secure backup of critical information, online backup services shine.

Whatever backup strategy you choose, its success ultimately depends on your ability and willingness to keep to a schedule, change the media, and put the backups in a safe place. The key is to make these steps an everyday routine, like checking your e-mail. In this calamity-prone world, a little bit of thoughtful backup effort can make all the difference. ■

PC World *Contributing Editor Stan Miastkowski says he backed up this article...and we believe him.*

Backup Checklist

BETWEEN FULL system backups, many files undergo changes. To make sure you back up your most important files regularly, include the following (listed in decreasing order of importance). To find out where they're located, you may need to poke around using Windows Explorer.

- Data files created by applications—for example, .doc, .xls, and .ppt files created by Microsoft Office.
- E-mail files such as Outlook and Outlook Express messages stored in .dbx files.
- Address book files ending in .wab.
- Browser favorites—files ending in .url in Internet Explorer, and Netscape's bookmark.htm.
- The entire \Windows directory.
- The entire \Program Files directory.
- The Windows Registry, which lists all your system's software and settings. (Because of the way Windows stores the Registry, it's not available as a file, but many backup programs offer specific options for backing it up. You can always use the Registry's Export command to make a copy of the Registry. From the Start menu, select *Run*, and then type regedit. Choose *Registry•Export Registry File*, and confirm that the All button is selected. Select a location to save the file, then click *Save*.)

Where to Buy

Tape drives

- **HP Colorado 20GB** $341, Hewlett-Packard, 888/999-4747, www.hp.com/storage
- **Seagate TapeStor 20GB** $259, Seagate, 800/626-6637, www.seagate.com/products

CD-RW drives

- **HP CD-Writer Plus 9310i** $249, Hewlett-Packard, 888/999-4747, www.hp.com/storage
- **Plextor PlexWriter 12/4/32** $499, Plextor, 800/886-3935, www.plextor.com/english

DVD-RAM drives

- **QPS Que** $645, QPS, 800/559-4777, www.qps-inc.com
- **Toshiba SD-W1111** $344, Toshiba, 800/631-3811, www.toshiba.com

Online backup services

- **@Backup** $99 per year for 100MB of storage space, Sky Desk, 800/538-2000, www.backup.com
- **SafeGuard Interactive** $10 per month, with up to 1MB of transfer per day, 412/415-5200, www.sgii.com

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Web **auction scams are up** a hundredfold in two years. The sites won't offer bulletproof protection, **so here's how to defend yourself—** or your business—**against con artists and cheats.**

BY NINA SCHUYLER

going... going... Gotcha!

EDWIN STODDARD, a computer systems analyst in McKenney, Virginia, loves bidding at online auction supersite EBay, successfully buying computer components and software. So when he was looking for a digital camera, he went directly to EBay, where he found a seller auctioning off 15 Sony digital cameras with a beginning bid of $400. He placed a bid of $542. ▶

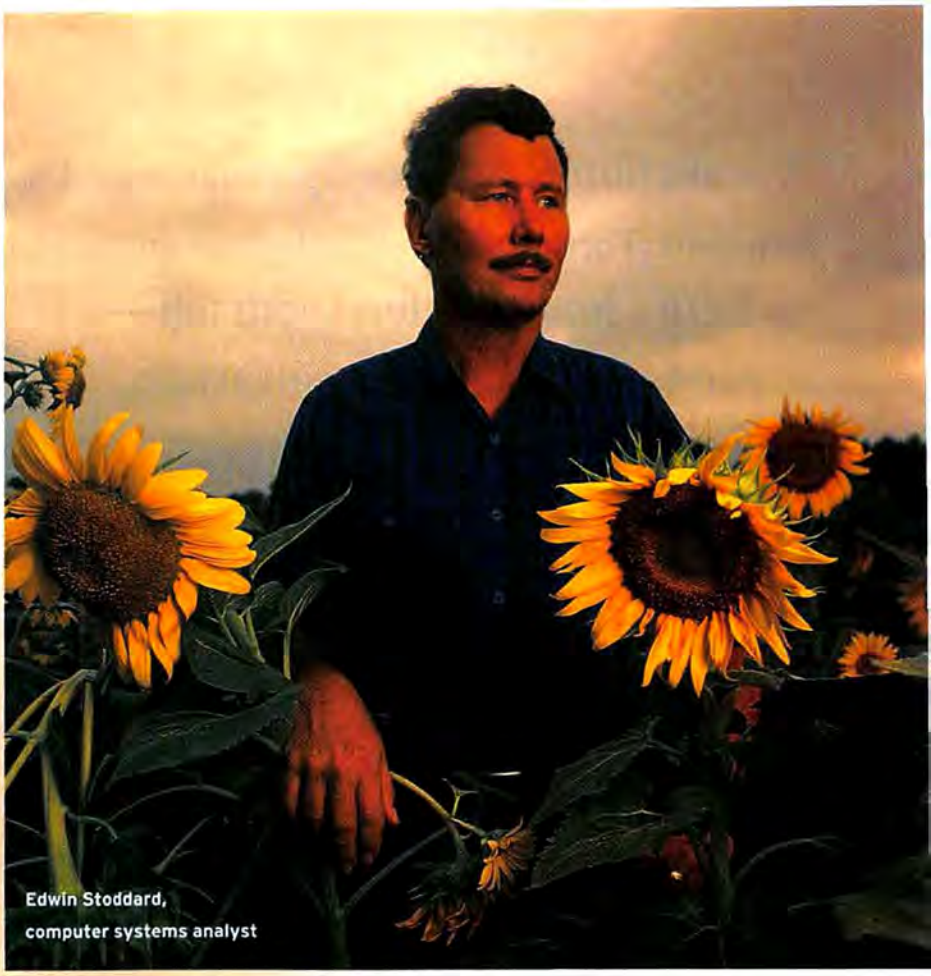
ILLUSTRATIONS BY CHRIS SHARP

When the auction closed, Stoddard got an e-mail from the seller, a man named Robert Guest, who notified him that he was one of the successful bidders and instructed him to send $557 (including shipping) via a postal money order. Guest gave him a post office box address and said to expect the camera in three days.

"I waited. And I waited," says Stoddard. "I started to get a funny feeling about it." Two weeks later, he got an e-mail from someone else who had successfully bid on one of Guest's 15 cameras. "He hadn't received anything and wondered if I had," remembers Stoddard. Then he got another, similar e-mail from another bidder, and then another. Over the next three weeks he heard from ten other buyers.

The group discovered that Guest had held prior auctions for watches and jewelry, and his EBay feedback ratings contained glowing reviews. But this impressive résumé turned out to be a front for a big-time scam. Over 30 people had sent him money without receiving a thing, and the comments in his feedback page were from people who never bought his wares.

Altogether, Guest's scam netted him $37,000. But after two months of swindling, he got caught by federal and local government officials. Guest, a former pizza delivery manager from Blue Jay, California, said he used the stolen funds to feed his addiction to video poker. He's serving 14 months in prison for fraud and has been ordered to pay over $100,000 in restitution to his victims.



Edwin Stoddard, computer systems analyst

SCAMS ON THE RISE

AS GUEST'S CASE illustrates, online auction fraud is booming. It ranks as the most common type of Web scam and accounts for more than half of all consumer complaints on the Internet, according to the Federal Trade Commission. In fact, the number of complaints rose from 100 or so in 1997 to 10,700 in 1999. "Anytime there's rapid growth in an industry, you also see rapid growth in fraud," says FTC Assistant Director Paul Luehr.

Most reported scams involve person-to-person auction sites, but fraudulent activities are becoming more sophisticated and are spreading to business-to-business auction sites, as well. B2B auctions—which can involve large-scale sales of raw materials and office equipment—provide opportunities for increasingly large frauds. In one recent case, I-Escrow, a Web-based escrow service, stopped a six-figure sale of satellite equipment to a buyer who tried to pass off a forged check. I-Escrow noticed discrepancies after the buyer's own information raised suspicions.

"B2B fraud is really coming to life," says Vince Gottman, senior director of customer support at I-Escrow. "Three years ago, most online auction purchases averaged about $20. Today, it's not unusual for [I-Escrow] to handle $100,000 to $200,000 deals."

Most of the major auction sites, such as Amazon Auctions, Auctions.com, EBay, and Yahoo, are taking steps to prevent fraud—albeit fewer than they could and should take. Government agencies are entering the fray as well, but they lack the finances and the personnel to chase every con artist. As a result, some victims have begun resorting to online vigilantism: warning potential victims and following scammers' digital tracks as the crooks change e-mail identities or acquire extra ones (see "Site Guardians," page 184).

For the unscrupulous, the anonymity of the Web makes perpetrating fraud at an auction site alluring, and this anonymity will attract more-sophisticated con artists, too. You take risks whether you're the seller or the buyer. Should you stop using auction sites altogether? Not necessarily. You can protect yourself by being a smart shopper, by reading the transaction terms, and by knowing how to negotiate an auction sale (see "Auction Tips," next page).

CON ARTISTS AT WORK

HUNDREDS OF con artists are prowling Web auctions for their next victim. It's all too easy. Swindlers can easily set up fake identities by signing up for free e-mail accounts using false information. And to keep their identities concealed, deceptive sellers demand payment in the form of cash or a money order, since these are hard to trace. You should pay with a credit card, if possible, so you have a record of the transaction; in most cases, you can get a refund if you don't get the product.

Why would normal, intelligent people fall for a scam? "If it looks reputable, we trust it," says Philip McKee, assistant director of Internet Fraud Watch, a program of the National Consumers League

PHOTOGRAPH: MANUELLO PAGANELLI

Despite losing $557 on EBay, Stoddard still shops at Web auctions. "But I warn people now: Don't be afraid, just be wary." – Edwin Stoddard

(NCL). "And it's easy to look reputable online. It's not at all difficult to set up a personal Web site or an auction site with grammatically correct descriptions of goods and fancy digital pictures."

Con artists use varying methods to conduct their shady deals. Some crooks, like Guest, auction off merchandise they don't have or don't intend to give up. That's what happened to Deborah Salem, a horse farm manager in New Jersey. She wired a seller—who supposedly lived in Romania—$1584 for a Compaq notebook she bid for on EBay. The laptop never arrived. When she e-mailed the seller, she never got a response. "I'll never buy anything on an online auction again," Salem says. "It's just too risky." She logged on to the FBI's Web site (www.ifccfbi.gov), where a case number was assigned to her incident. But the agency has yet to prosecute anyone.

Cons also lie about products to induce sales. Jon Marshall, a computer engineer in Texas, got scammed when he bought a $1600 IBM ThinkPad on EBay: It had a slower processor and a smaller hard drive than advertised. "I e-mailed the guy, and he said he'd send me a refund to make up the difference in [features], but he never did," says Marshall. "Four weeks later, the seller's e-mail address was no longer good."

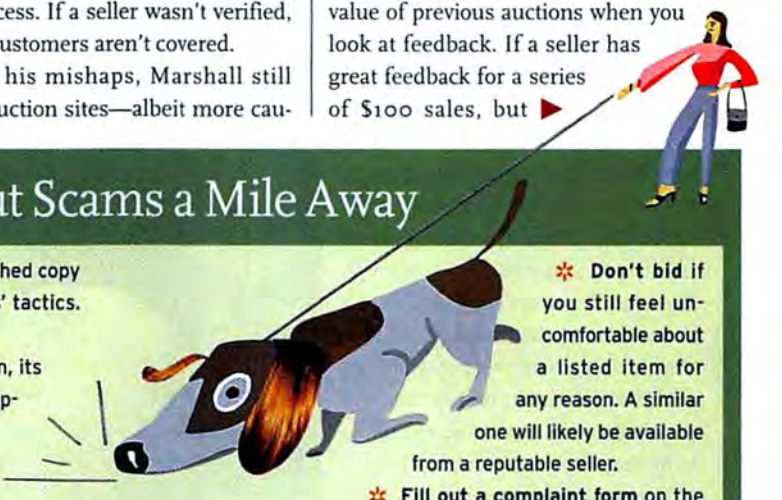
Marshall had paid with a credit card and tried to rescind the deal. But the credit card company refused because it had conducted a legitimate transaction with PayPal.com, a Web-based third-party payment service that Marshall had used to pay for the laptop. Customers enjoy limited protections when they use a credit card at PayPal. The company now reimburses defrauded customers—*if* the seller had previously passed PayPal's verification process. If a seller wasn't verified, however, customers aren't covered.

Despite his mishaps, Marshall still shops at auction sites—albeit more cautiously. "I finally found the ThinkPad I wanted on EBay," he says. "But this time, I made sure that the seller was local. I met him and closed the deal in person."

Most online auction transactions, though, can't be done in person. Shoppers often rely only on a site's information about the seller. Feedback forums, for instance, are places on auction sites where bidders or sellers can post feedback about trading partners. But the Web's anonymity lets dishonest sellers manipulate these areas.

"I've had cases where con artists have multiple e-mail addresses and use these different names to boost their ratings to build a stellar but false reputation," says Christopher Painter, an attorney with the Deputy Chief of the Department of Justice's Computer Crime and Intellectual Property Section. EBay's forum formerly allowed users to post numerical ratings about sellers and buyers without verifying that transactions between those parties had actually taken place.

One way to protect yourself from such a scam, suggests Painter, is to check the value of previous auctions when you look at feedback. If a seller has great feedback for a series of $100 sales, but ▶



Auction Tips Sniffing Out Scams a Mile Away

AS YOU SHOP AROUND for your next PC or an autographed copy of *Dr. Ruth's Sex for Dummies*, be aware of scammers' tactics. Here's what you can do to protect yourself:

- **Do your homework.** Know what you're bidding on, its value and warranty, and the seller's return policy and shipping charges. Insist that the shipment be insured.
- **Check the feedback ratings.** If the seller has bad or little feedback, don't bid.
- **Check the seller's background.** Get a seller's physical address and other identifying information, such as a phone number.
- **Avoid shills** (sellers or their cohorts bidding on an item to boost its price). See if the seller's and the shill's e-mail addresses have the same ISP domain name. If they do, withdraw.
- **Evaluate your payment options.** If possible, use a credit card or an escrow service (see "Payment Tips," page 186).
- **Read the terms of your credit card.** The National Consumers League reports that some auction sites bill charges to credit cards as cash advances, not as standard purchases, and these may not be fully covered by the cards' dispute rights.
- **Don't bid** if you still feel uncomfortable about a listed item for any reason. A similar one will likely be available from a reputable seller.
- **Fill out a complaint form** on the National Consumer League's site if you've been defrauded, and talk to an NCL counselor about how you can avoid the same problems in the future. The site will also help you file a fraud report that goes to the FTC and your state's attorney general. Report the scam to the U.S. Department of Justice and to the FBI's Internet Fraud Complaint Center at www.ifccfbi.gov.
- **Read the FTC's** *Internet Auctions: A Guide for Buyers and Sellers*, downloadable from the Web at www.ftc.gov. The NCL also offers *Be E-Wise: How to Shop Safely Online* at www.nclnet.org. If you are in doubt about a transaction, contact an NCL counselor at 800/876-7060 or www.nclnet.org for advice.

you're bidding on a $1500 computer, then you might want to reconsider the purchase. For this reason, Yahoo Auctions includes the values of sellers' previous auctions in its feedback forum.

Anonymity also lets swindlers participate in their own auctions under a different user ID—a practice called *shilling*—to drive up auction prices. And if the seller is using a different user ID, it's difficult to spot the fraud and stop it. Recently, EBay canceled a $135,805 sale of an abstract painting to a computer executive because the seller had violated its rules by bidding on the painting himself.

One way to spot a shill, according to the NCL, is to determine if the seller's and a bidder's e-mail addresses include the same ISP domain name. That isn't definitive proof, but it can be reason for suspicion. If you suspect a shill even though domain names differ, check the seller's feedback postings. Is the suspicious bidder leaving positive feedback on the seller? Also, look at the bidding pattern—shills tend to bid early and high in an auction to set a tone. Of course, none of these methods is foolproof. Fortunately, if you make a bid but then have doubts, most sites will allow you to cancel it as long as you can give a reason.

THIRD-PARTY VICTIMS

EVEN MORE complicated than shilling, according to the Internet Fraud Council, a private, nonprofit organization that monitors online fraud, is the *triangulation* scam. Such a scheme involves three parties: a con artist, shoppers, and an online catalog company. It is this third party that gets ripped off. The swindler purchases merchandise from e-merchants using stolen identities and credit cards, then sells the goods at auction sites to unsuspecting bidders who pay via wire transfer. The scammer then sends the items to winning bidders, thereby converting stolen computers and VCRs into cash. "This type of scam is unique to the Internet and is fostered by the high degree of anonymity and speed inherent in online transactions," says Paul Fichtman, chairman of the IFC. Scams of this kind are still going on, and law enforcement ▶

Site Guardians Consumers Fight Back on Their Own

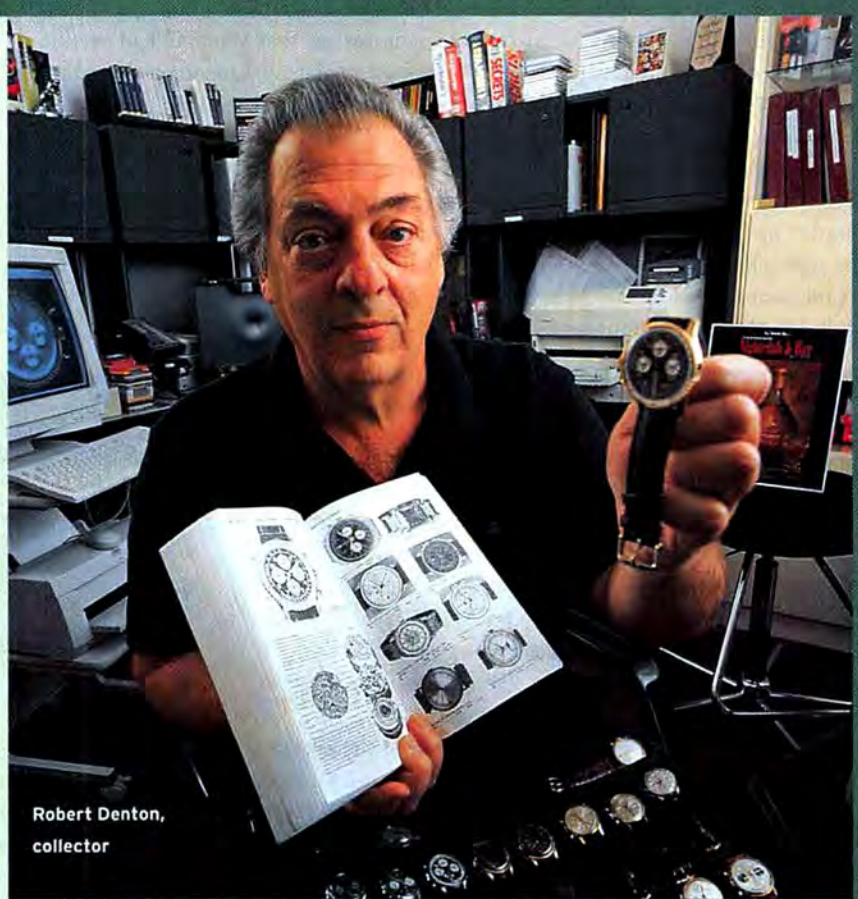
RECALLING REAL POSSES of the Old West, some Netizens are building virtual posses to track scam artists and warn shoppers of a con in progress.

Robert Denton of Michigan collects watches. He spends at least an hour and a half nightly on EBay monitoring watch auctions and spotting clues to fakes in photos. "I've seen listings for Cartiers, Guccis, and Rolexes that normally sell for $1000 and above, but on the site, the seller offers them for $10," says Denton.

He's written EBay over 50 times to inform the company of a fraud. He always gets a canned e-mail response, thanking him and saying the auction will be investigated. But the fraudulent auctions remain posted. Frustrated, Denton has taken to e-mailing the high bidder of a fraudulent watch auction, telling the buyer that he or she is buying a fake.

"I get letters of thanks all the time," Denton says. But he's also received death threats from sellers who want him to mind his own business. Denton does not take those threats too seriously, but EBay has warned him that he's interfering with auctions and must stop.

Why does he bother to get involved? "I feel an obligation to inform the buyer," he says. EBay passes along all fraud claims to the FTC and, to protect shoppers, insures purchases up to $200.



Robert Denton, collector

"I get letters of thanks all the time." But he also gets death threats from sellers and warnings from EBay.

PHOTOGRAPH: AMEEN HOWRANI

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officials have yet to prosecute such a case.

Though the fraud incidents that have been uncovered indicate the crooks are most often sellers, buyers can also be swindlers. Shoppers have used stolen credit cards to purchase goods at auction sites. They've also asked their credit card company to issue a refund for purchases they received by falsely attesting they never got the merchandise. Sellers are out the money if they can't prove they shipped the item (by providing a tracking number, for instance). More commonly, says Holly Anderson of the NCL, a dishonest buyer simply sends a bad check.

SEE YOU IN COURT

LAST APRIL, SIX DEFRAUDED shoppers filed the first class action suit of its kind against EBay, challenging its user agreement. The plaintiffs purchased autographed sports memorabilia that turned out to be forged copies. They argue that California law requires dealers and auctioneers of sports memorabilia to provide a certificate of authenticity to the buyer.

If the lawsuit is successful, all online auction sites will be required to authenticate at least the sports memorabilia that's for sale. "If we win," says James C. Krause, a San Diego attorney who filed the suit, "the wall that most auction sites hide behind will be cracked. Other suits could follow, extending liability beyond sports memorabilia."

SHIELDING THE SITES

AUCTION SITES are realizing that mounting fraud is likely to hurt business. But smaller sites aren't assuming too much responsibility for policing auctions, because they worry they'll be sued if something goes wrong. "They're [also] worried that too many safeguards would give the impression that [they] are not to be trusted, or that they aren't safe," says the NCL's McKee. And since auction sites get a percentage from each sale, most of them are focused on increasing volume rather than minimizing fraud.

Paul Luehr of the FTC says that some sites are lax in protecting users: "It's the smaller, newer sites, interested in carving out a niche, that typically have few fraud-prevention mechanisms in place." Some B2B auction sites, including TradeOut.com, don't provide even a feedback system. (See the chart "Who's Watching Your Back?" on the next page.)

The big auction sites, though, are taking action to minimize scams. "[They're] realizing that fraud may discourage users from participating in auctions and may affect their business," says Luehr. So they're establishing mechanisms to protect users. Amazon.com Auctions and EBay, for example, offer buyers a guarantee on purchases, though many other auction sites do not. (At Amazon, items are guaranteed up to $250, with no deductible.) Another mechanism is a system that allows the bidder to pay by credit card to the auction site—the function of Amazon Payments service and EBay Billpoint. The site then sends a direct deposit to the seller's checking account.

"It adds security because the buyer doesn't have to send cash or a money order, or reveal the number of a credit card," says Jeffrey Blackburn, general manager of Amazon Auctions. "It also lets us verify a seller's bank account and social security number." About 70 percent of Amazon's auction listings offer the Amazon Payments option, which guarantees purchases up to $2500.

Amazon also has a fraud-investigation team that ensures sellers are who they profess to be. Amazon and EBay require bidders and sellers (and Yahoo requires sellers only) to provide a credit card number, an address that matches the billing address on the credit card, and a phone number. "We think a credit card can be a disincentive to committing fraud," says Kevin Pursglove, spokesperson for EBay. Even so, crooks like Guest can evade that by using illegitimate credit cards.

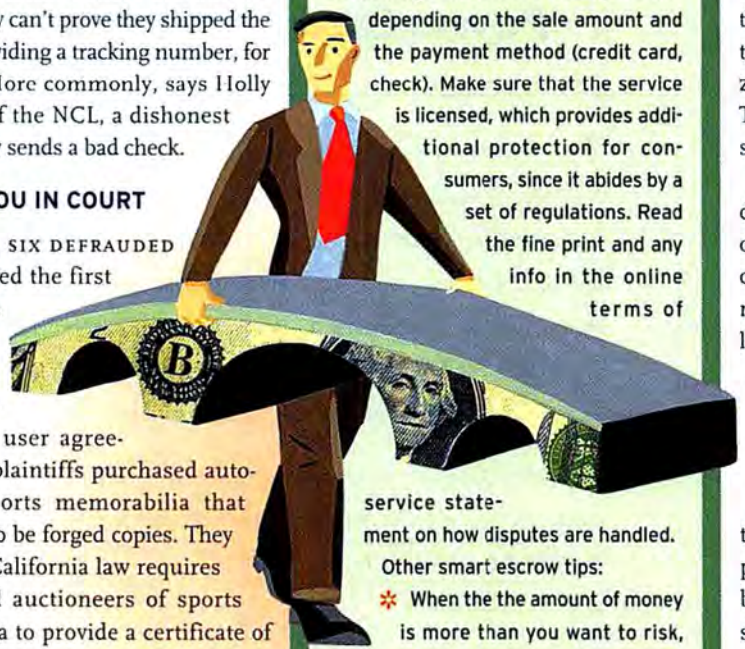
EBay insures transactions up to $200 (with a $25 deductible). Claims filed with EBay go to its fraud investigation team, and into the FTC's Consumer Sentinel database. EBay's fraud team monitors complaints, sometimes halting auctions or removing user privileges. The site offers an escrow service, I-Escrow.com, which holds payment until the bidder has inspected the purchase (see "Payment Tips," at left). EBay's software can detect deceptions like shilling, and it will now let you rate users only if you've conducted a transaction with them.

GOVERNMENT TAKES ACTION

FEDERAL, STATE, AND LOCAL LAW enforcement agencies are joining forces and stepping up efforts to tackle online auc-

Payment Tips

The Escrow Option



SEVERAL ONLINE ESCROW services want your business, but the most prominent are I-Escrow.com (www.iescrow.com) and escrow.com (www.escrow.com). Both charge similar fees—1 to 4 percent—depending on the sale amount and the payment method (credit card, check). Make sure that the service is licensed, which provides additional protection for consumers, since it abides by a set of regulations. Read the fine print and any info in the online terms of service statement on how disputes are handled.

Other smart escrow tips:

- When the the amount of money is more than you want to risk, then escrow is the way to go.
- Before bidding, ask sellers if they'll use escrow. If they refuse, don't bid.
- Escrow fees can be paid by the buyer, seller, or split. Make sure it's clear who pays. On high-ticket items, negotiate.
- Escrow services typically require buyers and sellers to resolve disputes themselves. Find out if the service will act as arbiter.
- Sellers should watch out for shoppers who may return a fake or a damaged version of the original. Mark items with an impossible-to-duplicate symbol, such as a signature.

—Gregg Keizer

tion fraud, but don't count on them to get your money back. The problem is too great for any one task force, so agencies are sharing information and resources. The FTC calculates that, since February, local, state, and federal agencies have filed at least 35 Internet auction fraud cases. Since 1994, the FTC itself has brought 140 actions against 406 defendants in Internet auction fraud cases. Crooks have had to pay fines or even serve prison time.

As part of the government's increased fraud surveillance, the FTC recently launched Project Safebid to train local, state, and federal law enforcement officers in fighting auction fraud and encouraging cooperation in investigating and prosecuting Web auction scam artists. The agency also established Consumer Sentinel, a consumer fraud database that holds over 250,000 complaints and is accessible to more than 200 U.S. and Canadian law enforcement agencies.

In May, following the lead of the FTC, Attorney General Janet Reno unveiled the Internet Fraud Complaint Center, which will be supported by the FBI and the National White Collar Crime Center. The complaint center has established a Web site as a central repository for allegations of fraud—a one-stop-shopping approach for tackling the problem.

For the most part, though, the Attorney General's offices have focused their efforts in prosecuting high-profile cases such as Robert Guest's, hoping to set an example that might deter similar crimes. But because online auction fraud is only one of the many problems government agencies must address, lots of fraud cases aren't investigated because the amount of money involved is small. "If someone has defrauded another out of $25, it's still fraud, but it's highly unlikely any law enforcement agency is going to assign the case to anyone," says Painter. The government hopes the new databases will help them track con artists and aggregate cases. "We'll be able to see that the one scam worth $25 was actually part of a larger scam worth $50,000," Painter adds. "Then we can rationalize spending a lot of money to further investigate a case."

