# WIRED

July 1997

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Cypherpunks plot world liberation

Fighting for the New Economy at Treasury

Moira Gunn

Where computers go to die

Dave Winer: Is Java bad?

WINNER NATIONAL MAGAZINE AWARD FOR GENERAL EXCELLENCE 1997 & 1994

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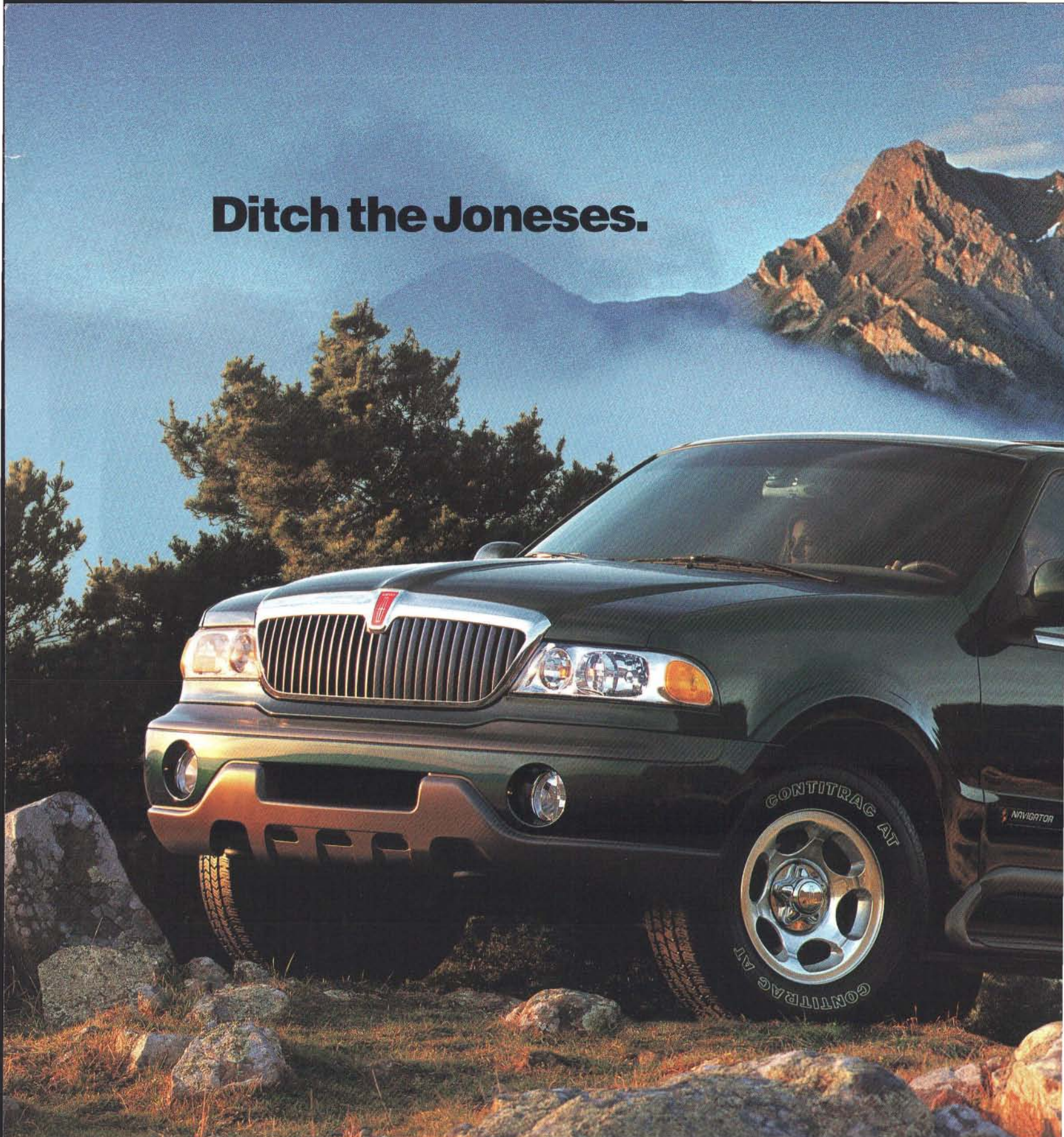
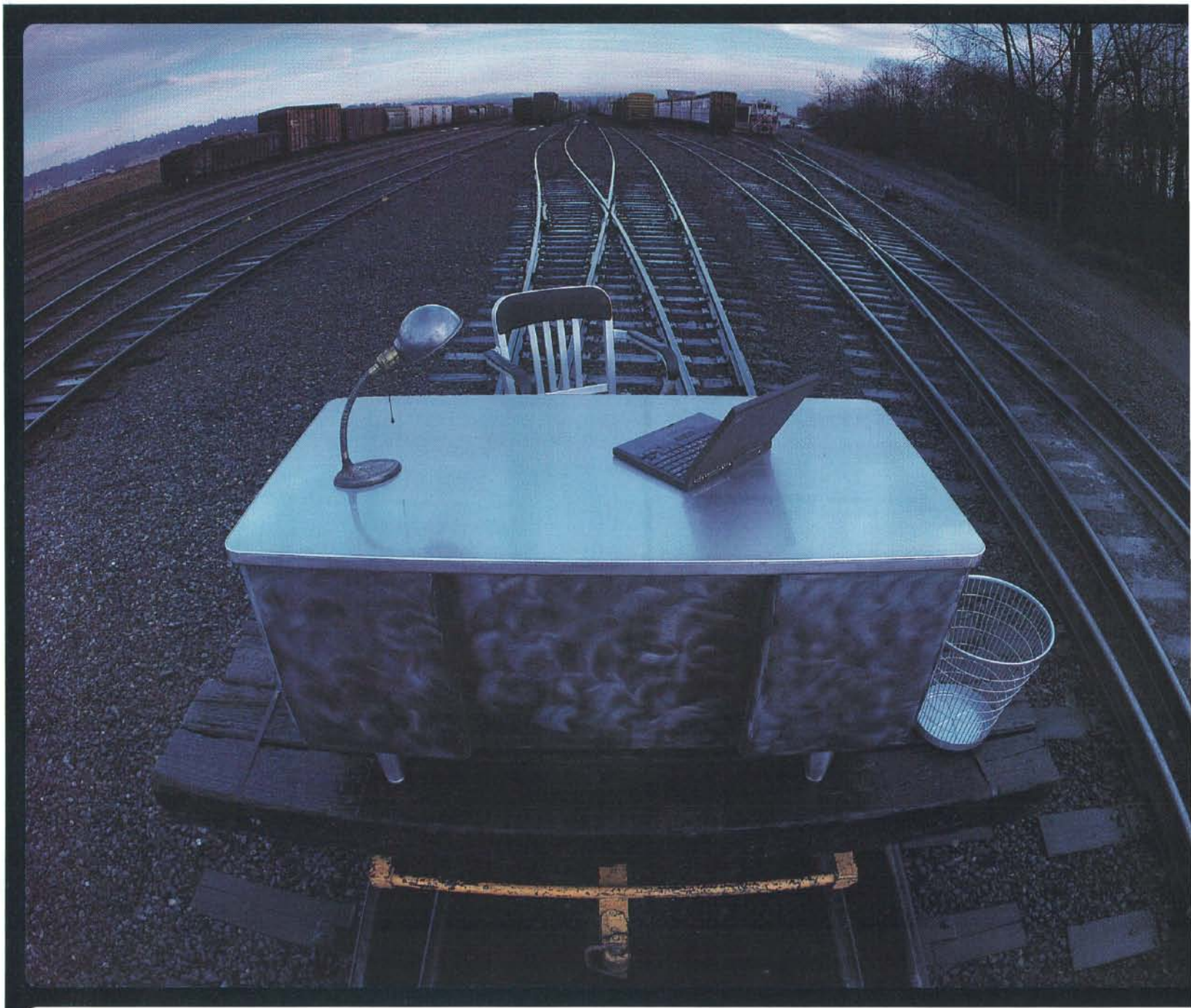



Although there's something to be said for getting ahead, the new Navigator has more to do with getting away. And taking life's luxuries with you. With up to 8,000 pounds of towing capacity. Available Control-Trac 4WD with load-leveling suspension that lowers the vehicle for easier entry.

