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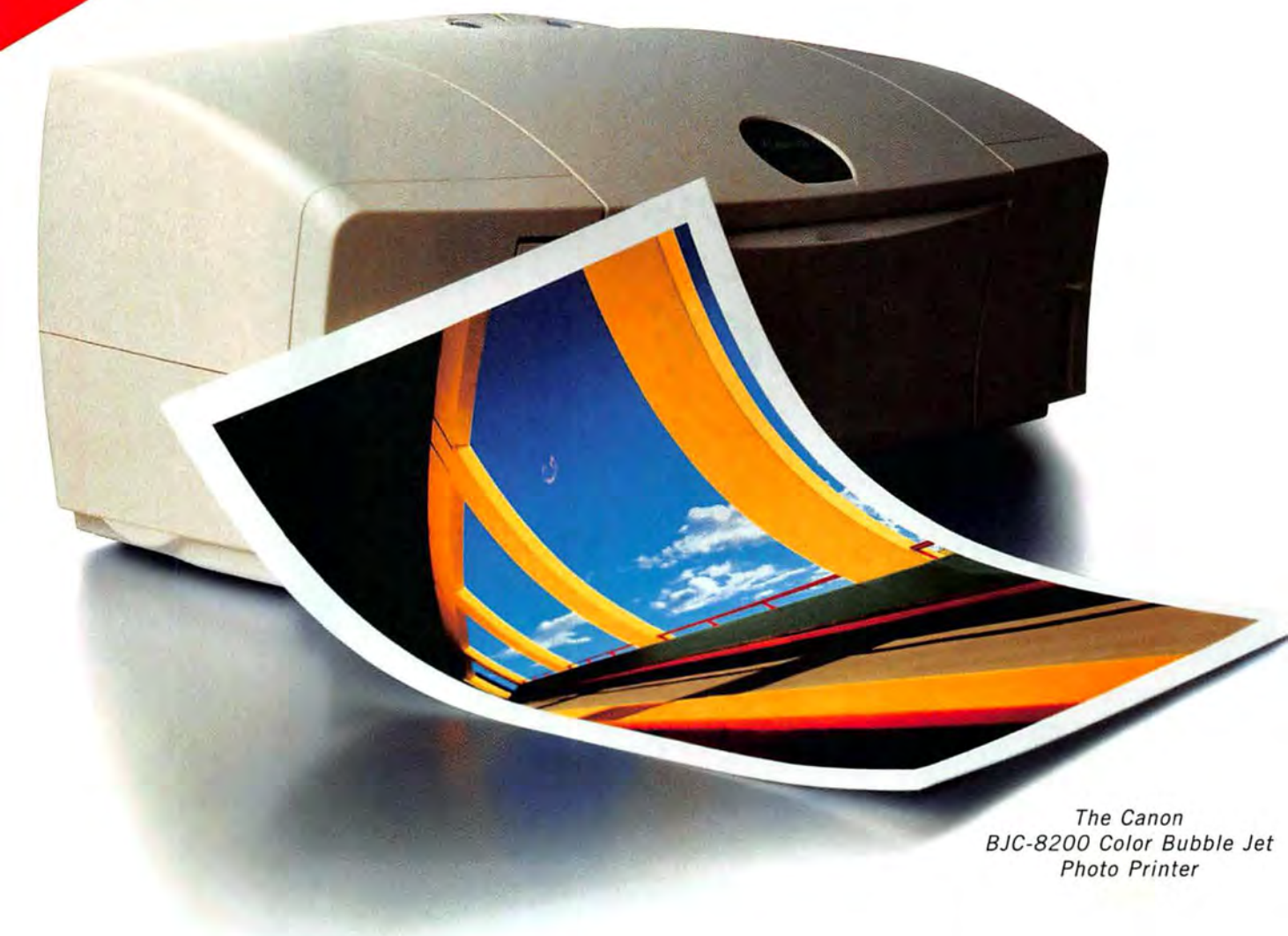

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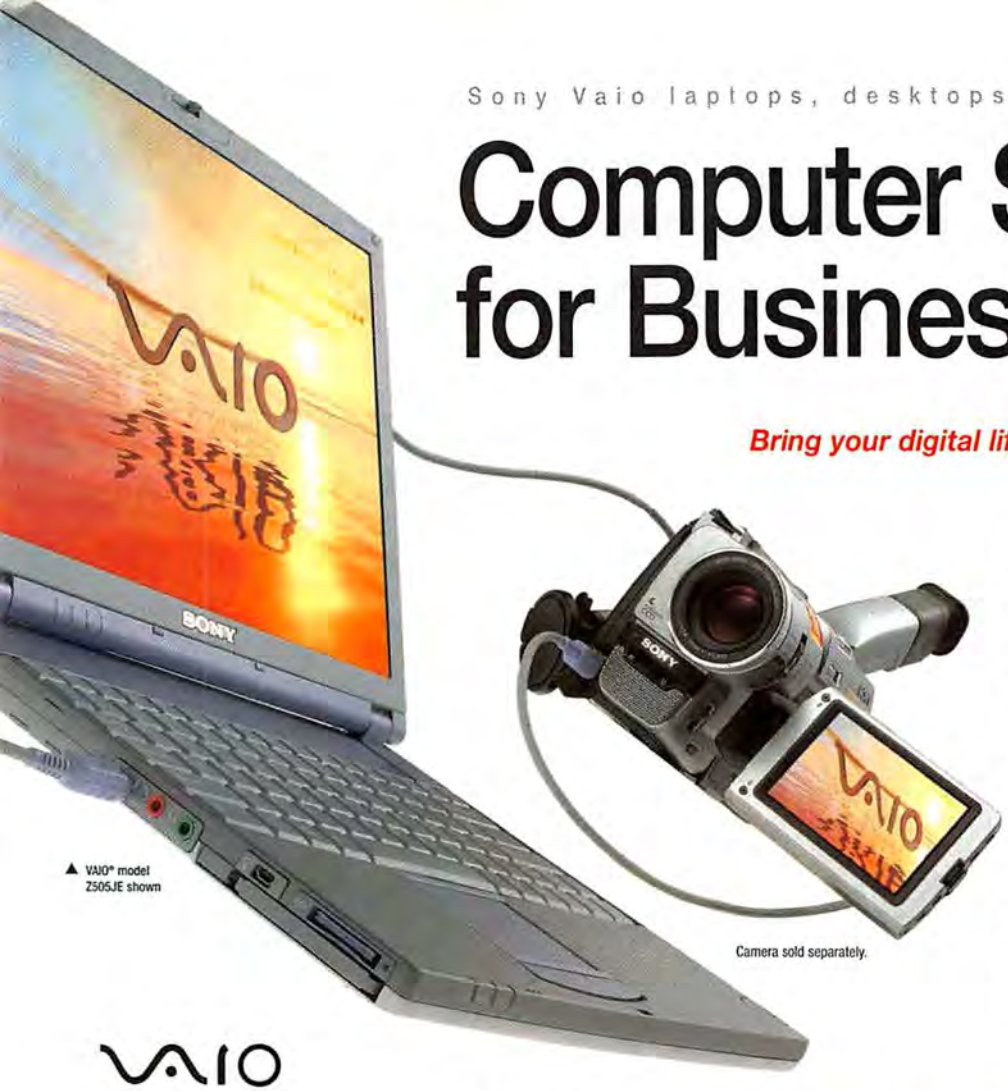

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▲ VAIO® model XG28K shown

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XG28K	Pentium® III 650MHz/SS†	12GB	128MB	DVD-ROM	Win 00	13.3" XGA TFT	CP15851	87/mo.	2899†
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▲ VAIO® model RX260DS shown

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RX270DS	Pentium® III 866MHz	40GB	128MB	DVD/CD-RW	CP16483	50/mo.	1699
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▼ CD-1000 back view

▲ CD-1000

- Captures and writes images to CD-R media
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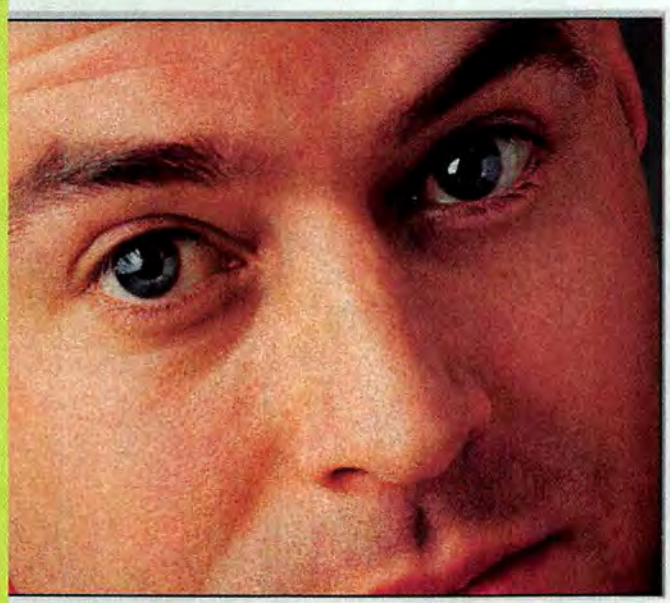

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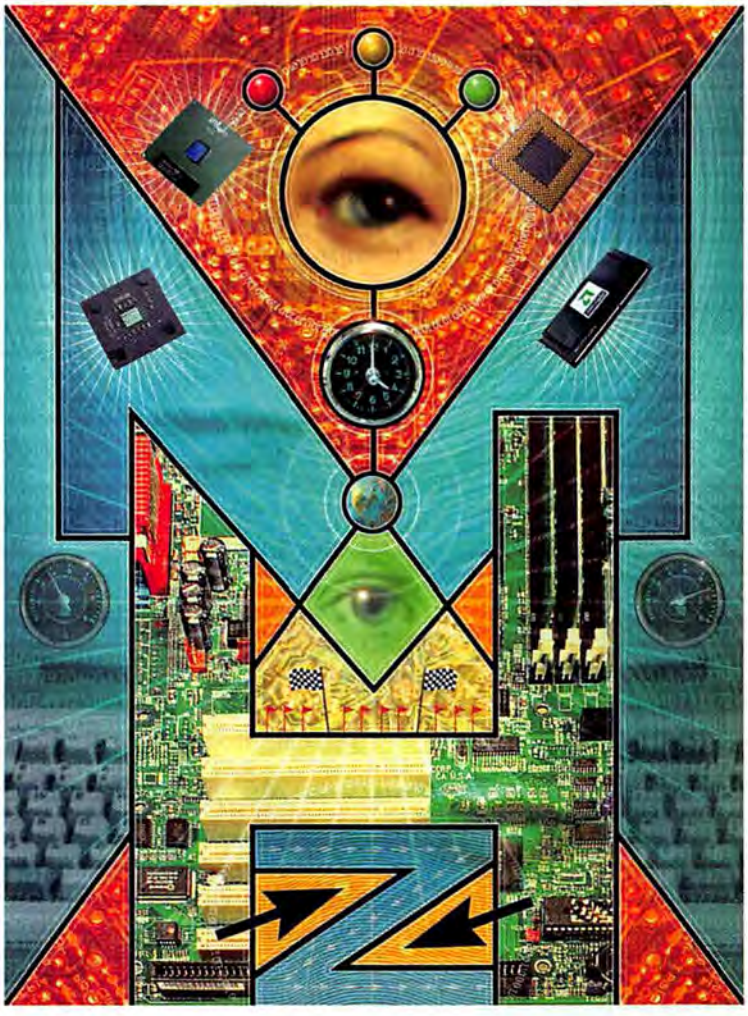

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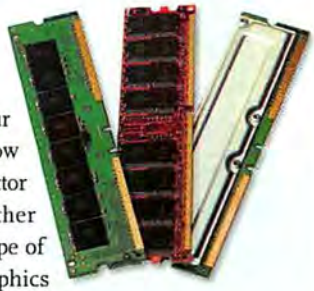
124 SPEED SECRETS

online If you've spent time studying our Top 100 charts, you already know that a CPU's clock speed is only one factor influencing a PC's performance. Other components—like the amount and type of memory, the hard drive, and the graphics subsystem—all play a part. But how much effect does each have? We sort through the specs and find some variables to watch.



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COVER *Photography by Ken Smith*

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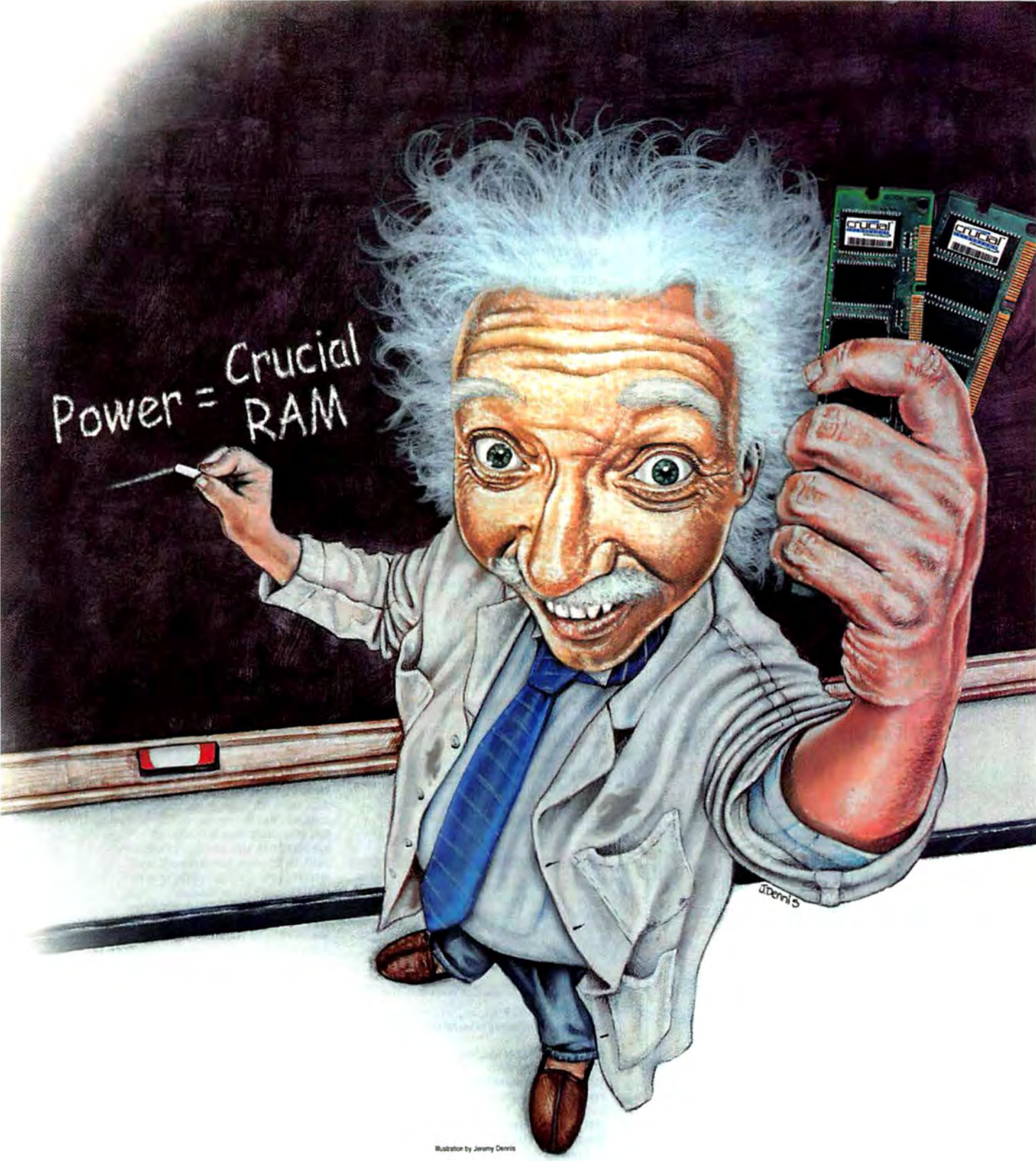

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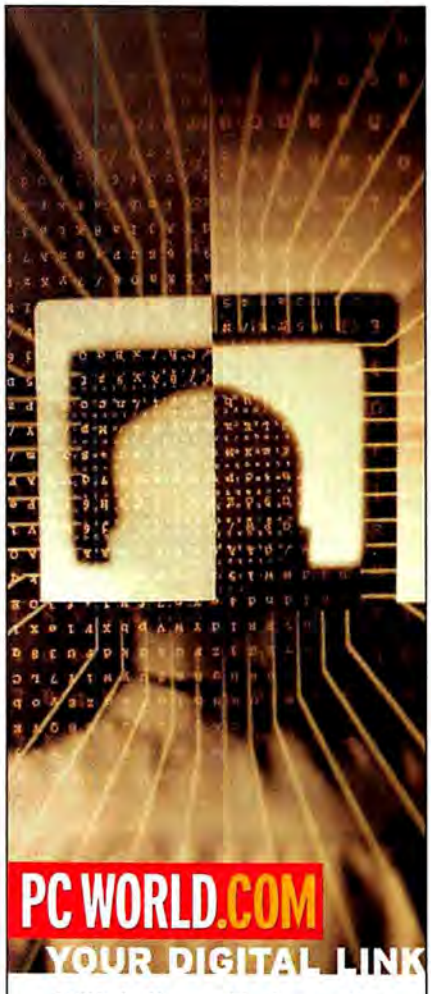

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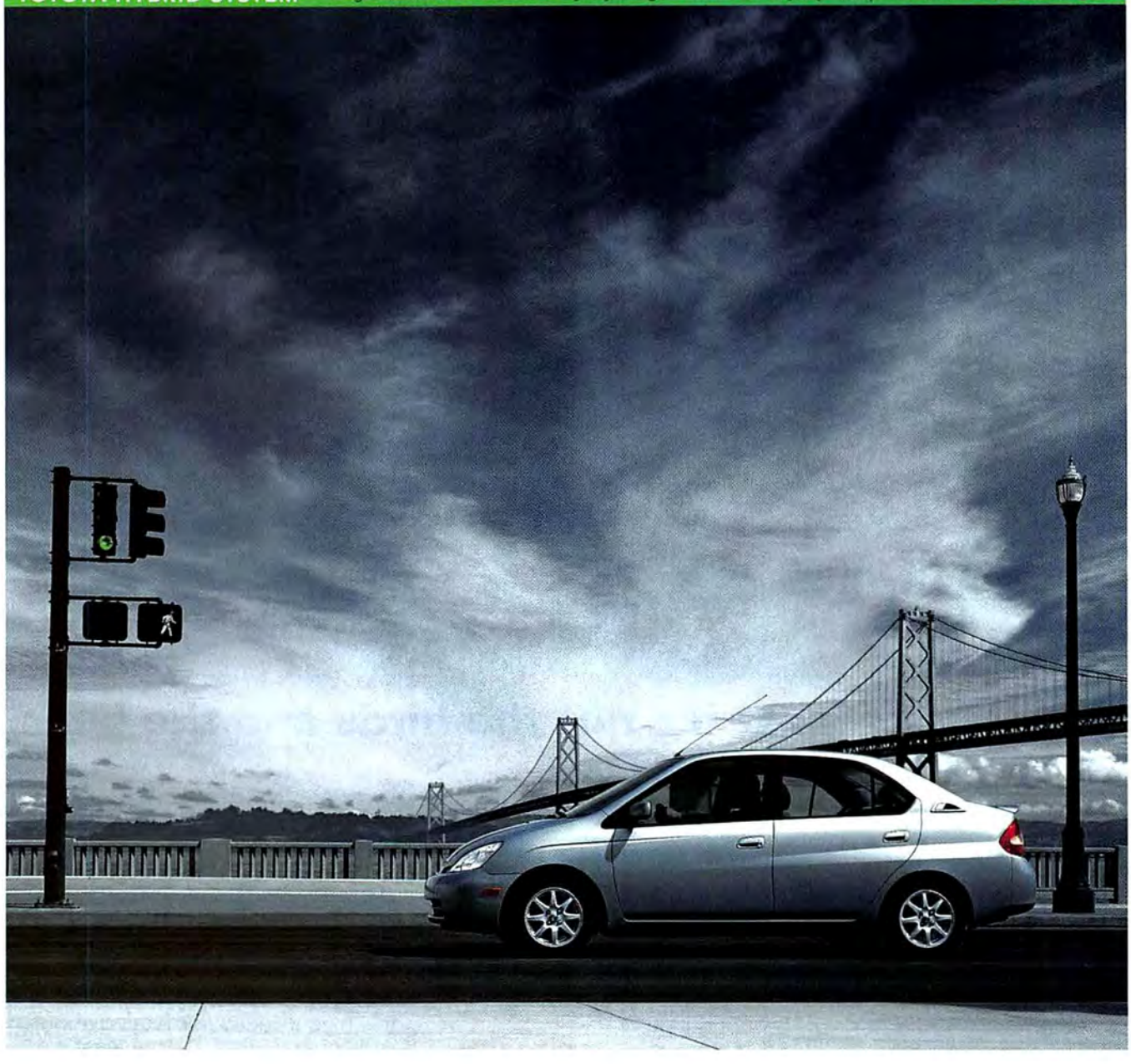

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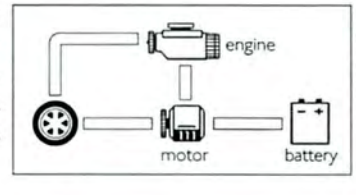

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An Inside Look at PC Performance

SEEING OUR COVER LINE "Speed Secrets," you might ask what could be so secret about computer speed? Just check out the CPU rating—in megahertz or, lately, gigahertz—and you'll have most of the information you need about how a PC will perform.

Not so fast. As writer Jeff Bertolucci points out in our cover package on page 124, there's much more to performance than just the processor. For starters, there's the speed of the bus that connects the processor to the so-called chip set that supports it. Also important are the capacity of the bus that connects the chip set to other components; the efficiency of both cache and main memories; hard disk access speeds; graphics accelerator card performance; and so forth.

Processor speed can be **misleading.** What **really counts** is how the **parts** of a PC **work together.**

PERFORMING IN UNISON

HOW WELL THESE elements work together is even more important now that processor speeds are pushing north of a billion cycles a second, as Bertolucci and *PC World* Staff Editor Eric Dahl note. "People are spending $3000 and more to buy machines with these speedy chips for computer-assisted design, photo and video editing, and games," says Dahl. "But to get the best performance in those areas, you need to understand how all the various pieces of your system fit together." Our cover story, quarterbacked by Associate Editor Grace Aquino, delivers some surprising recommendations.

Contributing Editor Dan Littman also offers up surprises in his review of ink jet printers (page 168). Today's ink jets are fast, powerful, versatile, and amazingly affordable, with low-end models selling for as little as $59. But some of them eat high-cost ink cartridges like an SUV gobbles gas. In fact, individual or business buyers who try to save money by going for lower-price models may find they pay more in the long run owing to the cost of such "consumables." That's why, starting with this issue, our list of the top ten ink jets will consider operating expense as well as price in computing the monthly ranking.

In *Home Office* (page 45), Steve Bass outlines strategies for controlling the deluge of "cookies" that are dropped on your hard disk as you travel the Web. He divides these snippets of code, which Web sites use to track you, into benevolent (perhaps they help a site remember your previously stored preferences) or malevolent (they may track you for marketing purposes).

An even more radical solution, which we've covered before, is Freedom 1.1 from Zero-Knowledge Systems (www.zeroknowledge.com). Available from www.pcworld.com/downloads, this software lets you travel the Web and receive e-mail with absolute anonymity for $50 a year. "Freedom lets you create as many as five digital pseudonyms," explains Austin Hill, president and cofounder of the Montreal firm. "You might have one for health care, one for political discussions, and so forth. Each pseudonym collects its own cookies and has its own e-mail address. For example, you could use the health pseudonym to join an Internet discussion on cancer without worrying about someone finding those postings and associating them with you."

LOW-TECH PRIVACY

BASS AND I share a simpler form of privacy protection when we fill out those personal information sheets that many Web sites demand before giving you free service. As Steve explains in his Net phones story (page 183), he always registers as an unemployed high-school grad with 16 kids who was born on January 1, 1900, and has an income under $10,000. Now by coincidence, I use that 1900 birth date as part of a fictitious profile for Web registrations too. It's easy to remember, and I figure it might turn up some interesting e-mail pitches aimed at centenarians. (No luck, so far; guess there aren't many marketers chasing the 100-plus crowd.)

Maybe there are more of us out there in the bogus class of '00. If you have a good pseudonym or other such tricks to protect your identity online, please tell me about it by writing to eddir@pcworld.com. Anonymously, of course.

COMING UP IN DECEMBER

Viruses–The Next Wave: The sons of Love Bug have their eye on your PC. We'll tell you what's coming and how to head them off.
Hot High-Tech Gifts: Handheld e-book readers with built-in MP3 players, pens that scan data into Palms—you get the picture.
Digital Camera Shootout: We rate 15 new megapixel models with prices under and over $500, and find two Best Buys.
Home PCs Holiday Roundup: Edit that video, mix that soundtrack. Home systems with brawn and brains can do all that and more.
12 Favorite Games for Grownups: Adventure, racing, sports, simulation—you name it. *PC World* editors pick the standouts.

Kevin McKean is editorial director of PC World. ■

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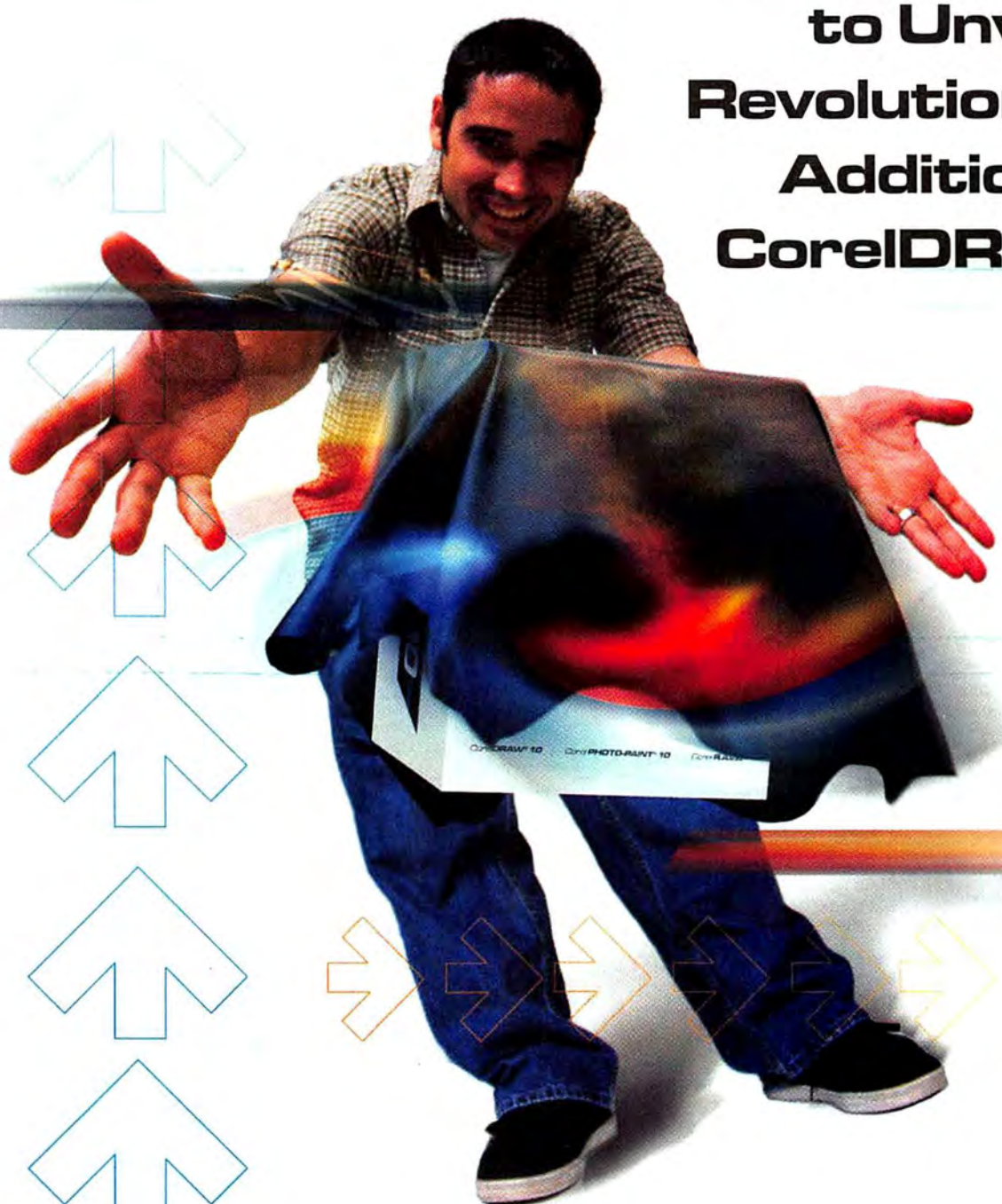

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YOUR TAKE ON: Laptops and flight safety ◆ Firewalls ◆ Car wars on the Net

BUSINESS PCs AND RELIABILITY

YOUR EDITORS, in explaining how they picked the "Best Products of 2000" [*Letters*, September], admit that "HP did not rank high in our PC Reliability and Service survey" but say that they selected the HP Vectra as Best Corporate PC "for its features, performance, and expandability." In the business world, it is not widgets and toys that count; it is reliability. Nothing else even comes close. We have several Vectras in our office, and quite a few of them have crashed with total data loss. As in real estate where it is *location, location, location*, in the business world it is *reliability, reliability, reliability.*

John Little
Madison Heights, Michigan

ELECTRONICS ON AIRCRAFT

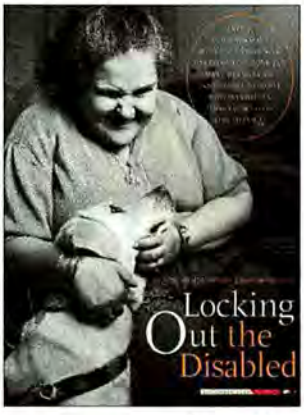
A READER questioned why airlines restrict the use of electronic devices like laptops in flight [*Letters*, September]. As someone who once did electronic interference research and testing for defense contractors, I believe I can explain.

All modern processor-based electronic devices emit radio-frequency energy in the VHF and UHF communications spectrum. These frequencies may interfere with radio navigation aids, radio altimeters, and satellite navigation receivers.

On top of that, emissions from cell phones and other such devices could conceivably interfere with certain control systems of the aircraft itself.

Your readers should ask whether the use of these devices is really so important during the time they are on an aircraft that it's worth risking their lives and maybe the lives of hundreds of others.

Warren D. Hoover
Durham, North Carolina



SEARCH ENGINE DIRECTORY

ONE OF THE search tips in "How to Stop Searching and Start Finding" [September] was to keep several search engines bookmarked. You can keep the number of bookmarks down if you bookmark www.searchgateway.com. This site includes a directory of search engines. You can search most engines straight from the Searchgateway page, or you can follow a link to the search engine's home page.

Jessica Roberts, Phoenix

HACKER-PROOFING

THE AUTHOR of "Make Your PC Hacker-Proof" [September] didn't get to do long-term testing of ZoneAlarm, one of your Best Buys, so he did not notice one problem it has. I work for an Internet services and applications provider, and customers who use ZoneAlarm have noticed that the program database gets corrupted with disturbing regularity—ICQ suddenly stops working and your FTP program no longer sees the Net, though the Web browser is fine. Once Zone Labs patches this, I think it will be worth recommending again.

Eric McCormick
Cybertime Network Services
Yucaipa, California

Editor's response: According to representatives of Zone Labs (www.zonelabs.com), this problem did occur in earlier versions of the product, through ZoneAlarm version 2.1.18. They recommend upgrading to the latest version, which at press time was 2.1.25. Users can upgrade for free by selecting the program's *Configure* panel and clicking *Check for Update.* –Seán Captain

SPACE-HUNGRY ME

IN YOUR "All About Me" (Windows Millennium) article [*Top of the News*, September], the chart on page 59 indicates the free space needed for the Me upgrade from various versions of Windows. For Windows 95 and 98, the chart says, ▶

HOT BUTTON

Readers: Web Should Be Accessible to All

REGARDING "Locking Out the Disabled" [September]: My eyesight is gradually deteriorating, and I'm having considerable trouble with poorly designed Web sites. Magnifiers, screen readers, and browser options may help some users. But there's a whole spectrum of people to satisfy, all different. Good design helps all users all the time.

David S. Brumley, San Diego

WEB DESIGN FOR accessibility is not a new concept. Tim Berners-Lee, an inventor of the Web, has said, "The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect."

Karen Cooney, Villa Park, Illinois

THE ATTITUDE expressed by some of the e-business people in your article is arrogant, ignorant, and insulting to all of us. As a college professor who teaches online classes, I have become increasingly aware of the need for greater flexibility in my Web site design, not only for my students who may have vision problems, but for all the students who have various learning styles. I am still trying to learn how to make my online courses more accessible. I just wish more Web designers would make a similar effort.

Mary Lou V. Crouch, Fairfax, Virginia

AS THE DEVELOPER of the most widely used tool to help designers and users evaluate Web site accessibility, the Center for Applied Special Technology is pleased to announce that its recently released Bobby 3.2 (www.cast.org/bobby) includes a shorter, friendlier report than Heim encountered, with more-detailed help files. We invite all your readers—whether affected by disabilities or not—to get a sense of accessibility issues by visiting and using Bobby.

Donald R. Giller
Chief Resource Development Officer
Center for Applied Special Technology
Peabody, Massachusetts

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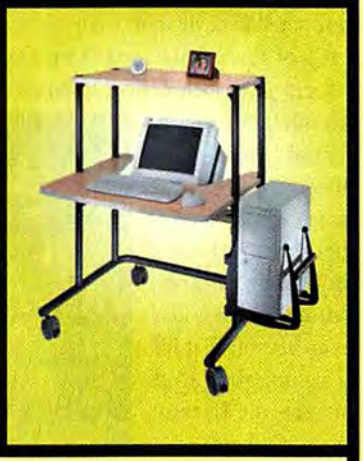

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you need 295MB; for Windows NT, 650MB; and for Windows 98 SE, 2GB! I do not understand these big differences and why such an unbelievable amount of free space is needed. What's going on?

Lou Masucci, via the Internet

Author's response: The information comes from Microsoft's Web site at www.microsoft.com/windowsme/guide/sysreqs.asp. The requirements reflect the tasks listed for each upgrade, and the big jump in required free space was to accommodate using Windows Movie Maker. That amount is arbitrary; digital video editing takes lots of disk space. The actual space needed will depend on how much digitized video you store on your hard disk. **–Scott Spanbauer**

WEB CAR WARS

I READ Christina Wood's "Web's Car Wars" [*Consumer Watch*, September] with special interest, as I just bought a new car using online car sites. The process was easy and pleasant—words I've never used before to describe buying a car.

Wood's fears that the industry will swamp these independent sites sound plausible, but I hope they are unfounded. May the Internet's empowerment of the consumer continue to grow!

Sherry Peruzzi
Columbia, Maryland

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

CORRECTIONS AND CLARIFICATIONS

OCTOBER'S *Table of Contents* should have credited the cover photo to Stan Musilek.

October's *Top 10 Midrange PCs* should have said that the NEC PowerMate ES SlimLine PIII-733 does have expansion slots; it has three PCI slots and one expansion bay.

In August's "Best of the Web" article, we implied that Hotmail doesn't integrate with an instant-messaging service. In fact, Hotmail can page MSN Messenger users when they receive new e-mail.

In August's *New Products*, we reported that OhGolly.com provides free Web site creation software and hosting. After our story went to press, the company introduced new Web site products and services for a fee.

PC World regrets the errors.

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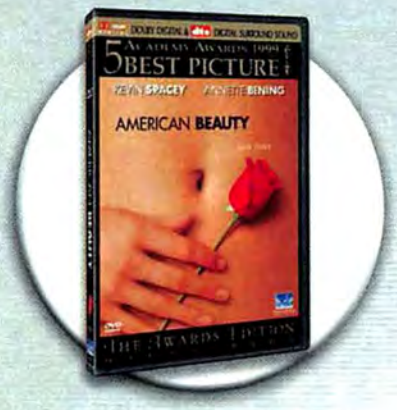

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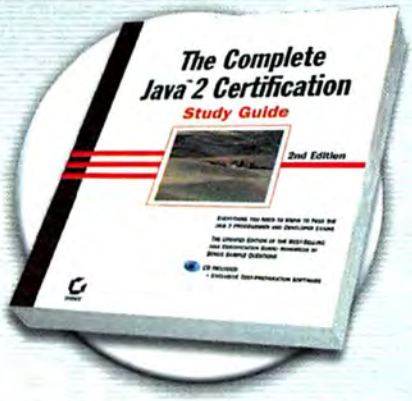

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Okay ATI, so I had a few doubts about all the rave reviews that have been awarded to your new RADEON™ graphics boards. Yeah sure, your new RADEON™ boards are fast, even screaming fast, but it was the realistic 32-bit color 3D graphics that truly made me weep! You have really done it this time with the RADEON™ 64MB DDR and its awesome 3D performance to power all of my favorite games. And the RADEON™ 32MB SDR board features stunning 3D and DVD playback. I am truly impressed with your challenge to take on the best and with RADEON™ you've left them in the last century. So, the only thing I say to you ATI is ....

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Privacy Policy? What Privacy Policy?

As more Web sites hit the skids, customer databases could go to the highest bidder.

ILLUSTRATION: RICHARD TUSCHMAN

THESE ARE HARD TIMES for Internet commerce sites. Scarcely a day passes without news of a dot com's financial trouble or demise. That isn't upsetting only for workers worried about their jobs or investors who could lose their money. It should be alarming for all of us who do business on the Web.

And it's not just about your money. Sure, your first concern might be to get your cash back if you ordered something from a company that promptly went belly-up. But many of these companies have a commodity that can be as valuable as your cash and that they hold on to long after a sale is completed. That commodity is your personal information—and it can be at serious risk when dot coms die.

Consider the death of Toysmart.com. This toy site ran into serious financial trouble when its majority owner, Disney, backed out. The site ultimately shut down in May and filed for Chapter 11 bankruptcy protection in June.

As part of its reorganization efforts, Toysmart tried to auction off the database of information the company had collected about customers. The database contained addresses, shopping preferences, family profiles with the names and ages of children, and other personal information. The site's privacy policy had promised that customer information would never be shared with third parties. Yet less than one year after the privacy statement was posted, that data was being offered for sale to the highest bidder.

Privacy experts worry that the Toysmart case is only the beginning. "Frankly, we are going to see a lot of dot coms go out of business," says Richard M. Smith, chief technical officer at the Privacy Foundation, a Denver-based group that works on privacy issues involving computer and communications technologies. "We may see a lot more of this kind of thing in the future."

In fact, in a new privacy policy sent recently to its customers, Amazon.com stated that "in the unlikely event" the company were bought, the new owners would "of course" receive shoppers' private information as part of the deal.

IN COME THE LAWYERS

TOYSMART'S PLANS set off an interesting legal brouhaha. The Federal Trade Commission, the attorneys general of 40 states, and privacy advocates all stepped in to block the sale.

The Federal Trade Commission proposed a settlement that would have prevented the Waltham, Massachusetts–based toy seller from selling its customer database except as part of the company—and then only to a buyer with a similar business. That wasn't good enough for the state attorneys general, who wanted to hold Toysmart to its promise that the information would *never* be sold. At press time, the parties were awaiting a judicial decision in the U.S. Bankruptcy Court in Massachusetts.

Considering all the legal powerhouses that have rallied to protect Toysmart customers, it's tempting to assume that you can continue to trust online privacy statements, no matter ▶

what happens to the firms you do business with. But that attitude might be taking things too much on faith.

"I don't want to say consumers should not worry. This is not a settled area of the law," says Dana Rosenfeld, assistant director of the Federal Trade Commission's Bureau of Consumer Protection.

WHO CAN YOU TRUST?

RICHARD SMITH WORRIES about the fate of other cyberlists, particularly those at sites that gather medical or other sensitive data. "What if you get into a situation where you enter your health records at a site? Then a drug company buys that site. What happens to that data then? I'd be a little worried about giving out information—especially health records."

How do you protect yourself? "Anytime consumers choose to do business online, they should check out the viability of the company they plan to do business with," says Brad Maione, a spokesperson for the New York State Attorney General's office.

Unfortunately, keeping track of which Web sites are in financial trouble is a full-time job. In the real world, you lower your risk by doing business at reputable firms with storefronts you can return to. On the Net, you can apply much of the same filtering. If you like to shop at the Gap, Williams-Sonoma, or other large merchants in the real world, visit their sites when you shop online. There are no guarantees—after all Toysmart's biggest investor, Disney, is no fly-by-night operation. But Williams-Sonoma will likely try not to anger online customers it hopes will also visit its brick-and-mortar stores.

When it comes to private information, shopping sites aren't the only online venues you should worry about. If you plan to use the Net to secure insurance, loans, or other stuff that requires you to enter a good deal of personal information, you should do some legwork before you commit to a particular site. Consult the Better Business Bureau and the attorney general's office in the state where the company is based. For more tips, see "Dealing with a Dead Dot Com" at www.pcworld.com/sepoo/dead_dotcoms.

No amount of research, though, can guarantee that a site won't sell information it promises to keep confidential. For that kind of protection, we may have to wait for legislative action. Both the FTC and the New York State Attorney General's office told me they have proposed legislation to protect consumers' privacy in this sort of situation.

I believe that someday we'll have some legal assurance that our private information will remain private. Until that day comes, don't be reckless on the Web. Avoid giving out information. Do business only with outfits you trust. In short, watch your back. It's really all you can do.

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

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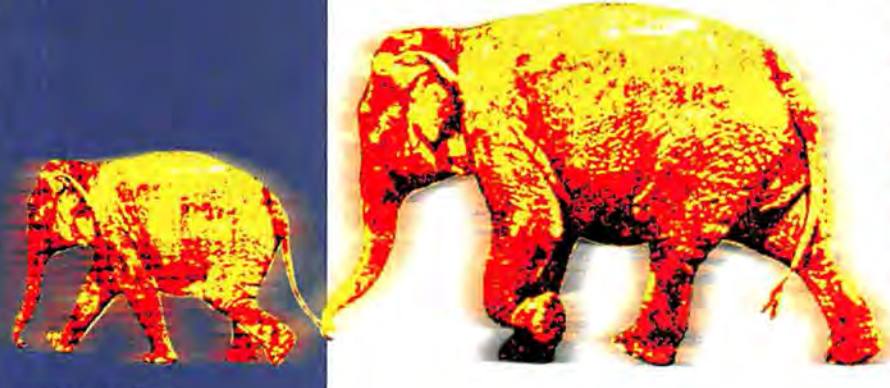
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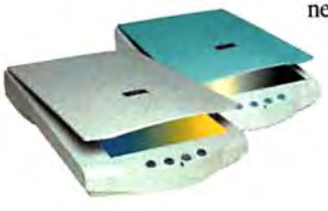

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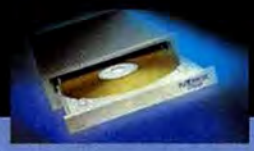

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Tech Advice Sites: Free or Fee?

IF YOU'VE EVER needed tech support—and who hasn't?—you know what it's like to spend hours on hold. Maybe you've already turned to the Web for help, where many sites offer free or fee-based service. But when it comes to online tech support, don't pay for what's already free.

A reader recently complained that Email The Tech.Com (emailthetech.com), which charges up to $40 a year for "unlimited tech support," lifts most of its information verbatim from reputable, free technical advice sites such as Tom's Hardware Guide (www.tomshardware.com). A visit to Email The Tech confirms the reader's observation. The site even acknowledges that "All of [its] resources come from very popular rated sites." Tom's Hardware Guide was not aware that Email The Tech was taking its information and charging money for it. Since many tech advice sites offer their information for free, why should anyone fork over $40 for the privilege of reading it?

Email The Tech itself raised more red flags than a used car lot. I noted links to the likes of "EZ cash." And how was I meant to interpret the puzzling promise "We don't give out fraud information"? Contact information—once I found it—was limited to a post office box somewhere in Mississippi. My attempts to contact the principals went unanswered.

If you have a problem your PC vendor can't solve, there are tech support sites you can turn to without spending a nickel (see "Free Support Free-for-All," www.pcworld.com/apr2000/free_support). Whether a site is hawking tech support or travel tips, do some investigating before you offer up your plastic. Read a site's policies to make sure the information it's selling isn't available elsewhere for free. Be wary of sites with links to items like get-rich-quick schemes and that don't provide a company address, phone, and e-mail.

ILLUSTRATION: JOHN CUNEO; ICONS: JEFFREY PELO

Heads Up...

EFax, Where Are You? Frustrated by lapses in service, EFax.com customers, who pay $4.95 a month to send and receive faxes and voice mail via their PC, complained of delays in sending documents and, in some areas, receiving them. The service was also unavailable for two weeks in parts of Colorado, Maryland, Rhode Island, Virginia, and Washington. EFax.com posted service updates on its Web site (www.efax.com), citing a power outage as one of the causes of the problem. **Web Pharmacies Get FTC Fix:** The Federal Trade Commission is cracking down on sites that sell prescription drugs without performing standard pharmaceutical checks. It charged several sites, including Worldwidemedicine.com and Focusmedical.com, with fraudulently claiming to have on-site medical and pharmaceutical facilities and with violating privacy and disclosure assurances. The charges have been settled, but it's best to see a doctor in person to get a prescription. If you fill it online, do so with a reputable site such as Drugstore.com. **AMS Goes O-U-T:** In July, I warned that things weren't looking good for notebook manufacturer AMS Technology; AMS has now shut its doors and filed for bankruptcy. Contact Mitac at 949/789-0100 or www.mitac.com for support info.

LETTER OF THE MONTH

WE PURCHASED SYMANTEC'S Norton SystemWorks 2000 to upgrade the Norton AntiVirus and Utilities programs that came preinstalled on our Dell PC. Symantec offered a rebate, so we downloaded the rebate form from its Web site. The vendor required either the first page of the manual or the original CD as proof of purchase. Since Dell preinstalled the software and we have neither a manual nor a CD, how do we furnish proof of purchase to get a rebate?

Jim and Maggie Coulson
Norfolk, Virginia

***On Your Side* responds:** In the rebate game, preinstalled, OEM (original equipment manufacturer) software plays by a different set of rules. Genevieve Haldeman, group manager of corporate communications at Symantec, explains that its rebate program "is designed for customers who own a previous retail [boxed or downloaded] product." However, the company's order desk and online upgrade center can offer prices equivalent to what you'd pay after rebate for the retail version. Bottom line? Ask your PC vendor if you are entitled to any rebates. ■

GOTTEN A RAW DEAL?

Or a great one? E-mail the details to onyourside@pcworld.com. We'll investigate complaints and publish items of the broadest interest. Anne Kandra is a contributing editor for PC World.

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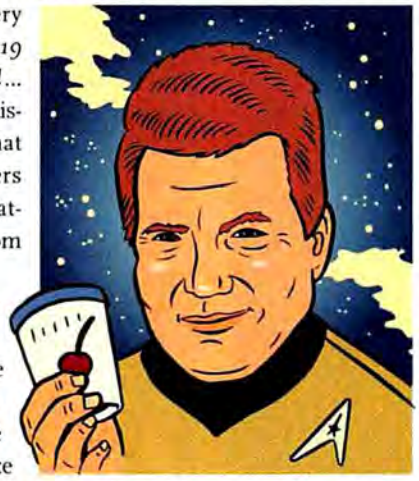
Where No Shopper Has Gone Before

WILLIAM SHATNER WAS wound up—*really* wound up. The starship-captain-turned-dot-com-salesman was on my TV, pitching a new Priceline.com service: Name-your-own-price groceries. With the weird urgency familiar from a gazillion *Star Trek* reruns, he declared that Priceline's WebHouse Club could save me up to 50 percent at the supermarket. Happy consumers confirmed his claims.

The ad could have been more convincing. For one thing, I had trouble picturing the actor best known as James T. Kirk fretting over his grocery bill. ("*Must save...19 cents on...canned... pears!*") And a brief disclaimer revealed that the ecstatic shoppers were actors, re-creating testimonials from real customers.



Still, Priceline has delivered when I've used it to reserve hotel rooms on the cheap. But does the name-your-own-price system designed for lodging, plane tickets, and home loans make sense for chicken parts and baby wipes? Or for gasoline, another new Priceline offering?

For the truly bargain-obsessed, maybe. The price breaks are indeed real—but what Mr. Shatner fails to mention are the hoops you must jump through to get them. As I angled for discounts, WebHouse Club's hitches and glitches began multiplying like Tribbles.

BIDDING FOR BRAN FLAKES

AS WITH ALL OF Priceline's services, "name your own price" tells only a sliver of the story. Sure, you can make offers for the foodstuffs and household items that WebHouse Club carries. But whether the service will *accept* your price is another matter. And until you agree to buy something, you don't know the brand you'll get. Or whether your local grocery store has it in stock. Or even how much dough (if any) you'll save.

I got my feet wet by haggling for yogurt. Priceline presented me with three brands (Breyers, Colombo, and Dannon) and told me to select at least two that I'd be willing to buy. It also showed me the different prices I could bid and the odds that each would be accepted. According to the site, the typical store price was 79 to 83 cents a cup; I offered 65 cents, which gave me a 90 percent chance of success.

Yogurt, as it happens, is among the most popular items offered via the WebHouse Club. An extensive but incomplete range of staples is available: ketchup, orange juice, and shampoo, for instance, but not mustard, grapefruit juice, or conditioner. With certain perishables such as meat, produce, and milk, you must bid using a form of online currency called Half-Price Tokens. According to Priceline, these tokens guarantee you a large discount (50 percent of an item's typical store price). But you can use them only if you have them. You get six tokens to start ▶

New on the Net...

Gift Guidance. So you need to purchase a present for a former Californian, or for a weight lifter or a conspiracy theorist—and you're stumped. Head to Surprise.com, and you'll find gift ideas for these and dozens of other folks. The recommendations, provided by site visitors, come from all over the Web. And with offbeat ideas like Krispy Kreme doughnut merchandise, desktop Zen rock gardens, and bungee-jumping lessons, they're fun just to browse through... **More Free ISP Fallout.** I'm still hearing from former users of now-defunct free ISPs Freewwweb and WorldSpy who aren't too pleased with Juno, the provider that acquired the failed services' customers. The most common gripes: slow connections and irksome on-screen ads. If you're in the market for a new free ISP, visit Freedomlist.com, a nifty guide to 500+ contenders, with a features comparison, message boards, and lots of reviews by real people. The one thing it can't tell you are the chances that a given free provider will be around for the long haul... **Point Program Redux.** Also in my mailbox: letters from folks who read my take on Web shopping-incentive programs such as ClickMiles and Greenpoints (see www.pcworld.com/sep2000/shopper_points). Many of the messages were from fans of FreeRide (www.freeride.com), a points program I didn't mention. So I checked FreeRide's site out—and if you're a freebie junkie, so should you. It lets you rack up points in more ways than most of its rivals do, including shopping, surfing, and even running Web searches at AltaVista and Go.com. And you can cash in the points you collect for discounts and free stuff at a bevy of merchants—everyone from Brooks Brothers to Toys "R" Us to Wine.com. Best of all, the site's cartoony look and feel are entertaining in themselves.

ILLUSTRATION: MARK MATCHO; ICONS: JEFFREY PELO

with, and you can accrue more through such acts of e-commerce as subscribing to Hickory Farms' e-mail newsletter.

Once you've filled your virtual shopping cart, Priceline takes about a minute to consider each of your bids individually. If any or all of them are successful, the site tells you the brands you've bought and bills your credit card then and there. You can pick up your purchases at any store that participates in the WebHouse Club program. (It's not available everywhere, but a growing number of major supermarket chains are on board.)

For all the intricacies of the bidding process, the rubber doesn't really hit the road until you reach your local supermarket. And as I wheeled my cart around, I discovered that some of my discounts

GIMME FIVE

Windows Information Sites

NEWS BULLETINS, trouble-shooting advice, application tips—the need for Windows information is never-ending. Check out these sites for high-grade help from true WinMavens:

1. About.com Focus on Windows (windows.about.com/compute/windows): A comprehensive, authoritative, and well-organized guide to all things Windows, from Registry secrets to Microsoft's legal woes.

2. Frank Condron's World O' Windows (www.worldowindows.com): One man's cornucopia of tips and news, plus an invaluable (albeit occasionally outdated) driver search engine.

3. Absolute WinInfo (www.barkers.org/windows): This directory of Windows resources from around the Web mimics the look and feel of the Win 98 desktop.

4. SearchWin2000.com: Just what its name says—a Yahoo-like search engine/portal that's all Windows 2000, all the time; lots of stuff for advanced users and technical types.

5. Bob Cerelli's Windows Page (www.halcyon.com/cerelli): Beginners and old pros alike will appreciate Bob's no-nonsense, step-by-step tips and tutorials on dozens of topics.

FYI

BUYER BEWARE! A new report on customer service at the top 50 online stores rates no site as better than "average."

SOURCE: GARTNER GROUP

were indeed steep. A bottle of Finesse shampoo that normally went for $3.99 cost me just $1.70; Swiss Miss cocoa mix fell from $3.99 to $2.25. A gallon of milk that I bought with a Half-Price Token dropped from $2.59 to $1.47—not half-price according to *my* math, but still a sizable price break.

On the other hand, my yogurt markdown sounded like a rounding error: I saved 1.6 cents per cup. (The supermarket's standard price was three cups for $2, well below Priceline's estimate of three for $2.37 to $2.49.) Worse, the store's standard price for Glad trash bags was $2.99; I'd already paid Priceline $3.19. In such cases, Priceline offers to make up the difference—but only in the form of credit against future purchases.

The store was out of the last item on my Priceline list, a half-gallon of Breyers frozen yogurt. So when I checked out—dutifully sorting Priceline purchases from the rest of my groceries, since they must be rung up separately—I asked Debbie, the cashier, what to do about out-of-stock groceries. She didn't know.

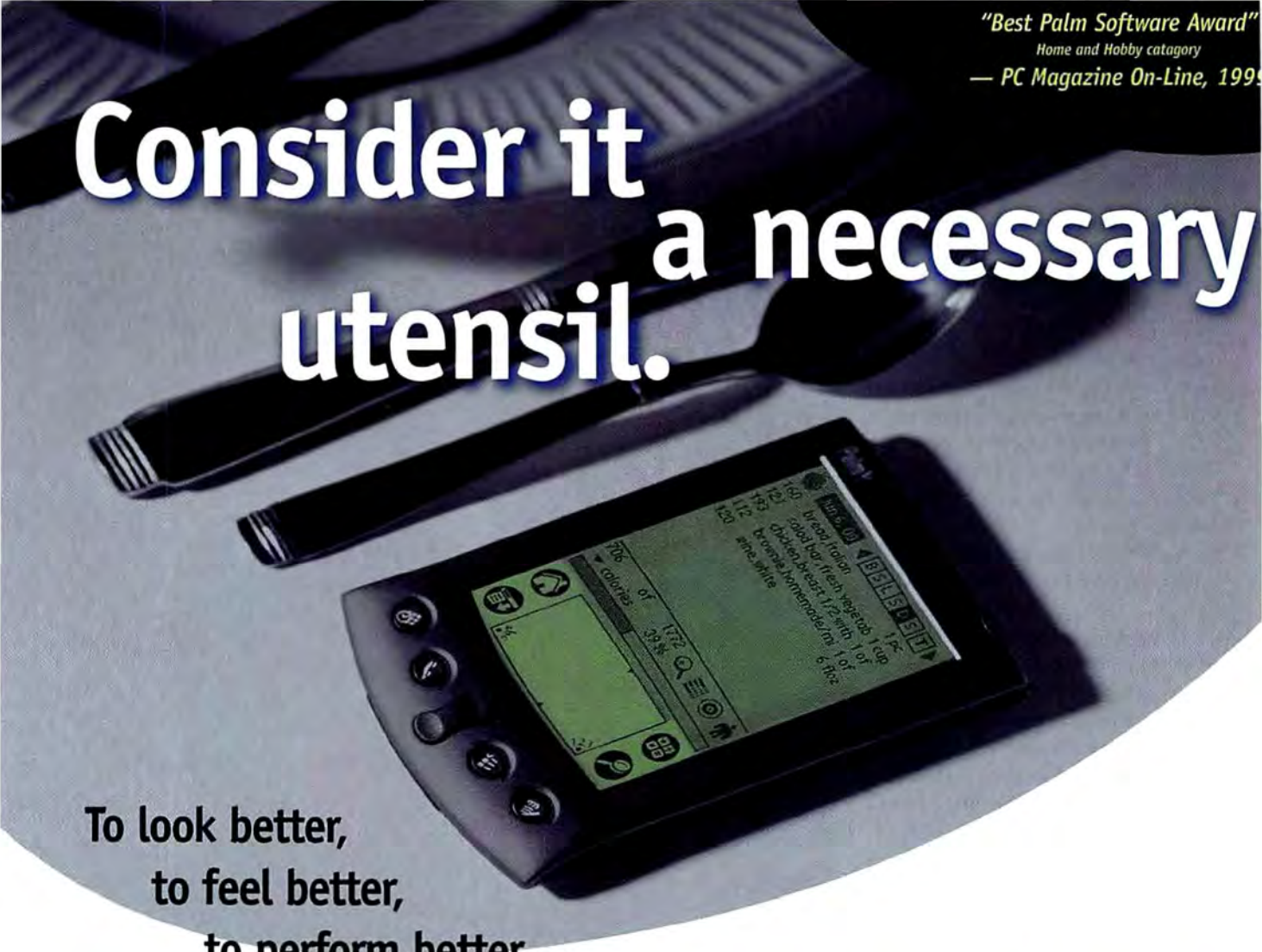
Turns out that Priceline does not issue refunds for out-of-stock items. Instead, you have to try again—and again and again, if the product happens to prove particularly elusive. I made a mental note to look for the frozen yogurt next time I descended on the grocery store.

FUEL ME ONCE

MEANWHILE, I TRIED Priceline's name-your-own-price gasoline service. In theory, the drill is this: You name the per-gallon price you're willing to pay and commit to buying gas (in 10-gallon increments) from any of at least three nearby participating stations. If Priceline accepts your offer, it directs you to a specific station and bills your credit card instantly. At the pump, you use a Priceline Gas Card to settle the transaction. ▶

"Best Palm Software Award"
Home and Hobby catagory
— PC Magazine On-Line, 199

Consider it a necessary utensil.



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My experience, though, was a fiasco almost from the get-go. I snagged 10 gallons of regular-grade gas at $1.53 a gallon, a dime less per gallon than the prevailing price in my neighborhood. But Priceline sent me to a nonexistent address: It said the station was in Boston, but the zip code was in Arlington, Massachusetts, 8 miles into suburbia. And the site provided no maps, driving directions, or distance estimates to help me out. There wasn't even a phone number for the filling station.

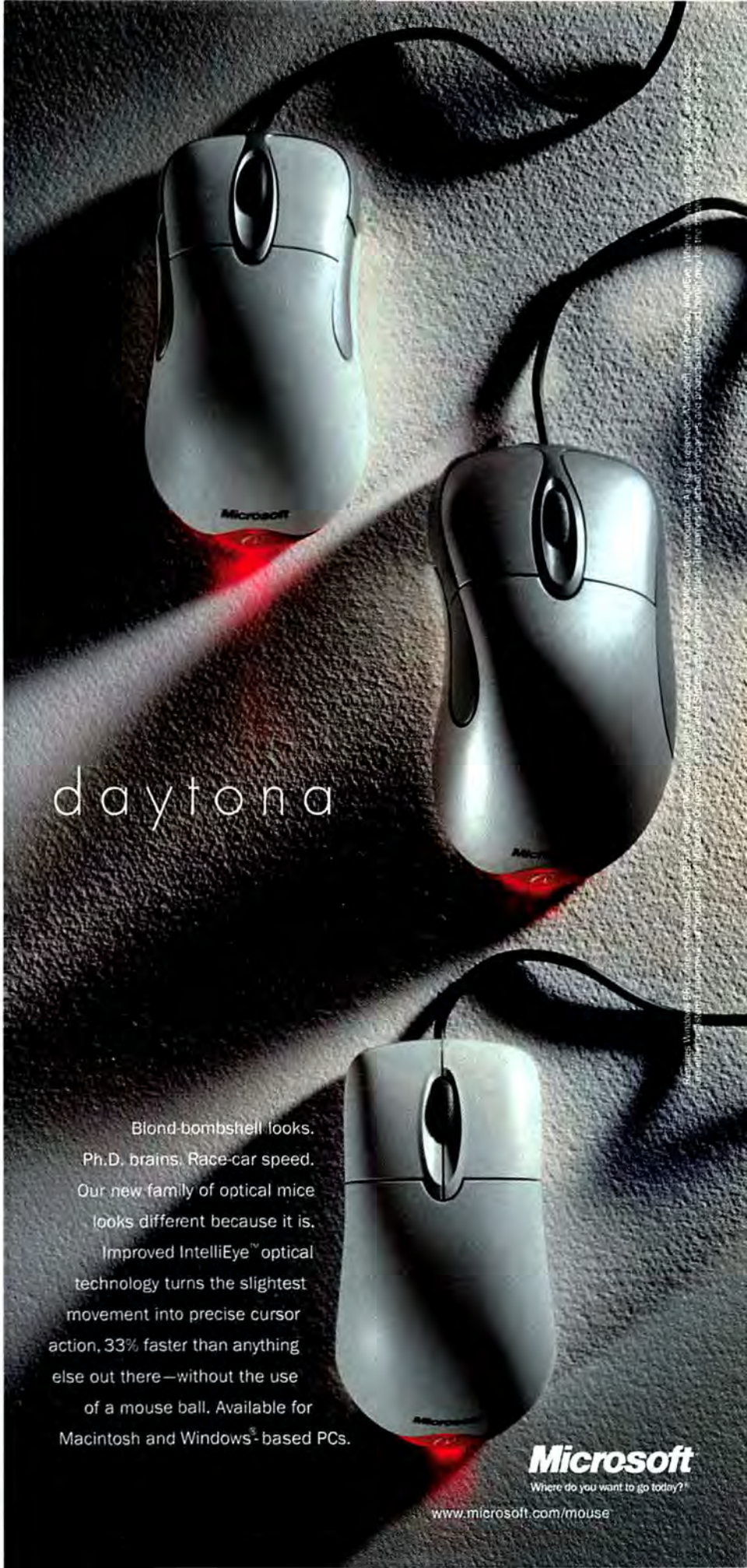
Eventually, I found the station and tanked up. But when I handed the attendant my Priceline card, he stared at me as if I'd forked over a wad of Monopoly money, and asked, "What is this?" Once he figured out how to handle the sale, he told me that my card had been declined. I ended up paying full price for the gas out of my pocket. Back home, I e-mailed Priceline customer support, requesting a refund and an explanation. The former arrived quickly; the latter never did. Later, a Priceline WebHouse Club spokesperson told me that my experience was atypical. One can only hope.

HIGHLY ILLOGICAL

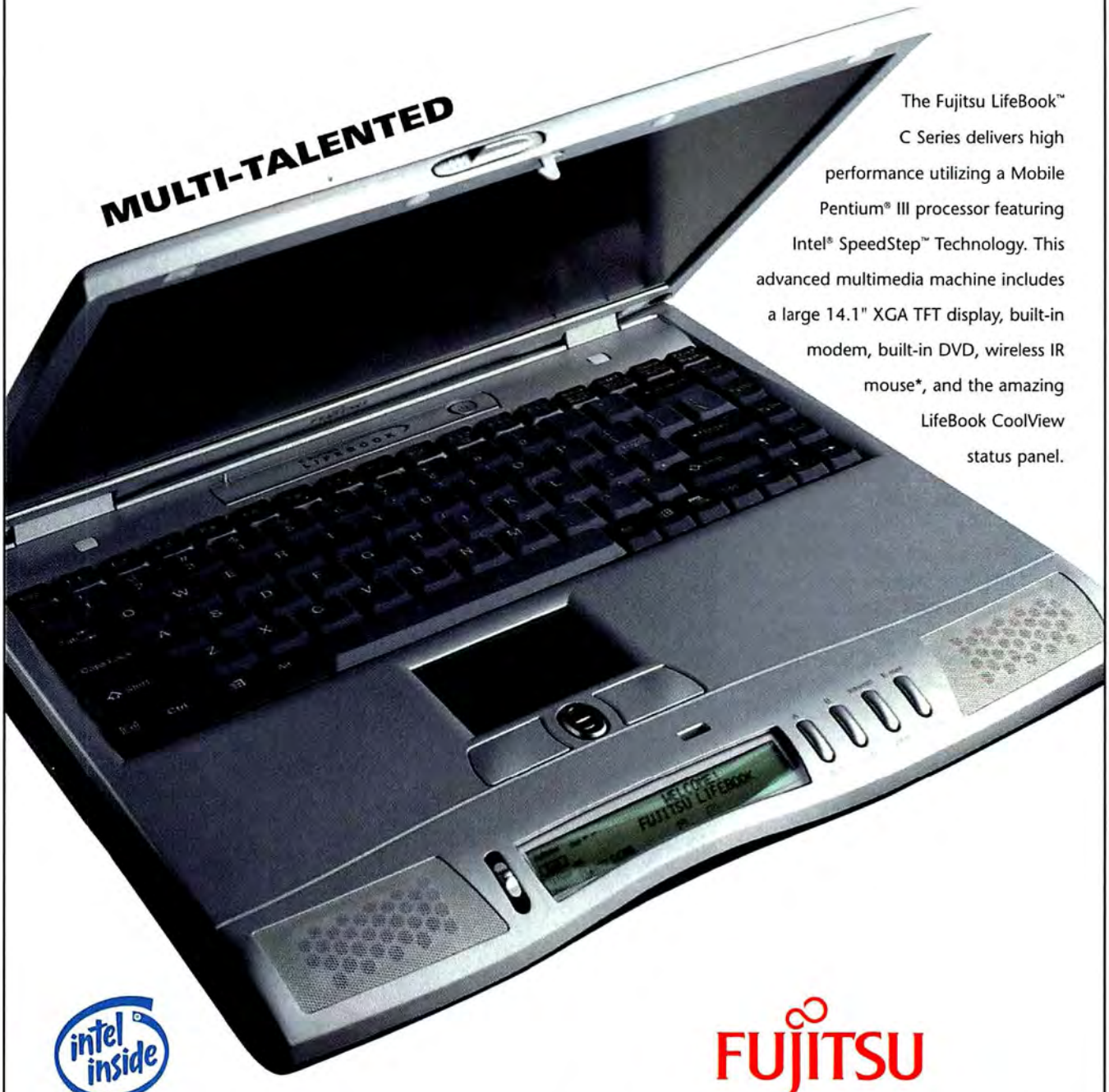
GROCERY SHOPPING and gas station visits aren't exactly scintillating experiences in the first place; the WebHouse Club's Byzantine rules and unforgiving policies only add to the drudgery. What's more, little charges chip away at the big savings that supposedly make it all worthwhile. WebHouse Club membership, for instance, is free for the first 90 days only. After that, you pay $3 in any month in which you bid on groceries. With grocery purchases, a small but mysterious "other charges" fee tags you for such items as the sales tax that *would* have been due had you paid the average full retail price for your items. And so on.

Hey, I'll still use Priceline for cut-rate hotel rooms—and as long as William Shatner keeps making goofy TV ads, I'll keep guffawing. But unless WebHouse Club gets more shopper-friendly, chances are it won't be part of my store trek.

Contact PC World *Executive Editor Harry McCracken at websavvy@pcworld.com.* ■



MULTI-TALENTED



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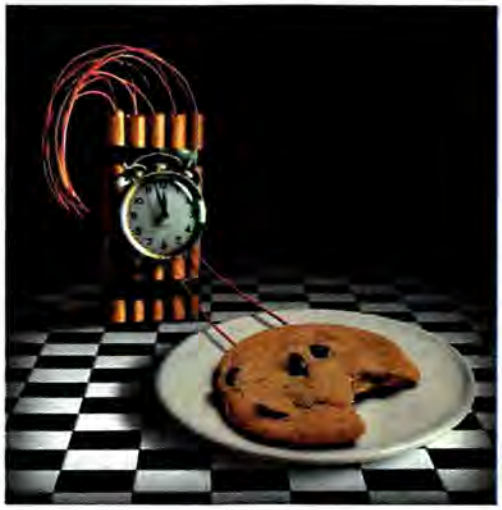
*Free with select models.

Fight for Your Online Privacy

THE INTERNET IS booby-trapped. Security leaks are pervasive, and violations of consumer and company privacy are commonplace. Folks, people are doing things behind your back, and you don't even know it.

I can hear you asking me, Ed McMahon–like, "How bad *is* it, Steve-o?" You probably already know that companies track the files you download, the sites you visit, and the things you buy. You may also be aware that free ad-sponsored programs such as PKZip for Windows and GoZilla place hidden files on your PC. Maybe you consider this part of the cost of going online, but do we really understand the threat data collectors pose to our privacy?

That's why I'm writing this column: I'm alarmed, I'm angry, and I'm determined to show you how to protect yourself.



Cookies are the most common **privacy invader,** and they're also the **easiest** for me **to control.**

OUT OF THE WEB SHADOWS

THE WHOLE PRIVACY issue is about informed consent. Tell me what you're planning to do *before* you do it, and maybe I'll allow it. But sneak behind my back, and the bits will hit the virtual fan (see June's cover story, "Privacy 2000: In Web We Trust?" www.pcworld.com/junoo/trust).

Cookies are the most common privacy invader, and they're also the easiest for me to control. Web sites begin to store these files on my PC when I first visit, so they can recognize me—along with my Web browsing preferences and maybe my buying history—when I return. I consider these *benevolent* cookies because they let a Web site remember, say, the DVDs I rented or the dog food I ordered for my pooch.

In the other corner are *malevolent* cookies used by third parties—such as ad companies like DoubleClick and Avenue A—to track my online travels without telling me. These cookies tell the next site about me (and my dog) so it can greet me with a banner ad pitching a DVD starring Lassie. (What, you thought sites had ESP?)

I rely on two sites to keep up-to-date on cookie innovations. The first of these, www.cookiecentral.com, provides a terrific overview of cookies; the second, www.privacy.net, steps you through a demo of how ad networks such as DoubleClick collect personal information.

HOW TO CRUMBLE A COOKIE

PLENTY OF PROGRAMS block cookies, but I have three favorites—all free (and available at PCWorld.com's Downloads).

IDcide becomes part of your browser and wedges itself between you and advertiser cookies while letting benevolent cookies through. You can reset the utility on the fly to block all cookies prior to visiting an untrustworthy site. Or if you're curious, IDcide can supply tracking details so you can see who's following your browsing.

I'm also happy with AdSubtract, which stops cookies *and* blocks bothersome ads. On the downside, AdSubtract stops *all* cookies except those you choose to accept from up to five Web sites. (A $15 version has unlimited, custom settings and lets you sort ad cookies and trusted-site cookies by giving them different colors.)

The most intriguing of the three programs, though, is Naviscope. Like AdSubtract, it stops cookies and ad intrusions. It also throws in a dozen nifty tools to eliminate other Web annoyances, such as sounds, pop-up windows, and blinking text. And it prefetches Web pages to make downloading subsequent pages faster.

THAT'S NOT OPPORTUNITY KNOCKING

WHILE YOU BUSILY number-crunch confidential data for your boss, ne'er-do-wells scan the Net looking for vulnerable computers. I get checked out a dozen times a day, and it's not due to my affable personality. Make your PC undetectable by using ZoneAlarm, an excellent firewall that's free for personal use.

ZoneAlarm is easy to set up, though it asks confusing questions the first time you access the Internet. With your permission, the firewall provides unhindered Net access for your e-mail, browser, antivirus updater, and other chosen programs. But it stops suspect incoming requests, asking for a consultation only at your direction. ZoneAlarm's MailSafe also stopped a Visual Basic script worm from sneaking in through e-mail as I wrote this column. (Note: For a review of the $40 ZoneAlarm Pro version, see this month's *New Products.*)

There's also lots of information leaving your PC while you surf. Next month I'll tackle ad-sponsored programs, RealPlayer's tricks, and ways to make yourself anonymous. *En garde!*

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

ILLUSTRATION: WILLIAM DUKE

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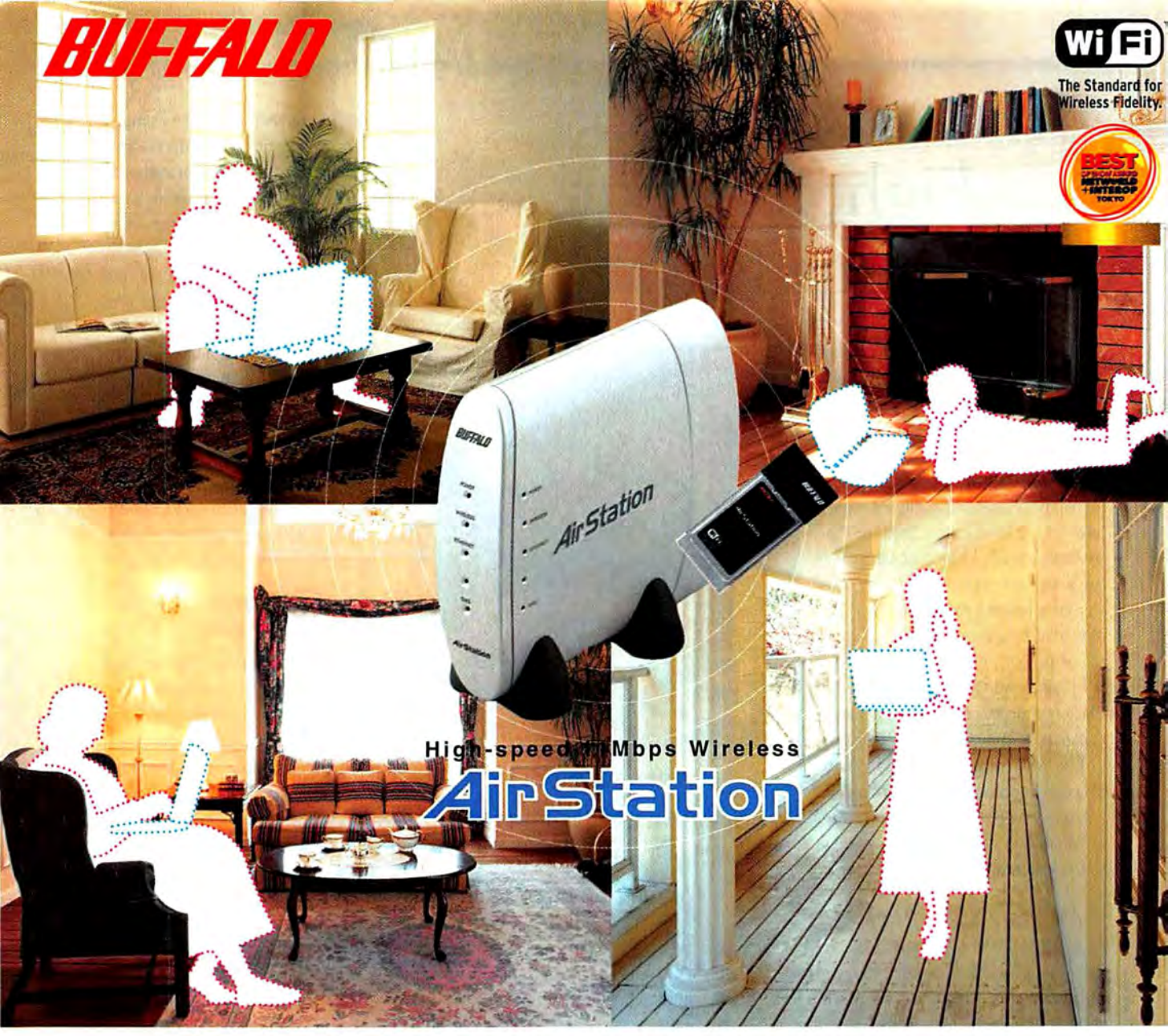
BEST



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Buggy browsers ◆ Palm OS devices host Trojan horse ◆ **Microsoft Money woes**

Java Lets Hackers Attack Your Browser

ICON: JEFFREY PELO

MOST SECURITY EXPERTS consider Java one of the safest Web technologies, thanks to its built-in security feature that scans any application running under Java for rogue code. But two recent discoveries raise doubts about Java's security. Bug sleuth Dan Brumleve found one Java-based hole in some versions of Netscape Communicator, while Microsoft identified another in its own Internet Explorer.