The Web's anonymity makes perpetrating a fraud at auction sites alluring for cons. "It's easy to look reputable online." – Philip McKee of Internet Fraud Watch

WHAT'S NEXT

FRAUD WILL INCREASE with the growth of Internet shopping and online auctions. "What we should see in the future is that con artists will become more sophisticated and be able to defeat the safeguards," says Jack Levin, a sociologist and criminologist at Northeastern University.

Most fraud watchers say auction sites can and must do more to help fight fraud. Sites should follow the lead of Amazon, EBay, and others by requiring users to submit a credit card number, address, and phone number. They also could bar users from submitting free e-mail–based addresses. Another option may be to require free e-mail services to get identifying personal information from their users. Auction sites could offer insurance and escrow services. As EBay is now doing, they could forward fraud complaints to the FTC's database.

Government agencies can allocate only limited resources to auction scams. But they must ensure that law enforcement officials are well informed about such tools as the FTC database and the FBI Web site for fraud complaints.

Ultimately, fraud watchers say that preventing scams comes down to savvy buyers and sellers. Organizations such as the FTC and National Consumers League publish guides to help buyers and sellers avoid online auction fraud.

As for Stoddard, who lost $557 on Robert Guest's scam, he still shops at online auctions. "You can find things there that you can't find in stores," he says. "And often for cheaper prices." But he now makes his purchases a little differently. He always checks EBay's feedback forum. "At least now you can be sure that the person posting the feedback has actually bought something from the seller." He also enters an auction only if the product being sold is what the seller has sold before. If he spends more than $100, he pays with a credit card or through a Web-based service such as PayPal.

So far he hasn't received money back from the Guest scam. "I don't expect to receive much or anything at all," he says. Despite his bad experience he'll continue to shop at Web auctions. "But I warn people now: Don't be afraid, just be wary."

For more on online auctions, see www.pcworld.com/oct2000/auctions. Nina Schuyler is a San Francisco–based writer and author of The Business of Multimedia *(Allworth Press). Gregg Keizer is a freelance writer in Eugene, Oregon. Chart data produced by* PC World *Senior Editor Ed Albro.* ■

Who's Watching Your Back?

SOME ONLINE auction sites have more safeguards against fraud than others. We looked at the fraud protections offered by five popular sites, and here's what we found out.

AUCTION SITE	Verifies users' ID [1]	Prevents shilling [2]	Insurance policy
EBay	●	●	Pays up to $200, $25 deductible
Amazon	●	●	Pays up to $250, $2500 with Amazon Payments
Yahoo	◐ [3]	●	None
Auctions.com	○ [4]	●	None
TradeOut.com	○	[5]	None

● Yes ◐ Partly ○ No

[1] Via for-pay e-mail account or credit card.
[2] False user ratings.
[3] Sellers only.
[4] Site plans to start verification before year's end.
[5] No feedback system.

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16X DVD-ROM Drive
32 MB nVidia TNT2 M64 Pro Graphics
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Creative Labs 1373 Audio with 128 Voices
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24X Max CD-ROM Drive
ATI Mobility M3 with 16 MB Video Memory
56K ITU V.90 PCI Modem
Integrated 10/100 BaseT Network Port

Personalize by choosing:

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CD-RW Drive: Add $250
32.0 GB UltraDMA Hard Drive : Add $250

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"I have a Dell computer at home, and it was running out of juice," says Ed Chadwick in his soft Southern drawl. "If I tried to open two windows at the same time, I'd just have to sit back and wait and think, 'Well, maybe someday you're going to open.' I guess I was like most people who have 32 or 64 Megs in their computers—these days, that just isn't enough."

The Charlotte, NC, native works at a printing company with an IT department that handles desktop upgrades. But at home, where he and his wife use the Dell computer for everything from online banking to storing recipes, Chadwick is on his own.

"I added a CD writer, and that chews up a lot of memory," he says. "I thought I was going to have to buy a new computer—the Dell is three years old. But when I did some research and asked around at work, the consensus was that all I needed to do was upgrade to 128MB of RAM."

Chadwick says that he looked at several sources, but found that their memory products were not compatible with his computer. He settled on Crucial Technology after a number of people recommended the company for the ease of ordering from its Web site, the high quality of its products, excellent back-up support, and fast shipping.

Crucial is a wholly owned subsidiary of Micron Technology, Inc., Boise, Idaho. Micron manufactures dynamic random access memory (DRAM) chips and assembles them into memory modules for the global computer industry. Micron launched Crucial in 1996 to meet the growing demand for high-quality memory upgrades. Crucial is the only memory upgrade supplier that is part of a major DRAM manufacturer—Micron is one of the top three suppliers in the world. Because the DRAM is made in-house, Crucial is able to sell top-quality memory that has been approved by all major original equipment manufacturers.

"I went to the Crucial Web site, and in three clicks I had my RAM ordered—it was that easy," says Chadwick. "The memory arrived in two days, I popped it into my computer, and—best of all—it worked!"

Chadwick used Crucial's award-winning Memory Selector to find the right memory for his system: He entered his computer make and model, and the Memory Selector provided a list of memory upgrades that were guaranteed to be compatible with his system.

He says the additional DRAM from Crucial solved his sluggish-computer problems. He also comments that he was impressed by the fast shipping at such a reasonable price and the depth and breadth of the company's support services, should he need any help.

The Crucial Web site—www.crucial.com—is designed to teach novice users everything they need to know about memory and upgrading their systems. Technical support is free and available 24x7.

"I was just delighted," Chadwick says. "I'm telling everyone I know—if you're looking to upgrade, call Crucial. Click your mouse three times, and you've got it."

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[*Genius.*]

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John Bowler, IT Consultant

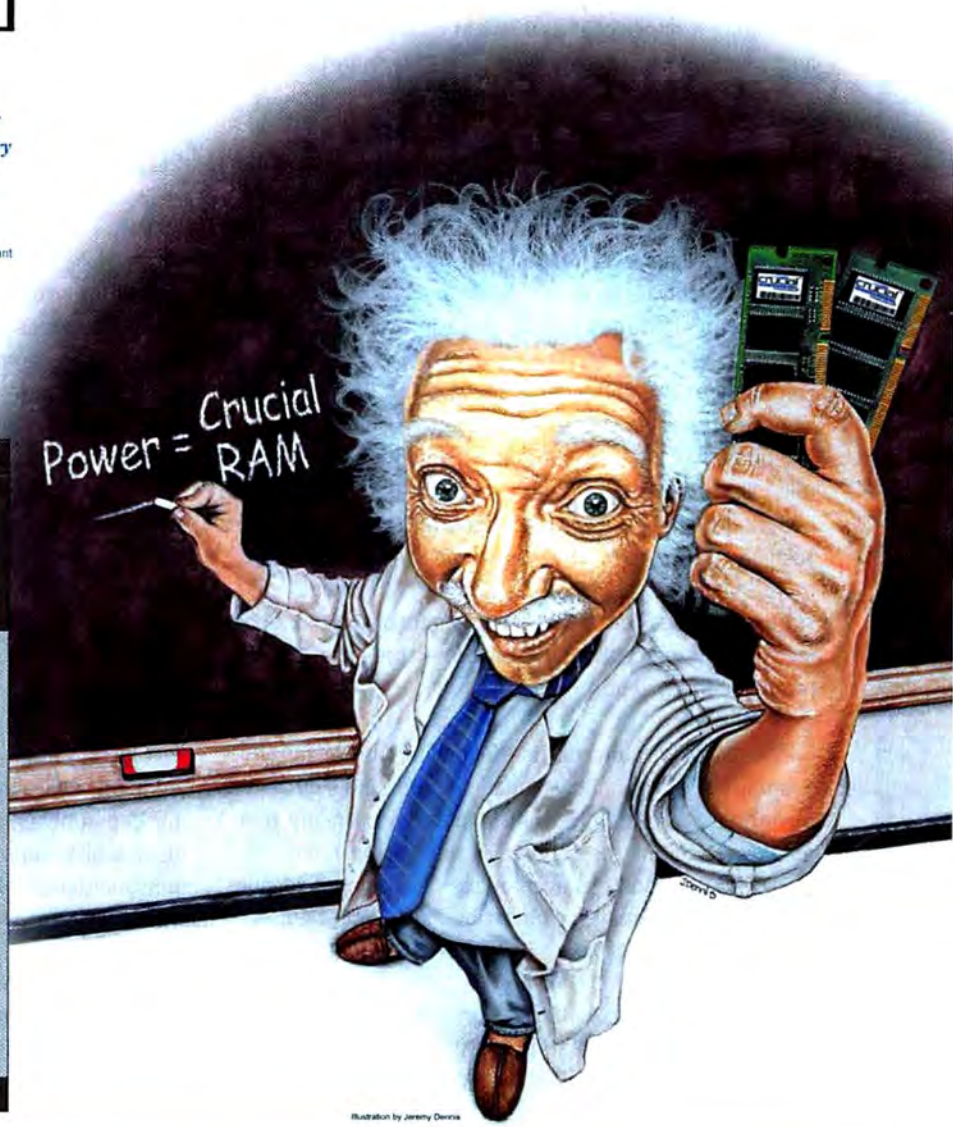

Illustration by Jeremy Dennis

Compare the Savings . . .

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Aptiva (2153) Model E2U	$111.00	$71.99
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Crucial prices reflect an automatic 10% discount for ordering online. Prices were taken from Crucial and Kingston Web sites on 8/1/00; however, they can (and do) change daily. Prices may vary according to specific system requirement.

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CDW: The Power of PAS

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Describing a rather confused knight-errant, Canadian humorist Stephen Leacock wrote, "He leapt on his horse and rode madly off in all directions."

This could easily describe the state of affairs around the online purchase of equipment and materials. All too frequently, anyone with access to the Web could purchase technology online, a situation that has led many senior technology buyers to restrict Web access to make sure that the organization's buying procedures are observed.

Fortunately, CDW Computer Centers, Inc. (CDW), the country's one-stop source for customized computing solutions, has an answer. CDW, headquartered in Vernon Hills, Ill., is the leading source for top name brands like Compaq, Computer Associates, IBM, Microsoft, and Toshiba. Founded in 1984, the company today employs more than 2,300 people. CDW's growth has been strong–net sales for the six months ended June 30, 2000 increased 59 percent to $1.8 billion, according to a recent quarterly report.

This year, CDW launched its Purchasing Authorization System (PAS). PAS allows small to medium-sized businesses to customize their extranets to ensure that employees follow the company's purchasing rules. Using the PAS tool, managers make purchasing guidelines mandatory—the guidelines must be strictly followed, or no purchase is possible.

Here's how it works. As the person responsible for corporate purchasing policy and procedures, you contact your CDW account manager, who then designates you as extranet administrator. You are then able to establish purchasing rules for your extranet. For example, you can determine which employees may make purchases and how much they can spend.

From that point on, company employees can buy only within the guidelines of the PAS rules. This not only

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makes for a more controlled purchasing situation, but it also streamlines operations and actually allows employees more freedom to make appropriate purchases. For example, instead of having a purchasing manager repeatedly approve requests for printer toner, you can set up a PAS rule that allows an executive assistant to buy the toner cartridges with a spending cap of $100. The PAS system lets you grant the assistant access to the CDW@work extranet and determine his or her maximum spending budget.

Because PAS enforces corporate purchasing guidelines, your company can grant access to the CDW@work extranet to a wider circle of employees—personnel who will benefit from its tools, features, and information. In addition, PAS allows you to stipulate buying guidelines for departments, work teams, or any other group that uses similar supplies. Like CDW@work's other features, personalization of the PAS tool is free. To request an extranet, go to www.cdw.com/cdwatwork.

PAS is just one more of the e-commerce services that CDW has made available on its two Web sites, www.cdw.com and www.cdwg.com. CDW·G, a wholly owned subsidiary, was formed in September 1998 to address the unique needs of customers in the government and education markets. Through customized extranets, agencies can instantly access purchase histories, verify order status, and obtain proper pricing with the click of a button. And, of course, they can make purchases within the ground rules they have set, using the power of PAS.

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While many motorists in Dimondale, Mich. say the family-owned Windmill Truck Stop is a home away from home, its controller, Kevin Edelmann, says it's been more like a house of accounting horrors. Besides monitoring retail fuel sales in the truck stop's "truckers only" area, he also has to keep an eye on commuters' and travelers' purchases in the king-sized complex's convenience store, family restaurant, motel, and auto service center. "Keeping track of all of that inventory has been a nightmare," Edelmann says.

The Point of Sale (POS) system that the Windmill had been using since 1982 did a fine job of ringing up sales, but it couldn't tell store managers anything about what was on the shelf. "The system only broke sales down by department," Edelmann says. "So it couldn't tell the difference between a tube of toothpaste and a bottle of shampoo."

PC AMERICA

Edelmann found only a few POS solutions that were easy to use, Microsoft Windows-based, and able to support multiple input devices. And none of them could manage the 20,000-plus items in the Windmill's convenience store and restaurant. "We desperately needed a solution that could bring all of these components of our business together," he says.

Things finally turned around at the Windmill once Edelmann deployed PC America's Cash Register Express (CRE 2000), a Windows-based POS program that works with ordinary PCs and peripherals, as well as barcode scanners, receipt printers, and pole displays (which show charges at the checkout counter). Now all of the Windmill's cashiers can use touch screens and barcode scanners to enter orders and update inventory. And setting up CRE 2000 could not be easier, says Edelmann. "PC America did an excellent job pulling all of the hardware together initially. But the great thing about their software is that I can grab any component I want off the shelf and throw it together in no time. This is one slick program."

The Windmill has processed more than half a million transactions with CRE 2000 and PC America's Restaurant Pro Express (RPE 2000) since October 1999. And Edelmann predicts that PC America will continue to develop the software he needs to keep things running smoothly. "PC America is constantly improving upon their products," he says.

Now PC America is helping retailers like the Windmill to move beyond the sale itself to increase revenues. A new feature in CRE 2000 gives businesses the ability to print coupons on the bottom of sales receipts on an Epson TM-T88II receipt printer. They can use the coupons to advertise specials on slow business days (e.g., "10 Percent Off All Purchases Every Tuesday"), or to give their customers discounts on overstock items (e.g., "Get a Free Six-Pack of Pepsi on Your Next Visit").

CRE 2000's couponing feature promises retailers an excellent route to a crucial dimension in retail sales. "Repeat business is the most important aspect of any business," says PC America's president, Howard Gosman. "With this addition to our POS package, we are giving our customers a quick and easy-to-use method for creating it."

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All PC America Software requires Microsoft Windows. The software was written in Visual Basic using Microsoft Access Files. The source code is available.

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PC WORLD

TOP 100

200 Power PCs

204 Midrange PCs

208 Budget PCs

212 Notebook PCs

214 Home PCs

217 Printers

219 Monitors

221 Graphics Boards

223 CD-RW Drives

The Quick and the Light

LIGHT BUT LOADED: The Micron TransPort LT (front) and the IBM ThinkPad T20 pack lots of processing power into small packages.

USUALLY REGARDED AS LIGHT in both weight and processing power, notebooks are becoming still smaller but also gaining speed. As this month's chart shows, lightweight laptops can now be powerhouse systems. The power notebook chart contains two featherweight travel laptops that more than hold their own in performance: the IBM ThinkPad T20 (with a travel weight of 6.5 pounds) in fourth place, and the Micron TransPort LT (6.1 pounds) in fifth. Both pack significant processing punch into a small package, with Pentium III CPUs running at speeds of 650 MHz or above. Good things can come in small (and light) packages.

CD-RW DRIVES, THUNDERBIRDS ARE GO

THE TECHNOLOGY behind CD-RW drives is improving apace, which is why we've introduced a new Top 10 review to cover them, expanded from the Top 5 featured on PCWorld.com. The first drive to claim the top spot is Plextor's new PlexWriter 12/10/32, which, as its name suggests, can write CD-R discs at 12X and CD-RW discs at 10X; it's the first to offer that impressive combination of speeds.

Similarly, AMD's new processor looks likely to impress. The Athlon was called Thunderbird during development, but the company now refers to it loquaciously as the AMD Athlon Processor with Performance-Enhancing Cache Memory. Whatever you call it, it looks like a seriously speedy processor.

One of the first PCs we've tested using the new Athlon lives up to the enhanced name. Polywell's Poly K7-1000A earned a score of 169 on our PC WorldBench 2000 tests—the highest we've seen from a Windows 98 system. However, this Poly just failed to make the chart, primarily because of its $3250 price. A not inconsiderable part of this cost is attributable to the new Athlon chip itself: AMD currently charges $990 for the processor alone.

Previous versions of Athlon sported 512KB of L2 cache located on a separate chip. The new Athlon has only 256KB of L2 cache, but it's integrated into the processor chip itself, speeding up data transfer between the processor and the cache and boosting overall performance.

A second new feature of the enhanced Athlon is its smaller size, says AMD representative Scott Carroll. Because previous Athlons needed both the processor chip and the cache chip, they had to be installed in the larger Slot A. Since the cache is now on the same chip as the processor, the new Athlons can sit flush against the motherboard in the smaller Socket A. "The new AMD Athlons are currently available in Slot A and Socket A form factors to make it easier for computer manufacturers," says Carroll. "AMD's Slot A Athlons will be available for a limited time, and then [the company will] move [completely] to Socket A."

THE PLEXWRITER 12/10/32 can write CD-RW discs at the speedy rate of 10X and CD-R discs at 12X.

ROOM WITH A VIEW

FOUR NEW 21-inch monitors enter the Top 10 this month. The CTX PR1400F, the ViewSonic PF815, and the NEC MultiSync FE1250 come in at under $900 but don't forgo image quality: All earned a rating of Good or better for text quality. The CTX PR1400F was particularly impressive, achieving a Very Good text rating for the attractive price of $799 and landing in third place on the chart.

Freelance writer Joel Strauch and PC World *editors Sean Captain, Katharine Dvorak, Mick Lockey, Kalai Murugesan, Karen Silver, and Alan Stafford contributed to the Top 100 this month. Testing was performed by Curt Buhler, Ulrikhe Diehlmann, Robert James, Elliot Kirshling, Jeff Kuta, Thomas Luong, Sean Tieu, and John Tijon of the PC World Test Center.* *See page 16 for contact information.* ▶

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following information should answer them.

How do the charts work? Each month we test numerous PCs, printers, scanners, monitors, graphics boards, and modems and compare them with previously reviewed products. Only the best products land on the Top 10 and Top 15 charts, which are refreshed monthly. System configurations are shown as tested. Vendors may have since changed components.

What does the overall rating mean? This 100-point scale reflects results from our hands-on evaluations and performance tests. A score in the 90s is exceptional, while one in the 70s is above average.

What does the PC WorldBench 2000 score mean? It's a measure of how fast a PC can run a mix of common business applications as compared with our baseline machine, an HP Pavilion 8380 with a PII-400 CPU, 96MB of RAM, and an 8GB hard drive. For example, a PC that scores 200 is twice as fast as the baseline system.

Where do scores for reliability, support quality, and support policies come from? Reliability and support quality scores are based on surveys of *PC World* readers and on anonymous support calls made by *PC World* staff. The policies score is based on vendor support policies.

online

POINT YOUR browser to www.pcworld.com/top400 for late-breaking reviews of desktop computers. In the Top 400 section, you'll find comprehensive reviews and ratings. You'll also find details of the PC WorldBench 2000 test suite at www.pcworld.com/benchmark.

PHOTOGRAPHS: MARC SIMON; ICONS: JEFFREY PELO; COMPUTER SCREEN GRAPHICS: JOHN GODDARD

PC WORLD

TOP 10 POWER PCs

	SYSTEM: $2000 AND OVER	Month tested	★ Overall rating	Street price (7/14/00)	PC WorldBench 2000 performance score [1] Faster	Base configuration
1	Micron Millennia Max 800 800/642-7667 www.micronpc.com	May 00	95	Very inexpensive: $2049	Good 149	**Very good:** Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 27GB hard drive, 19-inch monitor, Windows 98 SE
2	Dell OptiPlex GX300 800/388-8542 www.dell.com	May 00	94	Average: $2799	Good 165	**Outstanding:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 19-inch monitor, Windows 2000 Professional
3	Dell Dimension XPS B866r 800/388-8542 www.dell.com	July 00	93	Average: $2976	Good 170	**Outstanding:** Pentium III-866, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 2000 Professional
4	Sys Performance 850A 800/613-9963 www.sys.com	June 00	93	Average: $2549	Outstanding 198	**Outstanding:** Athlon-850, 128MB of SDRAM, 512KB L2 cache, two 20.5GB hard drives with RAID card, 19-inch monitor, Windows NT 4.0
5	Dell Dimension XPS B1000r 800/388-8542 www.dell.com	Aug 00	93	Very expensive: $3529	Very good 178	**Outstanding:** Pentium III-1000, 128MB of SDRAM, 256KB L2 cache, 40GB hard drive, 19-inch monitor, Windows 2000 Professional
6	Gateway Select 1000 800/315-2536 www.gateway.com	July 00	90	Average: $2773	Good 155	**Very good:** Athlon-1000, 128MB of SDRAM, 512KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 98 SE
7	Micron ClientPro Cn 800/642-7667 www.micronpc.com	NEW	89	Average: $2654	Very good 158	**Satisfactory:** Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 98 SE
8	HP Vectra VL400 800/752-0900 www.hp.com	NEW	89	Average: $2569	Outstanding 188	**Outstanding:** Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 2000 Professional
9	AcerPower 8600 800/733-2237 www.acer.com	July 00	89	Average: $2479	Very good 157	**Very good:** Pentium III-866, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 98 SE
10	IBM PC 300PL 800/426-2968 www.ibm.com/pc	Aug 00	87	Expensive: $3070	Outstanding 200	**Very good:** Pentium III-866, 128MB of SDRAM, 256KB L2 cache, 20.4GB hard drive, 19-inch monitor, Windows NT 4.0
	Best Buy	Percent of overall rating ▶		Price: 15 percent	Performance: 20 percent	Base configuration: 10 percent

[1] A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 199.

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

THE MICRON MILLENNIA MAX 800 retains its number one slot, while two new corporate systems from Micron and HP make a strong entrance further down the chart. These two systems, sporting Intel's new 815E chip set with support for fast 133-MHz memory, land at numbers seven and eight.

1 MICRON MILLENNIA MAX 800

WHAT'S HOT: A $100 price drop to $2049 keeps Micron's Millennia Max 800 at the top of the chart. A well-designed interior offers access to four open slots and five open bays, and the power supply swings out to clear even more workspace. The 19-inch Micron Trinitron CPD-4401 monitor produced sharp text up to the remarkably high resolution of 2048 by 1536. Colors of test images appeared rich (albeit a tad dark).

WHAT'S NOT: At this price, the Millennia Max 800 provides neither a removable storage option nor a CD-RW drive. And this Pentium III-800EB unit scored just 149 on our PC WorldBench 2000 tests.

WHAT ELSE: This Millennia earns points for documentation, thanks to its setup poster and thorough system manual, but it lacks some component manuals. The large midsize tower features twin fans, a case lock, and a side that pops off smoothly (getting it back on requires some fiddling, however). The motherboard provides both Slot 1 and Socket 370 processor connectors, so you can upgrade the system with either type of CPU.

BEST USE: With its excellent monitor, this PC makes a good presentation system.

2 DELL OPTIPLEX GX300

WHAT'S HOT: Running Windows 2000 Professional, this OptiPlex posted a PC WorldBench 2000 score of 165, trailing the Windows NT machines on the chart but outpacing all the Windows 98 PCs. A tidy interior offers chassis intrusion detection, a case lock, a swing-out power supply, five open PCI slots, and three open (and toolless) drive bays. Dell's 19-inch UltraScan P991 monitor delivers vibrant colors and crisp text at resolutions up to 1600 by 1200.

WHAT'S NOT: Dell posts most of its documentation online; the hard copy of the main system manual contains the bare minimum, and you won't find any paper documentation for individual components (though you can order it for free).

WHAT ELSE: Despite the easy-service chassis, the memory slots are buried, and the interior feels cramped until you swing the power supply out of the way. But with

Extra features	Design and expandability [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Good: VisionTek NVidia GeForce 256 graphics card with 32MB of SDRAM, 12X DVD-ROM drive, V.90 modem, case lock, Microsoft Office 2000 Small Business Edition	**Very good:** easy to remove case; midsize tower; 5 open drive bays, 4 open slots	Good	Fair/ Outstanding	24/7, toll-free	Varies [3]/1
Very good: Celestica NVidia GeForce 256 graphics card with 32MB of SGRAM, 8X/4X/32X CD-RW drive, network card, case lock, Wake-on-LAN, Microsoft Natural keyboard, MS IntelliMouse	**Good:** hard to remove case; midsize tower; 3 open drive bays, 5 open slots	Outstanding	Good/ Outstanding	24/7, toll-free	3/3
Outstanding: Celestica NVidia GeForce 256 graphics card with 64MB of DDR SDRAM, 8X/4X/32X CD-RW drive, Iomega Zip 100 drive, V.90 modem, network card, Microsoft Office 2000 Pro	**Good:** lots of expansion room; midsize tower; 3 open drive bays, 2 open slots	Outstanding	Good/ Good	24/7, toll-free	3/1
Good: Matrox G400 Max graphics card with 32MB of SGRAM, 17X-40X CD-ROM drive, network card, case lock	**Very good:** easy to remove case; midsize tower; 4 open drive bays, 3 open slots	[4]	Good [4]/ Good	24/7, toll-free [5]	Varies [4]/5
Outstanding: Celestica NVidia GeForce 256 graphics card with 64MB of DDR SGRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, network card, Microsoft IntelliMouse	**Good:** plenty of expansion room; midsize tower; 3 open drive bays, 2 open slots	Outstanding	Good/ Good	24/7, toll-free	3/1
Outstanding: Creative Labs NVidia Riva TNT2 graphics card with 32MB of SDRAM, 12X DVD-ROM drive, 4X/4X/24X CD-RW drive, V.90 modem, microphone	**Good:** hard to access memory; midsize tower; 4 open drive bays, 3 open slots	Good	Fair/ Outstanding	24/7, toll-free	3/3
Good: VisionTek NVidia Riva M64 graphics card with 32MB of SDRAM, 20X-48X CD-ROM drive, network card, case lock, Microsoft Office 2000 SBE, LANDesk, chassis intrusion detection	**Good:** toolless case removal; midsize tower; 5 open drive bays, 5 open slots	Good	Fair/ Outstanding	24/7, toll-free	Varies [3]/1
Good: Matrox Millennium G400 dual-head graphics card with 16MB of SGRAM, 4X/4X/38X CD-RW drive, network card, HP EDiagTools and TopTools administration software	**Satisfactory:** easy to access memory; midsize tower; 2 open drive bays, 3 open slots	Good	Fair/ Good	24/7, toll-free	3/3
Outstanding: Leadtek WinFast 3D GeForce 256 graphics card with 32MB of DDR SGRAM, 8X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem, network card	**Good:** no reset button; midsize tower; 2 open drive bays, 3 open slots	[4]	Fair [4]/ Good	24/7, toll-free	3/3
Good: Number Nine SR9 AGP graphics card with 16MB of SGRAM, 18X-48X CD-ROM drive, network card	**Satisfactory:** little expansion room; midsize tower; 2 open drive bays, 2 open slots	Good	Good/ Good	24/7, toll-free	3/3
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

[3] Five years on CPU and main RAM, three years on other parts.

[4] Insufficient data to give a rating, or the rating is derived from the vendor's Reliability and Service survey scores for its home PCs. For tech-support quality, this rating may also depend on our anonymous support-quality calls.

[5] Support hours drop to 9 hours Monday-Friday after one year.

[6] Six years on CPU and main RAM, three years on other parts.

this OptiPlex's 8X/4X/32X CD-Rewritable drive, making backups is fast and easy.