LINCOLN

And a 5.4L V-8 to escape civilization, Joneses and all (nothing against anyone named Jones). For information about this full-size luxury utility vehicle, call toll-free 1 888 2Anywhere (1 888 226-9943), visit our web site at www.lincolnvehicles.com or see an authorized Lincoln Navigator dealer.

**Navigator from Lincoln. What a luxury [ ] should be.**



.WORK THE WEB™

# THE GREAT INVISIBLE GUIDING HAND OF CAPITALISM HAS JUST SMACKED THE INTERNET UPSIDE THE HEAD ► NOW WHAT?

**NO MORE HYPE.** No more jargon. No more paradigm shifts, okay? Everybody agrees the Web has the potential to be a monumental economic force. But from a capitalist point of view, the Internet has had about as much impact as the two-dollar bill. Why? For one thing, security is lousy. For another, building interactive websites that are linked to corporate databases (which is to say, useful information) takes forever. For still another, keeping those websites updated with timely information costs a fortune.

**LOTUS DOMINO™ FIXES ALL THIS.** Lotus Domino is web server software based on Lotus Notes® technology. It makes powerful, interactive websites easier to build. It lets people edit and manage the content on those websites using ordinary web browsers – which means the people who have the information people need can make it available simply by changing it themselves (this is the way the Web should work, but until now, it hasn't).

It not only lets you control who gets into your system but also what they can see, and what changes they can make. So you can let your customers see one thing, and your management another. You can let your finance department make changes to information your European sales offices can only see.

This makes Domino a powerful tool for creating solutions that are customized to the needs of your business. To let employees, managers, contractors and suppliers all work together over the Web. To help customers find the answers they need. To turn the Web from a digital warehouse for stale jokes and silly photographs into a tool that businesses can use to actually get things done. Log in. Find out. **www.lotus.com/worktheweb**

NO. Lotus Domino is not about circulating theories about the origins of crop circles. Or for putting more stupid stuff on the Web.

.NO

**YES. Lotus Domino is for doing serious business on the Web. Transforming it into a powerful way to interact with customers and employees.**

.YES

Lotus
Working Together®

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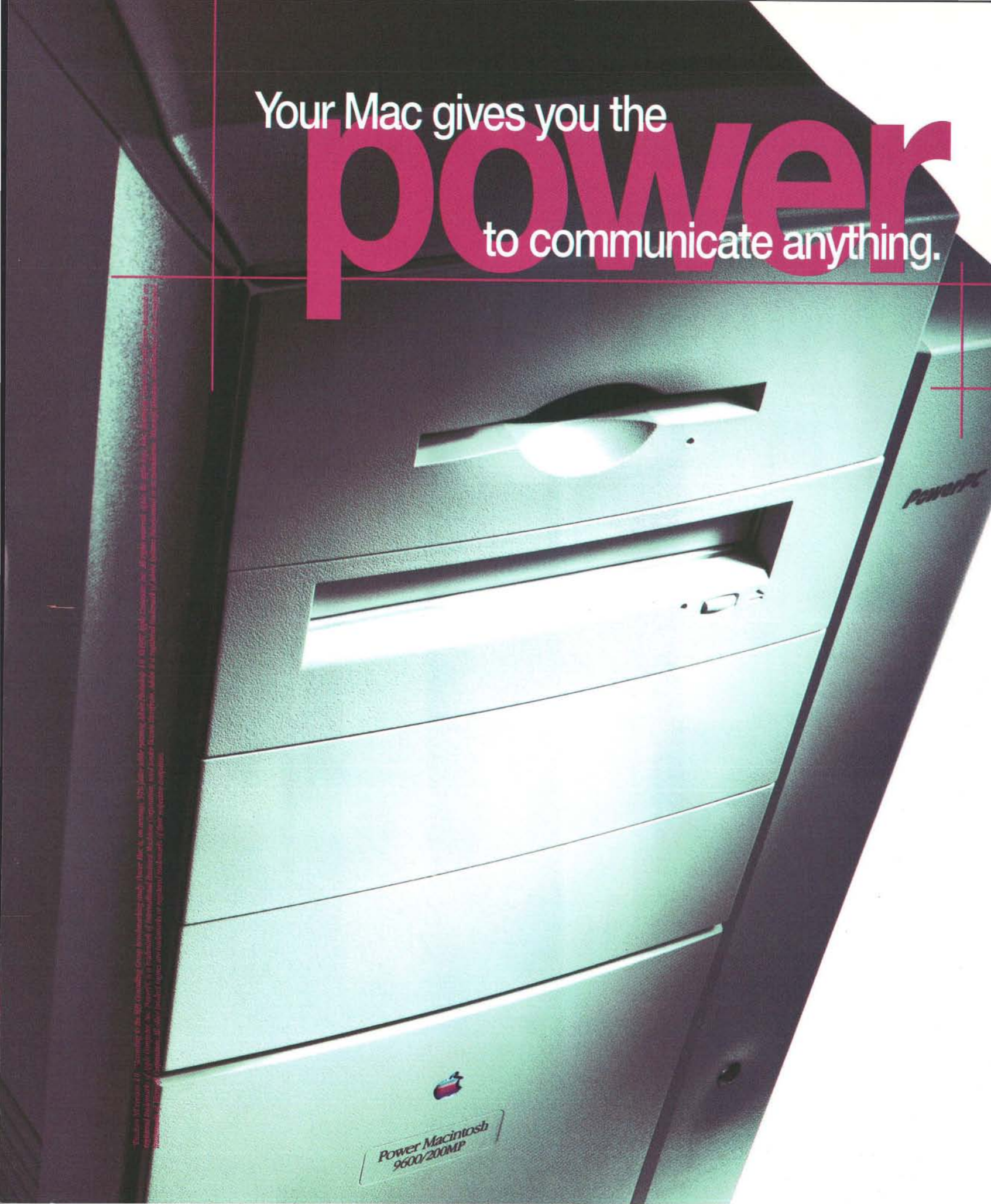
Your Mac gives you the
power
to communicate anything.
Power Macintosh
9600/200MP

# So why is it your parents still don't get what you do for a living?

Ever since the day you first wrapped your fingers around a crayon, you've been driven by the need to create. The way you create, however, has changed beyond recognition. Or at least beyond Mom and Dad's recognition.

Apple® Macintosh® computers have always understood people who create. In the words of *I.D. Magazine,* "The designer-friendly quality that characterizes the Mac is deep in the machine." Now, with our newest Power Macintosh® lineup, it's even deeper.

## We understand your need for speed.

The faster your computer, the more time you have to experiment. That's why we created the Power Mac® 9600/200MP with dual PowerPC™ processors. It blows away a PC with dual Pentium® Pro processors running Windows NT.®* In fact, Adobe® Photoshop runs 50% faster on a Power Mac.** Which translates into 50% less time staring at your screen and waiting for your computer to finish retouching photos, manipulating images or applying filters. Valuable time you could be spending actually doing all those things.