BUG Versions 4.05 through 4.74 of Netscape Communicator are vulnerable to attacks on the browser's Java virtual machine—the part of the browser that runs Java applets, which add interactivity to Web pages. A weakness in Java's security could allow a hacker to plant a malicious applet on the Web page and read files on your computer without your knowledge. (The hacker couldn't delete data, however.) Communicator browsers running on Windows 95, 98, NT, and 2000 are susceptible to attack.

FIX Netscape's latest browser upgrade, Communicator 4.75, plugs this security hole. You can get the 15.8MB upgrade at home.netscape.com/computing/download. If you're running version 4.74, you'll need only a 4MB patch (from the same URL). Alternatively, you can disable Java in your browser: Within Communicator, select *Edit•Preferences•Advanced*, and uncheck *Enable Java*. This second method disables all Java applets; as a result, Web sites that use them won't behave properly, and you'll miss out on some interactive features such as Internet phone keypads.

Safeguard Your Microsoft Money Files

IF YOU USE Microsoft Money, you know that the passwords protecting your financial files are encrypted. However, Microsoft recently discovered a security crack in Money 2000 and 2001. This flaw could reveal your passwords to an intruder as plain text, enabling the hacker to snoop around the financial files on your hard drive. To peer at your documents, however, the thief needs physical access to your PC. The attack itself cannot come over the Internet.

The company's fix for the problem encodes your Money passwords with 128-bit encryption. To get the patch, you must use the program's online update feature. Within Money itself, click *Tools•Update Internet Information*. Microsoft urges users to change their passwords after applying this fix. For more details, check out www.microsoft.com/technet/security/bulletin/fq00-061.asp.

IN BRIEF

Trojan Horse Hits PDAs

SAVE YOUR Palm PDA or Handspring Visor from the "Liberty Crack" Trojan horse. Identified by McAfee.com, the intruder deletes applications from infected Palm OS devices. McAfee.com has posted a fix that kills the horse on owners' PCs before it can infect their handheld devices. For the fix and more details, go to www.mcafee.com/wireless.

Hole in WordPerfect 8 for Linux

COREL HAS acknowledged a minor snafu in WordPerfect 8 for Linux that could let another user access your files over the Internet. Corel recommends deleting and reinstalling the program and then taking some additional steps. For specific instructions on the workaround, go to linux.corel.com/support/wp8_linuxfix.htm.

BUG A related flaw in Internet Explorer affects the Java virtual machine in IE versions 4.*x* and 5.*x* under Windows 95, 98, NT, and 2000. Many Web sites, such as online banks, store your personal log-in information in the browser for reuse. An ill-intentioned site operator could exploit IE's security hole to visit sites you're authorized to access, using your identity. The Java applet on a booby-trapped site passes your "credentials" to the hacker, who then can impersonate you while visiting other sites. The hole would not let the interloper steal passwords. Like the Netscape weakness, though, it would permit the intruder to read your files.

FIX Microsoft's patch will keep a creep from using the hole to steal your online identity. Get the 141KB fix at www.microsoft.com/technet/security/bulletin/ms00-059.asp.

KICK OUT THE KAKWORM

THE SIMPLE ACT of reading your e-mail can unleash the virus known as Wscript.KakWorm. The worm attaches a copy of itself to all outgoing messages, alters your Registry settings, and shuts down your PC at 5 p.m. on the first day of each month. If you use Outlook Express 5.0 and these symptoms sound familiar, your PC may be infected. For PCs running Windows 95, 98, and NT, Symantec has released a fix. Get the free 125KB download at www.symantec.com/avcenter/venc/data/wscript.kakworm.fix.html.

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

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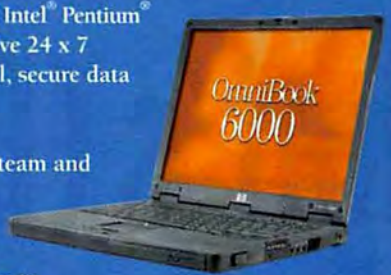

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TOP OF THE NEWS

That's (Digital) Entertainment!

◆ By Scott Spanbauer

Welcome to the revolution: Digital movies, books, and music are coming direct to your home by way of your PC. Soon, always-on entertainment will be just a mouse-click away.

COMPUTERS AND the Web will change the way we access and pay for entertainment in the 21st century as profoundly as film, radio, and television changed it in the 20th. Napster has already proved that we're ready and willing to get our music over the Web. Digital books and movies aren't far behind—the end-user tech-

ILLUSTRATION: HARRY CAMPBELL; ICONS: JEFFREY PELO

nologies for obtaining and enjoying them are falling into place right now, with more coming in the next six to twelve months.

Because digital entertainment isn't chained to a single device or physical location, it isn't hard to imagine a home entertainment system that links your television, stereo, PCs, and handheld devices to the Internet.

To be sure, technical issues abound. But the real obstacles are the movie studios, record labels, and book publishers afraid that this revolution will mean the end of their old ways of doing business.

They have reason to worry.

ADULTS WANT MP3s

AND WE WANT them now. Today you can download music files from Web sites, Usenet newsgroups, Napster, FTP servers, and other sources, and burn them to audio CDs, transfer them to handheld digital audio players, or play them right on your PC.

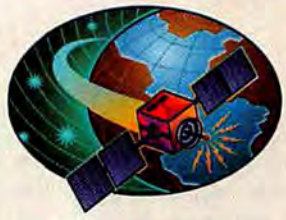
Unfortunately, most online music files are illegal copies. Of course, that hasn't stopped big-name manufacturers like Sony, RCA, and S3 from marketing portable players; and now that kids have turned their parents on to these file formats, a whole new market is springing up for MP3-based home stereo equipment.

The first of these home audio products—from companies like S3 and Stereo-link—are available online or on store shelves now. Others are set to reach the market as we go to press, and more are due out by the holidays (see "MP3s Come to Home Stereos," page 54).

But getting music into your PC or portable player in the first place is still something of a hassle, particularly if you want to do it legally (see "Pay to Play: MP3s by Subscription," page 58).

In the future, these operations may be simpler. At long last, wireless home net- ▶

DISPATCH



Product Pipeline

➤ **Sync It Up With Works 2001:** The latest upgrade to Microsoft's home productivity suite enables you to sync address and datebook entries with a Palm 3.0- or Windows CE 2.0-based device. Available now, the suite is a $109 upgrade for owners of any previous version of Works basic, Microsoft Word 6.0 or later, and select WordPerfect versions.

Tidbytes

➤ **Epson Color Fade:** Do you own an Epson Stylus Photo 870, 875DC, or 1270 and wonder why your glossy photos turn orange? In places with heavy ozone concentrations in the air, the printer's cyan (blue) ink deteriorates rapidly. Epson is reformulating its Premium Glossy Photo Paper to reduce its sensitivity to contaminants and is offering some refunds. For more refund information, call Epson's customer relations line at 800/533-3731.

➤ **MSN Billing Glitch:** Due to a bug in new billing software for MSN's Internet access service, some subscribers' bank or credit card accounts were hit with bank holds of $500 or more. Call the financial institution handling your MSN bill to find out if your account has been affected. If it has, call 800/386-5550; Microsoft will lift the hold and may deal with related problems. ▶

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.

MP3s Come to Home Stereos

I'LL BE BLUNT: Until fairly recently, most MP3s sounded crappy on a home stereo. But as the format's popularity has exploded, software for creating high-quality (160-bit or better) MP3 files has improved. Now hardware vendors are jumping on the bandwagon with components designed to unite PCs and stereo systems. These new products, including two real standouts—S3's Rio Digital Audio Receiver and Stereo-link's SL1200—deliver top-notch sound.

Stereo Component as PC Peripheral

THE SL1200 FROM Stereo-link (www.stereo-link.com) connects to your PC via a USB cable and to your receiver or preamp with standard RCA jacks—there is no software to install. And since your sound card is out of the loop, your music is free of interference from the PC's internal noises. On top of that, the SL1200's 20-bit digital-to-analog converters far outclass anything on a PC sound card.

The result is exceptionally sweet sound, particularly with high-bit-rate recordings: no more screeches on the high end, and much richer and fuller bass. I couldn't hear much difference between a CD of Garbage's "I Think I'm Paranoid" and a 192-bit MP3 version I have.

STEREO-LINK'S SL1200 and S3's Rio DAR.

The SL1200 is well worth its $199 price if you consider sound quality your top priority. You must, however, set up everything on your computer manually—organizing your songs, choosing your playlist, and pressing *go*. There's no remote. The SL1200 is merely a conduit for the music, and since cables keep the device tethered to your PC, you must keep your stereo close at hand.

REQUEST Multimedia's hefty AudioReQuest.

Music Everywhere

MUCH LIKE the SL1200, the Rio Digital Audio Receiver from S3 (www.riohome.com) can connect your PC, stereo, and speakers, but its real appeal is its ability to pipe music to any location in your home over an ethernet- or phone-line-based network.

The $249 Rio DAR has its own amplification system (10 watts per channel), so you can hook up your speakers directly to the unit. Then you plug the DAR into an ethernet port (or into a phone jack if you use a Home PNA network) and install the simple software on a networked PC. Turn the DAR on, and it searches your PC for music files.

Though this little unit is a bit underpowered, it delivered surprisingly robust audio, particularly when I connected it to my beloved NHT SuperOnes bookshelf speakers ($350). One downside: Your music may not be PC-bound, but your playlists are. You can't create a list from the DAR; you can only play a list already created on a PC, use the remote to play albums, or tediously search by author or title.

Unlike the others, the AudioReQuest from Request Multimedia (www.request.com) is a high-end product that comes with a 20GB hard drive and a Celeron CPU, and you can use it to record, store, and play back MP3s and WMA files. It also functions as a CD player. Its best feature is its ability to digitally encode anything you can play through a stereo, which means you can turn that old Steppenwolf cut into an MP3. But in the end, this big (17 by 3.5 by 13 inches), heavy (25 pounds), pricey ($799) machine's conveniences—MP3 playback without your PC, and the ability to rip CDs and vinyl records into MP3s—weren't enough to justify the price.

Overall, these first home audio components for downloadable music suggest music fans have plenty to look forward to. Now if I can just find a well-recorded version of Hendrix's "Midnight" to play through an SL1200, I'll be a truly happy camper.

—Ramon McLeod

works are fast enough to be practical; they can link your PC and its Internet connection to your home theater system, so you can stream files from the Net directly to your living-room dance floor.

Meanwhile, at the gym or in the car, you'll bring the music with you, using a handheld device or music-capable mobile phone that streams tunes over a high-speed wireless connection and hooks up with your car radio via a Bluetooth wireless link. And you'll probably pay for your music by subscription, just as you do for cable TV channels.

But who will you pay for access to this music? Don't count on the recipient being the current premier MP3 vendor, MP3.com. As we went to press, the company had just lost its copyright-infringement battle against Seagram's Universal Music Group, and could be liable for hundreds of millions of dollars, a financial burden that—if affirmed on appeal—would likely put the site out of business. "Suing MP3.com is exactly backward," states Forrester Research analyst Eric Scheirer. "At least with MP3.com, there is the potential for money to be made. But stamping out MP3.com is simply driving consumers to Napster."

Not that Napster is necessarily long for this world, either. But if the RIAA (the recording industry trade group) successfully sues Napster and Scour.com into near-extinction, less-vulnerable technologies will step into the breach. The Gnutella program and the Freenet and Usenet newsgroups are ownerless, don't rely on central servers, and are basically unstoppable. By con-

PHOTOGRAPHS: KEVIN CANDLAND

trast, MP3.com looks benign, and even potentially beneficial to copyright holders.

While the labels focus on lawsuits and fumble online sales, they risk losing control of the industry altogether. Sites like Garageband.com, IUMA.com, and Launch.com increasingly enable unknown bands to bypass the traditional recording industry and go directly to the masses.

COMING ATTRACTIONS

ONLINE VIDEO isn't yet as popular as online music, but it soon will be. The technology is almost here: DSL and cable are a must for downloading or streaming video that looks as good as what you see on TV; and encryption is improving, especially with the advent of new MPEG4 variants like DivX. You can watch streaming video with RealPlayer or Windows Media Player. And though they're illegal, you can download pirated MPEG and DivX movies and watch them on your PC or burn them to a video CD that plays in your DVD player (see "Will DivX Kill the Video Store?" below).

However, downloading and burning movies is a lot of work. "The danger of Napster-like video sharing is much less than with music because consumers use video differently," says Forrester's Scheirer, noting that most people don't watch the same video repeatedly, and that video rentals are cheap and fairly convenient. Webnoize analyst Ric Dube concurs: "You can already copy VHS tapes by using two VCRs, but it's simply not worth the effort. It's easier just to go and rent the movie." Further, unlike CD-based music, DVD content is currently sacrosanct, thanks to provisions of the Digital Millennium Copyright Act. Programs that allow you to defeat the format's CSS encryption abound, but they are likely to remain illegal hackerware indefinitely.

Meanwhile, you can record movies from your TV in DVD form, though it's outrageously expensive. Panasonic's ▶

Site to See: HomeJupiter.com

ACCURATELY ESTIMATING the cost of home renovation projects is neither fun nor easy. Homejupiter.com hopes to ease the anxiety with a fairly accurate set of cost estimation tools for pricing projects ranging from constructing a simple home office to renovating a complex kitchen. Prices reflect market rates in your area. The new site stumbles a bit when you drill into its products area, where you're supposed to find vendors and supplies for your project. But it appears to have the right foundation to become a good resource for home renovators.

Top PC World Downloads

1 Clean System Directory
72KB, 11,717 downloads
Improves system performance by removing unused DLL files.

2 Motherboard Monitor
1.2MB, 10,071 downloads
Reads temperature and fan data collected by your PC's BIOS; displays it in Windows' system tray.

3 Amazing Waterfalls
4.31MB, 8278 downloads
Waterfalls screen saver.

4 AquaSupreme
3.91MB, 7948 downloads
Adds fish, plants, bubble sounds, and more to your screen saver.

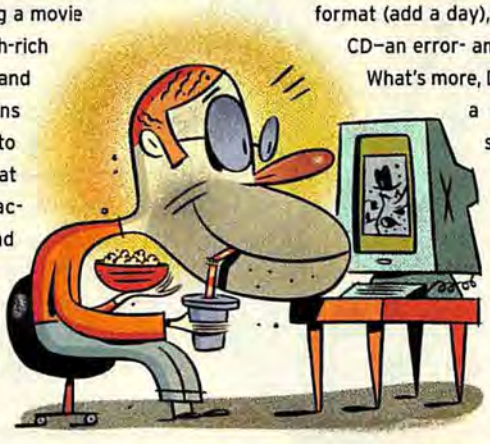
5 The Best Icons (All Icons)
2.56MB, 7606 downloads
A free collection of 5000 icons.

Find files on www.pcworld.com/downloads/top5/nov2000.

Will DivX Kill the Video Store?

SURREPTITIOUS WEB SITES, file-sharing tools like Gnutella and Scour Exchange, and pirated movies on Usenet newsgroups and Internet Relay Chat channels all prove one point: Many people already use the Net to get movies home-delivered.

But while downloading a movie may be fun for bandwidth-rich techies, it's also illegal and cumbersome. That means most of us will continue to get our movies offline—at least until broadband access is more widespread and downloaded movies are as high-quality and as simple to obtain as movies from your local rental store.



A new compression format could help speed that change. Hackers have reverse-engineered Microsoft's proprietary MPEG4 video-compression scheme and turned it into a digital-video equivalent of MP3. Several versions of the MPEG4 crack exist, but the one destined for stardom is DivX, named after (but unrelated to) Circuit City's failed DVD rental scheme.

Still, despite having a smaller download size than competing schemes (DivX files take 10 to 20 percent as much space as other formats), DivX is still probably more trouble than it's worth for now.

First, most of us aren't eager to devote the time needed to download a 600MB file. And watching a DivX file on TV means first converting it to MPEG format (add a day), and then burning it to CD—an error- and curse-prone process. What's more, DivX quality is currently a crapshoot: Although some DivX films are winners, many others are dark and are marred by compression artifacts that distort motion and speech.

Because all DivX movies are pirated, *you* have to solve all the problems of getting them off the Net and into your living room—downloading, decoding, converting, and saving. But don't yell "cut" yet. As broadband becomes more prevalent and compression tools improve, studios could adopt DivX-like solutions (many of which are in the works) to deliver their content to you in a tidy package. And using that package could one day become a viable alternative to jogging down to the video store. —Scott Spanbauer

ILLUSTRATION: HARRY CAMPBELL

$4000 DMR-E10 DVD recorder lets you use new 4.7GB DVD-RAM discs to tape TV programs the same way you would with a VCR. Your TV input, however, remains analog, limiting quality for now.

On another front, the film and cable industries have shown competence at delivering video content via pay-per-view and subscription models, and are likely to adapt these to a Net-based delivery system. Dube says Blockbuster is preparing to test an interactive video-on-demand service in Arizona that delivers movies to TiVo recorders over DSL.

As with music, there's still room for the little guys. Web sites like AtomFilms, Ifilm, and WireBreak are inventing new and shorter kinds of video content more suited to PC playback. It's risky business, though, and many failures litter the landscape.

REINVENTING BOOKS

THOUGH E-BOOKS have been around for over two years, only this year—with the arrival of Microsoft's Reader program and Stephen King's much-publicized foray into online self-publishing—did the technology attract buyer attention.

You can download thousands of books from Barnesandnoble.com's new Ebooks superstore or from sites such as Amazon.com, but e-books remain problematic (see "Pulp Friction," below). As with legitimate digital music, selection is skimpy in comparison to what you can find in stores; and prices are about the same as dead-tree versions, a turnoff for buyers who need an incentive to move to a new reading paradigm. "If there is going to be a legitimate model for e-books, it's going to be significantly lower-priced," predicts Scheirer.

E-books face other obstacles. At the moment, buyers—and publishers—must choose between several incompatible reader formats, among them Adobe's Acrobat and Glassbook, Microsoft's Reader, and Rocket's EBook. And like music and movie producers, book publishers fear piracy.

What's more, consum- ▶

Pulp Friction: E-Books Take On Paper

SINCE ELECTRONIC READERS appeared two years ago, we've heard heaps of hype about how they'll replace p-books, revolutionize publishing, save the rain forests, reduce global waste, and bring peace to the Middle East.

Okay, maybe not that last one.

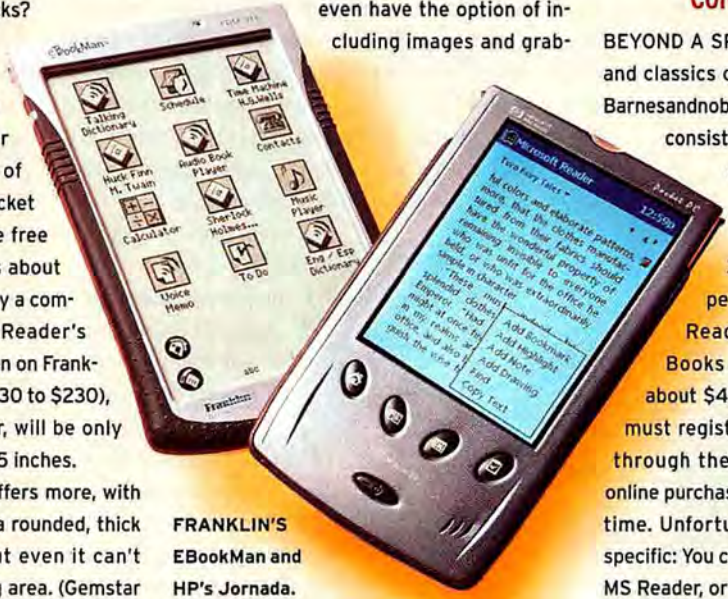
So why don't airports stock e-book readers instead of Grisham paperbacks?

It's the Visuals

FIRST, most e-book reading devices are too small. For instance, the reading area of the $499 HP Jornada, a Pocket PC unit that comes with the free Microsoft Reader, measures about 1.75 by 2.5 inches—not exactly a comfortable read, despite the Reader's Clear Type feature. The screen on Franklin's upcoming EBookMan ($130 to $230), which also uses the Reader, will be only slightly larger at 2.75 by 3.25 inches.

The $199 Rocket EBook offers more, with a 3-by-4.5-inch screen and a rounded, thick edge for easy gripping, but even it can't match a paperback's viewing area. (Gemstar TV Guide International, new owner of Rocket EBook and its competitor, Softbook, has stopped making these products. Instead, it has licensed the technology to RCA, which plans to release two new e-book devices, the $300 REB1100 and $600 REB1200.)

I preferred the Rocket EBook to the HP Jornada hands down, though the single-purpose Rocket meant I had to carry around an extra device just for reading. The Rocket was easier to read in bright light and also was more intuitive, even with its advanced features such as text searches and annotations. The Rocket lets you import any .txt or HTML file in a few simple steps. With HTML, you even have the option of including images and grabbing associated links. The Rocket also promises longer life: 40 hours from its battery versus the Jornada's 8 hours.



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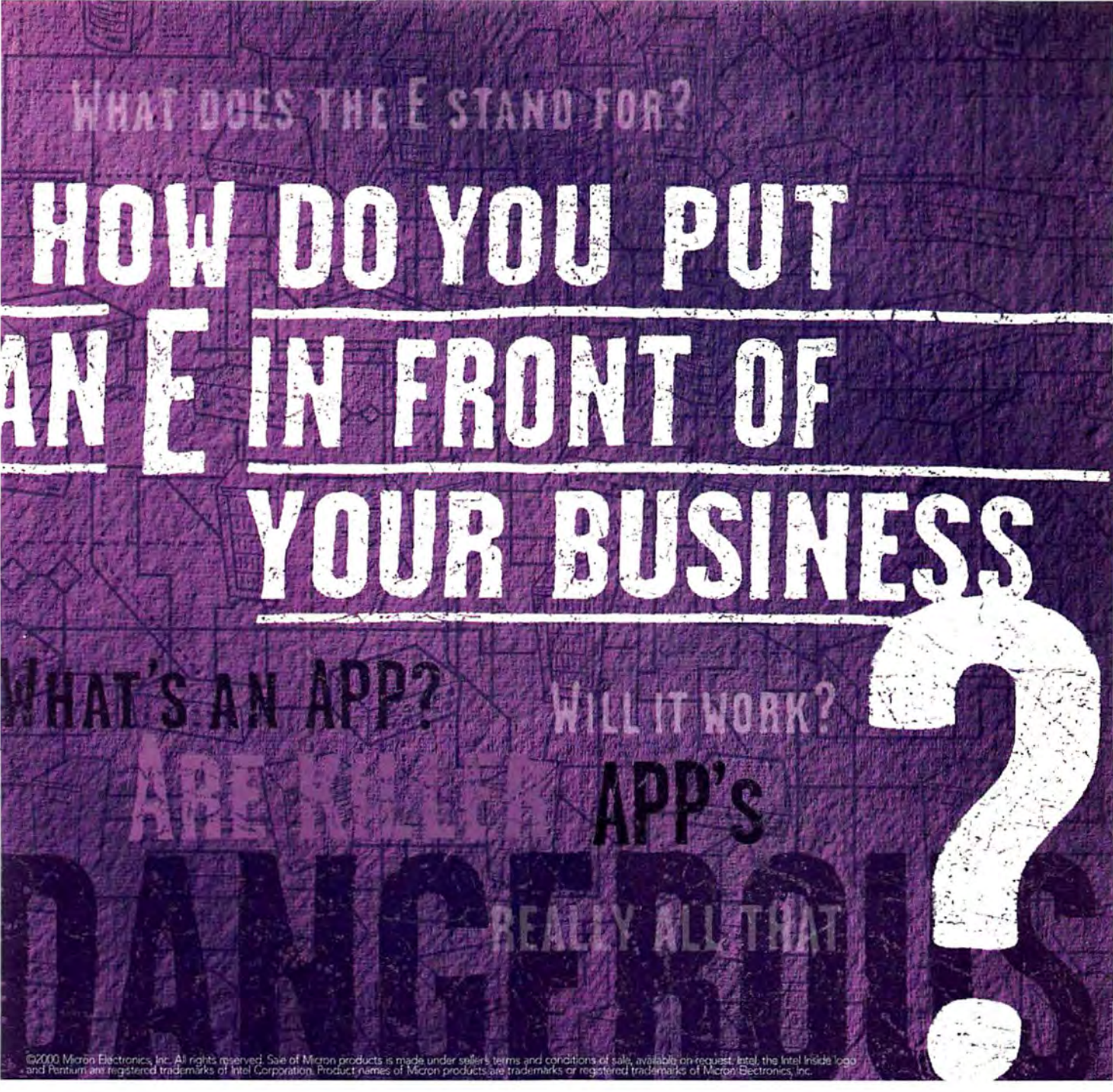
Although e-books offer an alternative for reading and storing technical and business titles (most devices can hold the content of at least eight standard books), they're unlikely to replace the printed word anytime soon. I might be persuaded to purchase an e-book for business, but I prefer the old-fashioned kind for pleasure. —Kim Zetter

PHOTOGRAPH: KEVIN CANDLAND



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ers approach each type of media differently. So far, for reading, many people still prefer old-fashioned paper over a PC screen or a handheld device. To overcome that preference, hybrid formats are beginning to appear. These attempt to combine the customization that digital downloads make possible—you can select chapters piecemeal, for instance—with the comfort of a physical book. IDG Books, in partnership with IUniverse, plans to make custom books a reality in the near future.

VOX AND POX POPULI

THOUGH PUNDITS argue that the entertainment industry has very little to fear from online copying—in fact, the RIAA's own reports confirm that CD sales are up, despite Napster—publishers will likely continue to move slowly toward embracing online sales as a revenue channel. For one thing, there's no single solution to the problem of digital media distribution. "We're going to see experiments, and they're probably going to fail," predicts Dube, who says he isn't holding his breath for the media conglomerates to devise a quick solution. "They aren't known for a real sense of adventure," he observes.

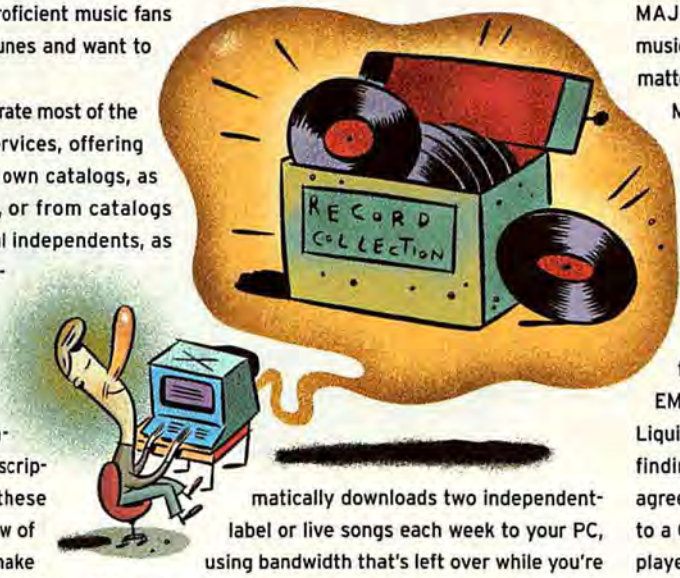
Subscription models currently offer the best mix of convenience and control, but these could still fail if content owners place overly restrictive conditions on use. Consumers are accustomed to buying and owning content, not keeping track of how often they transfer it from one medium—their PC, home theater system, or portable player—to another. Says Scheirer: "Consumers fundamentally want content that's easy to use and friendly. If the only thing out there is secure formats, then they're going to be driven to pirate sites."

Nothing is going to stop the digital entertainment revolution, because we've already decided that we want to use the Net and our PCs as a media conduit. We will still read books made of paper, buy CDs, and go to the movies. But we want our MP3s—and we're going to get them. ▶

Pay to Play: MP3s by Subscription

ONLY A FEW companies currently offer legitimate ways to get your tunes easily and for a reasonable fee, and their collections are limited. But the music delivery system that these pioneers offer should become increasingly attractive to Net-proficient music fans who simply must have tunes and want to obtain them legally.

Independent labels operate most of the existing subscription services, offering music either from their own catalogs, as SpinRecords.com does, or from catalogs aggregated from several independents, as EMusic.com does. RealNetworks offers both free independent-label music and subscription-based multimedia content. Some major labels have announced subscription plans, but none of these have debuted as yet; a few of the big-name labels do make a select (read: skimpy) number of albums and songs available for purchase, however.



Taking a Spin

SPINRECORDS.COM uses its $5-a-month service to promote its bands. It offers an unlimited number of MP3 files of songs by its roster of over 900 artists, but unfortunately the site's interface is cluttered. For $10 a month, EMusic.com has a larger catalog—125,000 MP3s—including some well-known artists. One nice feature is that you can buy albums on a one-shot basis. The sound quality is reasonably good, but downloads are slow.

Real.com Media, RealNetworks' free delivery service, takes a different tack: It automatically downloads two independent-label or live songs each week to your PC, using bandwidth that's left over while you're online. The free service downloads songs quickly over a broadband connection, but a good bit of hard-drive cranking accompanies the delivery. Sound quality is comparable to what you get at EMusic.com, and the download happens without any effort on your part. The service lacks specificity, however, letting you choose only a music genre.

For $10 a month, subscribers to RealNetworks' GoldPass service can receive original content from partners such as ABCNews.com and House of Blues. But considering the site's limited and mediocre streaming video content, the monthly charge seems unduly high.

Running the Gauntlet

MAJOR LABELS sell good downloadable music, but not conveniently. Universal's Bluematter service, offered via online retailers like Music.com, requires RealJukebox2, a Bluematter plug-in, and a Magex digital wallet account. But when I tried to buy a $2 single, I couldn't get the 6.3MB plug-in to download in three tries.

Sony's site sells $2.50 singles, but you must register, provide billing info, and get a plug-in for Sony's ATRAC3 format, which select jukeboxes accept. EMI Group offers 100 albums in WMA and Liquid Audio formats, but at CD prices—and finding the music can take all day. I had to agree to restrict playback to one PC, record to a CD only twice, and export to a portable player no more than three times. Over a T1 connection, a 69MB album downloaded in 10 minutes; I wouldn't try it by modem. Quality was reasonable, but for the same price I could buy the CD and rip it onto multiple PCs.

Indies are leading the way, showing that subscription services could solve many problems plaguing major-label downloads. But for now, the big-label services are cumbersome, demonstrating that the lure of free music isn't the only reason people love Napster.

—Cameron Crouch

ILLUSTRATION: HARRY CAMPBELL

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The Suite Hereafter: Sneak Peek at the Next Microsoft Office

FIRST LOOK

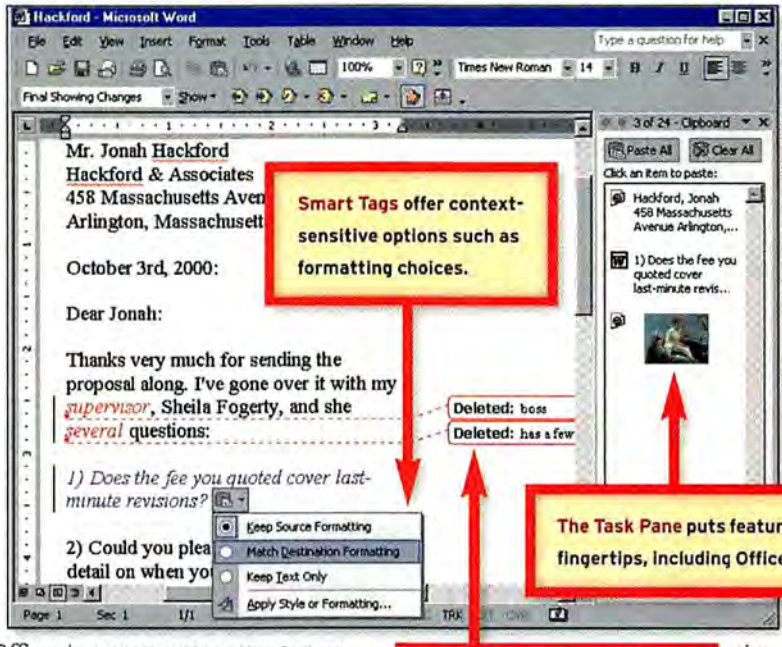
ARE THE suite wars over? In terms of market share, unquestionably. Superpower Microsoft Office accounts for a jaw-dropping 96 percent of retail suite sales, according to research firm PC Data. But Microsoft isn't done battling for our bucks. Every two years or so, it tries to sell the world on a new version of Office. Its next salvo, code-named Office 10, is due around the summer of 2001. Key enhancements improve ease of use, Web features, and workgroup tools—and add built-in speech recognition.

Sound familiar? Well, it should. When Office 2000 shipped in 1999, it concentrated on usability, the Internet, and workgroups; and Corel WordPerfect and Lotus SmartSuite have long offered voice recognition. Judging from the beta version we tested, Office 10 will nudge the suite forward a bit in many respects.

WORK IN PROGRESS

BUT LIKE ANY early beta release, this one is, in effect, a first draft. Some planned features are missing; others (like the voice recognition) are too raw to judge properly. Publisher and PhotoDraw are absent altogether, and the upgrade's name isn't set yet—much less the price. What we saw is a promising preview with a few rough spots.

With roots dating back to the 1980s, Office and its core components—Word, Excel, PowerPoint, Outlook, Access, and FrontPage—are as mature as software gets. So it's no surprise that most of this upgrade's improvements are nips and tucks, not radical innovations. Predictably, Microsoft seems poised to sidestep compatibility glitches by keeping intact almost all of Office 2000's file formats. The one partial exception: Access 10 will offer an optional new file format designed to speed up large databases.



A WISER WORD: New features simplify common tasks.

Many of the major changes aim to simplify existing features (see "Office Renovation: What's Up With the Apps," page 64). For example, Word's new Drawing Canvas keeps complex graphics creations from reformatting unexpectedly. Other innovations are Web-centric, including Outlook's integration with Microsoft's Hotmail and MSN Messenger services. And some offer a little bit of both: Excel's revised Web Query feature, for instance, streamlines snagging data from the Web and refreshing it on the fly.

Two nifty interface tweaks—the Task Pane and Smart Tags—offer instant access to information and options otherwise buried in menus and dialogs. Seemingly inspired by features in WordPerfect and Microsoft's own Internet Explorer, the Task Pane appears alongside documents to speed searching, formatting, and other jobs. It also makes cutting and pasting much easier by displaying all elements in the Office Clipboard (which can now store 24 items, up from 12 in Office 2000).

Smart Tags, meanwhile, are context-sensitive icons that show up as needed within documents. For example, when you paste a formula in Excel, a Smart Tag appears next to the cell; click it, and a menu lists formatting options that would otherwise show up only if you remembered to choose 'Paste Special' from the Edit menu. Smart Tags also let you disable AutoCorrect features such as automatic bulleted lists, either permanently or case by case.

TALK AND TEAMWORK

OFFICE 10's new built-in speech recognition capability may be its gee-whizziest addition. Word, Excel, and other apps now offer dictation and voice navigation features. In our informal tests, recognition was erratic at first but improved once we trained the system. But it's too early to gauge how this feature stacks up against third-party packages such as IBM's ViaVoice and Lernout & Hauspie's Dragon NaturallySpeaking.

In contrast, the new collaborative features seem almost ready for prime time. In fact, Word's revamped tools for wrangling revisions might justify the upgrade all by themselves if you use a tag-team approach to editing documents. Multiple users can ▶

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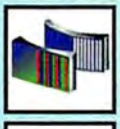

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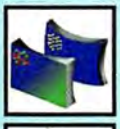

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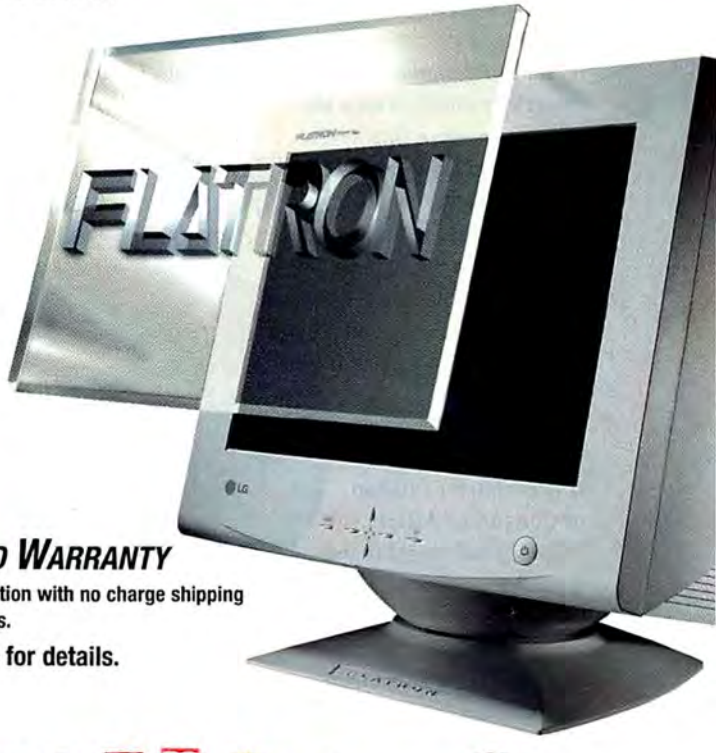

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now edit a file simultaneously; you can view changes as callouts in page margins (so they don't disturb page layouts); and you can compare and merge edits into a final version. Some of these features are present in other Office applications as well.

BETTER WEB TOOLS

OFFICE 10's workgroup Web tools far outshine their so-so Office 2000 predecessors. You can quickly set up and customize a slick Web site with message boards, scheduling tools, surveys, and document folders. But there's still room for improvement. For instance, integration between Outlook and the site's contact, event, and task lists is only rudimentary.

Office Renovation: What's Up With the Apps

EXPECT MODEST CHANGES everywhere when Office 10 makes its debut, probably sometime next year.

APPLICATION [1]	Enhanced features
Access	Improves PivotTable and PivotChart support; adds multilevel undo and redo in Data Access Page Designer; increases keyboard shortcuts; provides better support for multilingual databases.
Excel	Makes pivot tables and Web query tools easier to use; Watch Window lets you monitor a range of cells; improved find-and-replace tools and error checking.
FrontPage	Customizes Office's workgroup Web sites; creates photo galleries; supports AutoShapes and WordArt; introduces new tools for site publishing, usage monitoring, and reporting.
Outlook	Integrates with Hotmail and MSN Messenger; automatically completes e-mail addresses; allows on-the-fly switching between online and offline modes.
PowerPoint	Adds print preview, improved collaboration tools, and more animation and transition options; permits multiple design templates in a single presentation.
Word	Revamps tools for collaborative editing; displays changes as callouts to preserve document layout; permits on-the-fly word counting; includes built-in language translator.
Suitewide	Adds speech recognition, organization chart capability, and drawing canvas; Task Panes and Smart Tags offer fast access to features; crash recovery feature preserves work in progress; Office Clipboard holds 24 items.

[1] Information about Publisher and PhotoDraw was not available.

Even if Microsoft does ship Office 10 in mid-2001, it will face reinvigorated rivals. Lotus plans a SmartSuite upgrade by year's end; Corel's next WordPerfect Office upgrade is due during the first half of 2001. Sun Microsystems hopes to finally launch StarPortal—its free, Web-based suite—by the end of 2000. Stay tuned for details on these suite underdogs—and for further Office 10 updates.

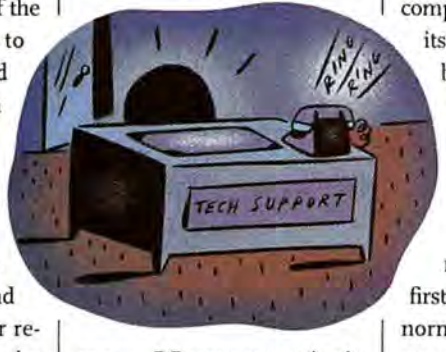
—Harry McCracken

Supplier's Bankruptcy Hits Quantex and CyberMax

CONSUMER ALERT

TWO DIRECT-PC vendors familiar to *PC World* readers—CyberMax and Quantex Microsystems—ran into severe problems in late August after Fountain Technologies, a key supplier, filed for bankruptcy protection. In the wake of the filing, customers' calls to these vendors' sales and tech support lines often went unanswered.

PC World also learned that the Somerset County (New Jersey) Division of Consumer Affairs is looking into CyberMax and Quantex operations after receiving complaints about the companies' lack of technical support. The three companies are located in Somerset County. (For more details on Fountain, CyberMax, and Quantex, search on those names at www.pcworld.com.)



Fountain Technologies filed for Chapter 11 bankruptcy protection in early August. It has been a primary supplier of parts and technical services to Quantex, CyberMax, and Pionex—a PC company active in the retail and VAR channel—as well as other companies.

Fountain's president and CEO Min-Tsong Chang told *PC World*, "We are doing our best not to have the bankruptcy affect the Quantex, CyberMax, and Pionex brands." He declined further comment.

Filing for Chapter 11 gives a company a bit of breathing room. Temporarily freed from the threat of creditors, the company can try to restructure its obligations and keep the business running, explains bankruptcy attorney Daniel D. Doyle.

WHAT USERS CAN DO

IF YOU need tech help, first try calling the companies' normal tech support lines. If you can't get through, check your vendor's Web site for frequently asked questions and drivers, which can often help solve common problems. Also try sites such as AskMe.com and Service911.com that let you e-mail or post a detailed problem description and may be able to provide free or low-cost instructions for a fix.

If you need to repair your system, try a local repair shop or one of the major chains such as CompUSA or Best Buy that service PCs bought elsewhere (see "PC Repair Undercover," www.pcworld.com/aug00/repair). Choose your repair store carefully—call around for prices, and ask friends for recommendations.

Call the vendor if you've paid for a product but haven't received it and want to change or cancel your order. If that fails, call your credit card company; most will let you cancel the charges in such cases.

—Tom Mainelli, Tom Spring, Anush Yegyazarian ▶

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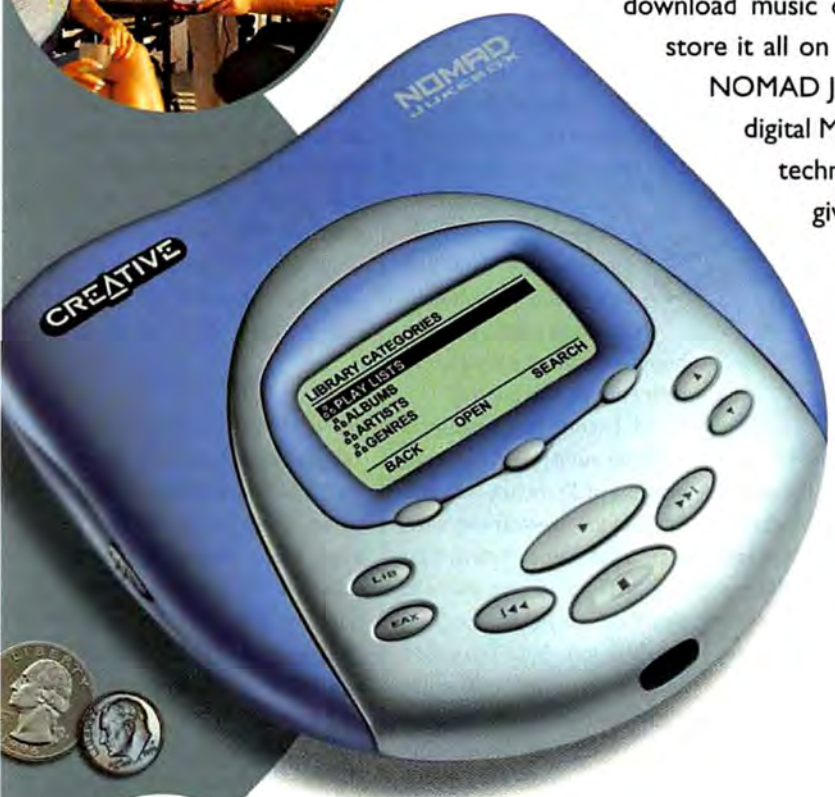

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EAX

Broadband on the Run: Wireless Internet Access for Travelers

SICK OF schlepping through airports looking for a place to get online while you wait out yet another delayed takeoff? Tired of stewing in your hotel waiting for e-mails with critical attachments? New wireless products from Wayport and Metricom work at broadband speeds, letting you cut the last of the ties that still bind you to phone lines.

Wayport offers its wireless broadband service in a number of airports and hotels; Metricom's Ricochet modem provides wireless Internet access over entire urban areas. Kris Kristofferson almost got it right: For laptop users who buy these services, freedom's just another word for no cord left to lose.

Wayport's service works with any IEEE 802.11b-compliant wireless ethernet PC Card. But while 802.11b theoretically supports transfer speeds of up to 11 mbps, actual speeds in our tests peaked at 538 kbps at Austin-Bergstrom International Airport in Texas and at 741.8 kbps in the lobby of the Sierra Suites Brookhaven hotel in Atlanta.

WHY SO SLOW?

TEXAS-BASED Wayport says that the bandwidth shortfall at hotels can be traced to the 1.6-mbps hookup between the hotels' base stations and Wayport's servers. At airports, Wayport says, speeds depend on the number of users online, the location, and other network-overhead issues.

Like any modem hookup, Wayport takes a toll on your laptop's battery life. The company warns you to expect a 15 to 20 percent reduction; in our tests, an IBM 240 ran out of juice after 55 minutes—that's more than 25 percent out of the usual 75-minute life span.

Wireless ethernet cards from vendors such as Lucent and 3Com start at about $170. Wayport charges by the "connection"—a customer's use from first log-on until midnight of the same day. In hotels, Wayport fees usually run from $8 to $10 per connection, which can be added to your hotel bill. The company also plans to offer packages of ten connections for $35. Through the end of the year, Wayport is offering a special deal that provides for up to 50 connections at no cost.

The price doesn't seem to frighten fans of the Wayport system. Jeff Eller, managing director of the Austin-based corporate public affairs firm Public Strategies, says that in an airport with Wayport service he can turn flight delays into productive work time. "I had a layover at Dallas–Fort Worth and got a tremendous amount of work done," Eller says. "It's just like being in the office."

Currently, Wayport's system operates in approximately 150 hotels and in two Texas airports, but the company plans to expand service soon to airports in California, New York, and Washington state, as well as to a total of 600 hotels. In coming years, Wayport hopes to offer its service in coffee shops and bistros.

Metricom, meanwhile, is rolling out its new, 128-kbps version of Ricochet—an upgrade of the five-year-old, wireless, 28.8-kbps system that serves about 30,000 users in Seattle, San Francisco, and Washington, D.C. Television ads show Ricochet users cruising around in a sleek convertible, swapping documents online (though the company's license agreement cautions you not to use your laptop while driving, for safety's sake). You subscribe through one of Metricom's resellers—which include Juno, WorldCom, and others—and the price fits the luxury car image: Modems cost $299, there's a $30 activation fee, and monthly service costs about $75.

NO STRINGS: Ricochet modem (left), Lucent 802.11b PC card.

The company launched the new service in Atlanta and San Diego this summer, and expects to add 41 other major metropolitan areas over the next year. Ricochet requires a gray, plastic, Palm Pilot–size external USB or serial modem (less-clunky PC Card modems from Novatel and Sierra Wireless are due by early 2001).

NOT SO FAST

IN OUR TESTS, Ricochet's speeds ranged from 65 kbps via a USB hookup to a desktop in an Atlanta suburb to 45 kbps when attached to the slower serial port on a notebook without USB. The company says the modem should run for about 6 hours without recharging.

Business folks who travel frequently should investigate these new services, especially as they become more widespread. Wayport will be particularly attractive to occasional travelers who already use 802.11b PC Cards for wireless home or business networks; Ricochet will look good to people who are constantly on the move in areas where the service is offered. Either way, you just have to be willing to pay the price.

—Joe Earle ▶

ILLUSTRATION: HARRY CAMPBELL; PHOTOGRAPH: KEVIN CANDLAND

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Are PCs Toast? Internet Appliances Arrive

FIRST LOOK

REPEAT AFTER ME: They are not computers. They are not computers. They are appliances, and they are no harder to use than a toaster.

These days it's a rare Internet device that hasn't been christened an appliance by its manufacturer. To the computer-savvy, this label may sound silly. Computers aren't appliances. VCRs, washing machines, and toasters are appliances. But the decision to apply the familiar language of the kitchen and laundry room to e-mail and Web browsing is a well-considered one: Toasters hold few mysteries; computers hold many.

To lure the unconnected (and presumably technologically impaired) masses, manufacturers have pared these machines down to the online essentials: a screen, a keyboard, a modem, and a browser (no hard disk or floppy drive). Plug the unit in, turn it on, and—ba-da-bing—you're on the Internet with a minimum of fuss and bafflement.

As a class of products, these devices remain practically new. But the ripple that started last year, when Netpliance released its I-opener, has become a wave. Compaq, Emachines, Philips, Thomson, and Vestel have all announced plans for—or shipped—Microsoft Network Companions. Intel and the New Internet Computer Company—backed by Oracle mogul Larry Ellison—have unveiled Linux-based systems. 3Com and NadaPC are working on units of their own, as is AOL in cooperation with Gateway. Especially for beginners, the cheapest of the new machines may make sense.

COMPAQ's IPaq I-A1 MSN Companion (left) and the New Internet Computer.

SIMPLE TO SET UP, EASY TO USE

WE TRIED out three of these devices: Microsoft Network Companions from Compaq and Vestel, and the New Internet Computer. With all three, getting online was only a bit more complicated than making toast, vacuuming the floor, or drying clothes. It's easy to imagine any of these units appealing to a non-PC user hankering to check out "this Internet thing."

The two MSN units have fairly simple designs. Both are small in comparison to typical desktop PCs. The Compaq IPaq I-A1 is a cute little beige number with a wireless keyboard and a tiltable color LCD screen about the size of a makeup mirror. Vestel's MSN Companion also has a 10-inch LCD, but it stands taller than Compaq's because you can't tilt it. Still, this silvery, futuristic unit would look at home on a bedside table in a sci-fi film. It's due to ship by early next year.

Setup in each case was quite painless. Using an embedded mouse—the Compaq's resembles the joypads on game controllers, while the Vestel's looks like a notebook touchpad—I was soon operating in a custom version of Internet Explorer 4.01. Shortcut buttons put common functions like e-mail, search, and news within easy reach. The modems seemed a bit poky, and these machines don't have sufficient memory for much online gaming. But the 56-kbps hookup should satisfy first-time surfers charmed by access to the vast library of ▶

In Features and Price, All Net Appliances Are Not Created Equal

APPLIANCE	Street price	Processor/ speed (MHz)	OS	Browser	Memory	Display	Mouse	Keyboard	CD-ROM	Ports
Compaq IPaq I-A1	$599[1]	AMD K6-2/ 266	Windows CE 3.0	Custom IE 4.01	32MB + 16MB flash	10.1-inch LCD, included	Embedded joypad	Wireless; 73 keys + 10 shortcut keys	None	4 USB, ethernet, phone
New Internet Computer	$200	Cyrix M II/ 266	Linux 2.2.15	Netscape Navigator 4.73	64MB + 4MB EEPROM	15-inch CRT, optional ($130)	2-button mouse	Standard PS/2; 107 keys	24X	2 USB, ethernet, phone, microphone, line-in jack
Vestel MSN Companion	n/a	Geode/ 200	Windows CE 3.0	Custom IE 4.01	32MB + 16MB flash	10-inch LCD, included	Embedded touchpad	PS/2; 73 keys + 12 shortcut keys	None	2 USB, phone, printer

n/a = Not applicable. [1]$400 mail-in rebate with 36 months of MSN Companion service at $22 a month; $200 rebate with 24 months of MSN service; $100 rebate with 12 months of MSN service. Offers apply through December 31, 2000.

PHOTOGRAPH: KEVIN CANDLAND

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the Web and by letters that arrive in a matter of minutes instead of days.

When I botched telephone number selection during setup, however, I had to call Companion tech support for a code to access the dialing screen and the correct numbers. If this were a computer, I could have tackled that research all by myself. (Later, when I needed to change the numbers, I couldn't reach Companion tech support at all.)

Then there's the cost. Pricing for the Vestel hadn't been set at press time. The initial outlay for the Compaq, meanwhile, is $599. You can recoup $400 of that price by committing to MSN as your ISP for 36 months at $22 a month (shorter commitments earn smaller rebates). Granted, the monthly amount is roughly what you'd pay for unlimited dial-up access from a major ISP anyway. But that kicks the total three-year investment up to almost $1000, and it's MSN or nothing: The device won't work without the service. A Web newcomer may find both the figure and the commitment daunting: If you decide 15 months into the deal that you want to switch to a free ISP, or pay more for DSL, you're out of luck. Not only must you get a different device, but you'll owe Microsoft an early termination fee that will still bring your total outlay to 70 percent of your service commitment.

If you decide 15 months into the deal that you want to switch to a free ISP, or pay more for DSL, you're out of luck.

Still, these two units do offer uncomplicated access to the Web without the vagaries of computers. If you're interested in visiting the Internet without setting up housekeeping, look into these options.

THE UN-COMPANION

THE NEW Internet Computer (NIC) is the antithesis of the two MSN machines. Its OS is Linux, running invisibly in the background. Netscape 4.73 is its browser. Both load from a CD-ROM. The NIC is the most computerlike of the three appliances, with a small vertical case, two standalone speakers, a tabletop mouse (with mouse pad), and a full-size computer keyboard that lacks the shortcut buttons included on the MSN Companions.

The NIC has the most to offer to the frugal-minded and to technology renegades who scorn the Microsoft OS (the MSN machines run a Windows CE variant). For all its computer components, it carries a modest price tag: $200, plus $130 for the 15-inch monitor, unless you can scrounge one up on your own (any SVGA monitor will do). And if you sign up with NetZero—one of the unit's default ISP options—you'll spend nothing for Internet access. This was an easy process—though a tad slow, owing to "Net congestion." The trade-off: As you browse, banner ads flit by at the bottom of the screen. (The unit also works with any ISP that supports a dial-up connection, however.)

One hitch: I began to get reports of 'modem not ready.' I wondered if this problem was a by-product of heat (the unit had been on for an hour or so), but NIC tech support suggested the messages meant that the provider was busy. When I checked in again, the unit logged in without a hitch.

At that moment, the device really did seem as simple and convenient as a toaster.

—Peter Olafson ■

Net Appliances for the Masses: Is the Price Wrong?

SIMPLER IS BETTER. That's the pitch for Internet appliances, a class of user-friendly, inexpensive alternatives to costly, complicated PCs for Web browsing and e-mail.

But consumers haven't exactly stampeded the stores for these products. Analysts say that's because the devices on the market so far aren't nearly as cheap as promised.

Netpliance's I-opener, for example, originally sold for as little as $99, but its price rose at one point to $399 before settling down to its current $299—not including a $22 monthly service charge. "That's still not cheap," says Richard Doherty, director of research at Envisioneering Group.

Neither is Compaq's $599 IPaq I-A1 home Internet appliance. Compaq does offer rebates of up to $400, but to get them you must commit to MSN as your Internet service provider for up to three years. Bottom line: You'll be out almost $1000 for the device and the service over the course of three years. For that money, you can buy a decent budget PC (that also lets you run productivity applications and games) and get free dial-up Internet access from an ISP such as AltaVista or Lycos.

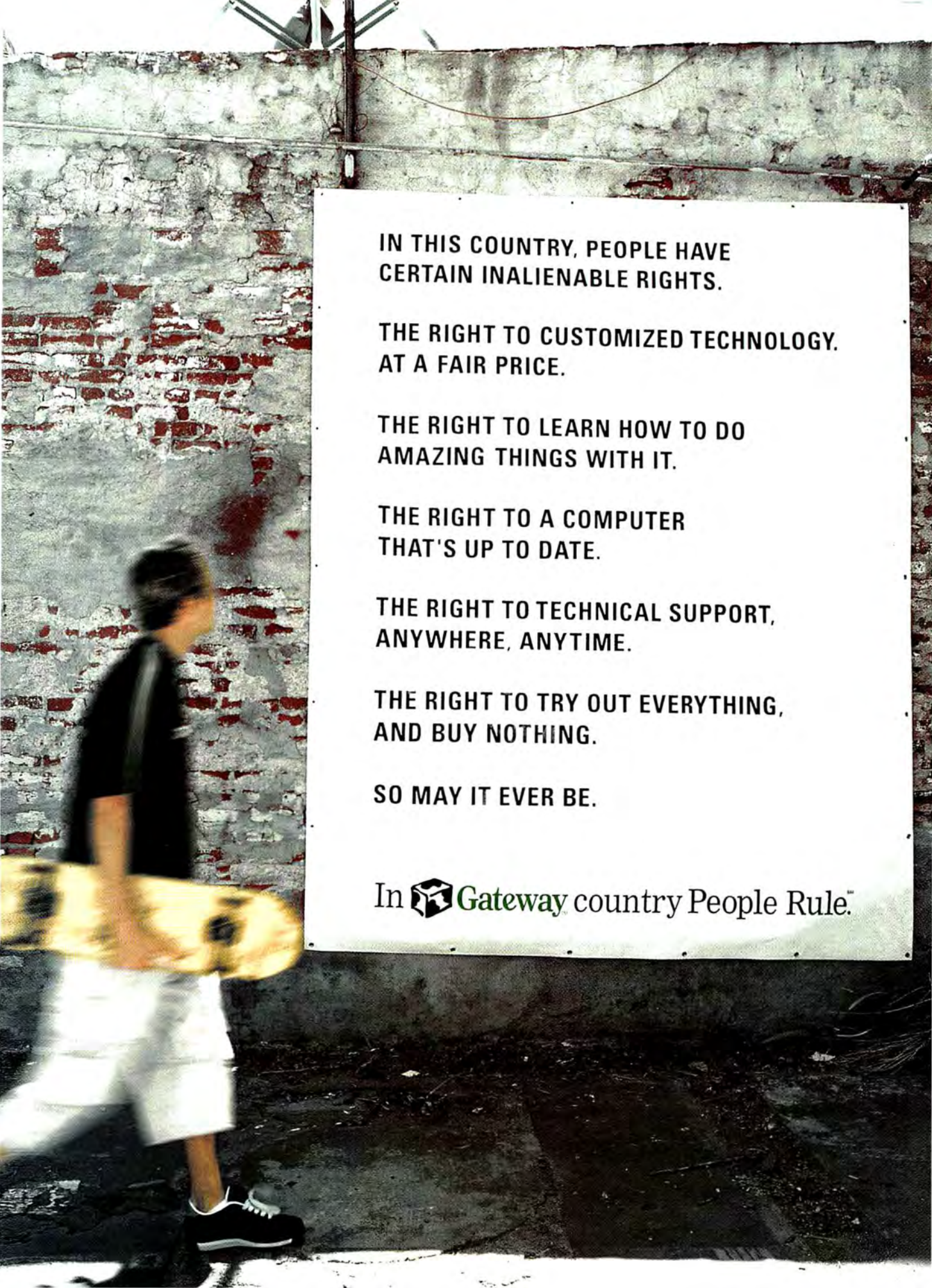
Milosz Skrzypczak, an analyst with the Yankee Group, thinks Net appliances will succeed in the long run, perhaps when banks and other organizations provide services that make the devices attractive to consumers. For example, Fidelity Investments has given select customers IBM-built Net devices for managing their financial portfolios, while Virgin Entertainment Group targets music devotees with its Virgin Connect Webplayer.

Volume manufacturing will help bring prices down, too, so who'll be buying?

The obvious targets are novices willing to pay a premium for easy-to-use devices. But PC-proficient users interested in complementing their home networks may eventually sign on for hassle-free access to specific Web services. The research company International Data Corporation estimates U.S. sales of Web terminals will reach 4.3 million in 2004, up from 220,000 this year.

"If I can buy a really cool Web tablet for $100 that I can write on and surf the Web, I'm going to buy it," Skrzypczak says. "How they make money on the sale is the tricky part."

–Tom Spring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THE PRESENTATION SERIES: PART FOUR

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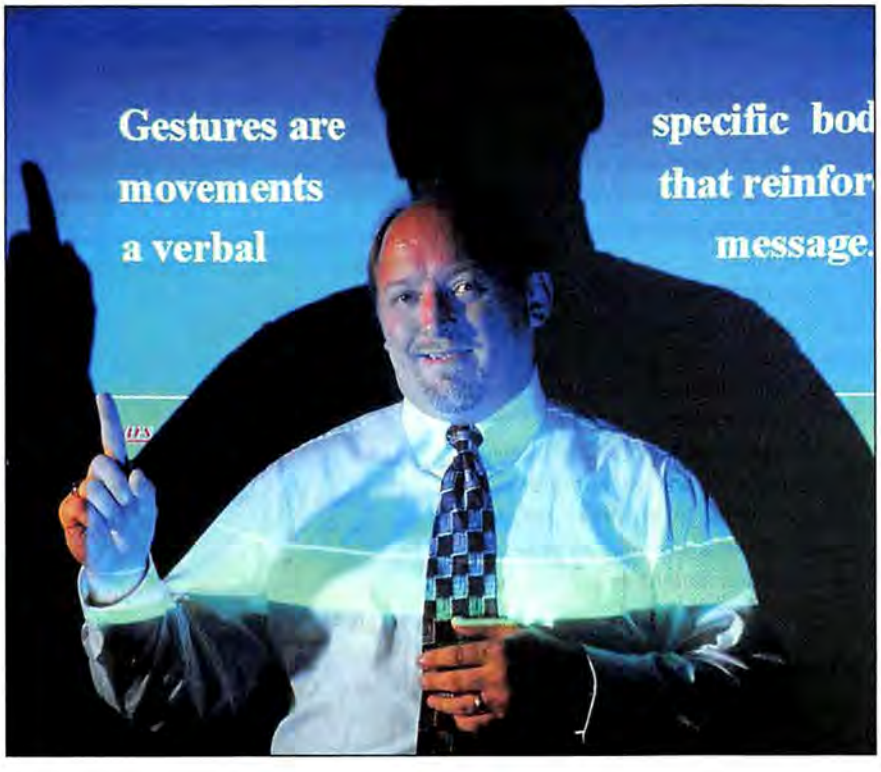

Ranking right up there with the sense of satisfaction generated by one of the world's most comforting phrases ("check enclosed") is the heady buzz created by a powerful idea. More often than not, the two events are related.

The connecting element is talent: a combination of vision, imagination, and artistic flair that enables you to transform an idea into knowledge and to effectively communicate it to the people who can profit from it. Increasingly, effective communications in a world in which people are awash in information involves using more images and fewer words.

"The eyes have it," says Robert Lindstrom, a Los Angeles-based author, lecturer, and executive director of the Digital Exploration Society. "We still perceive the world visually. From the beginning of time, people used art and hieroglyphics to communicate. While numbers and words are

Continued on page 2

Lenny Laskowski, author of *No Sweat Presentations—The Painless Way to Successful Speaking:* Establish two-way communications with your audience during Q&A periods.

IT'S SHOW TIME!

THE PRESENTATION SERIES: PART FOUR

Continued from page 1

latter-day inventions, presenters know that using visuals is the most effective way to transmit information."

users to run computerized presentations without a PC. Users transfer presentation files to a PC card that can be inserted into a slot on the projector. Files transfer easily using Epson's conversion software. Then, users can simply power-on and proceed with a presentation, or review files on the projector to edit or rearrange the order of slides. The PowerLite 715c is compatible with PCMCIA Flash memory, and, with an optional adapter, it can work with cards such as Compact Flash, SmartMedia, and MemoryStick.

Beyond the convenience and the advanced imaging features found in this new projector, the PowerLite 715c offers smoother-than-ever image transitions; JPEG or bitmap images can be advanced automatically or with a mouse click. Special effects from programs such as PowerPoint are preserved, and presenters can also create and save notes and annotations directly on their slides.

LIGHT IN SHINING ARMOR

Too little projector light and your audience will concentrate on trying to understand the slide instead of your message. Too much light, and they're likely to block out both the slide and your message. Use this table as a guideline for estimating the correct illumination you will need for filling screens that measure up to 300 inches diagonally.

Under Moderate Ambient Lighting Conditions

Projector lumens	60" DIAGONAL SCREENS	100" DIAGONAL SCREENS	150" DIAGONAL SCREENS	300" DIAGONAL SCREENS
500	6	4	2	2
800	9	6	5	4
1000	10	8	6	4
1500	10	9	8	5
2200	10	10	8	6
3200	10	10	9	7

KEY:
9-10 Blinding on data, good for video
7-8 Bright on data, passable for video
5-6 On the money for data, weak for video
3-4 Barely adequate for either data or video
1-2 Not effective for either data or video

Source: Art Feierman, CEO of presentingsolutions.com, an online community and e-sales site for professional presenters.

LETTING YOUR IDEAS SHINE

Ironically, it is advanced technology that enables people to return to their roots so easily. For example, presentation software, such as Microsoft's Presentations and WordPerfect's Presents, significantly simplifies the technology component of the creative process, putting the once-complicated process of developing effective visuals in the hands of the presenter. Slides that cost $100 each at a graphics shop just a few years ago can be created for less than $10 today.

One projector vendor has even devised a way to eliminate having to tote your laptop with you to make your presentation. The just-released PowerLite 715c, from Long Beach, Calif.-based Epson America Inc., takes presentation technology in a new direction with EasyMP. This new technology enables

MEETING THE CHALLENGE

While the cost of producing a presentation is dramatically less and the technology is easier than ever to manage, the formula for creating a persuasive presentation remains the same. The first step is to acquire the tools to transform your killer idea into a show that will leave your audience informed and, more importantly, motivated.

Experts advise you to select your presentation hardware with the same care as you would a car. After all, both are vehicles; one transports people, the other, ideas. Your choice of slide projectors (liquid crystal display or Digital Light Processing), resolution (SVGA or XGA), and illumination depends as much on the auditorium where you will present as it does on your audience (see chart: "Light in Shining Armor").

Most large projectors are stationary, or rolled on a cart. If you travel, you want a featherweight projector that's easy on the shoulders. How does five pounds sound? The new EzPro 710 projector from Optoma Technology Inc. (formerly CTX Opto) delivers dazzling colors plus crisp images and weighs a mere five pounds. Literally a standout, Milpitas, Calif.-based Optoma's vertical form factor uses Texas Instruments' innovative Digital Light Processing (DLP) technology to deliver 800 ANSI lumens and a rich 16.7 million color palette at a true XGA resolution (1024 x 768 addressable pixels). The 710's unique ver-

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IT'S SHOW TIME!

THE PRESENTATION SERIES: PART FOUR

Continued from page 2

tical form factor provides three significant benefits. First, its small footprint enables you to find room for the unit even on a crowded tabletop. Second, the upright design dissipates heat faster than flat models, resulting in longer bulb life and fewer heat-stressed components. And finally, the vertical form factor raises the 710 to a level nearer to the centerline of the screen, thus eliminating the trapezoidal appearance of images known as "keystoning."

Optoma Technology's innovative EzPro 710 portable projector

Another ultra-portable projector that's easy on the shoulders comes from Walnut, Calif.-based ViewSonic Corporation. Their PJ853 LiteBird, the company's lightest and most portable LCD projector, weighs just 5.2 pounds and stands a mere 2.8 inches high, making it especially well-suited for mobile sales and training professionals who demand high performance at an affordable price. For globetrotters, the projector's support for international formats, including NTSC, PAL, Secam, and S-Video, will simplify setting up and configuring the unit. Among the machine's other attributes are its bright three-panel active matrix LCD, which pumps out true 800 x 600 (SVGA) and 1024 x 768 (with advanced compression) images. At 800 ANSI lumens, your images appear sharp and crisp even in well-lit environments.

Epson America's just-released PowerLite 715c portable projector

IT'S ABOUT YOU

The visual aspect of a presentation includes more than slides and video. It includes you.

"The old adage that 'clothes make the man,' or woman, is still valid," says Marjorie Brody, in a white paper entitled "Seven Habits of Highly Effective Speakers" that can be found at www.brodycommunications.com. "The first thing your audience members see is your appearance. Before you get a chance to say a word, some of them will already have judged you based solely on how you look. Check with the event organizer; you can never be faulted for looking 'too professional,' even if the audience is dressed down. Be certain that your outfit and accessories don't detract from your presentation."

In addition to your attire, part of the visual signal you send is based on your actions. "Your body language will send the audience a message," Brody adds. "Don't cross your arms or fidget. Use gestures to emphasize points, but be careful not to flail your arms around." The most effective stance is to lean forward and make regular eye contact with audience members, "holding the connection to complete an idea." Finally, Brody notes, "If you nod occasionally, audience members will, too—creating a bond" between you and the audience.

GO WITH THE FLOW

In yesterday's corporations, information flowed from the top down and, sometimes, back up. At each stop along its tortuous path it was analyzed and scrutinized. Today, the advent of LANs, WANs, the Internet, e-mail, intranets, and extranets means that information flows in all directions. Ideally, it's the same with you and your audience: Information flows from you to them, and if you remain alert, back again.

Lenny Laskowski, a professional speaker based in Newington, Conn., and the author of the book *No Sweat Presentations—The Painless Way to Successful Speaking*, offers pointed advice on establishing two-way communication with your audience during a question-and-answer exchange.

The PJ853 LiteBird ultra-portable projector from ViewSonic

- Listen carefully to the question and repeat it aloud.
- Answer directly. Look directly at the person asking the question.
- Be friendly and always keep your temper. Using sarcasm will immediately draw the audience's sympathy to the questioner.
- Always tell the truth, even if it mo-

Continued on page 8

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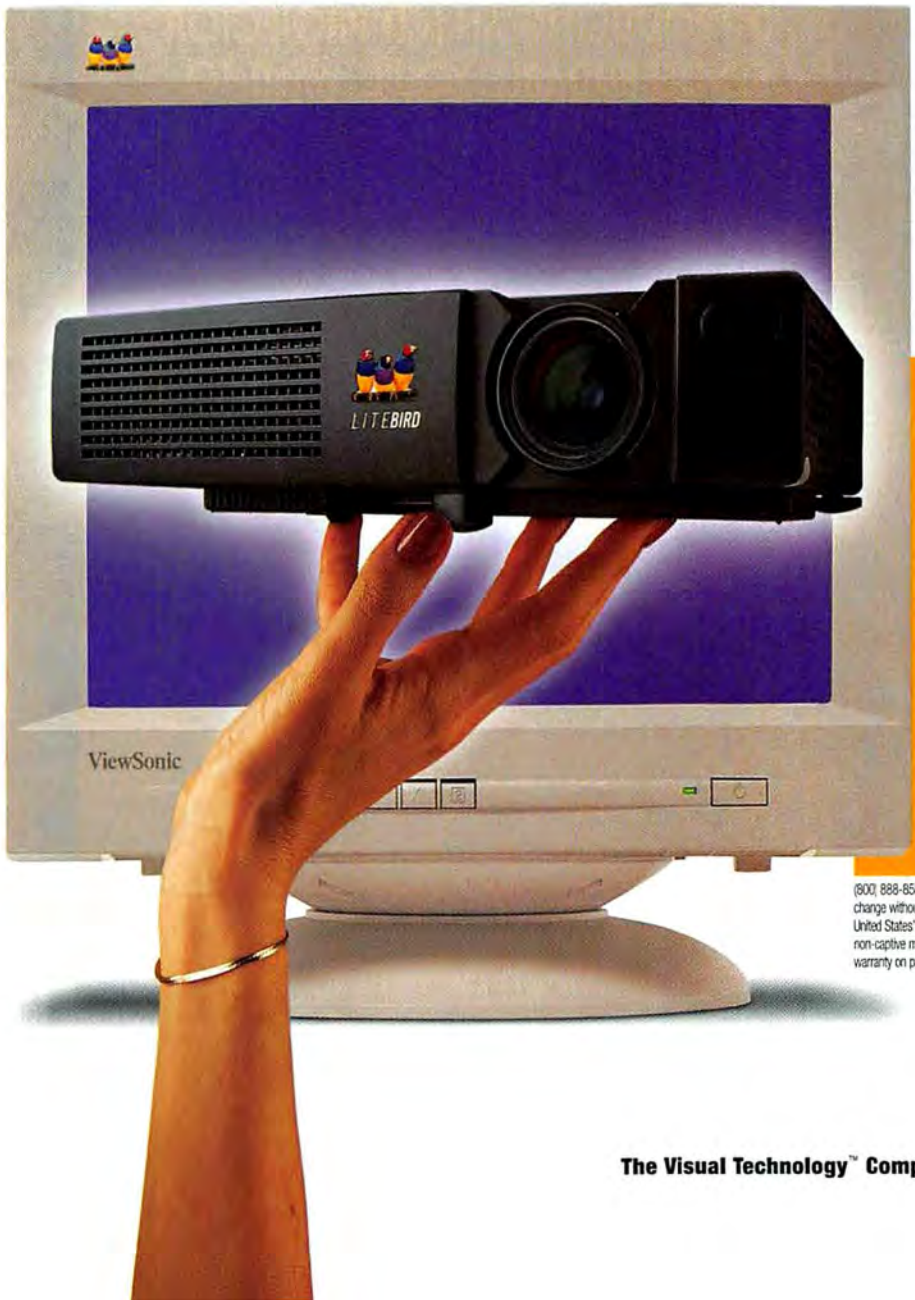

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For a limited time, when you purchase or rent a LiteBird PJ853 projector, you'll get a free executive carrying case. It's perfect for easy projector storage and travel. You can visit **www.ViewSonic-projectors.com** or participating dealers for details.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

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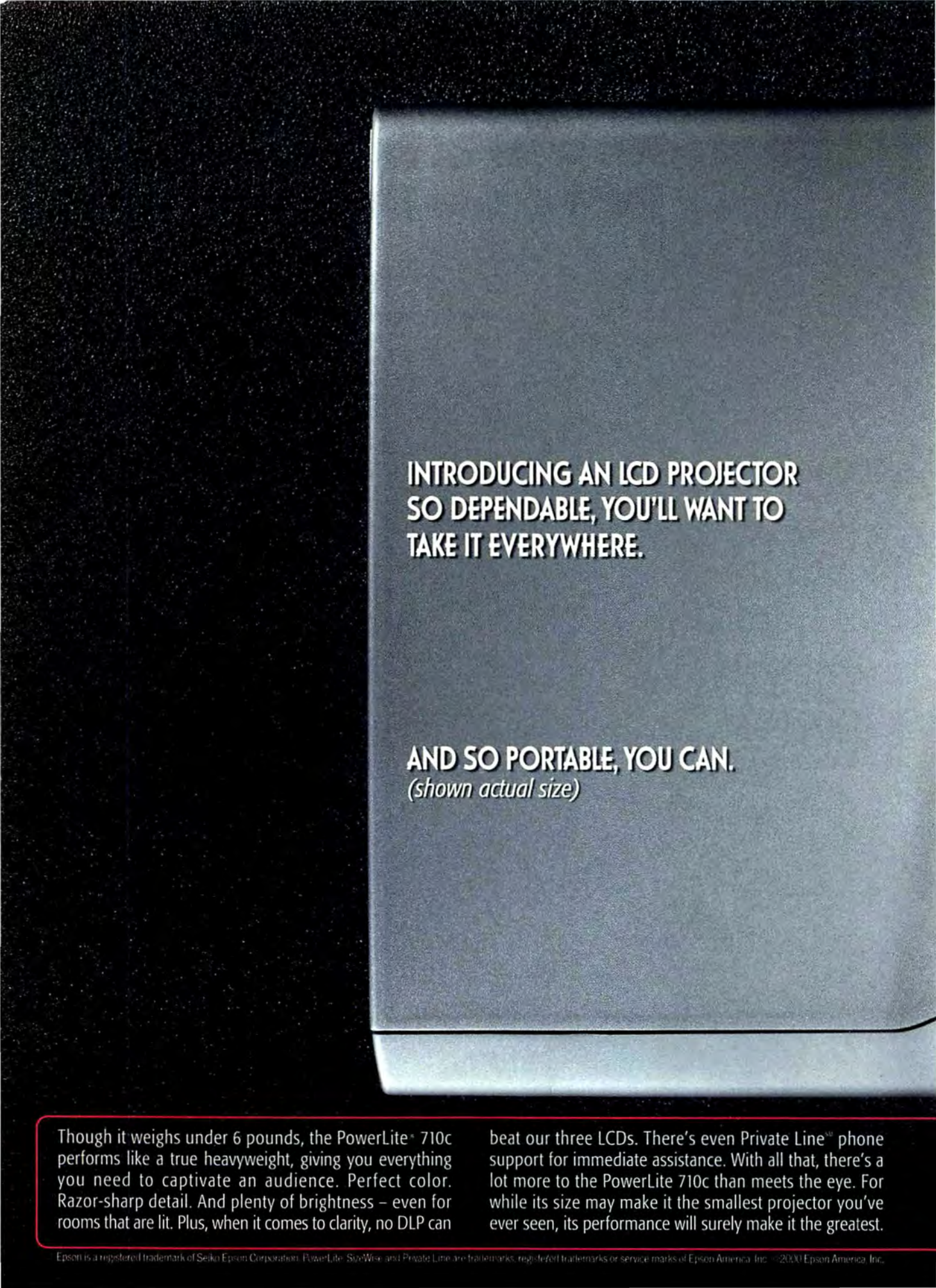

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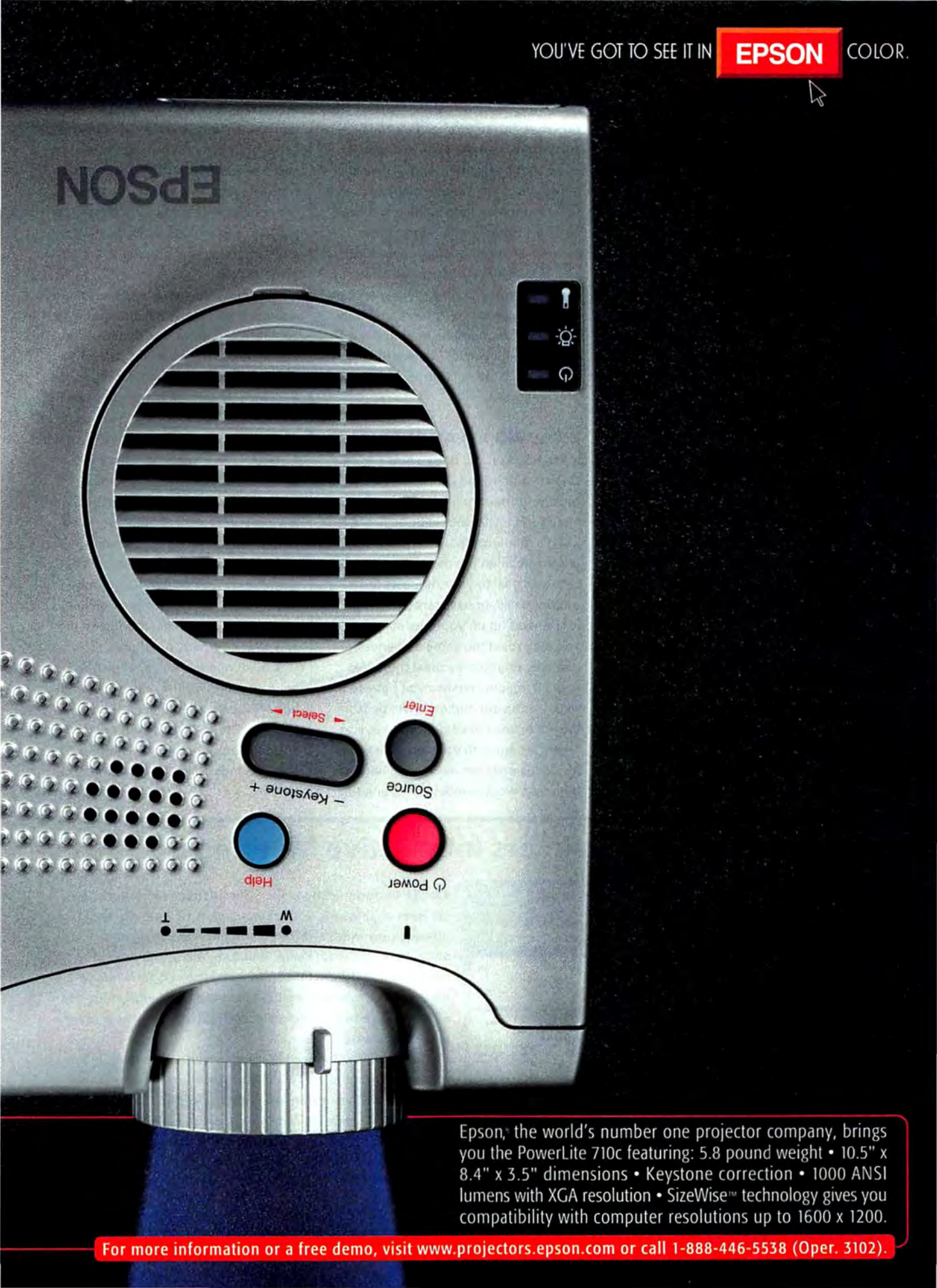

Epson, the world's number one projector company, brings you the PowerLite 710c featuring: 5.8 pound weight • 10.5" x 8.4" x 3.5" dimensions • Keystone correction • 1000 ANSI lumens with XGA resolution • SizeWise™ technology gives you compatibility with computer resolutions up to 1600 x 1200.