BEST USE: For businesses that want fast, managed Windows 2000 systems, this OptiPlex offers substantial bang, albeit for a lot of bucks.

New on the Chart

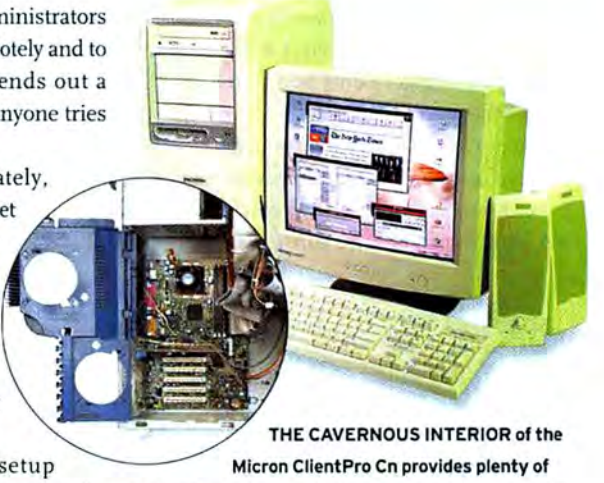
7 MICRON CLIENTPRO CN

NEW **WHAT'S HOT:** Armed with Intel's new 815E chip set, the ClientPro Cn packs 128MB of fast PC133 SDRAM memory and a network interface card. Opening the huge midsize tower proved simple, with a convenient handle on the side. The system also comes with a case lock. The monstrous interior's five open bays and five open PCI slots provide plenty of expansion options. Microsoft Office 2000 Small Business Edition is the mainstay of the above-average software bundle, which also includes LANDesk 6.0 Client Manager. LANDesk allows administrators to manage the system remotely and to spot problems, and it sends out a chassis intrusion alert if anyone tries to open the case.

WHAT'S NOT: Unfortunately, the system lacks both a reset button and an overall system manual, and it ships with only a 20X–48X CD-ROM drive. The keyboard was somewhat flimsy, but it did permit smooth and quiet typing.

WHAT ELSE: A quick-setup poster and decent documentation for individual components help compensate for the missing system manual. Powered by a Pentium III-933, the ClientPro Cn managed a respectable score of 158 on our PC WorldBench 2000 tests. The 17-inch Micron 700Ex monitor displayed rich colors, and text remained crisp until the highest resolution of 1280 by 1024, where it began to blur.

BEST USE: With a variety of high-end corporate features, the ClientPro Cn would be a welcome addition to any office. ▶



THE CAVERNOUS INTERIOR of the Micron ClientPro Cn provides plenty of expansion options, including five open PCI slots, and five open drive bays for extra hard drives.

PHOTOGRAPHS: RICK RIZNER

'Total Cost of Ownership' Defined

TECH TREND THE PHRASE *total cost of ownership* gets bandied about the tech industry like street slang in a middle school playground: Everyone uses it, but nobody is quite sure what it means. TCO, according to Michael Silver, research director at the Gartner Group, is the holistic view of all costs associated with an asset. For a PC, this means not just the initial purchase price, but also the cost of administering and repairing the system over time.

"The TCO for a PC can be as low as $2000 or as high as $20,000," he says. A typical number is about $8000 a year, which includes direct costs—hardware, software, and connection to a network—as well as indirect costs. These indirect costs can make up more than half of the TCO and include expenses such as downtime, time spent learning to use new systems, and "Hey Joe" support, which as Silver defines it, is "when you and your neighbor waste an hour trying to fix a problem that tech support could have solved in 10 minutes."

In a big company, TCO has a huge impact on buying decisions. Not surprisingly, says Silver, "vendors will give TCO benefits to cost-justify their product." TCO figures quoted by PC manufacturers should always be viewed skeptically: Ask for a breakdown of the TCO so you can see exactly what the figures mean.

8 HP VECTRA VL400

NEW **WHAT'S HOT:** Amazingly, the HP Vectra VL400's score of 188 on our PC WorldBench 2000 tests—the second highest we've seen from a Windows 2000 system—isn't its most impressive feature. The security features preloaded on this Vectra would keep *Mission: Impossible*'s Ethan Hunt at bay. Its Smart Card unit—part of the Protect Tools 2000 kit—requires the card for access, the case lock requires a key in order to open it, and its chassis intrusion detection keeps trespassers out. Expanding this Vectra is simple, with its pop-off case panel, two open easy-load bays, and three open PCI slots.

WHAT'S NOT: The system ships without speakers, office software, or a reset button. The only documentation included is a quick-start guide and some paperwork for the Smart Card security kit.

WHAT ELSE: Colors appeared true but a tad light on the 19-inch HP P910 monitor; text remained sharp up to the maximum resolution of 1600 by 1200, thanks to the Matrox Millennium G400 graphics card. The computer includes Intel's new 815E chip set and 128MB of PC133 SDRAM. An integrated network card, a 4X/4X/48X CD-RW drive, and EDiagTools for remote management round out this corporate package.

BEST USE: A powerful system with excellent management, security, and networking tools, this Vectra would be a near-perfect PC for a high-end environment.

HP'S VECTRA VL400 includes lots of security features, such as Smart Card access and a case lock.

Also of Note

THE POLYWELL Poly K7-1000A's scores are off the charts in almost every category—including price. Driven by one of the new 1-GHz enhanced Athlon CPUs, it earned a 169 on our PC WorldBench 2000 tests—the highest score we've seen for a Win 98 system. This Poly also boasts a pair of 40GB hard drives connected to a RAID card, as well as an 8X/4X/32X CD-RW drive. The 19-inch ViewSonic GS790 monitor produced vibrant colors and sharp text at all resolutions. However, the K7-1000A's $3250 cost kept it off our power chart for now.

Even more expensive, the $3499 Micro Electronics PowerSpec PC 7900, outfitted with a Pentium III-1000 CPU, scored 190 on our PC WorldBench 2000 tests, topping our previous high for systems running Windows 2000 Pro. The PowerSpec offers an 8X/4X/32X CD-RW drive, Microsoft Office 2000 Premium edition, a modem, a network interface card, and an excellent 19-inch monitor.

The $2729 Systemax PVW-1000A Excite PC recorded a respectable score of 176 on our PC WorldBench 2000 tests, with its 1-GHz Athlon processor. Other features include a 10X DVD-ROM drive, a 4X/2X/24X CD-RW drive, both a modem and a network interface card, and Microsoft Office 2000 Small Business Edition. It's a strong package, but not strong enough to reach the chart.

Tiny's Millennium SuperPower 933 packs in a lot: an 8X/4X/32X CD-RW drive, a hardware-accelerated 16X DVD-ROM drive, a 45GB hard drive, and a large software bundle including Microsoft Works Suite 2000. Sadly, this $2399 model is slow. The Pentium III-933 machine earned only a 144 on our PC WorldBench 2000 tests—14 points below the average for similarly configured PIII-866 systems running Windows 98. ▶

MORE REVIEWS ONLINE

online **WE EVALUATED the following systems along with the others, but they didn't score high enough to reach the *Top 10 Power PCs* chart. For write-ups, visit PCWorld.com (www.pcworld.com/t10pcs).**

- **Micro Electronics PowerSpec PC 7900**
- **Millennium SuperPower 933**
- **Polywell Poly K7-1000A**
- **Systemax PVW-1000A Excite PC**
- **Tiny Millennium SuperPower 933**

ILLUSTRATION: JEFFREY PELO

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Features	Toshiba Tecra 8100	Dell Latitude CPx	IBM Thinkpad A20m	WinBook Si
Processor Speed	Intel® Pentium® III processor			
	750 MHz	750 MHz	700 MHz	800 MHz
Display	14.1" TFT	14.1" TFT	14.1" TFT	14.1" XGA
Graphics	2x AGP	2x AGP	2x AGP	2x AGP
RAM	64 MB	64 MB	64 MB	64 MB
Hard Drive	6 GB	6 GB	12 GB	6 GB
DVD-ROM	6X	6X	6X	6X
Modem	56k/v.90	56k/v.90	56k/v.90	56k/v.90
3.5" Drive	Yes	Yes	Yes	Yes
Free Internet	No	No	No	Yes
Price	$3499	$3297	$2848	$1999

Configurations and prices are based on a web audit 7/26/00. All models using Windows® 98 Second Edition operating system. Configuration details may differ.

†56k modems are capable of 56 kps downloads. Due to FCC rules that restrict power output, however, current download speeds are limited to 53 kps. Upload speeds are limited to 33.6 kps. Actual speeds may vary depending on line conditions. Prices and specifications valid in U.S. only and subject to change without notice. All purchases are subject to availability. For a complete copy of Guarantees and Limited Warranties, contact WinBook Computer Corporation or our website at www.winbook.com/warranty.html. ©2000 WinBook Computer Corporation and My Favorite PC.com. All rights reserved. WinBook is a registered trademark of Micro Electronics, Inc. All rights reserved. Intel, the Intel Inside logo and Pentium are registered trademarks of Intel Corporation.

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PC WORLD

TOP 10 MIDRANGE PCs

	SYSTEM: $1200 TO $1999	Month tested	★ Overall rating	Street price (7/14/00)	PC WorldBench 2000 performance score [1] Faster ▶	Base configuration
1	Dell Dimension 4100 800/388-8542 www.dell.com	NEW	91	Average: $1659	Very good 154	**Very good:** Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
2	Micro Express MicroFlex 8A 800/989-9900 www.microexpress.net	NEW	89	Very inexpensive: $1249	Very good 153	**Very good:** Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
3	Micron Millennia Max 733 800/642-7667 www.micronpc.com	July 00	89	Average: $1499	Very good 148	**Very good:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
4	Dell OptiPlex GX110 800/388-8542 www.dell.com	July 00	88	Inexpensive: $1431	Good 140	**Good:** Pentium III-667, 128MB of SDRAM, 256KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
5	Micro Express MicroFlex 900A 800/989-9900 www.microexpress.net	Sept 00	87	Inexpensive: $1399	Very good 151	**Very good:** Athlon-900, 128MB of SDRAM, 512KB L2 cache, 20.5GB hard drive, 17-inch monitor, Windows 98 SE
6	NuTrend Sierra LE 888/482-6678 www.nutrend.com	Aug 00	86	Very inexpensive: $1259	Very good 142	**Very good:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
7	Gateway GP7-800 800/315-2536 www.gateway.com	June 00	86	Expensive: $1863	Outstanding 156	**Outstanding:** Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 98 SE
8	Systemax PVW-T733 Venture PC 888/450-7703 www.systemaxpc.com	NEW	85	Inexpensive: $1389	Very good 148	**Good:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
9	Sys Performance 800 800/613-9963 www.sys.com	Sept 00	84	Expensive: $1799	Very good 180	**Very good:** Pentium III-800EB, 128MB of RAM, 256KB L2 cache, 20.5GB hard drive, 17-inch monitor, Windows 2000 Pro
10	IDot.com SA Series 750 888/388-4368 www.idot.com	Aug 00	81	Expensive: $1766	Good 140	**Very good:** AND Athlon-750, 128MB of RAM, 512KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
	Best Buy	Percent of overall rating ▶		Price: 17 percent	Performance: 18 percent	Base configuration: 10 percent

[1] A system's performance word score is relative to the scores earned by other PCs running the same operating system. See "Your Guide to the Top 100" on page 199.

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

THERE'S A SHAKE-UP at the top of the midrange chart this month, with two new Best Buys assuming the throne. The similar Dell Dimension 4100 and Micro Express MicroFlex 8A (both sporting PIII-800EB processors, 20GB hard drives, and 17-inch monitors) posted nearly identical—and above-average—PC WorldBench 2000 scores. Toward the other end of the chart, the inexpensive Systemax PVW-T733 Venture PC logs on at number eight.

1 DELL DIMENSION 4100

WHAT'S HOT: Thanks to its 800-MHz PIII CPU, the Dimension 4100 scored near the top in performance among similarly configured Win 98 systems, earning a healthy 154 on our PC WorldBench 2000 tests. The $1659 system offers a lot of useful extras not often found at this price, including the top-of-the-line Celestica NVidia GeForce2 graphics board and a 17-inch Dell M780 monitor, which displayed vibrant colors and crisp text (albeit with some blur at the maximum resolution of 1280 by 1024). Note: Our review system came with a Microsoft Natural Keyboard and Microsoft Office 2000 Professional, but Dell now ships it with a Dell QuietKey keyboard, which provides smooth, quiet typing; MS Office 2000 Small Business Edition; and Norton AntiVirus 2000.

WHAT'S NOT: To reach the Dimension 4100's reasonable price, Dell had to forgo both CD-RW and DVD drives.

WHAT ELSE: A large reference-and-troubleshooting guide provides lots of detailed system information, and a poster makes setting up this system a snap. But even with thumbscrew access, removing the side panel of this lanky midsize tower took some work. Although a bit cluttered, with a support bar blocking access, the interior offered three open PCI slots and four open bays for expansion.

BEST USE: With a strong feature set and excellent performance for the price, this Dell would fit well into any office.

2 MICRO EXPRESS MICROFLEX 8A

WHAT'S HOT: Powered by a PIII-800EB processor, this MicroFlex earned a score of 153 on our PC WorldBench 2000 tests, slightly above the average for similar systems. Its $1249 price nearly qualifies it for our budget category. Opening the basic midsize

Extra features	Design and expandability [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Good: Celestica NVidia GeForce2 GTS graphics with 32MB of DDR SGRAM, 17X-48X CD-ROM drive, V.90 modem, Microsoft Office 2000 Pro	**Good:** plenty of expansion room; midsize tower; 4 open drive bays, 3 open slots	Outstanding	Good/ Good	24/7, toll-free	3/1
Good: ATI Rage Fury Pro graphics card with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem, Microsoft Office 2000 SBE	**Good:** easy access to memory sockets; midsize tower; 4 open drive bays, 4 open slots	[3]	Fair [3]/ Outstanding	24/7, toll-free	4/4
Very good: VisionTek NVidia TNT2 Pro graphics card with 32MB of SDRAM, 12X DVD-ROM drive, network card, case lock, Microsoft Office 2000 SBE	**Good:** easy access to motherboard; midsize tower; 5 open drive bays, 5 open slots	Good	Fair/ Outstanding	24/7, toll-free	Varies [4]/1
Good: Celestica M64 graphics card with 16MB of SDRAM, 20X-48X CD-ROM drive, network card, Wake-on-LAN, Microsoft IntelliMouse, case lock	**Good:** easy to remove case; midsize tower; 3 open drive bays, 3 open slots	Outstanding	Good/ Outstanding	24/7, toll-free	3/3
Good: ELSA Erazor X2 graphics card with 32MB of DDR SGRAM, 8X DVD-ROM drive, V.90 modem	**Good:** lots of room, easy access to memory slots; midsize tower; 4 open drive bays, 3 open slots	[3]	Fair [3]/ Outstanding	24/7, toll-free	4/4
Good: ATI Rage 128 Pro graphics card with 32MB of SDRAM, 8X DVD-ROM drive, V.90 modem	**Good:** plenty of expansion room; midsize tower; 4 open drive bays, 4 open slots	[3]	Fair [3]/ Good	24/7, toll-free	3/lifetime
Good: VisionTek NVidia Riva TNT2 graphics card with 32MB of SDRAM, 17X-40X CD-ROM drive, network card, Microsoft Office 2000 SBE, Norton AntiVirus, MS IntelliPoint Mouse	**Good:** easy access to memory; tower; 6 open drive bays, 3 open slots	Good	Fair/ Outstanding	24/7, toll-free	3/3
Good: 3dfx Voodoo3 2000 AGP graphics card with 16MB of SDRAM, 10X DVD-ROM drive, V.90 modem, Microsoft Office 2000 SBE	**Very good:** Microsoft Natural keyboard; midsize tower; 4 open drive bays, 3 open slots	[3]	Fair [3]/ Good	24/7, toll-free	Varies [4]/1
Good: Matrox Millennium G400 dual-head graphics card with 32MB of SGRAM, 10X DVD-ROM drive, LS-120 drive, network card, case lock	**Outstanding:** easy access to peripherals; mid-size tower; 5 open drive bays, 4 open slots	[3]	Good [3]/ Good	24/7, [5] toll-free	Varies [4]/5
Good: Diamond Viper2 Z200 graphics card with 32MB of SDRAM, 10X DVD-ROM drive, network card	**Very good:** easy access to memory; midsize tower; 4 open drive bays, 4 open slots	[3]	Fair [3]/ Good	24/7, toll-free	1/3
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

[3] Insufficient data to give a rating, or the rating is derived from our Reliability and Service survey scores for the vendor's home PCs. For tech support quality, this rating may also depend on our anonymous support-quality calls.

[4] Five years on CPU and main RAM, three years on other parts.

[5] Support drops to 9 hours Monday-Friday after one year.

[6] Six years on CPU and main RAM, three years on other parts.

tower case is easy—remove one thumbscrew, then pop off the top and the sides. Four open PCI slots and four open bays provide plenty of expansion room within the neat and spacious interior.

WHAT'S NOT: Colors on the Impression 7VX 17-inch monitor were rich, but they appeared rather dark. Text blurred slightly at the monitor's maximum resolution of 1600 by 1200, though it looked crisp at lower resolutions. Micro Express keeps costs down on this system by bundling no software with it, but most users will want at least a basic office suite, which can add significantly to the price.

WHAT ELSE: The ATI Rage Fury Pro graphics board offers composite input as well as S-Video and composite output for connecting to a video recorder or a TV. A spiral-bound system manual contains thorough system information and a helpful list of manufacturers' phone numbers, but screen shots have a photocopied look.

BEST USE: We have only minor complaints about this system, and the combination of below-average price and above-average performance might make it appealing to any small office.

New on the Chart

8 SYSTEMAX PVW-T733 VENTURE PC

NEW **WHAT'S HOT:** With a score of 148 on our PC WorldBench 2000 tests, this system performed about 5 percent faster than similarly configured Pentium III-733 computers running Windows 98. A setup poster and color-coded rear ports help to simplify assembly. You can remove and replace the solid side panel smoothly without tools, and the neat, spacious interior provides three open PCI slots and four open bays for expansion.

KING OF THE HILL: The Dell Dimension 4100 takes the top spot, thanks to its speedy 800-MHz processor.

WHAT'S NOT: The 17-inch Systemax DE-770 FA3 monitor delivered rich colors in our tests and sharp text at normal resolutions, but slight blurring occurred at the highest resolution of 1280 by 1024. In anonymous calls to the company's tech support, we received only fair service. ▶

PHOTOGRAPHS: RICK RIZNER

WHAT ELSE: The manual provides a decent glossary plus documentation for the individual components, while Microsoft Office 2000 Small Business Edition beefs up the software bundle. Microsoft's Internet keyboard, which features several programmable multimedia buttons, allowed for smooth, quiet typing.

BEST USE: For only $1389, any small office would welcome the above-average performance of this Systemax.

Also of Note

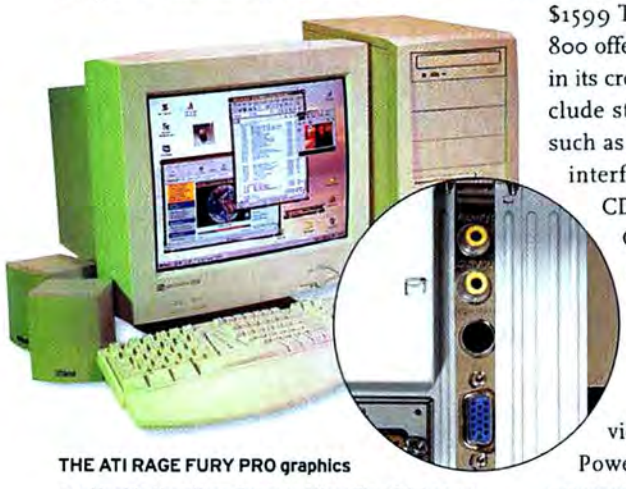
FOUR NEW MACHINES failed to crack the chart this month. For a midrange system, the $1739 Axis Orion AVM S3 offers a lot of extras: a PIII-933 processor, an 8X/4X/32X CD-Rewritable drive, a 16X DVD-ROM drive, both Slot 1 and Socket 370 processor connectors, and the Hercules 3D Prophet 2 GTS graphics board with 64MB of video memory. Unfortunately, the Axis Orion's below-average PC WorldBench 2000 score of 154 kept it off the chart.

Size does matter, and the minuscule NEC PowerMate ES SlimLine PIII-733 take up less space than most. The $1748 compact model features ports on the front for USB, a headphone, and a microphone; it also has chassis intrusion detection. Expansion is not an option, however, as the system has no free slots or bays, although you can fit extra RAM into the slots positioned precariously by the case edge.

SYSTEMAX'S PVW-T733 is a strong proposition for a small office, with very good performance at a below-average price.

Barely larger than the PowerMate, the $1599 Tiny Millennium Station 800 offers only one open PCI slot in its crowded interior. It does include strong business features, such as a modem and a network interface card, an 8X/4X/32X CD-RW drive, and Microsoft Office 2000 SBE. But its score of 136 on our PC WorldBench 2000 tests is below the average for PIII-800 Win 98 systems.

Even less expensive is Alvio's $1399 Techno 600B. Powered by a Celeron-600 processor, it matched the baseline score of 100 on our PC WorldBench 2000 tests; unfortunately, that baseline was set by a Celeron-500 PC. Its network interface card and 8X/4X/32X CD-RW drive soften the blow a bit, but this Alvio's performance keeps it from reaching the charts. ▶



THE ATI RAGE FURY PRO graphics card inside the Micro Express MicroFlex 8A has an S-Video-out port, so you can connect it to a TV.

ILLUSTRATION: JEFFREY PELO

MORE REVIEWS ONLINE

online

THE FOLLOWING SYSTEMS didn't score high enough to reach the *Top 10 Midrange PCs* chart. For a write-up, visit PCWorld.com (www.pcworld.com/t10pcs).

- **Alvio Techno 600B**
- **Axis Orion AVM S3**
- **NEC PowerMate ES SlimLine**
- **Tiny Millennium Station 800**

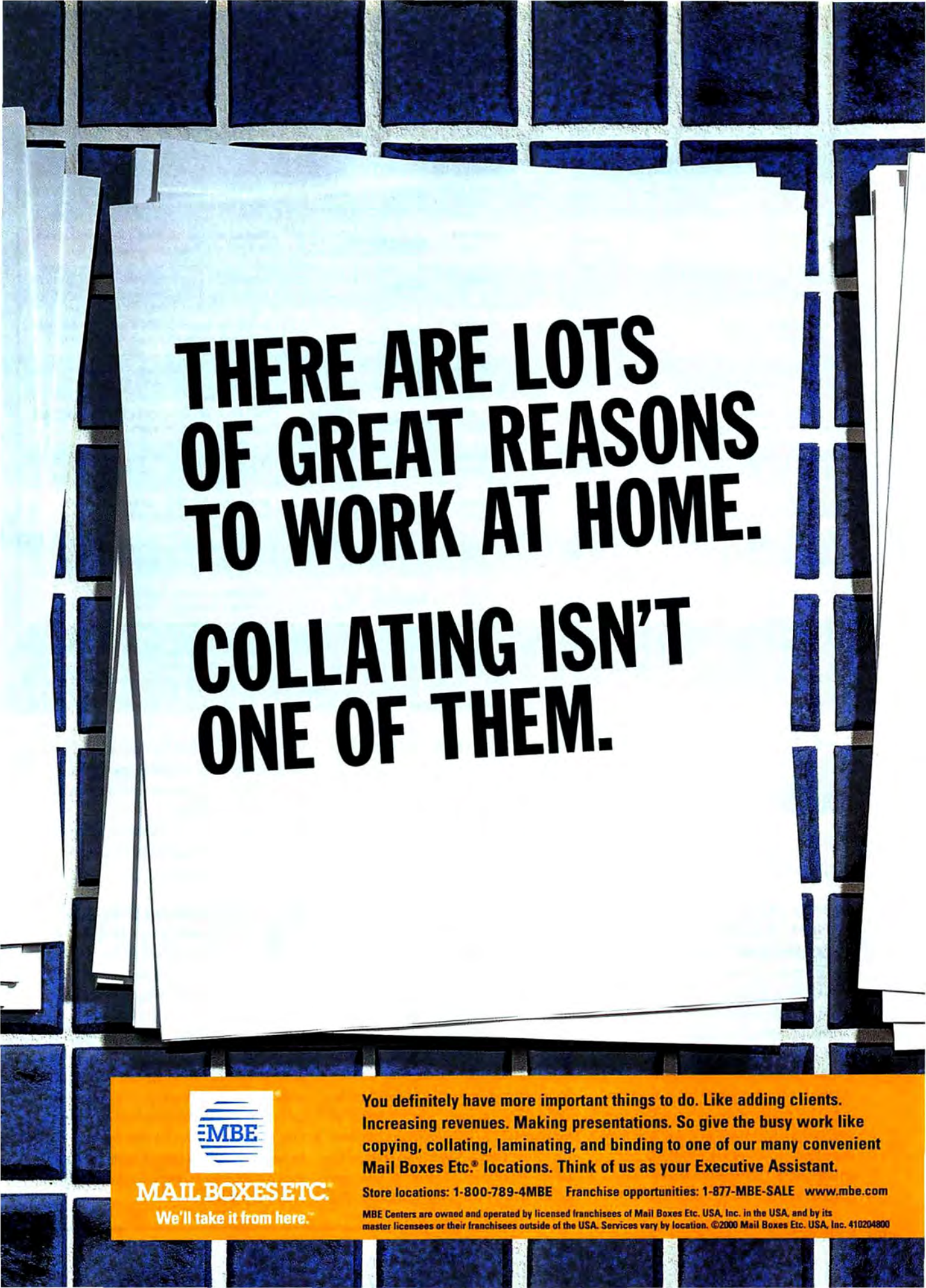
PC133 Versus PC100—Is Older RAM Slowing You Down?

TECH TREND AN INCREASING NUMBER of the systems we review use PC133 memory; others stick with the older PC100 variety. The difference between the two types is the speed of the system clock that determines how fast data can be sent to or retrieved from memory—100 MHz for PC100, 133 MHz for PC133.

Because PC133 memory runs at a higher clock speed than PC100 memory, it can send and receive data faster. But this extra speed won't make much difference if the rest of the system runs slower than the memory.

The important measure of the system speed is how fast it can run the applications that you want to use, which is precisely what our PC WorldBench 2000 tests reveal: the speed at which a system can perform tasks in a mix of common applications, including Microsoft Word and Netscape Navigator. This benchmark measures the performance of the entire system, not just of one individual part of the system.