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Some days you need to add memory. Some days, an expansion card (or three). With

a Power Mac 8600 or 9600 you won't need an MIS person, or even a screwdriver to do it. Push a button and they open up simply and gracefully, placing the logic board at your fingertips. So you can do what you need to do and get back to doing what you love.

## We understand your need to see how graphics will look in Windows.

Now you don't have to go out and buy a PC just to see how web sites and graphics you've created on a Mac® will look in Windows.® Just add a 166 MHz Pentium PC compatibility card, and your Power Mac can run Windows 95 or Windows 3.1 applications. You can also access a Windows network and exchange files with clients and other less fortunate folks who happen to use Windows.

For an even better understanding of the computers that understand you, visit us at www.powermacintosh.apple.com. Or call us at 800-538-9696 for the name of the Power Mac reseller nearest you. And then, if you haven't lately, call your mother.

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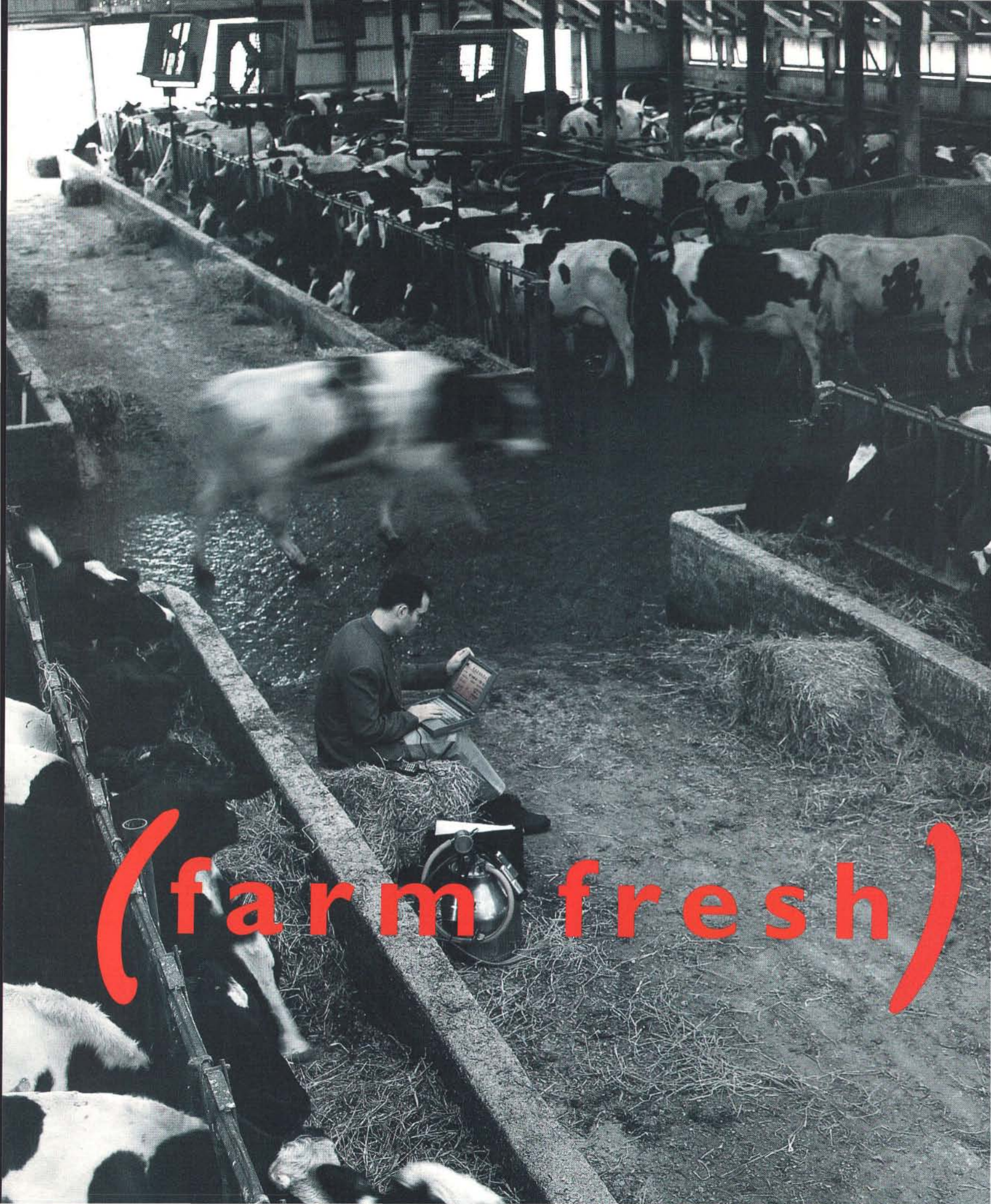
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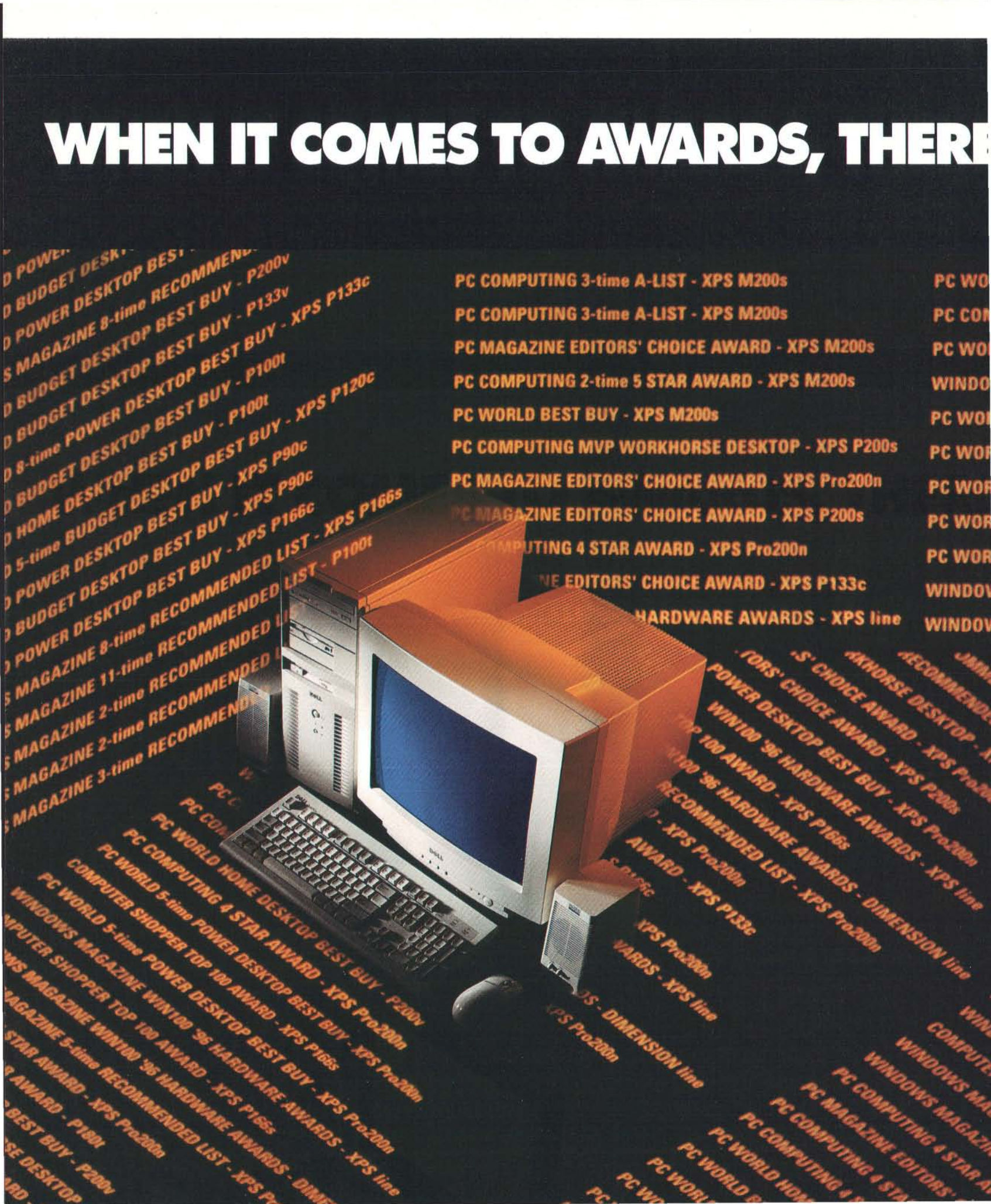
# WHEN IT COMES TO AWARDS, THERE