For more information or a free demo, visit www.projectors.epson.com or call 1-888-446-5538 (Oper. 3102).

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THE PRESENTATION SERIES: PART FOUR

Continued from page 4

mentarily weakens your position.

- Keep things moving and encourage many members of the audience to participate. There's a rhythm to a good question-and-answer exchange. It will volley back and forth briskly. Keep your answers brief and to the point.
- Don't place your hands on your hips or point at the audience—these are scolding poses.
- Conclude your presentation smartly. End with a summary statement that wraps up the essential message you want the audience to remember.

(A more complete list of suggestions for making effective presentations can be found in "Five Ways to Make Your Body Speak," a white paper available on Lenny Laskowski's website, www.presentation-skills-seminars.com.).

Other experts suggest that you focus on broadcasting confidence by not worrying, at least overtly, about your equipment. Specifically, they suggest that you always face your audience (not your laptop or projector), and that you watch the audience closely so you can identify subtle reactions such as raised eyebrows, wrinkled foreheads, and leaning away from you. (A yawn, incidentally, is not a subtle reaction.) And, above all, make eye contact sequentially with multiple members of the audience. A few "don'ts" to remember: don't roam around the room or stage, and don't look down. The audience will interpret roaming as nervousness, while looking down may be taken as "waiting for inspiration." Remember, your audience wants to believe that you are the expert, so you must retain control over the presentation.

BUILDING RELATIONSHIPS

In his forthcoming book *Third Time's a Charm*, author Jad Duwaik says that the most important rule he's discovered is "to interact with people three times to build a relationship. Once you have a relationship, then the person is more likely to say 'yes' to your requests for money, sales, or assistance."

Depending on your business model, you may meet the same audiences repeatedly or you may meet them just once. If the only chance you have to interact with your audience will be from the distance of the stage, you have to "meet" them with your eyes. Granted, it's not as effective as shaking hands, but it can work wonders. Pick one (or two) people easily visible to you, and "speak" directly to them. Be sure to observe other people as well, but concentrate on just a few. Eye-to-eye contact may not totally replace one-on-one contact, but it will keep you in touch with your audience, and provide you with vital feedback.

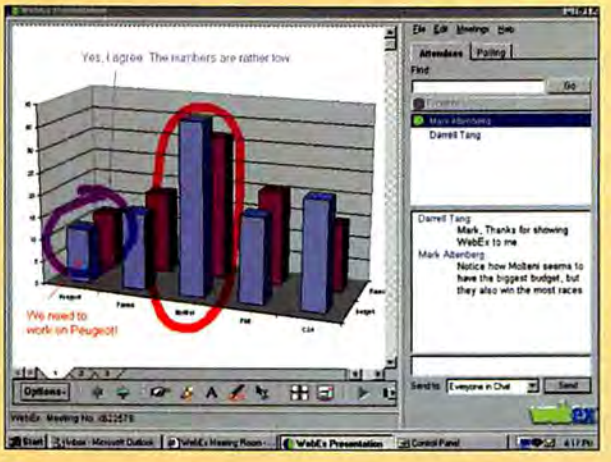
Similarly, Duwaik advises speakers not to try to impress an audience with content. "If you want to do that, then you should write an article or a white paper. Instead, you should impress the audience by engaging and entertaining them. You need to create an anecdote or story, using humor if appropriate, that illustrates every important point you are trying to convey to your audience."

Another way to make sure the audience leaves talking about your points rather than about your presentation graphics is to distribute handouts to extend the staying power of your message. These can include your business card, promo materials, reprints of the slides, or company brochures.

Collateral material must be based on solid planning for the entire presentation. "Prepare adequately," advises Marjorie Brody. "Clarify your objectives and then prepare the presentation." She recommends collecting your material

Continued on page 12

WebEx Delivers Interactive Meetings



WebEx Communications Inc.'s interactive communications services enable you, your colleagues, and your partners to attend impromptu or scheduled interactive meetings when and where you want them. WebEx's Meeting Center, the core of the multifunction suite, establishes a Web-based meeting environment that delivers the most important benefits of a face-to-face meeting: interactivity, empowerment, and spontaneity.

San Jose, Calif.-based WebEx's services can be fully integrated into your site and include numerous remote access capabilities. Platform-independent, Meeting Center enables Macintosh, Solaris, or Windows users to collaborate with one another effortlessly. For more information, visit www.webex.com.

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Bringing It All Together

Astound's Conference Center technology connects people and ideas for greater productivity.

IT'S SHOW TIME!

THE PRESENTATION SERIES: PART FOUR

In 1953, when today's interactive Web technology was mere science fiction, Winston Churchill foresaw how seamless collaboration among colleagues, customers, and partners would become the hallmark of successful businesses. "All great empires of the future," said the visionary, "will be empires of the mind."

Stephen McWilliam, vice president of marketing for Los Altos, Calif.-based Astound Inc., says that Web-based collaboration significantly improves the effectiveness of training. "It's about more than saving money and time by minimizing travel; it's about improving the person's effectiveness because they are empowered."

Studies bear out his point: retention rates are dramatically impacted by mode of learning. The retention rate for information that people learn through collaborating interactively is seven times greater than when they just read the same information, and 3.5 times greater than when they passively view a presentation about the material.

LEXMARK GATHERS AROUND ASTOUND

Printer solutions giant Lexmark International needed a technology to help them streamline and coordinate their communications efforts. Their goals were to improve the speed and quality of information sharing between colleagues and customers while reducing costs. Lexmark required a solution that would provide interactive Web conferencing to connect its 50 global sales offices, seven manufacturing centers on three continents, and 11,000-plus employees. After examining several Web conferencing products, Lexmark selected Astound's Conference Center.

Astound's McWilliam believes that to really leverage the Web, you need to move beyond simply showing a PowerPoint presentation: you must get interactive with your audience. "That's how you make online meetings really productive and effective. Astound's application-sharing capability is the key to making [interactivity] a reality," he says.

"The Astound Conference Center allows us to do training and sales presentations to staff, customers, or prospects anywhere in the country, at any time. Users simply log on and participate in an interactive presentation in real time," says Brett Butler, Lexmark's general manager of Worldwide Internet Marketing in Lexington, Ky.

Knowing that interactive participation encourages retention, Butler encourages trainers to walk participants through the screens interactively in real time. "While many solutions allow users to passively watch a live demo, the Astound Conference Center actually lets participants work on an application themselves, or provide input while the instructor or sales representative is online."

KEEPING YOU CONNECTED

In addition to internal events such as training, marketing meetings, product launches, and corporate education, Astound's Conference Center can also take clients and partners on a virtual tour of your company to help make a point. Because Conference Center synchronizes audio and video to accommodate variable connection speeds, participants can connect and participate independent of their equipment. "We make sure that, whether they're on a 28.8 modem or on a T1 line, everyone sees and hears the same thing at the same time," says McWilliam.

Ultimately, whether they are employees or customers, the participants in any Web conference want to focus on the business at hand and not on the underlying technology. Astound designs its products so they are easy to configure. In the words of Lexmark's Butler, "We signed the deal with Astound at 8:00 and [we] were online at 9:00. You simply pay an annual fee per seat and you're ready to go." Now, thanks to the Web and to the power of Astound's conferencing technology, there's no need for anyone to "go it alone." ■

For more information on Astound's solutions, call (877) ASTOUND or 877-278-6863; or visit www.astound.com.

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THE PRESENTATION SERIES: PART FOUR

Continued from page 8

and organizing it so there is a logical progression of ideas. Limit the points, keeping the message simple. Writing out transitions, in preparation for creating written handouts, will help you to reinforce your ideas and enable you to repeat them without seeming redundant.

WHAT'S LOVE GOT TO DO WITH IT?

Arnold Sanow, an adjunct professor at Georgetown University and the president of The Business Source Inc., advises presenters to woo and wow their audiences. All that takes, he says "is a little tender loving care." The bottom line is that your customers prefer to do business with people they know, like, and trust. His tips for helping you expand your "like-ability" quotient and develop a more intimate rapport with your audience include:

- Listen. A successful courtship starts with listening. People love to be noticed and listened to.
- Kill them with kindness. Follow Disneyland's example. Instructions issued to new Disneyland employees advise: "We love to entertain Kings and Queens, but the vital thing to remember is this: every guest receives the VIP treatment. It's not just important to be friendly and courteous to the public, it is essential!"
- Use a sense of humor in your sales presentation.
- Show a genuine interest in the needs and interests of the audience.

(See the paper "Develop Your 'Like-Ability' Quotient" at www.arnoldsanow.com for more advice from Arnold Sanow.)

Time-tested tips and techniques such as these, along with the right hardware and software, are essential to presenting your ideas persuasively. Ideas that entertain and educate people will enrich you as well. ■

Business as Visual

DLP technology helps improve the view

Increasing the brightness of the images coming from your projector is a key success strategy in maximizing the persuasive impact of any presentation you create. Improved, high-intensity image projection techniques, such as Texas Instruments' pioneering Digital Light Processing (DLP) technology, can help.

DLP offers significant improvements over other projector technologies. For example, the intense brightness of DLP-generated images make them easier to view from the side of a room, with less distortion even in ambient light. In addition, DLP delivers a sharp, high-quality image from both stationary and portable projectors. That helps make you and your presentations more effective in educating and persuading your audience.

One of the most popular projectors in use today, InFocus Corporation's award-winning LP435Z, deftly combines portability and power with DLP technology to project your message across the largest of conference rooms, even in ambient light.

The 435Z relies on DLP's array of microscopic mirrors to achieve its stunning brightness and richness of color. Because DLP is digital, it imbues images with greater three-dimensional depth and generates less visual "noise," allowing viewers to see more detail in the images.

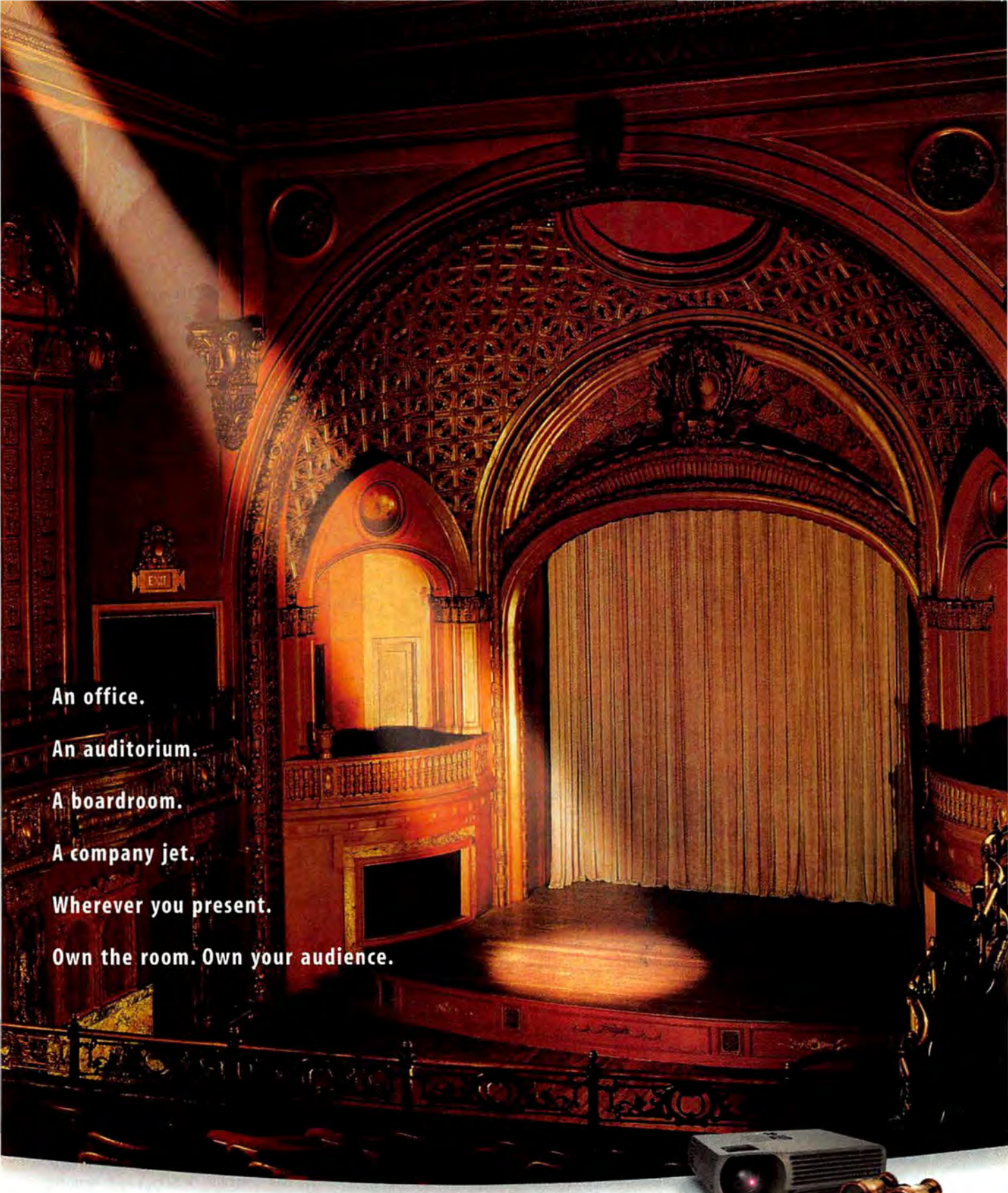
The LP435Z portable projector from InFocus

Unlike its sharp images, one of the 435Z's less immediately apparent features is InFocus' Technology Upgrade Program, which allows you to trade in your used InFocus projector for credit toward the purchase of a new InFocus projector. Also, until December 21, 2000, or as long as supplies last, InFocus is offering a $400 rebate on the purchase of the 435Z.

Another advanced projector, the UltraLight X350 from San Diego-based Proxima Corp., takes advantage of DLP technology's excellent light-to-weight ratio to pack 1100 ANSI lumens of brightness and true 1024 x 768 resolution into an easy-to-use, easy-to-carry three-pound package. Designed for the mobile user, the UltraLight X350 is the industry's brightest 1100 lumen three-pound projector. And the X350 is every bit as quiet as it is small. During operation, it produces less than 32dB of operating background noise, enabling your audience to listen to you and not to the fan.

Proxima's UltraLight X350 advanced projector

But small doesn't mean Spartan. When it comes to connectivity, the UltraLight X350 keeps pace with the big boys. It offers fast connectivity to a PC, DVD player, video, digital, or any other signal source. With a host of user-friendly features, the UltraLight X350 creates a new standard in small-format projection technology. For a limited time, this new Proxima projector includes a free video module, a $250 value. ■



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NEW PRODUCTS

Powerful New Tools Sharpen Photoshop 6

IN PHOTOSHOP 6, YOU CAN PLACE vector-based text directly onto the canvas and continually adjust leading, tracking, and other attributes. More important, Photoshop can now mix vector and bitmap objects in the same document. In this image, the text is a vector and the eye in the background is a bitmap.

GRAPHICS SOFTWARE

ADOBE PHOTOSHOP, long considered the best image-editing tool, adds powerful new text editing and vector graphics capabilities in its new version 6. As a result, rather than being a minor update, this is a substantial upgrade.

Photoshop 6 now allows you to create both vector shapes (rectangles, ellipses, and other forms, as well as freehand objects) and vector-based text. A vector graphic is created by a geometric formula, so when it's enlarged, it stays sharp. In contrast, a bitmap graphic contains information that describes each individual pixel; when you enlarge a bitmap, it can look fuzzy. Photoshop has been *the* professional graphics tool for editing bitmap images, while Adobe Illustrator held favor as the tool for drawing vector graphics.

With its new capability, the beta version of Photoshop 6 I tested produced what you'd expect with vector graphics: printed text and objects that look supersharp at any size.

Version 6 offers on-canvas text editing—just place your cursor on the canvas and start typing. The text remains editable so long as it is in vector format. A new font-warping feature does a great job of molding text around part of an object, but you can't write text on a path (you'll still need Illustrator for that). In Photoshop 6, you can add bevels, drop shadows, and various other cool effects to both text and vector objects, but for most of them, you must use a huge dialog box that obscures almost half the screen. Also, some tried-and-true Photoshop tools don't work on vectors—for example, you can't use a paintbrush or filter.

In version 6, you can group and lock layers and copy layer styles to apply to other layers, saving time and increasing consistency. You can create more layers than before, too; the maximum number isn't final yet, but it will be approximately 8000 (limited by the amount of memory in your PC, of course).

Photoshop 6 ($609; the upgrade is $199) still exports files to Adobe Acrobat's PDF (Portable Document Format), but now it retains layers and all other Photoshop file characteristics; saving work as a

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Adobe Photoshop 6

PRO: Vector capabilities expand uses; on-screen text editing.
CON: Interface is becoming cluttered.
VALUE: Major upgrade to what was already a highly capable professional product.
List price: $609; upgrade, $199
Adobe
800/492-3623
www.adobe.com

TIFF file does the same thing.

Adobe's Web application, ImageReady, remains separate and continues to be bundled with the new Photoshop. With ImageReady, you can create animations, JavaScript roll-overs, and image maps. Running Photoshop 6 and ImageReady at the same time, however, doubles the amount of memory you'll need, bumping it from 64MB to 128MB.

Drawbacks? Adding vector tools greatly expands Photoshop's reach but makes its interface more complex. And Photoshop users still must employ ImageReady as a separate program for Web work rather than having one killer app to take care of both their print and their Web needs.

—Alan Stafford

Web Image Editing on a Budget: Paint Shop Pro 7 and PhotoImpact 6

GRAPHICS SOFTWARE

WHILE THERE'S little doubt that Photoshop 6 will remain the king of the graphics hill, especially for professionals, other programs for users who don't need so much power offer excellent image-editing features at a lower price. New versions of Jasc's **Paint Shop Pro** and Ulead's **PhotoImpact** provide tools for such everyday image-editing jobs as touching up a photograph that didn't turn out the way you wanted.

I tested a preproduction version of Paint Shop Pro 7 and a shipping version of PhotoImpact 6. Both programs contain many new features, including a multitude of new tools for Web graphics. Each has a feature that allows a user to view images as they will look in different file formats and with various levels of JPEG compression. Both offer the ability to slice images (to create a menu from one image) and let you automatically generate the HTML code to rebuild the image. And both also have several new features for enhancing digital photos, such as a red-eye removal tool, an automatic color balancing tool, and a scratch filter.

WITH PAINT SHOP PRO 7's GIF Optimizer, image files can be heavily compressed without any significant loss of quality.

Of the two, Paint Shop Pro 7 offers more-comprehensive Web features. At the same time, these powerful features can be confusing: Paint Shop Pro's red-eye removal tool, for instance, takes time to master. PhotoImpact does include a wizard for creating buttons, banners, and JavaScript rollover graphics automatically from a selection of built-in styles—useful for creating or refreshing a Web site.

Paint Shop Pro 7 also edges ahead of PhotoImpact 6 on the strength of its ability to communicate with digital cameras: It can import photos directly from more than 140 models. Both of the programs, however, support the popular TWAIN protocol for importing images from digital cameras and scanners. Paint Shop Pro includes Animation Shop for creating animations, while PhotoImpact comes with PhotoImpact Album, for creating and browsing image catalogs.

Overall, Paint Shop Pro 7 is the more powerful of the two packages, with a better selection of image-editing tools, including quite a few found in higher-end programs. Beginners, however, may favor PhotoImpact 6's easier-to-work-with, wizard-based approach.

—Richard Baguley ▶

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

Paint Shop Pro 7

PRO: A program with powerful image-processing capabilities.
CON: Sometimes difficult to use.
VALUE: Less costly than Photoshop 6.
List price: $109
Jasc Software
800/622-2793
www.jasc.com

PhotoImpact 6

PRO: Simple, easy-to-use approach.
CON: Fewer features than Paint Shop Pro.
VALUE: A solid graphics program.
List price: $100
Ulead Systems
800/858-5323
www.ulead.com

Top Performance From Dell's Latitude C600

NOTEBOOK

POWERED BY Intel's latest mobile chip, Dell's pricey but packed new laptop—the **Latitude C600**—jumps right to the top of the performance heap. And traveling execs and salespeople especially will appreciate the C600's features.

Sporting a dark purple-gray case with a decorative Dell button on the lid, the Pentium III-850/700–based C600 racked up a blistering 169 on our PC WorldBench 2000 test suite, the highest score we've ever seen in a Windows 2000 Pro notebook system, and about 10 percent better than the previous mobile speed champ, a Dell Pentium III-750/550–based unit. A shipping unit also performed well on our battery test, lasting 3 hours and 28 minutes.

The $3378 Dell C600 has 128MB of RAM and a brilliant, 14.1-inch active-matrix LCD screen powered by an ATI chip set with 8MB of RAM. It comes with a nice-sized 10GB hard disk and with a CD-ROM drive in the media bay; other modules are available. Besides the standard ports, there are also ports for a 56-kbps modem, ethernet, and S-Video. The C600 packs all this into a trim, 1.5-inch-thick, 6-pound package (7.7 pounds with an AC adapter and an external floppy drive).

The keyboard is well laid out, although some may feel that the keys are a bit shallow.

Dell continues to use its dual pointing stick and touchpad scheme; both are very responsive. And a new Internet button located over the keyboard launches Internet Explorer, with MSN's home page as the default (the user can reprogram this button).

Minor gripes: The CD-ROM drive's eject button is slightly recessed, making it awkward to open; and hooking up the external floppy drive uses up the parallel port.

All in all, the new Latitude C600 backs up its new look with value that's a lot more than skin deep: You get top-notch performance and a full-featured package that won't break your back on the road.

—Anush Yegyazarian

Dell Latitude C600

PRO: A lightweight laptop for its class; a top performer.

CON: A bit pricey, tricky eject button for CD-ROM drive.

VALUE: Well suited for power-hungry business travelers.

Street price: $3378

Dell Computer

800/388-8542

www.dell.com

TEST PC WORLD CENTER THIS PRODUCT has been evaluated using tests designed by the PC World Test Center.

100-Plus Hours of Digital Music on the Go

MP3 PLAYER

IT LOOKS LIKE a portable CD player, sounds almost as good as one, and has many of the same settings, but Creative's **Nomad Jukebox** does not play CDs at all. Rather, it's an industrial-strength MP3 player, with a built-in 6GB hard drive that can store more than 100 hours of music.

THE NOMAD JUKEBOX from Creative also can function as a home stereo component.

The shipping version I tested truly stored more music than I could reasonably listen to in a month. Powered by four AA rechargeable batteries (two sets of four are included), the device played for 4 hours straight before pooping out. With its vast storage capacity, the $499 Jukebox could readily function as a home stereo component, when powered by the supplied AC adapter. (The adapter performs double duty as the battery recharger.)

Transferring MP3 files to the Jukebox proved effortless and amazingly swift. Using the bundled Creative PlayCenter 2 software, I was able not only to rip CD tracks in seconds but to send them to the Jukebox via the supplied USB cable at a rate of one song per 10 seconds or less. Using the intuitive on-board Music Library button, I could browse various albums or individual song tracks and move them to an active playlist with a single touch. I could also alter the music's sound by adjusting the Jukebox's EAX controls, which let me make Bruce Springsteen seem as if he were singing "Thunder Road" first in a living room and then in an auditorium.

But the device's strength—its sheer number of customizable features—could overwhelm users, at least at first.

The Nomad Jukebox carries some 20 hours of preloaded music and audio book recordings. It's certainly more expensive than most MP3 players, but it also offers additional content and user control.

Bit for bit and megabyte for megabyte, the Jukebox offers better bang for the buck than MP3 players that are armed with the standard allotment of 64MB of memory. I'd say this Nomad is going places.

—Michael S. Lasky ▶

Nomad Jukebox

PRO: Holds 100-plus hours of MP3 audio that can be loaded easily and quickly from a PC or other type of external device.

CON: Customizable options can be overwhelming at first.

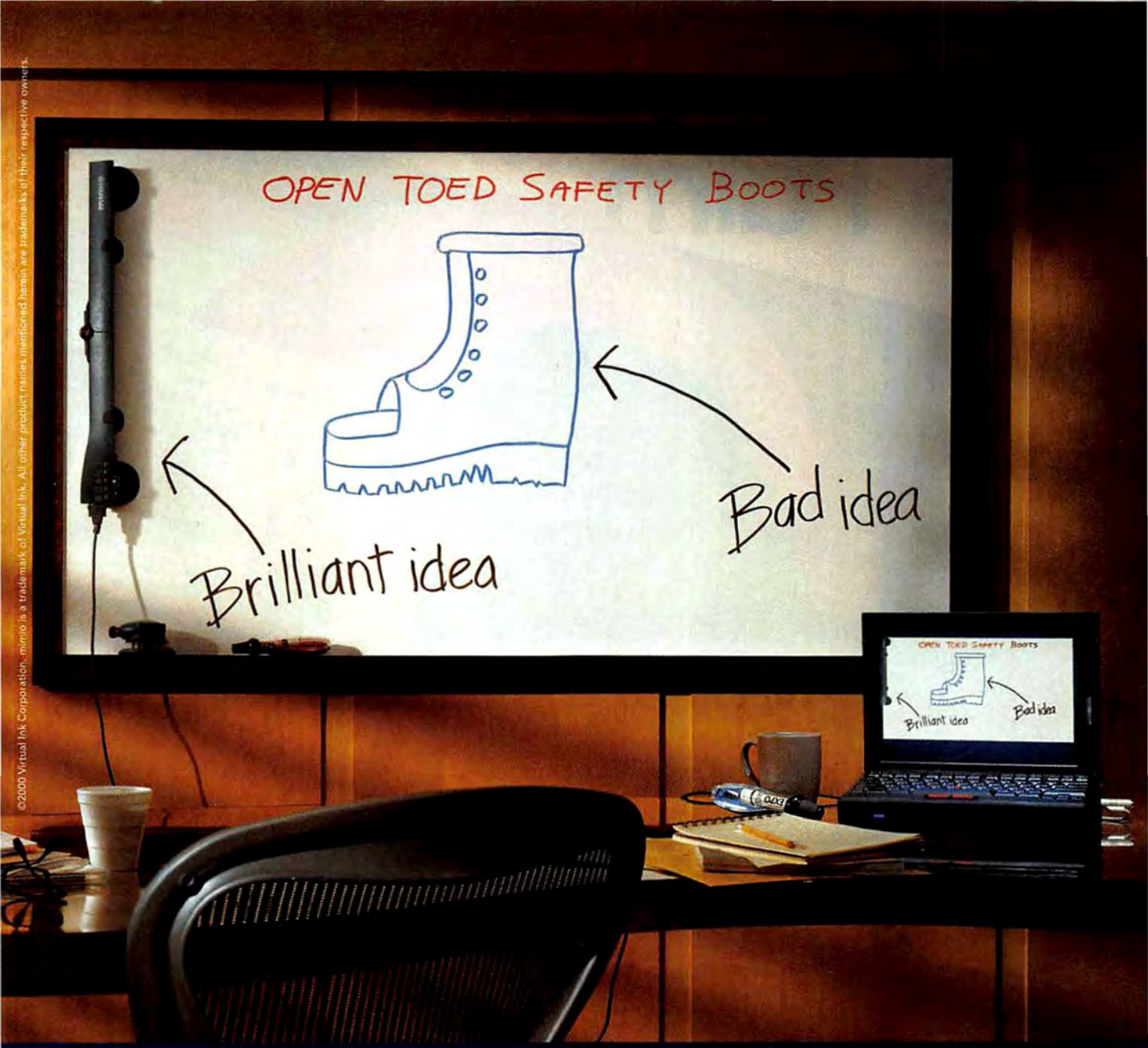
VALUE: This player is well worth the price for its robust features and large storage capacity.

List price: $499

Creative Labs

800/998-5227

www.creative.com



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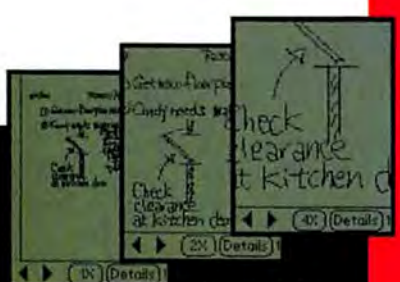

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A Business-Friendly Ink Jet From HP

PRINTER

CAN AN INK JET printer satisfy a busy workgroup that needs loads of color documents? Hewlett-Packard insists that its networkable **Business InkJet 2250TN** has the goods to do the trick, but I'm not so sure.

HP Business InkJet 2250TN

PRO: Very good print quality, especially on photos and graphics.
CON: Expensive; slow.
VALUE: Might have an edge over color lasers for businesses that print a lot of graphics.
List price: $999
Hewlett-Packard
800/552-8500
www.hp.com

TEST PC WORLD CENTER THIS PRODUCT has been evaluated using tests designed by the PC World Test Center.

This printer comes packed with an ethernet interface, 24MB of memory (expandable to 88MB), two paper trays that hold a total of 500 sheets, ink tanks that HP says last for 1750 prints, and two processors for converting data into dots and sending them to the printheads. HP says that the dual processors enable the 2250TN to print black text of normal quality at 11 pages per minute. Cost of all this: $999.

Alas, on the PC World Test Center's ethernet network, this shipping version of the 2250TN dribbled out text at only 4.9 ppm—too slow for any workgroup that's actually working. The 2250TN competes with color laser printers, especially the Minolta-QMS Magicolor DeskLaser 2. But in *PC World*'s tests, the $1100 DeskLaser 2 printed text at 7.8 ppm—that's almost 60 percent faster than the HP. The ink jet did beat the DeskLaser on printing graphics: 1.6 ppm to 1 ppm. As ink jets go, the HP 2250TN produced clean, crisp text, though it couldn't match the flawless look generated by a laser. It delivered excellent gray-scale photos, as well as graphics with subtle, lifelike textures and colors that only the most expensive color lasers can approach.

Is speed or quality more important? If your primary need is high-quality graphics, with text quality running a definite second, HP's Business InkJet 2250TN might be a good choice. All others should consider a color laser or a combination of a network-capable ink jet and a monochrome laser printer.

—Dan Littman

QUICK TAKES

Link Pocket PCs With Palms

IF YOU'RE A Pocket PC user feeling left out in a Palm-dominated world, Conduits Technologies has your invitation to the handheld party. Conduits' Peacemaker infrared-transfer utility will let you exchange contact entries and business cards with your Palm-equipped buddies. Simply choose one of the two items Peacemaker adds to the Tools menu in the Pocket PC's Contacts application: Beam Selected or Card Exchange. Peacemaker Professional ($15) also lets you quickly beam appointments, tasks, and notes. Conduits Technologies, 850/523-0426, www.conduits.com.

—Dennis O'Reilly

Cassiopeia EM-500: A PDA for the MP3 Set

PDA

CASIO'S **Cassiopeia EM-500** is one of a new—and more colorful—generation of Pocket PC handhelds that target the MP3 generation.

Thanks to the Windows Media Player's support for Windows Media Audio (WMA) and MP3 (as well as WAV), EM-500 owners will definitely be listening to the music. And the unit's powerful, 150-MHz CPU will help it play those multimedia files smoothly.

The $499 EM-500's built-in memory is reduced to 16MB from the 32MB of its predecessor, the E-115, but it adds a slot to accommodate MultiMediaCards, an alternative to the CompactFlash format. (Each MMC can store up to 64MB of data; an MMC with 32MB of memory costs about $99 extra.) In my informal tests, this PDA lived up to its promised 6-hour battery life.

THE CASSIOPEIA EM-500'S powerful CPU pumps up the music.

The EM-500 is easy to grip, once you've managed to extract it from the clutches of its too-snug padded nylon case. This case can cause the battery to run down inadvertently, by accidentally squeezing the power button on.

The EM-500 also carries a 240-by-320 TFT LCD screen (which can display 65,536 colors), as well as the usual Pocket versions of Microsoft Word, Excel, Internet Explorer (modem and Internet access are sold separately), Outlook, and Money. However, entering a significant amount of text would be quite a chore.

You can order this PDA in any of five colors—gray-blue, sky blue, yellow, green, or red—and you can synchronize files with your desktop PC via Microsoft's ActiveSync 3.1 software. File transfers fly over the provided USB connection. The EM-500 is a wonderful little take-along for music or Microsoft aficionados.

—Dennis O'Reilly ▶

Cassiopeia EM-500 Pocket PC

PRO: Pocket PC for MP3 devotees.
CON: Internet connectivity requires separate modem.
VALUE: Expensive, but its color screen, MMC storage, and familiar apps help mitigate price.
List price: $499
Casio
800/836-8580
www.casio.com

Quite a site to see. www.iiyamadirect.com

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ISO 14001

Battle of the Brands: New Speech Software

SPEECH RECOGNITION

NOW IT'S EVEN easier to start talking the talk with your computer. Both IBM's **ViaVoice for Windows Pro Edition** and Lernout & Hauspie's **Dragon NaturallySpeaking Preferred 5** offer improved, easy-to-follow audio setup wizards.

The required training for each shipping version took only about 5 minutes, and ViaVoice had a nice starting benefit: a helpful 3D image of how to wear the microphone headset. But NaturallySpeaking came out slightly ahead in my tests. Right off the bat, it recognized words more accurately, processed dictation faster, and was generally easier to navigate. Both products improved over time with additional voice training.

ViaVoice's hardware requirements are a tad stiffer than NaturallySpeaking's. ViaVoice ($200) demands that your PC have at least a Pentium II-300 CPU and 510MB of hard disk space, while NaturallySpeaking ($199) requires a Pentium II-266 and 150MB.

Both packages bundle high-quality, noise-canceling headsets, but IBM's Andrea Electronics NC-61 has a sturdy headband, a cushy earpiece, and a handy USB adapter; L&H ships a comparatively flimsy Telex headset.

Correcting flubbed words or enrolling odd pronunciations is easier with NaturallySpeaking. Still, ViaVoice's proactive Recognition Wizard is helpful.

Both packages enhance Web surfing by voice—you're no longer limited to basic functions such as "Forward," or "Back." ViaVoice now lets you hop directly to Internet Explorer Favorites by saying "Jump to" and a link's name as it was set up—for example, "Yahoo."

Buy NaturallySpeaking for its overall accuracy and ease of use, but ditch its bundled headset and invest in a better one.

—Aoife McEvoy

Dragon NaturallySpeaking Preferred 5

PRO: Very accurate from the start.
CON: Uncomfortable headset.
VALUE: The better speech recognition package by a hair.
List price: $199
Lernout & Hauspie
888/537-6688
www.dragonsys.com

ViaVoice for Windows Pro Edition

PRO: Terrific headset with USB adapter, very useful help tools.
CON: Improvements take longer.
VALUE: Good performance over time; headset USB adapter especially convenient for laptop owners.
List price: $200
IBM
800/825-5263
www.ibm.com/software/voice

New Internet Tools Beef Up Encarta 2001

REFERENCE SOFTWARE

MICROSOFT'S Encarta Reference Suite, the popular electronic encyclopedia, has some new capabilities that make it definitely worth a look. In particular, its Researcher tool allows you to capture Web information easily. I looked at a shipping version.

Encarta Reference Suite 2001 combines Encarta Encyclopedia Deluxe ($50 for the standalone edition) with an interactive atlas, a dictionary, and Encarta Africana, Third Edition, which focuses on black history and culture and is new in this version.

During installation, Encarta adds a Researcher button to the toolbar of Internet Explorer 5 or later (it doesn't support Netscape). Researcher then lets you highlight text and images from the Web and import them directly into your Researcher organizer. The tool automatically appends Web sources and bibliographical references to copied items.

From the organizer, you can edit and arrange your notes, and then export any or all of the items there to your word processor or to an HTML file.

ENCARTA 2001'S NEW RESEARCHER TOOL allows fast and easy capture of information found on the Web.

The software's Web Center makes getting to related online resources easier: Pull up an article on any major topic, and you get embedded links to Web sites chosen by Encarta's editorial team.

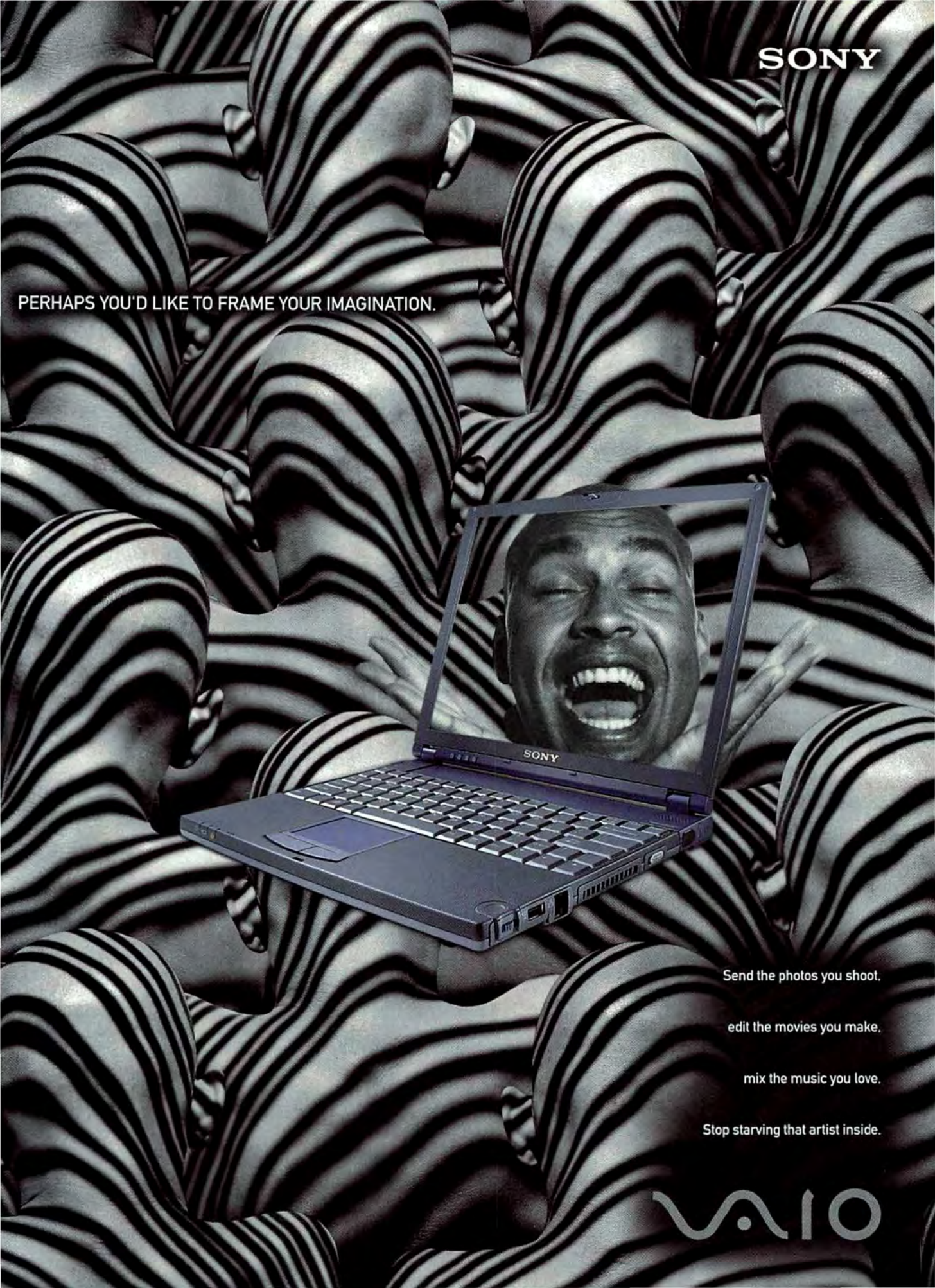
One notable downside: The CD-ROM version ($75) contains seven discs; swapping them to use the software can become tiresome. However, a one-disc DVD-ROM version, also $75, is expected soon.

Encarta 2001 successfully concentrates on the essentials—comprehensive, current content presented with state-of-the-art multimedia and design. World Book and Grolier both put out worthwhile competing titles annually, but Encarta's depth of content and superior online features keep it consistently in front.

—Glenn McDonald ▶

Encarta Reference Suite 2001

PRO: Upgraded encyclopedia; easily captures Web reference material.
CON: Swapping the CD-ROM discs gets annoying; DVD-ROM version definitely easier to use.
VALUE: Valuable, timesaving suite of reference tools.
List price: $75, for either CD-ROM or DVD-ROM version.
Microsoft
800/936-3500
encarta.com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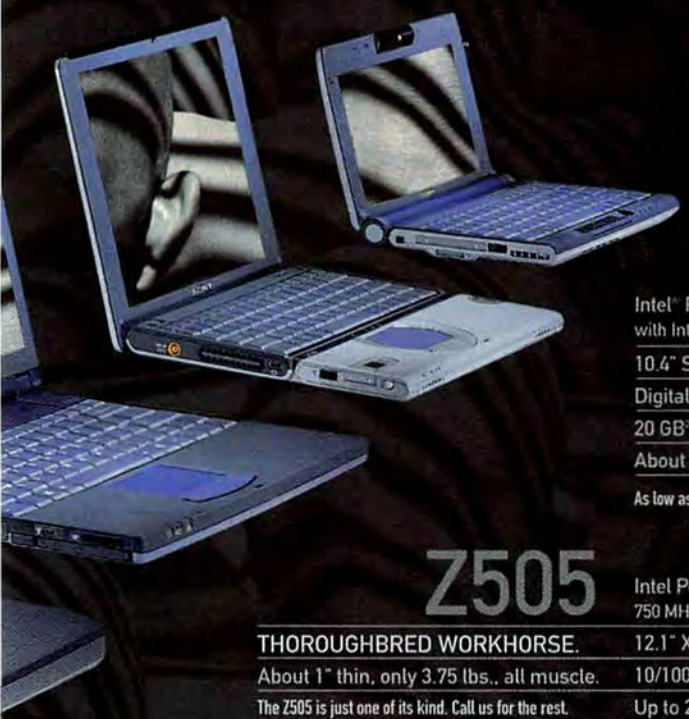

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High-End Features Pack Nikon's Coolpix 880

DIGITAL CAMERA

NIKON SETS a new standard for cool with its latest 3.3-megapixel digital camera, the **Coolpix 880**. It's the first camera to offer picture-in-picture mode, which lets you consult a thumbnail of your last picture while framing the next.

I looked at a preproduction version of the 880, which costs $799, less than Nikon's top-of-the-line Coolpix 990—but you may find it necessary to buy some add-ons.

The 880 packs most of the 990's high-end features, but it eliminates much of its sibling's complexity. Working with the camera's four intuitively labeled function buttons, an eight-setting mode dial, and a four-way toggle switch, I quickly got the hang of adjusting exposure, aperture, and shutter speed—as well as basic options such as flash and focus—without setting foot in a menu. I did find some dial settings unnecessarily confusing, however. For instance, to set shutter speed, you turn the dial to *M* or *CSM*.

The 9.7-ounce 880 is more compact than the 990, but it uses the same add-on lenses and the same smorgasbord of capture and playback controls, including a high 2048-by-1536-pixel resolution, smooth 4X zooming into captured photos, and video capture.

I liked the 880's Quick Review button, which puts a one-fourth-size image of the last photo taken in the LCD's upper left corner. If you don't want to fiddle with settings, 12 presets optimize the unit for photos of landscapes, sunsets, beach/snow scenes, fireworks, and other special shots.

The only uncool thing about the 880 is its high price. The camera comes with a nonrechargeable lithium ion battery and a skimpy 8MB CompactFlash memory card (many competitors ship with 16MB). You'll have to dole out $40 for a rechargeable lithium ion battery, $60 for Nikon's combination AC adapter/battery recharger, and $50 for a 16MB CompactFlash card—bringing the total cost to almost $1000.

This means that the Coolpix 990, which comes with an included 16MB CompactFlash Card and uses ordinary AA batteries, actually costs only slightly more than the 880 with all its options, even if you buy a recharger and batteries for the 990.

If you don't mind the 990's longer learning curve, don't need automatic settings, and like the flexibility of the 990's swivel body, it may be a better bet. Rookies with deep pockets should consider the 880.

—Carla Thornton

NIKON'S NEW COOLPIX 880 digital camera packs high-end features and offers a picture-in-picture mode.

Coolpix 880

PRO: Nice mix of basic, high-end, and convenience features.

CON: Some modes confusingly labeled; expensive.

VALUE: Good choice for digital photography newbies who want to grow.

List price: $799

Nikon

800/645-6689

www.nikonusa.com

A Snappy, Go-Anywhere Webcam

WEBCAM

A WEB OR videoconferencing camera used for business communications or chats with relatives must be located close to the PC. But sometimes you want to shoot stills or videos on the go. Intel's new $149 **Pocket PC Camera**, which works with Windows 98, 98 SE, or Me, joins a growing group of untethered Webcams—products versatile enough for videoconferencing and for capturing still images and making short videos away from the PC. But in my tests with a shipping version, this camera had its limitations.

PC installation via the USB interface was fast and easy. I first used the $149 camera in its cradle, perched atop my system's monitor. Then I took it outside and captured still images at the unit's highest-quality resolution (640 by 480), as well as several 10-second 30-frames-per-second AVI video clips. I found the Pocket PC Camera to be a capable videoconferencing tool. Intel's Create & Share software suite simplifies videophone call placement; the capture, editing, and organization of stills and videos; and the e-mailing of images and projects to friends.

The camera made a poorer showing untethered. Still images were pixelated and showed jaggies, and contrast and brightness were off.

If you want a Webcam that can do extra duty in a pinch under certain conditions, the Pocket PC Camera is a good deal. But for high-quality stills, you're be better off with a conventional 1-megapixel camera—which these days can run less than $250.

—Melissa J. Perenson ▶

Pocket PC Camera

PRO: 8MB of memory to store images taken on the go.

CON: Low-resolution still images and video clips; best for Web use.

VALUE: Worthwhile as a videoconferencing camera that takes low-res snaps when untethered.

List price: $149

Intel

916/377-7000

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Coolness Cubed: Apple's Radical New Mac

DESKTOP

APPLE'S **Power Mac G4 Cube** makes such an in-your-face design statement that a cynic might assume this new Macintosh is all beauty and no brains. Not so fast. Sure, its compact steel-and-clear-plastic body, high-style cooling vents, and top-mounted DVD-ROM slot make it look like the Jetsons' toaster (or maybe their Kleenex box). But the Cube also packs features so sensible that you wonder why all PCs haven't had them for years. These innovations help justify its somewhat steep list price: $1799 for a machine configured with a 450-MHz PowerPC G4 processor, 64MB of RAM, a 20GB hard drive, and a DVD-ROM drive, but no monitor. That's $200 more than Apple's entry-level Power Mac G4, which, at 400 MHz, has a slightly slower CPU.

Despite its flamboyant shell, the shipping unit I tested looked rather unobtrusive once set up. Its footprint is only 7.7 inches by 7.7 inches, and its convection cooling system renders it essentially silent. (By comparison, my PC roars like a blast furnace.) In my informal tests, the system's performance was adequate (unfortunately, PC WorldBench 2000 doesn't run on Macs), but the standard RAM allotment seemed tight when the system ran more than one app. So consider bumping the Cube up to at least 128MB of RAM. Adding the appropriate chips is a snap as the Cube's innards easily pop out.

APPLE'S POWER MAC G4 CUBE: Stylish and whisper-quiet, but a little pricey.

Both the baseball-like Harman/Kardon speakers and the display (if you spring for a new Apple Studio Display monitor) draw power from the system without requiring extra cords, minimizing cable clutter. Even its mouse is a cut above its typical PC equivalent. It's a ball-free, buttonless optical model—to click, just press the mouse itself down.

Apple has a long record of releasing brilliant computers with one inexplicable design glitch. (Think of the original iMac's unwieldy hockey puck of a mouse.) Here, it's the on-off switch, a glowing, touch-sensitive spot on the case's top. Brush it accidentally—I did, repeatedly—and the system goes into sleep mode. Traditionalists may also decry the Cube's lack of a floppy drive. And the absence of free drive bays means you can't add an internal Zip or CD-RW drive.

Still, I hope PC manufacturers take cues from Apple's innovations, as they've often done in the past. We may not need copycat cubes. But we certainly could use more systems that challenge our notions of how a computer looks, feels, and performs.

—Harry McCracken ▶

Apple Power Mac G4 Cube

PRO: Great-looking, compact, quiet, reduces cable clutter, nifty mouse.
CON: Troublesome on-off switch, no internal drive bays, a tad pricey.
VALUE: Neither cheap nor perfect, but Apple's typical elegance and innovation abound in this unit.
List price: $1799
Apple
800/692-7753
www.apple.com

ZoneAlarm Pro Firewall Means Business

PC SECURITY

IF YOU'RE worried about security for your small-office or home network (and you should be worried), look into **ZoneAlarm Pro**, an expanded version of Zone Labs' free basic ZoneAlarm software. To the simpler product's excellent protections against Internet hackers and viruses, ZoneAlarm Pro adds customization options and support for networked environments. It costs $40 for one PC, with volume discounts as the number of systems increases. I looked at a shipping version.

Basic ZoneAlarm is a robust firewall with a straightforward interface and panels where users of any level can configure the program. Pro adds buttons to give advanced users greater control over the inner workings of the firewall engine. Both work with Windows 9*x*, NT, 2000, and Me.

The biggest differences show up in the Security panel, where Pro lets you specify your network setup. The panel retains the basic version's sliders, so you can set your own security level: high, medium, or low. But Pro adds a Customize button for checking off exact firewall rules for each level; online help explains how to find the controls.

The Security panel also offers access to an expanded MailSafe utility, which scans e-mail attachments, quarantines potentially dangerous file types, and includes options for blocking 37 file types.

If you have a single computer at home, free ZoneAlarm is probably all you need. But if your home or small office is networked, $40 is reasonable for the powerful firewall protection of ZoneAlarm Pro.

—Seán Captain

ZoneAlarm Pro

PRO: Supports networks.
CON: Little value-add for single PCs.
VALUE: Good for tech-savvy users running smaller networks.
List price: $40 for one PC, discounts for multiple systems.
Zone Labs
800/201-5517
www.zonelabs.com

Never before has 8U made such an impact on network availability

APC's NEW Symmetra® RM; the first N+1 rack-mountable Power Array™ with all the reliability of Symmetra's patented redundancy and scalability.

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Symmetra RM is compatible with APC's multiple management accessories, like the MasterSwitch™ family for remote rebooting or the Environmental Monitoring Card for temperature and humidity monitoring.

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The Symmetra RM fits into any standard 19" enclosure and takes only 8U of space. Its power modules are hot-swappable, so you can scale them up without any downtime. Symmetra RM is also easily manageable with the industry-leading network platforms.

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YOU'D SMILE TOO IF YOU'D JUST BEEN NAMED

The editors of PC World magazine judged hundreds of products based on performance, consistency, innovation and value. Their verdict? "AMD's Athlon Processor is a superstar in all four" and "Athlon-based PCs sprinted to the top of our corporate and home PC charts." These are just a few of the reasons that they chose the AMD Athlon™ processor as "Product of the Year." You'd think we'd be

PC WORLD MAGAZINE'S PRODUCT OF THE YEAR.

used to this by now. After all, AMD Athlon processors have already won more than 65 awards worldwide. But when we hear things like "record-breaking performance," "architecturally superior to Intel Pentium III" and "the first to hit a clock speed of 1 gigahertz, beating Intel at its own game," we still can't help but grin. You will too when you see what an AMD Athlon processor can do for your productivity. Log on to **www.amd.com/pcworld.**

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Philips's Incredible Shrinking Projector

PROJECTOR

AT JUST under 3 pounds, the Philips **UGO X-Lite** projector redefines the term "ultraportable." Roughly the size of a smallish box of breakfast cereal, this is the lightest projector I've tested. Even when you include soft carrying case, cables, and remote control, the UGO X-Lite's traveling weight is barely 5 pounds.

The $5899 X-Lite is a good choice for travelers who do small-group presentations (to audiences ranging from 2 to 20 people) in rooms where the projector can be placed up to 22 feet away from the screen. But aside from its compact design—measuring just under 11 inches wide by 7 inches deep by 2 inches tall—the UGO X-Lite's feature set is standard for a portable projector.

WEIGHING LESS than 3 pounds, Philips's UGO X-Lite is the most compact ultraportable projector around.

Based on Digital Light Processing (DLP) technology, this projector uses an 800-ANSI-lumen lamp with a projected life of 1000 hours. (DLP projectors use lighter and less expensive projection components that produce brighter—though, typically, less colorful—images than those using competing technology.) Its native resolution is XGA (1024 by 768), but it can also resize and project images at resolutions ranging from VGA (640 by 480) to SXGA (1280 by 1024) without noticeable distortion.

I tested a preproduction X-Lite, using a notebook with a Pentium III-500 CPU to project PowerPoint presentations, digital photos, and other test images onto a 50-inch screen and a highly reflective white wall at distances ranging from 3 to 15 feet. I also hooked it to a TV tuner and an S-VHS VCR to see how satisfactorily it projected video images and played sound. The X-Lite performed reasonably well, even under low lighting conditions.

I particularly liked its digital features, including zoom, keystone correction for image distortion, and freeze.

You won't find a lower-weight projector in its class than the UGO X-Lite. But if you don't mind lugging a few extra pounds, you can save money with a less expensive portable projector—such as Proxima's $4600, 5.2-pound, 1000-ANSI-lumen UltraLight DX2, which delivers brighter images and works better for large-group presentations.

—Richard Jantz

UGO X-Lite

PRO: Smallest featherweight XGA projector, remote control.

CON: Not the brightest ultraportable around.

VALUE: Great choice for traveling light and for making small-group presentations.

Street price: $5899

Philips

888/873-4672

www.pcstuff.philips.com

Free, Easy E-Mail Management With Eudora 5

E-MAIL SOFTWARE

USING PARED-DOWN e-mail software that came with your browser? Do yourself a favor—try Qualcomm's **Eudora 5** instead. In my tests with a public beta, this new release handled multiple e-mail accounts smoothly, displayed excellent message filtering, and proved capable of importing mail, account settings, and address books from a current program in just three clicks. And Eudora 5 helps groups share current versions of files with the new Eudora Sharing Protocol (ESP).

To establish an ESP group, I followed a few simple steps to create a folder in Explorer and a mailing list. Eudora then sends out invitations to those on that mailing list. When recipients accept, their copy of Eudora sets up the list and a folder on their system, and syncs files automatically when members of the group check e-mail. You can designate group members as full or read-only participants (the difference: Read-only members can receive changes but can't broadcast their own).

Eudora 5 also includes a tool called MoodWatch that gauges the potential offensiveness of incoming and outgoing messages, flagging them for upsetting language. It sounds like a handy tool for people with delicate sensibilities, but the prerelease version I tested seemed uneven. It flagged some benign messages, yet ignored another in which I called the recipient an idiot.

Eudora 5 Sponsored is a free ad-supported download; Eudora Light, also free, drops ESP and other features, along with the ads. If ads bother you but you want the full package, $50 gets you a commercial-free version. Whichever mode you choose, Eudora 5 is a compelling upgrade.

—Matt Lake ▶

Eudora 5

PRO: Excellent filtering and mailbox sorting; features strong group file-sharing and syncing.

CON: MoodWatch function inconsistent; Sponsored mode's ads must remain visible at all times or Eudora's nag screens pop up.

VALUE: Can't beat a good, free program; $50 cuts out sponsor's ads.

List price: Light and Sponsored modes, free; ad-free mode, $50.

Qualcomm

800/238-3672

www.eudora.com

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MSN Explorer: Browser Plus for Beginners

WEB BROWSER

IF YOU'VE tried to wean buddies from America Online only to be told how much they love its convenient interface, Microsoft's new **MSN Explorer** is the perfect comeback. This free 5MB download is both a user-friendly browser and a gateway to popular (and free) MSN services—from Hotmail e-mail and a powerful search engine to Money Central personal finance applications and E-Shop shopping tools.

Throw in such AOL-like features as an attractive toolbar for easily accessing content and applications, and the capability to customize the browser for multiple local users, and you've got a pretty attractive package—especially for novices and families.

MSN needn't be your Internet service provider. The quick installation routine lets you set up a Hotmail e-mail account (if you don't have one on Hotmail or MSN). Expect multiple users? Nine people can log in and out separately under their e-mail name to access their own bookmarks, e-mail messages, and other settings—all maintained on an MSN server and accessible from any PC equipped with MSN Explorer (a feature I'd like to see expanded to Internet Explorer).

MICROSOFT'S NEW MSN Explorer: An exceptionally friendly browser.

In the preview version I tested, toolbars frame the usual browser window on top and on the left. On top, color icons point to e-mail, MSN Messenger Buddy Lists, and Microsoft Web sites. The left one (called My Stuff) links to personalized content from Microsoft and its partners. On the bottom, a built-in version of Windows Media Player lets you play Web music and videos without opening yet another window.

Nice touches abound. Type an e-mail address or keyword combination into the URL window, and MSN Explorer launches an e-mail form or a search. Free U.S. or Canadian Internet phone calls are easily placed with a phone dialer, accessed somewhat awkwardly through the Buddy List.

Drawbacks? Everything is highly Microsoft-centric; you can't, for example, change your start page from the MSN home page. Still, for beginners and people who prize AOL-style convenience over the power of the more complex Internet Explorer/Outlook Express combo, MSN Explorer is well worth a try.

—Yardena Arar

MSN Explorer

PRO: Supereasy access to Web content and services.

CON: Not so convenient for non-Microsoft content and services.

VALUE: This is a strong AOL alternative for Internet novices.

Free

Microsoft

preview.msn.com

Work or Home: Hot Graphics at a Cool Price

GRAPHICS BOARD

AN EASY WAY to add zip to 3D games or improve a 2D work display is to plug the latest graphics board into your system. But with prices for high-end models topping $300, that approach can be expensive.

Enter NVidia's budget-minded GeForce2 MX chip—the heart of Guillemot's impressive **Hercules 3D Prophet II MX**. This 32MB board costs a mere $150 and uses a trimmed-down version of NVidia's GeForce2 GigaTexel Shader (GTS) architecture.

The MX chip also offers several features for business users—including some not found on GTS-based boards. All MX boards have Digital Vibrance Control (DVC), which is designed to produce richer, cleaner on-screen colors in poor lighting environments, such as fluorescent-lit offices. DVC allows a user to adjust brightness, contrast, and other settings through a simple interface.

In tests with a shipping unit, Guillemot's Hercules performed comparably with GTS-based boards. In *PC World* tests, the 3D Prophet II MX board often produced frame rates—the number of times an image frame changes per second—close to those of its more powerful GTS sibling.

In some cases, however, frame rates were slightly lower, and resolutions higher than 800 by 600 pushed the MX chip's limits.

This isn't a top-of-the-line board, but it doesn't have a top-of-the-line price either. If you're looking to upgrade from an older AGP graphics board and you're on a budget, the 3D Prophet II MX hits the sweet spot dead-on.

—Joel Strauch ▶

Hercules 3D Prophet II MX

PRO: Fine performance on many games; even better price.

CON: Slower with high-end gaming.

VALUE: Excellent next-generation board at previous-generation price.

List price: $150

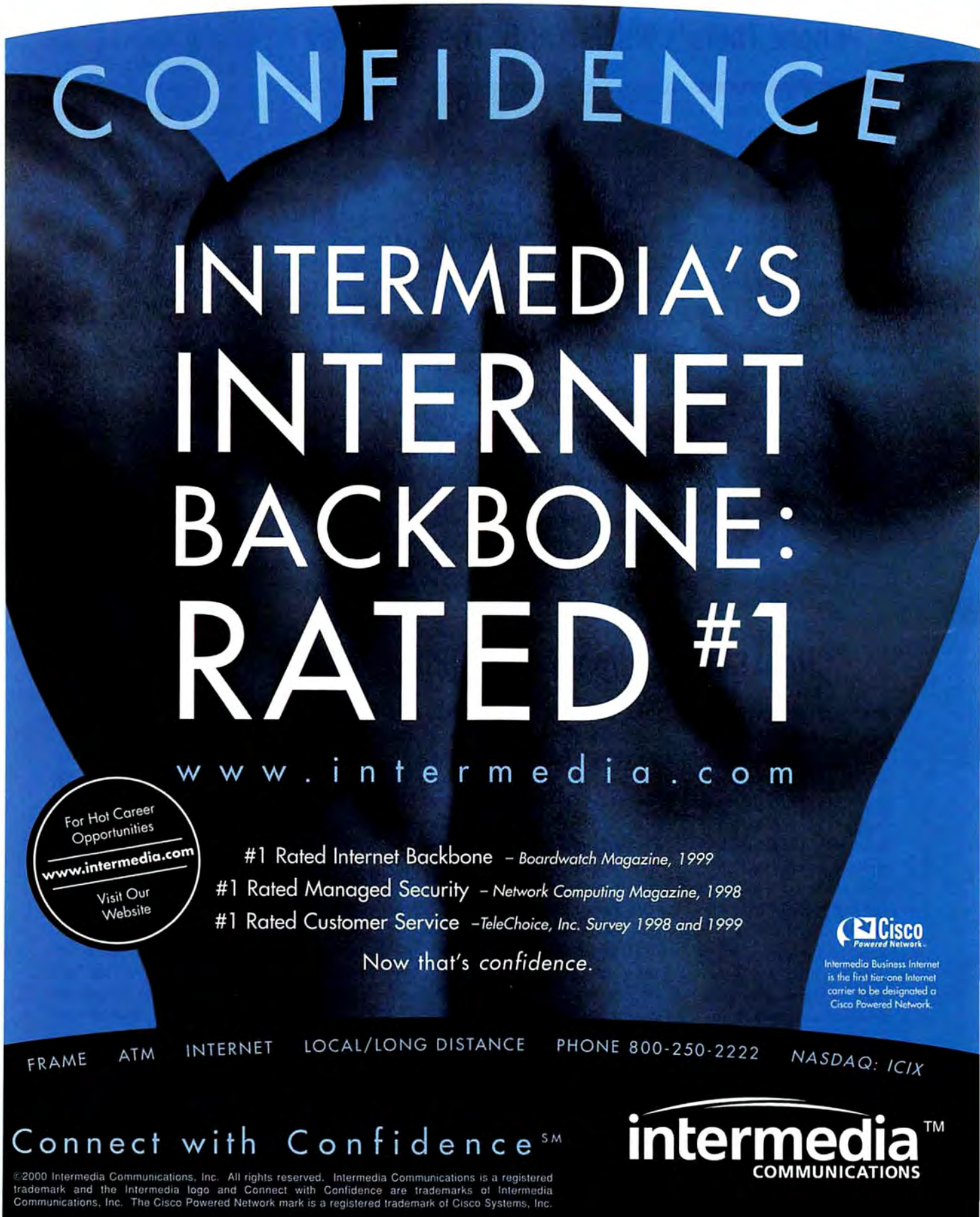
Guillemot

877/484-5536

www.hercules.com

TEST PC WORLD CENTER THIS PRODUCT has been evaluated using tests designed by the PC World Test Center.

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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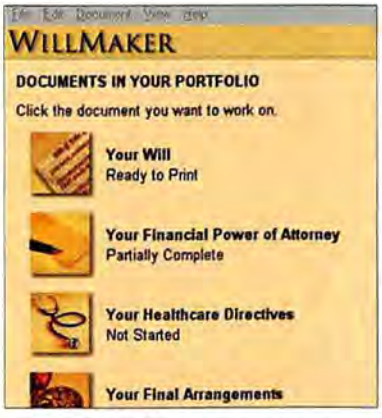
Where There's WillMaker 8, There's a Way

ESTATE PLANNING

THE ONLY SURE things in life, it's said, are death and taxes. Software can help with taxes. But must you face death without digital assistance?

Nope. With Nolo.com's **WillMaker 8**, $41, the latest revision of the company's estate-planning software for Windows 9*x* and 2000, you can prepare a will or confer power of attorney on the person of your choice in the event that you become incapacitated. You can also create instructions for what Nolo ominously calls Your Final Arrangements. (Quicken WillWriter 2001 can prepare similar documents, and Kiplinger's WillPower adds features that help to monitor the value of your estate.)



WITH WILLMAKER 8, you can easily generate many types of legal documents.

Will preparation was painless and quick with the Nolo product. I made a plan in less than an hour—about average, according to Nolo—for disposing of all my worldly goods.

The software also can guide you through preparing a host of other legal papers. New in this version: seven forms to create, ranging from an agreement with a child-care provider to authorization for someone to drive your car. Choose one, and the software asks you questions, explaining the practical effect of each option chosen. Answer the queries, then print a document ready to sign. One quibble: Even the large-type edition in my shipping version made me squint.

—Edward N. Albro

WillMaker 8

PRO: The software's simple procedures avoid legalese.

CON: Difficult to read on screen.

VALUE: Create a will quickly.

Street price: $41

Nolo.com

800/992-6656

www.nolo.com

Real Changes Improve RealPlayer 8

MEDIA PLAYER

NOW THAT Microsoft's free Windows Media Player 7 combines a media player and a music jukebox, is there any reason to use RealNetworks' **RealPlayer 8**? You bet. While its playback is somewhat comparable to that of WMP7, the new RealPlayer has more ways to control and access Web audio and video, and it features content channels, a radio tuner with access to 2500 stations, and a message service.

The program's familiar Windows interface is easy to navigate. In my tests of the shipping version, however, the player was slow to respond when I clicked from, say, the ESPN channel to Film.com. Enhanced Take 5, a video news and entertainment summary, struck me as a bit of a pastiche.

Annoyingly, it's difficult to find the free RealPlayer Basic on Real's Web site. A $30 Plus version adds a graphic equalizer, picture controls, and access to GoldPass, a subscription media service (now mostly video), which didn't seem worth an extra $10 a month.

Over my system's 56-kbps modem, playback with the company's latest video format was marginally better than with its predecessor. Images in a RealVideo 8 auto ad streamed at 36 kbps were fuzzy; the audio, pure static. A movie trailer at 220 kbps, which wouldn't tax any broadband connection, played well in a quarter-screen window. RealPlayer 8 also plays AVI files and streaming MP3 audio easily, but I had to download a Real plug-in for MPEG video.

You can download RealPlayer 8 as part of a Real Entertainment Center suite, which includes RealJukebox 2 and a tool for streamlining downloads. The cost is free or $50 for the Plus versions of Jukebox, Player, and Download. RealJukebox plays Windows Media Audio files, MP3 files, and several other formats.

Average users may be satisfied with Windows Media Player, especially if it is bundled with Windows Me. But if you want more control, and better quality than previous versions have offered, consider downloading RealPlayer 8. Only truly avid media buffs should pay for the Plus versions, however.

—Cameron Crouch ▶

RealPlayer 8

PRO: Supports multiple formats.

CON: Pop-up windows can overwhelm the desktop.

VALUE: Good for digital media fans who like to be in control.

List price: RealPlayer Basic, free; Plus version, $30; Entertainment Plus suite, $50; GoldPass service, $10 a month with RealPlayer Plus.

RealNetworks

888/768-3248

www.real.com

QUICK TAKES

Cat, Not Mouse

TIRED OF MICE? Then you might try a Cat. Cirque's **Easy Cat USB** is the first stand-alone USB touchpad peripheral. The Easy Cat is roughly the size of a credit card but thicker. Requirements: a USB port and Windows 9*x* or 2000 for the PC (for Macs, OS 8.5 or later). Cirque says this $50 touchpad reduces the strain of arm/wrist motions needed to guide a mouse. In my tests with a shipping unit, it took several hours to get used to directing a cursor with fingertip taps and glides. Once I did, I especially liked the ability to scroll up or down anytime by stroking the the right edge of the pad. Cirque; www.cirque.com; 801/467-1100.

—Gaea Zhou

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And by the way, Yap Gear starts at a mere $44.99. Now that in itself is worth talking about.

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For more info on Yap and the closest store to get it, go to www.yapgear.com

Get Smart: The Pluses and Minuses of E-Learning

◆ By Linda Grubbs

JEAN PAUL Balajadia, senior engineer with the San Francisco consulting firm Alfa Tech, wanted to update his project management skills, but like most of us, he's a busy guy. "I didn't have time to juggle an instructor-led class into my schedule, so I looked at e-learning." A friend suggested the training site Headlight.com. Balajadia found a free course offered there, so he enrolled. He was impressed with the training he received from the class and recommended the site to his company as a way to train employees. "We are looking for innovative ways, including Web-based learning, to provide continuing education to our staff," he says.

Busy, cost-conscious managers like Balajadia have good reason to be excited about e-learning. Online classes are easier than regular off-site courses to fit into a packed schedule, and some sites offer inexpensive or free tutorials in such useful topics as business software. But like most hot technologies—and most course topics—e-learning is more complicated than what you might expect.

E-LEARNING DEFINED

E-LEARNING—also known as online learning, Web-based training, computer-based training, and distance learning—comes to you via the Internet, and it's a booming business. In the past few years, a flurry of sites aimed at large and small companies have appeared, offering instruction on everything from software applications to project management training.

Proponents of e-learning tout its cost-effectiveness and convenience and point out that the course materials can be delivered in various ways directly to your desktop. For example, you can take a course led by a live instructor, where you can pose questions and participate in a discussion with the teacher in real time. Or you can choose to navigate a self-paced course at your own convenience.

But do online classes adequately substitute for on-site courses? To find out what all the cheerleading is about, I surveyed several e-learning sites. I sorted out the different types of training sites available, scrutinized some of the classes these sites offer, and isolated the pros and cons of the most popular sites (see the features chart on page 123). To help you choose from the daunting multitude of courses on the Web, I point out what to look for when picking an online class.

I discovered several things about e-learning. For one, course materials and prices for a class on the same subject can vary widely. A complete Excel 2000 course at one site may cost $267; but at another site, the Excel 2000 class may be divided into smaller components, and each lesson may cost as little as $20. Compared to a traditional instructor-led class priced at $385 in the San Francisco Bay Area, e-learning looks like a bargain.

I found scores of e-learning sites on the Internet, most of which fall into two basic categories: service providers and content providers. Service providers (sometimes referred to as portals) partner with businesses and provide a locus where students can find an array of training-related resources. Content providers, on the other hand, develop and sell custom-designed training courses in response to specific information the customer provides. Customized packages may include provisions for student assessments, such as performance tracking and progress reports. Businesses use this information to measure whether their training investment increases productivity and/or profits. ▶

CLASS ACT: Jean Paul Balajadia, Alfa Tech senior engineer, was impressed with the Web-based project management course he completed at Headlight.com.