PC133 memory costs slightly more than PC100 memory: A 128MB PC133 DIMM typically costs 5 to 10 percent more than a similar PC100 DIMM. However, now that more chip sets that support PC133 memory are becoming available, more vendors are starting to use PC133 memory as standard. (Chip sets are the system support chips, such as the Intel 815E, that manufacturers use to build motherboards.) Our PC WorldBench 2000 tests show a slight speed increase with the faster memory in otherwise similarly configured systems, but the benefit is marginal. When we tested a Micron Millennia system using both memory types, the system with PC133 memory came out less then 3 percent faster—a difference most users would never notice.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PC WORLD

TOP 10 BUDGET PCs

	SYSTEM: UNDER $1200	Month tested	★ Overall rating	Street price (7/14/00)	PC WorldBench 2000 performance score[1] (Faster)	Base configuration
1	Micro Express MicroFlex 600A 800/989-9900 www.microexpress.net	June 00	89	Average: $1099	Very good 134	**Outstanding:** Athlon-600, 128MB of SDRAM, 512KB L2 cache, 18GB hard drive, 17-inch monitor, Windows 98 SE
2	NuTrend Athlon Special 2 888/482-6678 www.nutrend.com	Sept 00	87	Expensive: $1199	Outstanding 140	**Outstanding:** Athlon-750, 128MB of SDRAM, 512KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
3	Micro Express MicroFlex 6A 800/989-9900 www.microexpress.net	Aug 00	86	Expensive: $1199	Very good 132	**Outstanding:** Pentium III-600, 128MB of SDRAM, 512KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
4	Sys TaskMaster 600D 800/613-9963 www.sys.com	(NEW)	86	Expensive: $1189	Very good 159	**Outstanding:** Duron-600, 128MB of SDRAM, 192KB L2 cache, 20.5GB hard drive, 17-inch monitor, Windows 2000 Pro
5	Dell OptiPlex GX100 800/388-8542 www.dell.com	Sept 00	84	Expensive: $1169	Good 111	**Good:** Celeron-600, 64MB of RAM, 128KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
6	IDot.com SA Series 600 888/388-4368 www.idot.com	July 00	82	Expensive: $1169	Very good 125	**Good:** Athlon-600, 64MB of SDRAM, 512KB L2 cache, 13.5GB hard drive, 17-inch monitor, Windows 98 SE
7	NuTrend Athlon Force 2 888/482-6678 www.nutrend.com	June 00	81	Expensive: $1149	Very good 133	**Very good:** Athlon-650, 128MB of RAM, 512KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 98 SE
8	Racer PC500c 800/843-8458 www.racerpc.com	Feb 00	81	Inexpensive: $799	Satisfactory 102	**Good:** Celeron-500, 64MB of SDRAM, 128KB L2 cache, 8.4GB hard drive, 17-inch monitor, Windows 98 SE
9	AcerPower 8400 800/733-2237 www.acer.com	May 00	76	Average: $1079	Satisfactory 104	**Good:** Pentium III-500, 64MB of RAM, 512KB L2 cache, 10.2GB hard drive, 17-inch monitor, Windows 98 SE
10	Polywell Poly LPC 1000 800/999-1278 www.polywell.com	Apr 00	76	Average: $999	Satisfactory 103	**Very good:** Celeron-500, 128MB of RAM, 128KB L2 cache, 27.3GB hard drive, 17-inch monitor, Windows 98 SE
	Best Buy	Percent of overall rating ▶		Price: 22 percent	Performance: 13 percent	Base configuration: 10 percent

[1] A system's performance word score is relative to the scores earned by other PCs running the same operating system. For more details, see "Your Guide to the Top 100" on page 199.

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

OUR TOP Best Buy system, the Micro Express MicroFlex 600A, retains its spot, while NuTrend's Athlon Special 2, a newcomer in September, moves up a notch to claim second place. The Sys TaskMaster 600D, powered by AMD's new Duron processor, makes a strong debut in the fourth position.

1 MICRO EXPRESS MICROFLEX 600A

WHAT'S HOT: An Athlon-600 processor propelled the MicroFlex 600A to a noteworthy score of 134 on our PC WorldBench 2000 tests, not far behind the 140 posted by NuTrend's second-place Athlon Special 2. The Microsoft Natural Keyboard may return overstressed wrists to comfortable, quiet typing. The midsize tower's uncluttered interior has three open PCI slots and four open bays for lots of expansion options.

WHAT'S NOT: This well-rounded system is hard to knock, though business users might wish it came with a network card instead of a modem for connectivity.

WHAT ELSE: A well-organized system manual provides lots of information, including a detailed glossary, but the blurred images and screen shots in the manual look like photocopies. Colors on the 17-inch Impression 7VX monitor appeared deep and rich, and text remained crisp except at the highest resolution of 1600 by 1200, when it began to blur slightly. The ATI Rage Fury graphics card offers both S-Video and composite output—boons for presenters, who can connect it to a TV or a video recorder. The included 6X DVD-ROM drive is a pleasant surprise at this unit's bargain price—many other budget systems feature a plain CD-ROM drive.

BEST USE: This is an excellent general-use system for a small office seeking performance on a shoestring.

2 NUTREND ATHLON SPECIAL 2

WHAT'S HOT: A 10X DVD-ROM drive and an Altec Lansing ACS33 three-speaker set are nice finds at this system's budget $1199 price. Although you have to remove two screws to take off the side of this basic midsize tower, the panel itself slides on and off quite smoothly, providing easy access for installing new memory or expansion cards. The moderately neat interior boasts four open PCI slots and four open bays, so there's an abundance of room for adding new PCI cards, extra hard drives, or even a CD-RW drive.

Extra features	Design and expandability [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Good: ATI Rage Fury graphics card with 32MB of SDRAM, 6X DVD-ROM drive, V.90 modem, hardware MPEG decoder card, Norton AntiVirus	**Very good:** easy interior access; midsize tower; 4 open drive bays, 3 open slots	[1]	Fair [3]/ Good	24/7, toll-free	4/4
Good: Guillemot Maxi Gamer Cougar graphics card with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem, network card, Corel WordPerfect Office 2000	**Very good:** easy access to memory slots; midsize tower; 4 open drive bays, 4 open slots	[1]	Fair [3]/ Good	24/7, toll-free	3/lifetime
Good: ATI Rage 128 Pro graphics card with 32MB of SDRAM, 8X DVD-ROM drive, V.90 modem	**Very good:** roomy case; midsize tower; 4 open drive bays, 3 open slots	[1]	Fair [3]/ Outstanding	24/7, toll-free	4/4
Good: Gigabyte GA-622 graphics card with 32MB of SDRAM, 17X-40X CD-ROM drive, network card	**Good:** no reset button; minitower; 2 open drive bays, 2 open slots	[1]	Good [3]/ Good	24/7,[4] toll-free	Varies [5]/5
Satisfactory: integrated Intel 810 graphics with UMA, 20X-48X CD-ROM drive, network card, chassis intrusion detection, Wake-on-LAN	**Satisfactory:** sturdy case; midsize tower; 3 open drive bays, 4 open slots	Outstanding	Good/ Outstanding	24/7, toll-free	3/3
Good: Leadtek NVidia TNT2 Series graphics card with 16MB of SDRAM, 17X-48X CD-ROM drive, network card, McAfee VirusScan, microphone	**Good:** cramped case, cables block access; midsize tower; 3 open drive bays, 4 open slots	[1]	Fair [3]/ Good	24/7, toll-free	1/3
Good: ATI Rage 128 graphics card with 16MB of SDRAM, 8X DVD-ROM drive, V.90 modem, Corel WordPerfect Office 2000	**Good:** easy access to memory sockets; midsize tower; 4 open drive bays, 4 open slots	[1]	Fair [3]/ Good	24/7, toll-free	3/lifetime
Satisfactory: integrated Intel 810 graphics with UMA, 4.8X DVD-ROM drive, V.90 modem	**Good:** limited expansion options; minitower; 1 open drive bay, 3 open slots	[1]	Good [3]/ Good	24/7, toll-free	Varies [6]/3
Good: ATI Xpert 98 AGP graphics card with 8MB of SDRAM, 24X-40X CD-ROM drive, network card, chassis intrusion detection, case lock, Wake-on-LAN	**Good:** no reset button; minitower; 3 open drive bays, 2 open slots	[1]	Fair [3]/ Good	24/7, toll-free	3/3
Good: integrated Intel 810 graphics with UMA, 24X-52X CD-ROM drive, V.90 modem, network card, Corel WordPerfect Suite 8, S-Video and TV-out ports	**Satisfactory:** small case, with no expansion options; compact; 0 open drive bays, 0 open slots	[1]	Fair [3]/ Good	24/7, toll-free	3/5
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

[1] Insufficient data to give a rating, or the rating is derived from the vendor's Reliability and Service survey scores for its home PCs. For tech support quality, this rating may also depend on our anonymous support-quality calls.

[4] Support hours drop to 9 hours Monday–Friday after one year.

[5] Six years on CPU and RAM, three years on other parts.

[6] One year on screen, mouse, and keyboard; three years on other parts.

WHAT'S NOT: While text looked sharp at 1024 by 768 resolution on the 17-inch Lite-On B1770 NSL monitor, colors at all resolutions in our test images appeared pale and somewhat washed out.

WHAT ELSE: The Athlon-750 processor inside this NuTrend machine earned the system a score of 140 on our PC WorldBench 2000 tests—around the average for similarly configured Windows 98 computers. A large binder houses all the documentation and software—including Corel's WordPerfect Office 2000. The system manual itself contains mostly generic information. A sturdily constructed multimedia keyboard allows smooth (though somewhat noisy) typing and has lots of buttons that can be programmed to do things like start an e-mail program, go to a home page, and so forth.

BEST USE: The NuTrend Athlon Special 2 delivers adequate performance for budget-minded users with multimedia needs.

New on the Chart

4 SYS TASKMASTER 600D

NEW **WHAT'S HOT:** Powered by AMD's new budget Duron processor, this 600-MHz TaskMaster earned a score of 159 on our PC WorldBench 2000 tests—higher than the score recorded by a similarly configured Pentium III-600 PC and close to the average for PIII-733 systems. With a case lock, a network interface card, and Windows 2000 Pro, the TaskMaster 600D ships corporate-ready.

WHAT'S NOT: The computer comes bundled with thorough documentation for individual components, but no overall system manual is included. The system also lacks a reset button. You can order a 10X DVD-ROM instead of the generic 17X–40X CD-ROM drive, but a CD-RW drive, useful for archiving data or backing up the system, isn't available. The price is also at the high end of the budget range, although it is still very competitive.

WHAT ELSE: Opening this basic minitower requires the removal of two screws. The side panel flexed when twisted, but it slid on and off smoothly. The small but tidy interior has two free PCI slots and two ▶

MICRO EXPRESS MICROFLEX 600A : Another month at the top for this budget Best Buy.

PHOTOGRAPHS: RICK RIZNER

open bays for expansion. Colors appeared rich on the 17-inch Optiquest Q71 monitor; text displayed clearly at the standard resolution, but letters blurred at the maximum resolution of 1280 by 1024. The keyboard offers smooth and quiet typing and has buttons for sleep, wake-up, and power, but the <Backspace> key is annoyingly undersized.

BEST USE: For corporate users looking to hop on the AMD budget bandwagon, this Sys machine offers a chance to check out the Duron for a terrific price.

Also of Note

THE ONE NEW SYSTEM we reviewed this month made the chart, though price reductions and discontinued models continue to shake up the rankings. Many computer manufacturers are waiting for the Duron processor to become available in larger quantities before releasing their new budget models, so we're expecting a slew of new Duron-based systems to appear in our lab over the next couple of months as a result.

Dell's OptiPlex GX100 pins down the fifth spot this month with tons of corporate features. The eighth-place Racer PC500c, a Celeron-500 PC first tested in February, retains a chart position by virtue of a low price and good performance for its processor class. Premio has cut the price of its Aries T440Z budget system, which we discussed in this space last month, from $1159 to $1040, but that reduction wasn't quite enough to move it onto the chart. And the Toshiba V3100 dropped from the bottom of the chart, bumped off by newer systems and falling prices elsewhere. Also of note for Top 10 watchers: Both Quantex PCs that appeared on last month's chart have been discontinued—the second-place Quantex SB500sx, and the number four M650sx.

As noted last month, AMD's Athlon CPU continues to make a good showing on the chart; it will be interesting to see over the next few months how many vendors switch to the cheaper Duron chip. Intel also has recently introduced Celerons that run at 700 MHz to try to keep the Celeron competitive with the Duron.

IMPRESSIVE PERFORMANCE from the Sys TaskMaster 600D bodes well for AMD's new Duron chip.

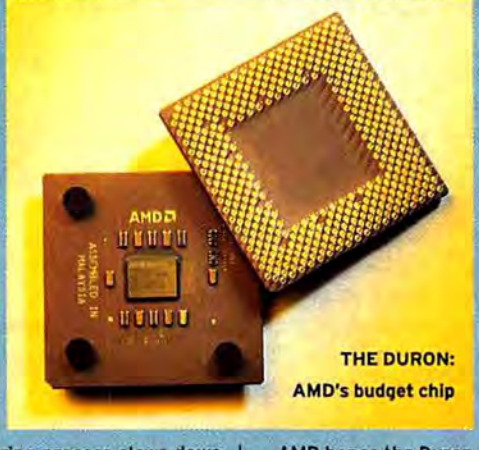
It is also interesting to note that many of the vendors are now switching to DVD-ROM drives from plain CD-ROM drives, mainly because prices of DVD-ROM drives have fallen significantly—they now cost only a few dollars more than CD-ROM drives. This means that adding a DVD-ROM drive doesn't add significantly to a PC's overall price, which is of course critical for budget systems. ▶

PHOTOGRAPH ABOVE: RICK RIZNER; PHOTOGRAPH BELOW: MARC SIMON

AMD's Duron Gives the Celeron Some Serious Competition

TECH TREND THIS MONTH WE GOT a first look at AMD's new budget CPU, the Duron, and were impressed. Installed in the Sys TaskMaster 600D, the Duron processor produced excellent numbers on our PC WorldBench 2000 tests. Running Windows 2000 Professional, the Duron scored higher than a PIII-600-based system we've tested. What makes this processor tick?

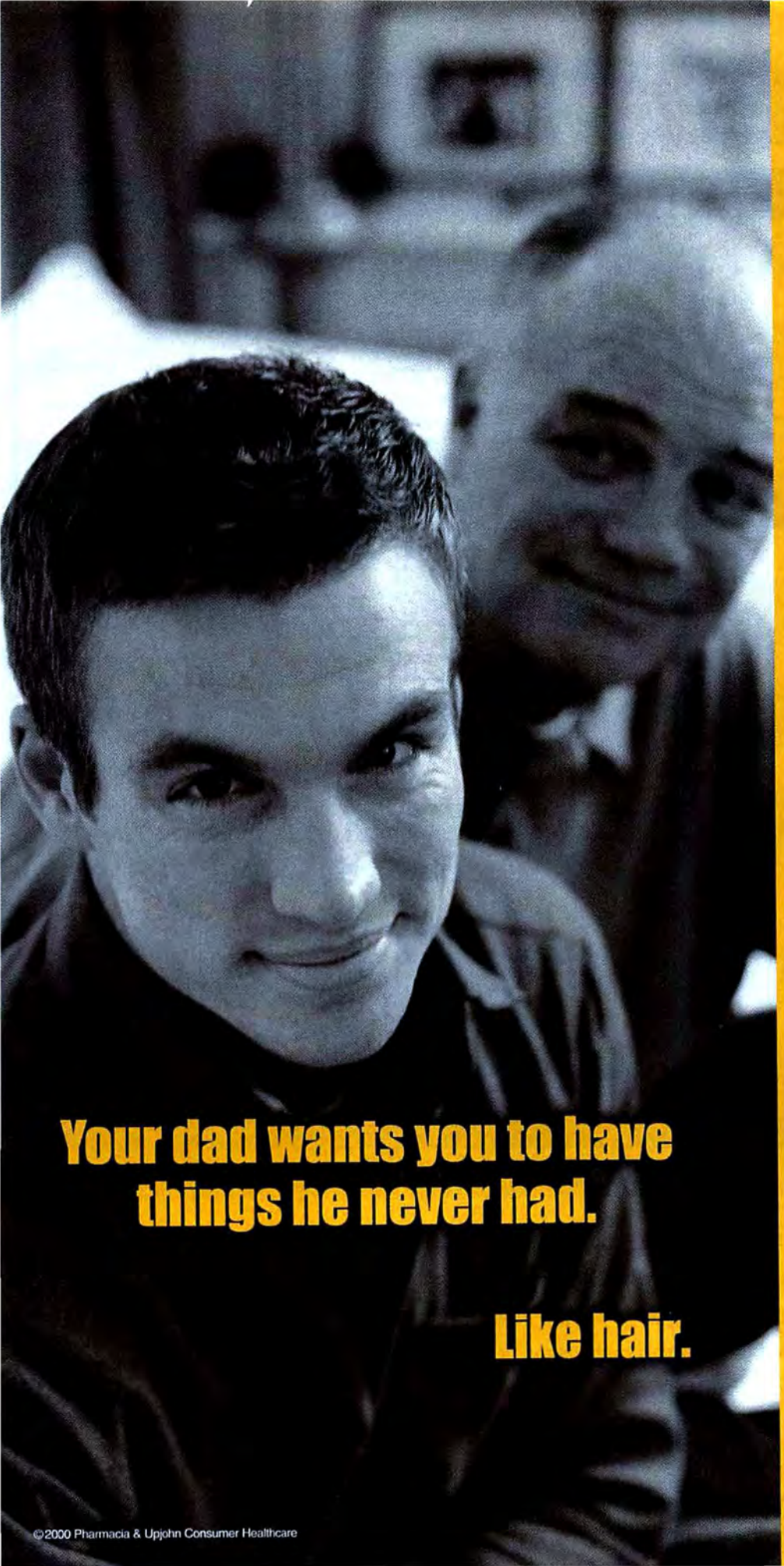
Unlike AMD's previous value processor line, the K6-2, the Duron uses an integrated Level 2 cache, meaning it's on the same piece of silicon as the processor. This design speeds up performance, since data doesn't have to move off the CPU into the cache on a separate chip, as it does in some other processors. The Duron contains only 64KB of L2 cache but uses a large 128KB of L1 cache, which doesn't have to mirror (that is, to contain exactly the same data as) the L2 cache; the mirroring process slows down some processors. The Celeron has 128KB of L2 cache and 32KB of L1 cache, for a total of 160KB—substantially less than the Duron's 192KB. The Duron's large integrated cache permits faster performance, but the real boost compared to the Celeron comes from the 200-MHz front-side system bus, which enables the Duron to deftly manage communication with system memory. The TaskMaster 600D uses 133-MHz memory, with which the Duron can communicate at the full 133-MHz speed. The Celeron's front-side bus runs at 66 MHz; that slower speed can create a serious bottleneck in system performance.



THE DURON: AMD's budget chip

AMD currently quotes an OEM price (the price it charges manufacturers who build systems using the processor) of $112 for the 600-MHz model, the same price Intel charges for the 600-MHz Celeron (after a price cut). But while the prices are the same, our early tests indicate the Duron has an edge in performance. That said, we'll have to see how the new chip performs in a wider range of systems before drawing any firm conclusions. We'll also see how the faster Durons compare with the new, faster Celeron processors that Intel has recently launched.

AMD hopes the Duron, currently available in 600-, 650-, and 700-MHz flavors, will be able to compete more successfully against Intel's processors than its K6-2 line did. "It's our first next-generation processor to compete in the value space," says Drew Prairie, a spokesperson for AMD. "It will be similar to what we did with the Athlon in the performance space."



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PC WORLD

TOP 15 NOTEBOOK PCs

	POWER NOTEBOOK: $2700 AND OVER	Month tested	★ Overall rating	Street price (7/17/00)	PC WorldBench 2000 performance score (Faster ▶)	Base configuration
1	**Dell Latitude CPx J750GT** 800/388-8542 www.dell.com	Sept 00	94	Average: $3603	Outstanding 153	**Very good:** PIII-750/600, 14.1-inch active screen, touchpad, eraserhead, 128MB of SDRAM, 18GB hard drive, Windows 2000 Pro
2	Gateway Solo 9300XL 800/846-2000 www.gateway.com	Sept 00	91	Average: $3420	Outstanding 143	**Outstanding:** Pentium III-700/550, 15.7-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 2000 Pro
3	HP OmniBook 6000 800/462-8947 www.hp.com	Sept 00	89	Inexpensive: $2799	Good 129	**Good:** Pentium III-600/500, 14.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 12GB hard drive, Windows 2000 Pro
4	IBM ThinkPad T20 800/426-7255 x4751 www.ibm.com/pc/us/thinkpad	Sept 00	89	Average: $3549	Very good 136	**Good:** Pentium III-700/550, 14.1-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
5	Micron TransPort LT 800/642-7667 www.micronpc.com	Sept 00	88	Average: $3599	Outstanding 146	**Good:** Pentium III-650/500, 13.3-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 2000 Pro
	MIDRANGE NOTEBOOK: $2000 TO $2699	Percent of overall rating ▶		Price: 14 percent	Performance: 20 percent	Base configuration: 5 percent
1	**Gateway Solo 2550LS** 800/846-2000 www.gateway.com	Sept 00	88	Inexpensive: $2049	Good 115	**Good:** Pentium III-600/500, 13.3-inch active screen, touchpad, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
2	Acer TravelMate 602TER 800/733-2237 www.acer.com/aac	Sept 00	84	Expensive: $2499	Very good 127	**Very good:** Pentium III-650/500, 13.3-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
3	Chem USA ChemBook 8400 800/866-2436 www.chemusa.com	(NEW)	83	Average: $2329	Very good 128	**Very good:** Pentium III-650/500, 14.1-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
4	Micron TransPort ZX 800/642-7667 www.micronpc.com	July 00	80	Expensive: $2499	Good 116	**Very good:** Pentium III-600/500, 14.1-inch active screen, touchpad, 64MB of SDRAM, 12GB hard drive, Windows 98 SE
5	Axis Systems Fusion 7280V 800/378-9014 www.axissys.com	Aug 00	80	Average: $2399	Very good 129	**Outstanding:** Pentium III-500, 14.1-inch active screen, touchpad, 256MB of SDRAM, 12GB hard drive, Windows 2000 Pro
	BUDGET NOTEBOOK: UNDER $2000	Percent of overall rating ▶		Price: 17 percent	Performance: 17 percent	Base configuration: 5 percent
1	**IBM ThinkPad I Series 1210** 800/426-7255 www.ibm.com/pc/us/thinkpad	(NEW)	95	Inexpensive: $1278	Very good 104	**Satisfactory:** Celeron-500, 13-inch dual-scan screen, eraserhead, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
2	Dell Latitude CPt S500ST 800/388-8542 www.dell.com	(NEW)	93	Average: $1658	Very good 109	**Good:** Celeron-500, 12.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
3	Compaq Presario 1200-XL110 800/345-1518 www.compaq.com	Sept 00	85	Average: $1499	Satisfactory 86	**Good:** AMD K6-2-475, 12.1-inch active screen, touchpad, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
4	Dell Inspiron 3800 C500 GW 800/388-8542 www.dell.com	June 00	84	Expensive: $1817	Good 101	**Good:** Celeron-500, 14.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
5	Enpower ENP-313+ 800/997-2258 www.enpower.com	Sept 00	83	Expensive: $1799	Outstanding 120	**Very good:** Pentium III-600/500, 13.3-inch active screen, touchpad, 96MB of SDRAM, 6GB hard drive, Windows 98 SE
	Best Buy	Percent of overall rating ▶		Price: 20 percent	Performance: 14 percent	Base configuration: 5 percent

[1] Unless otherwise noted, all notebooks come with a lithium ion battery.

[2] Includes computer; adapter; power cord; and floppy, DVD-ROM, or CD-ROM drive.

[3] Due to insufficient data from survey, score is based on responses to anonymous calls for tech support.

[4] Five years on CPU and main memory, three years on other parts.

THE NEWEST LIGHT laptops—those equipped with one internal bay instead of two—are hot, as this month's chart attests. By leaving these units' external floppy drives at home, you can knock nearly a pound off their carrying weight, yet enjoy the same big screens and fast processors their heavier brethren offer.

Thin-and-light models from Acer, HP, IBM, and Micron sashay down the runway and onto our list this month, while the Dell Latitude CPx J750GT's Ferrari-like performance helped it capture the power Best Buy title. IBM's ThinkPad T20, which earns fourth place on the power list this month, took the blue ribbon in our September roundup of travel notebooks with its elegant balance of weight and features. Weighing only 4.6 pounds with a travel module in its bay, the $3549 T20 includes standard notebook connections and a bigger screen—14.1

Extra features [1]	Design and ease of use	Battery life (hours:min)	Travel weight (pounds) [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Very good: single multipurpose bay, 10X-24X CD-ROM drive, PC Card modem	**Outstanding:** dual pointing devices and a smorgasbord of possible add-ins highlight flexibility	Good/ 3:15	Average/ 8.6	Good	Good/ Outstanding	24/7, toll-free	3/3
Outstanding: two multipurpose bays, 10X-24X CD-ROM drive, LS-120 drive, built-in modem, PC Card NIC	**Outstanding:** drive-in movie-size screen dominates fast SUV of desktop replacements	Good/ 3:24	Heavy/ 9.6	Good	Fair/ Fair	24/7, toll-free	3/3
Very good: single multipurpose bay, 12X-24X CD-ROM drive, built-in modem, built-in NIC	**Outstanding:** Bluetooth-capable, includes dual pointing devices, security Smart Card	Good/ 3:30	Light/ 6.8	Good	Good [3]/ Poor	24/7, toll call	3/3
Very good: single multipurpose bay, 6X DVD-ROM drive, built-in modem	**Very good:** travel ThinkPad is Bluetooth-capable, has network jack and great manual	Good/ 3:21	Light/ 6.5	Good	Good/ Fair	24/7, toll-free	3/3
Very good: single multipurpose bay, 6X DVD-ROM drive, built-in modem, built-in NIC, Microsoft Office 2000 SBE	**Satisfactory:** lightweight travel laptop can use optional USB floppy drive	Satisfactory/ 2:45	Light/ 6.1	Good	Good [3]/ Fair	24/7, toll-free	Varies [4]/3
Extra features: 5 percent	Design and ease of use: 10 percent	Battery life: 8 percent	Weight: 8 percent	Reliability: 20 percent	Support and warranty: 10 percent		
Satisfactory: 10X-24X CD-ROM drive, LS-120 drive, built-in modem	**Satisfactory:** two USB ports and built-in LS-120 drive highlight otherwise basic all-in-one	Very good/ 4:13	Average/ 8.3	Good	Fair/ Fair	24/7, toll-free	1/1
Very good: single multipurpose bay, 4X/2X/20X CD-RW drive, built-in modem, built-in NIC, MS Works 2000	**Very good:** LAN-ready lightweight with soft, quiet keyboard; CD-RW drive replaces floppy	Very good/ 4:21	Light/ 6.7	Fair	Good [3]/ Fair	24/7, toll-free	1/1
Satisfactory: 6X DVD-ROM drive, built-in modem	**Satisfactory:** lightweight, but sharp case edges and inconveniently placed ports hurt design	Good/ 3:07	Average/ 7.4	[5]	Fair [3]/ Fair	24/7, varies [4]	1/3
Good: single multipurpose bay, 6X DVD-ROM drive, built-in modem, Microsoft Office 2000 SBE	**Very good:** configurable laptop comes with soft faux-leather casing	Good/ 3:18	Average/ 7.6	Good	Good [3]/ Fair	24/7, toll-free	Varies [4]/3
Good: 4X DVD-ROM drive, PC Card modem	**Satisfactory:** two-tone all-in-one boasts handy external battery gauge and volume thumbwheel	Good/ 3:20	Average/ 8.2	[5]	Fair [3]/ Fair	24/7, toll-free	3/3
Extra features: 5 percent	Design and ease of use: 10 percent	Battery life: 8 percent	Weight: 8 percent	Reliability: 20 percent	Support and warranty: 10 percent		
Satisfactory: single multipurpose bay, 10X-24X CD-ROM drive, built-in modem, NiMH battery, Lotus SmartSuite	**Limited:** dual-scan screen a tad washed out; internal floppy drive not an option	Good/ 3:05	Light/ 6.8	Good	Good/ Fair	24/7, toll-free	1/1
Good: single multipurpose bay, 10X-24X CD-ROM drive, built-in modem	**Outstanding:** flexible; includes touchpad and eraserhead; bay can hold any of eight devices	Satisfactory/ 2:02	Average/ 7.4	Good	Good/ Outstanding	24/7, toll-free	1/1
Satisfactory: 12X-24X CD-ROM drive, built-in modem, Microsoft Word 2000	**Satisfactory:** thickish portable has buttons to launch Web sites but no docking connection	Good/ 3:04	Average/ 8.0	Fair	Fair/ Fair	24/7, toll-free	1/1
Good: single multipurpose bay, 10X-24X CD-ROM drive, built-in modem, Microsoft Works 2000	**Outstanding:** thinnish, flexible business laptop comes in different colors	Poor/ 1:58	Average/ 7.8	Good	Good/ Outstanding	24/7, toll-free	3/3
Satisfactory: 12X-24X CD-ROM drive, PC Card modem	**Limited:** boxy; reasonable weight for an all-in-one; keyboard could be better designed	Good/ 3:39	Average/ 7.1	[5]	Poor [3]/ Fair	11/6, toll-free	1/1
Extra features: 5 percent	Design and ease of use: 10 percent	Battery life: 8 percent	Weight: 8 percent	Reliability: 20 percent	Support and warranty: 10 percent		

[5] Insufficient data to give a rating.