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## 141 AWARDS ACROSS THE ENTIRE DIMENSION LINE

What do the awards given by *PC Magazine, PC Computing, PC World, Windows Magazine,* and *Computer Shopper* (over 140 honors since 1/96!) have to do with you? It means you'll now be running dramatic multimedia presentations on the high-end systems that have earned designations like *PC Magazine* Editors' Choice for Best Business PC. It means you'll be cruising the Internet on systems designated MVP and 5-Star Award winners by *PC Computing.* And it means a whole lot more since they're also awarding our great reliability and price. Which is what a firm commitment to cutting edge engineering will get you.

Just take a look at the brand new Dell Dimension XPS system with a 233MHz processor in the system above – 15% more raw speed than its 200MHz counterpart! So give us a call and let us build you a winner. After all, if you're judged by the company you keep, shouldn't you hang with the champs?

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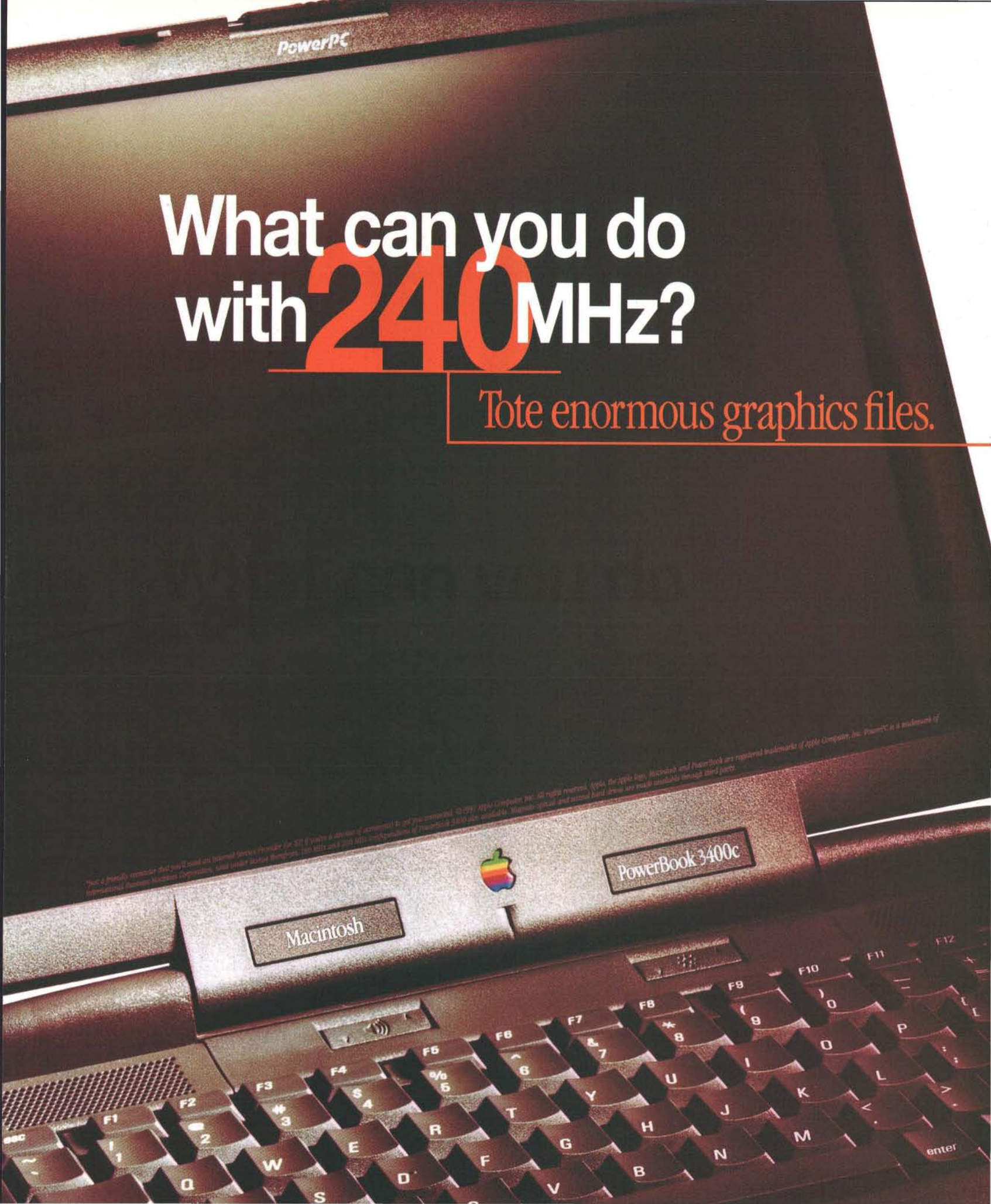

PowerPC
What can you do with 240 MHz?
Tote enormous graphics files.
Macintosh
PowerBook 3400c

*There's no shortage of things you can do with our best-selling PowerBook 1400, either. Play CD-ROMs, surf the web® and send e-mail to your boss back at the office.*

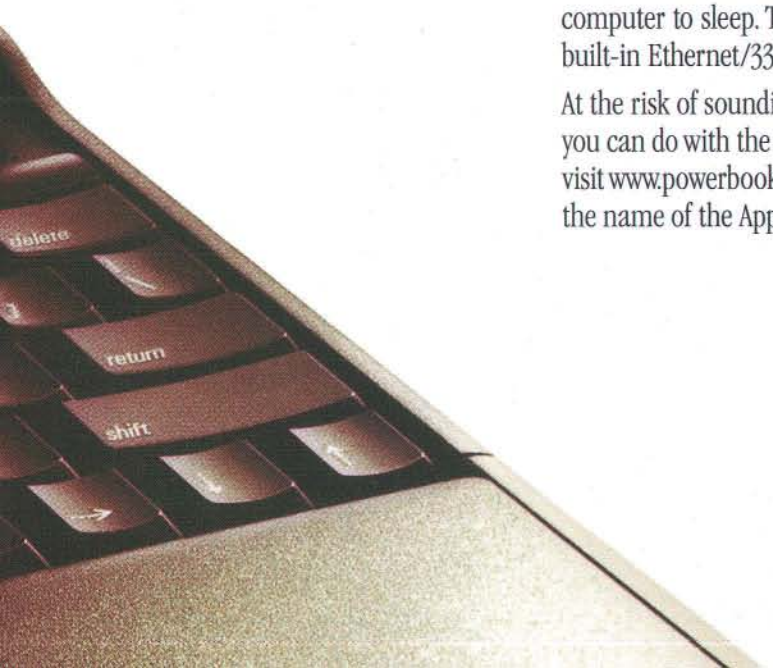
# Incite rubbernecking.