PHOTOGRAPH: ROBERT HOUSER

E-LEARNING courses let you learn on your own time, when it's convenient for you. With these classes, you can

- **work with a live instructor or pursue a self-paced course**
- **save money**
- **upgrade your skills or learn a new program**
- **test yourself to assess your skill level**
- **take a sample lesson to help you comparison-shop**

SAMSUNG ELECTRONICS

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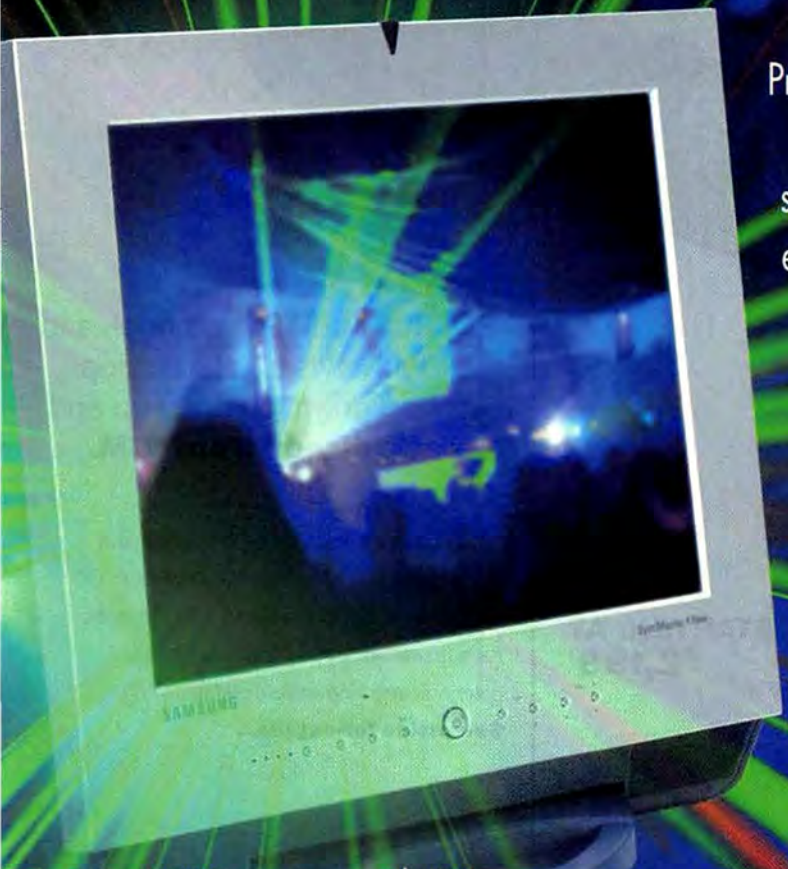

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IBM ThinkPad X20

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These days, it's all about looking good and working hard. Well, the new IBM ThinkPad® X20 notebooks and IBM NetVista™ X40 desktops have mastered both, with an easy-to-tote notebook and innovative desktop.

See inside for details...

LOOK INSIDE: unprecedented style and leadership design in the new IBM products.

intel inside
pentium® III

Which kind of course fits which business? If you seek specialized training for your employees on company-specific information such as sales and marketing procedures, a content provider will suit you best. On the other hand, if you need standalone, general-interest courses in areas such as word processing, spreadsheets, or Web-page design, you need a service provider. Keep in mind though, that the line between the two categories is becoming increasingly blurred, and some sites offer both types of training.

Hungry Minds is a service provider. Like most portals, Hungry Minds (recently purchased by IDG, *PC World*'s parent company) takes an everything-but-the-kitchen-sink approach to e-learning. Through Hungry Minds' partnership with businesses like Amazon.com and with schools like the University of California at Berkeley Extension, you can pursue your entire e-learning experience via this one Web site. The site offers 17,000 courses categorized into three broad topic areas. Hungry Minds also lets you order textbooks, interact with classmates via threaded discussions or real-time chats on Blackboard.com, and get help studying for university entrance exams with Examweb.com. The cost of taking a Microsoft Word course ranges from free up to $100.

OF COURSE, THERE'S A COURSE

MANY E-LEARNING classes are designed to let you learn at your own pace, and many offer classes in almost any subject you can think of, from plumbing to gardening to business software applications. **Learn2.com**—a site that's both educational and fun—added for-pay classes to its repertoire of free courses last year. Its instructional format includes engaging graphic illustrations that help clarify the subject matter. The site also offers courses for kids. Classes in such business applications as word processing, spreadsheets, and presentations cost as little as $20.

But while Learn2.com offers a huge array of classes, finding them can be difficult. Channel headings along the top navigation bar identify the free classes, but you must go to the Learn2 Store to find a complete list of courses. You'll also need to download a proprietary plug-in before taking some classes, a slight inconvenience that many e-learning sites have abandoned. (To read about a *PC World* editor's experience taking a Learn2.com Excel class, see "How One Student Fared With Online Learning" on page 122.)

DigitalThink customizes content for Adobe, Charles Schwab, and other Fortune 1000 companies. In addition, the site offers a library of courses it designs itself, such as Microsoft 2000 Certification. Although more expensive than some other content providers, DigitalThink is intelligently designed and well organized. Finding a particular course among its 200 or so offerings was a cinch thanks to easy-to-follow links. Most of the classes are for information technology professionals, but (as with Learn2.com), you can also find a small selection of classes about using desktop applications. Expect to pay $99 to $1000 for a class, depending on the topic and your starting skill level.

LEARN2.COM LETS YOU practice new skills. A command toolbar allows you to repeat material you missed the first time around.

Headlight.com offers 3000 online training classes targeting small to medium-size businesses. Peter Mellen, a cofounder of Headlight.com, explains how the site helps you to choose among its offerings: "Users are given the opportunity to take a Skills Assessment test prior to taking certain classes to help identify gaps in learning. Course recommendations are made based on the test results, and are kept in a password-protected user profile. Users can access their profile, and take quizzes as often as they wish." Jean-Paul Balajadia, the Alfa Tech engineer who took a course with Headlight.com, found this feature helpful. In addition to its handy preassessment tests, Headlight.com presents an interface that's easy to navigate. I had no trouble using the handy search bar at the top of the home page to locate classes. Prices range from a low of $11 all the way up to a still-modest $250.

Like Hungry Minds, **EduPoint.com** offers some classes that have an academic focus. Its clean, handsome design features a searchable database of 1.5 million classes, including 100,000 online options. The on-site classes are available through 4000 schools such as Northwestern University and California Polytechnic State University; you can search for local classes by en- ▶

Organizations are starting to recognize e-learning as a viable alternative to traditional training.

IBM ThinkPad X20

SMALL SIZE
BIG CAPABILITIES.

At about 3.1 lbs. light and under an inch thin,[2] it's hard to believe the ThinkPad X20 notebook offers so much. Like a full-sized keyboard that's lit with a top-mounted ThinkLight™ for easy nighttime use. And for added lightness (and to protect the roomy 12.1" TFT display), the ThinkPad X20 features Titanium Composite in the top cover.[2] Plus, a Compact Flash slot and 2 USB ports give you portable storage options and connectivity without added bulk.

If the ThinkPad X20 notebook isn't what you're after – check out the ThinkPad A and T Series models below, or call or visit our Web site for the full range of thin, light ThinkPad notebooks.

IBM THINKPAD NOTEBOOKS

NEW IBM ThinkPad X20

Mobile Intel® Celeron™ processor 500MHz*
12.1" SVGA TFT display
64MB SDRAM
10GB[3] HDD • 4MB graphics memory
Mini PCI 56K[4] V.90 modem
Microsoft® Windows® 98 Second Edition
Lotus® SmartSuite® Millennium Edition[5]
Li-Ion 4-cell battery
Titanium Composite cover
UltraPort™ connector
ThinkLight keyboard light
Starting at 3.1 lbs. travel weight, under 1" profile

$2,199[1]

SuccessLease™ for Small Business $80/MONTH[6]

NEW IBM ThinkPad A21m

Mobile Pentium® III processor 700MHz featuring Intel SpeedStep™ technology
14.1" XGA TFT display
64MB SDRAM
10GB HDD • 4MB graphics memory
8X-2X[7] DVD-ROM
Mini PCI 56K V.90 modem
Windows 98 Second Edition
Lotus SmartSuite Millennium Edition
Modular Ultrabay™ 2000
Li-Ion 6-cell battery
ThinkLight keyboard light
6.2 lbs. travel weight

$2,399[1]

SuccessLease for Small Business $87/MONTH[6]

NEW IBM ThinkPad X20

Mobile Pentium III processor 600MHz featuring Intel SpeedStep technology
12.1" XGA TFT display
128MB SDRAM
20GB HDD • 4MB graphics memory
Mini PCI 10/100 Ethernet adapter with 56K V.90 modem
Microsoft Windows 2000
Lotus SmartSuite Millennium Edition
Li-Ion 6-cell battery
ThinkLight keyboard light
3.6 lbs. travel weight, 1.2" profile
3-year limited warranty[8]

$3,099[1]

SuccessLease for Small Business $112/MONTH[6]

NEW IBM ThinkPad T21

Mobile Pentium III processor 750MHz featuring Intel SpeedStep technology
13.3" XGA TFT display
128MB SDRAM
10GB HDD
24X-10X CD-ROM
Mini PCI 56K V.90 modem
Windows 98 Second Edition
Lotus SmartSuite Millennium Edition
Li-Ion 6-cell battery
Titanium Composite covers
ThinkLight keyboard light
4.6 lbs. travel weight, slim 1.3" profile

$3,199[1]

SuccessLease for Small Business $116/MONTH[6]

CUSTOMIZE YOURS:

64MB 100MHz NP SDRAM Memory Upgrade
$119[1] or $4/month[6]
IBM ThinkPad Port Replicator
$149[1] or $5/month[6]
Onsite Service Upgrade: 3-Year/Onsite/ 9x5/Next Day Service[9]
$147[1] or $5/month[6]

CUSTOMIZE YOURS:

IBM ThinkPad Compact Carrying Case
$99.99[1] or $4/month[6]
IBM ThinkPad Dock **$499[1] or $18/month[6]**
Onsite Service Upgrade: 3-Year/Onsite/ 9x5/Next Day Service
$345[1] or $13/month[6]

CUSTOMIZE YOURS:

UltraBase™ X2 Media Slice
$274[1] or $10/month[6]
4X/4X/20X-10X CD-RW Ultrabay 2000 Drive
$389[1] or $14/month[6]

CUSTOMIZE YOURS:

128MB 100MHz NP SDRAM Memory Upgrade
$229[1] or $11/month[6]
Extra IBM ThinkPad Ultrabay 2000 Li-Ion Battery **$189[1] or $7/month[6]**
Onsite Service Upgrade: 3-Year/Onsite/ 9x5/Next Day Service
$147[1] or $5/month[6]

IBM

IBM recommends Windows 2000 Professional for business.

[1]Prices shown are prices available from IBM directly; reseller prices may vary for ThinkPad X Series Part #266211U, Memory Upgrade Part #20L0254, Port Replicator Part #02K8667, Warranty Service Upgrade Part #3 #08N1180, Ultrabay 2000 Drive Part #00N8252; ThinkPad T Series Part #264727U, Memory Upgrade Part #20L0255, Ultrabay Battery Part #02K6646, Warranty Service Upgrade Part #30L9197; NetVista A Series Part #09N9783, Printer Part #09N9779, Digital Camera Part #09N9785; NetVista X Series Part #664323U, Printer Part #09N9994, Flatbed Scanner Part #10K3650, Warranty Service Upgrade Part #30L9199. IBM price does process and options. [2]Titanium Composite Carbon Fiber Reinforced Plastic has three times the strength of ABS plastic as tested by IBM using the high flex modulus test on 2/28/00. Available on select models. [3]MHz m mode; battery optimization mode is approximately 80% of maximum performance mode. [4]GB means one billion bytes when referring to hard drive capacity. Accessible capacity may vary. [5]These modems are designed to depend on many factors and are often less than the maximum possible. [6]Some software may differ from its retail version (if available), and may not include user manuals or all program functionality. For non-IBM softw products. [7]SuccessLease is offered and administered worldwide by third-party providers of business financing approved by IBM Global Financing. Featured monthly lease payments are based on a 36-month term with pr terms and structures are available. Offer may be withdrawn or changed without notice. Options must be leased with system unit. SuccessLease is an IBM trademark. [8]ServicePac® is available for commercial use and variable read rate. CD-RW write and re-write speeds vary and list only the maximum possible. Actual CD-RW, DVD-ROM and CD-ROM speeds will vary and are often less than the maximum possible. [9]For terms and con product is offered. Telephone support may be subject to additional charges. All products ship with an operating system. IBM reserves the right to alter/withdraw offerings at any time, without notice. SuccessLease a company. Intel, the Intel Inside logo and Pentium are registered trademarks and Celeron and SpeedStep are trademarks of Intel Corporation. Microsoft and Windows are registered trademarks of Microsoft Corporation. ©

75% SMALLER THAN THE AVERAGE DESKTOP.

Don't be fooled by its simplicity – the pared-down proportions of the new IBM NetVista X40 desktop don't mean you'll compromise functionality. This small-footprint machine is designed for connectivity with advanced network, wireless and Internet technologies. The full-sized keyboard tucks conveniently beneath the 15" integrated monitor, while a handy drop-down CD-ROM drive folds right under the monitor with unprecedented style and design leadership. Certain to enhance your environment without crowding it, this NetVista desktop has everything you need in one space-saving design.

Other NetVista desktops are available; see the NetVista A20 and the Small Business Series below, or call or visit our Web site for full details.

IBM NetVista X40

IBM NETVISTA DESKTOPS

IBM NetVista A20m

- Intel Celeron processor 600MHz
- 64MB SDRAM
- 10GB HDD
- 10/100 Ethernet
- Integrated graphics
- Microsoft Windows Millennium
- Lotus SmartSuite Millennium License
- Microsoft Office 2000 Small Business
- 15" monitor (13.9" viewable)
- 3-year parts/1-year onsite labor limited warranty

$939[1]

SuccessLease™ for Small Business $34/MONTH[2]

IBM NetVista Small Business Series

- Pentium III processor 866MHz
- 128MB SDRAM
- 20GB HDD
- 2X/4X/24X-10X CD-RW
- Integrated graphics
- 56K V90 modem
- Windows Millennium
- Lotus SmartSuite Millennium Edition
- Microsoft Office 2000 Small Business
- 17" monitor (15.9" viewable)

$1,709[1]

SuccessLease for Small Business $62/MONTH[2]

IBM NetVista X40

- Pentium III processor 866MHz
- Integrated 15.0" TFT active matrix display
- 64MB SDRAM
- 30GB HDD
- 24X-10X CD-ROM
- Integrated 8MB graphics
- 10/100 Ethernet
- Windows Millennium
- Lotus SmartSuite Millennium Edition
- 3-year parts/1-year onsite labor limited warranty

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HEADLIGHT.COM provides practical information about its classes up front, including price, class duration, and optimal skill level.

tering your zip code. Most classes listed at EduPoint.com are academic, but the site also offers training in typical office applications such as Word and Excel. Unlike other e-learning sites that partner with schools, EduPoint.com helps you determine whether the credits you will earn by completing a class are transferrable to other accredited schools.

EduPoint.com's prices for classes vary depending on whether or not an instructor is present and on the level of interaction between the student and the instructor. Expect to pay university prices if you take a class for credit. If you are learning on your own time—without an instructor—you can expect to pay as little as $10 per class.

Not all Web-based classes are equal. Barry Schnell, vice president of technology-enabled solutions for the International Institute for Learning, which specializes in project management training, warns that consumers should beware of "shovelware"—course content taken from CD-ROMs, manuals, and other printed materials and dumped on the Web. These classes tend to be text-based, with a minimal number of graphics and with interactivity limited to pointing and clicking the mouse to answer questions. The best of the online classes let students participate actively in what they're learning by applying the skills that they're being taught.

In addition to these paid sites, a slew of free training sites are worth checking out. One place to look for free online classes is PC manufacturers' Web sites. For example, **EducateU,** Dell Computer's virtual campus, offers complimentary classes like "IE 5.0: Getting Started" if you register on its Web site. If you own a Dell computer or use one at work, you can select three free courses after you register and provide your service tag number (located on the bottom of your system) and customer number. Even if you don't own a Dell, registering on the company's Web site entitles you to take a free class.

EducateU has 1200 classes to choose from. Though the site is well organized and easy to navigate, you can't obtain pricing information until after you register. Prices are on a par with those at other e-learning sites—they start at $30 and go as high as $1300. Other computer companies, including Compaq, Gateway, and Micron, offer classes too.

How One Student Fared With Online Learning

AS AN EDITOR in *PC World*'s reviews department, I work with complex Excel formulas that help us compile the rankings you see in our Top 100 charts. Though I work with the program every day, I suspected I could do my job more efficiently if I dug deeper into the program's formulas. To learn this skill, I enrolled in a virtual class at Learn2.com: Excel 2000: Formulas and Functions.

I took the preassessment quiz to determine whether my Excel skill was indeed at the "intermediate" level. Taking the quiz made me feel like I was sitting through the GRE again. I found myself guessing at some (okay—a lot of) answers I didn't know. My score: a humbling 65 percent accurate at the intermediate level. Undaunted, I paid the $20 course fee and began my first class online.

The class consisted of five bite-size lessons, a good fit for my erratic schedule. I could choose to have both text and audio turned on or off. Each lesson carried over and expanded on previous lessons, a standard method that helped me retain what I learned from section to section. First grade: A for lesson plan.

FAILURE WAS NOT AN OPTION

SMOOTH AS THIS SOUNDS, however, the course posed enough frustrations to tempt me to drop out before I finished clicking through my first lesson. After downloading the necessary plug-in to run the course on my PC, I couldn't locate the training files the automated voice told me to view at the start of the lesson. I spent nearly an hour trying to find them. Finally, I called tech support and spoke with a patient fellow who helped me. As it turned out, the system neither alerted me to download the course materials nor directed me to where I might find them. Second grade: D for setup.

Once I began the course, my frustrations ebbed a bit. I took five lessons over several days and enjoyed being able to take each lesson when it fit my schedule. The lessons sometimes went too fast for me to follow, but the Pause button helped provide the extra time I needed. I completed the entire class in about 4 hours—the same amount of time you might expect to spend in a brick-and-mortar school, but with more convenience and at a lower cost. Third grade: B for course delivery.

LESSONS LEARNED

TO SUM UP, I felt a bit like Charlie Chaplin in *Modern Times*, wrenched inside technology's grinding gears. On top of the sign-up glitches, I had to weather minor snafus in the course delivery, as when I hit the Stop button and the program reverted to the beginning of the lesson. But, the class taught me to construct formulas more smoothly. If you have a little patience and choose a highly specific subject, a class online is worth the effort. Final grade: B+ —Mick Lockey

FINDING THE RIGHT FIT

GIVEN THE number of e-learning sites and online classes, trying to find the right one can be a daunting task. Luckily, many sites let you take a free or sample lesson before paying for the class, and both Learn2.com and Headlight.com throw in skill assessment as part of the free course. Depending on the topic, most free classes take no more than an hour to complete, and they can be a quick and helpful way to comparison-shop.

As you shop around, look to see whether you'll need special equipment to take the class, such as a plug-in, a special type of graphics card, or a high-speed modem. Some classes work better with a certain browser. DigitalThink, for example, includes a Setup page detailing minimum system requirements.

THE FINAL GRADE

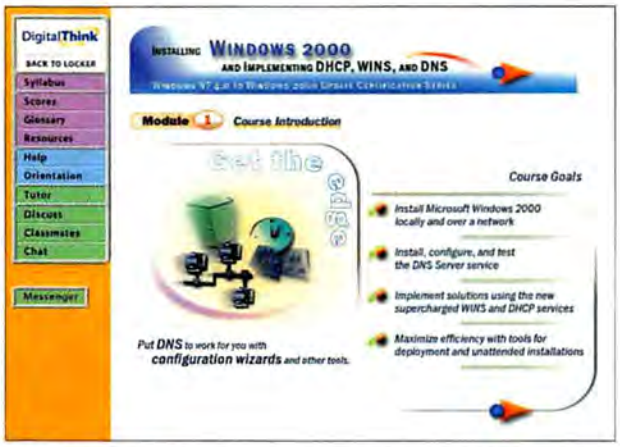
DESPITE ITS growing popularity, e-learning does not always make the grade. Elliot Masie, founder of the Masie Center, an educational think tank in Saratoga Springs, New York, says that e-learning has yet to reach its potential. "Right now, the hype, pressure, and anxiety are ahead of where the technology is," he says. Masie doubts that e-learning will compete with the richness of experience that the traditional classroom provides for at least another five to ten years. He believes that successful e-learning must present three features to users: "Well-structured content, the ability to do more than read, and a place to go when you're confused or have questions. Currently, only a few of the products do this fully, though we are seeing a trend towards this in newer offerings."

Other experts focus on high-quality content as the key to worthwhile online training. Peter Squier, president of the board of directors for the Information Technology Training Association, a trade association for IT professionals, says, "As e-learning becomes more mainstream, we'll start seeing the advent of enough good content to get the attention of the general public." If the class is not interactive, however, users are unlikely to stay long. On top of that, notes Squier, "It has to be available as just-in-time content, not scheduled. It has to be 'chunkable' into 5-to-10-minute segments that allow users to stay on task. They have to be able to get in and get out."

Improvements in interactivity and the quality of course content will help determine how e-learning shakes out in the future. Organizations are beginning to recognize that Web-based classes present a viable alternative to traditional training, and as bandwidth continues to improve, the number of home users who take online courses is expected to increase.

Even in its current hit-or-miss state, e-learning is probably worth looking into. If you need a quick skill upgrade and you don't have time available to attend a class in person, the convenience of taking classes online can't be beat.

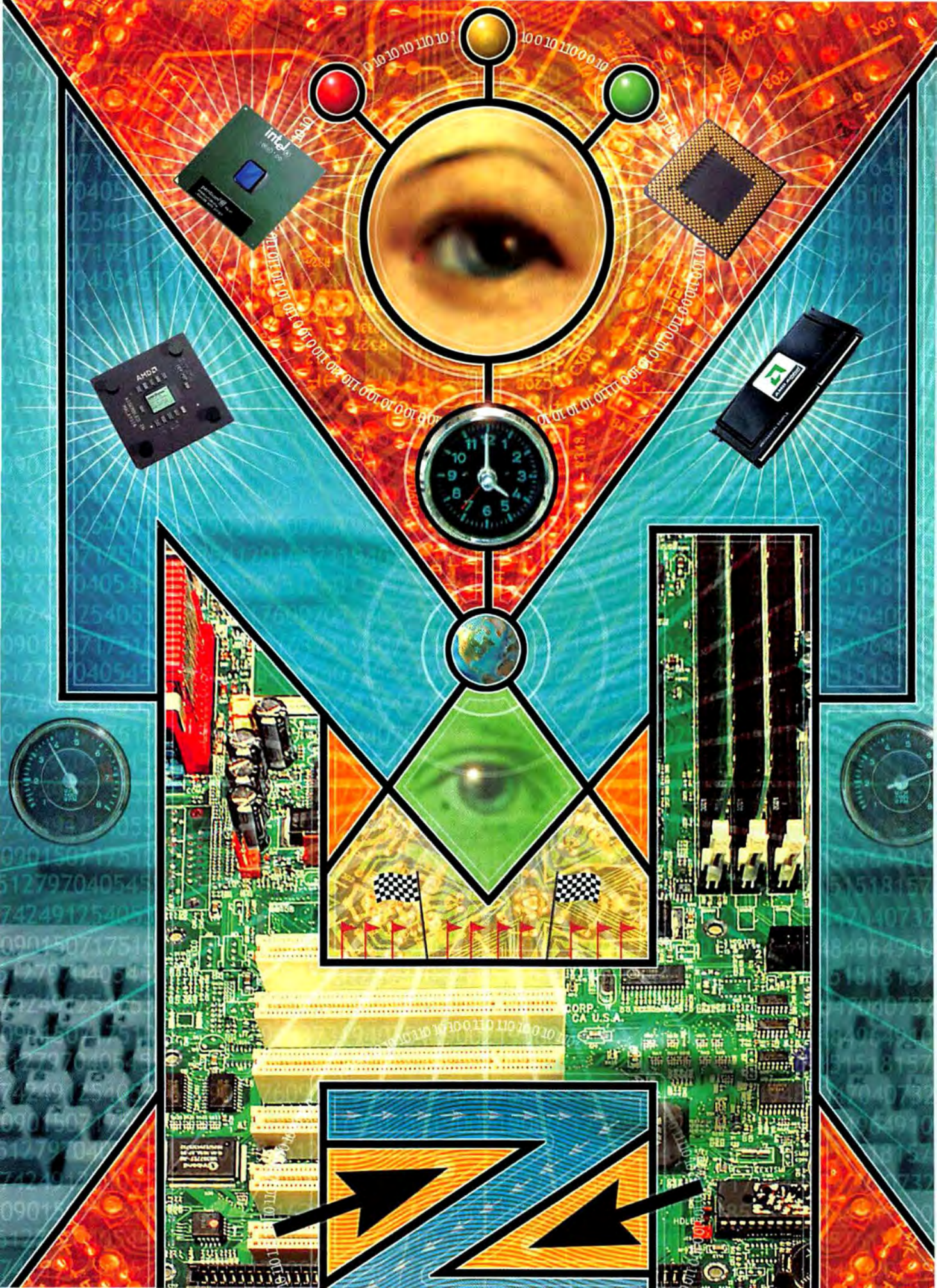
Linda Grubbs is a staff editor and Mick Lockey is an associate editor for PC World. ■



A CLEAN INTERFACE and easy site navigation highlight DigitalThink.

E-LEARNING SITES FEATURES COMPARISON

SITE	Comments	Target audience	Number of classes	Cost (per class)	Class duration
Dell www.educateu.com	**PRO:** Animated Web tour of virtual university. **CON:** Can see prices only after you register on the site.	Individuals and businesses	1200	$30 to $1300	Self-paced, or live, instructor-led online courses
DigitalThink www.digitalthink.com	**PRO:** Custom courses and clean Web site design make navigating the site a cinch. **CON:** Small selection of desktop and business classes.	Individuals and Fortune 1000 companies	200 off-the-shelf courses, and various custom courseware packages	$99 to $1000 (discounts available depending on volume)	8 to 15 hours per course
EduPoint.com www.edupoint.com	**PRO:** Lots of academic and business-related classes to choose from. **CON:** Difficult to distinguish between business and academic classes.	Individuals and Fortune 1000 companies	1.5 million, of which 100,000 are delivered online	$10 to $2500	Self-paced
Headlight.com www.headlight.com	**PRO:** Wide selection of classes; preassessment quizzes available. **CON:** None.	Small to medium-size businesses	3000	$11 to $250	2 to 8 hours per course
Hungry Minds www.hungryminds.com	**PRO:** Organized course categories, easy searches. **CON:** Search yields irrelevant topics.	Individuals and small businesses	17,000	Free to $1499	30 minutes to one semester
Learn2.com www.learn2.com	**PRO:** Preassessment available; business and leisure classes offered; users have one year of access to class. **CON:** Multitude of business classes get lost in the clutter; must use proprietary plug-in.	Individuals and small businesses	2000	$20 to $100 (volume discounts available)	Self-paced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BY JEFF BERTOLUCCI

Speed secrets

When you're looking for a new PC, deciding between Intel and AMD is only the beginning. Here's how to master the spec sheets and choose a genuinely speedy machine.

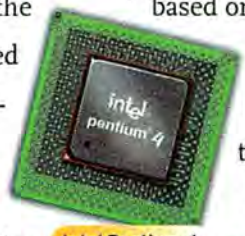
Photo Illustrations by Paul Watson

COMPETITION IS A BEAUTIFUL THING—especially if you're looking for a speedy new PC. Almost daily, Intel and AMD intensify their pitched battle for CPU supremacy. New chip companies enter the fray. Processor performance shoots up. Prices tumble. Buyers get more computer for less money.

But competition can also be confusing. Which CPU best fits your particular needs—Athlon? Celeron? Duron? Pentium III? Or should you fork over the extra bucks for one of the first Pentium 4 systems? What's more, the CPU wars are only the beginning. Will your new PC get more of a speed boost from RDRAM or SDRAM? How about DDR SDRAM? Megahertz or gigahertz? Chip sets galore. Homework!

Just four years ago, Intel's Pentiums first ▶

inched past the 200-MHz mark. Now the new Pentium 4 is flirting with speeds of 1400 MHz (1.4 GHz), with no upper limit in sight. But the days when megahertz was all that mattered are long gone. Components such as memory, hard drives, and graphics cards can make a huge difference in system performance. Even relatively obscure parts like processor chip sets—those unglamorous slabs of support silicon that regulate data flow between the CPU and memory or peripherals—play a big part.



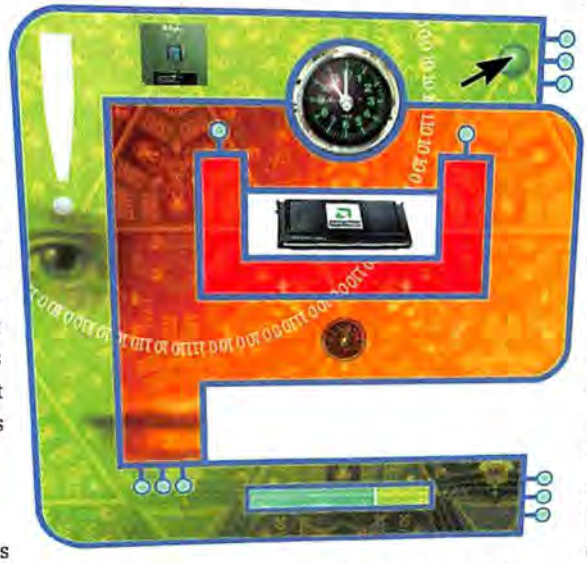
Intel Pentium 4

You need to make sense of it all, and that's not always easy to do. Some performance claims are based on cold, hard facts; others are sheer hype. Too often the technical arcana posing as intelligence are about as understandable as the nutritional information on a box of Froot Loops. That's why we've assembled this no-nonsense guide to CPUs, RAM, graphics subsystems, and other PC components (see "Anatomy of a PC: The Inside Story" on page 127). We'll help you find the speed you need—at the price you want to pay.

CPUs: the processor wars heat up

WHEN YOU BUY A PC, selecting a CPU remains your most important decision—and your choices are staggering. If you're in the market for a top-flight PC, you have plenty of options. Intel's Pentium 4, the current speed champ, comes in at clock rates approaching 1.4 GHz or greater. Nipping at its heels are the 1-GHz-plus AMD Athlon and Intel Pentium III CPUs.

Combined with pricey components such as Rambus DRAM (RDRAM) or Double Data Rate (DDR) SDRAM memory, 3D graphics accelerators, and ultrafast ATA/100 hard drives, these barn burners are suitable for heavy-duty multitasking and demanding applications such as computer-aided design and photo or video editing. But speed tends to be costly: Expect to pay $2000 and above for systems based on these CPUs (see the chart "Where the Chips Fall: How Today's CPUs Stack Up" on page 128).



CPU FLAVORS

THE 700- TO 900-MHz Athlons and Pentium IIIs are powerful yet affordable midrange choices for business and home users. Priced from $1000 to $2000, PCs based on these chips are great if you keep a word processor, spreadsheet, and Web browser open and frequently jump between them. Our PC WorldBench 2000 tests show only a few percentage points' difference between 800- and 900-MHz Athlons and Pentium IIIs. PCs based on those processors are among the fastest we've tested.

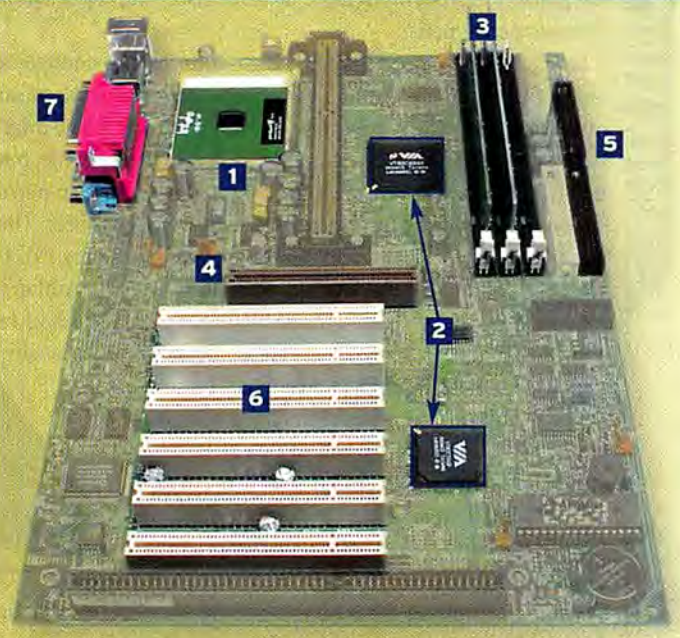
The PC market's bargain segment—systems under $1000—isn't saddled with weakling chips, either. Choices include the AMD Duron, Intel Celeron, and Via Cyrix III. AMD's Duron is the top CPU here, offering competitive prices, faster speeds, a larger cache, and a 200-MHz front-side bus (the bus serves as a digital pathway that transfers data and instructions from the CPU to the rest of the system). In last month's Top 10 review of budget PCs, the Sys Technology TaskMaster 600D, equipped with a 600-MHz Duron, outscored a comparably equipped Pentium III-600 system on our PC WorldBench 2000 tests by 13 points. Duron PCs are ideal for someone who runs standard business programs and an occasional game or two. Users with more-demanding graphics and multitasking applications will want a faster Athlon, PIII, or P4 system, however.

Cost-conscious buyers will also find bargains among systems equipped with Celeron and Via Cyrix III processors. Business and home users who usually perform standard computing tasks—such as word processing, e-mail, or Web browsing—will like the selection of desktops priced between $500 and $600, too. Most of these discount boxes have a CPU that runs at 500 MHz or faster. On the downside, many of these PCs provide only 32MB of RAM—64MB or 128MB is better for keeping several applications open at once—and come equipped with hard drives and other components that are slower, which hamper overall system performance.

THE SKINNY ON PENTIUM 4

AT PRESS TIME, Intel's Pentium 4 was the new kid in town. Though we didn't have any systems to test based on that CPU, tune in next month for hands-on reviews of the first P4 PCs.

anatomy of a PC: the inside story



PEEK INSIDE A PC, and you'll find a dizzying array of components connected to the motherboard. Here's a look at how those different chips, slots, and ports work together.

1 CPU The brain of the system, the CPU controls the calculations that run programs. Though other components are as important as the CPU, it still has the greatest influence on a PC's speed. See page 126.

2 Chip set These chips act as traffic cops on the motherboard, directing the flow of data and determining which devices the PC will support. See page 134.

A chip set directs the flow of data from the CPU to the graphics board and system memory. It also determines the speed of the front-side bus, memory bus, and graphics bus, as well as the capacity and type of memory supported.

In addition, it directs the flow of data through the PCI bus, IDE drives, and I/O ports and determines which IDE standards and types of ports the system will support.

3 System memory RAM holds programs and data where the CPU can access them while your PC is running. The amount, type, and speed of RAM has a large effect on system performance. See page 134.

4 AGP This dedicated path for graphics data gives the graphics controller direct access to the CPU and main memory. AGP comes in three speed flavors–1X, 2X, and 4X, which can transfer data at up to 1.07GB per second. Faster AGP speed can aid performance in graphics-heavy 3D games. See page 138.

5 IDE Data-storage devices like your hard disk and CD-ROM drive connect through the IDE interface. Early versions transferred data at 16.6MB per second. Common devices today use the ATA/33, ATA/66, or ATA/100 versions of the IDE and transfer data at up to 33.3 MBps, 66.6 MBps, or 100 MBps, respectively. See page 138.

6 PCI This bus provides connections for internal devices such as sound cards, internal modems, and SCSI controllers. It can move data at 133 MBps. Many computers still house slots for cards that connect to the slower ISA bus. See page 138.

7 I/O ports These provide connections (keyboard, mouse, parallel, serial, or USB) for external devices such as digital cameras, printers, and scanners. See page 140.

–Eric Dahl

Sporting a clock speed of 1.4 GHz, the Pentium 4 delivers more than just raw speed. It features the PC industry's fastest front-side bus, which runs at a blistering 400 MHz—three times faster than the Pentium III's 133-MHz bus, and twice as fast as the Athlon's 200-MHz bus. (AMD plans to boost the Athlon's bus speed to 266 MHz by the end of this year, however.)

But you shouldn't assume that a faster bus automatically makes applications run faster. In most cases, your word processor or spreadsheet doesn't need the extra velocity. For example, we ran tests on more than a dozen 800-MHz Pentium IIIs, each with a 133-MHz bus, using our PC WorldBench 2000. The average score of 150 was impressive. However, several 800-MHz PIIIs with slower, 100-MHz buses performed just as well.

So who will benefit from the Pentium 4's higher clock rates and bus speeds? People seeing the most improvement will probably be users of photo- or video-editing software, 3D games, and other graphics-intensive programs—"something that does a lot of disk and memory accesses, such as Adobe Photoshop," says Intel spokesperson George Alfs.

One of the Pentium 4's most interesting—and potentially confusing—characteristics is its chip-set and memory architecture. Intel originally stated that Pentium 4 PCs would require RDRAM for main memory—a memory type that offers little or no improvement over industry-standard PC133 SDRAM on PIII systems, according to PC WorldBench 2000 tests. At press time, Intel's 850 chip set—the only chip set that will support the P4 when it premieres in PCs—uses dual-channel RDRAM modules. However, Intel and chip-set competitor Via Technologies plan to introduce chip sets for the P4 early next year that will support PC133 SDRAM modules, and Via will also introduce a chip set for DDR SDRAM (see page 134, "Chip Sets and RAM: Partners in Performance," for a discussion of memory technologies).

AMD will counter the P4 with a souped-up version of the Athlon, code-named Mustang, that's scheduled to ship by the end of this year. It will feature a larger, 1MB Level 2 (secondary) cache (a chunk of on-chip memory that stores data that the CPU will most likely need next) and a 266-MHz front-side bus.

ATHLON VERSUS PENTIUM III

THE PENTIUM 4 may be getting all the attention, but most of us will still be buying Athlon and PIII systems for some time to come. The AMD Athlon has proven itself a worthy competitor of the Pentium III. With speeds ranging from 600 MHz to 1.1 GHz and beyond, the Athlon has earned the respect of industry reviewers and computer manufacturers. Major PC vendors, including Compaq and Gateway, sell high-end Athlon-equipped systems.

The Athlon's PC WorldBench 2000 scores are impressive, typically matching those of similarly equipped PIIIs in everyday business tasks. The Athlon's superior number-crunching floating-point unit (FPU), a processor component designed for specific mathematical functions, gives it a slight edge over the PIII in graphics-laden programs such as AutoCAD and Quake 3. "Athlon is quicker at a given clock speed," says Giga Information Group vice president and industry analyst Rob Enderle.

Until relatively recently, CPUs had a fast Level 1 (primary) ▶

PHOTOGRAPH: RICK RIZNER

cache built into the processor, and a slower Level 2 cache connected by a data bus to the chip. But today's CPU designs integrate both types of cache in the processor, and the result is speedier performance.

Level 2 cache memory, which was a performance bottleneck on the first-generation Athlon, is no longer an issue thanks to an integrated, 256KB L2 cache introduced last summer. The original Athlon suffered from a slower, 512KB, off-chip L2 cache, but that CPU should be history by the time you read this. To make sure you're buying an up-to-date Athlon PC, check its specs: The box should have 384KB of total processor cache (L1 plus L2). If the specs list 256KB of L2 cache, that's fine too. The Athlon's total cache surpasses the PIII's 288KB total cache (32KB of L1 and 256KB of L2). Generally speaking, the larger the on-chip cache, the better the performance.

The Pentium III, despite its smaller cache size and less stellar FPU (compared to the Athlon's), is no slouch either. It remains the midrange workhorse in Intel's CPU stable, with speeds at press time ranging from 733 MHz to 1 GHz. "If you just write letters to Mom, a Pentium III is good enough, but if you do video editing, speech recognition, and entry-level workstation stuff, the P4 might be more your cup of tea," says Intel's Alfs.

AMD Athlon

In truth, the PIII is much more capable than that. It's fast enough to handle heavy-duty graphics applications such as CAD and video editing. And if all you need is a word processor, you're probably better off saving a few hundred bucks with a dirt-cheap, 566-MHz Celeron. The PIII is a solid mainstream performer—for now, anyway. "Intel's plan is to introduce the P4 as a high-end part, then quickly migrate it down to the mid-performance PC market to compete with Athlon," says industry analyst Bob Merritt of Semico Research.

According to Giga Information Group's Enderle, Athlon, released just last year, has a newer architecture and greater headroom for higher clock speeds in the future, whereas the aging PIII has pretty much reached its apex at 1 GHz. "They might be able to go up a little more than that, but we're right at the end of the PIII," Enderle says.

Well, perhaps not. Intel is developing a revamped PIII, codenamed Tualatin, that's slated for release sometime in the middle of next year and will likely compete with the Athlon in the $1000-to-$1500 market, says InQuest Research analyst Bert McComas. The Tualatin will feature a larger, 512KB L2 cache and support either a 133- or a 200-MHz system bus. It may also allow the use of DDR SDRAM, but it's possible that Intel may reserve DDR for P4 systems, McComas speculates. So the PIII isn't dead yet.

CHEAP CHIP CHOICES

FOR PC USERS with simple needs—a little bit of Web browsing here, a mail merge there—so-called value processors might be a better buy than the PIII or Athlon. Boxed in PCs priced under $1000, chips such as the AMD Duron, Intel Celeron, and Via Cyrix III have speeds starting at 500 MHz. By the end of this year, the Celeron and Duron should reach—or get close to—800 MHz, and the Cyrix III will hit 700 MHz.

For speed at an affordable price, the Duron rocks. Our PC WorldBench 2000 scores show Duron PCs running neck and neck with the PIII. Not only did a 600-MHz Duron PC smoke a 600-MHz PIII by 13 points, it also scored a mere 5 points lower than a comparably equipped, 733-MHz PIII.

The Duron shines even brighter when you compare it to the Intel Celeron or the Via Cyrix III. Its 200-MHz front-side bus is three times faster than the Celeron's 66-MHz bus, and its 192KB of integrated cache (128KB Level 1 and 64KB Level 2) is 20 percent larger than the Celeron's 160KB (32KB L1 and 128KB L2). The larger the caches, the less often the CPU has to call out to main memory for information and instructions—and the im- ▶

PHOTOGRAPH: RICK RIZNER

where the chips fall: how today's CPUs stack up

CPU	Vendor	Processing speed (MHz)	Typical system price	Bus speed (MHz)	RAM type(s) supported	Typical PC WorldBench 2000 score	Comments
Athlon	AMD	600 to 1100	$1000 to more than $2000	266[1] or 200	PC100 SDRAM, PC133 SDRAM, DDR SDRAM[1]	132 (600 MHz) to 158 (1 GHz)[2,3]	**BEST FOR:** Folks such as graphics enthusiasts and gamers who use high-end applications. **PRO:** As fast as PIII. **CON:** Few systems are equipped with Athlon.
Celeron	Intel	566 to 700	Less than $1000	66	PC66 SDRAM, PC100 SDRAM	103 (566 MHz) to 118 (700 MHz)[2]	**BEST FOR:** Value seekers looking for a solid workhorse. **PRO:** Clock speeds keep rising. **CON:** Aging bus is slow by today's standards.
Duron	AMD	600 to 750	Less than $1000	200	PC100 SDRAM, PC133 SDRAM	133 (700 MHz)[2]	**BEST FOR:** Power seekers on a tight budget. **PRO:** Powerful, low-cost CPU. **CON:** No proven track record.
Pentium III	Intel	733 to 1000	$1000 to $2000	133 or 100	PC133 SDRAM, RDRAM	141 (733 MHz) to 165 (1 GHz)[2]	**BEST FOR:** Folks such as graphics enthusiasts and gamers who use high-end applications. **PRO:** Proven high-power chip. **CON:** Reaching its power peak.
Pentium 4[1]	Intel	1400 to 1500	$2000 and up	400	RDRAM; PC133 SDRAM, DDR SDRAM[1]	-[4]	**BEST FOR:** Power-hungry users, early adopters, gamers, graphics-software gurus. **PRO:** Megafast internal clock speed and system bus. **CON:** No proven track record, pricey.
Via Cyrix III	Via Technologies	500 to 700	$500 to $600	133, 100, or 66	PC100 SDRAM	-[4]	**BEST FOR:** Bargain hunters. **PRO:** Can't beat $500 system price. **CON:** No L2 cache until next year.

[1] Release planned for the end of this year or early next year.
[2] Systems tested before August 2000 running Windows 98.
[3] 1-GHz Athlon score includes scores of first-generation Athlons with slower, off-chip L2 cache.
[4] No systems were available for testing at press time.

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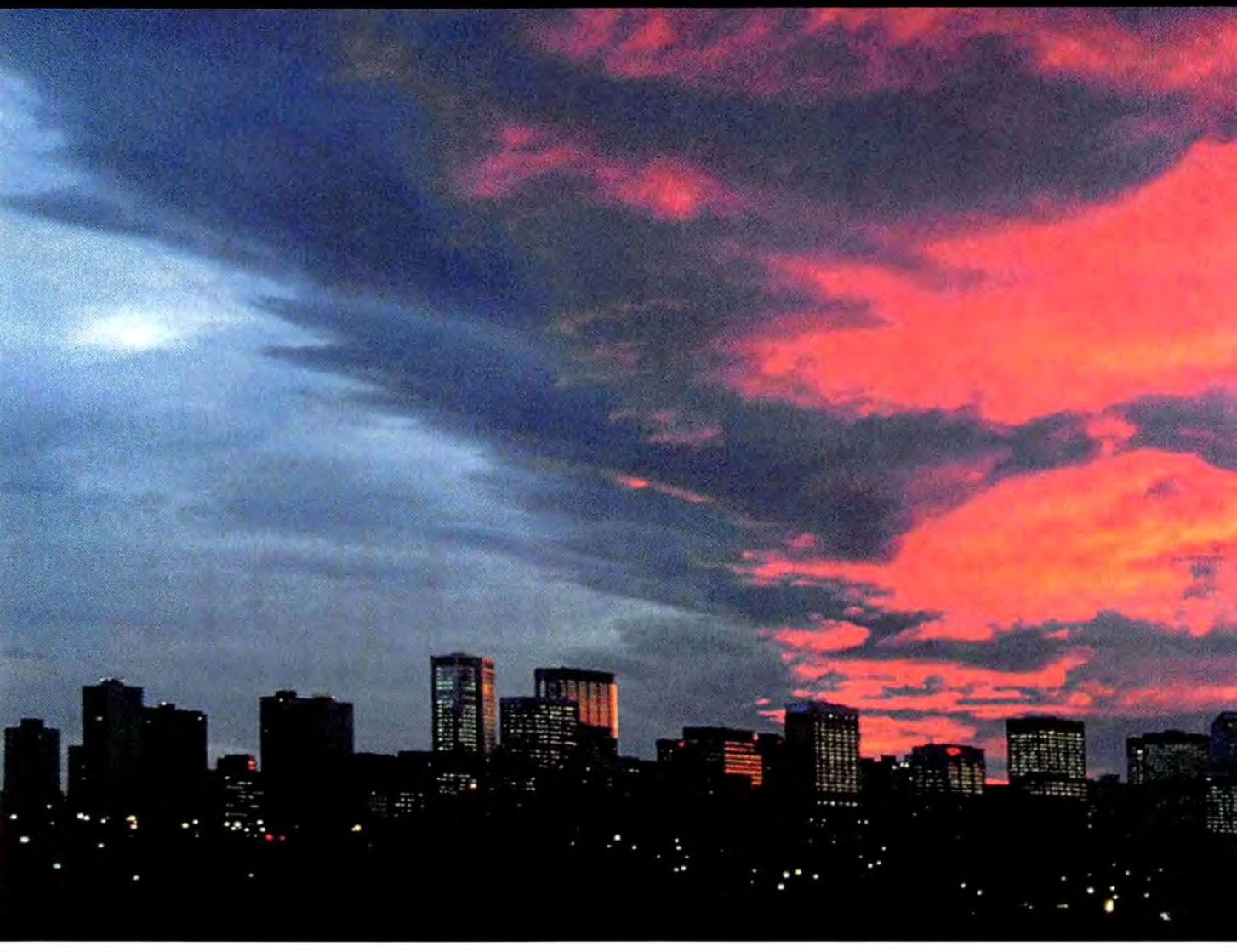

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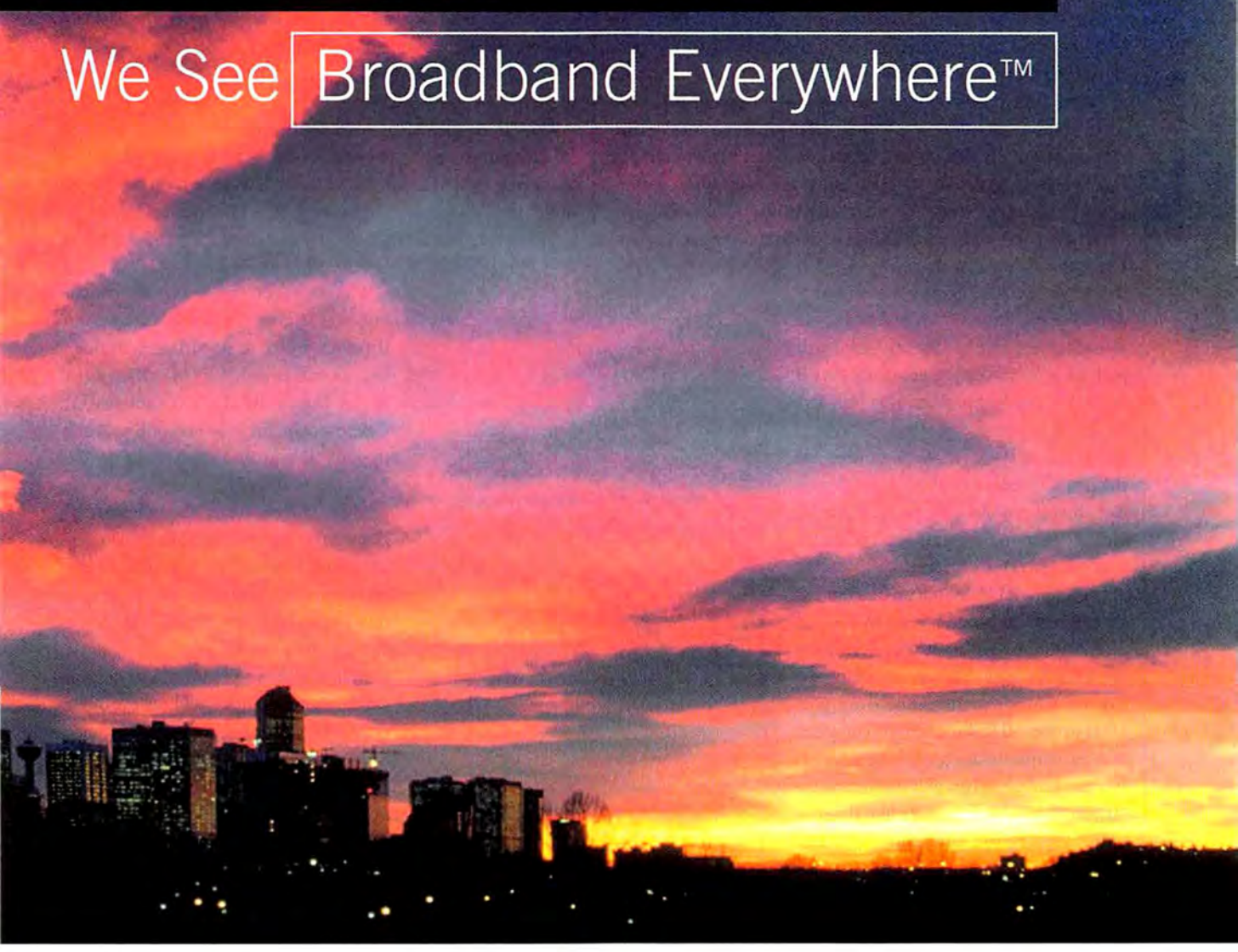

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Remember, though, that system performance depends on more than just the CPU. Consider, for example, that Celeron PCs usually ship with a graphics controller integrated into their chip set rather than one mounted on a dedicated graphics accelerator card, like those used in most PIII systems. Such integrated graphics controllers often share their memory with the PC's main system memory. Stress the system, and graphics performance will often slow down, resulting in the likes of choppy video playback in the latest 3D games. If you're a serious gamer, you'll be better off investing in a pricier PIII or Athlon PC.

The Via Cyrix III has a 128KB L1 cache but no L2 cache, making it the slowest of the three bargain chips. Via Technologies plans to introduce by early next year an updated Cyrix III—code-named Samuel II—that will include a performance-boosting, 64KB L2 cache. As for the front-side bus, the Cyrix III supports speeds of 66 MHz, 100 MHz, or 133 MHz. At press time, no major PC vendors in the United States had announced plans to use the Cyrix III chip, so its popularity among computer makers remains uncertain.

The Cyrix III will appear in systems starting around $500 or $600 by the end of the year, according to Via Technologies' director of marketing, Richard Brown. Clock speeds range from 500 MHz to 700 MHz, but even Via concedes that the chip isn't designed to be a speedster, particularly on graphics applications. "If you're looking at things like floating point, the Celeron definitely has better performance," admits Brown. However, when running standard productivity programs such as word processors and Web browsers, Celeron and Cyrix III performance "is pretty much equivalent," he says. The truth remains to be seen. Analyst Linley Gwennap of The Linley Group agrees that the performance of the Via Cyrix III may rival that of the Celeron, but only because Intel's bargain chip is running out of steam. "As Intel continues to crank the Celeron's clock speed, the chip is getting constrained by its 66-MHz bus," Gwennap says.

Intel is developing a Cyrix III competitor, code-named Timna, that will ship sometime early next year in computers priced at less than $700. The Timna will reduce system costs by integrating the graphics and memory controllers on the chip with the microprocessor. Timna's highly integrated design is not likely to interfere with system performance, Gwennap believes. In fact, he suggests, it might help some applications. "When you integrate the memory system onto one chip, there's actually a performance benefit in that the CPU doesn't have to go to the chip set to talk to memory," he says.

Intel Pentium III

Will Timna present another confusing processor product line for computer buyers to consider as they shop? Probably not, according to Gwennap. "Intel will likely introduce the Timna under the Celeron brand," he says. "The end user probably isn't going to care whether a 600-MHz Celeron PC has a Timna or Celeron chip inside."

What else is on the horizon for bargain hunters? Higher clock speeds are a given. But PCs will also need faster motherboards and peripherals to realize a real speed boost. Intel's next-generation Celeron chip, for instance, will probably upgrade the current version's poky 66-MHz bus to 100 MHz or higher, analysts predict—not because Celeron buyers are clamoring for it, but because the Duron's 200-MHz bus has raised the bar for low-end computing performance. "It depends on whether Intel sees the 66-MHz bus as a competitive weakness" says Enderle. "But honestly," he predicts, "I'm not convinced Celeron buyers will see the difference when running day-to-day applications." He also says that the system bus isn't a bottleneck for common applications. Intel officials agree. "Bus speed is of lesser importance for Celeron," says Intel's Alfs. "Consumers focus on the megahertz." In other words, when people do their comparison shopping, most pay more attention to a PC's CPU type and speed (Celeron-600, Duron-600, and so on) than they do to the nitty-gritty of what makes a PC run fast.

A wide array of subtle system bottlenecks do affect PC users, however. Affected people range from the everyday word processing crowd to the especially vulnerable group of users who rely on graphics software in their work with high-resolution images. One solution is to add more memory. If your hard drive churns when you jump from one open application to another, adding extra RAM can help. For instance, the average Pentium III-500 PC with 128MB of RAM ran nearly 13 percent faster on our PC WorldBench 2000 benchmark than the average PIII-500 with just 64MB of memory. ▶

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2000
FOURTH QUARTER

- **CHIP SET AMD 760:** High-end Athlon chip set.
- **CHIP SET Via Technologies DDR P4:** Keeps the heat on Intel to support DDR SDRAM.
- **BUS Intel 400-MHz for Pentium 4:** Faster, Intel, faster!
- **CPU AMD Athlon Mustang:** Athlon gets larger, 1MB L2 cache.
- **MOBILE CPU Transmeta Crusoe 5600:** Will it really double battery life?
- **PORT USB 2.0:** Up to 480-mbps transfer rate for digital video.

2001
FIRST QUARTER

- **CPU Via Technologies Samuel II** Brings much-needed L2 cache to Cyrix III.
- **CPU Intel Itanium:** 64-bit processor for workstation/server market.
- **CPU Intel Timna:** Integrated graphics and memory on the chip.
- **CPU Intel 800-MHz Celeron:** Bargain chip inches toward 1 GHz.
- **BUS Intel 100-MHz Celeron front-side bus:** Still lags behind AMD's Duron.

THIRD QUARTER

- **CPU Intel Tualatin:** PIII gets 512KB on-chip L2 cache and maybe 200-MHz bus.
- **CPU AMD Sledgehammer:** Intel Itanium competitor.

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MOBILE, POWER-SAVING CPUs

THE MOBILE COMPUTING front is changing rapidly, too. Laptop users in search of power-cord-free, all-day computing may finally have an answer to their prayers. And the solution isn't coming from chip behemoths Intel or AMD: Transmeta's Crusoe, a unique mobile processor designed to boost battery life, is expected to be shipping this year in 3- to 4-pound portables from major PC makers such as Fujitsu, Hitachi, IBM, and Sony. (None were available for testing at press time, however.)

AMD Duron

Rather than creating an Intel-compatible (x86) processor in hardware, Transmeta has created "code-morphing" software that translates x86 instructions into commands understood by the Crusoe's Very Long Instruction Word hardware engine. Operating systems and applications behave as if they're running on an x86 chip, though they're not.

The Crusoe chip promises stellar power savings—IBM anticipates 7 to 8 hours on a ThinkPad 240X. By comparison, a similarly equipped ThinkPad with a 500-MHz Pentium III chip runs for about 4 to 4.5 hours on a battery charge, the company says. Since Crusoe's hardware component is smaller and has fewer transistors than traditional mobile CPUs, it produces less heat and uses less power, making it ideal for lightweight, fanless notebooks and Web appliances. The Crusoe chip typically uses 500 milliwatts to 1.5 watts of power—a pittance compared to the 6 watts to 16 watts gobbled up by other mobile CPUs.

Apparently, however, IBM anticipates that the first-generation Crusoe will suffer from laggardly performance in comparison with the performance of mobile CPUs from AMD and Intel that have equivalent processor speeds. "The chip has a range of 300 MHz to 600 MHz, but its performance is much more like that of a 500-MHz PIII," says David Nichols, IBM's worldwide market segment manager. That speed disadvantage could decrease as subsequent versions of the processor emerge, though.

Meanwhile, competing mobile CPUs from AMD and Intel have power-saving technologies that the manufacturers claim reduce average power consumption to within striking distance of Transmeta's Crusoe. Intel's SpeedStep technology, for instance, automatically cuts the voltage and processor speed of mobile Pentium IIIs when operating on battery power. For example, one mobile Pentium III processor runs at 600 MHz on AC power, but at only 500 MHz on batteries. AMD's PowerNow technology runs the CPU at different voltages and speeds, depending on the needs of an application. Which technology offers the best overall power savings remains to be seen.

chip sets and RAM: partners in performance

EDUCATED BUYERS FOCUS ON chip sets and memory, both of which have a huge impact on system price and performance. Don't get us wrong: Unless you're building a PC from scratch, you probably won't be able to hand-pick a particular chip set, such as the Intel 820 or Via Technologies' Via Apollo KT133. But it's a good idea to understand the capabilities and limitations of the chip set and memory you're buying. If you don't, you may overpay for features or components you don't need.

Chip set information isn't always easy to find, though. Your best bet is to scan a vendor's Web site for technical specs, but even then you might come up empty-handed. We couldn't find chip set details for Presario desktops at Compaq's site; however, similar information was easy to track down at Dell's and Gateway's sites.

You can't discuss chip sets without also discussing main memory—the two are inexorably intertwined. Intel's high-end 820 and 820E chip sets, for instance, support Rambus DRAM, or RDRAM, a cutting-edge memory technology designed to take advantage of today's ultrafast CPUs. Whereas conventional SDRAM PC memory—PC100 or PC133—uses a wide, 100-MHz or 133-MHz memory bus to transfer data between the CPU and main memory, RDRAM uses a relatively narrow, 600-, 700-, or 800-MHz bus. (Most computers ship with PC100 or PC133 SDRAM.)

Theoretically, RDRAM should result in faster system performance. RDRAM PC-800 (800-MHz) memory, for instance, offers a maximum data-transfer rate of 1.6GB per second—60 percent faster than PC133's top rate of 1GB per second. But the PC World Test Center found that RDRAM offered no performance gain for mainstream applications, and only a slight boost for high-end graphics programs such as AutoCAD.

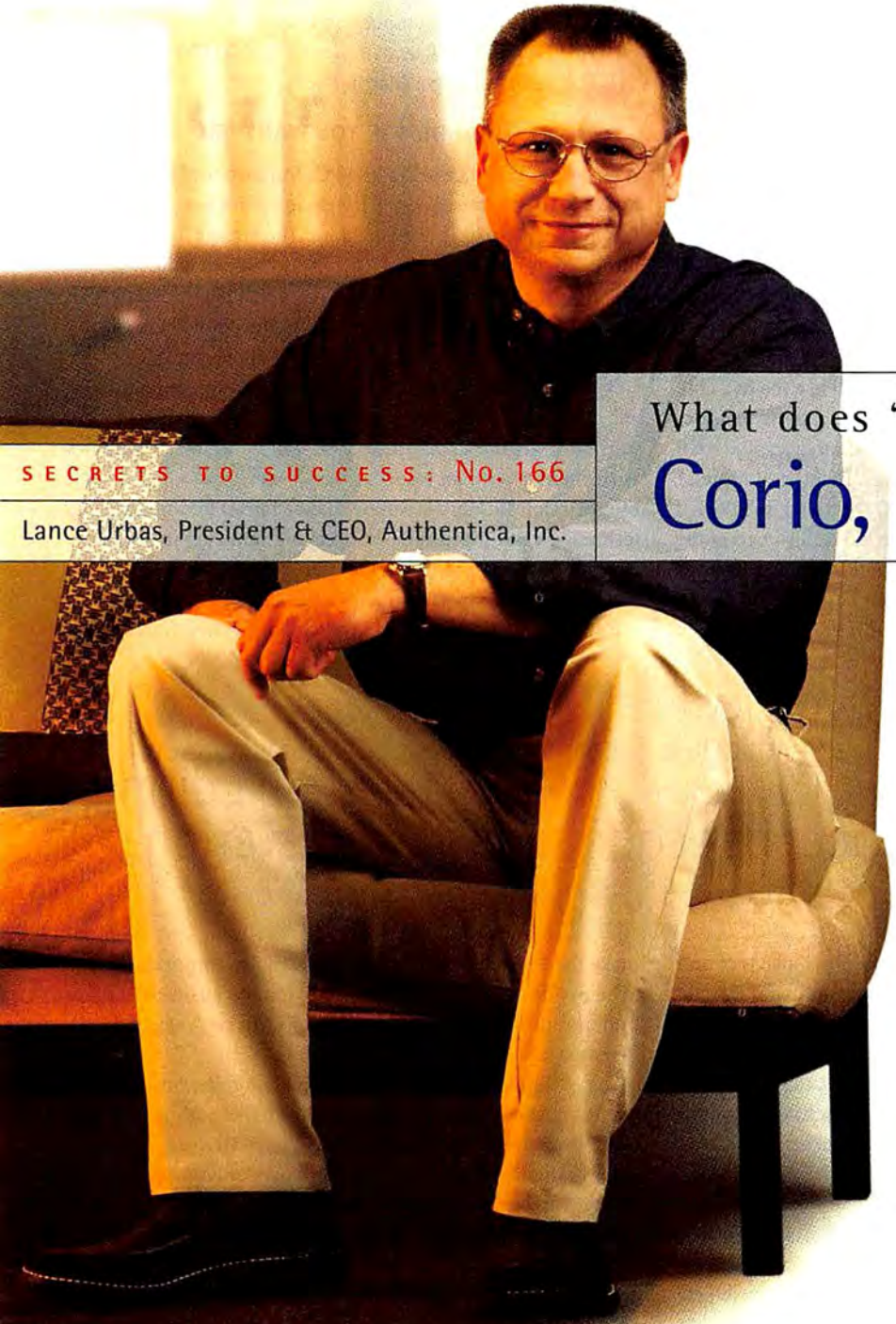
No surprise there, says Intel's Alfs. "On sequential benchmarks where you run Word for a while, then Excel for a while, the memory bandwidth isn't taxed," he says. "Those kinds of apps don't require a lot of bandwidth."

Analysts agree that today's applications aren't sufficiently demanding to prove the virtues of Rambus. "I agree with Intel's comment," says Semico's Bob Merritt. "There probably aren't industry-accepted benchmarks that do the multitasking, high-performance, data-streaming apps that could accurately test RDRAM." So what is RDRAM best for? Programs that shovel enormous chunks of data between memory, the CPU, and the hard drive. One example, says Alfs, is Photoshop, ▶

PHOTOGRAPH: RICK RIZNER

CORIO

APPLICATIONS ON DEMAND



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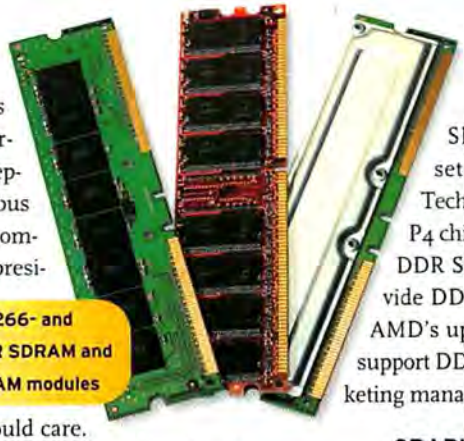
which users often call upon to edit multiple high-resolution images.

The speedy, 1.4-GHz Pentium 4, with its 400-MHz bus, will aid Rambus performance, according to Intel. Analysts are skeptical, however. Intel is "trying to put Rambus into systems where SDRAM is more economical," says Semico Research senior vice president Sherry Garber.



MICRON 266- and 200-MHz DDR SDRAM and PC700 RDRAM modules

Indeed, if RDRAM's only sin were that it provided just marginal performance gains, few computer users would care. But it's also expensive, adding roughly $150 to $200 to the price of a computer. At press time, a spot check at Price Watch (www.pricewatch.com), a search engine that finds street prices for computer goods, revealed that a 128MB Samsung PC133 module listed for about $100, whereas a 128MB Samsung PC-800 RDRAM module was about $250.

TOGETHER AT LAST

THE FIRST BATCH of Pentium 4 systems will use the 850 chip set, formerly code-named Tehama. The 850 supports the 400-MHz front-side bus, two channels of RDRAM memory, and AGP 4X graphics (see "Other Secrets: Graphics, Disks, and More..." on page 138). The 850 also uses a new I/O controller hub (which provides an interface to the PCI bus), the ICH2 (also part of the Intel 820E and 815E chip sets) that supports high-end features such as the fast ATA/100 hard drive standard (see "ATA/100 Hard Drives: Faster or Not?" on page 138), six-channel stereo sound, and multiple networking options for the computer manufacturer, such as 1-mbps home phone-line networking.

Intel is developing a Pentium 4–specific chip set slated to ship next year that will support PC133 SDRAM. At press time, Intel also said the company is evaluating DDR SDRAM—an evolutionary improvement over PC133 that offers memory bus speeds of 200 MHz or 266 MHz, as well as maximum data-transfer rates of 1.6GB or 2.1GB per second.

The verdict is still out on DDR's performance. But even if standard office apps don't fully utilize its impressive bandwidth, DDR should prove popular among memory manufacturers, analysts predict. "DDR has evolutionary features that make it attractive to DRAM vendors who think they can produce it in high volume," says Semico Research's Garber. And if DDR is cheaper to make than RDRAM, there's a greater likelihood you'll see PCs equipped with DDR very soon.

Cheaper production costs mean cheaper memory. According to Semico Research's Merritt, most DRAM makers expect a modest 5 to 10 percent cost premium for DDR SDRAM over PC133 SDRAM modules for the rest of this year. End users will likely see DDR SDRAM–based computers selling without the substantial price premium commanded by RDRAM-based systems.

Even if Intel decides not to support DDR SDRAM in its P4 chip set, competing chip set vendors will step in to fill the gap. Via Technologies, for instance, plans to introduce a P4 chip set next year that will support PC133 and DDR SDRAM. "Chip set suppliers will also provide DDR support for the Athlon," Merritt says. AMD's upcoming 760 chip set for the Athlon will support DDR as well, according to AMD product marketing manager Martin Booth.

GRAPHICS IF YOU WANT 'EM

MANY NEW midrange to low-end PCs feature one of Intel's 810E, 815, or 815E chip sets. The 810E is designed for low-cost Celeron PCs and includes integrated graphics. The 815 and 815E chip sets incorporate graphics features too, but also support either a graphics processor accelerator (or GPA, a card that plugs into an AGP slot and holds a 4MB SDRAM memory chip devoted to assisting in 3D functions) or a standard AGP 4X graphics card.

If you're serious about gaming, photo editing, or computer-aided design, an add-in card is a must. "The 815 has mediocre integrated graphics, and most users will notice better graphics performance with an external card," says Peter Glaskowsky, MicroDesign Resources senior analyst for 3D and multimedia technology. But if you're just crunching numbers in Excel, the lack of blazing graphics won't be a problem—unless, of course, you want ultrahigh resolution for huge spreadsheets.

It's exactly those cost-saving, mediocre integrated graphics that make the 815 and 815E chip sets attractive to corporate buyers. "The 815 has enough graphics power for any business application and thus has become a popular chip set," says Semico Research's Merritt.

"If you just write letters to Mom, a Pentium III is good enough," says Intel spokesperson George Alfs. "But if you do video editing, speech recognition, and workstation stuff, the P4 might be more your cup of tea."

The 815E includes the updated ICH2 controller bus found in the 820E, and hence supports the same list of cutting-edge features. Both the 815 and 815E support PC133 SDRAM. The older Intel PIII chip set, the 440BX, supports only slower PC100 SDRAM and lacks integrated graphics. It will be phased out early next year, according to Intel.

Intel has plenty of competition in the chip set market. Via Technologies' Via Apollo Pro133A and Acer Laboratories' Aladdin-Pro IV chip sets, for example, are popular among PC manufacturers as an alternative to the 815. Both chip sets lack integrated graphics—a surprising plus for many computer manufacturers and power-hungry end users. "A gamer would ▶

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probably prefer to use this chip set and add a graphics card," says Merritt. "With the 815, you've already paid for the minimum graphics that you won't be using."

AMD, meanwhile, isn't twiddling its thumbs. The AMD-760 chip set, which should be in production by the end of the year, supports a 266-MHz front-side bus and 2.1GB-per-second DDR SDRAM. Impressive technical specifications, certainly. "AMD's 760 chip set is intended for the mid-level to high-end PC market and will quite possibly blow the 815 away," predicts Merritt. Similar to Intel's 820/RDRAM/P4 platform, AMD's 760/DDR SDRAM/Athlon design should shine with heavy-duty graphics applications and speech-recognition programs.

other secrets: graphics, disks, and more...

THE GRAPHICS SUBSYSTEM can be a bottleneck in performance that many buyers don't expect, because they assume their 600-MHz Celeron will rip through Quake and other graphics-intensive games. But even a PC with a breakneck-speed CPU won't deliver great gaming performance unless it's also got a high-powered graphics subsystem.

PC buyers often encounter a baffling array of graphics terms, so here's a quick primer. *AGP* stands for Accelerated Graphics Port. It is a dedicated channel between system memory and the graphics controller, which is typically on a board. Most new PCs have AGP graphics. Older PCs use the *PCI* (Peripheral Component Interconnect) bus for this task. Since the PCI bus is shared by other system components, including the hard disk, it's not ideal for graphics-heavy games and apps.

HIGH-END GRAPHICS

MANY BARGAIN PCs feature integrated graphics, but 3D graphics cards are a must for power users. "The primary user would be a gamer, but ordinary users will also see a difference," says analyst Glaskowsky. "You'll get snappier 2D graphics, and the ability to support higher resolutions on the screen"—a noticeable improvement over integrated graphics. For instance, the Intel 815's built-in graphics deliver a maximum 2D resolution of 1600 by 1200 at a measly 16 colors. But the Matrox Millennium G400 Max, the top pick in our *Top 10 Graphics Boards* chart (see page 221), delivers a maximum 2D resolution of 2048 by 1536 with a whopping 16.8 million colors. The G400 Max will add about $200 to the cost of your PC. Of course, resolution that high would be overkill for most users with 17- or even 19-inch monitors. The primary benefactor of an ultrahigh-resolution display would be someone with a very large monitor (21 inches and up) who does lots of photo editing, for instance.

Which graphics chip is best? According to Glaskowsky, NVidia's GeForce2 Ultra leads the pack. On the memory side, boards with DDR SDRAM provide 20 to 50 percent faster performance than those using SDRAM, he adds. But the DDR SDRAM cards typically cost $50 to $75 more than the SDRAM versions, Glaskowsky says. In this month's Top 10, five of our ten picks use DDR memory, but the top choice—the G400 Max—does not. Keep in mind, however, that our overall graphics rating isn't based solely on performance, but rather on a combination of speed, features, price, and the vendor's support policies.

Future, faster graphics processors will be more adept at specific tasks, such as drawing pixels or calculating the locations of objects on the screen, Glaskowsky predicts. "By making the graphics chip smarter, you free the CPU to do more-important tasks, like managing a more sophisticated user interface for your PC." At the low end, integrated graphics are here to stay, he says, "because bargain hunters won't pay money for 3D graphics."

ATA/100 HARD DRIVES: FASTER OR NOT?

YOUR PC'S HARD DRIVE presents another potential system bottleneck. A sluggish drive can hamper performance by slowing the transfer of data from the disk to your ultrafast CPU. Demanding applications such as speedy data-backup programs, or graphical presentations with embedded video clips, need the fastest drives around.

The biggest and fastest drives support the new ATA/100 specification. ATA/100 is the most recent version of the venerable IDE interface that moves data between the drive and the PC's motherboard. ATA/100 supports burst-data rates (top transfer speeds) as fast as 100 MBps, whereas the older—yet still popular—ATA/66 specification supports burst-data rates up to 66 MBps. Major hard drive makers, including IBM, Maxtor, Quantum, Seagate, and Western Digital, began shipping ATA/100 drives earlier this year.