[4] Support toll-free from 8:30 a.m. to 5:30 p.m.; toll call at other times.

inches—for its case size than any other lightweight portable we've seen.

The IBM ThinkPad I Series 1210 captured our budget Best Buy with a low $1278 price tag. If Dell's top-of-the-line, $3603 Latitude CPx J750GT is out of your class, look to the number two budget notebook, the $1658 Latitude CPt S500ST. It offers the same basic design, but a less powerful configuration—and unfortunately, poorer battery life.

Contributing Editor Carla Thornton regularly covers notebooks for PC World.

FULL REVIEWS ONLINE

online

FOR DETAILED write-ups of all the new notebooks that were tested this month, visit PCWorld.com (www.pcworld.com/top400).

I THINK I CAN: IBM's ThinkPad I Series 1210 costs just $1278.

PHOTOGRAPH: RICK RIZNER

PC WORLD

TOP 15 HOME PCs

	POWER SYSTEM: $2000 AND OVER	Month tested	★ Overall rating	Street price (7/14/00)	PC WorldBench 2000 performance score [1] (Faster)	Base configuration [2]
1	Dell Dimension XPS B866r 800/388-8542 www.dell.com	Aug 00	93	Expensive: $2607	Outstanding 158	**Very good:** Pentium III-866, 128MB of RDRAM, 256KB L2 cache, 30GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
2	HP Pavilion 9600A-850 800/752-0900 www.hp-at-home.com	Sept 00	87	Inexpensive: $2115	Very good 152	**Very good:** Athlon-850, 128MB of SDRAM, 512KB L2 cache, 40.8GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
3	HP Pavilion 8700I-933 800/752-0900 www.hp-at-home.com	NEW	86	Average: $2367	Very good 154	**Good:** Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 40.8GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
4	ABS Performance 1 800/876-8088 www.buyabs.com	NEW	83	Expensive: $2599	Very good 156	**Outstanding:** Pentium III-866, 256MB of SDRAM, 256KB L2 cache, 40GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
5	Polywell Poly 800 K7-900 800/999-1278 www.polywell.com	Aug 00	78	Average: $2399	Good 148	**Very good:** Athlon-900, 256MB of SDRAM, 512KB L2 cache, 27.3GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
	MIDRANGE SYSTEM: $1200 TO $1999	Percent of overall rating ▶		Price: 10 percent	Performance: 20 percent	Base configuration: 10 percent
1	Dell Dimension 4100 800/388-8542 www.dell.com	NEW	98	Average: $1639	Outstanding 149	**Good:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
2	Micron Millennia Max 733 800/642-7667 www.micronpc.com	July 00	91	Expensive: $1965	Outstanding 150	**Very good:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20.5GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
3	HP Pavilion 9600A-700 800/752-0900 www.hp-at-home.com	Sept 00	89	Average: $1699	Very good 141	**Good:** Athlon-700, 128MB of SDRAM, 512KB L2 cache, 20.4GB hard drive, minitower, 17-inch monitor, Windows 98 SE
4	NuTrend Athlon Special 2 888/482-6678 www.nutrend.com	NEW	87	Inexpensive: $1299	Very good 147	**Good:** Athlon-850, 128MB of SDRAM, 512KB L2 cache, 20GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
5	Tiny Millennium Value Select 800 877/417-4178 www.tiny.com	NEW	83	Inexpensive: $1399	Good 136	**Good:** Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
	BUDGET SYSTEM: UNDER $1200	Percent of overall rating ▶		Price: 15 percent	Performance: 15 percent	Base configuration: 10 percent
1	Polywell Poly 700KD 800/999-1278 www.polywell.com	NEW	89	Expensive: $1199	Outstanding 131	**Very good:** Duron-700, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
2	NuTrend Duron Power 2 888/482-6678 www.nutrend.com	Oct 00	84	Average: $1099	Outstanding 133	**Very good:** Duron-700, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, minitower, 17-inch monitor, Windows 98 SE
3	NuTrend Maestro GE 888/482-6678 www.nutrend.com	May 00	81	Inexpensive: $879	Good 100	**Good:** Celeron-500, 64MB of SDRAM, 128KB L2 cache, 8GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
4	Compaq Presario EZ2200 800/345-1518 www.compaq.com	May 00	80	Average: $1098	Satisfactory 97	**Good:** Celeron-500, 64MB of SDRAM, 128KB L2 cache, 17.3GB hard drive, minitower, 17-inch monitor, Windows 98 SE
5	IDot.com Explora A450 888/388-4368 www.idot.com	July 00	77	Very inexpensive: $688	Satisfactory 86	**Good:** K6-2-450, 64MB of SDRAM, 512KB L2 cache, 8.4GB hard drive, minitower, 17-inch monitor, Windows 98 SE
	Best Buy	Percent of overall rating ▶		Price: 20 percent	Performance: 10 percent	Base configuration: 10 percent

[1] A system's performance word score is relative to the scores earned by other PCs in the same price category running the same operating system. For more details, see "Your Guide to the Top 100" on page 199.

HOME IS WHERE THE POWER IS: Dell's Dimension XPS B866r fends off new systems from Hewlett-Packard and ABS to remain our number one power system. The Dimension's chart-best PC WorldBench 2000 score of 158 is likely a product of its quick PIII-866 processor rather than its expensive RDRAM—*PC World* tests have shown RDRAM doesn't have a substantial effect on speed at current processor clock ratings. The new ABS Performance 1 is $8 less than the Dell and two points slower on our PC WorldBench 2000.

Our number three power system, HP's Pavilion 8700I-933, is the first home PC we've seen with Intel's 933-MHz Pentium III. Despite its higher clock speed, its PC WorldBench score of 154 is just two points better than the Pavilion 9600A-850.

Dell's new Dimension 4100 debuts at the top of the midrange list. It's the first

Extra features	Setup/ ease of use	Graphics	Reliability/ support	Comments
Very good: NVidia GeForce 256 graphics board with 64MB of DDR SDRAM, 12X DVD-ROM drive, V.90 modem	Outstanding/ Good	Very good	Outstanding/ Good	**PRO:** Fastest PC on the chart, solid graphics performance, $272 price drop. **CON:** Still a pricey system.
Outstanding: ASUS AGP-V7700 graphics board with 32MB of DDR SGRAM, 10X DVD-ROM drive, 8X/4X/32X CD-RW drive, network card, V.90 modem	Good/ Very good	Very good	Fair/ Fair	**PRO:** Top-notch performance, comes with DVD-ROM and CD-RW drives and a network card. **CON:** A cramped interior makes expansion difficult.
Very good: ASUS-V7700 graphics board with 32MB of DDR SGRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, network card, V.90 modem	Good/ Good	Very good	Fair/ Fair	**PRO:** Sprightly system, good for 3D gaming. **CON:** Weak sound system and smallish monitor for a PC at this price. Cramped interior is difficult to work in.
Very good: Leadtek WinFast GeForce 2 GTS graphics board with 32MB of DDR SGRAM, 10X DVD-ROM drive, V.90 modem	Good/ Satisfactory	Good	[3]/Fair [4]	**PRO:** Superb sound thanks to its five-speaker system; easy-access case. **CON:** Small text looked sharp at 1024 by 768, but blurred at 1280 by 1024.
Good: Guillemot 3D Prophet graphics board with 32MB of SDRAM, 8X/4X/32X CD-RW drive, V.90 modem	Satisfactory/ Satisfactory	Good	[3]/Fair [4]	**PRO:** Smooth, fast game play; lots of expansion room. **CON:** Muffled sound, small user manual.
Extra features: 10 percent	Setup/ease of use: 5 percent	Graphics: 15 percent	R & S: 30 percent	
Good: NVidia GeForce2 GTS graphics board with 32MB of DDR SDRAM, 12X DVD-ROM drive, V.90 modem	Outstanding/ Good	Good	Outstanding/ Good	**PRO:** Moderate price and robust performance. Good-looking graphics paired with a quality monitor. **CON:** Power supply hinders access to drive bays.
Very good: NVidia NV990 graphics board with 32MB of DDR SGRAM, 12X DVD-ROM drive, 8X/4X/24X CD-RW drive, V.90 modem	Outstanding/ Good	Very good	Good/ Fair	**PRO:** Strong graphics performer with plenty of room for upgrades. **CON:** DVD movies are too dark, player lacks brightness settings.
Outstanding: ASUS AGP-V6800 graphics board with 32MB of DDR SGRAM, 10X DVD-ROM drive, 8X/4X/32X CD-RW drive, network card, V.90 modem	Outstanding/ Very good	Very good	Fair/ Fair	**PRO:** Capable gaming machine that's easy to set up. **CON:** Claustrophobic interior inhibits expansion. Clumsy plastic door covers DVD-ROM drive.
Good: ATI Xpert 128 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem	Outstanding/ Satisfactory	Good	[3]/Fair [4]	**PRO:** Speedy system for the price. Plenty of room for expansion. **CON:** DVD movie playback was dark and sometimes jumpy. Text appeared blurry.
Good: NVidia Riva TNT2 M64 graphics board with 32MB of SDRAM, 8X DVD-ROM drive, V.90 modem	Good/ Good	Good	[3]	**PRO:** Monitor displays rich colors and sharp text; clear setup documentation. **CON:** Scratchy sound, especially in bass range.
Extra features: 10 percent	Setup/ease of use: 10 percent	Graphics: 10 percent	R & S: 30 percent	
Good: Micro-Star 6330 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem	Very good/ Outstanding	Good	[3]/Fair [4]	**PRO:** Surprising power, ample expansion room. **CON:** Speakers sound a bit muddy; game play at high resolution a bit choppy.
Good: minitower case, Leadtek WinFast TNT2 M64 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem	Good/ Good	Satisfactory	[3]/Fair [4]	**PRO:** Fast for the money; strong, sturdy case. **CON:** Cables hinder access to interior components.
Satisfactory: ATI Xpert 128 graphics board with 8MB of SDRAM, 40X-52X CD-ROM drive, V.90 modem	Good/ Good	Satisfactory	[3]/Fair [4]	**PRO:** Nice monitor, easy expandability in an accessible case. **CON:** Somewhat slow for its CPU class, flimsy keyboard.
Good: integrated Intel 810 graphics with UMA, 17X-40X CD-ROM drive, 4X/4X/24X CD-RW drive, V.90 modem	Very good/ Very good	Satisfactory	Poor/ Fair	**PRO:** Good storage with a 17GB hard drive and CD-RW drive. $100 price drop. **CON:** Weak gaming performance. Vertically mounted CD drives hard to load.
Satisfactory: integrated Trident Cyberblade i7 graphics with 8MB of SDRAM, 20X-40X CD-ROM drive, V.90 modem	Satisfactory/ Very good	Limited	[3]/Fair [4]	**PRO:** Bargain-basement price, nice 17-inch monitor. **CON:** Slowest system on our chart. Low-end integrated graphics, chintzy speakers.
Extra features: 10 percent	Setup/ease of use: 10 percent	Graphics: 10 percent	R & S: 30 percent	

[2] We define vertical cases as towers (taller than 20 inches), midsize towers (15.5 to 20 inches), or minitowers (shorter than 15.5 inches); and horizontal cases as desktops (5 inches or taller) or compacts (shorter than 5 inches).

[3] Insufficient data to give a rating.

[4] Due to insufficient data from survey, score is based on responses to anonymous calls for tech support.

Dimension to adopt Intel's new 815E chip set, which accommodates faster PC133 SDRAM. The 4100 series will eventually replace Dimension XPS-T models. Meanwhile, the fourth-ranked NuTrend Athlon Special 2 is nearly as fast, for $340 less.

More changes will come as vendors adopt the 815E chip set, faster Celeron chips, or AMD's new budget processor, the Duron. And stay tuned for Microsoft's new Windows Millennium Edition OS.

Kirk Steers is a contributing editor for PC World.

FULL REVIEWS ONLINE

online

FOR WRITE-UPS on all the systems we reviewed this month, visit PCWorld.com (www.pcworld.com/top400/newhomepcs).

STILL A WINNER: Dell's blazingly quick Dimension XPS B866r remains on top of the power list for another month.

PHOTOGRAPH: RICK RIZNER

New Diskeeper® 5.0 automatic disk defragmenter for Windows® 95/98/NT®/2000 is proven in test labs and mission-critical enterprises to provide average performance gains of 56%-81%. Diskeeper's "Set It and Forget It"® scheduling can save your network thousands if not millions of dollars by lowering total cost of ownership. IDC reports, ***"Corporations are losing as much as $50 billion per year as a result of not defragmenting every server and workstation on the network."*** —Steve Widen, IDC Analyst.

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PC WORLD

TOP 10 PRINTERS

	COLOR LASER PRINTER	Street price [1] (7/10/00)	Overall rating	Speed for plain text/full-page graphics (ppm)	Print quality for text/color graphics	Comments
1	Minolta-QMS Magicolor 2 DeskLaser 800/523-2696 www.minolta-qms.com	$1274	84	7.8/1.0	Very good/ Very good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 8MB of RAM, 600-by-600-dpi maximum resolution, 250 pages input and output. **SUMMARY:** Not only is it the least expensive model on the chart, but this well-designed Minolta-QMS color laser also is relatively speedy at printing text and produces high print quality across the board.
2	Brother HL-2400CeN 800/276-7746 www.brother.com	$1999	83	9.4/1.1	Very good/ Good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 32MB of RAM, 2400-by-600-dpi maximum resolution, 250 pages input and output. **SUMMARY:** The second speediest on the chart at printing text, the HL-2400CeN also creates crisp text and rich, detailed graphics for a low price. Its biggest negative is a confusing control panel.
3	Lexmark Optra C710N (NEW) 800/539-6275 www.lexmark.com	$2199	83	9.5/1.6	Very good/ Excellent	**FEATURES:** Rated 16 ppm monochrome/3 ppm color. Standard 32MB of RAM, 1200-by-1200-dpi maximum resolution, 300 pages input, 250 output. **SUMMARY:** Outstanding color quality and the fastest text printing on the chart earn this reasonably priced Lexmark a high debut spot. Toner cartridges could be a little easier to install, but that's a minor quibble.
4	Minolta-QMS Magicolor 6100 DeskLaser (NEW) 800/523-2696 www.minolta-qms.com	$2804	83	5.6/0.9	Very good/ Good	**FEATURES:** Rated 24 ppm monochrome/6 ppm color. Standard 32MB of RAM, 1200-by-600-dpi maximum resolution, 250 pages input and output. **SUMMARY:** Strong print quality, an intuitive design, and top-notch support bring the entry-level version of the 6100N onto the chart. The price is a bit higher than average, however, and performance could be better.
5	Lexmark Optra Color 1200n 800/539-6275 www.lexmark.com	$4589	82	7.8/2.1	Good/ Adequate	**FEATURES:** Rated 12 ppm on both monochrome and color. Standard 32MB of RAM, 1200-by-1200-dpi maximum resolution, 350 pages input, 250 output. **SUMMARY:** Lexmark's LED model performs well, printing graphics especially fast. It also offers a wealth of features—including the capability to produce tabloid-size pages (11 by 17 inches)—for a steep price.
6	Tektronix Phaser 750N by Xerox 877/362-6567 www.xerox.com/officeprinting	$2295	82	7.3/1.4	Good/ Very good	**FEATURES:** Rated 16 ppm monochrome/5 ppm color. Standard 64MB of RAM, 1200-by-600-dpi maximum resolution, 350 pages input, 500 output. **SUMMARY:** The Phaser 750N offers middle-of-the-road performance but strong print quality. Added benefits include a user-friendly control panel and a comprehensive online manual.
7	NEC SuperScript 4650N 800/632-4636 www.nectech.com	$2699	81	8.9/1.2	Very good/ Very good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 96MB of RAM, 1200-by-1200-dpi maximum resolution, 250 pages input and output. **SUMMARY:** NEC has discontinued its venerable line of SuperScript lasers, opening the door for its newer SS 4650N. This model boasts fast text speed and strong print quality, plus the ability to print from its own IP address.
8	Tektronix Phaser 850N by Xerox 877/362-6567 www.xerox.com/officeprinting	$2495	79	6.8/2.4	Very good/ Adequate	**FEATURES:** Rated 8 ppm on both monochrome and color. Standard 32MB of RAM, 450-by-800-dpi maximum resolution, 200 pages input, 500 output. **SUMMARY:** Using heated wax instead of a laser, the Phaser 850N prints graphics more quickly than any other model here. Those fast-printing images are grainy, however, and lack detail.
9	IBM Infoprint Color 8 800/358-6661 www.ibm.com/printers	$2872	79	5.5/1.9	Very good/ Good	**FEATURES:** Rated 8 ppm on both monochrome and color. Standard 32MB of RAM, 600-by-600-dpi maximum resolution, 500 pages input, 250 output. **SUMMARY:** Strong graphics speed and a reasonable price keep the Infoprint Color 8 on the chart. Text and graphics are clear and detailed, but text speed is too slow for busy offices.
10	Kyocera Mita Ci1100 800/222-6482 www.kyoceramita.com	$2649	78	7.0/1.2	Very good/ Good	**FEATURES:** Rated 16 ppm monochrome/4 ppm color. Standard 48MB of RAM, 1200-by-1200-dpi maximum resolution, 350 pages input, 500 output. **SUMMARY:** Dark, readable text and a good array of features round out this reasonably priced model. Unfortunately, the Ci1100's weak documentation and confusing control panel can be frustrating.

Best Buy

TEST PC WORLD CENTER

HOW WE TEST The overall rating for color laser printers is based on print quality (25 percent), price (25 percent), features (15 percent), ease of use (15 percent), speed (10 percent), and service and support (10 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

[1] All street prices include a network card.

THE EXCELLENT COLOR quality of Lexmark's new laser, the Optra C710N, launches it into this month's number three spot. It's also speedy and reasonably priced at $2199. Nearly as appealing is the number four debut, Minolta-QMS's $2804 Magicolor 6100 DeskLaser. NEC discontinued a few of its older lasers, bringing the SuperScript 4650N in at number seven, and Brother's new HL-3400CN just misses the Top 10. ▶

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PC WORLD

TOP 10 MONITORS

	21-INCH/22-INCH MONITOR	Month tested	Street price (7/10/00)	Overall rating	Quality of text/graphics	Comments
1	Cornerstone Technology C1025 800/562-2552 www.monitorsdirect.com	June 00	$595	87	Very good/ Good	**FEATURES:** 19.7-inch viewable area, .26mm dot pitch tube, up to 88-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 24-hour weekday toll-free support. **SUMMARY:** Dirt-cheap price and crisp spreadsheet text helps lift this model into top spot. Its higher-priced sibling, the C1001, offers slightly better graphics quality.
2	Compaq P1100 800/345-1518 www.compaq.com/monitors	NEW	$1099	86	Very good/ Very good	**FEATURES:** 19.7-inch viewable area, .24mm stripe pitch FD Trinitron tube,[3] up to 88-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Lush colors on Web pages and photos, clean-looking text, and advanced, easily adjustable controls justify high price. Good choice for corporate graphics pros.
3	CTX PR1400F 877/857-7846 www.ctxintl.com	NEW	$799	82	Very good/ Good	**FEATURES:** 19.9-inch viewable area, .24mm–.25mm stripe pitch FD Trinitron tube,[3] up to 115-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 12-hour daily toll-free support. **SUMMARY:** Crisp, legible text and logically laid out on-screen controls compensate for serviceable graphics scores and limited tech support hours.
4	Samsung SyncMaster 1100p Plus 800/726-7864 www.samsungmonitor.com	June 00	$839	81	Very good/ Good	**FEATURES:** 20-inch viewable area, .25mm dot pitch tube, up to 107-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 24-hour daily toll-free support. **SUMMARY:** Sharp text on word processing documents and spreadsheets, but colors could be livelier. BNC connectors,[4] intuitive on-screen controls, and round-the-clock tech support give this unit an edge.
5	ViewSonic PF815 800/888-8583 www.viewsonic.com	NEW	$899	79	Very good/ Good	**FEATURES:** 20-inch viewable area, .25mm–.27mm stripe pitch Diamondtron NF tube,[3] up to 107-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Offers sharp text, BNC connectors,[4] and a wide range of intuitive controls. A sibling, the P815, costs $50 less, but its text quality isn't as sharp.
6	Optiquest Q115 800/888-8583 www.optiquest.com	Jun 00	$745	79	Good/ Good	**FEATURES:** 19.7-inch viewable area, .26mm dot pitch tube, up to 88-Hz refresh rate,[1] Plug and Play ready,[2] TCO'92 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Remains on chart thanks to below-average competitive price. Not the best choice for professional applications but suitable for word processing and home-office tasks.
7	Sony CPD-G500 800/352-7669 www.sony.com/displays	Dec 99	$1199	78	Very good/ Good	**FEATURES:** 19.6-inch viewable area, .24mm stripe pitch FD Trinitron tube,[3] up to 97-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** Relatively weak graphics scores for this price point, but crisp, dark text, well-organized on-screen controls, and generous tech support help model tied for most expensive on chart.
8	KDS VS-21e 800/237-9988 www.kdsusa.com	Dec 99	$699	76	Good/ Good	**FEATURES:** 19.9-inch viewable area, .26mm dot pitch tube, up to 111-Hz refresh rate,[1] Plug and Play ready,[2] TCO'92 compliant, three-year warranty, 9-hour weekday toll-free support. **SUMMARY:** Competitive price helps this model stay afloat. Text looked fuzzy at small point sizes, and colors could be sharper. Adequate image quality overall, but tech support hours are the thinnest on the chart.
9	NEC MultiSync FE1250 888/632-6487 www.necmitsubishi.com	NEW	$899	73	Good/ Satisfactory	**FEATURES:** 20.2-inch viewable area, .25mm–.27mm stripe pitch Diamondtron NF tube,[3] up to 89-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** 22-inch model renders reasonably sharp text on word processing documents and spreadsheets, but graphics quality trails that of others.
10	Mitsubishi Diamond Pro 2040u 888/632-6487 www.necmitsubishi.com	June 00	$1199	73	Very good/ Satisfactory	**FEATURES:** 20.2-inch viewable area, .24mm stripe pitch Diamondtron NF tube,[3] up to 112-Hz refresh rate,[1] Plug and Play ready,[2] TCO'99 compliant, three-year warranty, 24-hour toll-free support. **SUMMARY:** 22-inch model renders crisp lettering on word processing documents and spreadsheets. Pricey, and colors lack gusto, but the large viewable area and a convenient USB hub are pluses.

Best Buy For reviews of products that didn't make the chart, visit www.pcworld.com/t10monitors.

TEST PC WORLD CENTER **HOW WE TEST** Ten judges rate a monitor's text and graphics quality. We evaluate each unit on how well it displays typical business letters, a newsletter, spreadsheets, Web pages, and scanned images. The overall rating is based on text and graphics quality (25 percent each), price (25 percent), features and ease of use (20 percent), and service and support (5 percent). The best possible overall rating is 100. Data based on tests designed and conducted by PC World Test Center. All rights reserved. [1] Highest refresh rate at 1280 by 1024 resolution. [2] Plug and Play monitors and graphics cards can communicate bidirectionally. However, Windows 95 does not fully utilize monitor Plug and Play. [3] Uses an aperture grille whose parallel wires near the sides of the screen are strung farther apart than those at the middle. [4] Specialized connector used with some high-end graphics cards.

FOUR NEW MODELS debut this month. The Compaq P1100 offers the best overall image quality. Units from CTX, NEC, and ViewSonic come with a flat-screen CRT, but the CTX PR1400F offers the best combination of price and performance. Meanwhile, Cornerstone Technology's C1025 again distinguishes itself with a rock-bottom price of $595. An HP monitor we tested failed to make the chart. Next month we review new 17-inchers. ▶

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PC WORLD

TOP 10 GRAPHICS BOARDS

	AGP BOARD	Month tested	Street price (8/5/00)	Overall rating	Mixed-media business rating	3D games rating	Features rating	Comments
1	Matrox Millennium G400 Max 800/361-1408 www.matrox.com/mga	Apr 00	$209	97	Excellent	Very good	Very good	**FEATURES:** 4X AGP, Matrox G400 Max chip, 32MB of SGRAM, 360-MHz RAMDAC, TV-out, two VGA ports, bundled Micrografx Picture Publisher and Simply 3D, plus 3D game—Rage Software's Expendable. **SUMMARY:** Solid speed and dual-display support keep card on top. Matrox's $299 Marvel G400-TV offers TV tuning.
2	Diamond Viper II 800/468-5846 www.s3.com	June 00	$179	96	Very good	Very good	Good	**FEATURES:** 4X AGP, S3 Savage 2000 chip, 32MB of SDRAM, 350-MHz RAMDAC, TV-out, bundled 3D game—Acclaim's TrickStyle. **SUMMARY:** Renders excellent performance in Unreal Tournament. For the cost conscious, Diamond's $99 Stealth III S540 Xtreme is a good value.
3	Cardexpert GeForce 256 DDR 800/539-2273 www.gainward.com	June 00	$230	91	Excellent	Excellent	Good	**FEATURES:** 4X AGP, NVidia GeForce 256 chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, TV-out, bundled 3D games—Psygnosis's Drakan and Rollcage. **SUMMARY:** Speedy gaming board looks good in Unreal Tournament and Quake 3. Still cheaper than most of its DDR competition.
4	Asus AGP-V6600 Deluxe 510/739-3777 www.asus.com	Apr 00	$189	90	Excellent	Very good	Excellent	**FEATURES:** 4X AGP, NVidia GeForce 256 chip, 32MB of SGRAM, 350-MHz RAMDAC, video capture, TV-out, 3D glasses, Ulead Video Studio, bundled 3D games—Psygnosis's Drakan and Rollcage. **SUMMARY:** Pleasing performer loaded with video extras; The AGP-7700 ($319) performs better in Quake 3.
5	Leadtek WinFast GeForce 256 DDR 888/532-3835 www.leadtek.com	May 00	$249	90	Excellent	Excellent	Very good	**FEATURES:** 4X AGP, NVidia GeForce 256 chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, TV-out, Asymetrix 3D/FX and Digital Video Producer, bundled color-calibration tools. **SUMMARY:** Costs less than most others with DDR memory and renders fine lighting effects in Quake 3.
6	ATI Rage Fury Pro 905/882-2600 www.ati.com	Feb 00	$139	88	Good	Good	Very good	**FEATURES:** 4X AGP, ATI Rage 128 Pro chip, 32MB of SDRAM, 350-MHz RAMDAC, TV-out, video capture, bundled 3D games—Activision's Heavy Gear 2 and GT Interactive's Need for Speed IV. **SUMMARY:** Inexpensive board performs impressively in every game but Quake 3 and is a good choice for casual gamers.
7	ELSA Gladiac 800/272-3572 www.elsa.com	Aug 00	$329	84	Excellent	Excellent	Very good	**FEATURES:** 4X AGP, NVidia GeForce2 GTS chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, two bundled 3D games. **SUMMARY:** The latest NVidia chip set helps this pricey card claim second place in 3D performance. Lighting effects look good in Quake 3. Comes with two free games, available online.
8	Creative Labs 3D Blaster Annihilator 2 800/998-1000 www.creativelabs.com	Sept 00	$300	84	Very good	Excellent	Very good	**FEATURES:** 4X AGP, NVidia GeForce2 GTS chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, bundled color-calibration tools. **SUMMARY:** Has high-powered 3D performance and carries a reasonable price for a board equipped with NVidia's latest chip set. Sky effects look blotchy in Quake 3, as with most GeForce2 cards.
9	3dfx Voodoo5 5500 800/234-4334 www.3dfx.com	Sept 00	$299	84	Very good	Very good	Very good	**FEATURES:** 4X AGP, 3dfx VSA-100 chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, bundled color-calibration tools. **SUMMARY:** This eagerly awaited card pulled in slightly lower 3D performance than cards with the GeForce2 GTS chip, but it earned the highest score in Unreal Tournament.
10	ATI All in Wonder 128 Pro 905/882-2600 www.ati.com	July 00	$249	84	Very good	Very good	Excellent	**FEATURES:** 4X AGP, Rage 128 Pro GL chip, 32MB of SDRAM, 250-MHz RAMDAC, Ulead Video Studio 4.0, bundled 3D games—Activision's Heavy Gear 2 and GT Interactive's Need for Speed IV. **SUMMARY:** $50 price cut helps ease this model onto the chart. Good choice for video editing, though gaming performance suffers.