## Run your own in-flight movie.

We didn't build the world's fastest laptop just to show off. But that's not to say you can't. Among its numerous talents, the PowerBook® 3400 is the ideal laptop for presentations. Its awesome speed means faster, more beautiful graphics, and its 12.1-inch diagonal screen is the perfect canvas to display your genius for persuasion.

But don't let the 3400's blinding speed blind you to its other features. Like its hot-swappable expansion bay. It lets you add all manner of drives, whether floppy, magneto-optical, CD-ROM or a second hard drive. All without putting your computer to sleep. To keep you connected, there's also a built-in Ethernet/33.6 Kbps modem.

At the risk of sounding immodest, there's no end to what you can do with the new PowerBook 3400. To learn more, visit www.powerbook.apple.com. Or call 800-538-9696 for the name of the Apple reseller nearest you.



*Pete Uller likes all the helmet room in the 1997 Saturn SC2.*

# A bigger back seat because of all those trophies. And more headroom. (Because of all those trophies.)

In designing our new coupe, we added something especially for people who race their Saturns: more ego room. (Although our engineers call it more headroom.) We also added a lot of things for people who just like to drive in their Saturns. Like a roomier, quieter interior and a sleek, new body design. And if our new coupes weren't already difficult to ignore, we've also added daytime running lights. (Even changes made in the name of safety can't help but make the new Saturns more attractive.) The way we look at it, if you liked our old coupe, chances are you'll like the improvements and changes on our '97 even more. Of course, we decided to keep the trophy-winning, 124-horsepower, dual-overhead-cam engine.

*In Solo II competitions, folks like Pete Uller set up courses at local airports and race against the clock. (It's probably fairer than racing against the planes.) Pete and his SC2 have brought home their share of first-place trophies.*

THE ICY RACING COUPE

*The 1997 SC2, as outfitted by Saturn's ICY racing team. One of the premier teams on the SCCA Pro Racing circuit, they'll be speeding the new coupe across many finish lines this season. And you can get one a lot like it.*

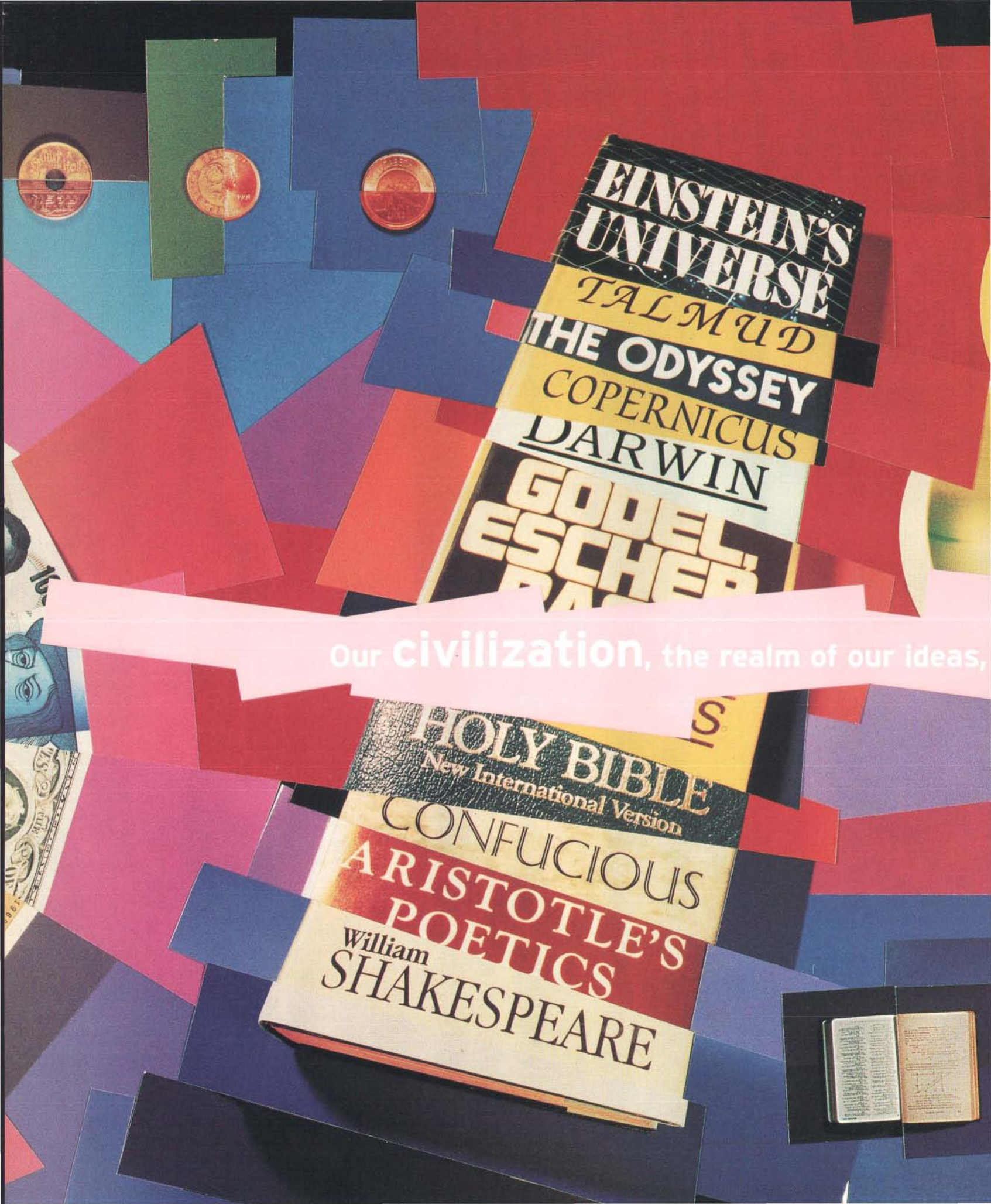
*(Pit crew not included.)*

**A DIFFERENT KIND *of* COMPANY. A DIFFERENT KIND *of* CAR.**

*This 1997 Saturn SC2 (with alloy wheels) has an M.S.R.P. of $14,415, including retailer prep and transportation. Of course, the total cost will vary seeing how options are extra, as are things like tax and license. We'd be happy to provide more detail at 1-800-522-5000 or look for us on the Internet at http://www.saturncars.com.* *©1996 Saturn Corporation.*

We're entering an age where diversity is truly valued -
Our ecosystem works best that way.