At first glance the ATA/100 interface seems like the best choice for speed freaks, but its faster burst rate may not translate into dramatically better PC performance. That's because the average hard drive operates at a sustained data-transfer rate of only 36.5MB per second, according to IBM product application engineer Jeff Johnson. "Since the sustained data rate is lower than what ATA/66 can already handle anyway, ATA/100 might not be that much faster," he says. Analyst Bob Zimmerman of ▶

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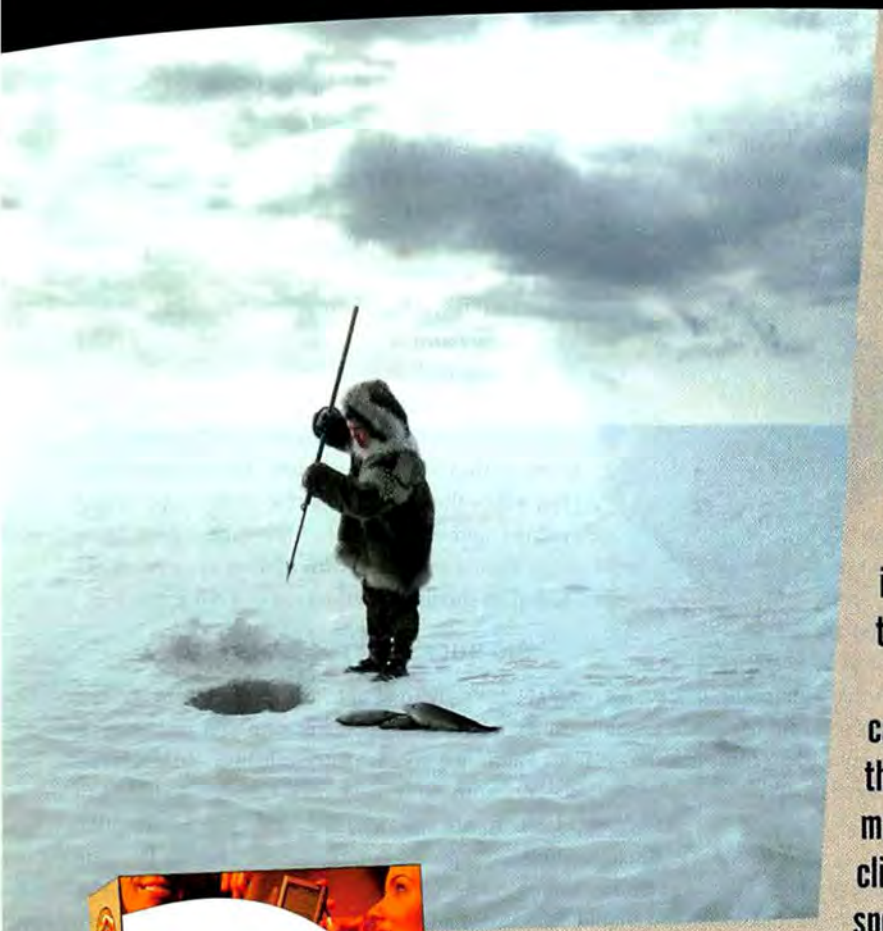

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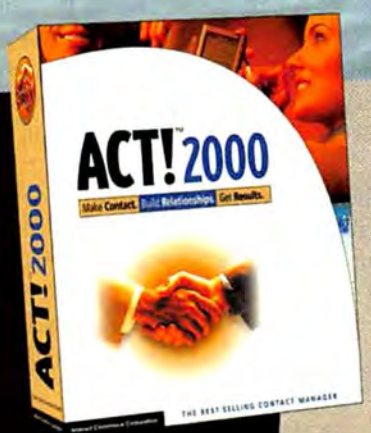

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the Giga Information Group agrees: "The typical desktop user is not driving the storage subsystem anywhere near its capacity. Applications that come close include high-speed backup programs and anything with embedded video, such as a PowerPoint presentation with a 15-second video clip," he says.

At first glance the ATA/100 interface seems like the best choice for speed freaks, but its faster burst rate may not translate into dramatically better PC performance.

Then again, it might help a little. "By bursting the data off the drive as fast as possible, ATA/100 helps overall performance," says Johnson of IBM, "but only by a few percentage points." So, peak transfer rates may exceed 66 MBps—but only occasionally, and only for the most demanding graphical programs.

That will change, however, as up-and-coming programs such as video editors demand a higher data-transfer rate. The advantage of ATA/100? Headroom. "If we put it in now, we enable a slight performance gain. More importantly, the next generation of applications and operating systems will be ready to go without any bottleneck," Johnson predicts.

Faster drive interfaces beyond ATA/100 are in the works. An industry consortium called the Serial ATA Working Group, which includes members from APT Technologies, Dell, IBM, Intel, Maxtor, Quantum, and Seagate, is developing data-transfer rates of 150 MBps and beyond; products could appear sometime next year.

IBM Deskstar 75GXP

In addition to keeping tabs on the ATA/100-versus-ATA/66 debate, you should also be aware of a drive's rotational speed, which is measured in terms of rotations per minute. Most of today's PC drives rotate at either 5400 rpm or 7200 rpm, although some SCSI drives spin as fast as 10,000 rpm. Faster disk rotational speeds mean less latency time—the amount of time the read/write head must wait for the drive to spin to the correct sector. On average, a 5400-rpm hard drive has a rotational latency of 5.7 milliseconds; for a 7200-rpm drive, the wait is only 4.2 milliseconds, according to Quantum.

POKY PORTS

A SYSTEM'S I/O PORTS can slow system performance. The venerable serial port, with its maximum transfer rate of 115 kilobits per second, is fine for some external 56-kbps modems, but it's inadequate for such bandwidth-hogging devices as high-resolution, 3-megapixel digital cameras. The equally creaky parallel port is faster, at about 150 KBps (the enhanced ECP/EPP versions deliver approximately 2 MBps) but is still rooted in technology from the 1980s. And both of these ports lack Plug and Play features.

Universal Serial Bus, on the other hand, makes installation easy. Connect a scanner or a printer to a USB port, and Windows 98 or Windows 2000 will automatically recognize the device and will ask the user, if necessary, to install the appropriate driver. But USB's 12-megabit-per-second transfer rate is still too slow for those peripherals that require faster bandwidths, such as digital video cameras.

To the rescue is USB 2.0, a much faster specification that boosts the maximum transfer rate to 480 mbps. Vendors will begin shipping USB 2.0–compatible devices and add-in cards by the time you read this; and next year's PCs will include USB 2.0 ports (which will also support current USB products).

IEEE 1394, also known as FireWire (Apple's trademark for the technology), also delivers speeds ranging from 400 to 800 mbps and is designed for high-bandwidth devices such as digital video cameras. But 1394 ports aren't standard on PCs. Will USB 2.0 kill off 1394? Not very likely, according to Gartner Dataquest analyst Martin Reynolds. "In the near future 1394 will be the port of choice for set-top boxes, digital televisions, and other devices." So while video-editing buffs might want a computer with built-in 1394 ports, the rest of us should be well served by USB 2.0.

BIG BUCKS, LITTLE BANG?

CPU AND PC MAKERS are fond of telling customers to buy systems built around the latest technologies to protect against obsolescence. Get a Pentium 4 because you'll actually need its blazing performance, oh, sometime next year. Go with RDRAM or ATA/100 because future apps may need the wider bandwidth.

But a wait-and-see approach is usually best. Take the Pentium 4. Unless you want to pay for the dubious benefits of RDRAM, you should delay your P4 PC purchase until after Intel and competing chip-set makers have enabled support for cheaper PC133 and DDR SDRAM. "We're not sure what the problems will be with the P4 architecture," Giga analyst Rob Enderle says, "and I'm not talking about the chip architecture so much as what needs to go on the motherboard to use the chip's improvements."

The good news? Even up-to-the-second innovations evolve into workhorse technologies—often sooner than you'd think. And when they do, they show up in mainstream, affordable PCs. Ultimately, buying a system based on proven, cost-effective components is one of the smartest moves you can make.

Jeff Bertolucci is a freelance writer based in Denver. Eric Dahl is a staff editor for PC World. ■

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INVOLVED WITH a caring Internet service provider can lead to a wonderful relationship. For example, Amy Hurka-Owen of Mebane, North Carolina, loves her local Internet service provider, Intrex.net. She loves the way its support personnel jump to help her solve a problem, and she loves the fact that she's never gotten a busy signal.

BY GREGG KEIZER

ISPs and Worst

That hasn't stopped Hurka-Owen, who teaches at nearby Elon College, from thinking about dropping that ISP like a stone. "I've been trying Road Runner this month," she says of Time Warner's cable modem–based Internet service, "and I don't think I can bear to go back to my local provider. Cable is so much faster. With Web pages now so graphical, I think we'll all be forced to go to higher speed and faster connections."

The only stumbling block to her switch is the price: more than double what she pays the local ISP she loves so much. But even though the higher cost may stretch her family's budget, Hurka-Owen can't get over the faster downloads and the way Web pages snap into place. "It's just a speed issue," she says, explaining why she's on the verge of switching.

Hurka-Owen has plenty of company. Millions of Web users are hungry for faster Internet speed, more reliable service, and better support. With the ISP picture mutating faster than a politician's positions in November, now's the time to see if you've got the right connections.

MANY PORTS IN A STORM

THE ISP BUSINESS is huge. According to *Boardwatch*, a publication that covers the ISP market, more than 7400 Internet service providers now compete for consumer and small-business customers. But the big daddy remains America Online. With membership estimated at 21.4 million by Internet analyst firm Jupiter Communications, AOL dwarfs every other ISP.

Not that others don't dream of challenging AOL's preeminence. EarthLink and MindSpring merged earlier this year, and long-distance telephone carrier Sprint Communications subsequently bought a quarter of the combined company. In June, SBC Communications, parent company of Ameritech, Pacific Bell, and Southwestern Bell, agreed ▶

to combine its consumer and small-business Internet operations with Prodigy Internet. The following month, national provider GTE and regional provider Bell Atlantic merged and renamed the result Verizon Online. (Both groups still offer slightly different services depending on where you live, so we've continued to list them separately in our chart.)

Meanwhile, cable providers like AT&T Cable and Time Warner frantically wire homes for the Web as well as for TV, and regional telephone companies and large ISPs push Digital Subscriber Line (DSL) access. EarthLink says it will have 150,000 DSL customers by the end of the year, out of its 3.7 million customers.

Then there's the joker of all ISP jokers: free Internet service providers. Led by NetZero, which claims a whopping 2 million active users, the free Web access services have made a big splash. "The free services are going for AOL subscribers, and those of other service providers," says Zia Daniell Wigder, a senior analyst at Jupiter Communications. "It's much cheaper to get someone [as a member who is] already online."

Innovative partnerships between ISPs and unrelated businesses mark another major shift in the Internet services market. These "affinity groups," as Wigder calls them, offer free or cheap Internet service as a way of promoting their brands. Some alliances, such as the one between brick-and-mortar retailer Kmart and online powerhouse Yahoo, result in free services like BlueLight.com; others, like the deals struck by AOL with Sears, Target, and Wal-Mart, are merely partnerships in which the retailers try to recruit customers for AOL in exchange for a bounty. Other outlets provide cobranded free access, ranging from the unexpected (the Democratic Party and online brokerage Ameritrade) to the downright wacky (*The Simpsons* and *Seventeen* magazine).

These partnerships enable companies to reach the not-yet-online users, but the strategy has also convinced some longtime Net heads to switch to free access—or to keep it as a backup to their paid provider. "There's simply no reason to pay for full access," Wigder says. Our survey respondents, however, don't agree: They see plenty of reasons, from download performance to support, to pay for access.

Best Buy

THE TELEPHONE company ain't what she used to be. Ma Bell has expanded onto the Internet in a big way, and its dial-up service, **AT&T WorldNet,** wins our Best Buy award by offering outstanding dial-up speed, a high connection success rate, great extras like multiple e-mail boxes, and superior support.

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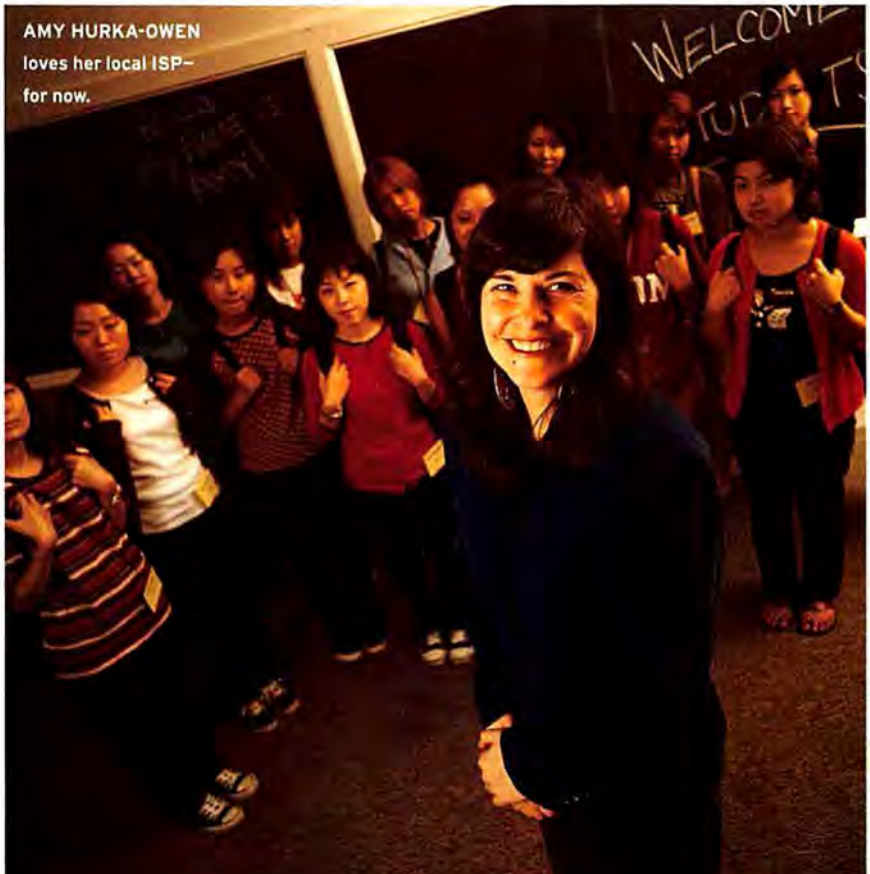

AMY HURKA-OWEN loves her local ISP—for now.

BAD NEWS FOR A DIAL-UP ISP:
"I've been trying Road Runner this month."

In our exclusive survey of 2053 *PC World* subscribers who were personally involved in selecting an ISP (see "Surveying the ISP Landscape," page 152), we uncovered additional trends. Local ISP use, participants report, is falling fast. Eighteen months ago, when we last reviewed consumer ISPs, nearly half of the respondents said they connected through a local provider. Today, fewer than 25 percent subscribe to a local service. More than half connect via a national provider, and 16 percent use a regional ISP.

Pay or free, fast or slow, busy signals or a clear line—you still have a ton of choices. With high-quality Web access available in most parts of the country, there's no reason to compromise, and it's easy to shop around. To help you, we've examined 15 major providers: the nine top national ISPs and six major regional providers. Unfortunately, we can't cover local ISPs due to their relatively low number of subscribers and scattered locations.

We assessed these 15 ISPs from three angles. To get a feel for real-world speed and reliability, we contracted with Visual Networks of Rockville, Maryland, for ▶

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ISP performance testing. We polled more than 2000 PCWorld.com visitors about their satisfaction with their own ISPs, including our 15 and nearly 500 local providers. And we talked with dozens of users personally, to dig into the whys and what-fors of their ISP choices, experiences, and expectations.

NATIONALS WIN AGAIN

THERE MAY BE MORE ISPs in your area than cereals in the supermarket, but providers come in only three flavors: national, regional, and local. National ISPs, naturally enough, cover virtually the entire country with their networks of dial-up nodes. Connection points typically run in the hundreds, if not the thousands. This strength in numbers means that no matter where you are, you can probably connect through a local phone call (though rural locations continue to suffer a shortage of connection options). Frequent travelers benefit most by going with a national like AOL or AT&T WorldNet, but nationals have other advantages, too. Of the five ISPs our poll takers rated highest for overall satisfaction, four are nationals.

Regional providers usually cover several states, just as the Baby Bells do for telephone service. In fact, the primary regional ISPs *are* the Baby Bells, including Ameritech, BellSouth, and Qwest (formerly U.S. West). Regionals offer some of the advantages of nationals—in particular, widespread dial-up—but their biggest advantage is extensive DSL service, typically more widespread than even national ISPs offer. All six regional ISPs we covered offer DSL connections, and 10 percent of survey respondents who were personally involved in selecting their ISP and who use a regional service connect via DSL.

Local ISPs tie users to distinct locales—access numbers rarely exist outside of town. In addition, according to our poll, locals charge an average of $2.20 more per month than the nationals. Their selling point? Better, more personalized support: As a group, local ISPs beat nearly all the national and regional providers on that score in our poll.

Eventually, broadband could take an even bigger bite out of the locals' market share. "Local providers aren't losing a significant chunk of the market to broad- ▶

Surveying the ISP Landscape

Who's KEEPING TABS ON THE NATION'S INTERNET SERVICE PROVIDERS? You are. We surveyed more than 2000 visitors to PCWorld.com to see what users think of their ISPs—and we got an earful. From the people who couldn't wait to tell us how good their provider is, to others who'd rather tell their ISP to stick it, PC World.com visitors have strong opinions. What follows are some of the highlights.

Note: All the statistics we cite below refer to survey respondents who said that they were personally involved in the selection of their ISP. —Alan Stafford

14% of respondents use America Online.

17% of those who identify themselves as AOL users say they're either "not very satisfied" or "not at all satisfied" (highest percentage in survey).

30% of AOL users plan to change ISPs in the next 12 months (highest percentage).

18% of MSN users plan to change ISPs in the next 12 months (lowest percentage).

74% say performance is the most important ISP feature (highest percentage).

10% say 800 number access is the least important feature (lowest percentage).

33% of respondents frequently or occasionally participate in chats or online messaging.

38% frequently or occasionally read or post messages to newsgroups.

.01% of respondents connect to the Internet via satellite dish.

16% connect with cable modems or DSL.

41% of respondents plan to upgrade to a faster connection in the next 12 months.

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band [providers]...*yet*," says Jupiter's Wigder. "But going forward [broadband access] is going to be a bigger part of the market." Local ISPs, which generally lag behind regionals and nationals in fast access, may have trouble matching the larger companies in providing broadband-specific content like audio and video.

HIGH SPEED AHEAD

THERE'S NO SUCH THING as a too-fast connection. Nearly three-fourths of respondents to our survey now use a 56-kbps modem to connect to the Internet—30 percent more than in 1999, when one in five still used a 33.6-kbps or slower modem. But users are still not satisfied with the speed of their connection. Over 40 percent say that they're likely to change ISPs or to upgrade to a faster Internet connection in the next 12 months. The rest say that they won't upgrade because of the increased cost, or because DSL or cable isn't yet available in their area.

"GOING FORWARD, [broadband access] is going to be a bigger part of the market."

The demand for more speed is constant because of flaky phone lines, heavy-on-multimedia Web pages, and plain old impatience. Performance is customers' number one priority when scouting for an ISP, our survey indicates. Yet only half of our respondents say they're satisfied with what they get. Lowest on the speed ladder: AOL and Prodigy, with just a third of users giving them a thumbs-up. But that doesn't stop millions, including George LeMien of Bethel, Connecticut, from using AOL. "I like [AOL's] ease of use, especially how it helps guide me around the Net," LeMien explains.

When Visual Networks conducted some real-world tests—timing how long it took to retrieve thousands of Web pages, plus measuring connection success rates, time to log in, and other gauges—the top performers were clear. Of the ISPs we reviewed, only AT&T WorldNet and BellSouth received Outstanding marks in overall performance. Concentric, GTE, and Quest earned Good ratings, while seven providers—Ameritech, AOL, Bell Atlantic, CompuServe, EarthLink/MindSpring, JunoWeb, and Southwestern Bell—pulled Fair scores. MSN and Pacific Bell staggered in with Poor grades.

AOL and CompuServe's Fair ratings

TOP INTERNET SERVICE PROVIDERS

SERVICE PROVIDER	Coverage area	Start-up fee (9/1/00)	Monthly fee	Toll-free access charge (per hour)	Customized start page	Standard number of e-mail accounts	Web site design/ hosting	Automatic credit card billing	Premium service/support available [1]
Ameritech 800/638-8775 www.ameritech.net	Midwest	None	$22	Not available	●	5	●/●	●	○/○
AOL 800/827-6364 www.aol.com	National	None	$22	$6	●	7	●/●	●	○/○
AT&T WorldNet 800/967-5363 www.att.net	National	None	$20 [5]	$6	●	6	●/●	●	●/●
Bell Atlantic 800/638-2026 www.verizon.net	Northeast	None	$20 [3]	Not available	○	1	●/●	●	●/●
BellSouth 800/436-8638 www.bellsouth.net	Southeast	$15	$18	$6	●	5	●/●	●	●/●
CompuServe 800/848-8990 www.compuserve.com	National	None	$20	$6	●	7	●/●	●	●/●
Concentric Networks 800/939-4262 www.concentric.com	National	None	$20	$5	●	5	●/●	●	●/●
EarthLink/MindSpring 800/395-8425 www.earthlink.net	National	$25 [4]	$20	$5	●	1	○/●	●	●/○
GTE Internet 800/927-3000 www.verizon.net	National [7]	$15	$20	$6	○	1	○/○	○	○/○
JunoWeb 800/879-5866 www.juno.com	National	None	$10	Not available	○	1	○/○	●	○/○
Microsoft Network 800/373-3676 www.msn.com	National	None	$22	Not available	●	1	○/○	●	○/○
Pacific Bell Internet Services 800/708-4638 www.pacbell.net	West	$15	$22	Not available	●	5	○/●	○	○/○
Prodigy Internet 800/213-0992 www.prodigy.com	National	None	$20	Not available	○	1	●/●	●	●/●
Qwest Internet Service 800/860-2255 www.qwest.net	Rockies/ Northwest	None	$15	Not available	○	2	●/●	●	○/●
Southwestern Bell 888/875-6388 www.swbell.com	Southwest	None	$20	Not available	○	1	●/●	●	●/●

Best Buy ● Yes ○ No

[1] For example, guaranteed uptime for services, and priority access to support.
[7] Performance results based on tests conducted by Visual Networks during two two-week periods in May and June 2000. Sample included 156,806 calls and 150,527 download attempts; minimum of 3525 calls to each ISP.

come with a catch. Each uses a proprietary compression scheme to reduce Web images' file sizes so they can be downloaded more quickly (but at the expense of image quality). As a result, AOL and CompuServe lead all ISPs in Visual Networks' Web page time trials. However, they aren't apples-to-apples tests—the other ISPs were ranked on their ability to download pages with a larger total file size (the company doesn't test file download speeds). The proof: AOL came in dead last in average throughput (the amount of data it could download per second), and CompuServe did only a hair better. This may not matter to some users, though. "If you just surf," says Visual Networks' Steve Slater, "AOL's great."

DIAL 911 FOR BROADBAND

THOUGH some ISPs provide fast dial-up service, many modem users are getting antsy for broadband services. Already, one in six respondents to our survey connects to the Net via those services. "There's no comparison between the two [analog and broadband] when it comes to speed," says Preston Ward, of Irvine, California. Ward switched to a cable connection almost two years ago, and won't go back even though his monthly fee is now twice what EarthLink charged him for dial-up access.

"It's definitely worth the money," says Joe Anderson, of Marietta, Georgia, a financial analyst and recent convert to cable-based Net access. "I'm disabled, and my outside world *is* the Internet."

CompuServe and MSN don't offer DSL or cable access, though both say they're considering offering faster access next year. Other major players, such as AOL and EarthLink, currently provide broadband service only to limited markets. Check with your current ISP about its broadband offerings (or plans to roll them out), but don't hesitate to switch providers to get faster service. "I kept my old ISP for about a month after I'd signed up with AT&T's @Home just to be on the safe side," says Kay Cahill, an independent salesperson in Great Falls, Montana. "But I was really happy with @Home, so I dropped my local ISP."

MONEY MATTERS

AFTER PERFORMANCE, our poll respondents who use national ISPs rated cost the second most important feature of a service. Interestingly, local and regional ISP users list cost as their biggest concern, even though they pay more on average than they would for a national provider.

Most ISPs we reviewed cost $20 to $22 per month for personal Internet access. The cheapest, JunoWeb, charges just $10 a month. Juno also offers free access, but the paid service gets you free support, priority access, and additional dial-up nodes. Bear in mind, many ISPs charge less ▶

FEATURES COMPARISON

High-speed access	Support (hours/days), charge	Performance rating [2]	Service and support satisfaction rating [3]	Summary
ISDN/DSL/T1/frame relay	24/7, toll-free	Fair	[4]	Regional ISP offers adequate performance in some areas, but testing reveals subpar connect speeds.
DSL	24/7, toll-free	Fair	Fair	Though this giant's users now say support has improved over the past year, poor performance (particularly Web throughput) still dogs AOL.
ISDN/cable/DSL/T1/frame relay/ATM	24/7, toll-free	Outstanding	Outstanding	First-class performance, satisfied users, and a wide variety of broadband options mark this ISP as the top choice.
ISDN/DSL/T1/frame relay/ATM	24/7, toll-free	Fair	Fair	Regional ISP suffers from poor performance during business hours and so-so support grades from users. GTE and Bell Atlantic merged into Verizon, but some services differ.
ISDN/DSL/T1/frame relay/ATM	24/7, toll-free	Outstanding	Poor	This ISP below the Mason-Dixon line boasts excellent performance, but users want better support.
ISDN/T1	24/7, toll-free	Fair	Fair	Not a bad pick, though the paucity of broadband options may deter many who want fast access.
DSL/T1/frame relay	24/7, toll-free	Good	[4]	Full suite of business services, but long log-on times and relatively few access numbers make it tough to recommend.
ISDN/cable/DSL/T1/frame relay	24/7, toll-free	Fair	Outstanding	Earns first-rate marks for support and easy installation, but its overall performance is nothing to crow about.
ISDN/DSL	24/7, toll-free	Good	Good	Solid ISP needs to add more features—for example, additional e-mail accounts—and do away with the start-up fee. GTE and Bell Atlantic merged into Verizon, but some services differ.
DSL	24/7, toll-free	Fair	Fair	Proof that sometimes you can get more for less: This ISP beats big-name providers like MSN and AOL in performance and costs half as much. Still, services are limited.
ISDN/T1	24/7, toll-free	Poor	Fair	10 percent of calls to this ISP don't get through, a dismal record that undercuts adequate support.
ISDN/DSL/T1/frame relay/ATM	24/7, toll-free	Poor	Poor	Log-on failure rate is second-highest among our reviewed providers. Plus, it's expensive.
DSL	24/7, toll-free	Fair	Poor	Performance has improved from last year, but this ISP ranks dead last among our reviewed nationals in support satisfaction.
ISDN/DSL/T1/frame relay/ATM	24/7, toll-free	Good	[4]	Cheaper than most regionals, this ISP retrieves Web pages almost as quickly as our Best Buy.
ISDN/DSL/T1/frame relay/ATM	24/7, toll-free	Fair	Poor	DSL is the one reason to consider this regional ISP; on all other counts, it rates as a mediocre pick. Most ISP services now provided by Prodigy Internet.

[1] Based on results of our survey of 2053 PCWorld.com visitors who are personally involved in the selection of their ISP.
[2] Not enough responses to accurately judge user satisfaction.
[3] Fee is for 150 hours; each hour thereafter is 99¢.
[4] Fee waived if user signs up online.
[5] DE, MA, MD, ME, NH, NJ, PA, RI, VA, VT, WV, and DC covered under Bell Atlantic.

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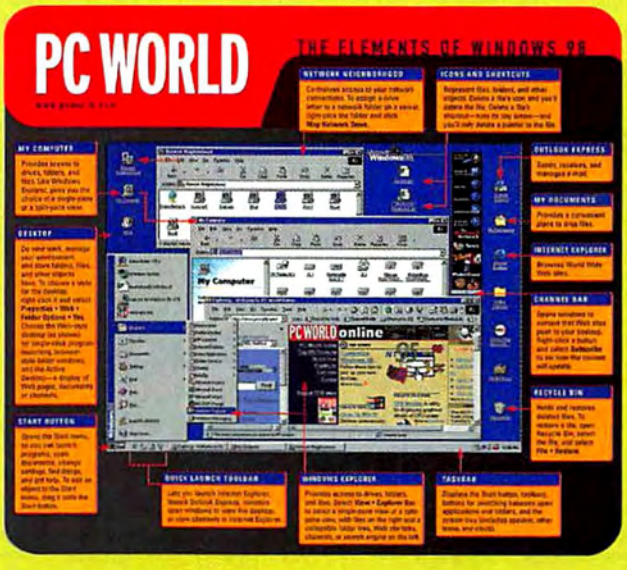

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if you pay for six months' or a year's worth of service in advance. Ameritech's annual prepaid plan, for instance, comes out to less than $18 per month.

The monthly charge isn't all you may have to pay, though. Some services levy start-up charges, ranging from $15 at several regionals we surveyed to a relatively steep $25 at EarthLink (though you can avoid EarthLink's charge by signing up online). Three ISPs—Bell Atlantic, GTE, and AT&T WorldNet—ding you a buck for each hour that you stay online past their limit of 150 hours per month.

Last year, only a third of the ISPs we reviewed allowed multiple e-mail accounts at no extra charge; such accounts are a blessing for families and small businesses. Today, two-thirds do. AOL and CompuServe lead the charge by permitting seven addresses each, while AT&T is not far behind with six. A half dozen ISPs, meanwhile, continue to offer a single e-mail account at the base price and make you pay for additional ones.

If you're looking for a guide to Internet content as well as a connection to it, check your ISP candidates for features such as customizable home pages and ready-to-use Web guides or directories. Two-thirds of our reviewed ISPs provide personal start pages. Of course, you can always set up with a Web portal (for example, Excite or Yahoo) to do the same thing.

BUSY SIGNAL BLUES

IF YOU FREQUENTLY can't log on because of constant busy signals, or if you have to connect via a long-distance number, your ISP is as useful as a knife in soup. Our survey respondents agree: They voted log-on success and a local access number as their third and fourth most important ISP assets (after speed and price). Not surprisingly, a local num- ▶

Business Connections

small

BUSINESSES AND HOME CONSUMERS want the same things from their ISP: a fast connection, a fair price, and solid service and support. Small businesses also use their Internet connections for many of the same reasons as home users. In our poll, businesspeople rank e-mail as their most important online activity, but researching products and services ranks a close second. People who use the Web for business clearly rely on the same ISPs as folks at home: AOL has more business subscribers than any other ISP, according to our poll.

But for business owners and employees, the Web is not a joyride but a critical tool for commerce. "The Web's vital," says petroleum geologist Craig Becker, "not just to maintain software or to keep up with technical support, but to retrieve files from my clients and transfer mine to them." Without the Web, Becker's job would be much more difficult.

Here are some of the things you should look for when you go searching for the right ISP for your business.

Fast connection. To consumers, the Web express lane leads to thousands of MP3 files. To business customers, it means fast connections to customers or the ability to make transactions. Among our business respondents, nearly a third connect via cable, DSL, ISDN, or a T1 line—while half say they're planning to upgrade to a faster connection in the coming year. But switching ISPs can be much more of a headache for companies than for individuals, since it entails notifying customers, changing business cards, and relocating Web sites. Fortunately, many national ISPs offer multiple connection options. AT&T WorldNet leads our 15 ISPs, offering dial-up, cable, or DSL access, as well as pricier options such as T1 and T3 lines. For businesses with less demanding needs, regional providers like BellSouth offer attractive DSL packages. That's one reason why, proportionately, more business users than consumers turn to regionals.

Web hosting. Among consumers, Web hosting barely shows up on the radar as an ISP feature. Not so with businesses: A quarter of the businesspeople we polled pay for Web hosting—four times the percentage of at-home surfers. But hosting is just half the battle for small businesses: They often need help designing a site, setting up an e-commerce storefront, and handling online payments via credit card. Several providers on our list offer these services, but shop carefully—some define "Web hosting" as the pages you build yourself with a form-based tool that's best suited to displaying pictures of your cat.

Premium support. On the whole, business users are less pleased with their ISP's service and support, but they rely on their provider's support more often than do consumers. One way to trump both issues is to pay extra for a premium support plan that guarantees fast response to questions and problems. AT&T WorldNet, CompuServe, Concentric, Bell Atlantic, BellSouth, Qwest, and Southwestern Bell all provide such plans.

Additional addresses. Nearly one in five business users we polled pays extra for more than one e-mail address. But if you shop around, you can avoid that expense by signing up with an ISP that offers multiple addresses as part of its basic package. This extra may be one factor that draws so many business users to America Online—AOL provides seven addresses, while AT&T offers six, and Concentric, Ameritech, BellSouth, and Pac Bell supply five.

ILLUSTRATION: JACK GALLAGHER

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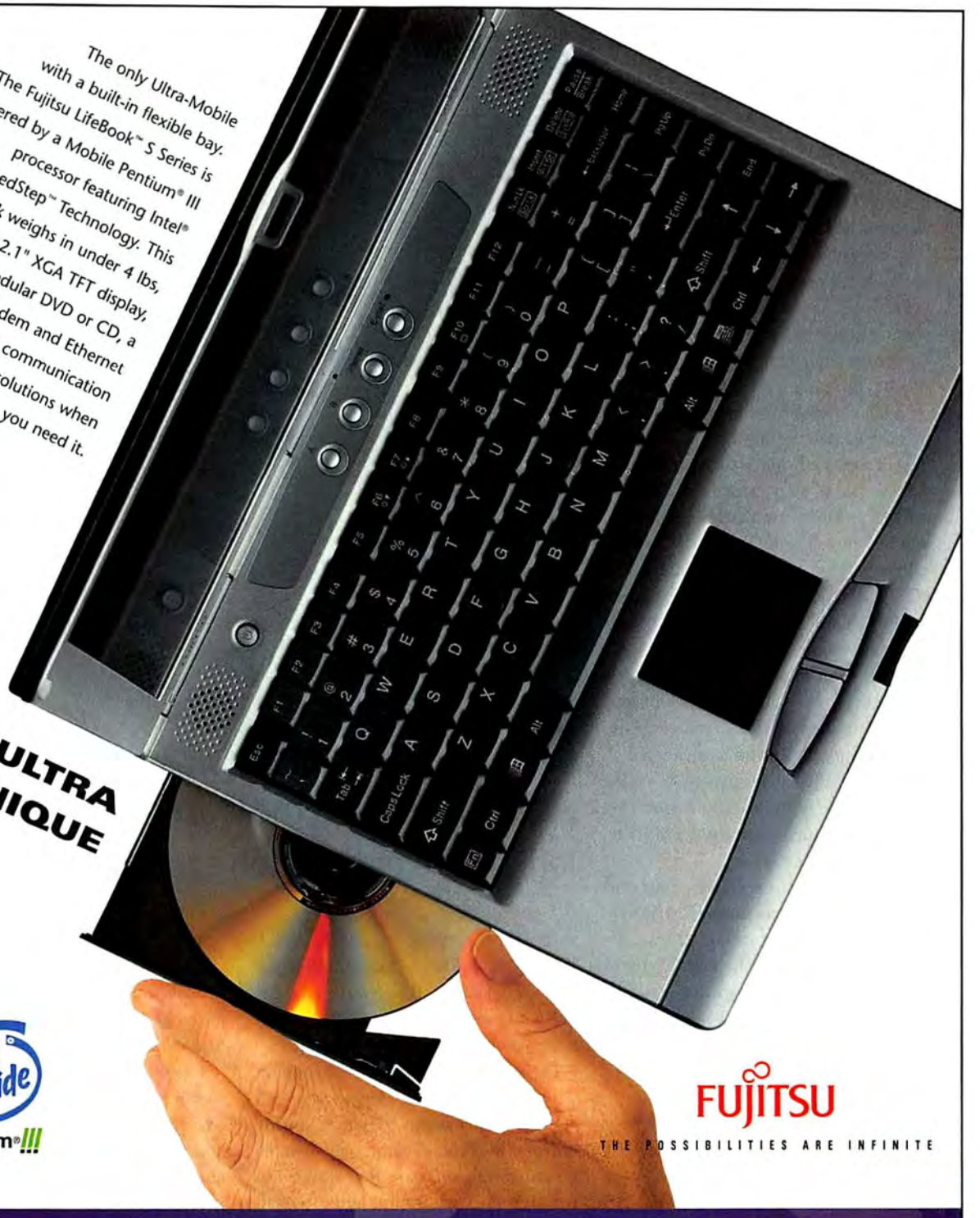

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ber scored as the second most crucial characteristic for users of local ISPs.

"I could live with the slow speed of my [former] ISP," says Craig Becker, a petroleum geologist who lives in Nacogdoches, Texas, "but anytime you wanted to log on, it would take 30 tries." Needless to say, he's switched providers.

To stress-test our 15 ISPs, Visual Networks dialed each one at least 3525 times at all times of the day and all over the country to tally log-on success, then broke out the resulting figures into business and evening hours.

AT&T WorldNet, BellSouth, and CompuServe earned the only Outstanding ratings in log-on efficiency, each achieving a success rate of 98 percent or better. AOL ranked as Poor; but MSN, Pacific Bell, and Southwestern Bell received the lowest grade: Unacceptable. The failure rate of calls was more than eight times higher to MSN than to AT&T. Based on Visual Networks' tests, you have about a one-in-ten chance of *not* getting logged on to MSN each time you dial. "One of our access providers suffered a national outage [during the months we tested]," offered an MSN spokesperson as explanation for the high call failure rate. The outage subsequently prompted MSN to switch to another provider.

For the most part, the results of our survey of real-world users mirror Visual Networks' conclusions. AOL users, for instance, are the least happy with their log-on and connection experience, while those who connect to AT&T WorldNet are among the top five most satisfied.

JOE ANDERSON jumped to cable Internet access.

AOL USERS are the least happy with their log-on and connection experience.

SIGN ON THE DOTTED LINE

SIGNING UP WITH A NEW ISP can be a hassle. Sure enough, we heard several horror stories. "It was a nightmare," says Joe Anderson of his experience switching to cable-access provider Media One (recently merged with AT&T). The setup trashed his Windows Registry, forcing him to reformat his hard drive, and left him without Web access for a month.

But Anderson's experience seems to have been an exception: Our respondents describe themselves as mostly happy with their ISPs' installation and setup. National and local ISP users give their provider an excellent rating, with scores of 78 and 77 percent, respectively. AOL, AT&T WorldNet, and EarthLink/MindSpring, scored even higher. (Too few regional ISP users responded to the installation question to provide meaningful results.)

The easiest way to get up and running with a new ISP—registering at a Web site—is available only to people already online. This process commonly involves downloading software that walks you through the registration and often includes a customized browser. Only two of our ISPs—Concentric and Qwest—don't offer this option. Alternatively, you should be able to phone in for a free CD that contains the necessary software. Every ISP we evaluated provides this option.

SUFFERING SUPPORT

THE WEB IS AMAZING when everything works. But when something does go wrong—whether it be constantly dropped connections or shaky software—the experience can be amazingly awful. So it should come as no surprise that four out of five respondents to our survey admit they've had to ask for help at some time.

Support issues convinced Kay Cahill to switch ISPs recently. "I kept getting booted off [my old ISP] before I could even get started," she recalls. They told me to change this, change that, but nothing seemed to help." So she dropped the local provider and signed up with @Home instead. Later, after her husband inadvertently disconnected the cable modem, she called for help. Cahill says, "They had someone out to the house in about an hour. I was impressed."

You can't expect house calls like that from every ISP, but you should insist on solid service and support. Too bad so few of our ISPs came through. Only AT&T WorldNet and EarthLink/MindSpring ▶

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earned Outstanding service and support satisfaction ratings in our poll. Of the rest, only GTE gained a Good mark, five received a rating of Fair, and a dismaying four sank to our lowest rating, Poor: Prodigy Internet and three regional ISPs—BellSouth, Pacific Bell, and Southwestern Bell. Local ISPs, meanwhile, collected a Good ranking overall.

On the surface, all 15 of our ISPs offer equal support policies—no charge, toll-free, and around-the-clock. But dig a bit deeper, and you'll find that some are worse than others. Bell Atlantic and Southwestern Bell garnered the highest percentage of complaints about support quality. Other ISPs provide exceptional service: Notably, EarthLink/MindSpring sported the lowest percentage of complaints of any ISP, just 6 percent.

INTERNET SERVICE PROVIDED?

IN THE ISP GAME, it's easy to stick with the status quo. But with more providers than ever, and with fast access and free services altering the landscape faster than you can say "TCP/IP," there is no sense in just settling for second best.

"I'm looking for where I can get the most bang for my buck," says Bill Smeltzer, a small-business counselor from Chillicothe, Ohio. "If I find that my ISP doesn't give me the service that it promised, then I'm gone."

Good advice, Bill.

Gregg Keizer is an Oregon-based freelance technology writer. Alan Stafford is a senior editor for PC World. ■

Free Me From ISP Fees

free LUNCH? On the Internet, it's available from dozens of providers, as long as you're willing to skip the appetizer and sign the guest book. In return for exposing yourself to ads and, in some cases, revealing lots of personal information, you'll receive dial-up for nothing.

People turn to free services for several reasons beyond the obvious one. Redundancy is another attraction. For those times when your for-fee ISP is down, balky, or busy, "having a backup that you never have to pay for is a great feature," says Steven Harris of research firm IDC.

We reviewed four of the most popular free providers—BlueLight.com, FreeInternet.com, Juno, and NetZero—and found that the list of what you don't get is longer than the list of what you do. The bottom line: Go with a free ISP only if you need a backup or are truly cash-strapped. Otherwise, steer clear.

WHAT YOU GET

56-kbps dial-up access. The rush to broadband service has been slow to extend to free ISPs, so what you get gratis is an analog connection. However, all the free ISPs we reviewed provide 56-kbps access across most, if not all, of their networks, and they maintain a surprisingly large bank of access numbers.

Local access number...maybe. The Achilles' heel of free ISPs is the uncertainty that they will have a local (read: free) access number in your area. The larger, more established free ISPs such as NetZero and Juno have the largest network of access numbers.

An e-mail account. Every free ISP also provides you with an e-mail account, though that's not saying much considering the plethora of free e-mail services. Few services, however, let you check that account with an e-mail client application such as Outlook Express. NetZero is an exception: It automatically configures various e-mail clients, from Eudora to Outlook, to grab your NetZero e-mail.

WHAT YOU DON'T GET

Simple setup. Free ISP installation and setup aren't as effortless as those of the slick for-fee providers. The downloads tend to be larger and longer than with the typical paid provider, due mostly to the specialized interfaces that free ISPs require to display ads. And baffling setup problems lurk, especially for the newer Web users who frequent free ISPs. We couldn't connect to NetZero, for instance, until we dug into our Dial-Up Networking folder and told the NetZero dialer to use a different modem setup.

Small-business tools. The free ISPs we surveyed don't offer free small-business Internet services, including Web hosting, e-commerce setup, and Web site design assistance.

Parts of your screen. If you hate Web page banner ads, you'll despise free services, which plaster big ad panels on your screen. You can't minimize them; some automatically return to their prominent place when you try to move them off-screen; and all of them will shut down the connection if you close the banner display window. You'll find yourself juggling the panel with other applications' windows, and even if you successfully dock it at the top or bottom, you'll surrender a good chunk of the screen.

Anonymity. Registering with a free service usually means handing over copious quantities of private information. Some providers stick to the basics—name, address, and phone number—but others, like Juno, want to know about the car you drive, the salary you make, and the publications you subscribe to.

24/7, toll-free support. Don't expect a lot of hand-holding from free ISPs. Though all provide technical support, it's usually delivered online or via e-mail. FreeInternet.com, Juno, and NetZero do offer phone support, but you pay for the call (through tolls or fees).

ILLUSTRATION: JACK GALLAGHER

"I need to morph media for a dynamic environment."

Sharleen Smith
Vice President
of Convergence
Oxygen Media

This "Face of COMDEX" self-portrait was taken with a Kodak DC290 Zoom Digital Camera.

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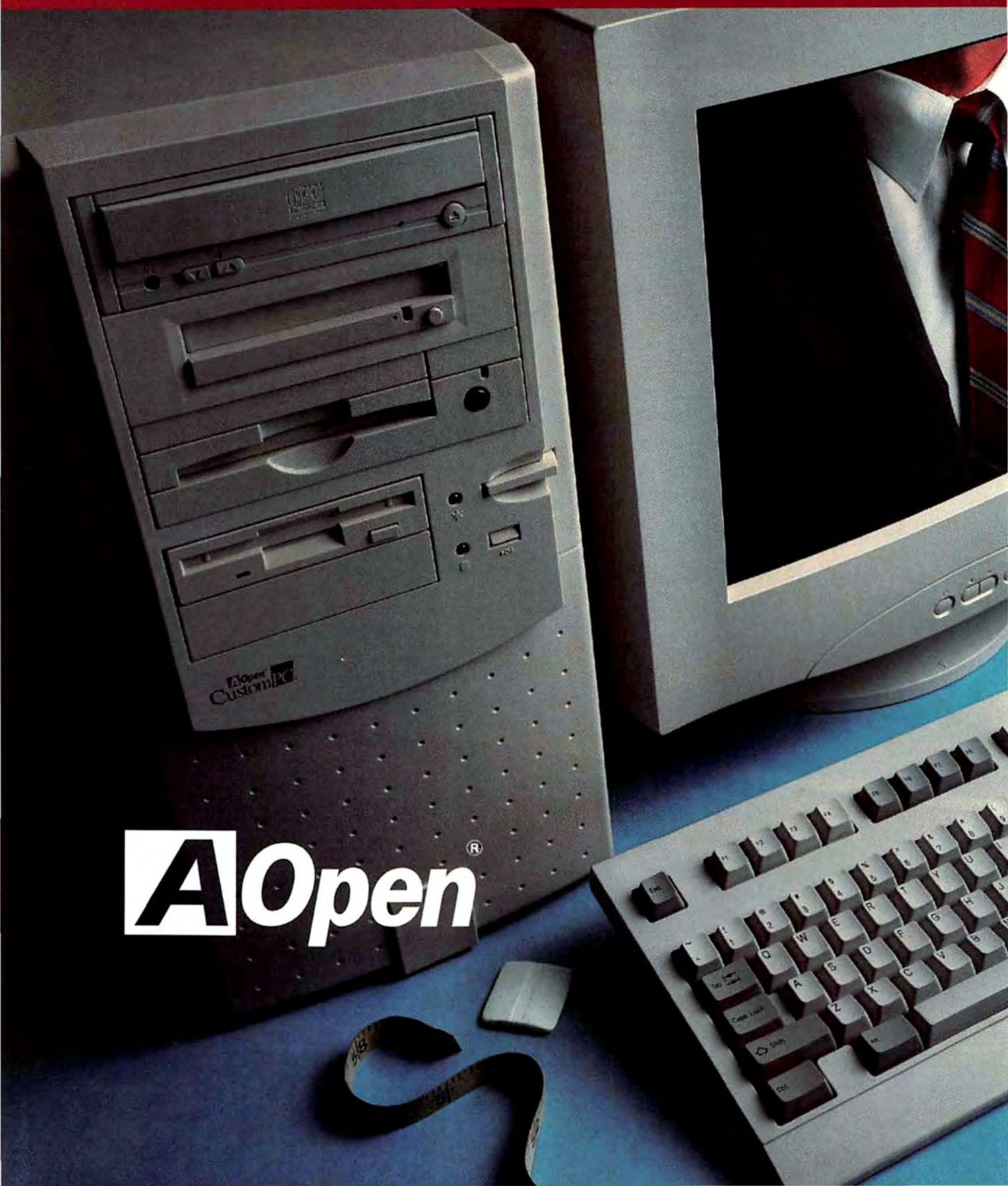

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BY DAN LITTMAN

the fine print on ink jets

Those speedy new color printers may be inexpensive, but ink and paper will cost you plenty. Our study of 25 models considers *all* expenses to find your best buy.

PHOTOGRAPHS BY NEAL BROWN

BEST BUYS

With quick printing speeds, superior output quality, and a $179 price, **Lexmark's Z52 Color Jetprinter** is a good all-around ink jet. For just $99, the **Lexmark Z32 Color Jetprinter** produces sharp text and rich color images.

with the price of printers dropping

to as low as $59, you might expect ink jet manufacturers to be awash in red ink, yet they remain firmly in the black. How do they do it? By reaping profits from another kind of ink—the kind that comes in cartridges costing as much as $38.

Ink is where the money is. Ink jet printer owners are using more of it these days for reports, presentations, and—thanks to the popularity of inexpensive digital cameras—ink-thirsty photographs. But unlike the printers themselves, ink is expensive. In fact, unless your printer sits on your desk gathering dust for weeks at a time, you'll soon find you've spent more on ink cartridges than you did for the printer itself.

For example, Xerox has priced its new model, the DocuPrint M750 at an inexpensive $149. But if you're a moderate user (someone who prints approximately 100 pages of text and 20 pages of graphics a month), after just three years you'll have spent double the purchase price—almost $300—on ink. If you routinely print photos, your long-term costs will run substantially higher. (For detailed prices of the ink tanks and cartridges for all of our Top 10 printers, see the chart on page 176.)

Xerox's ink jet isn't an isolated case. At $59, Lexmark's Z12 Color Jetprinter beckons to bargain hunters, but it ships with a single color cartridge. To print text in pure black rather than in a composite of colors that approximates black, you'll have to head back to the store and spend another $29 to get a black-ink cartridge, making the Z12 an $88 purchase to begin with. For a Z12 owner with light printing needs (about 25 pages of text and 10 pages of graphics a month), the first year's ink supply will tally $58, and the consumables total grows to $145 after just three years.

Because operating a printer can be more expensive than you'd expect, we analyzed the up-front and long-term costs of the latest crop of ink jets to get an idea of how much they'll cost over the long haul. Then we ran them through our usual battery of performance and hands-on tests. As a result, our *Top 10 Printers* chart now includes cost of operation. In this report (and on all future ink jet charts) we'll include cost-per-page figures for black text and for color graphics to help you decide which printer best suits your needs. For this article, we've added a line to each printer review, called "Consumables cost for one year," which we calculated based on a moderate level of use (100 pages of text and 20 pages of graph-

INK JET PRINTERS FEATURES COMPARISON

	SMALL-BUSINESS/HOME	Street price (8/11/00)	Overall rating	Vendor's rated speed for monochrome/color (ppm)	Tested speed for plain text/full-page graphics (ppm)	Print quality for text/color graphics	Maximum resolution (dpi)	Input/output capacity (sheets)
1	**Lexmark Z52 Color Jetprinter** 888/539-6275 www.lexmark.com	$179	94	15.0/7.0	5.4/0.6	Very good/Very good	2400 by 1200	100/50
2	**Lexmark Z32 Color Jetprinter** (NEW) 800/539-6275 www.lexmark.com	$99	94	7.5/3.5	2.5/0.3	Good/Good	1200 by 1200	100/25
3	**Xerox DocuPrint M750** (NEW) 800/832-6979 www.xerox.com	$149	93	10.0/6.0	4.2/0.8	Very good/Good	1200 by 1200	150/50
4	**HP DeskJet 932C** 800/752-0900 www.hp.com	$199	90	4.5/2.0	3.6/0.7	Good/Good	2400 by 1200	100/50
5	**Lexmark Z42 Color Jetprinter** (NEW) 800/539-6275 www.lexmark.com	$149	90	10.0/5.0	4.5/0.5	Good/Good	2400 by 1200	100/50
6	**Lexmark Z12 Color Jetprinter** (NEW) 800/539-6275 www.lexmark.com	$59	88	6.0/3.0	2.4/0.4	Good/Adequate	1200 by 1200	100/25
7	**HP DeskJet 842C** 800/752-0900 www.hp.com	$149	86	4.6/3.1	2.6/0.5	Good/Good	600 by 1200	100/50
8	**HP DeskJet 952C** 800/752-0900 www.hp.com	$299	84	5.1/3.6	3.9/0.7	Good/Good	2400 by 1200	100/50
9	**Canon S450 Color Bubble Jetprinter** (NEW) 800/652-2666 www.ccsi.canon.com	$149	84	10.0/7.0	5.8/0.6	Good/Good	1440 by 720	100/100
10	**Epson Stylus Color 980** (NEW) 800/463-7766 www.epson.com	$249	83	13.0/10.5	6.6/2.0	Adequate/Adequate	2280 by 720	100/50

Best Buy

ics per month). It covers the printer's standard ink cartridges and, where applicable, the printheads, but it doesn't include cost of the printer itself or of paper. Though we didn't test them, many vendors offer high-yield cartridges that may be more cost-effective if you print a lot of pages.

COLOR'S SILVER LINING

HIGH INK COSTS ASIDE, there's a lot to like about today's ink jets. Manufacturers clearly put plenty of their ink profits back into research and development, and consumers are reaping the benefits. New models outshine previous generations in many ways: They print faster, offer more versatility (such as optional networking), produce superior output, and are easier to install and operate. In short, they make the printers of just a couple of years ago look like relics from the Stone Age.

We analyzed and compared 25 ink jets, including 9 new models, ranging in price from $59 to $399. We tested printers for the small office and for the home office, printers for your kids and for your hobbies, fast printers, slow printers, great printers, and a few mediocre printers, too. Those that make our Top 10 chart (below) offer overall value. Our Best Buys, Lexmark's Z52 Color Jetprinter and Z32 Color Jetprinter, provide the top balance of speed, quality, features, usability, and long-term cost. For more information on ink jet printers, consult "How It Works: Ink Jet Printers," at www.pcworld.com/oct2000/printers.

XEROX OFFERS SEPARATE color cartridges with the M750, while Lexmark's Z12 ships with one color cartridge and no black.

Lexmark Z52
Color Jetprinter

- **Consumables cost for one year: $131**

WHAT'S HOT: Lexmark's Z52 took first place in our August *Top 10 Printers* chart as a newcomer and retains the top spot here, despite plenty of fresh competition. It prints text at a snappy 5.4 pages per minute and delivers a reasonable 0.6-ppm graphics speed—all for $179. The black text it produces is clean and crisp; color graphics are rich and detailed. Plus, Lexmark offers a one-year on-site warranty with its current batch of printers, including the Z52.

WHAT'S NOT: Like other Lexmark Z printers, the Z52 racks up steep consumables costs: A page of color graphics runs about 19 cents, compared to a chart average of just over 15 cents. The manual gives the basics but little else; online documentation simply reproduces the printed manual. The Z52 prints narrow lines messily and with some banding, and its gray-scale graphics appear grainy and lack detail.

WHAT ELSE: The Z52 lacks some paper-handling features of Lexmark's older Z51 Color Jetprinter, such as a bypass feed for slipping in a single envelope without emptying the paper tray, and a structural support for folded banner paper. In lieu of bundling software, Lexmark lets you choose two titles for $9 (and two more for an extra $30) from a list that includes much of Corel's lineup—Custom Photo, Print House 2000, Draw, and WordPerfect Office—as well as Home Depot's Home Improvement 1-2-3, a Williams-Sonoma cooking CD-ROM, and others.

BEST USE: The versatile Z52 can keep your small office humming, and it can entertain your kids. But its high cost of operation may not make it the best choice if you plan to print a lot of photos.

Cost per page for monochrome/color (cents)	Comments
5.2/19	The higher-end model in Lexmark's Z line of ink jets produces sharp text and smooth images for a reasonable price. It also prints text quickly, though graphics performance is less impressive.
7.1/20	The Z32 has impressive print quality for its $99 price, producing clean text and rich, detailed images. Its performance is slow, however, and its consumables are costly.
5.9/17	With high text speed and crisp text quality, the M750 offers a lot for its reasonable $149 price. Other features, such as a large input tray and a straight paper path, make it an even better deal.
3.6/11.1	The 932C produces solid text quality, sharp gray-scale images, and detailed—if somewhat light—color graphics. Speed is acceptable but not dazzling.
5.2/19.1	The Z42 is one of the faster models on the chart for text, and it prints both text and color graphics smoothly and evenly. Gray-scale images are not as impressive, however.
7.1/12.9	In price, the Z12 beats the rest of the printers on the chart, but that benefit is tempered by sluggish text and graphics speeds and the fact that it includes a color ink cartridge only.
7.2/14.6	HP's DeskJet 842C comes in at a good price, but its performance is rather slow. Output quality is a bit mixed, with dark, crisp text and smooth but slightly foggy graphics. Documentation is outstanding.
3.6/11.1	With reasonable print speeds and print quality, the DeskJet 952C fits well in a home or small office. For $100 less with just slightly lower text speed, the number four 932C makes a better choice, however.
3.6/10.7	The S450 offers high text speed and reasonable print quality for its $149 price. Design could be better, though: Control buttons are confusing and paper trays are flimsy.
3.5/9.8	The speediest model on the chart by far, the Stylus Color 980 is almost as fast as a monochrome laser. Unfortunately, its smudged, jagged text and filmy, dotted graphics don't live up to the ideal.

Lexmark Z32
Color Jetprinter

- **Consumables cost for one year: $174**

WHAT'S HOT: Though the Z32 Color Jetprinter isn't a speed demon—text and graphics print at a NEW leisurely 2.5 ppm and 0.3 ppm, respectively—its $99 price is certainly right. The Z32 produces accurate, clean text, albeit with a slightly grayish cast, and it renders color and gray-scale graphics with rich tones and good detail despite ▶

slightly dotted textures. It also prints narrow lines with just a touch of roughness—better than many other ink jets. The Z32's straight paper path avoids creasing and wrinkling heavier stock such as photo paper, and the paper trays close up like a clam to keep out dust when the unit isn't in use. Lexmark doesn't include software with the Z32, but it does offer the same deal as with the Z52: two titles for $9, and two more for an additional $30.

WHAT'S NOT: The Z32 has high consumables costs—among the worst for chart-making ink jets. From Lexmark's cartridge prices, we estimate that a single page of color graphics will expend about 20 cents' worth of ink, and a page of black text about 7 cents' worth. Costs are much higher if you print a photo. Speaking of photos, the Z32's photographic print quality falls short on glossy paper, with oversaturated color and dark shadows.

WHAT ELSE: The Z32 carries a one-year on-site warranty—strong support for a home printer. Its driver is basic, which is great for users who don't like grappling with confusing options.

BEST USE: With its great price, support, and overall print quality, the Z32 should be a favorite at home.

Xerox
DocuPrint M750

- **Consumables cost for one year: $124**

NEW **WHAT'S HOT:** Xerox's DocuPrint M750 looks like a dowdy fax machine, but it runs faster than many other models on the chart and comes stocked with some attractive features for its moderate $149 price. We clocked its text speed at 4.2 ppm, and the unit turns out solid black letters with even weights. Graphics print at 0.8 ppm and show good detail and subtle shading, though colors do look somewhat dark. We also liked the realistic-looking photographs that the M750 generated on glossy paper. The sturdy case holds a roomy 150-sheet paper tray, and a cover keeps dust out even when the tray is loaded. You can feed single sheets of media into the printer through a straight auxiliary path, which avoids bending labels, stiff photo paper, and card stock. Xerox includes a discount offer of two software titles for $6 from a list that includes the KidPix paint package, a Williams-Sonoma CD-ROM on cooking, and Quicken Expensable, among others.

WHAT'S NOT: The M750's straight-path feeder could be more convenient: It feeds from the rear and has only a narrow support, so it's awkward to use. Despite individually replaceable ink tanks, the M750's color ink costs a steep 17 cents per color page; black ink is more reasonable at just under 6 cents per page.

WHAT ELSE: Though the M750 worked fine with our PIII-450–equipped test PCs, we encountered a few error messages while running hands-on tests with an old 266-MHz Pentium. Xerox technicians say that the M750 requires an IEEE 1284–compatible parallel cable to ensure proper communication with the PC. When we used the cable and set the parallel port ▶

print samples

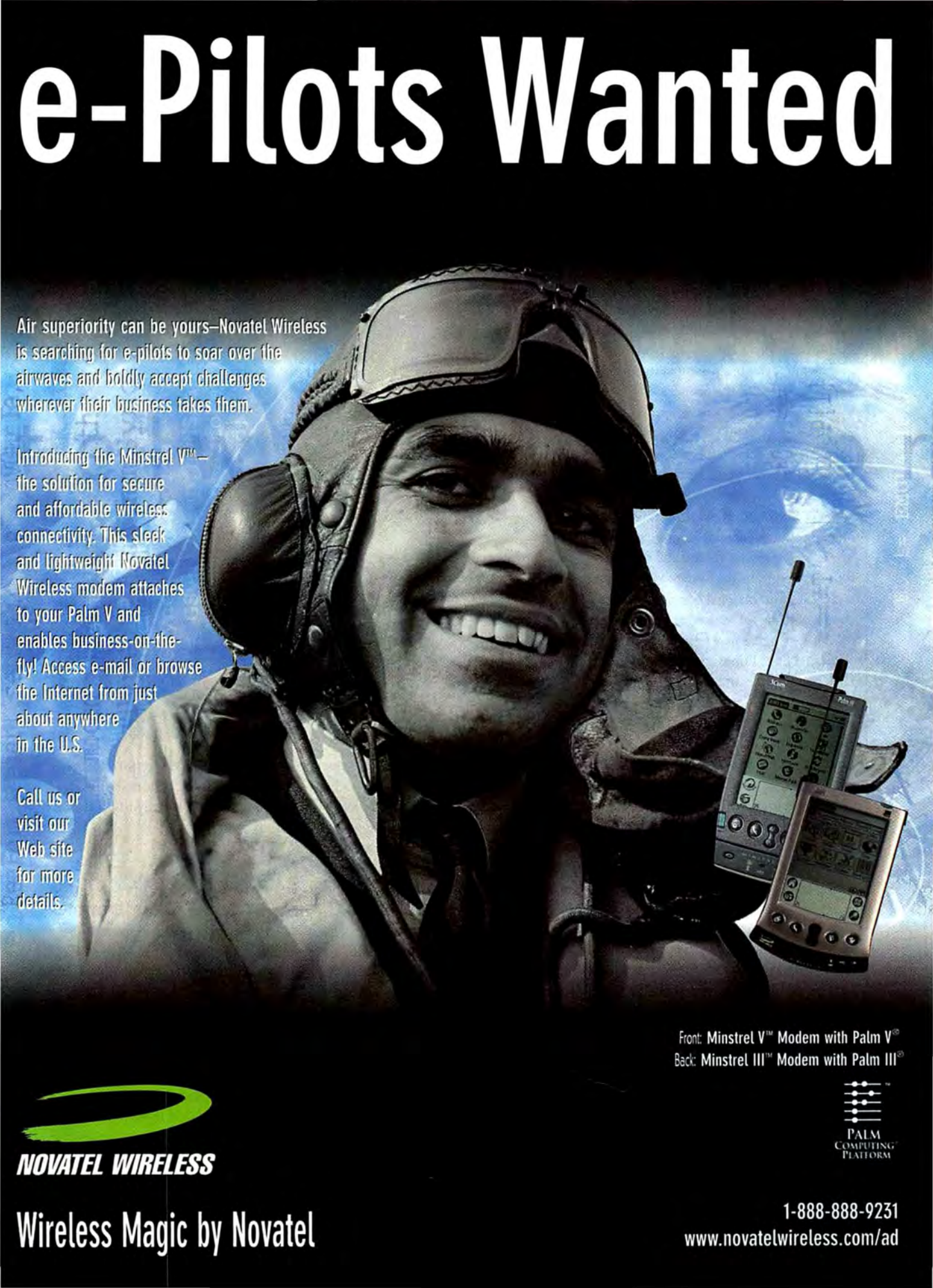
Lexmark Z52 Color Jetprinter
Our Best Buy handles color graphics and text with ease, producing straight, even letters with very slight jaggedness, even on extremely small fonts. Smooth transitions and strong contrast mark the Z52's color images, and we were impressed by the detail it delivered.

Lexmark Z12 Color Jetprinter
The Z12 can use either a black or a color cartridge—but not both—at one time. When loaded with the bundled color cartridge, the printer combines colors to generate black; the resulting images lack richness and have a foggy cast. The color cartridge yields slightly grayish text, but quality improves when the printer uses a true black ink cartridge.

Epson Stylus Color 980
The Stylus Color 980 prints almost as fast as a laser, but its print quality falls short. Text looks rough and jagged, and gray-scale graphics, while smooth, seem to have a film over them. Color images suffer as well, appearing dotted and foggy, and lacking strong detail.

HP DeskJet 990C
Though it just misses the chart, the DeskJet 990C sustains remarkably good print quality. Text shows a few rough edges but looks generally solid, and color images appear smooth, rich, and detailed. The 990C may print too pale for some tastes, but our reviewers didn't think the colors' lightness detracted from their evenness and the pictures' rich detail.

e-Pilots Wanted



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to bidirectional mode, we had no problems, and the M750 should be trouble-free on any PC with USB ports.

BEST USE: The M750 would make a fine printer for heavy text and graphics work in a home office or hobby room.

HP DeskJet 932C

• **Consumables cost for one year: $94**

WHAT'S HOT: Print quality is the DeskJet 932C's strong suit. The unit produces sharp black text and narrow lines, and it prints graphics with subtle shading, fine detail, and realistic colors. The 932C does even better if you use print-quality ink-jet paper. We also like the printer's envelope bypass feeder, which lets you print a single envelope without emptying the main paper tray. At 11 cents per page for color ink and 3.6 cents per page for black ink, consumables costs are quite reasonable.

WHAT'S NOT: At $199, the 932C is no longer a bargain, and its once-impressive print speed (3.6 ppm for text and 0.7 ppm for graphics) trails the leaders today. The 932C can print on legal-size paper, but a couple of inches of the longer paper hang off the edge of the paper tray.

WHAT ELSE: Popping out the 932C's back paper guide and slipping in an optional $79 duplexer permits you to print on both sides of the page without flipping pages over by hand. HP's $100 JetDirect print server can put the 932C on a network. The 932C features a curvy, bulbous profile with nary a straight line, all colored in several shades of leathery tan. And the 932C runs whisper-quiet.

BEST USE: Strong print quality, a fair price, and solid performance make the 932C welcome in any office or home.

Lexmark Z42

Color Jetprinter

• **Consumables cost for one year: $131**

NEW **WHAT'S HOT:** The Z42 Color Jetprinter resembles the bargain-priced Z32 in some ways, but it costs $149 ($50 more), and it prints text and graphics almost twice as fast—its 4.5-ppm text-printing speed is better than the chart average. It turns out even, smooth letters, and its color graphics show bright colors and subtle shading, without the Z32's dotted look. Lexmark claims the Z42 can print at a resolution of up to 2400 by 1200 dpi; and unlike Lexmark's other Z-series printers, it produced satisfying photos on high-resolution glossy paper. Finally, the Z42's driver has plenty of controls for tweaking prints (in sharp contrast to the Z32's minimalist driver), including exceptional ones for printing on both sides of the page and for creating booklets.

WHAT'S NOT: Graphics speed isn't terribly swift, at 0.5 ppm, and the dark, grainy, banded gray-scale graphics disappointed us. The Z42 has the same flimsy output tray as the Z32, and its estimated cost for color ink almost tops the chart, at about 19 cents per page—though black ink is a more reasonable 5.2 cents per page.

WHAT ELSE: The Z42 comes with Lexmark's standard warranty and its usual software deal—a choice of two titles for $9 and two more for an additional $30.

BEST USE: Fast text performance and reasonable black ink costs make the Z42 a good candidate for printing business memos and reports.

Lexmark Z12

Color Jetprinter

• **Consumables cost for one year: $145**

NEW **WHAT'S HOT:** At just $59, the Z12 almost qualifies as a disposable item, like cardboard cameras and plastic razors. It has the same software deal as Lexmark's other Z-series printers, and it performs at about the same speed as the Z32—2.4 ppm for text and 0.4 ppm for graphics. Text is clean, if grayish. Unlike on other Z printers, the Z12's paper support folds back to feed banner paper automatically, though it was a bit difficult to reposition.

WHAT'S NOT: The Z12 holds one ink cartridge at a time, forcing you to change ▶

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cartridges to switch to all-black printing from color. Because the color cartridge uses a composite of all its hues to approximate black, color images lack oomph and clarity; glossy photos looked realistic, however. Lexmark ships only a color cartridge with the Z12, so prepare to spend an extra $29 for your first black cartridge.

WHAT ELSE: Since it doesn't use black ink while printing in color, the Z12's cost per page is a modest 13 cents for graphics. Text printing with a black-ink cartridge, however, runs a pricey 7 cents a page.

BEST USE: Fits in well as a second printer where middling graphics and deliberate printing speed are acceptable.

HP DeskJet 842C

- **Consumables cost for one year: $152**

WHAT'S HOT: The DeskJet 842C isn't a dazzler, but it makes a solid, respectable choice. This competent, somewhat slow printer with a midrange price of $149 produces text at 2.6 ppm and graphics at 0.5 ppm. On regular paper, it turns out readable black text and even, accurate parallel lines; and like other HP printers, it prints beautiful text and graphics on coated ink jet paper. The printer comes with a generous helping of HP software for producing greeting cards, photographs, and other specialized documents.

WHAT'S NOT: On ordinary paper the 842C's graphics look slightly filmy, with muted grays and colors and some missing detail. We liked the text and graphics on glossy paper at high resolution, but photographs printed on the 842C didn't wow us. Consumables costs are high: Color graphics run about 15 cents per page and black ink about 7 cents.

WHAT ELSE: HP's printed manual for the DeskJet 842C is brief but clear. The extensive online manual covers the printer in much greater detail, with thorough explanations and tips for such tasks as choosing paper and printing photos.

BEST USE: Go with the 842C if you are committed to buying an HP and can't afford to spend more than $150. However, other inexpensive printers offer better performance and similar quality.

HP DeskJet 952C

- **Consumables cost for one year: $94**

WHAT'S HOT: On ordinary paper, the DeskJet 952C produces crisp, clean, eminently readable text, though the black ink has a slightly grayish tinge. The narrow parallel lines it delivers appear distinct and even—almost like laser prints—and gray-scale images are subtle and delicate with perfect detail. Color graphics show realistic, rich colors, and though rough texture obscures some detail on regular paper, the problem disappears if you use ink jet paper. The 952C prints both text and graphics reasonably swiftly—at 3.9 ppm and at 0.7 ppm, respectively. As with the 932C, consumables costs are very reasonable: 11 cents a page for color prints and 3.6 cents a page for black text.

WHAT'S NOT: This machine is essentially an upgraded, more expensive version of HP's DeskJet 932C, our fourth-ranked printer. It prints text almost 10 percent faster but costs $100 more, at $299. We're not sure that equation balances out.

WHAT ELSE: The 952C's paper assembly has an extra slot that holds snapshot-size media. This might be convenient for digital photography enthusiasts, but it's not a big advantage, since the main tray can feed small sheets, too.

BEST USE: The DeskJet 952C performs quite well, but you can save $100 with the DeskJet 932C if you're willing to put up with slightly slower print speeds.

Canon S450

Color Bubble Jetprinter

- **Consumables cost for one year: $78**

NEW **WHAT'S HOT:** Canon has finally shipped an ink jet that outperforms most of the competition. The S450's ability to pump out text at a scorching 5.8 ppm makes it a candidate to replace a light-duty monochrome laser—and it's priced at a bargain $149. You'll continue to save money down the road, since the S450 also has the second-lowest consumables cost on the chart: 3.6 cents per black page and 10.7 cents per color page. The printer ▶

think ink

THAT NEW PRINTER might look like a great bargain, but its supplies sure aren't. Before you buy, take a close look at how much our ten highest-ranking printers cost to run.

PRINTER	Total cost of printer for one year [1]	Average cost per page (cents)	Black cartridge price	Black cartridge page yield	Color cartridge price	Color cartridge page yield	Printhead price	Printhead page yield
Canon S450 Color Bubble Jet [2]	$78	7.1	$14	500	$12	560	$38 (black), $43 (color)	5000 (black), 6000 (color)
Epson Stylus Color 980	$96	6.6	$30	840	$36	570	not applicable	not applicable
HP DeskJet 842C	$152	10.9	$30	415	$32	430	not applicable	not applicable
HP DeskJet 932C	$94	7.3	$30	833	$34	450	not applicable	not applicable
HP DeskJet 952C	$94	7.3	$30	833	$34	450	not applicable	not applicable
Lexmark Z12 Color Jetprinter [3]	$145	10	$29	410	$29	225	not applicable	not applicable
Lexmark Z32 Color Jetprinter	$174	13.5	$29	410	$29	225	not applicable	not applicable
Lexmark Z42 Color Jetprinter	$131	12.1	$31	600	$38	275	not applicable	not applicable
Lexmark Z52 Color Jetprinter	$131	12.1	$31	600	$38	275	not applicable	not applicable
Xerox DocuPrint M750 [2]	$124	11.4	$22	400	$12	350	$40 (black and color)	10,000 (black and color)

[1] Cost of cartridges, ink, and printheads, based on printing 100 text and 20 graphics pages per month. Prices and page yields received from vendors.
[2] Printer comes with replaceable printheads and separate ink cartridges for each color.
[3] Printer uses only one cartridge at a time when printing and doesn't come with a black cartridge.

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uses separate ink tanks for each color, so if you tend to exhaust one color faster than the others you can replace it without throwing out the rest. The unit produces acceptable—though not awe-inspiring—black text, and somewhat pale but nicely shaded color graphics. The S450 can print on a wide variety of materials, including T-shirts and refrigerator magnets.

WHAT'S NOT: The S450 wrecks grayscale images—they print with a denim-like pattern and no detail. It also stumbles over narrow, straight lines, which bunch up and overlap until they resemble a ribbed shirt. The printer's output paper tray is sturdy enough, but it doesn't attach soundly—it fell off when bumped slightly. The driver offers a few special effects such as duotones and an "illustration" look, but they're pretty cheesy; we recommend learning to use a photo editor instead.

WHAT ELSE: Canon bundles plenty of software with the S450, including American Greetings' CreataCard SE, PrintMaster SE, and the Textbridge Pro OCR package. You can pop out the printhead and slip in a $69 scanner cartridge, though that option's appeal has declined as scanners have dropped to as low as $100. Canon provides adequate printed documentation, and its 500-page online manual provides a top-notch education in printing, with extensive information on paper, the Windows driver, and how to optimize print quality. The online manual is reproduced on the CD-ROM, but it's buried, so you may have to search for it.

BEST USE: Though the S450 might disappoint users who need high-quality graphics, it will work just fine for personal use, and the fast text printing makes it a natural as a home-office workhorse.

Epson Stylus Color 980

- **Consumables cost for one year: $96**

NEW **WHAT'S HOT:** Epson's new Stylus Color 980 prints faster than any other model in our Top 10 chart. It churns out text at 6.6 ppm and prints graphics at 2 ppm—twice the speed of the next-fastest ink jet. That's a lot of performance for $249. Its permanent printheads help the 980 maintain the lowest costs per page on the chart, at 3.5 cents per page for black ink and 9.8 cents per page for color. Epson throws in some nice photo-editing software, and the printer driver includes settings for creating special effects—such as converting images to a sepia tone or giving them a canvas- or parchment-like texture—for people who don't want to fine-tune the software themselves. A final plus: The printer is heavy and its components seem to be made of sturdy stuff.

WHAT'S NOT: Though it prints text almost as fast as a monochrome laser, it doesn't print it nearly as well. Edges of letters have a gridlike hatching, and large letters show roughness on curves and straight lines. Color graphics appear grainy, slightly foggy, and poorly detailed. The printer's paper support fits loosely into slots rather than clipping tight to the machine; consequently, when you move the 980, the paper support often falls off. Finally, the printer is loud.

WHAT ELSE: Epson's printed documentation clearly explains how to set up, operate, and troubleshoot the printer. This top-notch effort is complemented by an online manual that includes Flash animations of common maintenance tasks.

BEST USE: The 980 makes a workhorse machine for the small office or home, though print quality could be better.

Dan Littman is a contributing editor for PC World. ■

Beyond the Top 10

online WE ALSO TESTED three new printers that missed the chart. For full write-ups, visit www.pcworld.com/t10printers.