Best Buy For reviews of other new graphics boards that we tested this month, visit www.pcworld.com/t10graphics.

TEST PC WORLD CENTER **HOW WE TEST** We test boards under Windows 98. Business tests include PC WorldBench 98. Our 3D-gaming score is based on four games, each evaluated on frame rate and image quality. We test AGP boards in a Dell Dimension XPS T600 with a Pentium III-600 CPU and 128MB of RAM. Overall AGP rating is based on performance (42.5 percent), features (27.5 percent), price (20 percent), and support policies (10 percent). For all scores, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

NEITHER OF THE two new boards this month earned a spot on the chart. The ATI Radeon, with 64MB of DDR SGRAM, came closer to chartdom, but a high, $399 price and lackluster performance in 3D games kept it off. MSI's $269 StarForce 815 is inexpensive for a board with an NVidia GeForce2 GTS chip, but it lacks video features that others include. The Matrox Millennium G400 MAX and Diamond's Viper II hang tight to the top two spots. ▶

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PC WORLD

TOP 10 CD-RW DRIVES

	CD-RW DRIVE	Street price (7/26/00)	Overall rating	Performance/ support policies	CD-R write speed for 430MB/CD-RW write speed for 100MB (min:sec)	Comments
1	Plextor PlexWriter 12/10/32 (NEW) 800/886-3935 www.plextor.com	$275	85	Excellent/ Very good	5:14/1:32	**FEATURES:** 12X/10X/32X,[1] IDE, internal, 2MB buffer, Adaptec Easy CD Creator 4.02 and DirectCD 3.01, one-year warranty, 11-hour weekday toll-free support. **SUMMARY:** Plextor's new drive supplants its PlexWriter 8/4/32 sibling despite a $75 price premium. State-of-the-art CD-R and CD-RW write speeds make this drive the fastest on the chart.
2	Sony Spressa Professional CRX140E/CH2 800/352-7669 www.sony.com	$200	85	Very good/ Excellent	7:04/3:24	**FEATURES:** 8X/4X/32X,[1] IDE, internal, 4MB buffer, Sony CD Extreme 1.1, Sony AbCD 1.3, one-year warranty, 24-hour weekday toll-free support. **SUMMARY:** Sony's CD Extreme and AbCD provide excellent mastering and packet-writing packages. Sony's SCSI version, the CRX140S/C offers virtually identical performance.
3	Plextor PlexWriter 8/4/32 800/886-3935 www.plextor.com	$200	85	Very good/ Very good	7:06/3:43	**FEATURES:** 8X/4X/32X,[1] IDE, internal, 4MB buffer, Adaptec Easy CD Creator 3.5c and DirectCD 2.5b, one-year warranty, 11-hour weekday toll-free support. **SUMMARY:** This unit offers great performance and features at a bargain price. It extracts digital audio quickly, and its AudioFS drivers allow drag-and-drop extraction of CD audio tracks.
4	Yamaha CRW8824EZ 888/926-2426 www.yamaha.com	$249	84	Very good/ Very good	7:14/1:57	**FEATURES:** 8X/8X/24X,[1] IDE, internal, 2MB buffer, Adaptec Easy CD Creator 4.02c, DirectCD 3.01c, and Toast 4.1; Adobe PageMill 3 and PhotoDeluxe BE 1.1; MusicMatch 5.1, one-year warranty, 12-hour weekday toll-free support. **SUMMARY:** Compared to an 8X/4X/32X drive, this unit cuts CD-RW write time in half, but its 24X read performance is slow.
5	Hewlett-Packard CD-Writer Plus 9100i 970/635-1500 www.hpcdwriter.com	$249	83	Very good/ Good	7:10/3:25	**FEATURES:** 8X/4X/32X,[1] IDE, internal, 4MB buffer, Adaptec Easy CD Creator 3.5 and DirectCD 3.0, one-year warranty, 12-hour weekday toll support. **SUMMARY:** Quick 8X CD-R and 4X CD-RW performance, plus easy installation and lots of software. HP's 9110i model has identical hardware but a software bundle better suited for writing music.
6	LG Electronics CED-8080B 800/243-0000 www.lgeus.com	$185	81	Very good/ Very good	7:12/3:41	**FEATURES:** 8X/4X/32X,[1] IDE, internal, 2MB buffer, Adaptec Easy CD Creator 4.02 and DirectCD 3.01, one-year warranty, 12-hour weekday toll-free support. **SUMMARY:** Sturdy design helps this inexpensive drive work quietly. Read and write times were average, but overwrite times ran almost three times longer than for some drives we tested.
7	Ricoh MediaMaster MP7080A 877/742-6479 www.ricohdms.com	$239	81	Very good/ Excellent	7:11/3:28	**FEATURES:** 8X/4X/32X,[1] IDE, internal, 4MB buffer, Adaptec Easy CD Creator 4 and DirectCD 3.0, one-year warranty, 14-hour weekday toll-free support. **SUMMARY:** This affordable drive comes with around-the-clock tech support. The unit excelled in our CD-RW overwrite tests and showed solid overall performance.
8	Creative Labs CD-RW Blaster 8432 800/998-1000 www.creative.com	$220	80	Very good/ Good	7:13/3:27	**FEATURES:** 8X/4X/32X,[1] IDE, internal, 2MB buffer, Nero 4, Prassi AbCD 1.3.3, one-year warranty, 14-hour weekday toll support. **SUMMARY:** Though slower than some new drives, this unit provided steady performance with Direct Memory Access (DMA) enabled. Unfortunately, unlike most 8X drives we've seen, this unit has a 2MB buffer, not 4MB.
9	Hewlett-Packard CD-Writer Plus 9310i 970/635-1500 www.hpcdwriter.com	$249	80	Very good/ Good	5:51/3:23	**FEATURES:** 10X/4X/32X,[1] IDE, internal, 4MB buffer, Adaptec Easy CD Creator 3.5 and DirectCD 3.0, one-year warranty, 12-hour weekday toll support. **SUMMARY:** It burned discs quickly on both our CD-R and CD-RW tests. However, the 9310i's read speed was the lowest we've seen from a 32X-rated drive—slower than some 24X-rated drives.
10	Ricoh MediaMaster MP9060A 877/742-6479 www.ricohdms.com	$299	80	Good/ Good	9:17/3:31	**FEATURES:** 6X/4X/24X,[1] IDE, internal, 2MB buffer, Adaptec Easy CD Creator 4 and DirectCD 3.0, Software CineMaster, one-year warranty, 14-hour weekday toll-free support. **SUMMARY:** For a premium, this drive delivers DVD playback along with its CD-RW capabilities. Performance on our CD-R write test, however, was slower than the norm.

Best Buy

For capsule reviews of new CD-RW drives, visit www.pcworld.com/reviews/cd-rws.

TEST PC WORLD CENTER **HOW WE TEST** We test CD-RW drives on a Micron Millennia Celeron-400 system with 64MB of RAM, a 13GB hard drive, and Windows 98. To gauge CD-ROM read performance we use Testa Labs' CD Tach 98 version 2.0, and install Microsoft's Office 2000 suite in its default configuration. To determine CD-R write performance, we burn 430MB of data to CD-R from an image file and on the fly. To test CD-R read performance, we copy back the same 430MB of data to the hard drive. We evaluate digital audio extraction speed by extracting a 250MB track from an audio CD to the hard drive. We measure CD-RW packet-writing performance by copying 100MB of files to a CD-RW disc twice. Overall ratings are based on performance (40 percent), price (20 percent), features (20 percent), tech support policies (10 percent), and ease of installation (10 percent). [1] CD-R Write/CD-RW Write/CD-ROM read speeds; 1X = 150KB per second.

THIS MONTH we present our first Top 10 list dedicated to CD-Rewritable drives. Expanded from PCWorld.com's Top 5 CD-RW Drives, our chart covers a variety of drives. If you're after speed, check out Plextor's $275 PlexWriter 12/10/32, the first drive we've tested that offers 12X CD-R write speed. If you want convenience, consider Ricoh's $299 MediaMaster MP9060A, which combines DVD playback with the capabilities of a CD-RW. ■

HERE'S HOW

WINDOWS TIPS SCOTT DUNN

Make Your Backups Painless and Brainless

ALL Versions

ONE DAY, THAT 100-YEAR-OLD oak outside your home-office window is going to plop onto your PC, or your power supply will dry up just as you attempt to save a huge Excel spreadsheet, or you'll have the one-in-a-million "reliable, robust" hard drive that suddenly, inexplicably gives up the ghost. What, you worry? Not for a minute, because you've set your system for automatic backups.

We all know we should make copies of our files in case of emergencies, but few of us do it regularly. Taking a few steps to set up a good system, though, can make the task of backing up files too easy to bother avoiding and too automatic to forget. This month I cover Windows 95 and 98 strategies; next month I'll describe backups for Windows NT and 2000.

Divide and conquer: If you want truly automatic backups, the copied files must fit on the destination medium without your having to swap tapes or disks. Tape drives, Jaz disks, Zip disks, and network drives are ideal destinations for backup files because they can hold so much data. Even these media can fill to capacity, however, if you back up your entire system in one swoop. The solution is to create several mini-backup systems, each with its own schedule and destination. For example, if you use Microsoft Backup, you can create one backup .set file that copies your Windows and root directories on Mondays, another that copies your Program Files folder on Wednesdays, and a third that copies your data files on Fridays. Then you just have to remember to put in a disk or tape with sufficient space every couple of days—no more of a challenge than remembering to put a blank tape in your VCR.

Automation 95: If you have Windows 95 and Microsoft Plus, you can use the System Agent utility to run Microsoft Backup. Begin by choosing *Start•Programs•Accessories•System Tools•Backup.* Use the check boxes in the left and/or right panes to select the folders or files you want to back up. Then click *Next Step* and select a destination folder, disk drive, or tape drive for your backup. Choose *Settings•Options,* click the *Backup* tab, and check *Quit Backup after operation is finished.* Next, specify any other desired settings on the Backup tab of the Options menu, and click *OK.* Choose *File•Save As,* specify a name and location for this backup set, and click *Save.* Choose *Settings•Drag and Drop* and uncheck *Confirm operation before beginning* (see **FIGURE 1**). Click *OK,* and choose *File•Exit.* Now double-click the *System Agent* icon in the tray area of the taskbar (the area near the clock). Choose *Program•Schedule a New Program,* and click the *Browse* button. For the "Files of type" designation, choose *All Files (*.*).* Navigate to the folder where you saved your backup set, select it, and click *Open.* Doing this adds the set to the Program dialog box. Ordinarily, you'd include the actual backup program here, but since .set files are associated with Microsoft Backup, simply

ILLUSTRATION: RICHARD DOWNS

FIGURE 1: DISABLE CONFIRMATION prompts to make Microsoft Backup run automatically.

listing the file will launch Backup when you need it. Now click *When To Run*, specify your desired schedule, and click *OK*. Close the System Agent window.

If you want to schedule multiple backups for different sets of files and/or for different locations (see "Divide and conquer" above), repeat the steps in this tip, using a different .set file name each time.

Automation 98: Now for the bad news: The Microsoft Backup version that accompanies Windows 98 does not permit automated backups. Sure, you can use the Task Scheduler to start Microsoft Backup, but it will still need input from you before it does anything useful.

If you upgraded from Windows 95 and don't mind using the Win 95 version of Backup, you can use the older version to automate backups. First, make a new folder on your hard drive to hold the old version of Backup. For easy configuration, give this folder a name containing no more than eight characters, and make sure its parent folders have short names, too (more on this later). Next, pop your Win 95 CD into the CD-ROM drive, and use Windows Explorer to locate the Win 95 .cab files, which are the compressed "cabinet" files holding the files you want. Make a note of the path.

Now choose *Start•Run* and type three things: the command to extract the files—namely, **Extract /a /l**—followed by the path to your new folder (use quotation marks if the path contains spaces or long file names); the path to the .cab file you want to begin looking in (win95_04.cab should work in most cases); and the names of the files you want to extract. The three elements should be separated by spaces. The /a switch ensures that the command looks through all .cab files, starting with the one you name; and the /l switch lets you specify the destination of the extracted files. If your new folder is C:\Program Files\Old Backup and your Win 95 .cab files are in E:\win95, your command would look something like this: **Extract /a /l "C:\Program Files\Old Backup" E:\win95\win95_04.cab backup.* Chiadi.dll Chikdi.dll Qic117.vxd**. (Of course, your paths will likely differ somewhat.) Then press **<Enter>**.

A DOS window will open as the program extracts and copies files. If you don't obtain all the necessary files, check your typing and try starting with an earlier .cab file number (such as **win95_02.cab**). When you've successfully copied the files, close the DOS window (if necessary), and move the Qic117.vxd file from your new folder to the Windows System folder.

Now you need to associate your backup .set files with this Windows 95 program so launching them will automatically back up the specified files. In Explorer, choose *View•Folder Options* and click the *File Types* tab. In the list of registered file types, select *File Set for Microsoft Backup*, and click *Edit*. Select *Open* in the Actions list, and click *Edit*. In the next dialog box, click *Browse*, find and select the newly installed Win 95 backup.exe file, and click *Open*.

If your backup application is stored in a path that uses no spaces or long folder names, the path you see in the dialog box will have no quotation marks. If so, everything's fine. If not, you need to revise the path to address some quirks involved in using this program in Windows 98: Start by deleting the quotation marks; then edit any long folder names or names with spaces to delete all but the first six characters and eliminate the spaces. Finally, add **~1** to the end of each truncated folder name. For example, if you used the path from the above example, your edited text would read **C:\Progra~1\OldBac~1\Backup.exe** (see **FIGURE 2**). Again, your specific path may differ. When you've finished trimming the path appropriately, click *OK* and *Close* twice to close all dialog boxes.

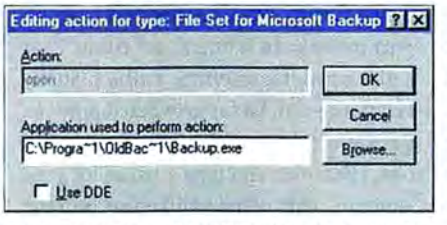

FIGURE 2: USE SHORTENED FOLDER names to get Windows 95 Backup to work in Windows 98.

Now you can start the old backup application by double-clicking the backup.exe file (or a shortcut to it). Follow the instructions in "Automation 95" above to configure Backup and to create a custom .set file. (For easiest configuration, save your .set file with a short file name in a path with short folder names.) This time, however, you will use Task Scheduler instead of System Agent: Double-click the Task Scheduler icon in the taskbar's tray area (the area near the clock), or double-click the *Scheduled Tasks* folder in the My Computer window. Then use Explorer to locate the .set file you created, and drag it into the Scheduled Tasks window. Right-click the icon and choose *Properties*. If the path in the Run box has any long folder ▶

CONTENTS

WINDOWS TIPS
224 Automate your Windows backups; create shortcuts for document printing.

ANSWER LINE
228 Delete shared files when doing so is safe; resolve Windows "illegal operation" messages.

INTERNET TIPS
235 Microsoft's Windows Media Audio file format; the Gutenberg Project for electronic books.

WORD PROCESSING
238 A better way to browse long documents; Word 2000's hidden function-key toolbar.

HARDWARE TIPS
240 Get more storage space on your hard drive; why a new PC has old DOS system files.

UPGRADE GUIDE
244 Taking a DIMM view of memory upgrades.

online

Here's how to get Windows Millennium Edition's new features without the upgrade: www.pcworld.com/heres_how/me_too.

Want an alternative to high-speed DSL and cable? Look to the skies with satellite Internet access: www.pcworld.com/how_it_works/satellite.

names, long file names, or spaces, trim it to eliminate the quotation marks and the excess characters, just as you did with the path to backup.exe. For example, if the path in the Run box reads "C:\My Documents\My Backup.set", edit it to read **"C:\MyDocu~1\MyBack~1.set"**. Click the *Schedule* tab, and specify when you want the backup to be made; then click *OK*.

If you don't happen to have a Windows 95 CD-ROM, you can find an alternative approach described on PCWorld.com at www.pcworld.com/sep2000/wintips.

SPEED UP REPETITIVE PRINTING CHORES

DO YOU FREQUENTLY print copies of the same document? It's probably not cost-effective to send the document to a copy shop and then store the extras in a drawer, but the process of launching an application, opening the document, choosing File•Print, and exiting the application isn't very efficient either. You can print in a jiffy by saving the printing instructions to a file and creating a shortcut that sends the instructions to the printer whenever you need a copy. One caveat: This tip will not work with Postscript printers.

Open the document in the application you usually use to print it. Choose *File•Print* to open the Print dialog box, and check the *Print to File* option. Some applications, including Notepad, don't have a Print dialog box, and others don't have a Print to File option. In such situations, choose *Start•Settings•Printers*. In the Printers window, right-click the icon for the printer you normally use, and choose *Properties*. Then look for an option that specifies ports; frequently, it appears on the Details tab. From the Ports list, select *FILE: (Creates a file on disk)* or the equivalent. Then click *OK*.

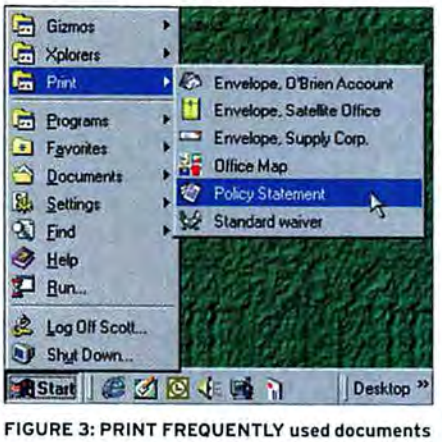

FIGURE 3: PRINT FREQUENTLY used documents from the Start menu with a single click.

Return to your application, and choose the *Print* command. Click *OK* in the Print dialog box. The program should prompt you for a place to save the print file. Select a convenient location, and type a name (such as **printme.prn**); then click *OK*, and exit the application.

The next step is to create a shortcut that sends this file to the printer. Right-click the *Start* button, and choose *Open* or *Explore*. Navigate to the folder where you want to keep your document-printing shortcuts. If you have several such documents, consider making a new folder in the Start Menu folder so that the shortcuts are available from the Start button. After opening the proper folder, right-click an empty area and then choose *New•Shortcut*. When the the Command line prompt appears, type **command.com /c copy /b "C:\My Documents\printme.prn" lpt1:**. The name and path of your print document may differ. Be sure to use quotation marks if any part of the path uses spaces or long file or folder names. If you print to a port other than lpt1, you'll have to change this part of the example to match your printer's port. To identify the correct name, return to the Ports listing in the printer's Properties dialog box, as explained above. Common port names are "com1:" or "com2:" for serial printers, or entire paths (usually beginning with \\) for networked printers. Once you've entered the proper command line, click *Next* and type a name for your shortcut. This name will appear on your chosen menu within the Start menu. When you're done, click *Finish*.

To add some finishing touches, locate the icon you just created, right-click it, and choose *Properties*. Click the *Program* tab. Your command line is shown here, in case you need to edit it or correct a typo. From the Run drop-down list, choose *Minimized* to hide the DOS window that appears when the file is sent to the printer. Make sure *Close on exit* is checked. If you like, you may click *Change Icon* and select a different icon to give your shortcut a distinctive or more meaningful look. When you're done, click *OK* as many times as necessary to close the dialog boxes. Thereafter, whenever you need a copy of your document, just choose your new shortcut from the appropriate menu on the Start menu (see **FIGURE 3**).

You'll find files mentioned in this article at www.fileworld.com/magazine, and you'll find more tips at www.pcworld.com/heres_how. Send your tips and questions to scott_dunn@pcworld.com. We pay $50 for published items. Scott Dunn is a contributing editor for PC World *and a principal author of* The PC Bible, 2nd Edition *(Peachpit Press, 1995).* ■

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YOU MAY NOT realize how many programs your computer is running at any given time. You can press <Ctrl>-<Alt>-<Delete> to see a list of these and shut down selected items, but you might inadvertently shut down something vital and crash your system. Leading Interactive's $18 Process Control 2 has a task manager that lists all system processes and highlights vital ones in red. You can start, stop, and change the priority of each process. The utility can take the place of the Close Program dialog box whenever you press <Ctrl>-<Alt>-<Delete>. A demo version of Process Control 2 is available at FileWorld or from the program's developer at www.linteractive.com.

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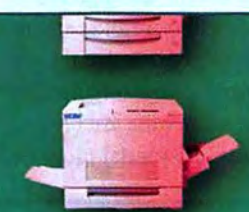

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YOUR QUESTIONS ON: 'Illegal operation' messages • Password-protecting folders

Delete Files Safely, Recover Files Easily

WHILE UNINSTALLING an application recently, I was given the option to remove several shared files. The uninstall program stated, 'The system indicates that the following shared file is no longer used by any programs'. But if programs are indeed using the file, there may be problems. Should I or should I not delete these (formerly) shared files?

Alan Michka, Driggs, Idaho

THERE'S NO SIMPLE answer to this question, but fortunately the likelihood of a disaster resulting is small.

Windows keeps a counter in the Registry for each file that may be shared by multiple programs. When you install a program that uses that file, the counter goes up by one. When you uninstall a program, the counter goes down by one.

When an uninstall brings a file's counter to zero, you get the message that you describe because Windows thinks you're removing the last program that uses the file. But Windows isn't always correct in its assumptions. Installs and uninstalls do not always progress smoothly, and it's possible for the counter to be wrong.

So what should you do? If you're worried about hard drive space, click *Yes To All* and delete that shared file and any others the uninstall routine finds. The chances of a problem are slight, and if one does come up, reinstalling the first program that complains about the missing file should put the file back where it rightly belongs.

If you're not too concerned about hard drive space, click *No to All* and leave the files where they are. Beyond taking up some hard drive sectors, they won't do any harm.

RESTORING DELETED FILES

THERE ARE TIMES when I regret having removed a file. How can I recover files that I have deleted?

Ann Ferguson, via the Internet

IF YOU'VE RECENTLY deleted a file via Windows Explorer by highlighting the file and pressing the <Delete> key, or by selecting Delete from the right-click menu, restoring the file will likely be a breeze.

That's because Windows did not really delete the file—it simply moved it to the Recycle Bin. To get the file back, you need only double-click the *Recycle Bin* icon on the desktop, find the file, right-click it, and select *Restore*.

Things get trickier if you deleted the file from within an app or at the DOS prompt. If you have emptied the Recycle Bin between deleting the file and realizing it was a mistake, the deleted file's space on your drive has been made available to other files. But until another file uses that space, the data is still there and perhaps can be recovered. For that reason, avoid creating or changing files until you recover the lost one.

You'll need a special program to undelete the file. Be sure to install it before you need it, because installing a program involves putting files on your drive, and those files might overwrite the very deleted ones you need to recover.

DOS 6 came with such a program, simply called Undelete. Unfortunately, the program isn't in Windows 9*x*. You can download it from FileWorld or from support.microsoft.com/download/support/mslfiles/pdo646.exe. (Note: Microsoft hasn't kept Undelete up to date, and it doesn't work with FAT32 files.)

Utility suites such as Symantec's Norton Utilities (www.symantec.com) include undelete programs. (In Norton, launch the UnErase Wizard.) If you don't have one of these packages, I recommend Briggs Softworks' Directory Snoop (see **FIGURE 1**), a $29 shareware program. You can download Directory Snoop from FileWorld or from www.briggsoft.com.

Of course, your best solution is to do all your deleting through the Recycle Bin, ▶

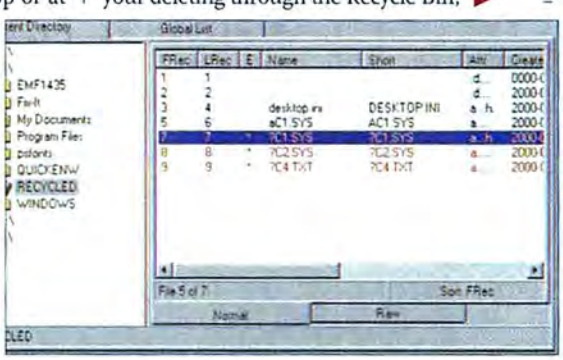

FIGURE 1: BRIGGS SOFTWORKS' DIRECTORY SNOOP restores deleted files after the Recycle Bin has been emptied.

Outlook Express Boilerplate

BOILERPLATE TEXT is anything you find yourself typing all the time—such as your mailing address. By telling Outlook Express 5 that an address or other boilerplate copy is a signature, you can make the program type it for you. To set this up, select *Tools•Options*, click the *Signature* tab, and then the *New* button. Enter the boilerplate text into the Text box, then click *Rename* and name your entry. Click *OK*. To insert the text into a message, select *Insert•Signature* and then the appropriate name.

ILLUSTRATIONS: RICHARD DOWNS (LEFT); JEFFREY PELO (RIGHT)

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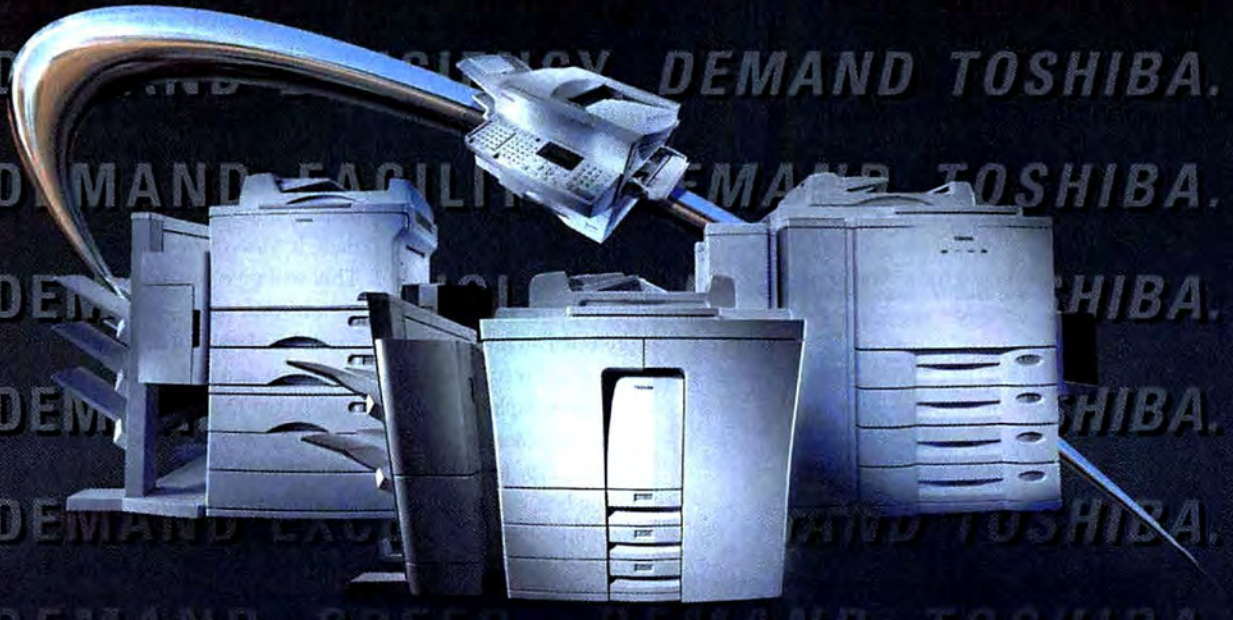

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and think twice before you empty it. Keep your important files backed up, too. For more on backups, check "Hassle-Free Backups" on page 167, and this month's *Windows Tips* column on page 224.