the more options the better.
Our market economy works best that way.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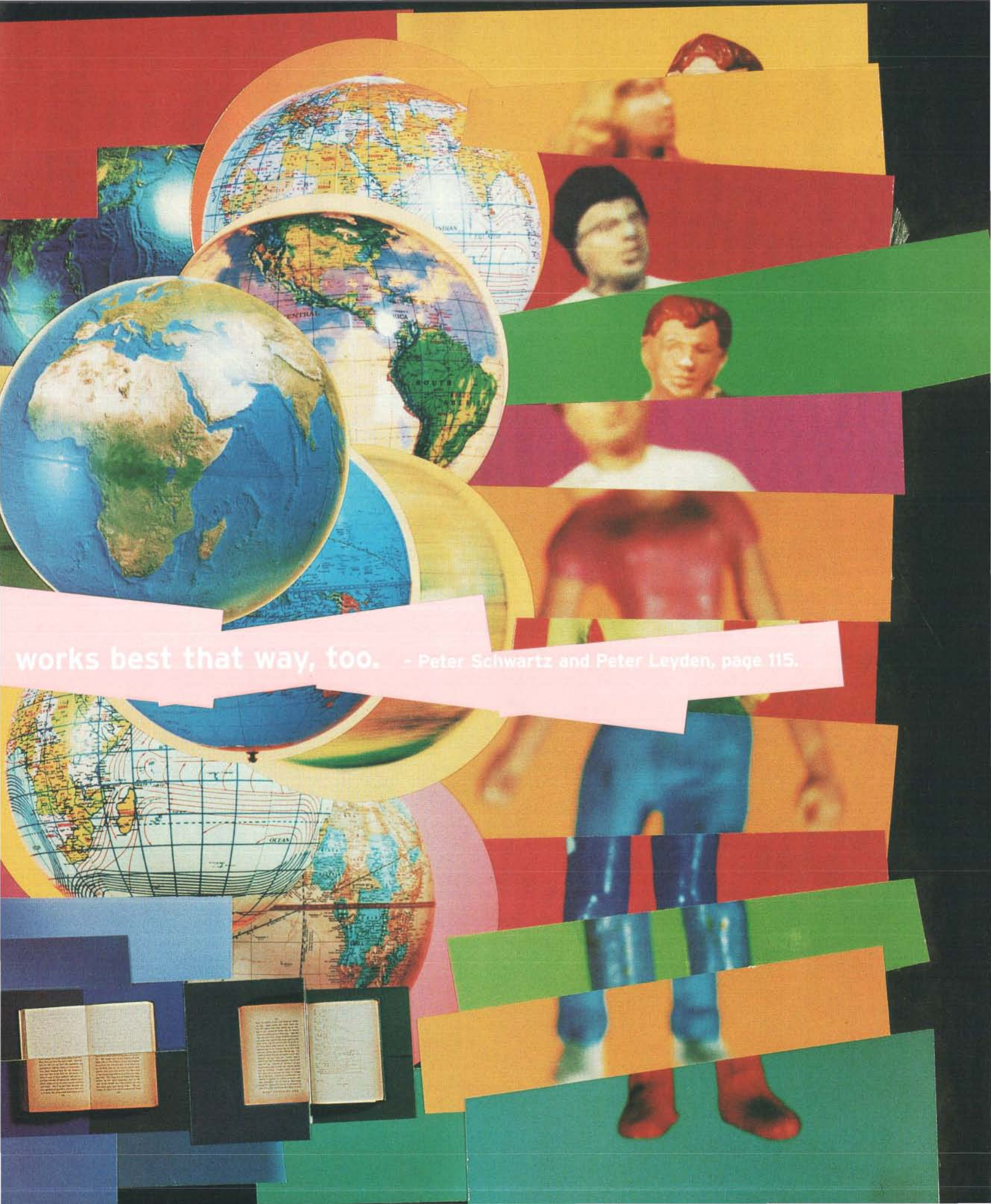

works best that way, too. - Peter Schwartz and Peter Leyden, page 115.

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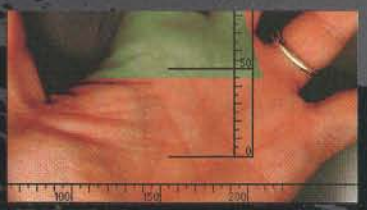
**Look for URLs that begin**

www.wired.com/5.07/

**throughout this issue to connect with the readers and creators of *Wired*.**



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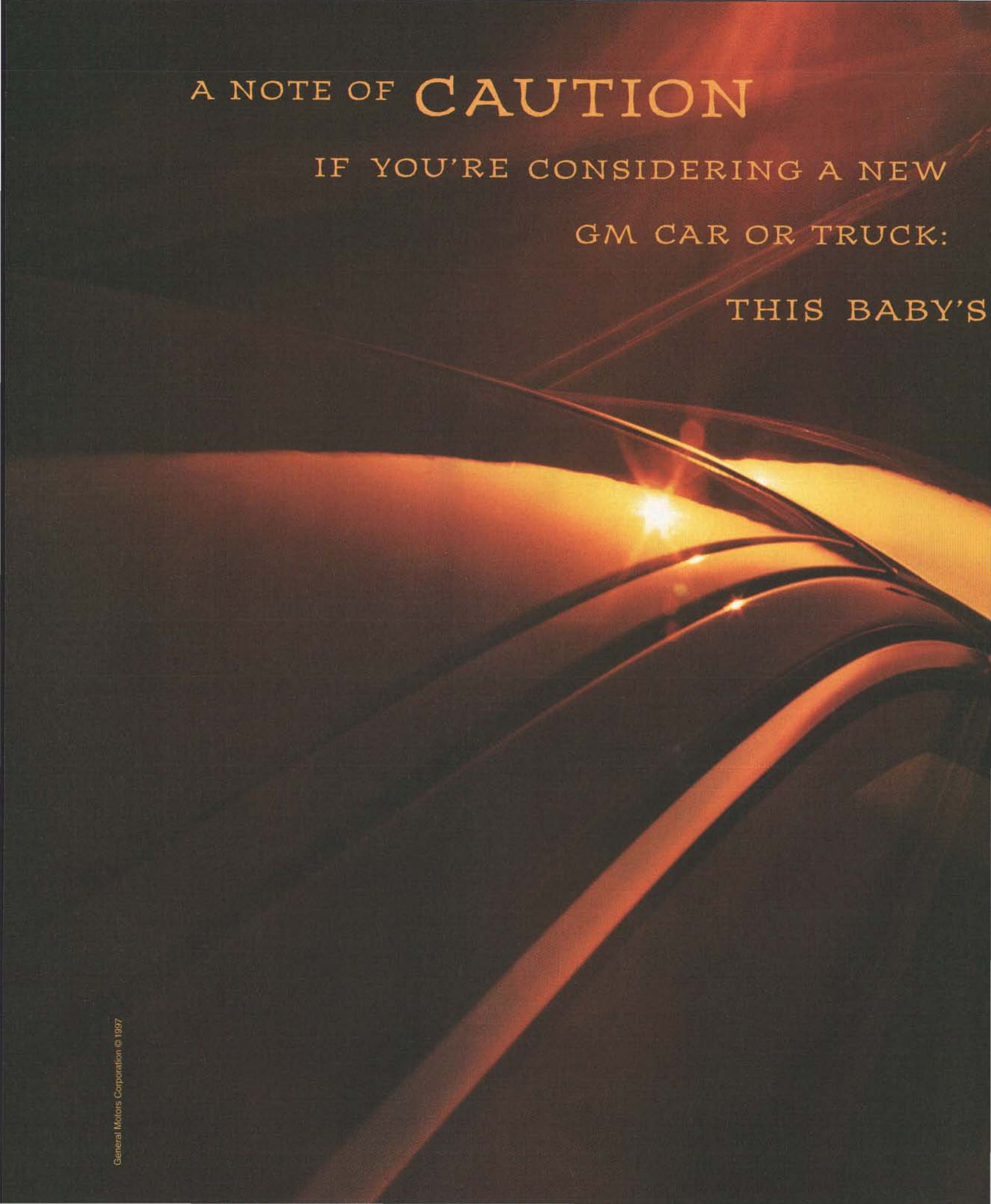
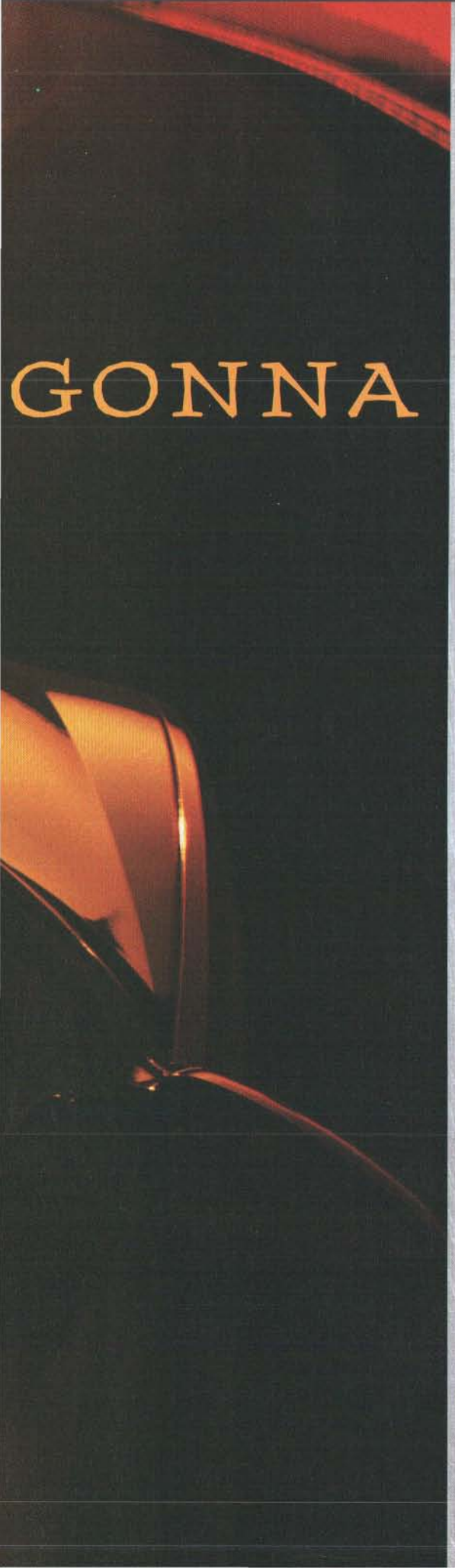