- **Compaq IJ750**
- **HP DeskJet 648C**
- **HP DeskJet 990C**

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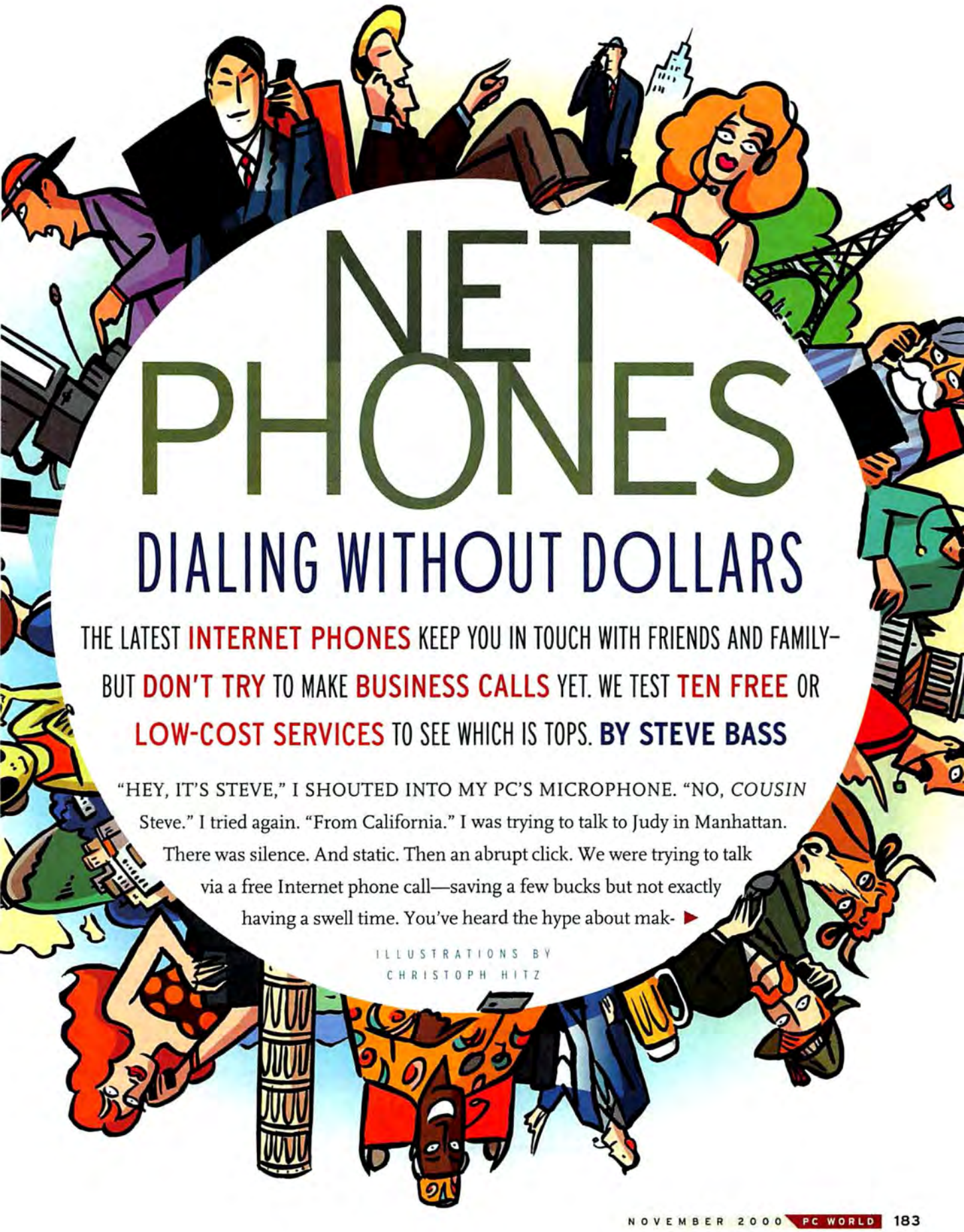

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"HEY, IT'S STEVE," I SHOUTED INTO MY PC'S MICROPHONE. "NO, *COUSIN* Steve." I tried again. "From California." I was trying to talk to Judy in Manhattan. There was silence. And static. Then an abrupt click. We were trying to talk via a free Internet phone call—saving a few bucks but not exactly having a swell time. You've heard the hype about mak- ▶

ILLUSTRATIONS BY CHRISTOPH HITZ

ing cheap—even free—phone calls over the Internet, right? Well, for the price of a Net connection, you can save a bundle on phone calls by using any of more than a dozen available services. With some of these services, you can chew the fat with your buddy anywhere in the United States for as long as you want, and it won't cost you a nickel. Or spend $5—about half AT&T's weekday rate—to talk to someone at your branch office in Japan for an hour.

INTERNET phone quality still isn't thrilling. But if you want to use one of these Net phone services regularly, your best bet is Deltathree (www.deltathree.com). Through its consumer division, IConnectHere.com, Deltathree permits both PC-to-PC and PC-to-phone calls. You can call anywhere in the United States for free. And voice quality is consistently good. Deltathree also provides an easy-to-use interface with a handy address book.

BEST BET

But you pay a price for free phone calls. In most cases, you have to put up with inconsistent—and sometimes very poor—sound quality. And with a few of the freebies, you can't escape glaring ads on your computer screen.

NOW YOU'RE TALKING

INTERNET PHONES have been around for years. I tested nine of them in 1997 (see "Internet Phones Take On Ma Bell" at www.pcworld.com/jun97/iphones), and seven of those nine are no longer alive and kicking. At the time I reviewed them, the phones weren't something I'd use regularly—and they definitely weren't good enough for business calls. Several factors contributed to their downfall: Sound quality was poor, and both parties had to be online and using the same software. On top of that, you couldn't call someone who used an ordinary phone.

Now there's a new generation of services for calling over the Internet. I spent a dizzying month testing ten Internet phone services (see the features chart below), along with other enterprises such as Web-based answering services (see "Get a Virtual Secretary Online" on page 186). I also experimented with a dozen PC headsets and Net2Phone's Yap Jack, a hardware gizmo that uses the Internet to make calls without a computer. And I asked more than 1000 members of my Pasadena Users Group for feedback on the Internet phones they use.

Internet phones have come a long way in three years. You can now call your Uncle Sal, who doesn't own a PC and never will. And the sound quality has improved. Sure, sometimes you sound like you're calling on a chintzy cell phone from a closet in Lithuania—with cotton in your mouth. But when Internet phones work

NET PHONES FEATURES COMPARISON

INTERNET PHONE SERVICE	Free PC-to-phone calls in U.S.	Free PC-to-PC calls	Voice mail/personal address book	Comments
Deltathree www.deltathree.com	●	●	●/●	**PRO:** Consistently good voice quality, clean interface, handy address book, free calls to directory assistance. **CON:** Limited speed dial, flashing ad.
Dialpad www.dialpad.com	●	●	●/●	**PRO:** Simple, easy-to-use interface; voice quality often good. **CON:** Company ad takes up lots of space; two separate windows—one for dialing, one for address book.
Firetalk www.firetalk.com	○[1]	●	●/●	**PRO:** Instant messaging; easy to use once you learn to navigate. **CON:** Small Web-based window crammed with information; PC-to-PC calls only.
HotTelephone.com www.hottelephone.com	●	○[1]	○/●	**PRO:** Free overseas calls. **CON:** No PC-to-PC calls; separate windows for dialing and address book; irritating flashing ads.
MediaRing www.mediaring.com	●	●	●/●	**PRO:** Cool-looking interface; free calls to China; lets you send e-mail messages with streaming technology. **CON:** Flashing ad; separate field for country code.
Net2Phone www.net2phone.com	●	●	●/●	**PRO:** Voice mail and faxing; free headset after you purchase call time. **CON:** Ad hogs screen; field where you enter number is somewhat awkward, can't use number keypad.
Pagoo Internet Phone www.pagoo.com	●	○[1]	●/●	**PRO:** No ads; enables you to receive calls when you're online, Caller ID, address book, free calls to directory assistance. **CON:** No PC-to-PC calls.
PhoneFree.com www.phonefree.com	●	●	●/●	**PRO:** Voice mail and videoconferencing; video mail; buddy lists; free calls to directory assistance. **CON:** You can't minimize the program window when making a call.
TalkFree www.i-link.net	●	○[1]	○/○	**PRO:** No headset, sound card, or other PC devices required; excellent voice quality; uses standard phones. **CON:** Still in beta phase, overloaded service, few extras, no PC-to-PC calls.
ZeroPlus www.zeroplus.com	○	●	●/●	**PRO:** Call forwarding, call waiting, Caller ID, buddy lists, speed-dial, online billing, white pages, handy text-chat feature. **CON:** Ungainly interface.

Best Bet ● Yes ○ No [1]Option unavailable.

perfectly, which happens about a third of the time, calls on at least two Net phone services (namely, Deltathree and I-Link's TalkFree) sound almost as good as if you were on a landline. And you'll definitely save money. Using Internet phones to call numbers within the United States—and to call many overseas countries—can't get any cheaper than free.

Would I use an Internet phone for business—say, trying to close a sale with a new client? Nope, the technology is still too unreliable. But with a little planning, the right equipment, and a few tricks, Net phones are reasonably serviceable for calling friends and family around the United States and in other parts of the world.

I-LINK'S TALKFREE offers an easy-to-use service. You initiate the call on your PC, but you and your friend end up talking on real phones.

FAREWELL, MA BELL?

AS INTERNET PHONE SERVICES IMPROVE, the marketplace is starting to boom. Dataquest, a research firm in San Jose, California, estimates that the telephony market, a $255 million business in 1998, will jump in value to $21 billion by 2003. Microsoft is grabbing a big piece of the pie by offering Microsoft Network Messenger users free long-distance Internet calls to numbers within the United States and Canada, using Net2Phone's technology. Nonetheless, traditional phone companies probably won't start losing customers for quite some time.

Pull back the curtains—or wires—and the technology behind Internet phone calls is easy to understand. You speak into your computer's microphone or headset; a program then digitizes your voice, divides the words into data packets, and sends them hurtling through the Internet toward the person you're calling. When the transmission arrives at the other end, a matching program or a hardware device reassembles the packets, and your friend hears your disembodied voice. If all the packets make it through okay, you sound great; if not, your buddy will hear echoes, distortion, or worse audio glitches.

NET2PHONE'S $55 Yap Phone looks like a regular phone, but you hook it up to your computer.

PHOTOGRAPH: ROBERT CARDIN

HOW IT WORKS

INTERNET PHONE SERVICES let you communicate in a number of ways. You can make an Internet call from one PC to another by dialing the Internet Protocol address of your friend's computer. The software lets you type in the digits of the IP address, and you start talking. Seven of the ten products that I tested permit PC-to-PC calling, and Firetalk offers PC-to-PC only—no PC-to-phone calls. Seven products let you place a call from your computer to your friend's regular phone. The PC-to-phone feature is astonishing, even to a jaded technodweeb like me. The other person (like Uncle Sal) needn't be near—or even own—a computer.

About half the products can be used directly from the companies' Web sites or upon downloading a small program. Some of the software that I downloaded, such as PhoneFree, MediaRing Talk, and Deltathree, ended up supporting better-quality connections than their respective browser-based programs.

When you sign up, brace yourself for some intrusive questions, typical of free services. (My profile? I'm an unemployed high-school grad with 16 kids. I was born on January 1, 1900, and have an income under $10,000. Ethical? Decide for yourself.)

Once you've registered, a telephone dialing pad pops up on your screen. Punch in a number—or grab it from the service's address book—and click the button to dial the number. Wait a second or two, and you're connected. All services (with the exception of TalkFree) let you talk with no time limit.

FREE MEANS FREE?

EVERY PRODUCT EXCEPT FOR PAGOO allowed free calls within the United States. Deltathree, HotTelephone.com, and MediaRing also let you call Canada for no charge. If you're in the habit of calling directory assistance to obtain listings in other states, you can cut out the frequently exorbitant cost of those calls with Deltathree, Pagoo, PhoneFree, or ZeroPlus, which provide free directory assistance—a nice plus.

All PC-to-PC products can make free international calls. To date, only three products provide free overseas PC-to-phone calls: HotTelephone.com, to over 30 countries worldwide; Dialpad, to Korea; and MediaRing to China (Web-based service only).

But if the country that you're calling isn't a freebie, an Internet call may not be worth the hassle. Lucky Dog 10-10-345 traditional phone service to Japan, for example, costs a scant 5 cents per minute more than Deltathree—one of the cheapest Internet phone services. Deltathree offers a 5-cent-per-minute rate on calls to ▶

YOU MAY NOT be able to make Internet calls from work if your company's IS department uses a firewall. Check to see if a specific port on your PC can be opened for outgoing calls. Note: Any personal firewall you might use, such as Zone Labs' free ZoneAlarm can accommodate Internet calls.

GET A VIRTUAL SECRETARY ONLINE

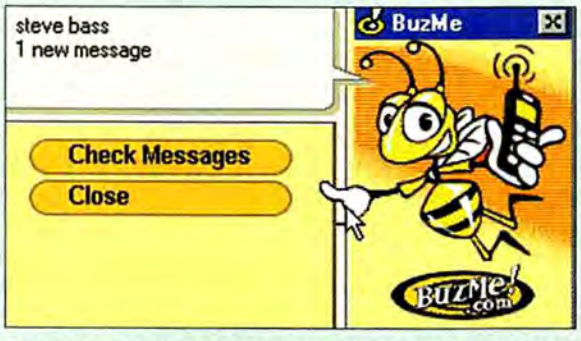
NEED A PERSONAL ASSISTANT to answer the phone, route your calls, and take messages? A growing number of Web-based phone services have nifty features that handle those jobs.

I tried a handful of these fun and useful programs—BuzMe, Pagoo's Call Catcher, and CallWave—and each worked as advertised. While you're online (or on the phone) and somebody else tries calling, BuzMe (www.buzme.com) intercepts the call and forwards it to a toll-free number; a pop-up window alerts you to the incoming call. You can send the caller to voice mail or reject the call entirely (if it's a telemarketer, say). With BuzMe, you can also use a regular phone to check for messages. The basic service is free, but it's sponsored by Web-based ads. For $5 per month you can pay to have ads turned off.

Like BuzMe, Pagoo's Call Catcher (www.pagoo.com) forwards your calls to a toll-free number, and a pop-up window alerts you, letting you hear your caller's message. But instead of bothering you with ads, Pagoo charges $5 per month for six months of service or $4 per month for a year. You can try it free for 30 days.

CallWave (www.callwave.com) lets you hear your caller's message too, but its small window stays put on your desktop, blinking ads whenever you use the service. Unlike BuzMe, however, CallWave does not allow you to get rid of the ads.

Note: To use these cool tools, you must subscribe to your phone company's Forward Busy/No Answer Call Forward service. Depending on your phone company, these fees can start at as little as $1 per month (see also "Halfway-There Solutions to Internet Dial-Up Dilemmas" at www.pcworld.com/feb2000/dial-up).



TIRED OF MISSING CALLS while you're online? BuzMe takes charge and alerts you to incoming calls, using a pop-up screen.

England from California, only 5 cents per minute less than Working Assets' rate (see our comparison chart on page 187).

CALLS WITH A CATCH

ALL THE INTERNET PHONE UTILITIES I looked at offer free services—but there's a trade-off. Not only must you deal with the prying questions on the registration form, but you also must contend with the online advertising that most Web sites rely on to survive. Many of the programs have irritating banner ads that scream at you in fluorescent colors.

The worst offender was HotTelephone.com—it crammed two eye-popping, flashing ads into the browser dialing window, then proceeded to open another ad window when I completed the call. Minimizing a program's window doesn't always work. Dialpad, for instance, pops back up when a new ad is displayed, and PhoneFree refuses to minimize when you're on a call.

I-Link's TalkFree is a hybrid that uses a PC to initiate the call—but its similarity to other Internet phones stops there. I type my phone number into a field on I-Link's Web site, then enter my friend's number in another field. I-Link calls me first on my landline, asking me to confirm my friend's number (by hitting the pound key); the call goes through, and then my pal and I chitchat on our familiar phones. And yes, it's a freebie for both of us. Like other Internet phones, TalkFree uses the Internet for transmission. But because of I-Link's proprietary hardware and software, the voice quality is incredibly good. When I called my cousin in Manhattan using TalkFree, she thought we were connected on a landline. At worst, she said, I sounded as if I were using a good-quality cell phone (minus the cotton).

If it's that impressive, you ask, why isn't TalkFree a *PC World* Best Bet? It has several snags. First, it's still in a testing phase, and the service tends to get overloaded—I often had to try a dozen times before I could dial. Second, calls can last for 20 minutes, but you have to click on a pop-up screen every minute after the first 4 to extend your call time. This infuriating inconvenience makes TalkFree a no-no for business calls—but it's worth a try for chatting with family and friends. (I-Link regards TalkFree primarily as a promotional vehicle for its fee-based services.)

WHAT YOU'LL NEED

TO GET STARTED using an Internet phone service, all you need is a sound card with a microphone and speakers, a 56-kbps modem, an Internet connection (AOL is okay), and a browser. To increase your chances of making the service work right, though, you need to do a few things.

First, make sure your sound card is full-duplex, and upgrade if necessary. Most old sound cards are half-duplex—you'll know you have an older card if only one person can talk at a time, as with a two-way radio. If you're running at half-duplex, you might be able to fix the problem with a new driver. Check your sound card maker's Web site for an update. In my tests, I used both Creative Labs Sound Blaster Live and AWE full-duplex sound cards with no problem.

Next, you should consider buying a sturdy headset. This device will help block external noise, making it easier to hear the caller. And in most cases a headset is superior in quality to the sticklike microphone that sometimes accompanies sound cards. Even poor connections sound better over a good headset.

YOU CAN QUICKLY SWITCH between a headset and your PC speakers without crawling under your desk. Buy a $5 pair of 6-foot male/female extension cables at an electronics store. Plug the extensions into your sound card's speaker and microphone jacks. Do the same for the speaker's connectors and bring them near the front of your computer.

Finding a comfortable, technically solid headset involves trial

NET PHONES: HOW MUCH CAN YOU SAVE?

INTERNET PHONE SERVICE can reduce your bills for domestic calls and help you ring up some savings on international calls, depending on the country you're calling. Note: Traditional long-distance carriers charge monthly fees ranging from $2 to $6 (in addition to special per-minute rates), which will increase overall charges made from landline phones.

PHONE SERVICE [1]	New York	Canada	Denmark	United Kingdom	China	Japan
Internet						
Deltathree	Free	Free	8 cents	5 cents	21 cents	8 cents
HotTelephone.com	Free	Free	Free	Free	Free	Free
MediaRing	Free	Free	9 cents	8 cents	Free	11 cents
Net2Phone Yap Phone	1 cent	1 cent	10 cents	4 cents	36 cents	11 cents
Traditional						
AT&T	7 cents	7 cents	29 cents	10 cents	32 cents	16 cents
Lucky Dog 10-10-345 [2]	10 cents	8 cents	$1.12	22 cents	31 cents	13 cents
Working Assets	7 cents	7 cents	29 cents	10 cents	42 cents	16 cents

[1] All figures based on daytime per-minute rates for calls initiated in Pasadena, California. [2] Additional 10-cent connection charge for international calls.

and error. One of my favorites is Andrea's $40 NC-72 PC monaural. It's lightweight, and people said my voice sounded terrific. For comfort and quality, Telex's $90 H-551, a stereo USB headset, was another winner. Riparius's $25 telephone-like handset (sold by ZeroPlus) was hard to hold, and Labtec's $50 LVA-8550 was the worst of the bunch, with poor sound reception from the earphones and substandard audio transmission.

If you don't like headsets, try Net2Phone's $55 Yap Phone, a handheld device that looks like a phone and connects to your PC. Calling someone who owns a Yap Phone is free. If the person you're calling doesn't have one, calls cost a penny a minute in the United States and 3.9 cents or more a minute for overseas calls. But the Yap Phone performed no better than Net phones used with a headset, and working with it wasn't any easier.

Another Net2Phone product, the Yap Jack—which charges the same fees as the Yap Phone—doesn't require either party to have a PC, but the caller does need an Internet service provider. Attach a regular phone to the $160 Yap Jack, connect the Yap Jack to the wall jack, and start making calls. The Yap Jack was handy, but setup was arduous. It's also mighty expensive. Net2Phone offers a calling card, too. Its rates are about the same as those of online services, and it doesn't require you to make calls from your PC.

IF YOU'RE having trouble with sound quality, experiment with the product's microphone and speaker settings while you're connected. For instance, Deltathree worked best with the mike set to low and the speaker to high.

NET CONNECTION MATTERS

IF YOU HAVE A DIAL-UP CONNECTION, you must use a 56-kbps modem. Anything slower, and you'll experience dreadful voice quality—static, dropped words, and echoes. That said, even with a 56-kbps modem, I frequently had to play the CB radio game of saying "over" to signal I was finished speaking.

Dick Norton, a frequent Internet phone user in Burbank, California, uses Dialpad with his 56-kbps modem. He reports that his calls "typically last 30 to 40 minutes and are good quality on an amazingly consistent basis."

If you want your Internet phone to work like a regular phone—and you plan to use it on a regular basis—get a high-speed DSL or cable modem connection. Voice quality was substantially better (but still imperfect) in all my tests using cable or DSL.

IF YOU'RE USING A 56-kbps connection and the voice quality is poor, hang up and try again. (Let's hope your friend doesn't mind the interruption.) Still awful? Switch to another of your ISP's dial-in numbers.

I'm not the only one with a preference for a high-speed connection. "My uncle in Texas called me [in Canada] on his dial-up connection, and it was worse than a ham radio communication to Mars," says Shawn R. Ahmed, a student in Bedford, Nova Scotia. Yet when I used DSL to call Ahmed on Deltathree's PC-to-phone product (and again when he used his cable modem to call me), we understood each other easily.

As broadband ramps up, the technology behind Internet phone services will undoubtedly improve, but don't say adios to Ma Bell just yet. For the time being, most of us will use Internet calls only for shooting the breeze with friends and relatives. I predict, however, that in three years you'll probably make at least half your calls via Internet phones. But until Web-based telephony becomes as easy to use as regular phone service and offers the latter's crystal-clear quality, few of us will switch to it completely for our business calls.

Contributing Editor Steve Bass is president of the Pasadena IBM Users Group. He can be reached at steve_bass@pcworld.com. ■

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Digital camera enthusiasts learn quickly that snapping the shot is just the beginning of a picture-perfect journey.

Is photography an art or a craft? To some extent, it depends upon the eye of the individual photographer. But one thing is certain: Both the art and the craft of photography are greatly enhanced when a digital camera is used, first to create the art, and then to manipulate the images, skillfully yet easily, in the digital darkroom—elevating the craft of photography to new levels.

Photography began both as an art and a craft when black-and-white photos were carefully processed in darkrooms, often by the photographer. The advent of color photography largely took the darkroom work away from the photographer, being very complicated to do well, and gave that over to color labs. What you saw from the lab is what you got, period.

Perhaps that is the single most attractive element of digital photography; namely, the giving back to the photographer the craft of taking and then enhancing color (or black-and-white) images. The photography industry continues to respond to the fast-building digital photography wave with a flood of low-cost cameras, slick camera accessories, and software that turns today's power-packed personal computers into the ultimate photo manipulation tools.

ROBERT HEINE PHOTOGRAPHY INC.

Heads up! Great software makes mixing and matching different digital photos a snap, as this Bob Heine original shows. (Story, page 5.)

IT STARTS WITH A CAMERA

It stands to reason that all great digital photography starts with a great camera, and these days there is a dizzying array of camera choices. One feature-packed choice is the QV-3000EX Plus from Casio Inc., Dover, N.J., a 3.34 megapixel powerhouse preloaded with Photo Loader software that automates image transfer with a PC. This camera-to-PC image uploading starts automatically whenever the camera is connected to the computer using a special USB cable.

IT'S ALL IN THE CARD

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Photograph taken with an Olympus C-2500L digital camera on Lexar Media USB-enabled 8x digital film.

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Don't worry about losing track of the myriad shots you'll want to take. Uploaded images are stored in folders named according to the dates that images are taken, while the images themselves can be viewed with a standard browser.

Other features of the QV-3000EX Plus include a noise reduction system for peerless night shots; landscape, portrait, and night scene modes for easy recording of a variety of subjects; a Canon F.20 3X optical zoom wide aperture lens; and a spacious IBM 340MB microdrive that can store up to 245 high-resolution images.

The saying goes, don't forget film. After taking the right shots with your digital camera, you'll want to make sure you're recording those shots on the best digital film. Today's beefy megapixel cameras capture higher-resolution images than ever before, and the very large image files they produce can make you wait to take the next picture. To harness and reduce this digital wait state, check out the 4X and 8X digital film from Lexar Media Inc., Fremont, Calif. Lexar's 4X and 8X technology (600KB per second and 1.2MB per second transfer rate, respectively) records your images at more than double the speed of generic film currently available.

QV-3000EX Plus from Casio comes with a 340MB IBM microdrive.

Lexar's USB-enabled CompactFlash digital film and JumpShot connection kit.

Once you've made the shot, Lexar has harnessed the speed and power of universal serial bus (USB) technology to provide an easy-to-use, low-cost image transfer solution. Lexar's USB-enabled CompactFlash digital film and JumpShot connection kit let you quickly capture high-resolution images and easily transfer them to either a PC or a Mac through the USB port on your computer. There's no lengthy installation process and no need for a separate card reader. With Lexar Media's JumpShot connection kit, you can now transfer your CompactFlash images to your computer up to 25 times faster than your camera's

CONTINUED ON PAGE 7

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Canon Camcorder: You're the Director

A digital camera is not the only way to produce a high-quality image. Today a digital camcorder offers the same ready-for-editing still images in addition to a whole new world of full-motion movie fun that is Internet-ready.

The Canon Elura2 MC from Canon Inc., Lake Success, N.Y., sits in a digital camcorder class by itself. Weighing about the same as a can of soda, this powerful and feature-rich camcorder can fit into a purse, coat pocket, or glove compartment, though it was designed to fit most perfectly into your hand. And because it is a digital camcorder, the Elura2 MC lets you get creative with your movies in a way never possible with standard film camcorders, while letting you share your movie memories over the Internet.

Leading-edge features of the Elura2 MC include:

An image stabilizer that corrects shaking and rattling while allowing long-distance filming without use of a tripod.

A Canon 10X zoom lens with a 40X digital zoom yields super-high definition from great distances along with superb contrast, which is a reflection of the high-resolution capability of digital video technology.

A bright 2.5-inch color LCD viewfinder with a twist and flip feature allows you to shoot from any angle.

And, of course, you can shoot either high-resolution still photos or digital video movies. In either case, you'll have the added digital benefit of the widest-possible range of editing features, making the Elura2 MC with its compact design a leading innovator.

Soul mates.

The Elura 2MC not only records full motion video, true 30 frame-per-second Progressive Scan Digital Motor Drive™ and digital stills, but stores images on both Flash Memory MultiMediaCard and Mini DV. So now connecting to your PC to e-mail images, stream video and edit digital movies is easier than ever.

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SHARPER IMAGES

Cleveland's Bob Heine:

You Can't Beat Digital

As a professional studio photographer for 20 years, Bob Heine knows quality photos. And for the last three years, he's done much of his professional work using digital cameras. We caught up with him outside his studio in Cleveland (www.heinephoto.com) and asked for some tips on and insights into the digital photography world.

Q: Why go digital?
A: For enthusiasts and amateurs, digital means instant gratification for your efforts. You see the shot right away and if you don't like it, you take another. Then, of course, you can manipulate the photo an infinite number of ways on your PC with the great software out there. For the professional, it's the ability to leverage the Internet to do things that just aren't practical with a film camera.

Q: Such as?
A: One of my clients is a major importer of gifts and crafts like silk flowers and wreaths from Asia. I have shot thousands of his products, which he then sends to his distributors so they can easily create sales sheets and even catalogs for their customers, such as florists. He also takes an inexpensive digital camera with him to the Far East on month-long buying sprees, snapping shots of items, which he then e-mails back to his clients around the world, gauging their interest in these items. So here we see business applications within the same small business both for high-end work like mine and for simple point-and-click work that he does on the road.

Q: Any other business experiences come to mind?
A: Once I was shooting the staff of a brewery for their Christmas card. One gal by her own admission did not photograph well in most shots. I took several group shots with her in them and then the owner picked the one he liked. Then I shot this woman several times alone until we got a shot we liked. I then easily cut her face from the individual shot and dropped it into the group shot and voilà! We had the perfect brewery holiday card.

Q: Are there aspects of digital photography people should be careful to note?
A: Most people print their digital photos from standard ink jet printers. What they will find is that the inks in those printers today, for the most part, will fade and discolor pretty quickly. That happens less with good quality photo paper, but it is more expensive and it still happens over time. The good news is that the printer companies are developing better inks that will attack the problem, given the rising popularity of digital photography.

Q: Other issues?
A: Whether it is a digital camera or a film camera, the lens interprets the colors it sees rather than recording them exactly. So some colors, like fluorescent greens or purples, just don't reproduce always the way your eye sees them. The good news with digital photography is that software allows you to correct the colors to be whatever you want them to be.

Q: Are we at the beginning of the end of film photography?
A: The technology of digital cameras and accessories and software is getting so good so fast, and the medium is so versatile, that I think digital is going to continue to grow in popularity very fast. After a while many people will abandon film as we know it today except for some specialty uses. But when it comes to putting the power in the hands of the user to correct bad photos, adjust lighting, get the cropping you want, and the colors you see, you just can't beat digital.

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*IBM ® Microdrive™

SHARPER IMAGES

CONTINUED FROM PAGE 3

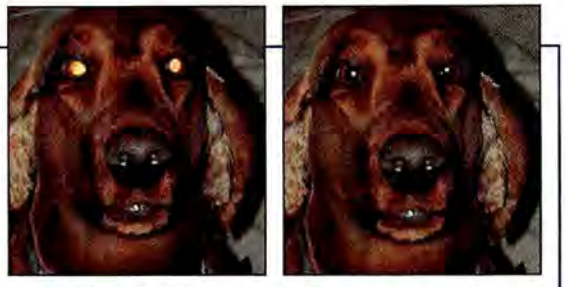
serial cable connection. That translates into more useful time to enhance your photos, and less "hurry-up-and-wait" time in the digital darkroom.

HAVING SOME FUN

Now that you've got the images safely tucked away on your personal computer, it's time for some fun, which is another word for craft when it comes to digital photography.

For a fast-growing number of digital photographers, whether they are amateurs, professionals, or business users, Paint Shop Pro 7 from Jasc Software Inc., Eden Prairie, Minn., is proving to be one of the digital darkroom's most capable assistants. Paint Shop Pro 7 delivers the quintessential combination of photo editing, painting, illustration, and Web tools—all available to amateur and experienced digital photographers through an intuitive and sharp interface.

The automated photo enhancement features of Paint Shop Pro 7 allow users to dramatically improve photo quality literally with the click of a single button, achieving color balance, eliminating red eye and scratches, and doing it all with ultimate ease-of-use.



Paint Shop Pro 7 from Jasc Software lets you fix almost anything, including red eye and scratches.

Paint Shop Pro 7 also features a wealth of built-in Web tools that create image slices for faster downloads. These tools allow you to preview graphics in standard Web file formats, while the addition of the PNG file format gives users access to all supported Web file formats within a single, streamlined dialogue. ■

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BEFORE

Before, they're just photos. With Paint Shop Pro, they're perfect. Unlike other expensive digital imaging software, Paint Shop Pro lets you create professional results easily and affordably. So you can make yourself and your company look great. It's packed with powerful tools that let you edit your photos, create unique web graphics, draw, paint, and animate. And now, you can download a free trial version of new Paint Shop Pro 7. Or order it today by calling 800-622-2793.

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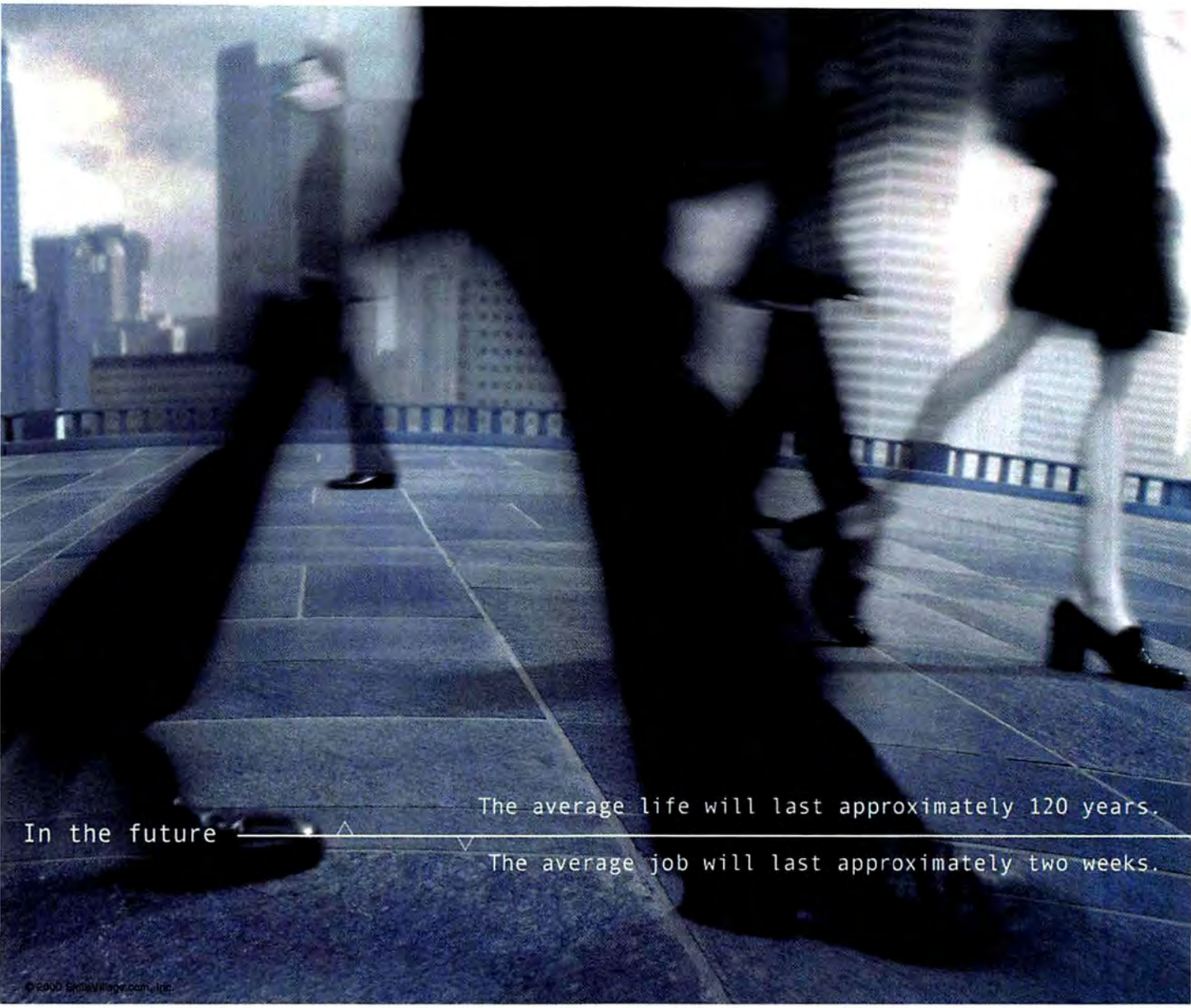

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PC WORLD

TOP 100

202 Power PCs

206 Midrange PCs

210 Budget PCs

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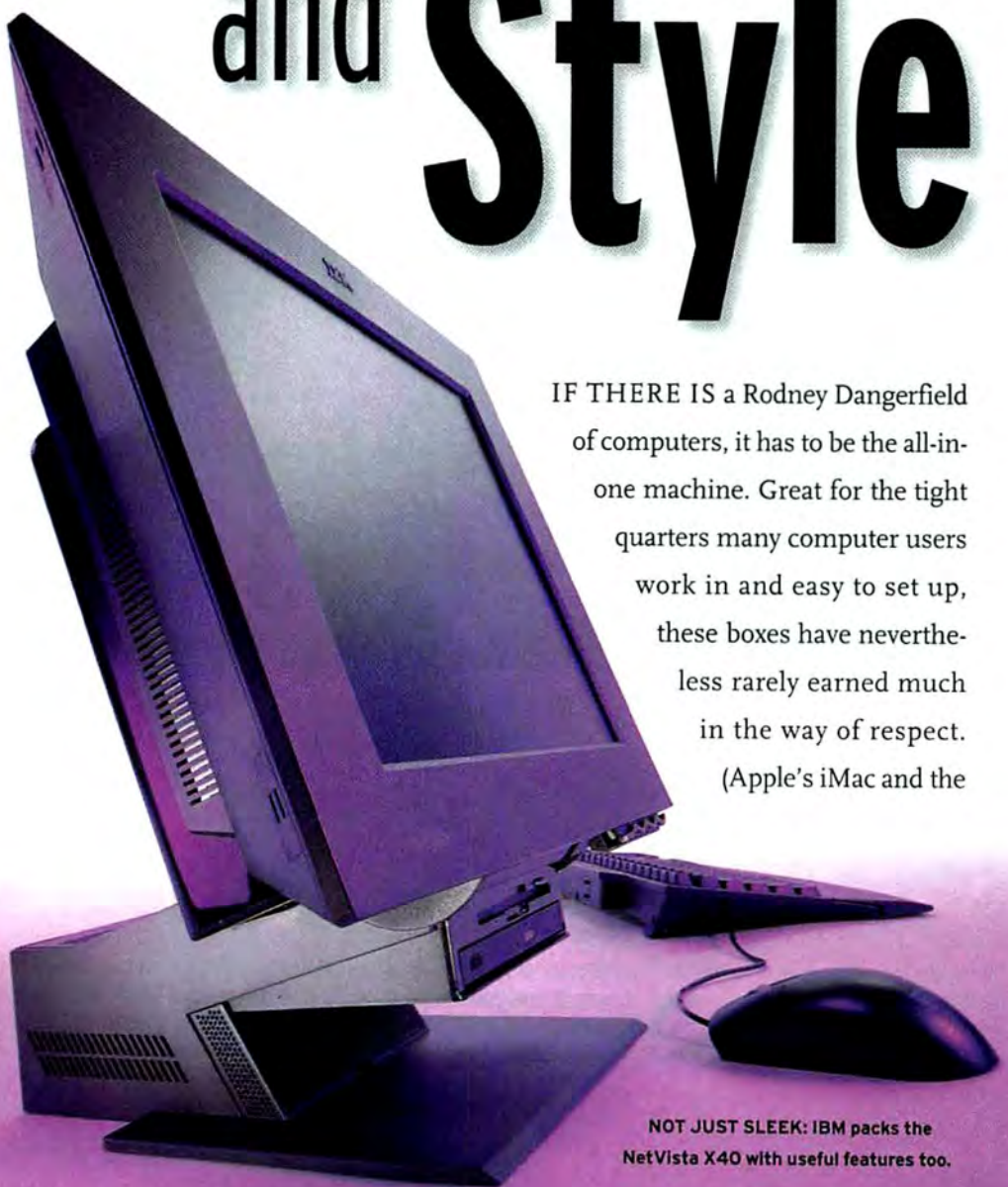
219 Monitors

221 Graphics Boards

223 Scanners

Substance and Style

IF THERE IS a Rodney Dangerfield of computers, it has to be the all-in-one machine. Great for the tight quarters many computer users work in and easy to set up, these boxes have nevertheless rarely earned much in the way of respect. (Apple's iMac and the



NOT JUST SLEEK: IBM packs the NetVista X40 with useful features too.

original Mac are, of course, the famously successful exceptions.) With a striking combination of style and substance, IBM's svelte NetVista X40 system should start changing that state of affairs for PCs (it debuts on the power chart at number ten). In contrast with the curvy, candy-colored iMac, the NetVista has an angular, black, 21st-century look. It's very cool.

From a technological standpoint, however, the NetVista is hardly revolutionary; both Gateway and NEC beat IBM to the punch with their own all-in-one models, the Profile 2 and PowerMate 2000, respectively. But IBM has refined the category. The floppy and CD-ROM drives are more accessible, and the LCD flat-panel display is easier to adjust. Most of all, the NetVista just looks great on your desk. That said, IBM couldn't solve a couple of problems inherent to the all-in-one design—particularly, limited expansion room: The NetVista has no drive bays and only one expansion slot. A second problem is price. A flat-panel display, while conserving desk space, adds significantly to the cost of the package. The $2499 NetVista comes with a Pentium III-667 processor and so is quite a bit slower than more-traditional systems priced about the same. Check our *Top 10 Power PCs* chart for some comparisons.

EIZO'S FLEXSCAN T561: Excellent ratings for both text and graphics.

ME HITS HOME

THIS MONTH THREE systems crack the Top 100 running Microsoft's latest operating system, Windows Millennium Edition (aka Windows Me). One, Dell's Dimension 4100 PIII-800, lands on the *Top 15 Home PCs* chart as our midrange Best Buy. The Dimension 4100 achieved a PC WorldBench 2000 score of 145—fairly typical for its CPU class. See September's *Top of the News* (www.pcworld.com/sep2000/millennium) for more information on Windows Me.

ENHANCED ATHLONS TAKE OVER

OVER THE PAST few months, the majority of vendors have switched from the older "classic" Athlon to the new, enhanced Athlon with the on-die cache; it's important to understand which you're getting when you buy a system. A good way to tell the new Athlons from the old is to check how much Level 2 cache the system has: New, enhanced Athlons have 256KB; the classic Athlons have 512KB. Although the new variety now have a smaller Level 2 cache, their overall performance has increased because the cache is integrated. There are no compatibility problems with the new Athlon (any application that runs on an old Athlon will run on the new one), but if performance is a priority, processor-intensive programs will run faster on a system based on the new Athlon.

On the strength of rare Excellent ratings for both text *and* graphics, Eizo's new FlexScan T561 achieves a number six ranking on our 17-inch monitors Top 10 chart. Only the steep $489 price keeps it from placing higher.

Fountain Technologies, supplier of components to computer makers Quantex and CyberMax, declared Chapter 11 bankruptcy in August. The financial consequences to CyberMax and Quantex are far from clear, but until we can establish the status of the companies, we have removed all Quantex and CyberMax systems from the Top 100. Read our *Top of the News* story on page 64 for more about the Fountain bankruptcy, and check PCWorld.com for the latest developments.

Peripherals maker S3 has decided to close its Diamond Multimedia graphics card division. S3 will continue to support existing Diamond Multimedia products but won't make any new graphics cards.

Writers Richard Jantz, Dan Littman, and Joel Strauch, along with PC World *editors Richard Baguley, Seán Captain, Mick Lockey, Kalai Murugesan, and Kalpana Narayanamurthi, contributed to the articles in this month's Top 100. Testing was performed by Curt Buehler, Ulrike Diehlmann, Robert James, Elliott Kirschling, Jeff Kuta, Thomas Luong, Sean Tieu, and Jon Tjon 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 a large number of 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 the 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 on the PC WorldBench 2000 test suite at www.pcworld.com/benchmark.

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PC WORLD

TOP 10 POWER PCs

	SYSTEM: $2000 AND OVER	Month tested	★ Overall rating	Street price (8/13/00)	PC WorldBench 2000 performance score [1] Faster	Base configuration
1	Dell Dimension XPS-B1000r Special Edition 800/388-8542 www.dell.com	Aug 00	95	Expensive: $3219	Good 178	**Outstanding:** Pentium III-1000, 128MB of RDRAM, 256KB L2 cache, 40GB hard drive, 19-inch monitor, Windows 2000 Professional
2	Dell OptiPlex GX300 800/388-8542 www.dell.com	NEW	92	Expensive: $3322	Good 179	**Outstanding:** Pentium III-866, 128MB of RDRAM, 256KB L2 cache, 20GB hard drive, 19-inch monitor, Windows 2000 Professional
3	Sys Performance 1000A 800/613-9963 www.sys.com	NEW	92	Average: $2699	Outstanding 197	**Outstanding:** Athlon-1000, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 2000 Professional
4	Xi Computer K1000 MTower 800/432-0486 www.xicomputer.com	NEW	92	Inexpensive: $2499	Outstanding 171	**Very good:** Athlon-1000, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 98 SE
5	Gateway Select 1000 800/315-2536 www.gateway.com	July 00	91	Average: $2734	Good 155	**Very good:** Athlon-1000, 128MB of SDRAM, 512KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 98 SE
6	Acer Power 8600 800/733-2237 www.acer.com	July 00	89	Inexpensive: $2479	Good 157	**Very good:** Pentium III-866, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 98 SE
7	Micron ClientPro Cn 800/642-7667 www.micronpc.com	Oct 00	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	Oct 00	88	Average: $2569	Very good 188	**Outstanding:** Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 2000 Professional
9	ABS Performance 1 Athlon 800/876-8088 www.buyabs.con	July 00	86	Average: $2599	Good 154	**Outstanding:** Athlon-900, 256MB of SDRAM, 512KB L2 cache, 40GB hard drive, 19-inch monitor, Windows 98 SE
10	IBM NetVista X40 800/426-2968 www.ibm.com/pc	NEW	85	Inexpensive: $2499	Satisfactory 150	**Good:** Pentium III-667, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 15-inch flat-panel monitor, Windows 2000 Professional
	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 201.

[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).

NEW MODELS and a big price drop shake up the top of the power chart. Due to a makeover of Micron's Millennia Max line, last month's number one is no longer available. Helped by a $310 price plunge, Dell's Dimension XPS-B1000r Special Edition leaps from number five up to the top spot. New PCs from Dell, Sys, and Xi occupy the next three slots. Fueled by AMD's hot 1000-MHz Athlon-1000, both the Sys and the Xi turned in notable performances.

1 DELL DIMENSION XPS-B1000R SPECIAL EDITION

WHAT'S HOT: An impressive list of features and Dell's highly rated reliability distinguish the XPS-B1000r. The system sports both a 12X DVD-ROM drive and an 8X/4X/32X CD-RW drive, plus a modem and a network interface card. A Dell NVidia GeForce 256 graphics card offers both analog and digital output, and that output looks very nice indeed—the 19-inch UltraScan P991 flat-screen CRT delivers richly saturated colors and ultracrisp text, even at resolutions higher than the standard 1280 by 1024.

WHAT'S NOT: Although the system costs less this month, you'll still pay for the privilege of having one of the hottest processors available: You could buy both Best Buys on the *Top 10 Budget PCs* list plus a third system for this Dell's $3219 price.

WHAT ELSE: With a PC WorldBench 2000 score of 178, this Dimension is slower than some of the PIII-1000 PCs we've seen. You'd probably help performance by increasing RAM to 256MB, but RDRAM is still expensive. Getting the midsize tower PC up and running is simple, thanks to a detailed setup guide, well-labeled rear ports, and an excellent manual. Releasing two latches lets you slide the side panel off easily to gain access to the system's interior. Inside are two open PCI slots and three open drive bays. A Harman Kardon HK595 three-speaker set highlights the multimedia features.

BEST USE: This Dimension XPS-B1000r will please those looking for one of the fastest, most tricked-out systems available.

2 DELL OPTIPLEX GX300

WHAT'S HOT: The Pentium III-866–equipped OptiPlex GX300 scored a blazing 179 on our PC NEW WorldBench 2000. That's about 5 percent above the average for similarly configured systems running Windows

Extra features	Design and expandability [2]	Vendor's system reliability	Tech support quality/ policies	Tech support (hours/days, charge)	Warranty for parts/labor (years)
Outstanding: Dell 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
Very good: Dell NVidia Geforce+ NV10 graphics card with 32MB of SDRAM, 8X/4X/32X CD-RW drive, network card, Microsoft Natural Keyboard, OpenManage Client, case lock	**Good:** tool-free drive bay carriers; midsize tower; 3 open drive bays, 5 open slots	Outstanding	Good/ Outstanding	24/7, toll-free	3/3
Good: Matrox Millennium G400 dual-head graphics card with 32MB of SGRAM, 17X-40X CD-ROM drive, 16X DVD-ROM drive, network card	**Very good:** roomy case; midsize tower; 5 open drive bays, 5 open slots	[3]	Good [3]/Good	24/7, toll-free	Varies [4]/5
Good: Hercules 3D Prophet II GTS graphics card with 64MB of SDRAM, 16X DVD-ROM drive, V.90 modem, Corel WordPerfect Office 2000, Norton Utilities 2000	**Good:** well-organized case; midsize tower; 4 open drive bays, 1 open slot	[3]	Fair [3]/ Outstanding	24/7, toll-free	3/3
Outstanding: Creative Labs NVidia Riva TNT2 graphics card with 32MB of SDRAM, 16X DVD-ROM drive, 8X/4X/32X 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
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	Poor	Fair [3]/Good	24/7, toll-free	3/3
Good: VisionTek NVidia Riva M64 graphics card with 32MB of SDRAM, 20X-48X CD-ROM drive, network card, Microsoft Office 2000 SBE, case lock, LANDesk Client Manager	**Good:** tool-free case removal; midsize tower; 5 open drive bays, 5 open slots	Good	Fair/ Outstanding	24/7, toll-free	Varies [5]/1
Good: Matrox Millennium G400 dual-head graphics card with 16MB of SGRAM, 4X/4X/38X CD-RW drive, network card, ProtectTools 2000, HP EDiagTools	**Good:** easy to access memory; midsize tower; 2 open drive bays, 5 open slots	Good	Fair/Good	24/7, toll-free	3/3
Very good: Creative Labs Annihilator Pro graphics card with 32MB of DDR SGRAM, 8X/4X/32X CD-RW drive, V.90 modem, microphone	**Good:** front-mounted MIDI inputs; midsize tower; 2 open drive bays, 4 open slots	[3]	Fair [3]/Fair	11/5, toll-free	3/lifetime
Good: integrated SiS UltraAGP graphics with 16MB of SDRAM, 10X-24X CD-ROM drive, network card, Lotus SmartSuite, Norton AntiVirus	**Limited:** small footprint; all-in-one case; 0 open drive bays, 1 open slot	Good	Good/Fair	24/7, toll-free	3/1
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 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] Six years on CPU and main RAM, three years on other parts.

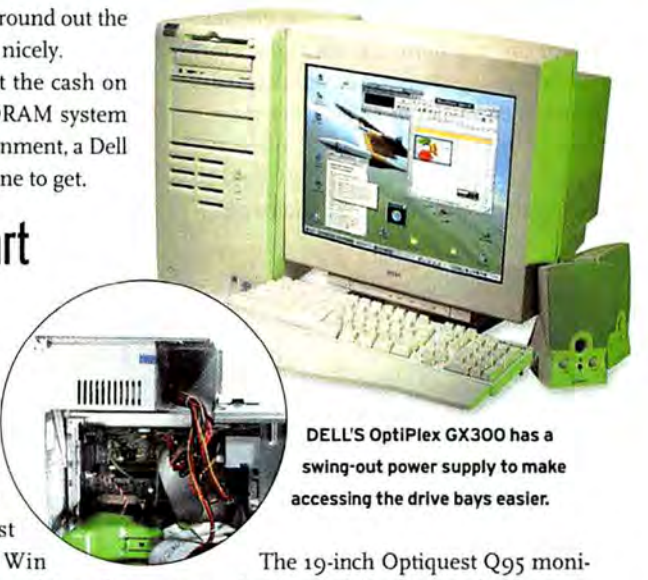
[5] Five years on CPU and main RAM, three years on other parts.

2000 Professional, and slightly higher than the score of the 1000-MHz Dimension in first place on the chart. Opening the wide midsize tower case is a breeze, thanks to a release button on the front of the system. Inside, a swing-out power supply makes access to the three open, tool-free drive bays easy, while the five open PCI slots are totally clear of obstructions. Dell's 19-inch UltraScan P991 monitor produces bright, rich colors and crisp text. **WHAT'S NOT:** The $3322 price attached to this OptiPlex is attributable partly to the 128MB of RDRAM, which means future memory upgrades won't be cheap either. **WHAT ELSE:** The Microsoft Natural Keyboard bundled with this OptiPlex permits smooth, comfortable, quiet typing, while the 8X/4X/32X CD-RW drive adds a speedy backup option. Chassis-intrusion detection, a case lock, a network interface card (with Wake-on-LAN support), and the included OpenManage Client remote administration software round out the set of corporate features nicely. **BEST USE:** If you've got the cash on hand to invest in an RDRAM system for your corporate environment, a Dell OptiPlex GX300 is the one to get.

New on the Chart

3 SYS PERFORMANCE 1000A

NEW WHAT'S HOT: Raw speed is this 1-GHz Athlon system's strength: It posted a 197 on PC WorldBench 2000 tests—the highest score we've seen for a Win 2000 Pro system. Its network interface card supports Wake-on-LAN, and the five open PCI slots and five open drive bays in the neat and spacious interior provide ample expansion room.



DELL'S OptiPlex GX300 has a swing-out power supply to make accessing the drive bays easier.

The 19-inch Optiquest Q95 monitor displayed rich colors and crisp text. Characters blurred only a little at a resolution of 1600 by 1200—the maximum that the Matrox Millennium G400 graphics card could handle. ▶

PHOTOGRAPHS: RICK RIZNER

Intel's 820E Chip Set: Another Try

TECH TREND INTEL WOULD PROBABLY like to forget the debacle it endured shortly after introducing its 820 chip set: It ended up replacing many motherboards because of problems with the memory translator hub. Plus, recent tests by *PC World* (see www.pcworld.com/aug00/rambus) have shown that the much more expensive RDRAM (the main type of memory designed for use with the 820 chip set) performs little better than standard SDRAM. So what's in the recently released 820E chip set that makes it worth getting?

"The difference between the 820 and the 820E is that the 820E has the second iteration of the I/O controller hub, called ICH2," says Dan Francisco, a spokesperson for Intel. "What the 820E gives you is some system performance benefits, and it gives the vendor and customer some flexibility." The new version of the ICH hub contains an additional USB controller (which allows four USB ports), dual controllers for the faster hard-drive standard ATA/100, and six-channel audio capability. It also includes support for the new AGP4X standard, which doubles the speed at which the graphics card can access the system's main memory (assuming that the graphics card supports AGP4X).

The new chip set also includes built-in networking, which can be used for either 10/100-mbps ethernet or the new 1-mbps Home PNA networking standard.

WHAT'S NOT: There is no system manual, but manuals for the components are included. The $2699 price doesn't buy you any business software: Adding Microsoft Office 2000 SBE ups the price by $219.

WHAT ELSE: If you need dual monitors, the Matrox Millennium G400 graphics card can run both of them at the same time—you could display a text document on one and a graphics file on the other.

BEST USE: With exceptional speed and high-end attributes, this Sys would be right at home in any small or home office.

THE SYS PERFORMANCE 1000A houses AMD's speedy 1-GHz Athlon chip and Matrox's Millennium G400 graphics card, which can drive two monitors at once.

4 XI K1000 MTOWER

NEW **WHAT'S HOT:** For $2499, you get your money's worth with the Xi K1000 MTower. Powered by a 1-GHz Athlon processor, this computer earned an impressive 171 on our PC WorldBench 2000 tests—the highest score of any computer running Windows 98 that we've tested. The system employs a 3D Prophet II GTS graphics card with 64MB of SDRAM and an Optiquest Q95 19-inch monitor, which provides rich colors and sharp text.

WHAT'S NOT: The midsize tower case (with interchangeable color panels on the front) has just one empty PCI slot, which severely limits your expansion options.

WHAT ELSE: Opening the case requires only flipping two switches, and the neat interior offers easy access to the four open drive bays. A detailed system manual contains lots of useful information, including a thorough FAQ section. The K1000 MTower comes with a Logitech Internet keyboard-and-mouse combo, which allows smooth but slightly clacky typing. The centerpiece of the PC's business software bundle is Corel WordPerfect Office 2000.

BEST USE: Whether you want strong performance for your small office or an excellent presentation machine, this Xi is it.

10 IBM NETVISTA X40

NEW **WHAT'S HOT:** The sleek, compact, black, all-in-one NetVista X40 could improve the aesthetics of almost any desktop. Both the floppy drive and the laptop-style 10X–24X CD-ROM drive pop up into the undercarriage of the flat-panel display. Five USB ports and a network port (with Wake-on-LAN) provide an abundance of expansion options.

WHAT'S NOT: The NetVista lacks a reset button, and upgrading could be problematic: No drive bays are open, and reaching the one open, low-profile PCI slot requires that you remove four screws and take off pieces of the case. Running Windows 2000 Pro on a Pentium III-667, this NetVista earned a lackluster PC WorldBench 2000 score of 150—8 points lower than the score of a similarly equipped PIII-650.

WHAT ELSE: Thanks to a helpful setup poster, assembling the NetVista couldn't be easier. Colors on the 15-inch flat-panel monitor displayed richly (for a flat panel), with crisp text at 1024 by 768.

BEST USE: If you're looking to spend what it takes to save desk space, the $2499 NetVista should do it. (Note: Since we reviewed this model, IBM has replaced it with a Pentium III-800–based system at the lower price of $2399.)

Also of Note

TANGENT DIDN'T hold much back with its Medallion ProDV 1-GHz PC. It comes with a 46GB hard drive, a FireWire card with two ports, and 256MB of SDRAM. An excellent PC WorldBench 2000 score of 184 wasn't enough to offset the high $3295 cost, so it missed the chart. ▶

ILLUSTRATION: DOUG ROSS

MORE REVIEWS ONLINE

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THE FOLLOWING SYSTEM didn't score high enough to reach the *Top 10 Power PCs* chart. For a write-up, visit PCWorld.com (www.pcworld.com/t10pcs).

◆ Tangent Medallion ProDV

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PC WORLD

TOP 10 MIDRANGE PCs

	SYSTEM: $1200 TO $1999	Month tested	★ Overall rating	Street price (8/13/00)	PC WorldBench 2000 performance score [1] (Faster)	Base configuration
1	Dell Dimension 4100 800/388-8542 www.dell.com	Oct 00	91	Average: $1779	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	Oct 00	89	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	Compaq Deskpro EX 800/345-1518 www.compaq.com	NEW	88	Average: $1705	Outstanding 193	**Outstanding:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 15GB hard drive, 19-inch monitor, Windows NT 4.0
4	Gateway GP7-800 800/315-2536 www.gateway.com	June 00	88	Average: $1763	Outstanding 156	**Outstanding:** Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, 19-inch monitor, Windows 98 SE
5	Micro Express MicroFlex 900A 800/989-9900 www.microexpress.net	Sept 00	86	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	Systemax PVW-T733 Venture PC 888/450-7703 www.systemaxpc.com	Oct 00	86	Inexpensive: $1389	Very good 148	**Good:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, 17-inch monitor, Windows 98 SE
7	ABS Conquest GL 800/876-8088 www.buyabs.con	Sept 00	86	Average: $1439	Very good 150	**Outstanding:** Athlon-850, 128MB of SDRAM, 512KB L2 cache, 20GB hard drive, 19-inch monitor, Windows 98 SE
8	NuTrend Business Athlon 1 800/482-6678 www.nutrend.com	NEW	85	Average: $1449	Very good 142	**Very good:** Athlon-800, 128MB of SDRAM, 512KB L2 cache, 30GB hard drive, 17-inch monitor, Windows 98 SE
9	Sys TaskMaster 600D 800/613-9963 www.sys.com	Oct 00	84	Inexpensive: $1255	Good 159	**Good:** Duron-600, 128MB of SDRAM, 64KB L2 cache, 20.5GB hard drive, 17-inch monitor, Windows 2000 Pro
10	Polywell Poly 830 700K7 800/999-1278 www.polywell.com	NEW	82	Inexpensive: $1299	Good 136	**Good:** Duron-700, 128MB of SDRAM, 64KB L2 cache, 20.5GB 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. For more details see "Your Guide to the Top 100" on page 201.

[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).

EVEN A $120 PRICE increase couldn't knock Dell's Dimension 4100 out of first place this month, and three new systems earn spots on the chart. Compaq's DeskPro EX debuts at number three, NuTrend's Business Athlon 1 lands at number eight, and Polywell's Poly 830 700K7 sneaks in at number ten. Meanwhile, Gateway knocks a chunk of change off its GP7-800 to boost that system to fourth place from last month's seventh place.

1 DELL DIMENSION 4100

WHAT'S HOT: Equipped with a Pentium III-800EB CPU, the Dimension 4100 earned a healthy 154 on our PC WorldBench 2000 tests, near the top in performance among similarly configured Windows 98 machines. The system offers many extras rarely found at this midrange price, including the top-of-the-line NVidia GeForce2 graphics board and a 17-inch Dell M780 monitor, which delivered vibrant colors and crisp text (albeit with some blurring at the maximum resolution of 1280 by 1024). *PC World* readers gave Dell an outstanding reliability rating.

WHAT'S NOT: A $120 price hike is significant, and the system does not come with either a CD-RW or a DVD-ROM drive.

WHAT ELSE: A large reference-and-troubleshooting guide provides lots of detailed system info, and an intuitive setup poster makes it a snap to put this system together. But even with thumbscrew access, removing the side panel of this lanky midsize tower took some work. The interior is a bit cluttered, but it offers three open PCI slots and four open bays for expansion.

BEST USE: With fine performance for the price, this Dell would fit well into any office. (Note: Our review system came with a Microsoft Natural Keyboard and Microsoft Office 2000 Pro, but Dell now ships the model with a Dell QuietKey keyboard, Microsoft Office 2000 Small Business Edition, and Norton AntiVirus 2000.)

2 MICRO EXPRESS MICROFLEX 8A

WHAT'S HOT: Fueled by a PIII-800EB processor, the MicroFlex 8A earned a score of 153 on our PC WorldBench 2000 tests, above the norm for similar systems.

WHAT'S NOT: Colors on the Impression 7VX 17-inch monitor were rich but appeared rather dark. Text blurred slightly at

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: Dell NVidia GeForce2 GTS graphics card with 32MB of DDR SGRAM, 20X-48X CD-ROM drive, V.90 modem, Microsoft Office 2000 Professional	**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, composite and S-Video output, Microsoft Office 2000 Small Business Edition	**Good:** easy interior access; midsize tower; 4 open drive bays, 4 open slots	[3]	Fair [3]/ Outstanding	24/7, toll-free	4/4
Good: Mitac NVidia M64 Pro graphics card with 16MB of SDRAM, 20X-48X CD-ROM drive, network card, Compaq Intelligent Manageability	**Satisfactory:** easy-service case; midsize tower; 2 open drive bays, 2 open slots	Good	Fair/ Good	24/7, toll-free	3/1
Good: VisionTek NVidia Riva TNT2 graphics card with 32MB of SDRAM, 17X-40X CD-ROM drive, network card, Microsoft Office 2000 SBE, Microsoft IntelliPoint Mouse	**Good:** roomy, easy-access case; tower; 6 open drive bays, 3 open slots	Good	Fair/ 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 memory slots; midsize tower; 4 open drive bays, 3 open slots	[3]	Fair [3]/ Outstanding	24/7, toll-free	4/4
Good: 3dfx Voodoo3 2000 AGP graphics card with 16MB of SDRAM, 10X DVD-ROM drive, V.90 modem, Microsoft Office 2000 SBE, Microsoft Natural Keyboard	**Very good:** room for expansion; midsize tower; 4 open drive bays, 3 open slots	[3]	Fair [3]/ Good	24/7, toll-free	Varies [4]/1
Good: Guillemot Cougar Video Edition graphics card with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem, Corel WordPerfect Office 2000	**Very good:** neat, roomy interior; midsize tower; 4 open drive bays, 4 open slots	[3]	Fair [3]/ Fair	11/5, toll-free	3/lifetime
Very good: Guillemot Maxi Gamer Cougar graphics card with 32MB of SDRAM, 32X-52X CD-ROM drive, V.90 modem, network card, Microsoft Office 2000 SBE	**Very good:** roomy, well-organized interior; midsize tower; 4 open drive bays, 3 open slots	[3]	Fair [3]/ Good	24/7, toll-free	3/lifetime
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	[3]	Good [3]/ Good	24/7, [5] toll-free	Varies [4]/5
Very good: Guillemot 3D Prophet graphics card with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem, 8X/4X/32X CD-RW drive, Lotus SmartSuite Millennium Edition	**Good:** noisy keyboard; midsize tower; 3 open drive bays, 5 open slots	[3]	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		

[3] 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] Five years on CPU and main RAM, three years on other parts.

[5] Support hours drop to 9 hours Monday-Friday after one year.

[4] Six years on CPU and main RAM, three years on other parts.

the monitor's maximum resolution of 1600 by 1200. Micro Express keeps costs down on this system by bundling no software with it; most users will want to add at least a basic office suite.

WHAT ELSE: The ATI Rage Fury Pro graphics card offers S-Video and composite output for connecting to a VCR or TV. A spiral-bound system manual contains thorough information. Opening the basic midsize 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.

BEST USE: This sturdy, no-frills PC is fine for any general business computing need.

New on the Chart

3 COMPAQ DESKPRO EX

NEW **WHAT'S HOT:** With a PIII-733 processor running Windows NT 4.0, this midsize tower earned an impressive score of 193 on our PC WorldBench 2000 tests, surpassing the similarly configured HP Vectra VL600 by 3 points. The 19-inch Compaq S910 monitor delivered deep, rich colors, and text stayed sharp at all resolutions, even at the monstrously high maximum of 1920 by 1200.

WHAT'S NOT: The Deskpro EX lacks a reset button, and gaps showed both above and below the basic 20X–48X CD-ROM drive. Extras are limited, with integrated audio and video and only a 15GB hard drive.

WHAT ELSE: The front of the PC says "Deskpro," but the system is a renamed Prosignia (see the budget Top 10 "Also of Note," page 212). The unit lacks the Deskpro's heavy-duty management features, though it supports DMI and comes with Compaq's Intelligent Manageability software. The rear ports—and the space around them—are plastered with color, making setup easy. The good documentation includes an overall system manual and a safety-and-comfort guide. Expansion options are limited, with two open PCI slots and two open drive bays—which do allow easy, tool-free drive installation, however. The sturdy keyboard ▶

THE COMPAQ DESKPRO EX provides an alluring mix of a good price and impressive performance.

PHOTOGRAPH: RICK RIZNER

FireWire Still Smoldering

TECH TREND THIS MONTH WE'VE seen two new business systems with FireWire capabilities: the midrange ABS Conquest 2000 and the power Tangent Medallion ProDV.

FireWire—more properly known as IEEE 1394—was designed to be a quicker, more flexible alternative to USB as a high-speed standard for connecting peripherals. But even on high-end Apple Mac computers, which have included a FireWire port for several years, this high-speed bus has claimed its niche only as a port for digital cameras and camcorders. (FireWire is Apple Computer's trademarked name, but it's easier to remember than IEEE 1394; Sony calls its version iLink.)

FireWire's chief benefit is speed: While USB runs at 12 megabits per second, FireWire can deliver data rates of up to 400 mbps. That makes FireWire well suited for peripherals that transfer lots of data, such as scanners and digital video cameras. The majority of devices don't need the extra speed, however, and very few peripherals vendors use FireWire interfaces in their products. For the moment, it remains a niche feature for digital video use. Nevertheless, the research firm Cahners In-Stat reports 300 percent growth in the FireWire market from 1998 to 1999, and even greater expansion is expected.

permits smooth, quiet typing and has eight programmable multimedia buttons.
BEST USE: The Deskpro EX is a good fit for small to medium-size offices looking for performance at a lower price than Compaq asks for its corporate Deskpros.

8 NUTREND BUSINESS ATHLON 1

NEW **WHAT'S HOT:** Assembling the Business Athlon 1 is simple, thanks to the excellent setup poster and color-coded rear ports. A Microsoft Internet Keyboard with nine programmable buttons facilitates smooth, quiet typing. The system comes with both a modem and a network interface card and is bundled with Microsoft Office 2000 Small Business Edition.
WHAT'S NOT: Powered by an Athlon-800 processor, the Business Athlon 1 scored 142 on our PC WorldBench 2000 tests—just under the average for similarly configured systems. We rated the service we received in our anonymous calls to NuTrend's tech support lines only Fair.
WHAT ELSE: The Guillemot Maxi Gamer Cougar graphics card and ViewSonic E771 17-inch monitor delivered vibrant colors in our test images and crisp text at normal resolutions; the display began to blur only at the E771's maximum resolution of 1280 by 1024. The sturdy side panel slides on and off smoothly, and inside cabling is neatly tied away for easy access to the three open PCI slots and four open bays.
BEST USE: The connectivity and software bundle included with this reasonably priced, reasonably fast NuTrend make it a likely option for a small office—as long as top-notch support is not a priority.

CARRYING BOTH A NETWORK CARD and a V.90 modem, the NuTrend Business Athlon 1 provides a strong package for a small business.

10 POLYWELL POLY 830 700K7

NEW **WHAT'S HOT:** Powered by AMD's new Duron 700-MHz budget processor, this Poly 830 700K7 scored 136 on our PC WorldBench 2000 tests, just a few points below the average for PIII-700 PCs. The entire case comes off smoothly for interior access. Inside, you'll find abundant expansion room, with five open PCI slots and three open bays.
WHAT'S NOT: The Polywell keyboard is clacky, and its <Backspace> key is annoyingly small. The Optiquest Q71 17-inch monitor displayed deep and rich colors, but text became quite blurry at a resolution of 1280 by 1024.
WHAT ELSE: The software bundle includes Lotus SmartSuite Millennium Edition, and the system comes with a 10X DVD-ROM drive. A modem provides the only connectivity option.
BEST USE: At a near-budget price of $1299 with midrange speed, this Poly would settle nicely into any small office.

Also of Note

LEGACY-FREE PROVED the theme for the $1299 Acer Veriton 5100 (with four USB ports) and the $1749 ABS Conquest 2000 (with three FireWire ports). Each offers some nice extras: The Acer includes chassis-intrusion detection, and the ABS has a dual-head graphics board, but slow performance on PC WorldBench 2000 tests kept these models off the chart.

Powered by a PIII-733, the $1899 Sys Tech Performance 733 earned a 169 on our PC WorldBench 2000 tests, while the $1799 NuTrend Athlon Ultra 2 scored 151. However, the high sticker prices kept both systems out of the Top 10 this month. ▶

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).

- ABS Conquest 2000
- Acer Veriton 5100
- NuTrend Athlon Ultra 2
- Sys Tech Performance 733

PHOTOGRAPH ABOVE: MARC SIMON; PHOTOGRAPH BELOW: RICK RIZNER

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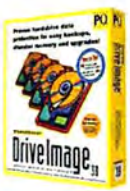

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PC WORLD

TOP 10 BUDGET PCs

	SYSTEM: UNDER $1200	Month tested	★ Overall rating	Street price (8/13/00)	PC WorldBench 2000 performance score [1] (Faster)	Base configuration
1	Micro Express MicroFlex 600A 800/989-9900 www.microexpress.net	June 00	88	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: $1169	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	Dell OptiPlex GX100 800/388-8542 www.dell.com	Sept 00	85	Average: $1094	Good 111	**Good:** Celeron-600, 64MB of SDRAM, 128KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
5	NuTrend Athlon Force 2 800/482-6678 www.nutrend.com	June 00	82	Average: $1099	Very good 133	**Very good:** Athlon-650, 128MB of SDRAM, 512KB L2 cache, 15GB hard drive, 17-inch monitor, Windows 98 SE
6	Compaq Deskpro EXS 800/345-1518 www.compaq.com	(NEW)	79	Average: $1090	Satisfactory 106	**Good:** Celeron-566, 64MB of SDRAM, 128KB L2 cache, 10GB hard drive, 17-inch monitor, Windows 98 SE
7	Amax MicroPlex 5000 800/800-6328 www.amax.com	Apr 00	76	Average: $949	Poor 96	**Good:** Celeron-533, 64MB of SDRAM, 128KB L2 cache, 10.2GB hard drive, 17-inch monitor, Windows 98 SE
8	AcerPower 8400 800/733-2237 www.acer.com	May 00	75	Average: $1079	Satisfactory 104	**Good:** Pentium III-500, 64MB of SDRAM, 512KB L2 cache, 10.2GB hard drive, 17-inch monitor, Windows 98 SE
9	Toshiba V3100 800/867-4422 www.buy.toshiba.com	Mar 00	75	Inexpensive: $890	Satisfactory 99	**Satisfactory:** Celeron-500, 64MB of SDRAM, 128KB L2 cache, 8.5GB hard drive, 17-inch monitor, Windows 98 SE
10	NEC PowerMate ES Slimline 888/863-2669 www.nec-computers.com	Aug 00	72	Expensive: $1188	Satisfactory 106	**Very good:** Celeron-533, 128MB of SDRAM, 128KB L2 cache, 10GB 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 201.

[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).

IT'S DÉJÀ VU at the top of the budget chart this month. Micro Express holds on to the first and third spots with well-rounded systems, and NuTrend retains second place with leading-edge performance. Only one newcomer earns a place in the elite ten: Compaq's Deskpro EXS pops up at number six. Designed for use in small to medium-size businesses, the Deskpro EXS is one of several replacements for PCs in Compaq's now-defunct Prosignia line.

1 MICRO EXPRESS MICROFLEX 600A

WHAT'S HOT: Micro Express's MicroFlex 600A keeps its grip on the Best Buy title for the sixth straight month with a fine balance of moderate price and solid performance. The system's Athlon-600 processor propelled it to a noteworthy score of 134 on our PC WorldBench 2000 tests, not far behind the fastest machine on the chart, NuTrend's second-place Athlon Special 2. The Microsoft Natural Keyboard included with our MicroFlex 600A may return overstressed wrists to comfortable, quiet typing. The midsize tower's uncluttered interior has three open PCI slots and four available drive bays ready to accommodate a host of expansion options.

WHAT'S NOT: This well-rounded computer is hard to knock, although business users might wish that it came with a network card instead of a modem for expanded connectivity possibilities.

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, where it began to blur slightly. The ATI Rage Fury graphics card offers S-Video and composite output—boons for presenters, who can connect the system to a television set or a video recorder. The included 6X DVD-ROM drive is a pleasant surprise at this unit's bargain price. We've received relatively few comments on the reliability of Micro Express systems, but in this area no news may be good news.

BEST USE: The Micro Express MicroFlex 600A is an excellent general-use system for a small office looking to pick up performance on a shoestring.

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, Microsoft Natural Keyboard	**Very good:** easy interior access; midsize tower; 4 open drive bays, 3 open slots	[2]	Fair [2]/ Outstanding	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	[2]	Fair [2]/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	[2]	Fair [2]/ Outstanding	24/7, toll-free	4/4
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: ATI Rage 128 graphics card with 16MB of SDRAM, 8X DVD-ROM drive, V.90 modem, Corel WordPerfect Office 2000	**Good:** neat interior; midsize tower; 4 open drive bays, 4 open slots	[2]	Fair [2]/Good	24/7, toll-free	3/lifetime
Good: integrated Intel 815 graphics with 4MB AGP display cache, 20X-48X CD-ROM drive, network card, Microsoft Office 2000 SBE, Compaq Intelligent Manageability	**Satisfactory:** tidy interior; compact; 2 open drive bays, 2 open slots	Good	Fair/Good	24/7, toll-free	3/1
Good: integrated Intel 810 graphics with UMA, 8X DVD-ROM drive, network card	**Good:** well-kept interior; minitower; 2 open drive bays, 0 open slots	[2]	Poor [2]/Good	24/7, toll-free	3/1
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:** neat interior; minitower; 3 open drive bays, 2 open slots	Poor	Fair [2]/Good	24/7, toll-free	3/3
Good: integrated Intel 810 graphics with UMA, 17X-40X CD-ROM drive, network card	**Satisfactory:** well-organized interior; minitower; 2 open drive bays, 2 open slots	[2]	Good [2]/Good	24/7, toll-free	1/1
Satisfactory: integrated Intel 810 graphics with UMA, 20X-40X CD-ROM drive, network card, chassis-intrusion detection	**Satisfactory:** cramped case; compact; 0 open drive bays, 3 open slots	Fair [2]	Good [2]/ Outstanding	24/7, toll-free	3/3
Extra features: 10 percent	Design and expandability: 15 percent	Reliability: 15 percent	Support and warranty: 15 percent		

[2] 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.

2 NUTREND ATHLON SPECIAL 2

WHAT'S HOT: The NuTrend's Athlon-750 processor powered the machine to a PC WorldBench score of 140; the system handily outpaced all other systems on the budget chart. A 10X DVD-ROM drive and an Altec Lansing ACS33 three-speaker set are nice finds at this PC's $1169 price. Though you have to remove two screws to take off the side of the basic midsize tower, the panel slides on and off smoothly, providing easy access when you want to install new memory or add-in cards. The fairly neat interior offers four open PCI slots and four open bays for expansion.

WHAT'S NOT: While text looked sharp at 1024 by 768 resolution on the 17-inch Lite-On B1770 NSL monitor, the colors in our test images appeared washed out. As is the case with Micro Express, we've received few comments on the reliability of NuTrend systems.

WHAT ELSE: A large binder houses all the documentation and software, including Corel's WordPerfect Office 2000, but the system manual itself contains primarily generic information. The multimedia keyboard feels solid and allows smooth (albeit a bit clacky) typing; it comes with lots of programmable buttons.

BEST USE: The NuTrend Athlon Special 2 makes a fine choice for any experienced business-PC user looking for performance on the cheap.