KEEPING OPERATIONS LEGAL

ALL TOO OFTEN I get an error message saying, 'This program has performed an illegal operation and will be shut down', after which the program I'm using closes. How can I prevent this?

Luis Lazo, Miami

THERE IS NO WAY to completely free yourself of "illegal operation" messages, but if you're getting a lot of them, you need to figure out what's causing the problem and what you can do to fix it.

If it's always the same program that goes down, it's probably a bug in that program—especially if it always goes down under similar circumstances. Next time it happens, click the error message's *Details* button. You'll get something like 'EXCEL caused an invalid page fault in module FM20.DLL at 0137:60007585'—not very useful information for most of us.

But if the vendor knows about the bug, those unfriendly numbers will help you figure it out. Visit the vendor's Web site and search for the words "illegal operation" or the numbers from the Details box. With some luck, you'll be able to locate a patch or a workaround.

If you're getting "illegal operation" messages from a number of programs, or if you can't fix the problem through the vendor's Web site, a driver may be at fault. Printer and video drivers often cause illegal operations in other programs. In the case of printer drivers, you need not even be printing for the problem to occur.

Updating the driver may do the trick. Or you can try going the opposite route and use a more generic driver. For instance, most laser printers will work with an HP LaserJet Series II or LaserJet III driver. These have been around for a long time, and all the kinks are pretty much ironed out. Video drivers are more iffy. You could use VGA, but you're limited to 640 by 480 resolution. Even SuperVGA may dock you with that limitation. Sometimes there's a driver for a specific chip, like the S3, but in that case, you have to know what chip drives your video card.

PASSWORD-PROTECT FOLDERS

CAN I PUT a password on a folder so that others can't access my sensitive files?

Frederick Szczepanski, Irving, Texas

IF YOU HAVE a file-compression program such as WinZip, you can password-protect the files in your folder as you put them into a .zip file. Since most compression programs let you launch, edit, and save files within the archive, you can use the .zip file much as you would a folder.

Creating a password-protected archive in WinZip 8 is pretty easy: In Windows Explorer, right-click the folder and select *Add to Zip*. In the Add dialog box, click the *Password* button in the lower-right corner, and then just follow the prompts.

Once you're sure your files are safe in their .zip file, delete the original folder and its contents securely. Telling your compression program to "move" the files will leave them recoverable on your hard drive. See May's *Answer Line* for details (www.pcworld.com/may00/al).

If you want more than a zip program can offer, consider Encrypted Magic Folders by PC-Magic Software. Downloadable from FileWorld or www.pc-magic.com, it encrypts and hides the folder to make it completely inaccessible. You have to use a hot key and your password to bring up the app, and only then can you access the folder. Just one problem: the $59 registration fee. You better really want to keep those files protected but accessible.

Encrypted Magic Folders
$59; PC-Magic Software;
www.pc-magic.com

HIDE FUTURE TASKS IN OUTLOOK

CAN I hide tasks in Outlook until their Start date? Tasks now show up immediately after I enter them. If I enter a task to start on October 10, I don't want to be reminded of it until October 10.

Tg Glazer, Chicago

NO, BUT workarounds can help. One option: Use the Due Date rather than the Start Date. To hide a task with a Due Date more than a week away, select *View•Current View•Next Seven Days*. But don't enter separate Start and Due dates, or you may be reminded to do something too late.

Another option, and the only one that actually understands the concept of a start date, is *View•Current View•Task Timeline*. This will give you an entirely different view of your tasks—one where each task marks or blocks out the space between its Start Date and its Due Date.

If you use Outlook 98 or 2000, you may want to alter your Outlook Today view as well. Go to *Outlook Today*. Then in Outlook 98, click *Options;* or in Outlook 2000, click *Customize Outlook Today* (see **FIGURE 2**). In the Tasks section, for 'In my task list, show me', select *Today's tasks*. Click *Save Changes*. (But remember, Microsoft assumes 'Today's tasks' are those *due* today, not ones starting today. Oh, well.)

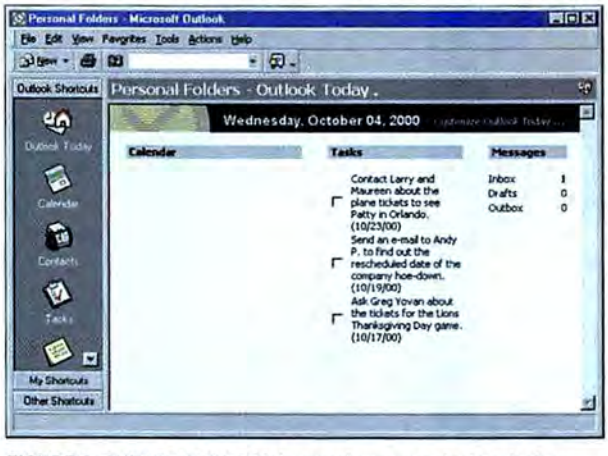

FIGURE 2: OUTLOOK TODAY lets you view your schedule, but you need to tweak its settings for it to display 'Today's tasks'.

Find files from this article at www.fileworld.com. Send your questions to answer@pcworld.com. We pay $50 for published items. Contributing Editor Lincoln Spector writes the syndicated humor column Gigglebytes. ■

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Audio Wars: WMA Tops MP3...Sometimes

WHEN IT COMES to subverting popular computing technologies to serve its own stockholders, nobody beats Microsoft. The company did it with graphical user interfaces, it did it with dozens of disk and file utilities, and it did it again with the Web. Now Microsoft wants you to leave the widely accepted MP3 file format behind and come over to the dark side: Windows Media Audio. It would be easy to dismiss WMA as a crappy substitute for the real digital-audio McCoy, but—surprise!—WMA may actually turn out to be better than MP3 for many of us.

MP3 encoders such as Jukka Poikolainen Software's Easy CD-DA Extractor (www.poikosoft.com/cdda), the MusicMatch Jukebox (www.musicmatch.com), and Xing Technology's AudioCatalyst (www.xingtech.com/mp3/audiocatalyst) let you create MP3 files at a variety of bit rates suited to the audio quality of different sources—64 kbps may be plenty for a vintage monophonic jazz reissue, but a modern stereo recording might need 192 kbps or more. Most MP3 encoders can hear the difference between a CD track encoded at 128 kbps and the same track encoded at 160, 192, 224, or 256 kbps. The higher the bit rate, the better the sound—especially at the higher frequencies and when played through first-rate audio equipment. But the higher the bit rate used for encoding, the bigger the resulting file—which means that downloads will take longer, and fewer files will fit on your digital audio player.

According to Microsoft, WMA files sound as good as MP3 clips, at half the bit rate (thus consuming half the disk space). The truth isn't quite so simple. In a test conducted by the National Software Testing Labs (see Final MSAudio Report at www.nstl.com/downloads), a majority of listeners thought that a WMA file encoded at 64 kbps sounded more like the original audio CD track than an MP3 file encoded at 128 kbps did. The lab didn't compare the formats at higher bit rates, though.

In a herculean double-blind test, *Sound and Vision* magazine found that the quality of MP3 and WMA were roughly equivalent when both were encoded at 128 kbps, so it's possible that WMA's advantage exists only at the lower rates. To read the *S&V* article, browse on over to www.soundandvisionmag.com, enter **Windows Media Audio** in the search box, press **<Enter>**, and choose *Download Showdown*.

If you currently download or encode a lot of 128-kbps MP3 audio files, switching to 64-kbps WMA could save you a fair number of megabytes and let you cram twice as many tracks into your digital audio player's limited memory. Microsoft's free Windows Media Player 7 lets you encode CDs into WMA format, play back both MP3 and WMA files, and upload either format to your audio player. You can download the 7.2MB player from www.microsoft.com/windows/windowsmedia.

Microsoft predicts that most digital audio players being sold this holiday season will play WMA audio. RCA's Lyra plays both MP3 and WMA formats, but most other players are MP3-only, so don't jump on the WMA bandwagon yet if that's how you primarily listen to digital audio. As we went to press, Creative Labs and Diamond promised WMA compatibility upgrades for their respective Nomad II and Rio 500 players.

If you don't use a digital audio player, WMA could still be a good choice. Most leading digital audio playback applications—including Winamp, RealPlayer, and (of course) Windows Media Player—play WMA files. And if all those downloaded files are piling up on your hard disk faster than you can burn CDs, you may want to convert your existing library of MP3s to WMA. A great tool for the conversion is Dennis Rebentrost's $19 Audio Converter 2.05 (see **FIGURE 1**). ▶

FIGURE 1: DOUBLE YOUR DIGITAL audio capacity by converting MP3 files to Microsoft's WMA format.

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ILLUSTRATION: RICHARD DOWNS (LEFT); JEFFREY PELO (RIGHT)

You can download a 30-day demo version of the utility from www.dennisre.com/audconv/index.html. You may also need to download the Windows Media Audio component from ftp.dennisre.com/audconv/wmaudiosetup.exe, and install it.

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I RECENTLY PURCHASED a notebook computer and would like to sync it with my desktop machine. Is there a way to copy my desktop's Internet bookmarks and address book to my notebook without having to retype them?

Jack Serrano, Floral Park, New York

YES, AND IT'S NOT as hard as you might think. You don't say which browser or mail program you use, so I'll provide steps for the most recent versions (as we went to press) of both Netscape Communicator and Microsoft's Internet Explorer.

First we'll look at the procedure with Communicator. To move your Navigator 4.7 bookmarks to another PC, start the program, press **<Ctrl>-B** to open the Bookmarks window, choose *File•Save As*, browse to a floppy disk, and click *Save* to create a copy of the file using the default name of bookmark.htm. (You could also browse to a folder on the other computer if the PCs are linked by a network or other connection.) If you copied the file to a floppy disk, insert the floppy into the destination machine's drive, launch Navigator on the system, press **<Ctrl>-B**, choose *File•Import*, and browse to the bookmark.htm file that you just saved.

FIGURE 2: EXPORTING INTERNET Explorer Favorites from one PC to another is easy using the Import/Export Wizard.

To copy your address book, press **<Ctrl>-<Shift>-2**, or select *Communicator•Address Book* to open the Address Book window, select *File•Export*, browse to a floppy disk or folder as described above, enter a name for the file, and click *Save*.

Now all you need to do to finish the process is to move to the destination machine, open Address Book, choose *File•Import*, select the *LDIF file (address book)* option, click *Next*, and select the file in the Import LDIF file window.

Here's the same procedure for IE 5: choose *File•Import and Export* to start the Import/Export Wizard, and click *Next*. Highlight the *Export Favorites* option in the following screen and click *Next* again. Select the *Favorites* folder in the next screen and click *Next* yet again. Then select *Export to a File or Address*, browse to the floppy drive or folder on the destination machine, and click *Save*. Then click *Next* and *Finish* to complete the job (see **FIGURE 2**). To import the file on the new machine, start the Import/Export Wizard, click *Next*, select *Import Favorites*, click *Next*, select *Import from a File or Address*, and browse to the file you exported. Click *Save•Next*, then *Next*, and finally *Finish*. At this point you may want to ice down your aching index finger and send your mouse in for its 10,000-mile maintenance service.

Transferring your address book is a bit less click-intensive: Open Outlook Express, choose *File•Export•Address Book*, select *Text File (Comma Separated Values)*, and click *Export*. Browse to the proper location, type in a file name, and select *Save•Next*. Select the data fields you want to export and click *Finish*. To import the file, open Outlook Express on the destination machine, choose *File•Import•Other Address Book*, select *Text File (Comma Separate Values)*, and click *Import*. Browse to the file you saved previously, click *Next*, and then click *Finish*.

Send your Internet-related questions and tips to nettips@spanbauer.com. We pay $50 for published items. Scott Spanbauer is a contributing editor for PC World. ■

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Browse Instantly in Long Documents

MOVING AROUND IN long documents can be time-consuming and imprecise. Word's instant browsing feature helps you minimize your page-scrolling.

Instant browsing lets you jump through documents by page, section, table, or other feature. Here's how it works.

Word 97 and 2000: Start by clicking the little button between the two double arrows at the bottom of the vertical scroll bar. In response, a selection palette will pop up (see **FIGURE 1**), letting you choose the object to use in browsing the document. To display a description of an object, simply move the pointer over it. Click the desired browse object to select it, and close the palette; then click one of the two double arrows located on the scroll bar to jump forward or backward in the document to the next occurrence of the object.

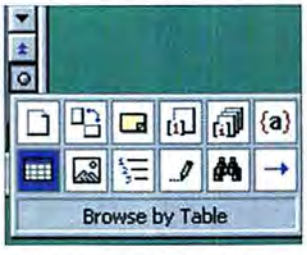


FIGURE 1: THESE OBJECTS can speed Word document browsing.

WordPerfect 9: This program has a tool similar to Word's at the bottom of the vertical scroll bar. Click the small icon between the double arrows to cycle through available browsing objects, which are described next to the icon when you click. Use the double arrows to jump up or down in the document from object to object. WordPerfect 8's double scroll bar arrows can also be used to browse, but they are limited to browsing by page.

USE YOUR MOUSE TO ENTER TEXT IN WORD

MAYBE YOU'RE NOT the world's fastest typist, or maybe you make so many typing errors that your spelling checker has resigned. Or maybe you're just plain tired of typing. Here's good news: Word 97 and 2000 offer you an easy way to enter text in a document with just your mouse.

Start by selecting *Insert•Symbol* to display the Symbol dialog box illustrated in **FIGURE 2**. Then drag the box out of the way of your typing position in the document. To work with text in your document's normal font, select the *(normal text)* option from the Font list. If you need a special-character or symbol font, you may select it from the drop-down list.

Click on the location in the document where you want the text to go, then insert a character by double-clicking it in the dialog box. You'll find all of the standard English text characters near the top of the Symbol dialog box's characters window; foreign-language characters and other symbols are near the bottom. You can see an enlarged version of any character by clicking it once.

Word 2000 supports even more foreign-language characters and additional symbols, which are visible when you scroll down the character display. All the characters will appear on the monitor, but not all of them will print out, so be sure to do a test printing.

And don't forget the Special Characters tab. There you'll find em and en dashes and spaces, breaking and nonbreaking hyphens, ellipsis marks, various types of quotation marks, and other useful symbols of all types and descriptions.

TRY WORD 2000'S HIDDEN FUNCTION-KEY TOOLBAR

WORD'S FUNCTION-KEY shortcuts can save you a considerable amount of time, but because they're difficult to remember, they are rarely used. Most of Word 2000's toolbars pop up automatically when needed, but the one that lets you use your mouse to activate function-key shortcuts can't be found by right-clicking a toolbar or selecting *View•Toolbars*. Here's how to enable one of my favorite hidden features.

Select *Tools•Customize*, then click the *Toolbars* tab in the Customize dialog box. Select *Function Key Display* in the Toolbars list, then click *Close*. A new toolbar will appear just above Word's status bar. Click a Function Key button on the bar to activate the shortcut. To access shifted functions, press the **<Shift>**, **<Alt>**, or **<Ctrl>** key (or a combination of those keys) to see the new function on the toolbar, then click the button without releasing the keys. Now you just have to remember to use it.

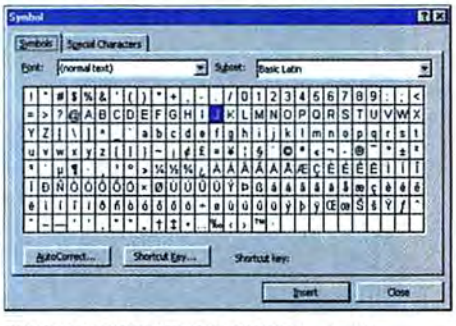


FIGURE 2: TYPE WITH A MOUSE by double-clicking a character in Word's Symbol dialog box.

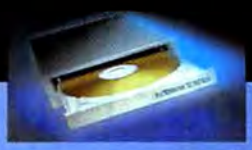
You'll find additional tips at www.pcworld.com/heres_how. Send your questions and tips to george_campbell@pcworld.com. We pay $50 for published items. Contributing Editor George Campbell invites you to visit his Web page at www.osomin.com. ■

Keep Words Together on a Line

WORD AND WORDPERFECT automatically wrap text at the end of a line. To keep two or more words on the same line of type in Word 97 or 2000, press **<Ctrl>-<Shift>-<Space>** to insert a nonbreaking space. In WordPerfect 8 or 9, press **<Ctrl>-<Space>** to insert a Hard Space code instead of a normal space. To prevent a hyphenated word from splitting at the end of a line in Word, press **<Ctrl>-<Shift>-<Hyphen>**; similarly in WordPerfect, you can insert a nonbreaking hyphen by pressing **<Ctrl>-<Hyphen>**.

ILLUSTRATION: JEFFREY PELO

Don't let your CD sessions go to the dogs



If you've got an inefficient drive—and there are many around—excessive speed during a burn session can kill a disc. The faster the drive attempts to burn, the harder it becomes for the drive's buffer to process the data in a continuous manner. The result? Buffer underrun errors, which can bring recording sessions to a screeching halt. When that happens, your CD disc will be nothing more than a frisbee, ready to flip to the family dog.

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Configure disk clusters ◆ Legacy DOS system files ◆ **Avoid double-writing data**

Squeeze More Data Onto Your Hard Disk

THREE OF LIFE'S certainties: You can never be too healthy, you can never find too many tax deductions, and you can never, ever, have too much hard disk space. Despite the proliferation of double-digit-gigabyte hard disks, the amount of data you need to store can quickly expand to fill your available space.

Thanks to today's huge software programs and multimedia content such as MP3 files, most of us need every megabyte of storage we can get.

Fortunately, it's cheaper than ever to add storage: A 6GB, 8GB, or even 10GB hard drive costs less than $200. But if you don't want to spend money on a new hard disk, or you want to avoid the bother of installing one, here are a few things you can do to free up wasted disk space and extend the life of your current drive.

CLEANING HOUSE

THE EASIEST WAY to clear disk space is to delete files you don't need, but you can't always tell which files are safe to delete. Windows 98's Disk Cleanup utility helps remove some of that uncertainty.

FIGURE 1: DELETE UNNEEDED files automatically with Win 98's Disk Cleanup utility.

To run Disk Cleanup, click *Start•Accessories•System Tools•Disk Cleanup*. You'll see the dialog box shown in **FIGURE 1**. Then click *OK* to delete files in each of the four categories listed in the dialog box: Temporary Internet Files, Downloaded Program Files, Temporary Files, and Recycle Bin.

Deleting temporary Internet files and downloaded program files removes data and programs deposited on your drive by Web sites you've visited. If you frequently visit a site, these files help you avoid repetitive downloads, but if you rarely visit the site, the files are dead weight.

Software programs created the files listed under Temporary Files for temporary use but didn't delete them at the end of the session. There's no danger in deleting them. If you're hesitant to empty your Recycle Bin (and you may have good reason for this; see *Answer Line*, page 228), just uncheck the box next to its listing.

The Disk Cleanup utility's More Options tab (see **FIGURE 2**) lists two options: Windows components and installed programs. Both launch the Add/Remove Programs applet found in Control Panel. Search under the Windows Setup tab for files you can live without, such as the 30MB of Desktop Themes or the 31MB of Web TV for Windows. Under the Install/Uninstall tab, you can remove old or unwanted programs. Always use Add/Remove Programs to remove programs; deleting the program's files via Explorer may leave behind troublesome system files and Registry entries.

If you upgraded to Windows 98 from Windows 3.*x* or Windows 95, Windows backed up the old operating system files to disk. You can free up many megabytes of disk space by uninstalling the backup. You'll find it listed on the Install/Uninstall tab if it's still on your hard disk.

Finally, scan all the large files on your hard disk. You may be surprised at how many useless files lurk there. In Explorer, select the hard drive and press **<F3>** to bring up Find. On the Advanced tab, select *At least* and *100KB* for 'Size is'. Select *Find Now* to generate a file list, and click the *Size* column header to sort the resulting list by size.

FIGURE 2: IF THE DISK CONVERSION option is grayed out, the hard disk uses FAT32.

CLUSTER'S LAST STAND

YOUR HARD DRIVE will hold more data if you can reconfigure it to reduce the size of its clusters. A cluster is the smallest ▶

Improve Drive Performance

ONE WAY YOUR PC speeds up your Zip, Jaz, and other removable drives is by storing frequently accessed data in a high-speed cache. It also writes the same data to disk. You may be able to improve your drive's performance by eliminating data writes to the disk. Right-click *My Computer* and select *Properties•Performance•File System•Removable Drives*. To keep the PC from double-writing the data, check *Enable write-behind caching on all removable disk drives*. Every little performance tweak helps.

ILLUSTRATION: JEFFREY PELO

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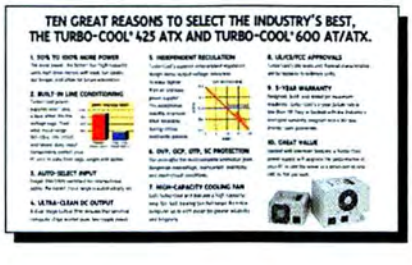

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standardized block of data Windows uses to organize data and files on the disk. Cluster sizes are fixed—4KB, 8KB, 16KB, or 32KB (see **FIGURE 3**).

A file written to the hard disk occupies as many clusters as it needs. For example, on a hard disk configured with 16KB clusters, a 40KB file uses three—two clusters filled with 16KB of data, and the last filled with 8KB of data and 8KB of empty space. This doesn't seem like much until you multiply it by the thousands of files on a typical PC.

PARTITION SIZE		Cluster size (KB)
FAT16	FAT32	
128MB-255MB	512MB-8GB	4
256MB-511MB	8GB-16GB	8
512MB-1GB	16GB-32GB	16
1GB-2GB	> 32GB	32

FIGURE 3: LARGER PARTITION size means larger cluster size—and larger clusters mean wasted disk space.

To reduce the waste of space, configure your hard drive with the smallest possible clusters. To determine your current cluster size, click *Start•Run*, type **chkdsk**, and press **<Enter>**. You'll see the size of your disk's clusters—which chkdsk calls "allocation units"—along with several other statistics.

If your disk already has 4KB clusters, you don't want to make them any smaller, but if the clusters are larger than 4KB, there are a couple of ways to shrink them.

The easier approach is to convert your disk from the FAT16 file structure to the new FAT32 scheme—assuming your disk isn't already configured for FAT32. Almost any system purchased new with Windows 98 or with the OSR2 version of Windows 95 should already be using FAT32, but systems upgraded to Windows 98 may still be using FAT16. To check your system's file structure, right-click the hard disk's icon in Explorer and select *Properties* (see **FIGURE 4**).

If your disk is using FAT16, go to the Disk Cleanup utility's *More Options* tab (mentioned above), and click the *Convert* button in the Drive conversion (FAT32) box. Third-party utilities such as PowerQuest's PartitionMagic also perform FAT conversions, and unlike the Windows utility, they can convert from FAT16 to FAT32 *and* from FAT32 to FAT16.

A FAT32 partition will support only the OSR2 version of Windows 95, not the original version. And some older software, especially older hard-disk utilities and file/data compression programs, won't work correctly with FAT32. Check with the software manufacturer for updated versions before converting.

If converting to FAT32 won't shrink your clusters, you can lower your cluster size by repartitioning your hard drive.

Partitions are subdivisions of a hard drive, each with its own drive letter. Many hard disks come with only one partition (and a single drive letter), but hard drives can have many partitions.

As Figure 3 shows, the size of the partition determines the size of the clusters used in it. Splitting a 2GB drive into two 1GB partitions using FAT16 could reduce cluster size from 32KB to 16KB and recover substantial disk space.

Windows' Fdisk utility lets you add partitions and alter their size, but only if you delete all the data on your hard disk. A third-party utility such as PartitionMagic lets you add, remove, and resize partitions much more quickly and easily.

PartitionMagic 5
$70, PowerQuest, 800/379-2566, www.powerquest.com

FOSSILIZED FILES?

WHEN MY WINDOWS 98 system boots up, the screen displays several DOS messages telling me that my sound card and another device—I think it's my CD-ROM drive—are being initialized from the autoexec.bat and config.sys files. I thought these old DOS files had gone the way of the dodo. Why did my seven-month-old system come configured to use them? Do I risk losing use of these devices if I delete either or both of these files?

Lloyd Grove, Austin, Texas

THE AUTOEXEC.BAT and config.sys files are used to configure hardware and software for the DOS operating system. While they're definitely on their way to becoming digital dinosaurs, they aren't extinct yet. There are a couple of possible reasons why your system may still use these files to configure hardware.

First (and less likely), your PC may have an old graphics card, hard disk, or other component using real-mode DOS drivers that can be loaded only from autoexec.bat and config.sys. Unless you bought your PC out of the trunk of a '68 Buick from a guy listening to Barry White and the Love Unlimited Orchestra on his eight-track, it's unlikely to have such outdated hardware or drivers.

The second, more likely explanation is that the PC manufacturer loaded DOS drivers for your sound card and your CD-ROM drive so you'd have access to these devices when running programs under DOS. New systems continue to enable both sound cards and CD-ROM drives in DOS to support the many popular DOS-based games still being played.

You could probably eliminate these files without causing any problems, but it's not a particularly good idea. If your system crashes and you can't get Windows to launch properly, you'll want your CD-ROM drive to work in DOS mode so you can access replacement files on your Windows CD-ROM.

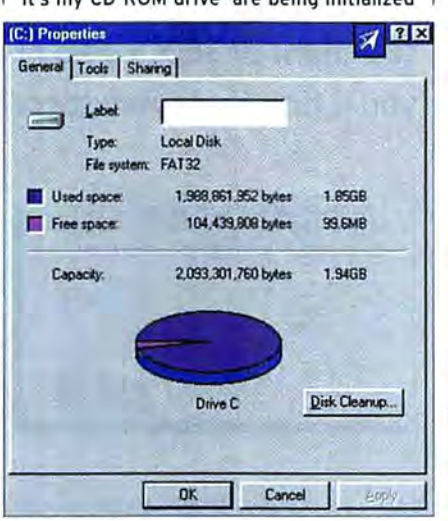

FIGURE 4: THE HARD DISK PROPERTIES tab will tell you if your disk uses FAT16 or FAT32.

For more hardware tips, see www.pcworld.com/heres_how. Send tips and questions to kirk_steers@pcworld.com. We pay $50 for published items. Kirk Steers is a PC World *contributing editor.* ■

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Boost Your PC Memory

TODAY'S OPERATING systems and applications are RAM hungry. When software runs out of RAM, Windows starts swapping data to and from your PC's hard disk—a much slower process than fetching it from and writing it to RAM. Adding RAM to your PC is one of the easiest and cheapest ways to boost its performance.

Just a few years ago, 16MB or 32MB of RAM were adequate for most PCs, but you need 64MB or even 128MB these days to get optimum performance with a typical set of Windows 98 applications. Plentiful RAM is even more important if you use Windows 2000 Professional. People who process images, edit video, or perform other graphics-intensive work on their PCs may need up to 384MB of RAM.

Compared to most other upgrade options, installing additional RAM is a bargain. Though prices fluctuate, the pricing trend over the past few years has been downward. At press time, RAM prices hovered at approximately $70 for 64MB, and about $125 for 128MB.