General Motors Corporation © 1997



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One hundred thousand mile
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Two-sided galvanized steel body panels.
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We're using materials that last.
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PEOPLE IN MOTION

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# Christian Murphy was non-verbal. He lived with a wall between himself and the world.

1 THIS IS CHRISTIAN.
*He can see, hear, feel, touch, but he cannot speak. He was born with autistic tendencies that cut him off from the world around him.*

**2** A TEACHER DISCOVERED *that Christian would respond to images from his life. She put visual cues to the story of his new puppy on a special keyboard.*

*NEC MultiSync Monitors*
*E and A Series*

THE MONITORS THAT ARE BEST FOR CHRISTIAN'S NEEDS *can also speak to yours. Introducing the NEC MultiSync® Enterprise and Advanced Series, the monitors for people looking for superior, lifelike images. And the monitors for people who want the kind of flexibility that super high resolutions and refresh rates ensure.*

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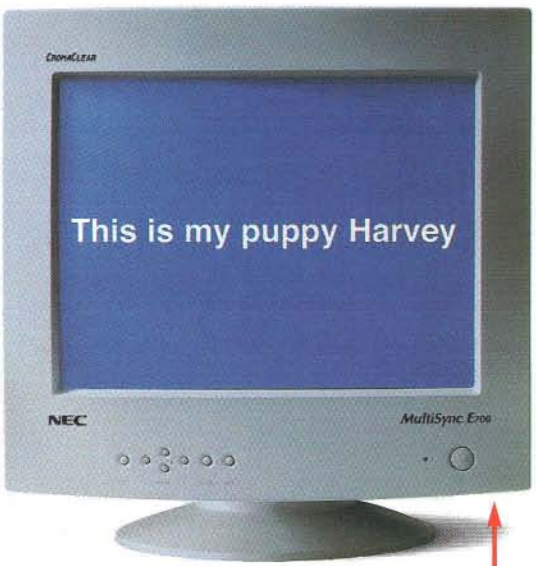
*For more information on the new performance-driven MultiSync Enterprise and value-oriented Advanced Series call 1-800-NEC-INFO or visit www.nec.com.*

**3** THE MONITOR BECAME HIS VOICE. *With it he makes class reports and conversation. With it, Christian, 11, has been in the regular Osterville, MA public school since first grade.*




**Until he found this window.**

**4** WITH THE PICTURES, HE MADE SENTENCES. *With the sentences, he made friends. Christian's monitor is the window between his non-verbal world and the speaking world of his friends. Through it, he teaches them many things.*

MULTISYNC® MONITORS

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| A700 | 1280 x 1024 @ 65Hz | 119MHz | Dot Trio | 0.28mm dot |
| E500 | 1280 x 1024 @ 65Hz | 119MHz | CROMACLEAR | 0.25mm mask |
| E700 | 1600 x 1200 @ 65Hz | 177MHz | CROMACLEAR | 0.25mm mask |
| E1100 | 1600 x 1200 @ 65Hz | 177MHz | Dot Trio | 0.28mm dot |

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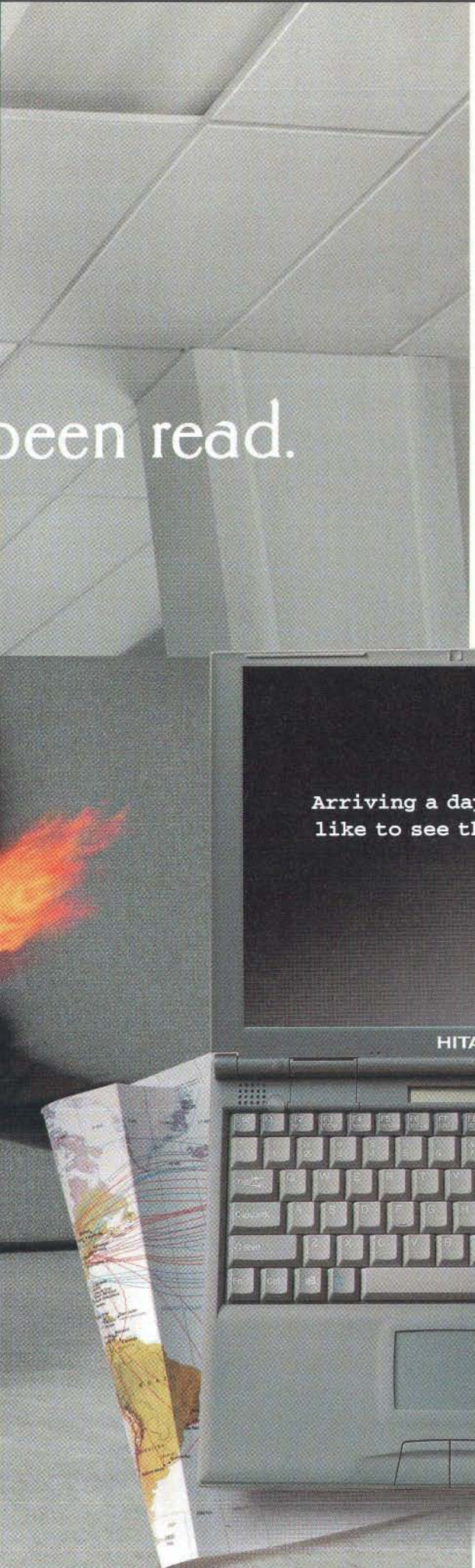


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With its extra large 13.3" screen, hyper-fast x2™ modem, and slim media filebase, its functionality and communications abilities are uncompromised. Including access to information and graphics on the Internet or your company server. The Hitachi VisionBook Elite. Roam the planet as you must, your influence at the home base remains undiminished.