New on the Chart

6 COMPAQ DESKPRO EXS

NEW **WHAT'S HOT:** With Microsoft Office 2000 Small Business Edition installed and an attractive $1090 price, the Deskpro EXS is clearly intended for the home office or small business looking for a complete system in a small package. Opening the EXS to add memory or PCI expansion cards proved simple: You can free the entire desktop-style case for removal by turning latches on either side of the machine. Cramped but neat, the ▶

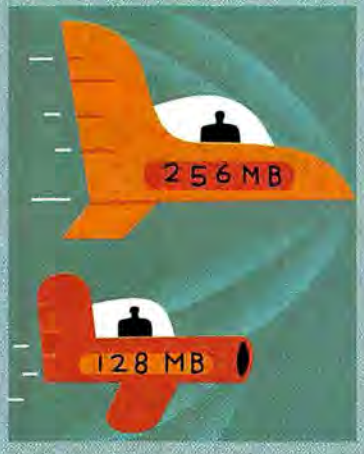
COMPAQ'S DESKPRO EXS offers small-business features for a budget price.

PHOTOGRAPHS: RICK RIZNER

Future-Proof Your PC With More RAM

TECH TREND THE MINIMUM AMOUNT of system memory required to run today's applications seems to increase day by day. For some time now, we've recommended 64MB as the absolute rock bottom, but we may soon have to up that figure to 128MB. Today, buying extra memory or making sure that your new machine comes well stocked with RAM looks like a good idea for smooth computing as well as a fiscally sound decision.

"We're in a state of flat memory pricing," says Jim Handy, an analyst at the research firm Dataquest. "There is a possibility that memory prices will go up next year by as much as 30 percent—it's happened before. Because of that, now is as good a time to buy as next year, if not better," he says. The memory market moves in cycles, he explains, and Dataquest doesn't expect the bottom to fall out again until 2003.



So if you want to prepare your PC for the next few years of memory demands, you'll need to anticipate your system's minimum required RAM. No doubt you can manage to use programs with 64MB, but things tend to slow down if you run more than one program at a time, so consider raising memory to 128MB or even 256MB if you can afford it.

Handy says that the average PC today leaves the manufacturer with 100MB of memory, and that users tend to increase their system's RAM by roughly 45 percent a year. Consequently, to prepare your computer for next year's demands, you'll want about 150MB, he says; to keep up for two years, you'll want around 220MB.

Deskpro's interior supports a surprising level of expandability—two open PCI slots and two open bays. Integrated networking would probably have been a better choice for this machine, but the network interface card installed in one of the PCI slots provides users with flexibility. The keyboard permits smooth and comfortable typing, and it includes eight programmable multimedia buttons.

WHAT'S NOT: The system lacks a reset button, and the components are strictly no-frills: integrated audio and video (from Intel's 815E chip set, with the optional 8MB AGP Graphics Performance Accelerator card), a plain 20X–48X CD-ROM drive, and just 64MB of RAM. Colors on the 17-inch Compaq S710 monitor looked light, and text appeared a bit fuzzy at lower resolutions and blurred significantly at the maximum resolution of 1280 by 1024.

WHAT ELSE: Powered by a Celeron-566 CPU, the Deskpro EXS scored 106 on our PC WorldBench 2000 tests, 2 points above the average for Celeron-533 systems running Windows 98 SE with 128MB of RAM. Although the Deskpro EXS isn't really optimized for a corporate environment, it has remote-management capabilities (such as Wake-on-LAN and DMI) and comes with a copy of Compaq's Intelligent Manageability software. In our anonymous calls to the Compaq tech support line, we received good service.

BEST USE: For small and medium-size companies whose business runs on mainstream applications, the Deskpro EXS is a safe, solid choice.

Also of Note

THE SYS TASKMASTER 600D, which landed in fourth place on last month's budget chart, has migrated to the midrange chart (where it finishes at number nine) following a price increase of $66. Also, Dell trimmed the tab of its number four OptiPlex GX100 model by $75, pushing that system's price down to $1094.

Meanwhile, we are still seeing only a limited number of systems launched that use AMD's new Duron processor. Although the chip does seem to provide strong performance, AMD is concentrating its efforts more on the high end, with the new enhanced Athlon, and the company has only recently started manufacturing the Duron in large quantities. However, *PC World* will be reviewing Duron-based systems over the next few months, including some that are based on a new addition to the Duron family of processors that runs at a speedy 750 MHz.

It's the end of the line for Compaq's small-business–directed Prosignias. Compaq Computer is consolidating all of its business PCs under the better-known Deskpro moniker, so systems previously known as Prosignias will now become Deskpros. Both the Deskpro line and the Armada notebook line will include an S series, which will offer software, support, extended warranties, and prices all applicable to small businesses, according to Karan Sangha, director of customer experience at Compaq. This month we review both the midrange Deskpro EX (which supports full remote management and comes without business software) and the budget Deskpro EXS (which comes with Microsoft Office 2000 Small Business Edition and is aimed at small-business and home-office users).

"Our perspective is that it is very important to simplify the choices we present to the customer—not limit, but simplify," says Sangha. In other words, Compaq customers probably had trouble distinguishing between the two lines. ▶

THE MICRO EXPRESS MICROFLEX 600A extends its run at the top of the chart to six straight months.

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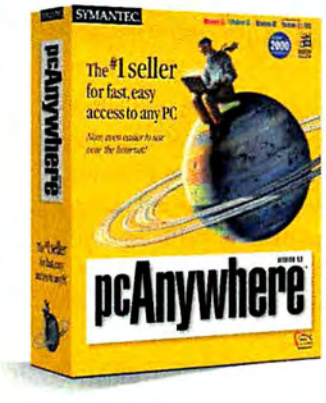

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PC WORLD

TOP 15 NOTEBOOK PCs

	POWER NOTEBOOK: $2700 AND OVER	Month tested	★ Overall rating	Street price (8/11/00)	PC WorldBench 2000 performance score (Faster ▶)	Base configuration
1	**Dell Latitude CPx J750GT** 800/388-8542 www.dell.com	Sept 00	90	Expensive: $3802	Outstanding 153	**Very good:** Pentium III-750/600, 14.1-inch active screen, touchpad, eraserhead, 128MB of SDRAM, 18GB hard drive, Windows 2000 Pro
2	IBM ThinkPad T20 800/426-7255 ext. 4751 www.ibm.com/thinkpad	Sept 00	89	Average: $3349	Good 136	**Good:** Pentium III-700/550, 14.1-inch active screen, eraserhead, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
3	Gateway Solo 9300XL 800/846-2000 www.gateway.com	Sept 00	89	Average: $3420	Very good 145	**Outstanding:** Pentium III-700/550, 15.7-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 2000 Pro
4	Micron TransPort LT 800/642-7667 www.micronpc.com	Sept 00	85	Average: $3599	Very good 146	**Good:** Pentium III-650/500, 13.3-inch active screen, touchpad, 128MB of SDRAM, 10GB hard drive, Windows 2000 Pro
5	HP OmniBook 900 800/462-8947 www.hp.com	June 00	84	Inexpensive: $2799	Good 132	**Good:** Pentium III-650/500, 13.3-inch active screen, touchpad, eraserhead, 64MB 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	**HP Pavilion N3390** 800/462-8947 www.hp.com	NEW	87	Inexpensive: $2199	Very good 123	**Very good:** Pentium III-600/500, 14.1-inch active screen, touchpad, 128MB of SDRAM, 10GB hard drive, Windows 98 SE
2	IBM ThinkPad A20m 3SU 800/426-7255 ext. 4751 www.ibm.com/thinkpad	NEW	87	Average: $2268	Good 113	**Good:** Celeron-500, 15-inch active screen, eraserhead, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
3	Acer TravelMate 602TER 800/733-2237 www.acer.com/aac	Sept 00	86	Average: $2400	Very good 127	**Very good:** Pentium III-650/500, 13.3-inch active screen, touchpad, 128MB of SDRAM, 12GB hard drive, Windows 98 SE
4	Chem USA ChemBook 8400 800/866-2436 www.chemusa.com	Oct 00	85	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
5	HP Omnibook 6000 800/462-8947 www.hp.com	Sept 00	85	Expensive: $2499	Very good 129	**Very good:** Pentium III-600/500, 14.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 6GB hard drive, Windows 2000
	BUDGET NOTEBOOK: UNDER $2000	Percent of overall rating ▶		Price: 17 percent	Performance: 17 percent	Base configuration: 5 percent
1	**IBM ThinkPad I Series 1230** 800/426-7255 ext. 4751 www.ibm.com/thinkpad	Oct 00	92	Inexpensive: $1349	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	Oct 00	92	Average: $1658	Very good 109	**Satisfactory:** Celeron-500, 12.1-inch active screen, touchpad, eraserhead, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
3	Sceptre Soundx S7300 800/788-2878 www.sceptre.com	NEW	86	Expensive: $1909	Very good 115	**Very good:** Pentium III-600/500, 13.3-inch active screen, touchpad, 64MB of SDRAM, 6GB hard drive, Windows 98 SE
4	Compaq Armada 100S 800/345-1518 www.compaq.com	NEW	85	Average: $1499	Satisfactory 85	**Good:** AMD K6-2-533, 13.3-inch active screen, touchpad, 64MB of SDRAM, 5GB hard drive, Windows 98 SE
5	Dell Inspiron 3800 C500 GW 800/388-8542 www.dell.com	June 00	85	Average: $1767	Good 101	**Good:** Celeron-500, 14.1-inch active screen, touchpad, eraserhead, 64MB 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.

WHAT'S FLAT as a pancake, not much heavier, and a whole lot better at running applications? A new thin-and-light laptop from Sceptre or Gateway. The Sceptre Soundx S7300 and the Gateway Solo 3300 don't break new ground in the ultraportable category, but either makes a swell choice if you live out of a suitcase. The $1909 Soundx, which earned the number three slot on our budget chart, weighs 4.4 pounds without external CD-ROM and floppy drives or an AC adapter. A 1-pound slice ($199) adds drive bays and IEEE 1394 connections. Hobbled by its higher price and slower processor, the $2373 Solo 3300 just missed making our midrange list. Nevertheless, this metallic blue, 3.7-pound superslim—Gateway's first—is a choice worth considering if portability tops your priorities.

Three other newly tested notebooks join our charts this month. HP's consumer

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	**Excellent:** 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**
Very good: single multipurpose bay, 6X DVD-ROM drive, built-in modem	**Very good:** travel ThinkPad adds Bluetooth port and access to great electronic manual	**Good/ 3:21**	**Light/ 6.5**	**Good**	**Good/ Fair**	**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/ Good**	**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	**Average:** 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]/1**
Satisfactory: single multipurpose bay, PC Card modem, 12X-24X CD-ROM drive	**Very good:** subnotebook stashes drives in external caddy	**Satisfactory/ 2:44**	**Light/ 6.6**	**Good**	**Good [3]/ Fair**	**24/7, toll-call**	**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**		
Satisfactory: 6X DVD-ROM drive, built-in modem	**Average:** plays CDs without turning notebook on, but audio buttons a little hard to press	**Satisfactory/ 2:31**	**Average/ 7.8**	**Good**	**Good [3]/ Poor**	**24/7, toll-call**	**1/1**
Good: single multipurpose bay, 10X-24X CD-ROM drive, built-in modem, built-in NIC	**Very good:** all-in-one desktop replacement with great ThinkPad keyboard	**Good/ 3:21**	**Average/ 7.7**	**Good**	**Good/ Fair**	**24/7, toll-free**	**1/1**
Very good: single multipurpose bay, 4X/2X/20X CD-RW drive, built-in modem, built-in NIC, Microsoft 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 [6]**	**1/3**
Very good: 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**
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/ Good**	**24/7, toll-free**	**1/1**
Satisfactory: 10X-24X CD-ROM drive, built-in modem, built-in NIC	**Average:** includes full set of ports; slice adds internal bays and IEEE 1394 ports	**Good/ 3:07**	**Light/ 6.8**	[5]	**Good [3]/ Fair**	**9/5, toll-free**	**1/1**
Poor: 10X-24X CD-ROM drive, built-in modem, Microsoft Word 2000	**Limited:** basic and compact; nonremovable floppy and CD-ROM drives; so-so sound	**Satisfactory/ 2:52**	**Average/ 7.6**	**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/ Good**	**24/7, 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.

[6] Support toll-free from 8:30 a.m. to 5:30 p.m. PST; toll call at other times.

notebook-cum-portable CD player, the Pavilion N3390, wins the top spot on our midrange chart, and IBM's ThinkPad A20m 3SU, a low-end model in the company's new desktop replacement line, follows closely. Compaq's Notebook 100, last seen on September's budget chart, reappears in burlier form this month as the Armada 100S. The 100S boasts a bigger screen and a more powerful AMD processor at a somewhat higher cost ($1499).

Contributing Editor Carla Thornton regularly covers notebooks for PC World.

FULL REVIEWS ONLINE

online

FOR DETAILED write-ups of all the new notebooks that we tested this month, visit PCWorld.com (www.pcworld.com/top400).

THE IBM THINKPAD A20m 3SU offers desktop replacement flexibility for a midrange price.

PHOTOGRAPH: RICK RIZNER

PC WORLD

TOP 15 HOME PCs

	POWER SYSTEM: $2000 AND OVER	Month tested	★ Overall rating	Street price (8/11/00)	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	Very good 158	**Very good:** Pentium III-866, 128MB of RDRAM, 256KB L2 cache, 30GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
2	Dell Dimension XPS B1000r 800/388-8542 www.dell.com	NEW	90	Very expensive: $2969	Very good 158	**Very good:** Pentium III-1000, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, midsize tower, 19-inch monitor, Windows Me
3	Gateway Select Deluxe 1100 800/315-2536 www.gateway.com	NEW	88	Very expensive: $2933	Outstanding 164	**Very good:** Athlon-1100, 128MB of RAM, 256KB L2 cache, 46GB hard drive, midsize tower, 19-inch monitor, Windows Me
4	HP Pavilion 8700I-933 800/752-0900 www.hp-at-home.com	Oct 00	84	Average: $2367	Good 154	**Good:** Pentium III-933, 128MB of SDRAM, 256KB L2 cache, 40.8GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
5	ABS Performance 1 800/876-8088 www.buyabs.com	Oct 00	83	Average: $2449	Very good 156	**Outstanding:** Pentium III-866, 256MB of SDRAM, 256KB L2 cache, 40GB 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 PIII-800 800/388-8542 www.dell.com	NEW	96	Average: $1689	Very good 145	**Good:** Pentium III-800EB, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, midsize tower, 17-inch monitor, Windows Me
2	Micron Millennia Max 733 800/642-7667 www.micronpc.com	July 00	91	Very 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	Tiny Millennium Value Select 800 877/417-4178 www.tiny.com	Oct 00	84	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
4	ABS Supreme DVD 3 800/876-8088 www.buyabs.con	NEW	84	Average: $1749	Outstanding 150	**Very good:** Pentium III-866, 128MB of SDRAM, 256KB L2 cache, 20GB hard drive, midsize tower, 19-inch monitor, Windows 98 SE
5	Tiny Internet Writer 733 877/417-4178 www.tiny.com	Sept 00	82	Average: $1799	Very good 141	**Good:** Pentium III-733, 128MB of SDRAM, 256KB L2 cache, 30GB hard drive, minitower, 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	Oct 00	83	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 Maestro GE 888/482-6678 www.nutrend.com	May 00	82	Inexpensive: $849	Good 100	**Good:** Celeron-500, 64MB of SDRAM, 128KB L2 cache, 8GB hard drive, midsize tower, 17-inch monitor, Windows 98 SE
3	NuTrend Duron Power 2 888/482-6678 www.nutrend.com	Oct 00	81	Average: $1099	Outstanding 133	**Very good:** Duron-700, 128MB of SDRAM, 64KB L2 cache, 20GB hard drive, minitower, 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	LEK SpeedPro 4566A 800/284-8459 www.lektech.com	Oct 00	72	Very inexpensive: $759	Good 99	**Satisfactory:** Celeron-566, 64MB of SDRAM, 128KB L2 cache, 10GB hard drive, midsize tower, 15-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 201.

CHANGES ARE AFOOT. This month sees the debut of a new operating system and two new processors—all heralding the future of our *Top 15 Home PCs* chart. Three new systems—Dell's Dimension XPS B1000r and Dimension 4100 PIII-800, and the Gateway Select Deluxe 1100—feature Microsoft's Windows Millennium Edition, the successor to Windows 98 Second Edition and, according to Microsoft, the last in the 9*x* dynasty of OSs. Windows Me packs built-in multimedia tools for managing digital images and sound, plus features to keep users from trashing key system files and settings inadvertently. (For more on the new OS, see "Windows Millennium Edition: All About Me" at www.pcworld.com/sep2000/millennium.)

On the processor front, we saw the arrival of our first 1-GHz Pentium-III home system, the Dimension XPS B1000r, as

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:** Speed and solid graphics make it a long-standing chart-topper. **CON:** At this price, it should have a CD-RW drive and better speakers.
Very good: NVidia GeForce2 GTS graphics board with 64MB of DDR SDRAM, 12X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem	Outstanding/ Good	Very good	Outstanding/ Good	**PRO:** Fast system with smooth graphics and good color. **CON:** Speakers are not first-rate; monitor blurs at high resolutions.
Very good: NVidia GeForce2 GTS graphics board with 64MB of SDRAM, 16X DVD-ROM drive, 8X/4X/32X CD-RW drive, V.90 modem	Good/ Very good	Very good	Fair/ Fair	**PRO:** Fastest home PC we have seen; SCSI hard drive is perfect for video editing. **CON:** You pay for the bragging rights.
Very good: ASUS AGP-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 GeForce2 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 five-speaker system; $150 price cut this month. **CON:** Small text looked sharp at 1024 by 768 but blurred at 1280 by 1024.
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:** Speedy for the price; has Windows Me's system-monitoring and multimedia features. **CON:** Lacks setup poster; access to slots slightly hindered.
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.
Good: NVidia 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.
Good: ATI Magnum Xpert 128 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem	Good/ Good	Satisfactory	[3]/Fair [4]	**PRO:** Great 3D sound system; monitor displays crisp images and high-quality color. **CON:** Games and DVD movies appeared dark.
Good: Leadtek WinFast 3D S320 II-Ultra graphics board with 32MB of SGRAM, 8X DVD-ROM drive, 6X/4X/32X CD-RW drive, V.90 modem	Good/ Good	Good	[3]	**PRO:** Comes with tons of features, including a printer and a scanner. **CON:** Graphics scores and speaker sound could be better.
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/ Satisfactory	Good	[3]/Fair [4]	**PRO:** Surprising power, ample expansion room. **CON:** Speakers sound a bit muddy; game play is somewhat choppy at high resolution.
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: Leadtek WinFast TNT2 M64 graphics board with 32MB of SDRAM, 10X DVD-ROM drive, V.90 modem	Satisfactory/ Satisfactory	Satisfactory	[3]/Fair [4]	**PRO:** Fast for the money; strong, sturdy case. **CON:** Cables hinder access to interior components.
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 a CD-RW drive. **CON:** Weak gaming performance; vertically mounted CD drives hard to load.
Satisfactory: ATI Rage 3D Pro graphics board with 8MB of SDRAM, 24X-52X CD-ROM drive, V.90 modem	Satisfactory/ Satisfactory	Limited	[3]	**PRO:** Adequate speed for the low price. **CON:** Small monitor, limited graphics, weak documentation.
Extra features: 10 percent	Setup/ease of use: 10 percent	Graphics: 10 percent	R & S: 30 percent	

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.

well as our first 1.1-GHz Athlon system, the Select Deluxe 1100. The Gateway system is also the first home PC on the chart equipped with AMD's new, redesigned Athlon processor, which now has the L2 cache on the same chip as the CPU, yielding a slight speed advantage. Machines with the older Athlon chip have dropped off our chart this month as vendors move the new Athlon CPUs into their offerings.

Kirk Steers is a contributing editor for PC World.

FULL REVIEWS ONLINE

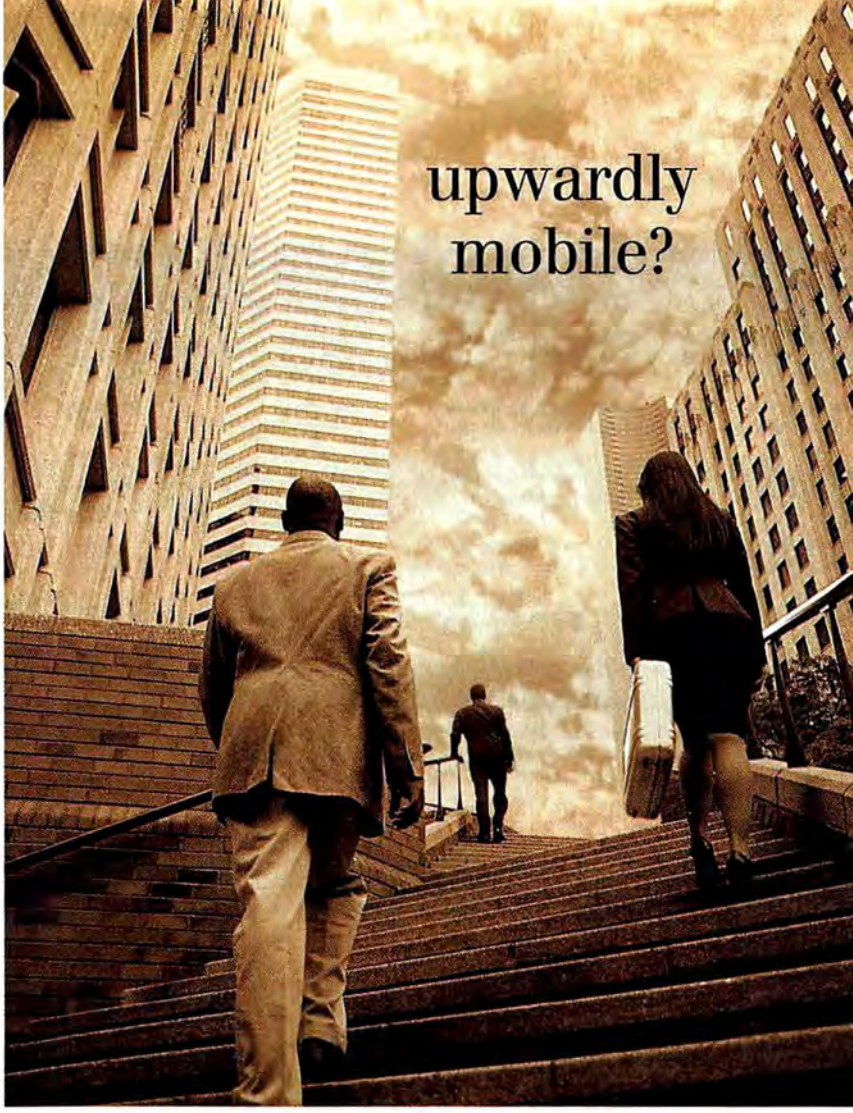
online

FOR WRITE-UPS on all the systems we reviewed this month, visit PCWorld.com (www.pcworld.com/top400/newhomepcs).

FIRST OF THE ME GENERATION: Three new home systems sport Windows Millennium Edition.

PHOTOGRAPH: RICK RIZNER

Is your IT team



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TOP 10 MONITORS

	17-INCH MONITOR	Month tested	Street price (8/23/00)	Overall rating	Quality of text/graphics	Comments
1	ViewSonic EF70 800/888-8583 www.viewsonic.com	Sept 00	$265	85	Very good/ Excellent	**FEATURES:** 16.1-inch viewable area, .25mm stripe-pitch Diamondtron NF tube,[1] up to 87-Hz refresh rate,[2] Plug and Play ready,[3] three-year warranty, 24-hour daily toll-free support. **SUMMARY:** Deep, saturated color in graphics and a $34 price drop keep this model at the top. Sophisticated on-screen control menu is easy to navigate with standard buttons on the front bezel.
2	Samsung SyncMaster 700NF 800/726-7864 www.samsungmonitor.com	July 00	$312	84	Very good/ Very good	**FEATURES:** 16-inch viewable area, .25mm stripe-pitch Diamondtron NF tube,[1] up to 85-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 24-hour daily toll-free support. **SUMMARY:** Radiant colors and fine detail make this a good choice for heavy graphics work. Easy-to-use on-screen controls are set on a retracting panel.
3	Princeton AGX740 800/747-6249 www.princetongraphics.com	Apr 00	$225	83	Very good/ Very good	**FEATURES:** 15.8-inch viewable area, .25mm stripe-pitch Diamondtron tube,[1] up to 85-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 9-hour daily toll-free support. **SUMMARY:** Competitive price boosts this model up two spots. Lively colors on photographs. Offers high-end controls, but zoom settings on other models work better.
4	Sony Multiscan CPD-G200 888/315-7669 www.sony.com/displays	July 00	$400	83	Very good/ Excellent	**FEATURES:** 16-inch viewable area, .24mm-.25mm stripe-pitch FD Trinitron tube,[1] up to 85-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 24-hour daily toll-free support. **SUMMARY:** Colors are brisk and text is razor-sharp, but you can find comparable image quality at a lower price. On-screen controls very difficult to navigate.
5	LG Flatron 795FT-Plus 800/243-0000 www.lgeus.com	Sept 00	$310	83	Very good/ Very good	**FEATURES:** 15.9-inch viewable area, .24mm stripe-pitch LG Flatron tube,[1] up to 120-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 12-hour daily toll-free support. **SUMMARY:** Bright, saturated color makes this model a good choice for extensive graphics work. The small, sophisticated on-screen controls on the front bezel are simple to use and navigate.
6	Eizo Nanao FlexScan T561 800/800-5202 www.eizo.com	NEW	$489	82	Excellent/ Excellent	**FEATURES:** 15.9-inch viewable area, .25mm stripe-pitch Mitsubishi Diamondtron NF tube,[1] up to 118-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 8-hour weekday toll- free support. **SUMMARY:** Top-of-the-line image quality sets this model apart from the others—but for a pretty penny. Meager support hours; extremely confusing on-screen controls require the manual.
7	NEC MultiSync FE700 888/632-6487 www.nectech.com	Feb 00	$299	82	Very good/ Very good	**FEATURES:** 15.6-inch viewable area, .25mm stripe-pitch Diamondtron NF tube,[1] up to 97-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 11.5-hour weekday toll-free support. **SUMMARY:** Rich colors on photos and Web pages, but text in word processing documents and spreadsheets could be just a little sharper. On-screen controls require lots of button pressing.
8	CTX PR705F 800/888-9052 www.ctxintl.com	Apr 00	$319	81	Excellent/ Good	**FEATURES:** 15.9-inch viewable area, .24mm-.25mm stripe-pitch FD Trinitron tube,[1] up to 105-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 12-hour weekday toll-free support. **SUMMARY:** Great choice for extensive word processing and spreadsheet work. Includes one USB port but lacks advanced controls. A $30 price drop keeps it competitive.
9	Mitsubishi Diamond Pro 710S 888/632-6487 www.mitsubishi-display.com	NEW	$399	81	Very good/ Very good/	**FEATURES:** 16.3-inch viewable area, .25mm stripe-pitch Diamondtron NF tube,[1] up to 106-Hz refresh rate,[2] Plug and Play ready,[3] TCO'99 compliant, three-year warranty, 24-hour daily toll-free support. **SUMMARY:** Pricey, but nuanced colors on photos and Web pages make this a fine choice for graphics pros. On-screen controls are intuitive and easy to use.
10	EPI AOC7GIr 888/838-6388 www.epius.com	July 00	$199	81	Satisfactory/ Very good	**FEATURES:** 16-inch viewable area, .25mm dot-pitch tube, up to 85-Hz refresh rate,[2] Plug and Play ready,[3] TCO'92 compliant, three-year warranty, 10-hour daily support. **SUMMARY:** Nudges its way back onto the chart thanks to its budget price and deft display of graphics. Text quality lags behind that of other monitors. On-screen menu has some advanced controls.

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] Uses an aperture grille whose parallel wires near the sides of the screen are strung farther apart than those at the middle. [2] Maximum refresh rate at 1280 by 1024 resolution. [3] Plug and Play monitors and graphics cards can communicate bidirectionally. However, Windows 95 does not fully utilize monitor Plug and Play.

IT'S RARE FOR a monitor to display perfect image quality. But the new FlexScan T561 from Eizo Nanao, number six on our chart, achieves that with its impeccable text and lively graphics. Just be prepared to shell out serious cash if it suits your fancy. The chart's other newcomer, Mitsubishi's ninth-place Diamond Pro 710S, won't make as big a dent in your wallet and still offers bold text and graphics. Next month we look at 19-inchers. ▶

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TOP 10 GRAPHICS BOARDS

	AGP BOARD	Month tested	Street price (9/5/00)	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	94	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 this card on top. The $299 Marvel G400-TV offers TV tuning.
2	Cardexpert GeForce 256 DDR 800/539-2273 www.gainward.com	June 00	$210	93	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:** $20 price cut. Speedy board looks good in Unreal Tournament and Quake 3. Cheaper than much of its DDR competition.
3	Asus AGP-V6600 Deluxe 510/739-3777 www.asus.com	Apr 00	$189	92	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:** Diamond's demise boosts card up a notch; has lots of video extras; AGP-V7700 Deluxe ($319) does better in Quake 3.
4	Hercules 3D Prophet II MX 877/484-5536 www.guillemot.com	NEW	$150	91	Excellent	Excellent	Very good	**FEATURES:** 4X AGP, NVidia GeForce2 MX chip, 32MB of SGRAM, 350-MHz RAMDAC, bundled 3D games include Quake 3 Arena and Rayman2. **SUMMARY:** Offers brisk performance and an ample gaming bundle at an alluring price. A fine choice for cost-conscious gamers.
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 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	85	Excellent	Excellent	Very good	**FEATURES:** 4X AGP, NVidia GeForce2 GTS chip, 32MB of DDR SGRAM, 350-MHz RAMDAC, two bundled 3D games. **SUMMARY:** Pricey, but this swift performer renders lovely images and features digital output. Lighting effects look good in Quake 3. Package includes 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 sports a reasonable price for the GeForce2 GTS chip set. Sky effects look blotchy in Quake 3, as is typical of boards that use this chip.
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, 64MB of DDR SDRAM, 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	83	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:** Competitive price helps keep model on the chart. A 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 PIII-600 CPU and 128MB of RAM. Overall 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.

X MARKS THE SPOT—GeForce2 MX, that is. NVidia's latest chip energizes Hercules's 3D Prophet II MX board, which nabs fourth place. This card offers impressive performance at an attractive price. Diamond's Viper II (last month's number two) is being discontinued; the company is pulling out of the graphics board race but says it will continue to offer support and updated drivers. Matrox's Millennium G400 Max retains first place. ▶

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TOP 10 SCANNERS

	SOHO SCANNER	Month tested	Street price (8/29/00)	Overall rating	Scan quality	Scan speed (seconds per page) B&W	Scan speed (seconds per page) Color [1]	Comments
1	Epson Perfection 1200S 800/463-7766 www.epson.com	Aug 00	$299 [2]	95	Good	17 @ 300 dpi	249 @ 1200 dpi	**FEATURES:** SCSI, 1200 by 2400 dpi, 11.3-by-16.8-by-3.5-inch case,[3] 9.9 pounds, 8.5-by-11.7-inch scanning area; optional transparency adapter and automatic document feeder. **SUMMARY:** Epson's SCSI unit offers sharp resolution and high-quality color and runs a bit faster than the USB model—but costs $50 more.
2	Umax Astra 6450 800/562-0311 www.umax.com	NEW	$299	94	Good	39 @ 300 dpi	50 @ 600 dpi	**FEATURES:** IEEE 1394, 600 by 1200 dpi, 12.2-by-18.4-by-3.9-inch case,[3] 8.5 pounds, 8.5-by-11.7-inch scanning area; includes transparency adapter. **SUMMARY:** Our first IEEE 1394 (FireWire) unit (card and cable included) delivers ultrafast 600-dpi scans with 42-bit color. Color quality is less than perfect.
3	Microtek ScanMaker V6 USL 800/654-4160 www.microtekusa.com	Oct 00 [4]	$149 [2]	94	Good	50 @ 300 dpi	82 @ 600 dpi	**FEATURES:** USB and SCSI,[5] 600 by 1200 dpi, 11.8-by-21.5-by-3.2-inch case,[3] 11.5 pounds, 8.5-by-14-inch scanning area; includes 35mm transparency adapter. **SUMMARY:** Legal-document-capable model offers small transparency unit plus SCSI card/cable combo. A dual interface USB/parallel unit is available for $129.
4	Umax Astra 3400 800/562-0311 www.umax.com	Sept 00	$99	94	Good	31 @ 300 dpi	121 @ 600 dpi	**FEATURES:** USB, 600 by 1200 dpi, 11.6-by-18.1-by-3.2-inch case,[3] 5.7 pounds, 8.5-by-11.7-inch scanning area; no optional transparency adapter or ADF. **SUMMARY:** Impressive unit features speedy performance, easy push buttons, generous support, and a bargain price. Fine value for home users.
5	HP ScanJet 5370Cse 800/722-6538 www.scanjet.hp.com	Oct 00 [4]	$299	93	Fair	37 @ 300 dpi	243 @ 1200 dpi	**FEATURES:** Parallel and USB,[6] 1200 by 2400 dpi, 11.9-by-19.9-by-4.1-inch case,[3] 10.7 pounds, 8.5-by-11.7-inch scanning area; includes transparency adapter; ADF optional. **SUMMARY:** This versatile performer has high resolution and quick-start buttons, but overall scan quality is less than stellar.
6	Agfa SnapScan e50 888/281-2302 www.agfahome.com	Oct 00 [4]	$179	92	Good	60 @ 300 dpi	416 @ 1200 dpi	**FEATURES:** USB, 1200 by 2400 dpi, 13.3-by-19.7-by-3.7-inch case,[3] 14.5 pounds, 8.5-by-11.7-inch scanning area; includes 35mm transparency adapter but no ADF. **SUMMARY:** With high resolution and four push buttons, this two-in-one unit delivers good-looking reflective and transparent scans.
7	Acer 1240UT 800/733-2237 www.acerperipherals.com	NEW	$149	92	Fair	48 @ 300 dpi	448 @ 1200 dpi	**FEATURES:** USB, 1200 by 1200 dpi, 12-by-18-by-4-inch case,[3] 9.5 pounds, 8.5-by-11.7-inch scanning area; includes transparency adapter. **SUMMARY:** Newcomer offers high resolution, versatile software, and around-the-clock tech support. But scan quality and performance are only average.
	CORPORATE SCANNER							
1	Microtek ScanMaker X12USL 800/654-4160 www.microtekusa.com	Aug 00	$389 [2]	97	Good	31 @ 300 dpi	438 @ 1200 dpi	**FEATURES:** USB and SCSI,[5] 1200 by 2400 dpi, 11.9-by-21.4-by-2.8-inch case,[3] 12.1 pounds, 8.5-by-14-inch scanning area; optional transparency adapter and ADF. **SUMMARY:** Still top dog, legal-document-capable unit boasts high resolution, 42-bit color, and solid scan quality. Also available for $40 less without a SCSI card.
2	Epson Expression 1600 Artist 800/463-7766 www.epson.com	Aug 00	$899 [2]	94	Good	18 @ 300 dpi	495 @ 1600 dpi	**FEATURES:** USB and SCSI,[5] 1600 by 3200 dpi, 13-by-22.2-by-5.2-inch case,[3] 18.7 pounds, 8.5-by-11-inch scanning area; optional transparency adapter and ADF. **SUMMARY:** Strong performance and color accuracy keep this a premium-priced, high-resolution unit on the chart. Offers robust optional accessories.
3	HP ScanJet 6350C 800/722-6538 www.scanjet.hp.com	Aug 00	$499 [2]	88	Fair	57 @ 300 dpi	265 @ 1200 dpi	**FEATURES:** USB and SCSI,[5] 1200 by 2400 dpi, 12.3-by-19.6-by-7.6-inch case,[3] 15.8 pounds, 8.5-by-11.7-inch scanning area; includes 35mm transparency adapter and ADF. **SUMMARY:** Made for frequent OCR tasks, this veteran unit features a built-in ADF, but scanned image quality and performance are only mediocre.

Best Buy For expanded reviews of this month's scanners, visit www.pcworld.com/t10scanners.

HOW WE TEST All scanners are tested with default settings under Windows 98 on a Gateway GP7-550 (Pentium III-550) PC with 128MB of RAM, using each unit's bundled software. Overall score is based on scanned image quality (25 percent), scanning speed (SOHO, 22 percent; corporate, 25 percent), ease of use (SOHO, 17 percent; corporate, 10 percent), features (SOHO, 16 percent; corporate, 20 percent), support (10 percent), and price (10 percent). Speed tests are timed from start of scanning until cursor control is regained. Data based on tests designed and conducted by the PC World Test Center.

[1] Color scan speed is at unit's maximum optical resolution. [2] With SCSI adapter. [3] In order: width, depth, height. [4] Online-only chart. [5] Tested with USB interface. [6] Tested with SCSI interface.

THIS MONTH, Umax's Astra 6450, an IEEE 1394 scanner, lands on our SOHO chart. The Astra 6450 blazes a new speed record on our maximum resolution test and garners impressive color and feature ratings. Also new this month is Acer's 1240UT. Generous service policies and a low price help this unit make the chart. On the corporate side, Canon has phased out its CanoScan FB 1200S, allowing for the return of HP's ScanJet 6350C. ■

Crucial.com

Micron Memory, Affordable and Factory Direct

www.crucial.com

Sooner or later, even the most cost-conscious of PC consumers will concede that—when it comes to memory—you've got to pay to play. California resident Jessica Leah learned this truism shortly after setting up her new computer. With only 32MB RAM, "It was pretty weak," she admits. Leah knew that adding more RAM would be the most efficient way to boost her system's performance, but she was discouraged by the disparate memory prices she found at vendor sites throughout the Web.

"I came across some 128MB modules that sold for more than 200 dollars," Leah says. "But I finally found all the memory I needed at Crucial.com, at a much lower price." Crucial, a division of Micron Technology Inc., is the largest DRAM manufacturer in the U.S., and the only chip maker that ships its memory directly to end users. Micron makes all of its own memory components, from silicon wafers to fully assembled modules, which it then sells through the Crucial Web site. Micron offers its DRAM at prices often 50 percent lower than vendors who buy their DRAM on the open market. And Crucial brings the cost to consumers down even more by conducting 80 percent of its sales online.

Crucial also educates consumers with up-to-date tips and how-to features, articles about memory manufacturing, and answers to frequently asked questions about DRAM. Crucial's Comprehensive [Microsoft] Windows 2000 Upgrade Guide, for example, recommends RAM for performance PCs and lists hardware and software requirements for users upgrading to the new operating system.

Shoppers can quickly search Crucial's Web site for over 10,000 PC and printer upgrades with its Memory Selector tool, which now offers more than 49,000 upgrade options. Users simply enter their computers' make and model information into the Memory Selector, and Crucial returns a list of memory upgrades that are guaranteed to be compatible with that system. Leah says her installation was seamless, and her 128MB module has given her PC a new lease on life.

All of Crucial's products ship with a limited lifetime guarantee (they are the same modules, after all, that PC makers Gateway, IBM, and HP build into their base systems). Micron works closely with OEMs like Intel to ensure complete compatibility stability at high processing speeds. And Micron tests all of its modules under extreme temperatures, voltages, and operating conditions before selling them through Crucial's Web site and telephone sales service.

Crucial.com customers rave about the site's streamlined 24 X 7 ordering system, same-day shipping, multiple delivery options (including overnight delivery), and shipment tracking features. Those who register with the Crucial Customer Program get streamlined access to memory products, dedicated account service, and priority technical support. Crucial's memory experts will respond personally to their questions about DRAM and memory management. Leah says she enjoys reaping the rewards of Crucial's customer-centric approach and attention to detail. "I am getting outstanding results—much better than I expected. You can bet that I'll be going back to Crucial regularly for whatever memory upgrades I need."

The world's largest PC manufacturers buy our memory direct.

[*Genius.*]

Buy your memory direct from one of the largest memory manufacturers in the world. Performance, reliability, selection *and* factory-direct savings — Crucial Technology, a division of Micron.

I ordered my memory yesterday and am up and running today! Super service, super product, and outstanding Web site! I will recommend Crucial to anyone!!!

Jim McClintock, Taynik Consulting

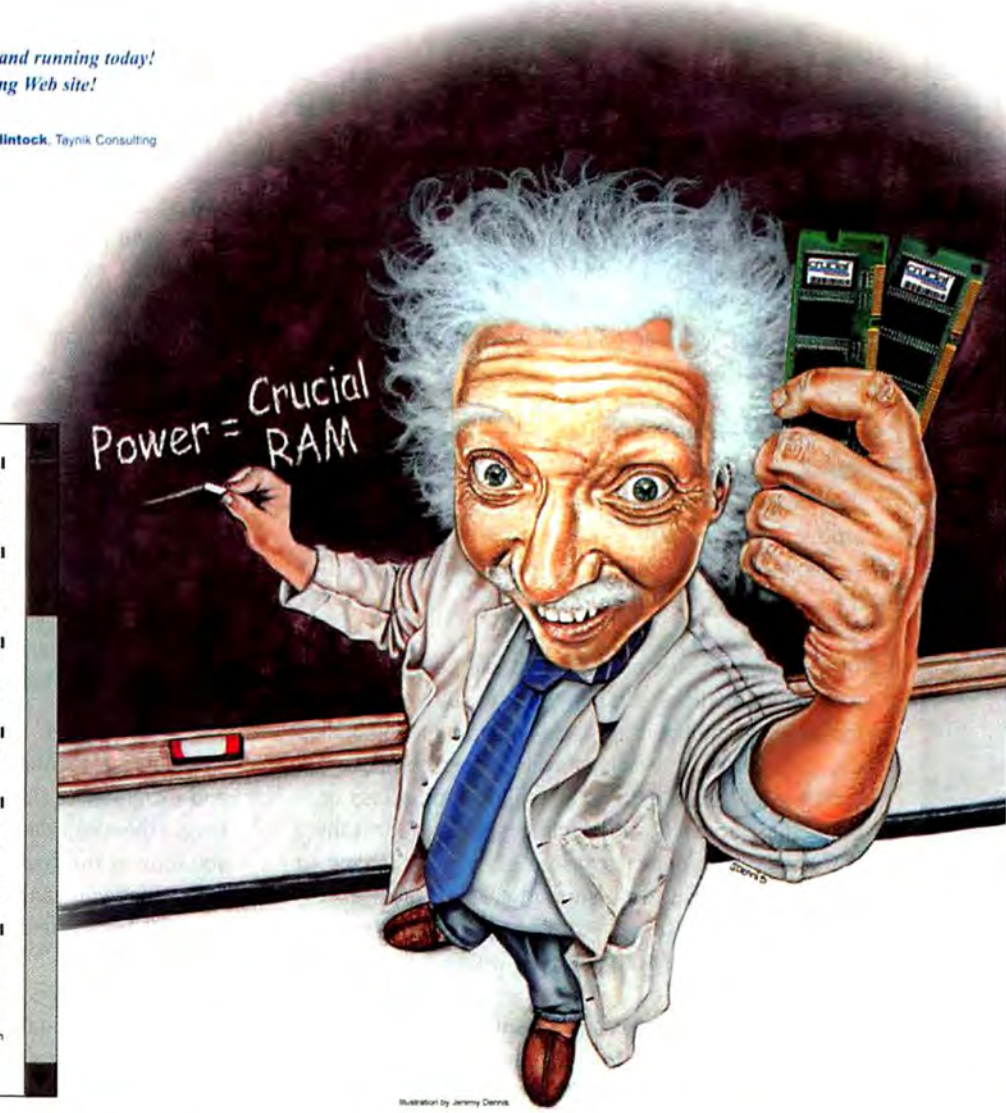

Illustration by Jeremy Dennis

Compare the Savings . . .

64MB Upgrades

Compaq	Kingston	**Crucial**
Presario 5304	$126.00	$71.99
Presario 5070	$126.00	$71.99
Presario 5360	$126.00	$71.99
Micronpc.com	Kingston	**Crucial**
Millennia 400	$115.00	$71.99
Millennia 450	$115.00	$71.99
Millennia MAX 450	$115.00	$71.99
Gateway	Kingston	**Crucial**
G6-450	$115.00	$71.99
G6-400	$115.00	$71.99
Performance 450	$115.00	$71.99
IBM	Kingston	**Crucial**
Aptiva (2153) Model E2U	$111.00	$71.99
Aptiva (2139) Model E5D	$111.00	$71.99
HP	Kingston	**Crucial**
Pavilion 4530	$126.00	$71.99
Pavilion 4535	$126.00	$71.99
Kayak XU PC Workstation 440BX Chipset	$143.00	$89.99
Vectra VL Series 8	$111.00	$71.99
Apple	Kingston	**Crucial**
iMac (G3-350)	$117.00	$71.99
Power Mac G3 PC100	$117.00	$71.99
Power Mac G4	$121.00	$71.99

Crucial prices reflect an automatic 10% discount for ordering online. Prices were taken from Crucial and Kingston Web sites on 9/5/00; however, they can (and do) change daily. Prices may vary according to specific system requirement.

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www.ethentica.com

For mobile knowledge workers and on-the-go executives, laptops aren't a convenience. They're sacred treasures. Actually, what's sacred is the data they contain. From confidential competitive analyses and strategic planning documents to personal e-mails and contact lists, corporate laptops quickly accumulate lots of highly sensitive information. With laptop loss and/or theft a growing phenomenon, securing that sensitive information is a major IT concern.

And passwords don't cut it. People forget them, which causes work delays and generates support calls. If they do pick a password that's easy to remember, it's probably easy enough to figure out—especially for someone who has stolen a laptop and has all the time in the world to crack it.

That's why biometric authorization can be so valuable to today's information-centric enterprises. By verifying laptop users' identities using their fingerprints, companies can fully protect themselves against the potential exposure of secure data as a result of laptop loss or theft. This approach also eliminates the support calls that password problems cause every year. According to Forrester Research, those support calls can cost a company $200-$340 per year per user. So a biometric solution can actually pay for itself within a few months.

And Lake Forest, Calif.-based Ethentica Inc. has such a solution: the MS 3000 Touch Verification PC Card. The MS 3000 is an easy-to-use PC card with a durable, self-contained touchpad that instantly recognizes the user's fingerprint. This fingerprint-based authentication can be used to replace the full range of passwords that users require in the course of a work day—including those for local files, corporate applications, and secure Web sites. In fact, the MS 3000 even provides a secure screen saver that's activated whenever the laptop isn't in use for a given period of time. A single touch on the MS 3000 is all it takes to get back to work.

Unlike other biometric cards, Ethentica's MS 3000 is completely hot-swappable and can work in a wide range of lighting conditions. It's compliant with Microsoft's BAPI standard, so it will integrate with future third-party biometric products. And its unique polymer surface can endure years of hard use without failure.

ethentica
SECURING YOUR DIGITAL WORLD

"Biometric authentication technology is mature, reliable, and extremely useful for mobile users," declares Bret Berg, Ethentica's director of product marketing. "When you look at the cost of our MS 3000 cards and the ease with which you can deploy them, it's pretty hard to come up with a reason not to roll them out."

And if the numbers alone aren't convincing enough, the sheer emotional logic should be. Just imagine someone tapping gleefully at your laptop, uncovering all your plans and inside information—and planning to use that information for their own nefarious purposes. Then imagine that same person cursing in frustration as they try to access your hard drive and can't—because they're not the owner of the necessary finger. For most of us, that sense of security is well worth the price of the Ethentica card.

User name: ganderson
Password: pudgybutt
OK
Cancel

User name: greganderson
Password: Feb1361
OK
Cancel

User name: greg3
Password: cujo
OK
Cancel

User name: anderson7
Password: wanda
OK
Cancel

User name: grega
Password: mumsy
OK
Cancel

User name: ganders4
Password: june0595
OK
Cancel

Coming up with passwords is one thing. Remembering them is another.

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Networks, e-mail, websites – they all require passwords. Passwords you have to remember. You use your birthday, your daughter's name, your college mascot. Try and recall 30 or 40 of them and the first person you will have locked out is yourself. The Ethenticator™ MS 3000 Touch Verification PC Card links all of your passwords to your unique fingerprint. Convenient and secure, it's the one-touch solution you'll never forget.

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firstsourceconnect: Customized Portals for the Web Marketplace

www.firstsourcecorp.com/pcworld

TheBancorp.com is not the largest financial institution in the world, but on the Web, it can take on just about any bank. The Web site offers FDIC-insured checking accounts, online bill payment, car loans, and other options to individuals and businesses—all with just 70 employees in its Delaware and Pennsylvania offices. Until recently, while TheBancorp was extending a warm hand to its online customers, the bank itself was getting the cold shoulder from B-to-B marketplaces that have shunned small and midsize businesses.

Pete Chiccino, TheBancorp's vice president for networking and security, had already been cultivating a strong, long-standing friendship with firstsource.com, which builds B-to-B e-commerce solutions for small and midsize companies and Internet resellers. When firstsource announced its new e-procurement service, firstsourceconnect, Chiccino made sure TheBancorp would be among the first companies to try it. "Because of our excellent track record with firstsource," he says "we figured that this new service deserved a closer look. As it turns out, connect was a perfect match for our procurement requirements."

firstsourceconnect streamlines and economizes purchasing: it reduces paperwork and research, operation costs, and purchase cycle time. It also tightens controls over employee purchases and eliminates so-called "maverick" buying problems. TheBancorp uses connect to gauge product prices and availability, customize its pricing templates and billing reports, establish budgets, and enforce workflow procedures. Chiccino uses connect to sign off on purchases initiated by any of TheBancorp's 70 employees. "Every time someone places an order, I automatically receive an e-mail through connect, requesting my approval," he explains. "I can then respond with an approval, or send the purchaser an explanation of why I am declining the purchase."

firstsourcecorp℠
Business Purchasing. Made Smart.℠

Through connect, TheBancorp has 24x7 access to firstsource's massive knowledge base, featuring more than 1.2 million products and services in ten categories, including computer hardware and software, consulting, and financing services. And firstsource saves TheBancorp time and money with real-time stock status information (no surprise back-order delays), and lists of top-selling items and weekly specials. "We're always able to buy everything from print consumables to computers in one place, and at an excellent price," Chiccino says.

While connect relies on firstsource's proprietary FSP platform, inpowr, to join TheBancorp with multiple B-to-B product distributors, the connection is nearly transparent for connect users. firstsource customized TheBancorp's portal to blend seamlessly with its own internal procurement systems. "firstsource matched the look and feel of our own Web pages almost exactly," says Chiccino. firstsource can configure and launch new customized client portals within 15 days. Since the portals are Web-based, updates occur on the client side automatically—no new downloads and reconfigurations are required.

Chiccino thinks that connect is the next evolutionary step in firstsource's support for small and midsize clients. "We're used to receiving a high level of customer service from our firstsource account executive," he says. "And connect is an extension of that service. We will now be doing most of our procurement over the Web, but we'll still have access to real service representatives for technical assistance, or when we want to make changes to our ordering system."

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HOSTING THE RACKSPACE WAY

www.rackspace.com

In today's e-business playground, if you're not on the Web, you're not in the game. But for many evolving e-businesses, the technical challenges of establishing and running a successful Internet site can be daunting. To be successful in the Web-driven economy, a site must be scalable, affordable, and absolutely reliable. Most sites are now hosted on complex Web servers, which are expensive to purchase and maintain. Servers, facilities, setup, and security are a few of the key infrastructure challenges any Web-enabled organization must face, even before loading the software that makes a Web site work.

A New Approach—Managed Hosting

A new server management model has emerged—one that solves this platform challenge and frees the enterprise to focus on applications, strategy, and e-business opportunities. Managed hosting offers significant benefits to Web designers, application service providers (ASPs), and corporate end users. Today, e-businesses benefit by leasing dedicated servers from managed hosting providers such as Rackspace Managed Hosting.

"By renting servers month-to-month, companies avoid the heavy capital investment needed to build and maintain their own infrastructure," said Graham Weston, chief executive officer of Rackspace Managed Hosting. "And ongoing costs are diminished by outsourcing the technical aspects of keeping the servers up and running."

Unlike virtual hosting, where numerous Web sites share space on a single server, managed hosting provides the security and flexibility of a customized server dedicated to only one company. Unlike colocation, which requires companies to purchase, configure, and manage their own servers, managed hosting decreases set-up and ongoing costs while eliminating the risks of managing your own infrastructure. And, managed hosting provides virtually instant access to the precise level of server resources needed to get the job done.

Rackspace Excels Where Others Do Not

Ask your hosting provider if they do it the Rackspace way:

Can you get my business up and running in Internet time? Rackspace guarantees to have a server customized for your business online in less than 24 hours.

Are you accountable if my site goes down? Rackspace guarantees 99.9 percent network uptime, so if your site goes down, you get money back.

The Internet works 24 X 7. Do you have an expert on hand at all times to troubleshoot? Call Rackspace any time of the day or night, and you get instant access to a tech expert capable of solving any problem you might have.

With Rackspace, when it comes to fulfilling your hosting needs, the answer is—absolutely. Need a robust security solution to guarantee data integrity? No problem. Need to add a server for a special promotion? We do it every day. Looking for robust back-up solutions to guarantee you never lose data? Sure. How about content distribution services to ensure the best end-user experience possible? Definitely.

"Everything we do is built on fulfilling critical customer needs as quickly as possible," said Weston. "The managed hosting concept, combined with our fanatical commitment to customer satisfaction, offers e-businesses of all types a new way of reaching their customers reliably, without the headaches."

Absolutely.

Do you have guaranteed uptime of 99.9% or better?
Is a tech expert available if I call in the middle of the night?
Can you get my server up and running in less than 24 hours?
Will you increase my capacity as quickly as my business grows?
Can I sign up with only a month-to-month commitment?

Will my hosting headaches go away?

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The Rackspace Advantage

Guaranteed Uptime: 99.9% uptime supported by five premium backbones from our world-class Cisco-powered data centers.

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Expert Support: Our Linux, NT/W2000 and Solaris specialists are available instantly 24 hours a day.

Unlimited Flexibility: With no long-term commitments, you have the flexibility to increase or decrease your capacity anytime.

A Few Options

Rackspace Starter:
- 600MHz Processor
- 256MB RAM
- 15GB EIDE Drive
- 10GB Burstable Data Transfer
- 24x7 Support
- Monthly: $299

Rackspace Advanced:
- 800MHz Processor
- 18GB SCSI Drive
- 256MB RAM
- 12/24GB Tape Drive
- Offsite Tape Storage
- 50GB Burstable Data Transfer
- Advanced Monitoring
- 24x7 Support
- Monthly: $859

Rackspace Cluster (Two servers with the following):
- Dual 750MHz Processor
- 2x9GB SCSI Drive with RAID 1
- 512MB RAM
- 12/24GB Tape Drive
- Offsite Tape Storage
- 50GB Burstable Data Transfer (per server)
- Advanced Monitoring (on each server)
- 24x7 Support (on each server)
- Load Balancing
- Monthly: $2999

*All configurations priced for Red Hat Linux 6.2 and exclude one-time setup fee.

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CDW.com: Finding the right parts has never been easier

www.cdw.com

At the National Cable Television Association, folks don't like to wait long for their high-tech tools. And why should they? The cable systems, hardware suppliers, and services the organization represents are striving to bring cable TV and high-speed Net access to tens of millions of households nationwide. Meanwhile, the organization's 85 lobbyists, lawyers, and technologists are turning to David Grenkevich, NCTA's network administrator, with their own tales of woe from the information superhighway. Grenkevich's job is to get them moving again as quickly as possible, which often means replacing outmoded equipment.

Indeed, Grenkevich spends nearly as much time acquiring IT resources as he does installing them. "My title may be network administrator," he says, "but I buy so much equipment and software for our organization on a day-to-day basis that my title may as well be 'purchasing agent.'" To streamline the process, Grenkevich uses a number of purchasing tools at CDW.com, the number-one authorized direct seller of hardware and software from Compaq, Computer Associates, Microsoft, Toshiba, and other top-brand-name manufacturers. CDW targets small and midsize business buyers with customized purchasing features, personalized customer service, and special offers.

CDW's online configurators help to ensure that Grenkevich is getting the right memory, drives, and peripherals for NCTA's desktop and notebook PCs. And CDW even supports the most mobile among NCTA's mobile users. The Simple Technology memory configurator, for example, boasts a database of memory, hard drive, and flash-card upgrades for computers, digital cameras, and handheld devices. Grenkevich can even search for upgrades using OEM part numbers. And the Smart Buy column on CDW's Configurator page features up-to-date deals and discounts from Simple, Kingston Technology, and other memory providers.

CDW™ *Computing Solutions Built for Business™*
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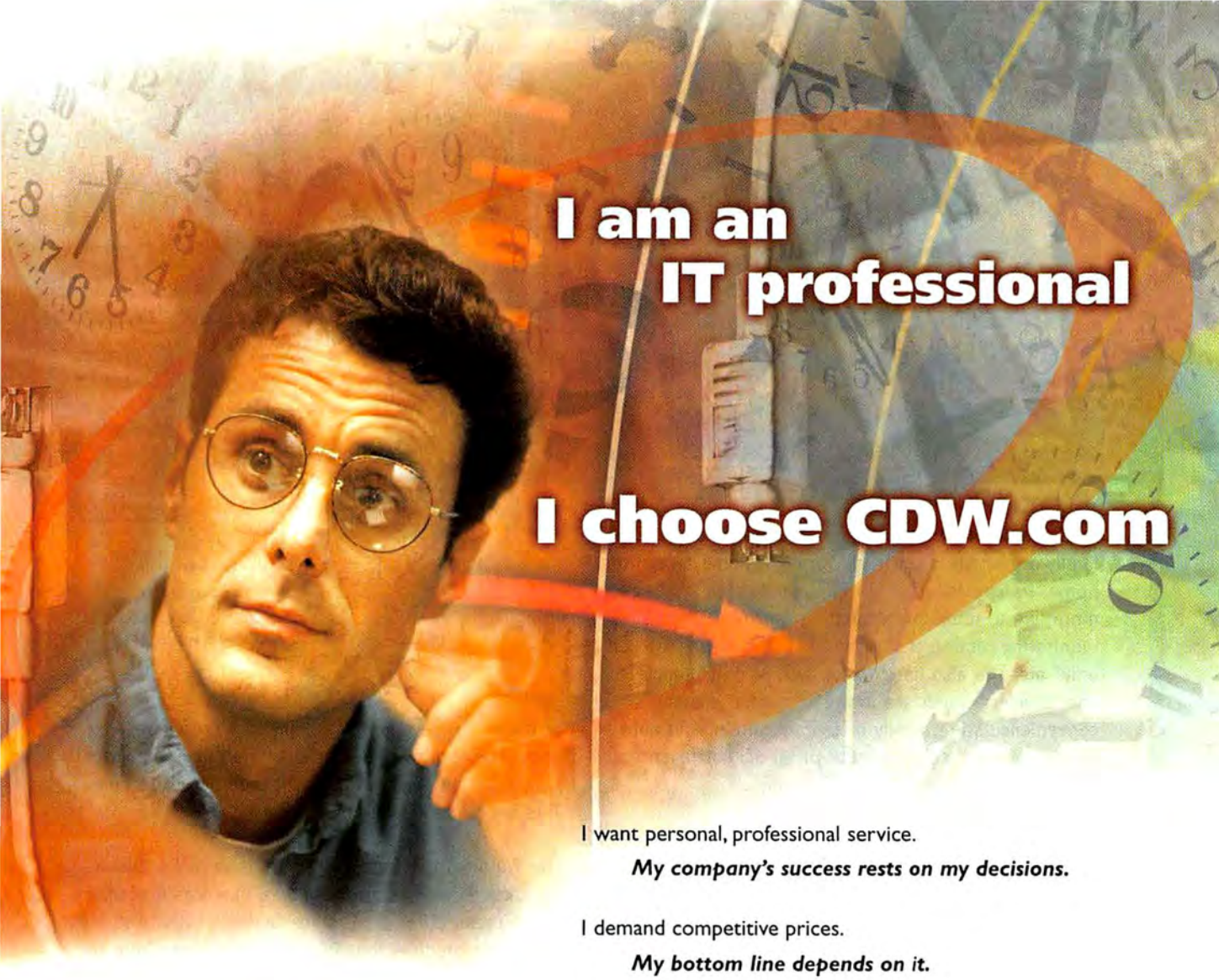
800-306-4239

Grenkevich also uses CDW's Product Compare tool to check the prices of everything from modems and monitors to network hubs and adapters. Compare instantly sorts products from competing manufacturers by any criteria. Grenkevich generates side-by-side comparison charts that he sorts according to product pricing and specifications. Compare then lets him save the results of his research and e-mail them to his coworkers.

Before picking up NCTA's next notebook, Grenkevich might also take a look at CDW's new Notebook Finder, which lists the notebook PCs that most closely match his search criteria. From drop-down menus, notebook shoppers can choose their preferred manufacturers, minimum battery life, weight, display size, and the maximum price they are willing to pay. The Product Compare tool can then narrow their search even further.

CDW's other tools, like its powerful search engine (which supports product name or part-number searches) and Quick Accessories feature (found under Notebooks and on other category pages), also make quick work of any hunt for a product. For Grenkevich, their combined effect helps to make shopping a bit more fun, and a lot less painful. "CDW's Web site makes it easy to find the products I need—plus any related accessories—quickly and easily, so that I can get back to administering the network," he says. "Overall, it has helped to make the purchasing part of my job much easier."



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Inventory Management at Point of Sale

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The home page for PC America speeds you to the point-of-sale products you need.

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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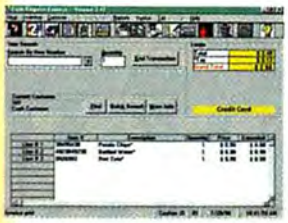

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All PC America Software requires Microsoft Windows. The software was written in Visual Basic using Microsoft Access Files. The source code is available.

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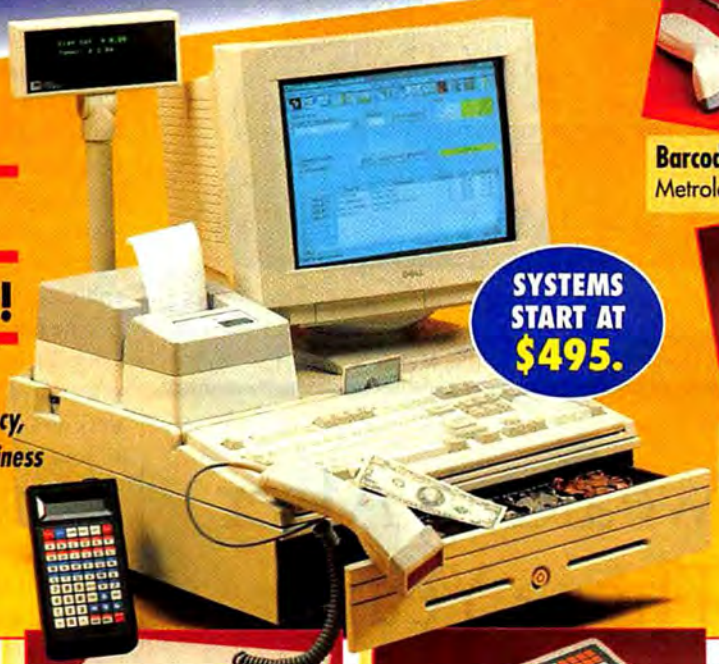

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HERE'S HOW

WINDOWS TIPS SCOTT DUNN

Still Tweaking After All These Years

SHORTLY AFTER THE ARRIVAL of Windows 95, Microsoft released Microsoft Power Toys, a collection of free utilities. The centerpiece of Power Toys was Tweak UI, an extremely useful tool that permitted users to customize Windows to their heart's content. The bad news: Microsoft has not yet updated Tweak UI specifically for Windows 98 or Windows 2000. The good news: Many of this aging utility's features work just fine in these newer versions of Windows.

First, make sure you have the most recent version of Tweak UI. You'll get the most features if you do. Windows 95 users can stick with version 1.1, but Windows 98 users will benefit from the latest version, which was 1.25 as we went to press. A "Tweak UI 2000" beta is available, and the final version may be released by the time you read this. Microsoft has posted only version 1.1 at its Web site (www.microsoft.com/NTWorkstation/downloads/PowerToys/Networking/NTTweakUI.asp), so get the latest at PCWorld.com's Downloads area.

If you're not sure which version you have, locate tweakui.cpl in either the Windows\System folder (Win 9*x*) or the Windows\System32 folder (Win NT or 2000). Right-click the file and choose *Properties*. Click the *Version* tab to see the version number displayed near the top.

Here are just a few of the useful things you can do with this marvelous software:

Relocate system folders: Tweak UI makes it easy to move the StartUp folder up the Explorer hierarchy, or to move the My Documents folder to another drive. The first step is to create the folder that you want to act as a system folder in Explorer. Next, start Tweak UI, click the *General* tab, and choose the folder that you want to change from the Folder drop-down list. Click *Change Location*, select the folder you created, and click *OK* twice. If you work on a multiple-boot system and want all your versions of Windows to use the same Favorites (or other) folder, you won't be forced to make changes to each of the systems you boot to.

Help with Help: You can click the question mark that appears on the Tweak UI title bar and select an item to get information, but often the resulting pop-up help says only, "No Help topic is associated with this item." If you get that message, try right-clicking the item and choosing *What's This?* Chances are you'll see pop-up help where you thought none existed.

Quicker fixes for your right-click New menu: In the June 2000 issue, I told you probably everything you wanted to know (and maybe more) about adding file types to and removing them from the New menu you see when you right-click an empty part of the desktop or folder window. However, as Ken Lee (and others) pointed out via e-mail, it's much easier to add items to this menu and remove them from it using Tweak UI. Just click the *New* tab. To add a file type to the right-click

ILLUSTRATION: PETER HOEY

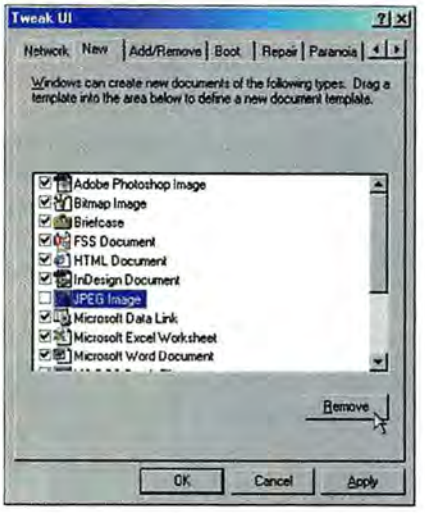

FIGURE 1: TWEAK UI MAKES IT easy to add or remove items from the right-click New menu.

New menu, create a template file for it and drag the template file to the list on Tweak UI's New tab. (You can then delete the template file if you want; Tweak UI stores a copy in the Windows\ShellNew folder.) To temporarily remove an item from the menu, uncheck the box next to it in the Tweak UI list. To remove an item permanently, select it and click *Remove* (see **FIGURE 1**). Then click *OK*. This is a lot easier and safer than editing the Registry. The tip in the June issue is still useful if you want to remove all occurrences of a particular file type from your system.

Second chance for lost uninstall options: Although its developers probably didn't intend this use, Tweak UI can help solve a special problem. Let's say you go to the Add/Remove Programs applet to uninstall an application, only to discover that the application is no longer listed. This can occur if you restore the Windows Registry from a backup that predates the installation of your software. You could reinstall the application in the same folder and then turn around and uninstall it again, but a better approach may be this simple technique submitted by Don Ferron of Worland, Wyoming: Double-click the *Tweak UI* icon in Control Panel and click the *Add/Remove* tab to bring it to the front. Select the application you want to uninstall from the list and click the *Edit* button. Then drag over the text in the Command box (or press **<Alt>-C**) to select it, right-click the highlighted text, and choose *Copy* (see **FIGURE 2**). Click *Cancel*, choose *Start•Run*, and press **<Ctrl>-V** to paste the command line over the existing text. Click *OK*, and the uninstall routine for that application will proceed as if you had launched it from the Add/Remove Control Panel. This solution works only if you install Tweak UI while the original uninstall list in Control Panel is intact.

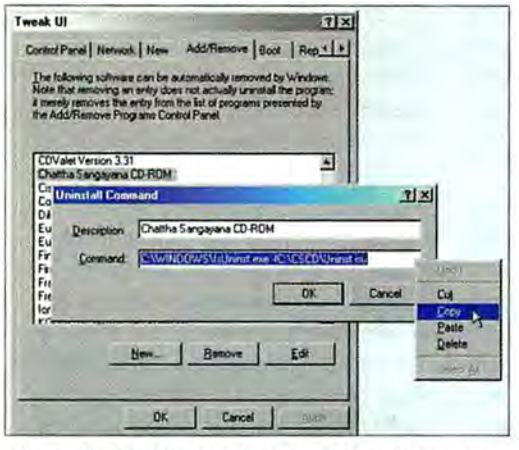

FIGURE 2: LOST YOUR UNINSTALL ICON? If you use Tweak UI, the necessary command line is there to copy.

BACKUP FOLLOW-UP

LAST MONTH'S column described how to automate backups for Windows 95 and Windows 98 systems. Here's how to do the same for Windows NT and Windows 2000:

Automating NT: The version of Backup that comes with Windows NT supports tape drives only. If that limitation doesn't bother you, NT has all the tools you need to make automatic backups. (If you want to copy files elsewhere, see "An Alternate Approach" at www.pcworld.com/oct2000/wintips.) Log on as the Administrator and click *Start•Programs•Accessories•Notepad*. Next you'll enter a command line that launches ntbackup and copies the folders whose contents you want to back up. To do this, enter the **backup** parameter first, then specify paths to folders. You'll need to use shortened, DOS-style folder names if any of the specified folders have long names or spaces. For example, to back up the "My Documents" and "Program Files" folders on your C: drive, type **ntbackup backup c:\mydocu~1 c:\progra~1**. To add a description to the specific backup job, use the /d switch followed by a description in quotation marks. Similarly, you can get a report of the whole procedure by adding /l and a log path and file name in quotation marks. Here's an example of a command line using these options: **ntbackup backup c:\mydocu~1 c:\progra~1 /d "my documents backup" /l "c:\backup log.txt"**.

For information on other parameters, such as for an incremental or differential backup, start the Backup program manually (*Start•Programs•Administrative Tools (Common)•Backup*), choose *Help•Contents*, click the *Index* tab, and double-click the *batch files* topic in the list. When you're done editing your command line and settings in Notepad, save your work as a command file: Choose *File•Save As*, navigate to a convenient folder, and type a name with the .cmd extension. Be ▶

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Here's how to avoid committing the worst e-mail faux pas: www.pcworld.com/heres_how/email_nonos.

It doesn't have to cost you anything to breathe new life into your old PC. Find out how at www.pcworld.com/heres_how/workout.

sure to use quotation marks so Notepad will not add its default .txt extension—for example, **"backup.cmd"**.

Next, make sure the Schedule service is up and running on your machine. Choose *Start•Settings•Control Panel* and double-click the *Services* icon. Select *Schedule* and click *Start*. To guarantee that the service starts every time you start Windows NT, check to make sure Schedule is still selected. Click the *Startup* button, select *Automatic*, and click *OK*. Then click *Close* and exit Control Panel.

To schedule your backup, open a command prompt window (*Start•Programs•Command Prompt*) and at the prompt, type **at** followed by the time you want the backup to begin (in 24-hour-clock time).

For regular backups, use the **/every:** switch followed either by a number (representing the day of the month) or by an abbreviation for the day of the week (m, t, w, th, f, sa, su). Separate multiple dates with commas, and add the name and path of the command file with your backup settings. For example, if your command file is stored in a folder called "command files" on your C: drive and you want to schedule your backups at 11:15 p.m. every Monday and Friday, you should enter **at 23:15 /every:m,f c:\command files\backup.cmd**. When you do this, the At command responds by assigning a job ID number. To see a list of all scheduled commands, simply type **at** at the command prompt and press **<Enter>**. To cancel an item you previously scheduled, type a command such as **at 0 /delete** and press **<Enter>**. (Replace the 0 with the number of the job you want to cancel, or omit the number if you want to cancel all scheduled jobs.) For a list of other options for the At command, type **at /?** at the command prompt and press **<Enter>**.

FIGURE 3: BACKUP SCHEDULING comes built into Windows 2000. Click *Properties* to specify schedule options.

Naturally, you'll have to remember to keep a suitable cartridge in your tape drive. If you forget to insert a tape or if you use one with insufficient capacity, you may not be able to run Windows NT Backup again until after you have restarted the operating system.

Automating 2000: Windows 2000 makes the process easier by including scheduling options within Microsoft Backup. To schedule a regular backup, first choose *Start•Programs•Accessories•System Tools•Backup*. Click the *Backup* tab and choose *Job•New*. Then use the check boxes that appear in the left and/or right panes to select the folders or files you want to back up. Choose *Job•Save Selection As*, type a name for the selection list you just created, and click *Save*. At the bottom of the window, choose a destination medium (click *Tape* for a tape device or select *File* for everything else).

If you choose File, type in a path to the disk and/or folder where you want the backup to be stored, as well as a backup file name with the .bkf extension—for example, **e:\backup\my backup job.bkf**. An alternative method is to click *Browse* to select a folder via a conventional dialog, then simply type a backup file name in the File name box and click *Open*.

Now click the *Start Backup* button (not exactly an intuitive choice, since you're only going to schedule a backup, not start one). Set any desired options in the Backup Job Information dialog box, and if those aren't enough, click *Advanced* and set more options there.

Click *OK* to close the *Advanced Backup Options* dialog box. Click *Schedule*, type in a password and confirmation, and click *OK*. In the Scheduled Job Options dialog box, type a name for this scheduled backup, and then click *Properties* (see **FIGURE 3**).

In the Schedule Job dialog box, specify the time for the backup to occur. Close all dialog boxes. If you change your mind about your schedule settings, click the *Schedule Jobs* tab in the main Backup window, and then click the icon corresponding to your scheduled job to open the dialog box for changing schedule options. To schedule multiple backups for different sets of files or different locations, see the October column's "Divide and conquer" subsection (www.pcworld.com/oct2000/wintips). For more on PC backup alternatives, consult "Hassle-Free Backups" at www.pcworld.com/oct2000/backups.

You can find files mentioned in this article at www.pcworld.com/downloads, and more tips at www.pcworld.com/heres_how. Windows Tips pays $50 for published tips and questions. Scott Dunn is a contributing editor for PC World *and a principal author of* The PC Bible, 2nd Edition *(Peachpit Press, 1995).* ■

WINDOWS TOOLBOX

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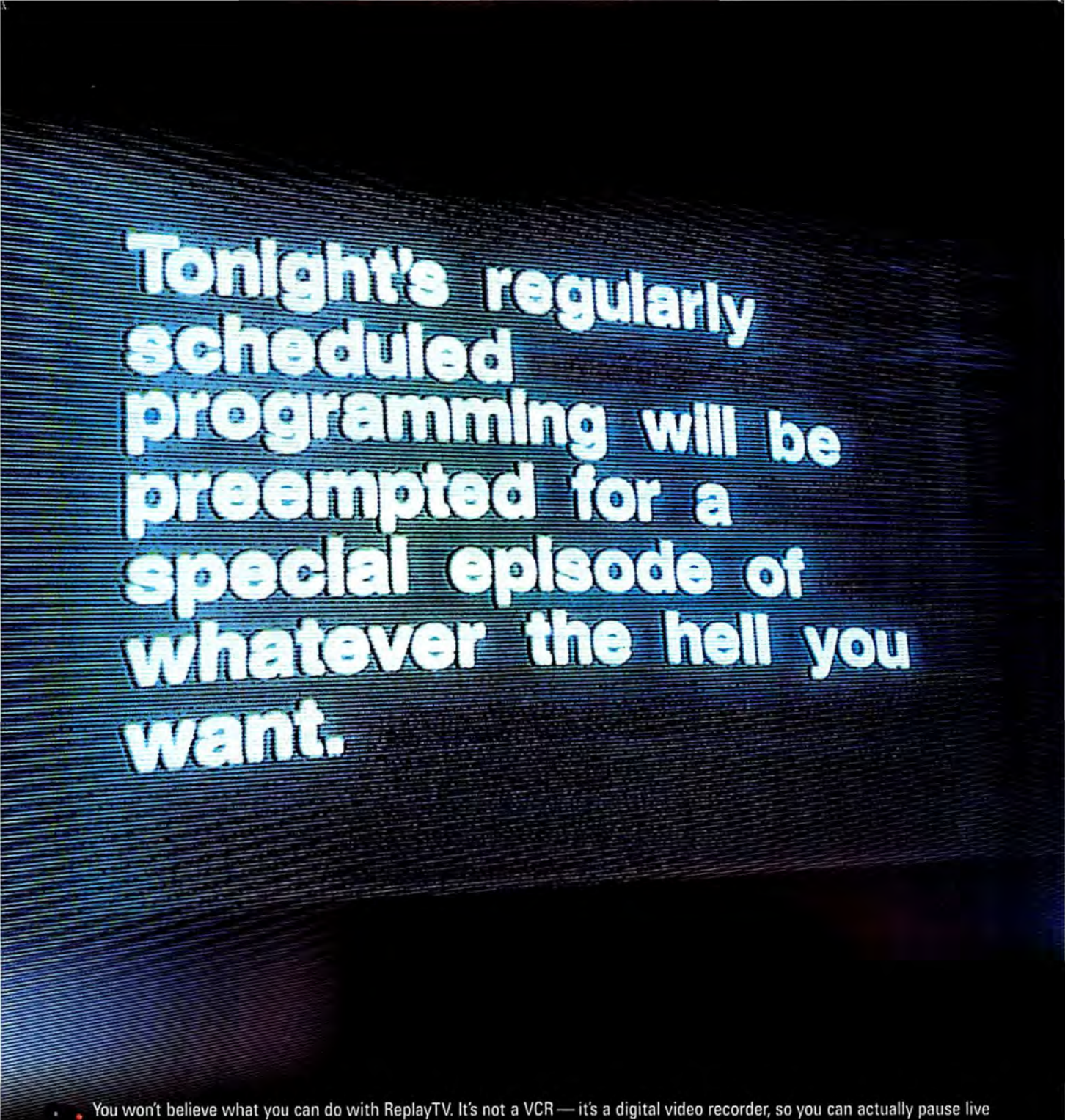

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YOUR QUESTIONS ON: Altering Office's Place Bar • Outlook 2000 on a LAN

Identify Mystery Apps Running in the Shadows

I CLOSE EVERY window and every icon in the system tray, then press <Ctrl>-<Alt>-<Delete>, but I still see that programs are running in the background. What are they?