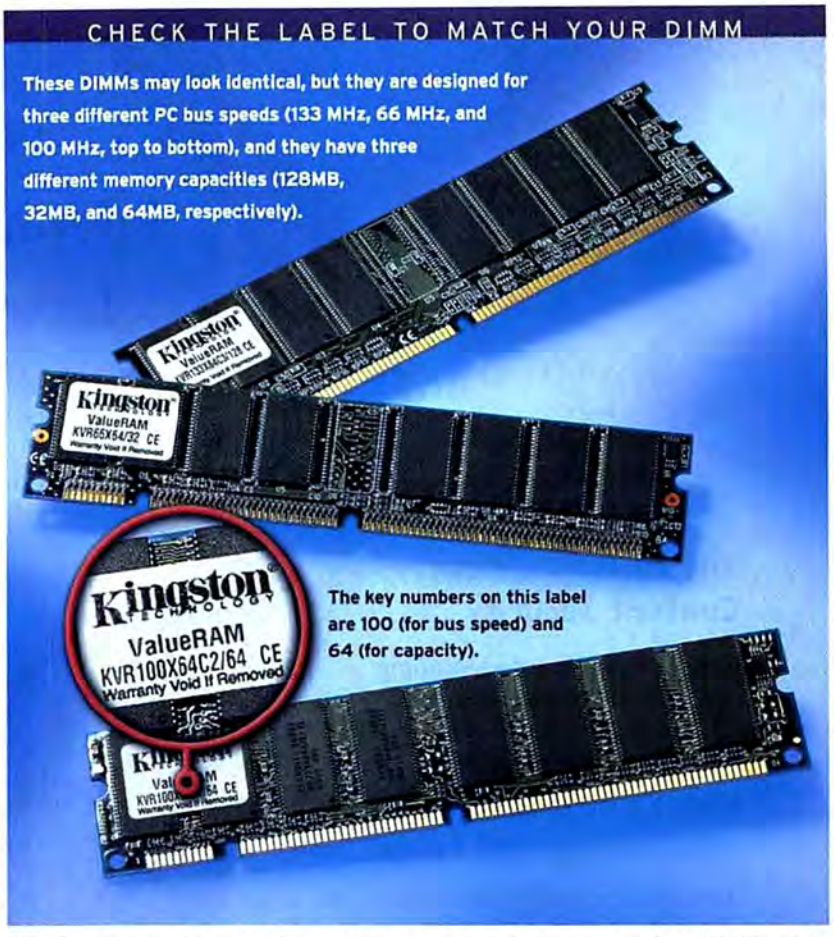
DIMMING OF THE DAY

RAM IS SOLD in the form of chips contained on small circuit boards called memory modules. If your current desktop PC was manufactured in the last three or four years, it most likely uses 168-pin DIMMs (dual in-line memory modules). DIMMs vary depending on their capacity (16MB, 32MB, 64MB, and 128MB), the PC's bus speed, the type of RAM chips they contain, and other factors. You can usually determine what type of DIMM your PC uses by consulting the PC's manual or by calling the vendor's technical support line. Most memory vendors are happy to help (see "The Top Down"). It's important not to mix different types of memory modules in your PC.

Most PCs have three DIMM sockets on their motherboards, and one or two of them are usually free. Adding RAM is as simple as plugging in new DIMMs.

THE TOP DOWN

Cost: $70 (64MB) to $200 (128MB), depending on current market conditions
Time required: 30 to 60 minutes
Tools required: Large Phillips screwdriver, antistatic wrist strap (recommended)
Expertise level: Intermediate
Resources: Crucial Technology (www.crucial.com), Kingston Technology (www.kingston.com), Simple Technology (www.simpletech.com)



SIMMS LIKE OLD TIMES

IF YOUR PC is more than three or four years old, it probably uses SIMMs (single in-line memory modules). Though the examples of memory modules shown in the accompanying photos are DIMMs, the process of upgrading SIMMs is similar. The differences are that SIMMs pivot rather than plug into their slots, and they must be installed in pairs.

Most PCs today require a type of memory called PC-100 (100-MHz) SDRAM, though slightly older systems need PC-66 (66-MHz SDRAM), and somewhat newer systems depend on PC-133 (133-MHz VC SDRAM). Some brand-new high-performance systems use a new type of memory known as RDRAM (Rambus DRAM), which currently costs considerably more than DIMMs. Another new type of memory, known as DDR (double data rate) SDRAM, is showing up in some high-speed PCs, mainly those that use AMD processors. To find out more, check out www.rambus.com or www.ami2.org.

Stan Miastkowski is a contributing editor for PC World. ■

PHOTOGRAPHS: KEVIN CANDLAND

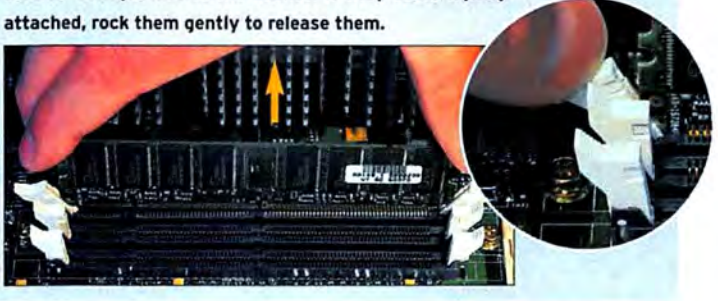
BEFORE YOU BEGIN

How much RAM do I have? To determine how much RAM is currently installed in your PC, watch the screen when you turn it on. Most systems check RAM at start-up and display the amount. You can also consult your system BIOS setup (details for entering it vary by PC). Or from within Windows 95 or 98, right-click *My Computer* and select *Properties*. The amount of RAM appears at the bottom of the list of system information.

1 No static, please. Memory modules are highly susceptible to damage from static electricity. We strongly advise you to purchase an antistatic wrist strap from your local electronics store—such as Radio Shack—before attempting to upgrade your RAM. And since you must unplug your PC before you begin, you'll need to connect the wrist strap to a ground. One option is to slightly loosen the screw holding the faceplate of an AC outlet and connect the strap to the screw. If you don't use a wrist strap, ground yourself by touching a grounded metal object before removing your new memory modules from their antistatic packaging.

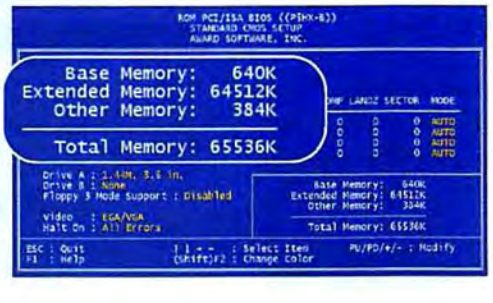
2 Where's the RAM? Turn off your PC and unplug the AC power. In Pentium II and III systems, the DIMM sockets are situated just in front of the processor, toward the front of the motherboard as you face the PC (see below, top photograph). Intel's ATX system-board specification states only that the memory slots be placed to the right of the seventh expansion slot. Adjacent to the sockets, you should find labels on the motherboard indicating the sockets' numbers. Insert DIMMs in the lowest-numbered empty sockets first.

3 Out with the old RAM (optional). Usually, the easiest way to upgrade your RAM is to plug in one or more new modules, adding to what you have. But if sockets are filled with low-capacity DIMMs, you may need to remove them just to clear space. Most DIMMs have clips on either side that you can easily push aside. Once you've disengaged the clips, you usually can pull the DIMMs straight out of the socket. If they seem tightly attached, rock them gently to release them.

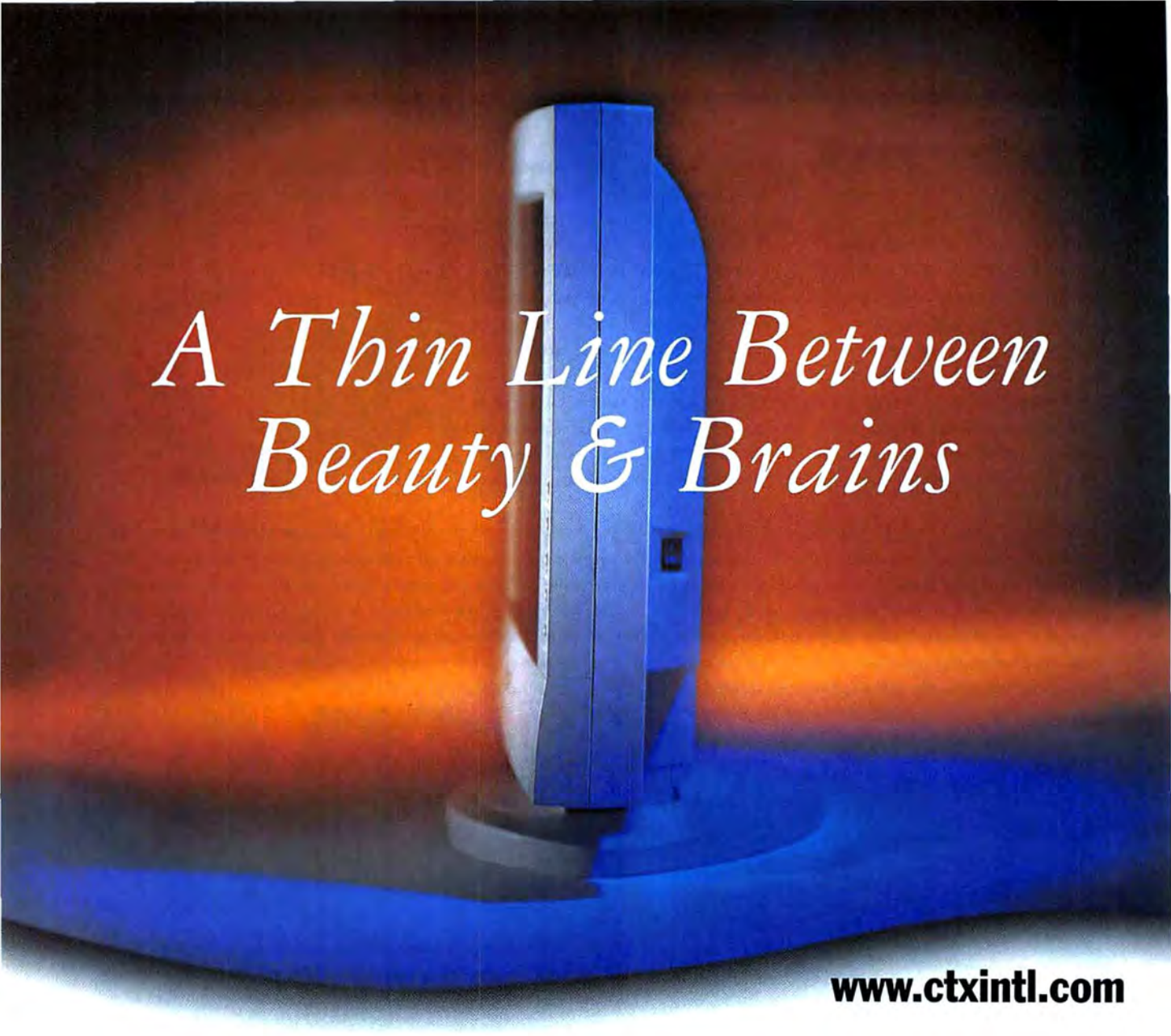


4 In with the new RAM. DIMMs have two notches that allow them to be inserted in only one way. Press them straight down into the socket, but don't force them. You'll know you've correctly inserted them when the clips on each side of the socket automatically snap into place. If the clips haven't snapped in, you haven't lowered the module far enough into the socket.

5 Power it up. Don't put the cover back on your PC until you are sure that everything is working. Plug it in and turn it on. If all is well, the system will automatically recognize the new memory and (usually) show it on the screen.



6 Got problems? If your PC refuses to recognize the new RAM, locks up, or won't start at all, first turn it off, unplug it, and check to confirm that the memory modules are firmly seated in their sockets. If seating is fine but the lock-up persists, take out all the memory modules and reinsert them. If you still don't have any luck, the problem may be a defective memory module, though that's rare. To check, call your memory vendor's tech support line.



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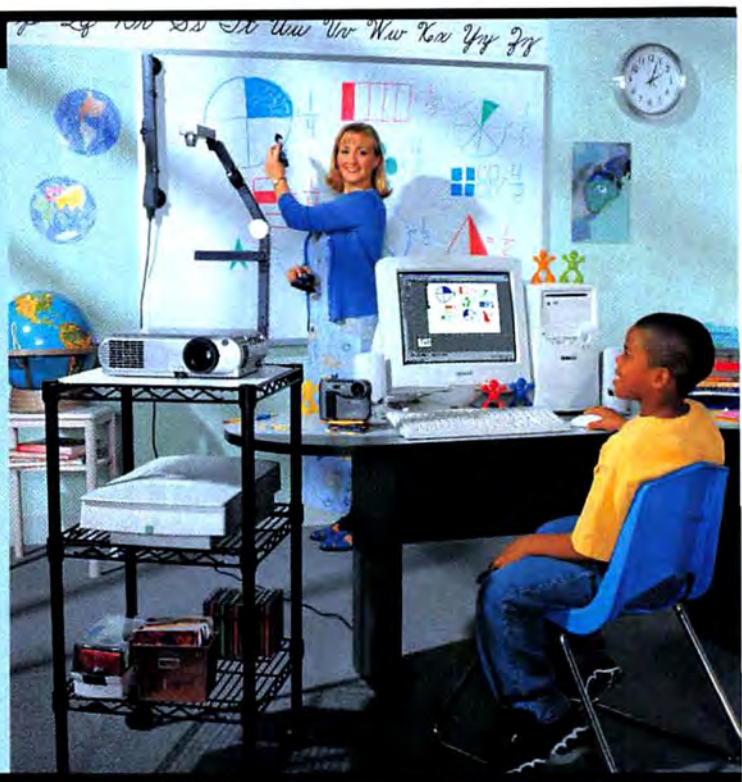

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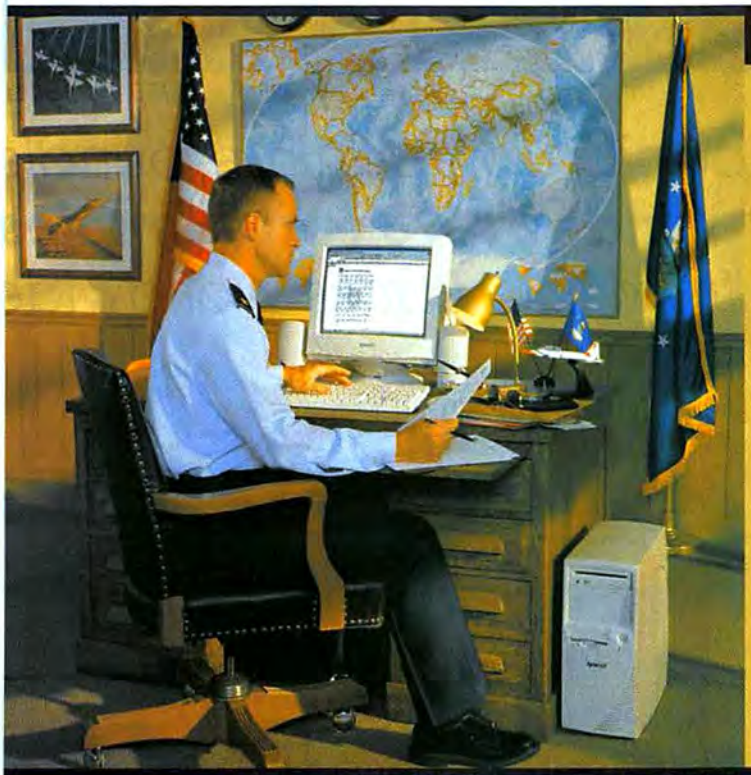

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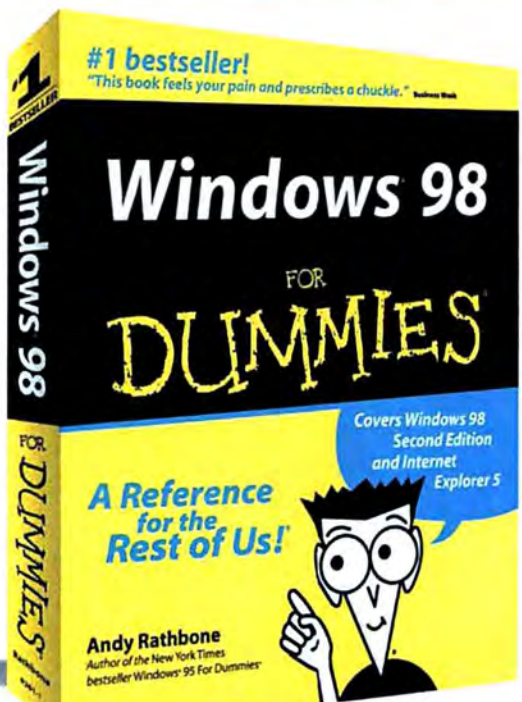

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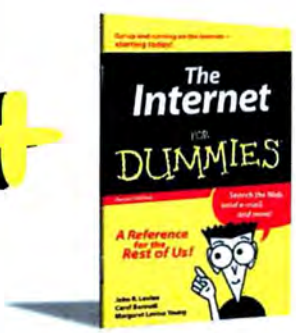

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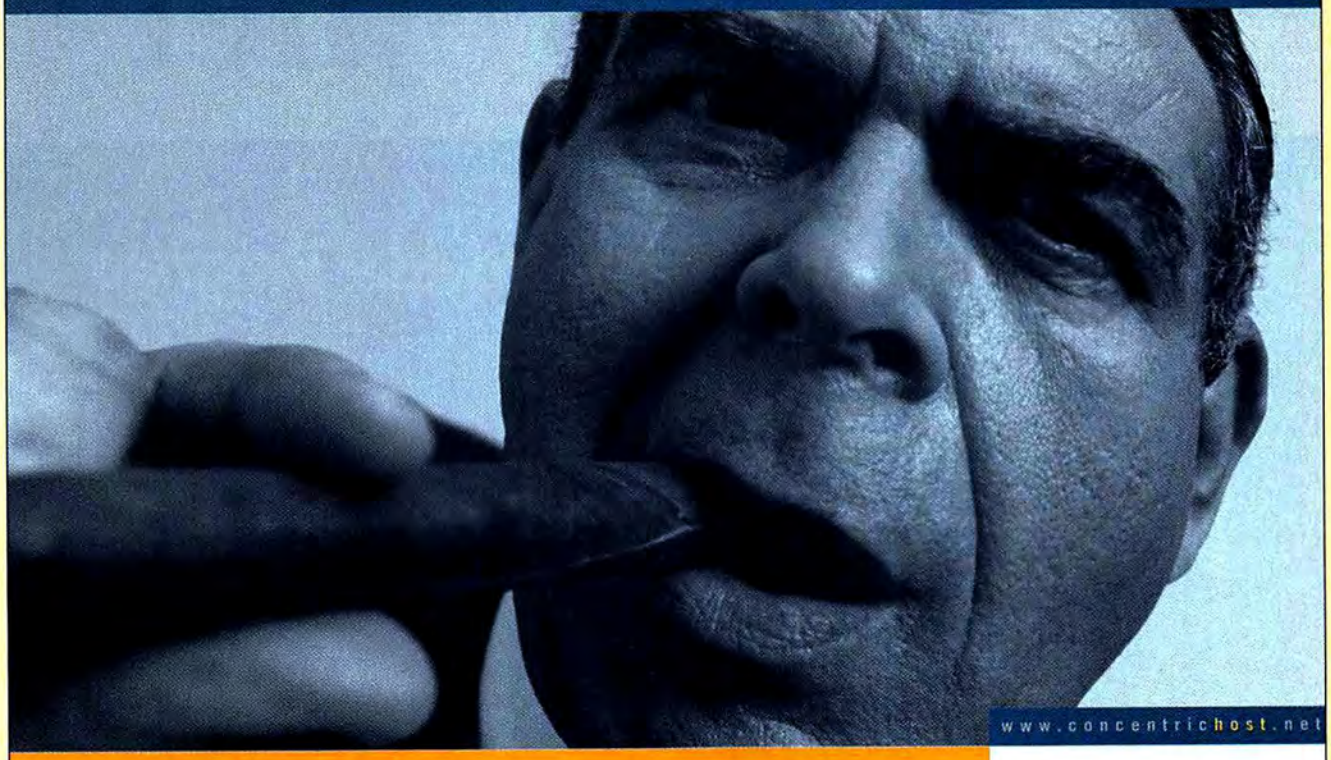

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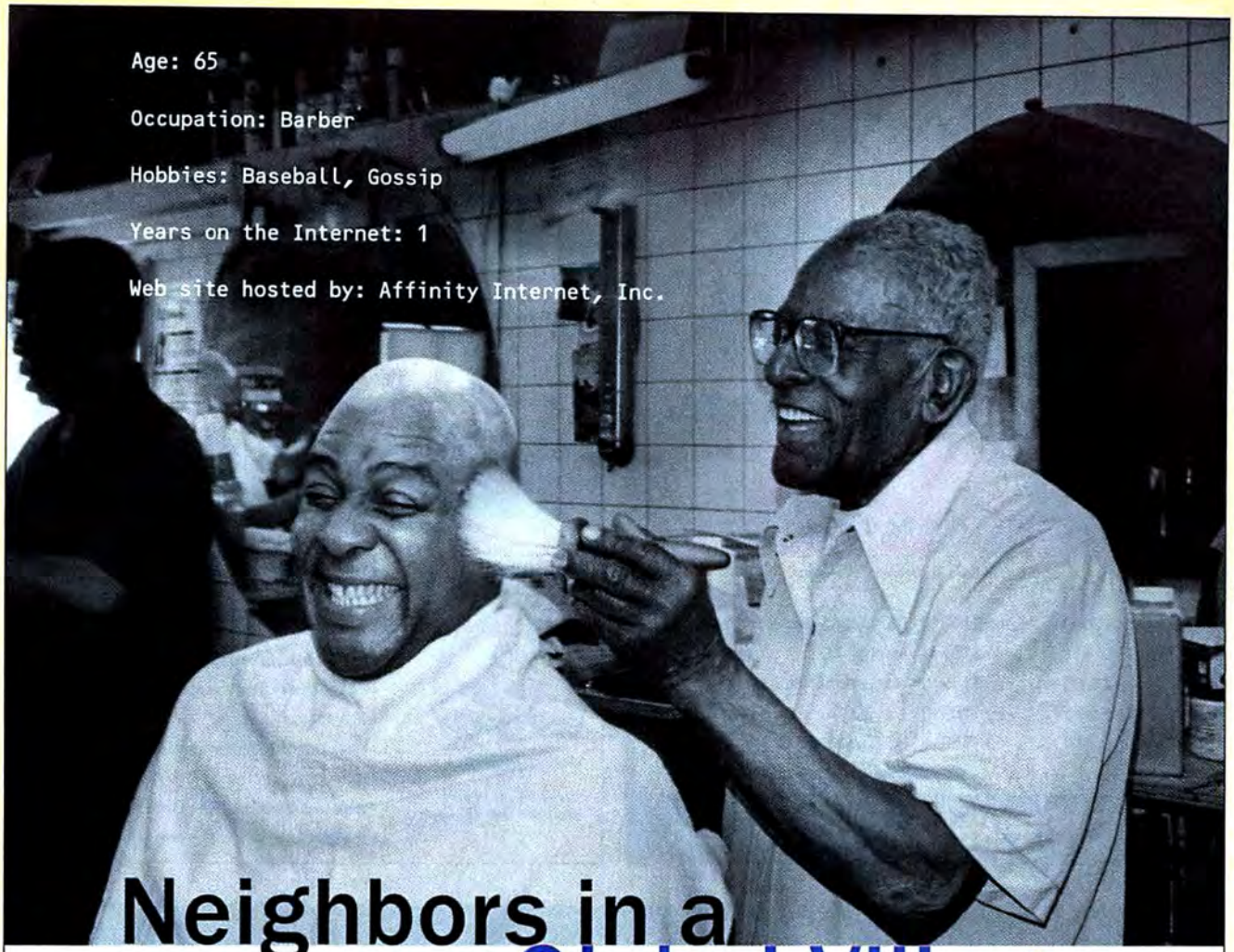

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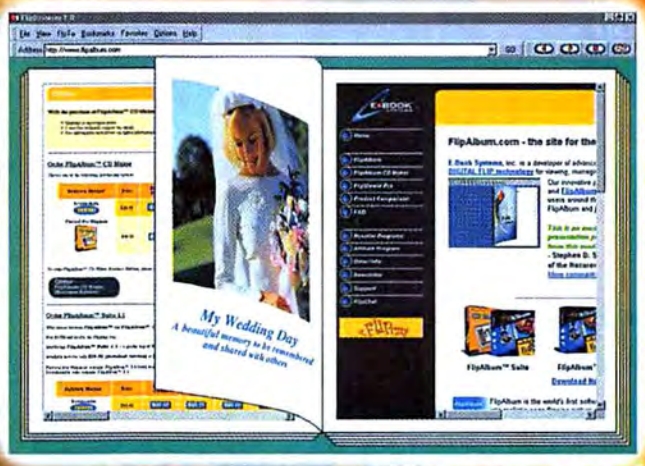

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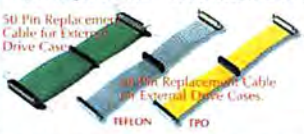

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The PC Is Dead? Long Live the PC?

THE CASKET IS READY. The grave is deep. The dirges are sounding. Enemies on every side declare the PC fatally fat and musclebound, awaiting what they insist will be its imminent death. Buzzards hover above the corpse-to-be. Linux jocks claim their altruistic operating system can run for months without crashing and do everything an old-fashioned Windows or Mac machine can do and more—except run a program you really like or send decent output to your printer. Bandwidth mavens point to a world where all data will reside in some repository at the far end of a wire, from which you'll retrieve it instantly—as soon as you manage to get that fiber-optic cable installed. Wireless-phone promoters paint a similar scenario but advise you to skip the wire—if you can wait several years until they update their systems. And defenders of the average guy insist that cheap, simple new Internet appliances will make the world safe for those who refuse to learn about .ini files—unless they want to do anything more interesting than read text and send e-mail.

The poor PC has enemies everywhere, but its flexibility and ubiquity keep the Grim Reaper away.

A COMPUTER IN THE FRIDGE?

ANY DAY NOW, say other vultures, the PC will give way to a box atop your TV. Or a PlayStation. Or a panel on your refrigerator. Or a screen phone clipped to your belt. Or maybe all those things at once, networked to each other and to a megaserver somewhere in the cybersphere. Yet for all the claims and predictions, the poor PC continues to fend off the Grim Reaper. What could possibly account for the incomprehensible-to-buzzards fact that PC sales keep increasing every year?

Flexibility, for openers. Nothing can match the PC's adaptability. Turns out that in a world where devices proliferate, the PC is useful as a humble peripheral to all of them. What else can serve as a hub for everything from a Palm organizer to a cell phone to a digital video camera? Until every digital device comes with its own Internet address and access to fast connections, the PC's speed and storage remain unbeatable.

And PCs keep getting cheaper and faster. Omit a major component in the interest of price, as Net appliances do by eliminating the hard disk, and usability suffers. The defining elements of a PC—local storage and the ability to run programs offline—turn out to be major assets. That's one reason the Palm, which has both, is so popular. Add an external keyboard, and the Palm becomes even more PC-like.

OMNIPRESENT = OMNIPOTENT

THEN THERE'S UBIQUITY: Since PCs are everywhere, programmers can depend on them to run creations like Napster and Gnutella. But who's going to expend a lot of effort developing programs for some Internet appliance with 623 users? Though much programming creativity has migrated to the Internet, the Web experience on a PC remains superior to what it is on any other platform—because the PC is the platform most sites are designed for. Those who natter about PC substitutes ignore the power of the PC's installed base of users, programmers, peripherals, and drivers.

Talk is cheap. For years I've been hearing about the imminent arrival of wonderful Internet appliances, e-mail devices, Web phones, and the like. The products that actually arrive are far less wonderful. Almost inevitably, they flop in the marketplace when they turn out to be overpriced and overhyped.

The PC desperately needs to be more reliable, easier to use, and more secure. But new devices are not necessarily more reliable or simpler. My Sprint PCS Wireless Web phone fails to connect to the Internet far more often than my PC does. Slow communications, limited graphics, and serious browsing constraints frequently make the Web experience with a Palm or a wireless phone downright annoying.

And the PC need not die for the competition to flourish. Let a thousand flowers bloom! Bring on a pocketable unit that combines a Web-connected cell phone with an organizer and a detachable wireless keyboard! Bring on digital TV and electronic picture frames and e-books!

But don't imagine that they'll kill off the PC anytime soon.

PC World Contributing Editor Stephen Manes is a cohost of Digital Duo, a series appearing on Public Television stations nationwide. For program information, see www.digitalduo.com. ■

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