Chris Madaio, Baltimore

THEY COULD BE anything; many programs have modules that lurk in your PC's shadows. To find out what a particular unidentified program is, press **<Ctrl>-<Alt>-<Delete>** to open the Close Program dialog box, then write the program's name down on paper. After you've closed the box, select *Start•Find•Files or Folders*. In the Named field, enter the name of the program followed by **.exe**, such as **dbserver.exe**. In the Look In field, select *Local hard drives*, then click *Find Now*.

Chances are you'll find the file. When you do, the folder it's in should tell you what program put it there. For instance, if the file's in C:\Program Files\Microsoft Office, chances are it's part of Office.

If a file search doesn't turn up a program, or if it's in a common dumping-ground folder like C:\Windows\System, turn programs on and off. Select *Start•Run*, type **msconfig**, and press **<Enter>**. Click the *Startup* tab for a list of all programs that load at boot-up. Find out what's loading a particular program by unchecking options and rebooting until you can identify the malefactor.

Programs you're likely to find in the Close Program dialog box include:

Explorer and **systray:** Basic parts of Windows that should always be up.

Findfast and **osa:** Parts of Microsoft Office 97 (but not of Office 2000). If you don't want them, you can get rid of them by removing Microsoft Find Fast and Office Startup from the Start•Programs•Startup menu.

Rnaap: Part of Windows. It loads when you use dial-up networking, and then stays in memory until you close Windows.

CUSTOMIZE THE OPEN DIALOG PLACE BAR IN OFFICE 2000

ON THE LEFT SIDE of the Office 2000 File Open dialog box are icons for five locations where Microsoft assumes you want to keep your files. How can I customize these choices to add the folders that *I* want to have there?

Brad Williams
Victoria, British Columbia

THIS IS SO typically shortsighted of Microsoft. It gives you a handy feature that absolutely requires customization to be useful, and then it doesn't tell you how you can customize it!

To change what Microsoft calls the Place Bar (see **FIGURE 1**), you have to edit the Registry. As usual, you should back up the Registry first (for instructions on doing this, see May's *Answer Line* at www.pcworld.com/may00/al).

Note: Before you start editing the Registry, close all Office applications.

When you're ready, select *Start•Run*, type **regedit**, and press **<Enter>** to bring up the Registry Editor. Navigate in the left pane to HKEY_CURRENT_USER\Software\Microsoft\Office\9.0\Common\Open Find\Places\StandardPlaces.

The dialog box allows you to display only five place icons, so for every one you want to add, you must hide one of Microsoft's defaults. (Later I'll show you how to outwit this requirement.) Beneath StandardPlaces you'll find a key for every icon on the Place Bar. Right-click on one for an icon you don't want, and select *New•DWORD value*. Name the value **show**, and leave it with its default value of 0. Repeat this procedure for every icon you want to hide.

Once you've hidden a few folder icons, you're ready to create new ones. Right-click the *UserDefinedPlaces* key under Places, and then select *New•Key*. Give the key any name you wish.

Right-click the new key and select *New•String Value*. Name this value **name**. Press **<Enter>**, type in an appropriate name, and press **<Enter>** again.

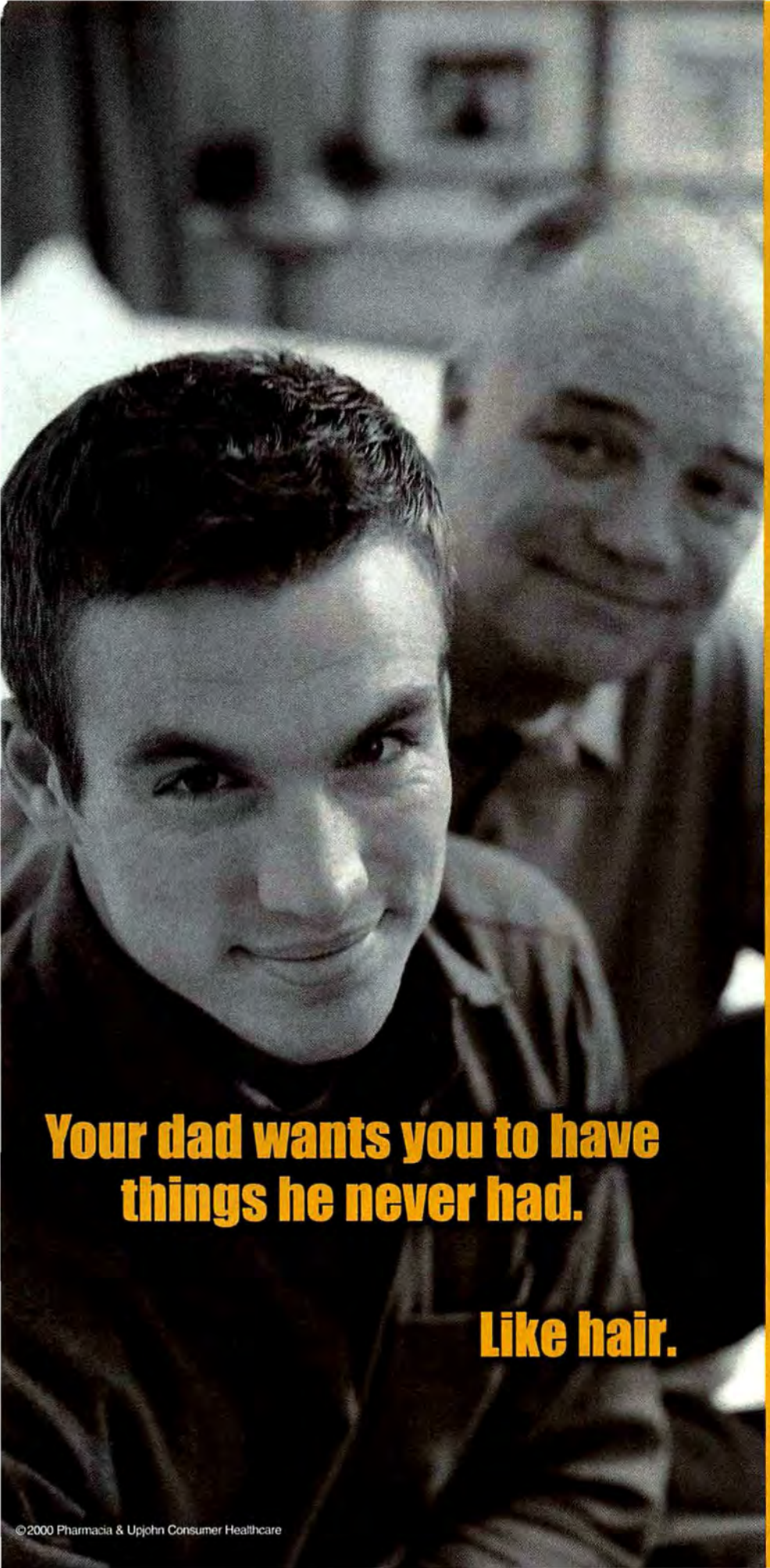
Right-click the key again ▶

FIGURE 1: CHANGE THE folders listed in the Office 2000 Open Dialog Place Bar (or add new folders, as at right) by editing the Windows Registry.

ILLUSTRATION: JEFFREY PELO

Put Favorite Files on a Menu

GOT FILES YOU open regularly? Want to make them easier to get to? Put them on the Start menu. In Windows Explorer, go to the appropriate folder and select the file. Drag it to the *Start* button, wait until the Start menu pops up, then place the file where you want it. (You're not moving the file, just creating a shortcut.) If you want all such files in one subfolder, right-click the *Start* button and select *Explore* to bring up the Start Menu folder in Windows Explorer. Then create a folder called, say, Favorite Files.



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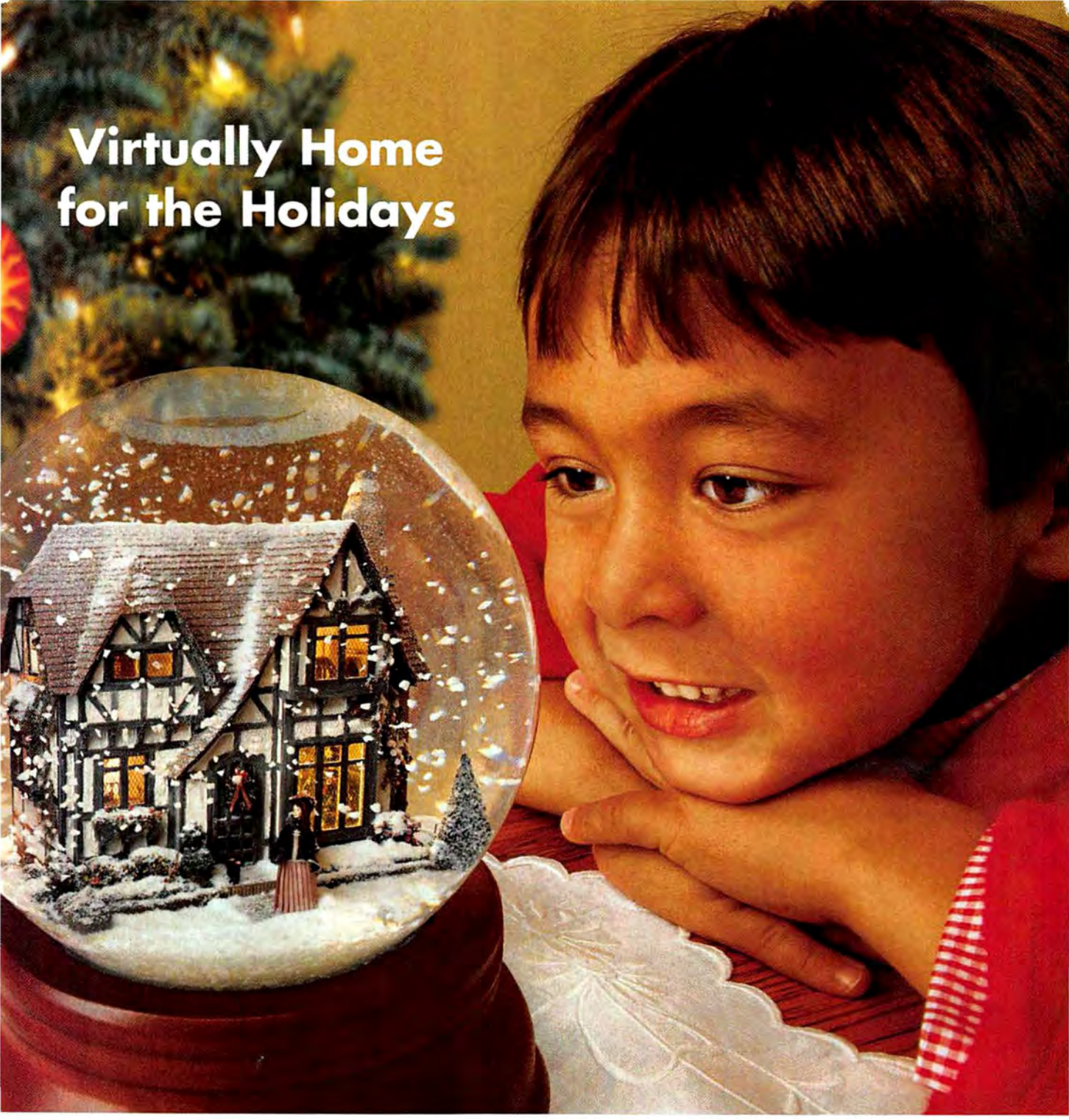

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and select *New•String Value*. Call this one **path**; for the text string, enter the full path to the folder. For instance, if you want a shortcut to your Alternate Docs folder on your D: drive (as in Figure 1), your name value might be **Alternate Docs** and your path value **D:\Alternate Docs**.

There's a way to get around the dialog box's five-folder limit. Right-click the *Places* key and select *New•DWORD Value*. Name the new value **ItemSize** and leave it with the default value of 0. The folder icons will be smaller, and you'll be able to fit more of them in the dialog box, as shown in the right-hand panel of Figure 1.

SHARE AN OUTLOOK CALENDAR

WE WANT TO share one Outlook 2000 calendar across a small-office LAN. We can't figure out how to do it. Can you help?

Matthew Brenengen, St. Paul

OUTLOOK 2000 offers several ways to share calendar information. I'll describe two that are easy to set up.

Net Folders relies on e-mail, so if everyone on your LAN uses Outlook as their e-mail client, you can use Net Folders. First, select *File•Share•Calendar* (you may have to wait for the Share option to appear). If you are told that a feature must be installed, click *Yes* and insert your Office CD-ROM.

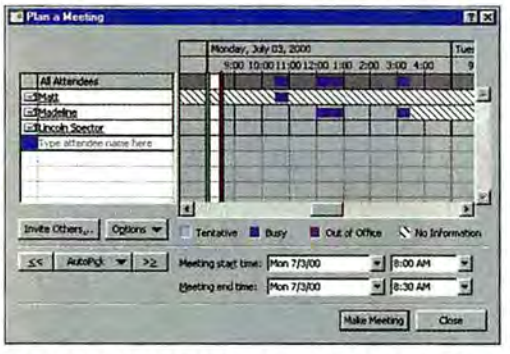

FIGURE 2: USE MICROSOFT OUTLOOK TO SEE who's free for a meeting by setting it to share information.

Once everything is installed, Outlook will bring up the Net Folder Wizard. On the wizard's second page, where you identify the people you want to share your calendar with, click the *Permissions* button to allow them to alter the calendar.

The next time you send e-mail, Outlook will mail invitations to everyone you listed. When recipients click the invitation's *Accept* button, a copy of your calendar is loaded onto their computer. To see that calendar, they select *View•Folder List*. To make the calendar more readily available, they can drag it from the folder list to the shortcut bar. E-mail exchanges are generated automatically to keep individual copies of the calendar in sync.

Internet Free/Busy won't show you someone's whole calendar, but it will let you see the times other people are available, which is useful for setting up a meeting. The function is designed to work over an Internet connection, but it will work on any network with shared folders if you make the paths to those folders a URL (more on this below).

The first step is to create a folder that everyone can access on a network server or workstation. If you put it on a workstation, that system's owner must give everyone full read/write rights to it. Don't use spaces in the folder name (URLs can't have spaces). To publish your own information, select *Tools•Options*, click the *Calendar Options* button and then the *Free/Busy Options* button.

In the resulting dialog box, check *Publish my free/busy information*. Then, in the 'Publish at this URL' field, enter the path to your as-yet-uncreated file in the shared folder. This path must be entered as a URL, starting with **file://** and using forward slashes (/) instead of backslashes (\). For instance, if the shared folder is called *freebusy* and is on a computer identified as 'shared' on the network, and your name is Matthew, you might enter **file://shared/freebusy/matthew.vfb**. (The file extension *must* be **.vfb**.)

In the 'Search at this URL' field, enter a URL to a generic file in the same path: **file://shared/freebusy/username.vfb**. Click *OK* three times to return to Outlook.

After you've set up your information, you'll have to send it manually. Select *Tools•Send/Receive*, wait for *Free/Busy Information* to appear on the menu, then select it. From now on, Outlook will ▶

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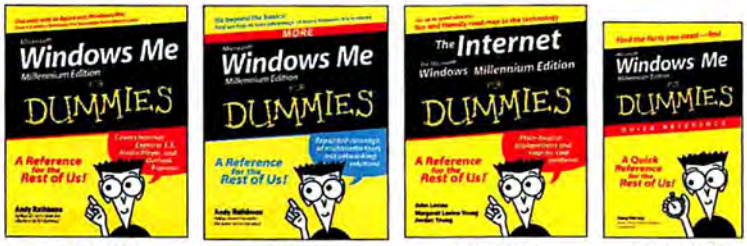

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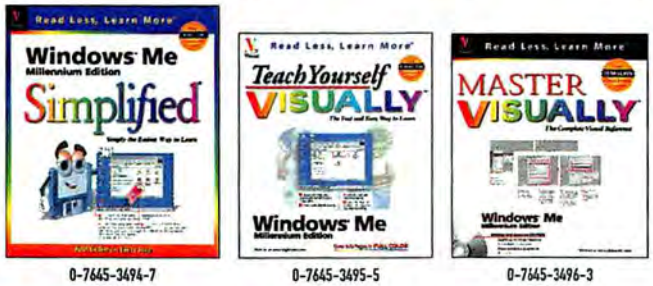

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update this information automatically.

To use other people's Internet Free/Busy, follow the steps above for sharing your own information, then go to Outlook's Contacts page and double-click the name of a coworker whose information you want to access (add any coworkers who aren't listed). In the resulting Contact dialog box, click the *Details* tab. At the bottom of the dialog box, in the Internet Free/Busy section, type the URL path to them, such as **file://shared/freebusy/irving.vfb**. *Save* and *Close* the dialog box.

Outlook provides a number of ways to use this information. For instance, go to the date in the Calendar and select *Actions•Plan a Meeting*. Click the *Invite Others* button to select people to invite. After you select them and return to the Plan a Meeting dialog box, you'll see when each invitee is available (see **FIGURE 2**).

SNAPPING DESKTOP ICONS

MY DESKTOP ICONS have lost their snap! They used to snap into position on the desktop. Now they stay where I put them. Is something broken?

A. Kilcup, Alexandria, Virginia

NO, YOU JUST inadvertently changed the desktop's Auto Arrange setting. If you

FIGURE 3: SNAP DESKTOP ICONS via Auto Arrange on the right-click menu.

want the icons to snap into place and they don't, or if they're snapping and you'd rather they didn't, just right-click the desktop and select *Arrange Icons•Auto Arrange* (as shown in **FIGURE 3**).

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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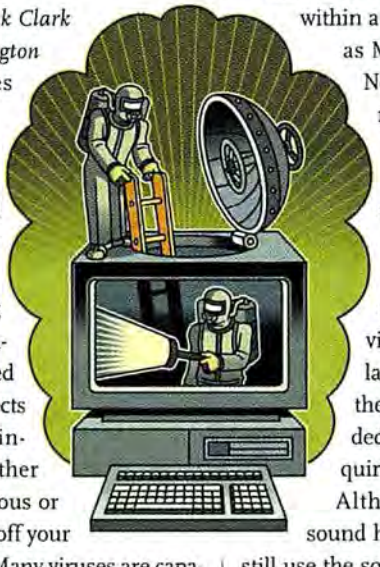
An AOL e-mail utility • Online auto price information • WYSIWYG HTML editing

Tools and Rules of Internet Security

HAVING BEEN BITTEN by the I Love You virus, I know never to open an e-mail attachment with the file extension .vbs. I also know about the dangers of opening e-mail attachments with the extensions .exe (executable files) and .doc (Microsoft Word files with macros). But what other potentially nasty files should I never open? And are there files that are safe to open no matter what?

Frank Clark
Everett, Washington



YOUR LETTER raises many fundamental questions about the ways we use our computers and about the safety of our information.

If you were stung by the I Love You virus, you experienced one of the worst effects a virus can have: inconvenience. Whether the virus is pernicious or benign, cleaning it off your system takes time. Many viruses are capable of destroying data on your computer or stealing it from your PC, but most do neither and are written merely to prove the existence of flaws in the operating system or e-mail software they infect.

Of course, much of the flawed software comes from Microsoft, which has triggered more than one Gates basher to call for a boycott of Windows, Internet Explorer, and Outlook as a way to ensure security. Whatever the merits of this approach, the issue is not that simple, and just switching to Linux, Eudora, or Opera won't protect you from every Internet security threat that's lurking out there.

Viruses can use various means to insinuate themselves into your computer—through a floppy disk, a program copied from a different PC, or software downloaded from AOL or the Internet. Alternatively, they may be introduced via a macro or other script file that runs within a standard application such as Microsoft Word, Outlook, Netscape Navigator, or Eudora. Ordinarily, you have to take some action to start a program, macro, or script running on your computer, but many viruses trigger the application automatically. Recently e-mail viruses have turned up that launch as soon as you view the message they are embedded in—no other action is required on your part.

Although the situation may sound hopeless, it is not. You can still use the software of your choice, and you can still open e-mail attachments. Here are several basic rules that can help you protect yourself from viruses.

Use antivirus software. I generally dislike installing utilities on my computer because they conflict with other programs and the operating system itself, and they make troubleshooting much more difficult. Antivirus programs are among the worst offenders, but just the same, most people should install one and keep that program updated. Doing so will protect you from the vast majority of viruses. Skip this step at your peril. (Look for a feature on viruses and antivirus programs in next month's *PC World*.)

Update your software. In the last couple of years, software makers have become increasingly responsive to reports of security flaws in their software. The whole issue has moved out of the realm of obscure discussions buried in Usenet newsgroups and onto the pages of the *New York Times*, the *Wall Street Journal*, and of course, *PC World*'s *Bugs and Fixes* column. These days, software vendors often post security fixes to their Web sites before a real-world threat has even materialized.

To update Netscape Navigator, select *Help•Software Updates*. To update Internet Explorer or Windows 98, 2000, or the new Millennium Edition (Me), choose *Start•Windows Update*, or cruise direct- ▶

FIGURE 1: TO EXPOSE E-MAIL VIRUSES masquerading as innocent file types, uncheck Explorer's 'hide' option.

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WHEN YOU BUY or sell a used car or motorcycle, there's only one place to find a realistic price: the Kelley Blue Book. If you can't make it to your library's reference section, zoom over to www.kbb.com to look up the price of new and used vehicles in your area. Also provided are reviews and tips for buyers and sellers, plus links to Web-based car dealers, financing sources, and insurance providers. A "lemon check" reports a vehicle's odometer, salvage, and major accident history based on the vehicle ID number.

ILLUSTRATIONS: PETER HOEY (LEFT); JEFFREY PELO (RIGHT)

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ly to windowsupdate.microsoft.com. This Microsoft site will determine what software versions you are currently running and will assist you in downloading and installing required updates.

Understand and use security settings. Most applications that host macro code or scripting languages have security settings that let you control when and how the scripts run. Know what those settings are and make sure they meet your security needs. In Internet Explorer, choose *Tools•Internet Options*, click the *Security* tab, and then select the *Internet* zone. Click the *Custom Level* button to browse security options, or click the *Default Level* button to make sure security is set to *Medium*. To find Netscape Navigator's security settings, choose *Edit•Preferences*, and then select *Advanced* in the *Category* window. Don't forget your application's macro security settings. In Word, Excel, or Outlook 2000, choose *Tools•Macro•Security*, and make sure your setting is at least *Medium*. If your Word files don't rely much on macros, choose *High*.

Another important security setting in Windows Explorer relates to file extensions that have been hidden on such file types as .vbs (Visual Basic script). Several Outlook e-mail attacks have tricked users into launching .vbs attachments by giving them names such as *filename*.jpg.vbs. Since the .vbs extension disappears, the file looks like a nonexecutable, nonscriptable .jpg image file that is safe to open. To protect yourself from this trick, open an Explorer window, choose *Tools•Folder Options* or *View•Folder Options* (depending on your version of Windows), select the *View* tab, remove the check from *Hide file extensions for known file types*, and then click *OK* (see **FIGURE 1**).

Don't launch executable or scriptable files. Executable or scriptable file types include those with .exe, .com, .bat, .xls, .doc, and .vbs extensions. Your best bet is to scan all downloaded files for viruses before running them. If an arriving e-mail contains a Word (.doc) document, assume the document will infect your system. Don't open it until your antivirus software has scanned it and declared it virus-free. Just because the document comes from your boss or your mother doesn't mean it's safe. If you want to view the contents of a file without triggering any macros it may include, open it in Notepad or Quick View. Regrettably, the Quick View utility is not included in Windows 2000 or in Windows Me, but you can buy a third-party copy of Quick View Plus 6 from Jasc Software for $49 downloaded or $59 boxed.

The major shareware sites—including PCWorld.com's Downloads—scan programs for viruses before posting them for download, and of course legitimate software vendors ensure that the applications they post to their Web sites are free of viruses. Software posted to pirate (so-called "warez") sites or newsgroups may be infected, however, and the pirated applications floating through such file-sharing systems as Napster and Gnutella must also be considered virus hazards.

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Jasc Software; 800/622-2793;
www.jasc.com/product

ANOTHER AOL MAIL ALTERNATIVE

IF YOU SHOUTED, "Hallelujah!" when you read in the September *Internet Tips* column (www.pcworld.com/sep2000/internet_tips) about the Netscape 6 preview release's ability to access America Online Mail accounts, you may need to curb your enthusiasm a bit. Netscape has unleashed a second preview release that's as buggy as the first and likewise remains suitable only for testing.

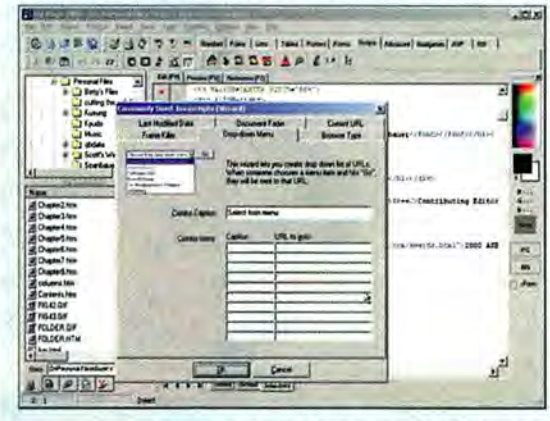
But rather than moping about poor commercial software development, you should rejoice. ENetBot's $20 ENetBot Mail lets you check your AOL mail from within any POP3-capable e-mail program (including Eudora, Outlook, Outlook Express, and Messenger). Once you have calmed down from all the excitement, you can download the 1.75MB, 30-day trial version of the utility from PCWorld.com. For the full version, go to the company's Web site at www.enetbot.com.

Find files from this article at www.pcworld.com/downloads. Send your questions and tips to nettips@spanbauer.com. We pay $50 for published items. Scott Spanbauer is a PC World *contributing editor.* ■

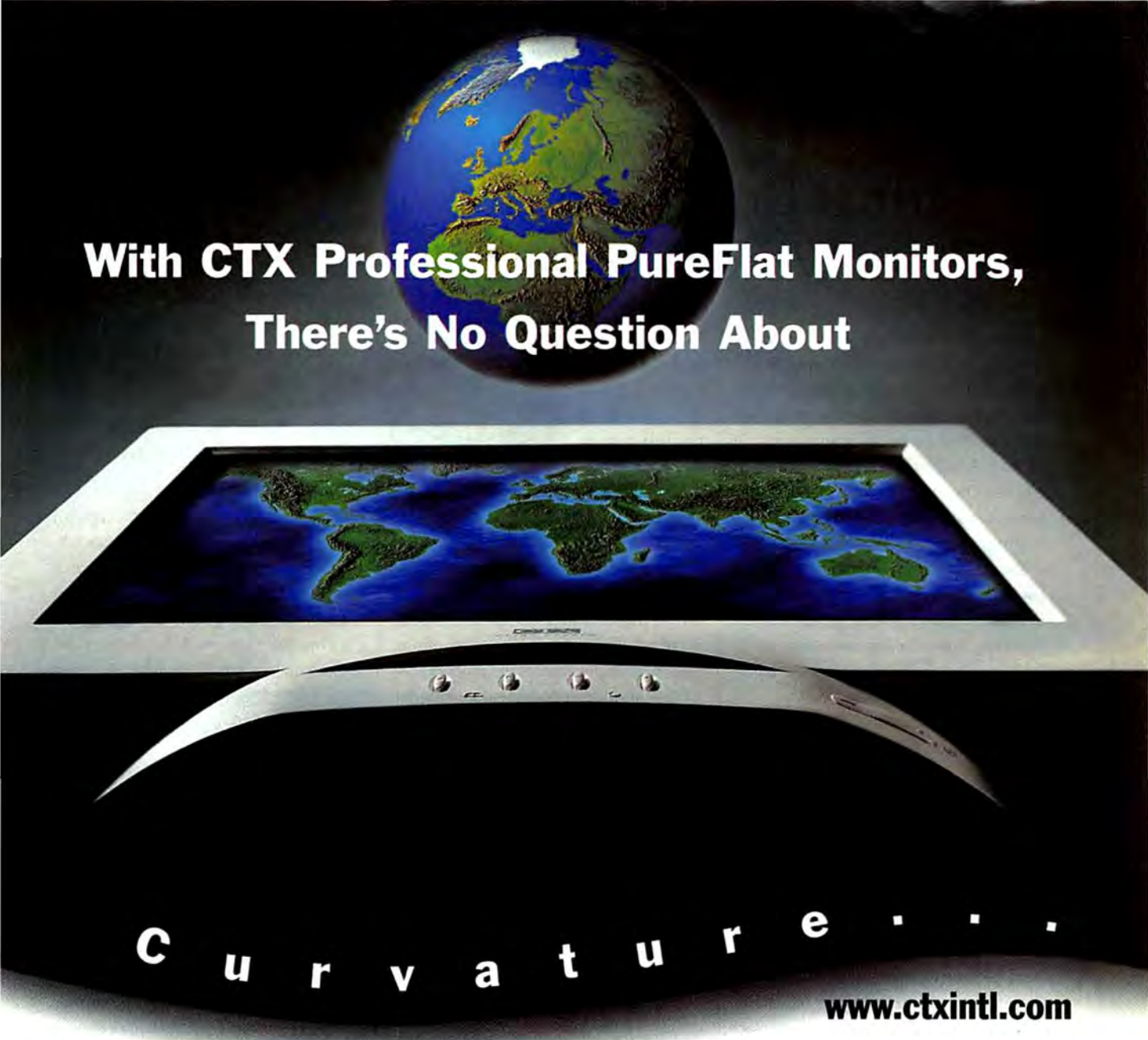
DOWNLOAD OF THE MONTH

1st Page 2000 2.0

EVRSOFT'S FREE 1st Page 2000 HTML editing software breaks all the molds: It supports frames, scripting, and style sheets (unlike some of its commercial counterparts), and the HTML it creates is free of the bogus tags and extra code common in most WYSIWYG editors. 1st Page 2000 (the name will be changed when it's next updated) generates standard, bug-free HTML code, and it may be the simplest way to take your Web authoring skills to the next level.



The freeware works with existing HTML files, or you can use it to start new ones that support Cascading Style Sheets and Java applets. The editor highlights tags in color and lets you insert tags from lists. Reference guides and tutorials are included for HTML 4.0, Cascading Style Sheets, and other Web technologies. Also provided are hundreds of prefabricated JavaScript, CGI, and Perl scripts to pop into your Web pages. If that's too geeky for you, an Easy mode hides advanced tools and options until you're ready for the Expert or Hardcore modes. Find the 5MB download at PCWorld.com's Downloads (www.pcworld.com/downloads).



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Format Documents for Other Word Processors

IF YOU'RE CREATING a document in Word 97 or Word 2000 that you plan to share with users of another word processing program, you can do more than save the document in the other program's file format. A little-known feature in Word lets you fine-tune a document to look the same in the format of another word processing program as it does in Word.

To set up a document for another word processor, select *Tools•Options* and click the *Compatibility* tab in the Options dialog box. Drop down the *Recommended options for* list and select the word processing program the recipient will use. You'll see specific features of that program checked in the Options list. If the exact version of the recipient's word processor isn't on the list, choose the closest version.

Take this step before you begin working on the document to see it, while you create it, the way your recipient will see it. Finish up by using *File•Save As* to save the document in the other program's format. **Hint:** To apply these compatibility settings to all documents, open the default *normal.dot* template as you would any other document, follow the steps above, and select *File•Save*. To locate normal.dot, select *Tools•Options*, click the *File Locations* tab in the Options dialog box, and note the directory in which templates are stored. If the folder name is truncated, double-click it, and you'll see a list of the full path in the Modify Locations dialog box.

FIGURE 1: MARK TEXT AS INDEX entries. This dialog box remains visible as you work.

Where's My Document?

UNLIKE EARLIER versions, Word 97 and 2000 no longer show the full path specification of your documents in the program's title bar. Many Word users who store documents in multiple directories for version control or save documents to removable media drives sorely miss this feature. If you need to know exactly where a document is stored, you can find out by selecting *File•Properties*, then clicking the *General* tab in the Properties dialog box. You'll find the full path in the Locations field.

MARK TEXT FOR AN INDEX

WHEN YOUR DOCUMENT page count creeps into double digits, you may need a way to direct readers to specific topics. Word's indexing tools take much of the mystery and labor out of the process.

Scroll through a document looking for a word or phrase you want to index. When you find one, select it and then press **<Alt>-<Shift>-X**. You'll see the Main Entry field of the Mark Index Entry dialog box filled with the selected text (see **FIGURE 1**). If you want to mark the term as a Main Index entry, click *Mark*. To mark all identical text in the document as a series of separate index entries, click *Mark All*. To create a subentry, type the text in the subentry field; and to create a third-level entry, type a colon after the subentry text, followed by the text for the index item.

The Mark Index Entry dialog box stays on the screen after you click *Mark* to allow you to create new index entries. When you finish marking entries, click *Close*. To create the index, press **<Ctrl>-<End>** to move the cursor to the bottom of the document. Then select *Insert•Index and Tables*, click the *Index* tab in the Index and Tables dialog box, and click *OK*.

EASY EM AND EN SPACES

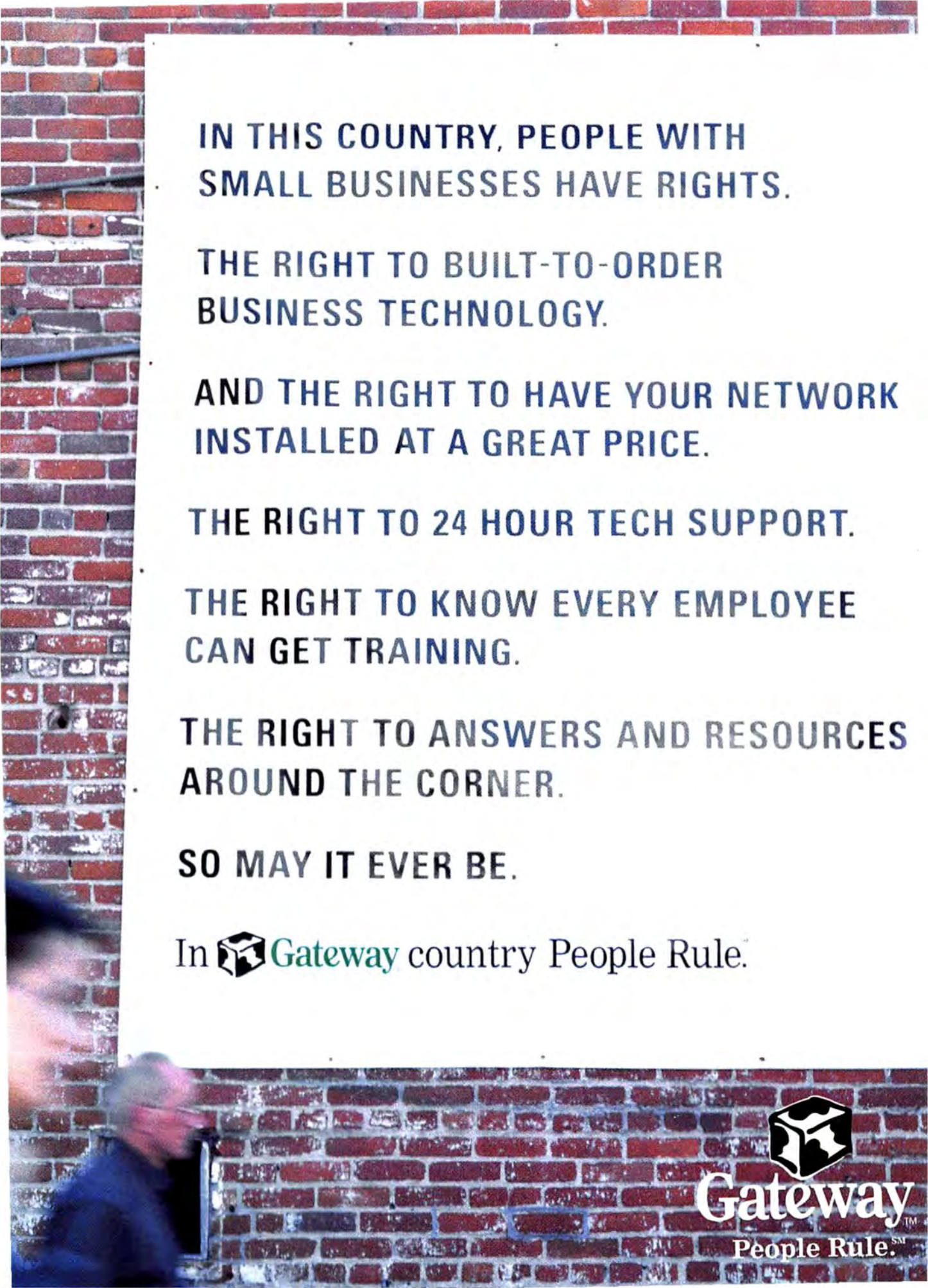
TYPOGRAPHICAL em and en spaces are useful formatting tools in Word 97 and 2000, but few users know how to access them. They are wider than normal spaces and are useful in lists, following a number, or anywhere a fixed-width space will help align text or numbers.

Select *Insert•Symbol*, and in the Symbol dialog box click the *Special Characters* tab. Choose *Em Space* or *En Space* and click *Insert*. Add the characters to your Insert menu by selecting *Tools•Customize* and clicking the *Commands* tab in the Customize dialog box. Then select *Insert* in the Categories list and scroll to the Insert Em Space or the Insert En Space entry in the Commands list. Click an entry and drag it to the Insert menu (see **FIGURE 2**). When the Insert menu drops down, drag the mouse pointer to where you want the command, then release the mouse button. Repeat these steps for the other Insert Space command, then click *Close* in the Customize dialog box.

FIGURE 2: ADD EM AND EN SPACE commands to the Insert menu from the Customize dialog.

Send your questions and tips to george_campbell@pcworld.com. We pay $50 for published items. George Campbell is a contributing editor for PC World. He *invites you to visit his Web page at www.osomin.com.* ■

ILLUSTRATION: JEFFREY PELO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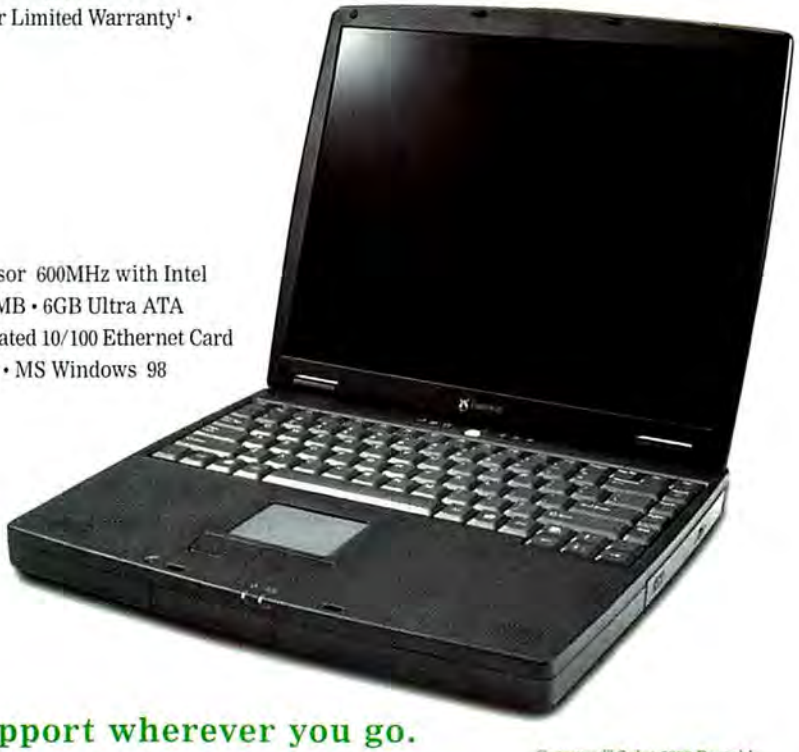

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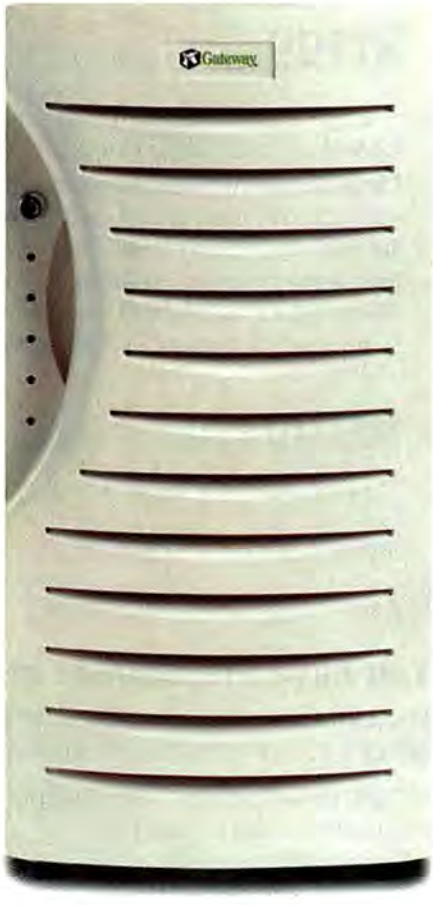

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Muzzle your modem ◆ A screen-saver alternative: Shut down your monitor

Windows' System Monitor Peeks Under a PC's Hood

YOU CAN THINK of Windows 98's System Monitor as your PC's dashboard. Like the one in your car, it gives you an instant status report on your machine, and it will let you know when trouble is brewing under your PC's hood.

The System Monitor's real-time graphs provide a snapshot of key performance statistics (see **FIGURE 1**). You can watch your system adjust its memory, CPU, and other settings in real time, which is great for optimizing or troubleshooting a PC.

You'll find System Monitor under *Start•Programs•Accessories•System Tools*. If you don't see it there, install it from the Add/Remove Programs applet in Control Panel. Simply select the *Windows Setup* tab and click *System Tools*.

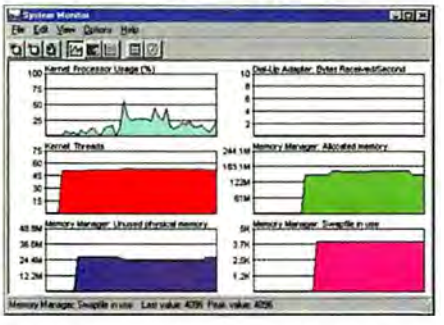

FIGURE 1: SYSTEM MONITOR'S GRAPHS display useful data about your PC's operation.

Once System Monitor is running, you need to determine the best way to display your chosen statistics. To add a statistic to the System Monitor screen, open the *Edit* menu, select *Add Item*, and pick a statistic from one of the seven categories shown.

Before adding items to view, however, you'll want to set up the System Monitor display. Keep System Monitor's statistics visible while you work so you get to know what's normal for your PC and your work habits. The easiest way to do that is to run System Monitor in a small, easy-to-read window that is unlikely to interfere with other computing tasks (see **FIGURE 2**).

To get your System Monitor window to look like the one shown in Figure 2, open the System Monitor's *View* menu and check the *Numeric Charts* setting. Line and bar charts are colorful and fun to look at, but a numeric chart is more precise and easier to read. Also check the *Always on Top* and *Hide Title Bar* settings.

Finally, resize the System Monitor window as desired, and place it on the edge of your screen where it's out of the way. You can make it quite small if you're willing to forgo identification labels and to use color to identify each statistic's box.

BEHIND THE NUMBERS

FAR MORE STATISTICS are available for viewing than you would ever want to put on a single screen. Most of them are too technical for the average user. (Alas, the explanations offered by the *Explain* button on the *Add Item* screen are a joke.) But a handful of statistics are useful to just about every PC user.

Kernel: Processor Usage (%). This is an excellent indicator of your PC's overall computing burden. If your CPU usage consistently runs at over 75 percent, you're overtaxing your PC. The underlying cause may be insufficient memory, too many programs running at once, or a corrupt program that won't release the CPU. In some cases adding memory will fix the problem (see below). In others you need to get a more powerful system.

If you're stuck with high CPU usage—say, because you have an older PC that uses newer, more demanding software—make sure your CPU fan and power supply fan work properly, and confirm that air flows through the case without obstruction. A CPU that is heavily burdened runs hot, and without proper cooling the chip can fail.

Kernel: Threads. Active threads are small pieces of software that occupy RAM. The right number of threads for your PC depends on the software you happen to be running. My nonnetworked desktop system usually has 50 to 70 active threads when Windows 98 is running with no other applications open.

Once you have a feel for what's normal for your PC, keep an eye out for sudden changes. A program that increases the number of threads when open but does not release those threads when closed may be eating up your memory—a phenomenon called a memory leak. ▶

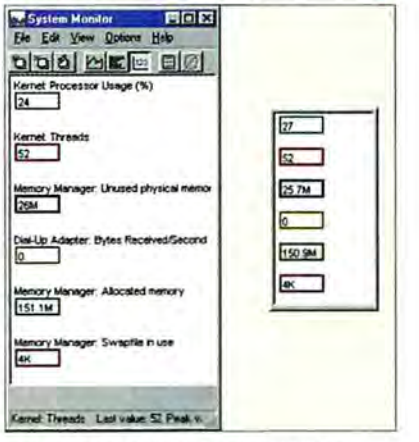

FIGURE 2: SET SYSTEM MONITOR'S View menu to "Always on Top" for easy viewing.

ILLUSTRATION: JEFFREY PELO

Hey, Modem! Shaddup Already!

WANT TO SILENCE your squeaky modem? No problem. In Control Panel, double-click *Modems*, highlight your modem, and select *Properties*. Under the General tab, you'll find a 'Speaker volume' control. Unfortunately, not all modems support this feature. If yours doesn't, go to the *Connection* tab and click the *Advanced* button. In the Extra settings text box, enter the string ATM0 (that last character is a zero, not the letter *o*). Close the open dialog boxes, and you'll never have to listen to that digital cacophony again.

Memory leaks were common under Windows 3.x, and the only fix was to restart your system. Leaks are much more infrequent in Windows 9x, but they still occur, most often with older 16-bit applications. In Windows 9x, you can usually release stranded threads by closing the offending application.

If a newer 32-bit program (one written for Windows 9x) continually eats up memory and leaves stranded threads, the source of trouble may very well be a corrupted file. If this is the case, you need to reinstall the application.

Memory Manager: Unused physical memory. As you'd expect, this is the amount of physical RAM that's still free for use. You may be surprised at how little RAM remains available under Windows, even when only a few applications are running. This is because Windows constantly moves data in and out of the swap file on the hard disk. The 'Unused physical memory' setting is most useful when viewed in conjunction with the following six memory statistics.

Memory Manager: Swapfile size. Windows uses a swap file (also called virtual memory) as a temporary holding area for RAM data not currently being used. This allows Windows to run more programs concurrently than would fit in the installed physical memory alone.

Swap-file size is the size of the file created by Windows on the hard disk. If your system has a limited amount of hard-disk space, you can use this statistic to balance your hard-disk storage needs against Windows' memory needs.

Memory Manager: Swapfile in use. This statistic indicates the amount of RAM data that is actually stored in the swap file at any given moment.

Memory Manager: Page faults, Page-outs. If either of these two statistics jumps to higher-than-normal levels, Windows may be relying too heavily on the swap file. If the increase coincides with sluggish performance, you need to add more physical RAM to your system.

Memory Manager: Allocated memory. This identifies the total amount of data that Windows is manipulating in memory. To determine exactly how much RAM a given program requires, subtract the 'Memory Manager: Disk cache size' value from the amount of 'Allocated memory', with and without the program running. The difference is the amount of RAM used by that program.

Memory Manager: Locked memory. Locked memory refers to the amount of data that must remain in physical RAM and can't be swapped to the hard disk. If an application forces a high percentage of data to be locked in physical RAM, other applications' performance can slow because an inordinate amount of data must be shuttled on and off the hard disk.

Memory Manager: Disk cache size. This statistic reports the amount of RAM allocated to caching hard-disk data. On systems running the original version of Windows 95 with the FAT16 file system, you may be able to rescue a few megabytes of RAM by lowering this setting.

Watch your disk cache values to determine your system's maximum cache needs. If you see more than a megabyte of difference between what your disk cache uses and its fixed maximum value—which is determined by the MaxFileCache= setting listed under [vcache] in your system.ini file—you can recover some of the wasted RAM by lowering the MaxFileCache= setting. Of course,the memory you save may not be worth the effort if your system has more than 32MB of RAM. But if you're working with 32MB of memory or less, your applications will benefit from the extra RAM.

FIGURE 3: USE CONTROL PANEL'S Power Management to shut a monitor off automatically.

Dial-Up Adapter: Bytes Received/Second. This is a handy indicator for checking your dial-up connection speed. System Monitor also maintains a Bytes Transmitted/Second statistic.

BLANK IS BETTER

I FREQUENTLY LEAVE my desk for several minutes to several hours each day with my PC and monitor running. I've been told that I should use a screen-saver program to prolong the life of my monitor. Should I?

Alan Halprin, Chicago

PROBABLY NOT. In the Early Jurassic period of computing, when monochrome monitors dominated the desktop landscape, screen savers were a necessary piece of software. Leaving those monitors on and displaying a single image for extended periods could burn that image into the monitor's screen. The phosphorus in today's color monitors is much less susceptible to burn, however, so today's screen savers serve primarily as a source of entertainment and a handy way to automatically password-protect your PC when you leave your desk for long periods.

In fact, using a screen saver can actually *shorten* your monitor's life. The first component likely to fail on color monitors is the electron gun that guides its illuminating beam. The best way to prolong the gun's life is to shut down your monitor when it's not in use. And if you can't be bothered to manually shut down your monitor each time you leave your desk, let Windows 98 do it for you.

Open Control Panel's *Power Management* applet and click the *Power Schemes* tab (see **FIGURE 3**). Even if you use the "Always On" power scheme, you can set your monitor to shut down automatically after a set time. Any keystroke will reactivate it immediately.

For other hardware tips, see www.pcworld.com/heres_how. Kirk Steers is a PC World *contributing editor.* Hardware Tips *welcomes your tips and questions and pays $50 for published items.* ■

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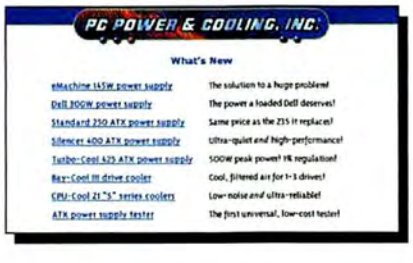
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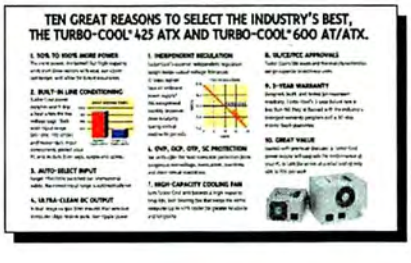
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Manage Your Drive Connections

THE EIDE INTERFACE is the main storage connection in most PCs, not just for hard drives and CD-ROM drives but for CD-RW and removable-media drives as well. A poor configuration can hurt performance, so the more devices you hook up, the more important managing the multiple connections becomes.

All standard desktop PCs have two EIDE channels (primary and secondary), each of which can handle two drives, designated as master and slave. If four drives aren't enough, you can purchase cards that add an extra pair of EIDE channels for $50 to $75. These cards also support fast Ultra DMA/66 (aka ATA/66) hard drives, which don't work to their full potential in PCs more than a couple years old. (Other EIDE peripherals, such as tape drives and CD-RW drives, don't need or use the extra speed of Ultra DMA/66.)

If your PC is more than three or four years old, it may have problems recognizing some newer EIDE drives, so you may need to update your PC's BIOS. Some PC makers let you do that by downloading a file from their Web site. Otherwise, you'll have to buy an upgrade chip (about $50).

Stan Miastkowski is a PC World *contributing editor.* ■

THE TOP DOWN

Benefits: Bigger and faster hard drives, removable-media drives, and tape drives; faster CD-ROM and CD-RW drives.

Costs: Hard drives, $125–$250; CD-ROM drives, $50–$130; CD-RW drives, $200–$300; removable-media drives, $100–$150; tape drives, $150–$300

Expertise level: Intermediate

Time required: 1–2 hours

Tools required: Phillips screwdriver, needle-nosed pliers, antistatic wrist strap.

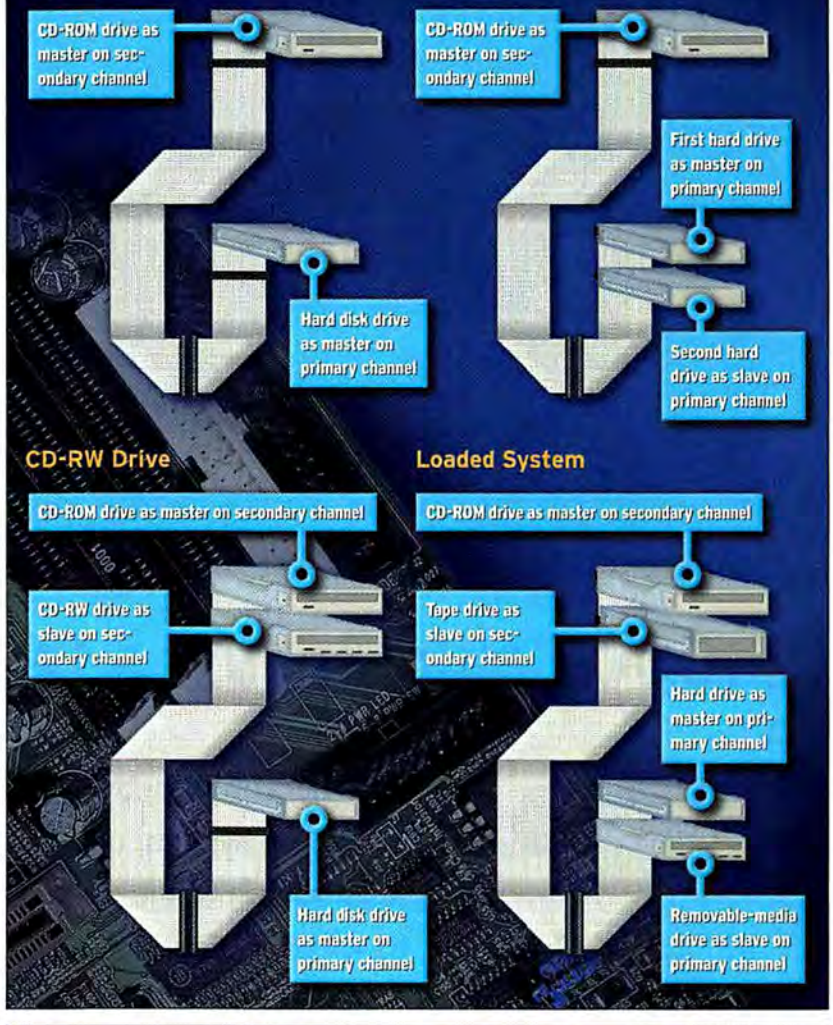
If you need...

Additional EIDE channels: Promise Technology (www.promise.com)

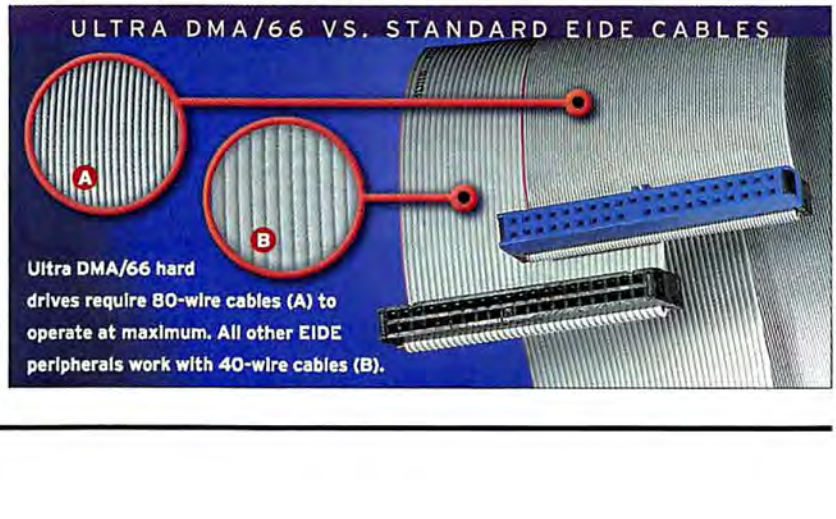
A BIOS chip: Unicore (www.unicore.com)

A FEW EXAMPLES OF EIDE CONNECTIONS

For best overall system performance, keep hard drives (the fastest peripherals) on their own EIDE channel. You can, however, mix and match as needed.



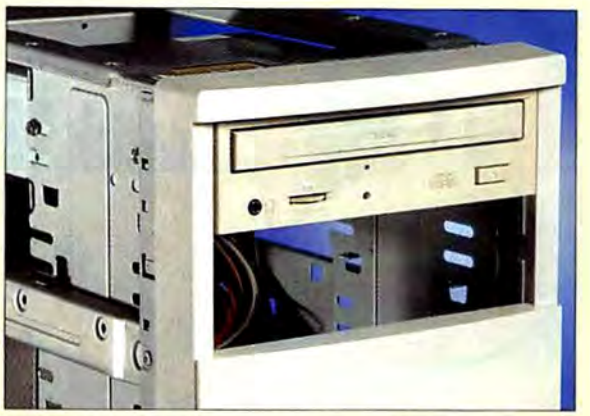
ULTRA DMA/66 VS. STANDARD EIDE CABLES



Ultra DMA/66 hard drives require 80-wire cables (A) to operate at maximum. All other EIDE peripherals work with 40-wire cables (B).

PHOTOGRAPHS: RICK RIZNER

1 Back up your data. As always, make sure you have a full backup of your PC before you do any major upgrade work. If you'll be installing a tape backup drive, copy your most important data to floppy disks until you're ready to use the drive.



2 Find a space for your new drive. Turn off your PC, unplug it, and remove the cover. Depending on the size of your new drive, find a free small (3.5-inch) or large (5.25-inch) drive bay. If you're installing a peripheral (such as a CD-RW drive) that requires front-panel access, remove the bay's cover from the front panel of your PC's case. If you have a small drive and don't have an extra 3.5-inch bay, don't worry: Most drives come with an adapter that allows them to be mounted in a 5.25-inch bay. If your drive doesn't, you can obtain an adapter at extra cost.

Before you go any further, make sure that the wide data cable has a second connector for hooking up the new drive and that this connector can reach the drive in the bay you're planning to use. Also make sure that you have a free red, yellow, and black power connector. If not, you'll need to buy another ribbon cable or a Y-adapter that creates two power connectors out of one.

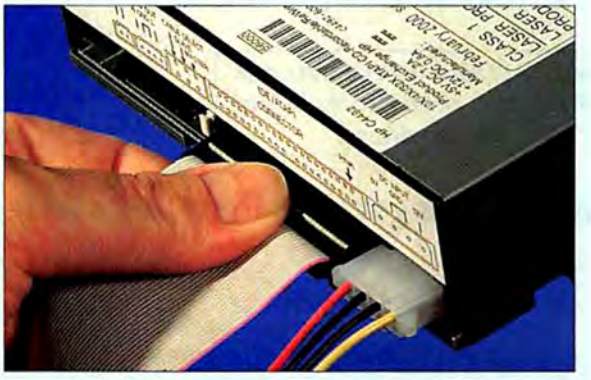
3 Set the drive jumpers. If, as is normally the case, you're installing your new drive as the second drive on an EIDE channel, make sure the jumper on the drive is set to slave. If it's not clearly marked on the drive, consult the manual.

If you're installing a second drive on the primary EIDE channel, to go along with your PC's primary hard drive, you may need to change the jumper on your main hard drive. Some hard drives use different settings, depending on whether they're the only drive on an EIDE channel.

4 Hook up the new drive. Mount the drive in the bay, using the screws that came with it. (In some cases, you may need special brackets. Extra brackets usually come with your PC. If not, contact your PC maker to obtain extras.)

Attach the free connector on the wide data cable to your drive, making sure that pin 1 (the red wire) on the cable goes to pin 1 on the drive. There's usually a key on the cable that allows you to connect it only one way. If not, pin 1 is usually marked on the connector on the drive, though you might have to look closely to find it. Make sure that the other end of the cable is securely attached to the EIDE connector on the motherboard.

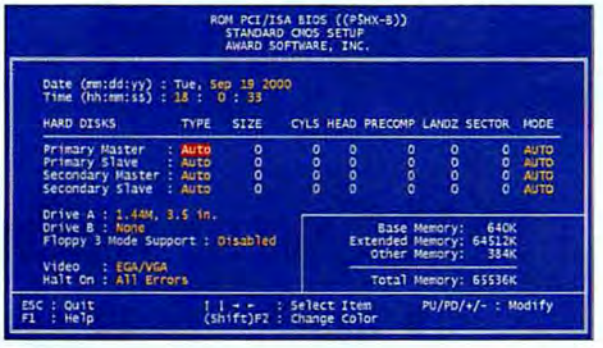
Plug in a power connector to the new drive.



5 Check the setup. Enter your PC's setup program. Details vary by manufacturer, but you'll often see a message such as "Press the DEL key to enter setup" as your PC starts up. Make sure the BIOS setting for each of the drives is set to AUTO, which should automatically detect the new drive and set up the correct parameters.

Save the setup settings and reboot your PC. If your new drive requires special software, install it, and test the drive.

If Windows doesn't recognize the new drive, double-check all your connections. If that doesn't work, it's time to call tech support.



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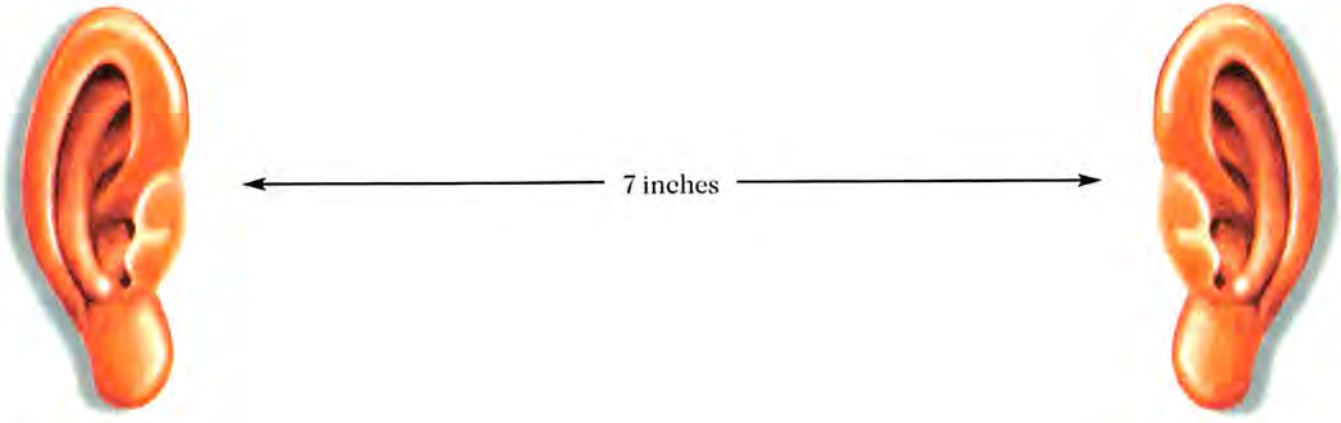

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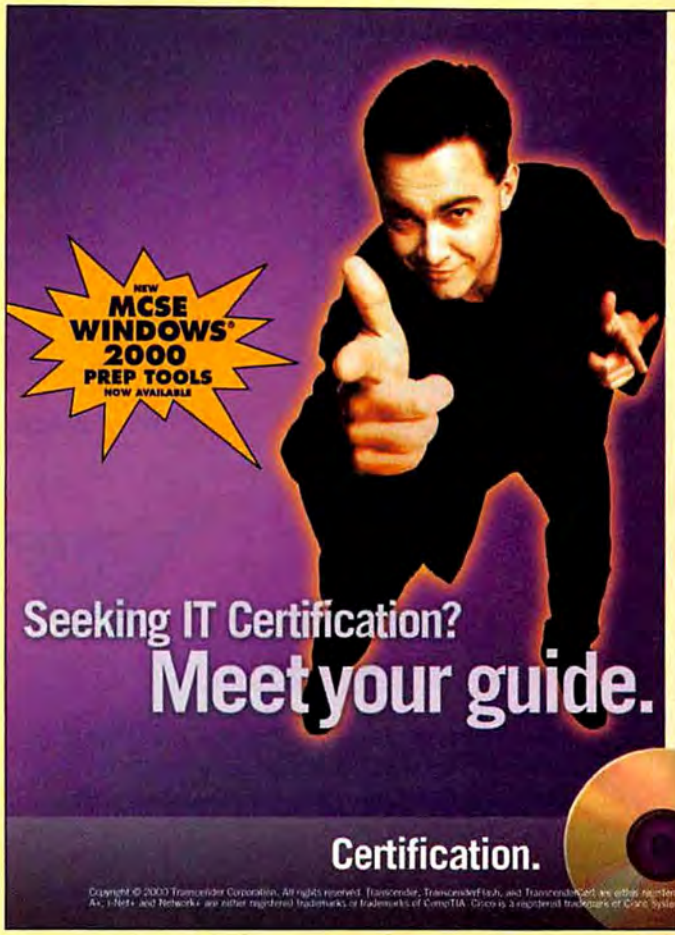

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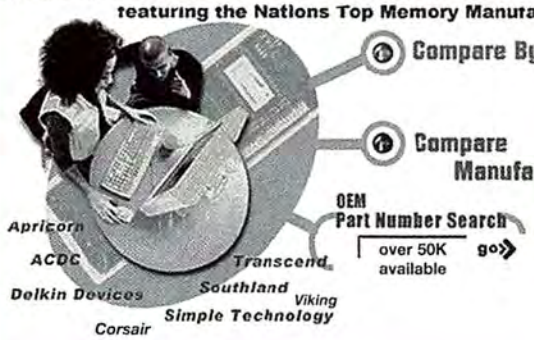

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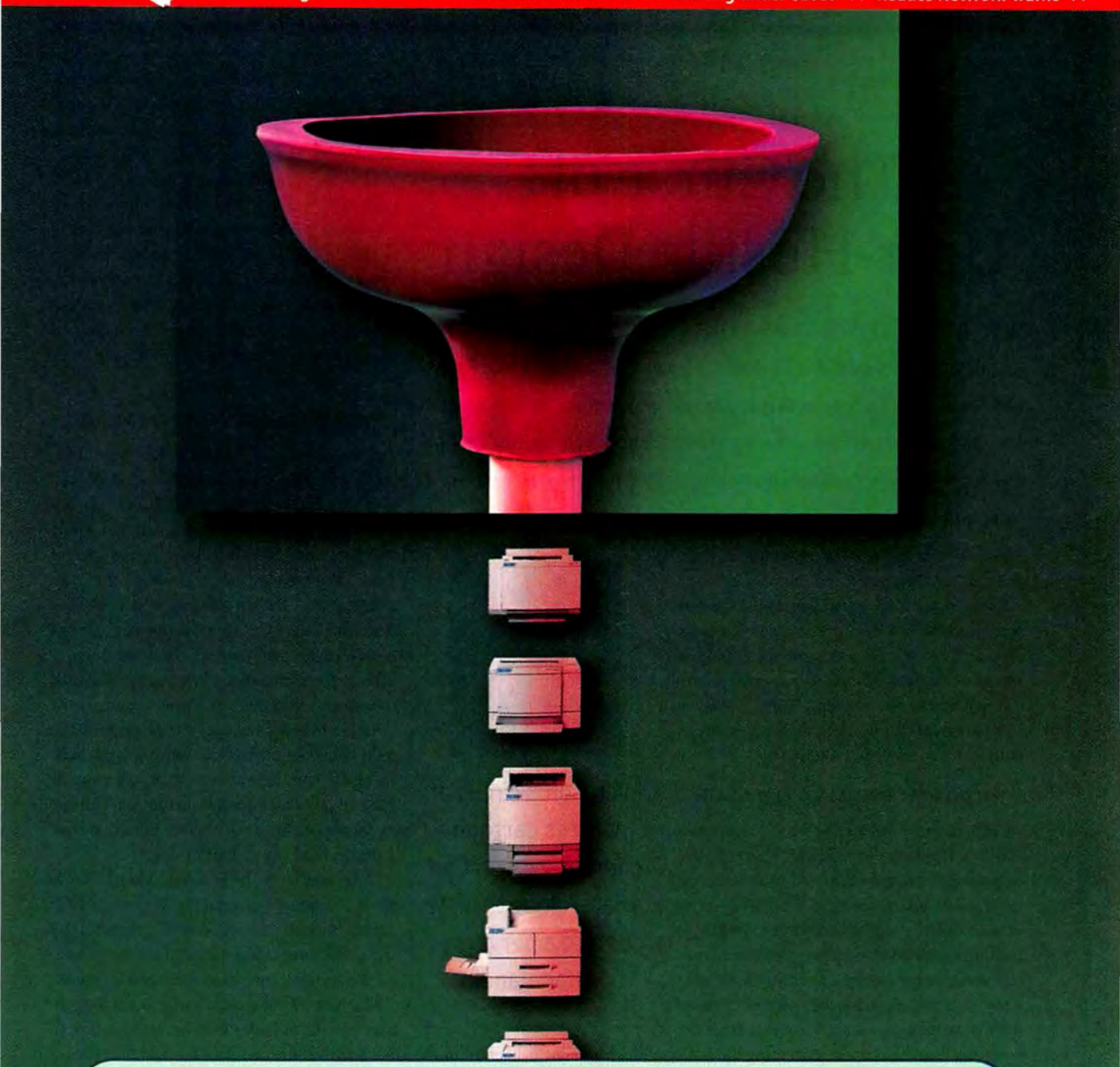

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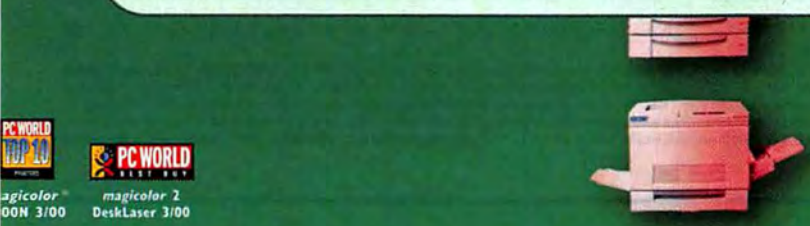

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The Curse of User-Hostile Design

WHERE AM I? WHAT IS THIS PLACE? That's what I keep wondering as I surf the Web with Compaq's new IPaq Home Internet Appliance. Turns out this appliance, which runs on Microsoft's new MSN Companion software, doesn't show you the address of the page you're on unless you got there by typing it in. Arrive via a link, and your whereabouts are unknown to you—unless you can figure out that you need to choose the *Page options* tab and then pick 'Send this page by mail'.

Speaking of mail, when you wait for yours with this device, the hourglass gives way to an animated cat or dog in the grand tradition of Microsoft Office's detested paper clip. You might prefer to do something useful while you wait, but the IPaq won't let you. Novices, apparently, can't be trusted to multitask.

Microsoft's circus of witless cartoon characters won't go away; Adobe thrusts us into a perverse Adobeland.

MICROSOFT BOB ALL OVER AGAIN

THESE DESIGN HOWLERS DON'T come as a shock. Despite its phalanxes of Smart Guys—or perhaps because of them—Microsoft just can't get its interfaces right. The behemoth's idea of user-friendliness amounts largely to treating novices with condescension by removing or submerging helpful tools (in the name of simplicity) and replacing them with a circus of witless cartoon characters. It's as though the company were bent upon redeeming the legacy of the hopeless botch known as Microsoft Bob.

When Microsoft originates something clever, like Internet Explorer's History folder, it soon manages to "improve" it by making it less useful. Worse, it seems to change basic interface concepts with every new release. The goofy, incomprehensible Active Desktop, once promoted with so much fanfare, has now largely disappeared. Windows Me's default look and feel are just different enough from Win 98's to be frustrating, with such irritations as the adaptive menus first seen in Office 2000. Change for its own sake is a bad idea that Microsoft can't seem to shake.

Of course, Microsoft is only the most visible design offender. Navigating through documents in Adobe's Acrobat is always an unpleasant exercise, and the company's other products tend to assume you live in a perverse Adobeland. Larry Ellison's hapless New Internet Computer does just about everything wrong, thanks to Oracle's policy of tossing underachieving Linux software into an underpowered box without doing anything to insulate users from the unhappy results. And don't get me started on the annoyances perpetrated by virtually every Web site around.

BUILDING A BETTER INTERFACE

FOR GLIMPSES OF what interfaces could be, check out "The Humane Interface" (Addison-Wesley, 2000; $25). Author Jef Raskin, responsible for many aspects of the original Apple Macintosh user interface, now believes some of those ideas were mistakes, including the desktop metaphor. Raskin also designed a machine called the Canon Cat, which flopped in 1987 but embodied concepts only now becoming trendy, such as the notion that when you sit down at a computer, you should start where you left off.

Raskin believes that user interfaces should be rethought quantitatively as well as qualitatively. Just how many keystrokes does a task require? How small can a button be before you're likely to overshoot it with the mouse? Does that error message hold any real information?

User interfaces, he believes, should be rethought from the ground up. Why should file names be central to our lives? Why must cables have confusing connectors? If we never pose such questions, interfaces will never improve.

The best recent example of a sea change in user interfaces is the Web browser, with brilliant innovations such as the Stop and Back buttons. Too bad for novices that on the IPaq, the Back icon that appears on the screen looks like the keyboard's left-arrow key—instead of matching the special key that actually performs the Back function.

But if things run true to form, the next MSN Companion release will make both the icon and the key look like the animated cat. And Microsoft will trumpet that as a breakthrough.

PC World *Contributing Editor Stephen Manes is the cohost of* Digital Duo, *a series appearing on public television stations nationwide. For program information, see www.digitalduo.com.* ■

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- 2X AGP 8MB ATI Rage Mobility™-M1 3D® Video
- Li-Ion Battery with ExpressCharge™ Technology
- Internal PCI V.90 56K Capable[6] FaxModem
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- 59WHr Li-Ion Battery
- Internal PCI V.90 56K Capable[6] FaxModem
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- 3-Yr Ltd Warranty[2]
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