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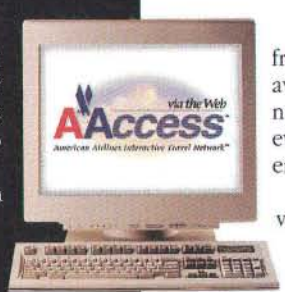


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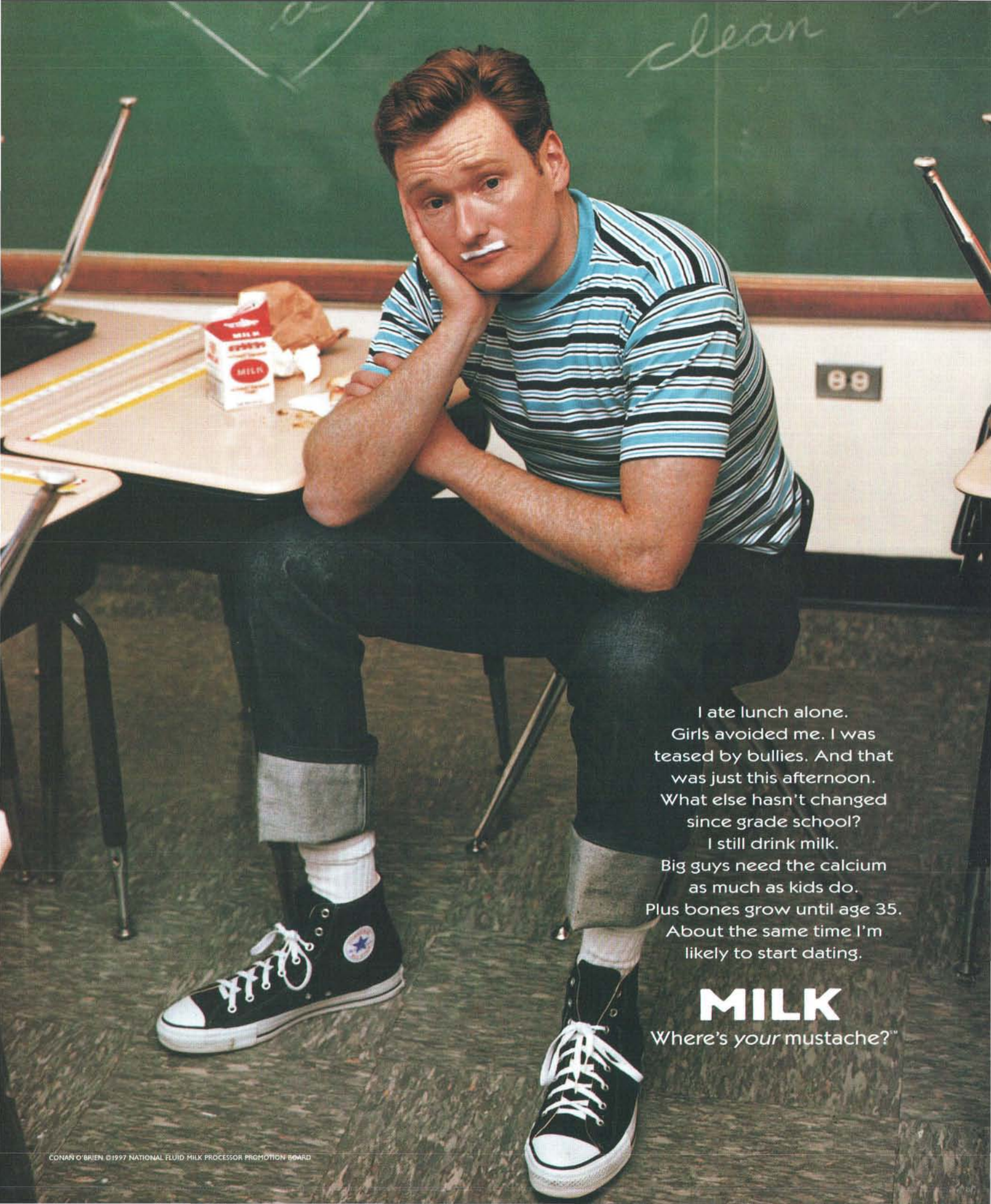
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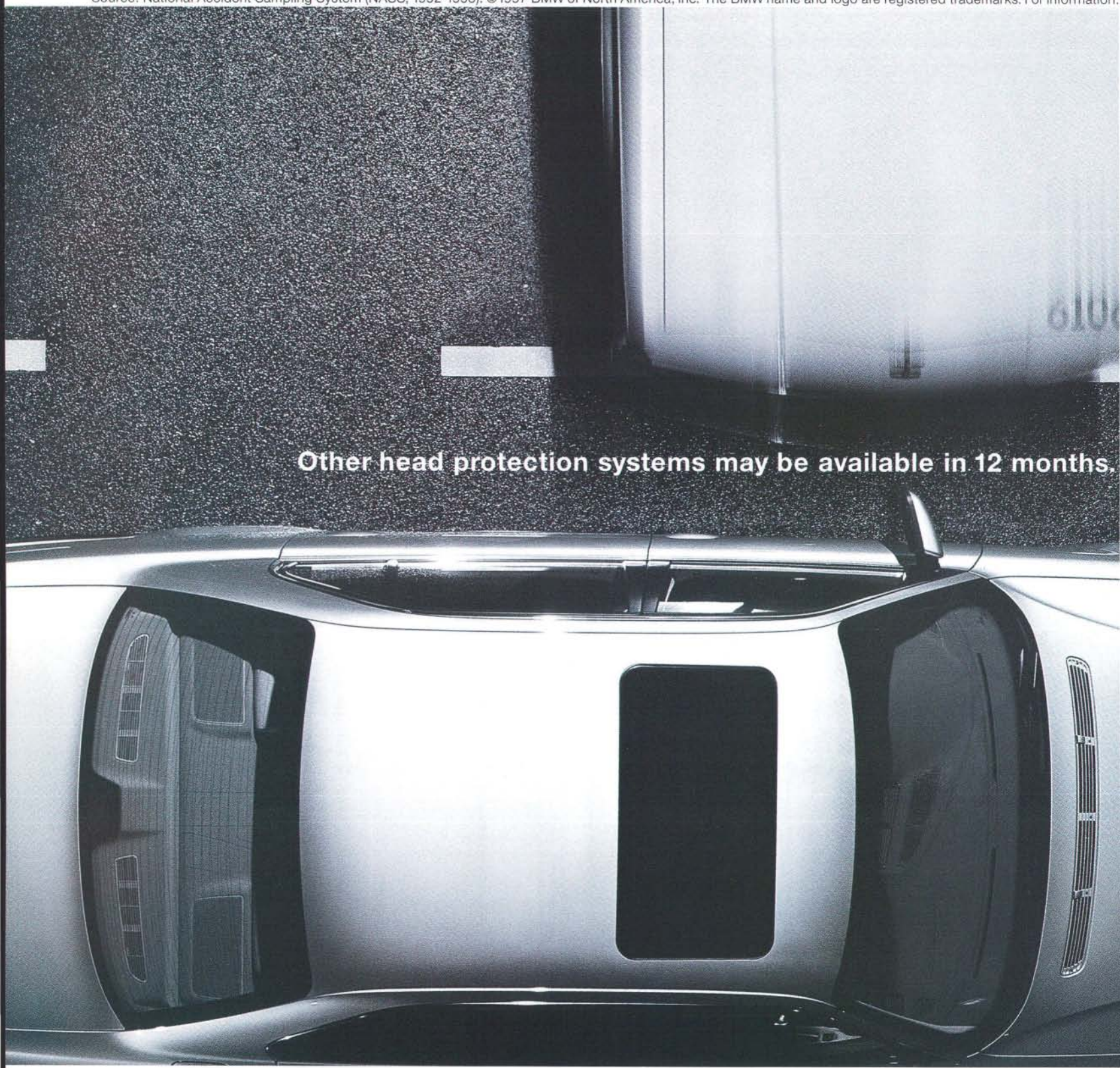


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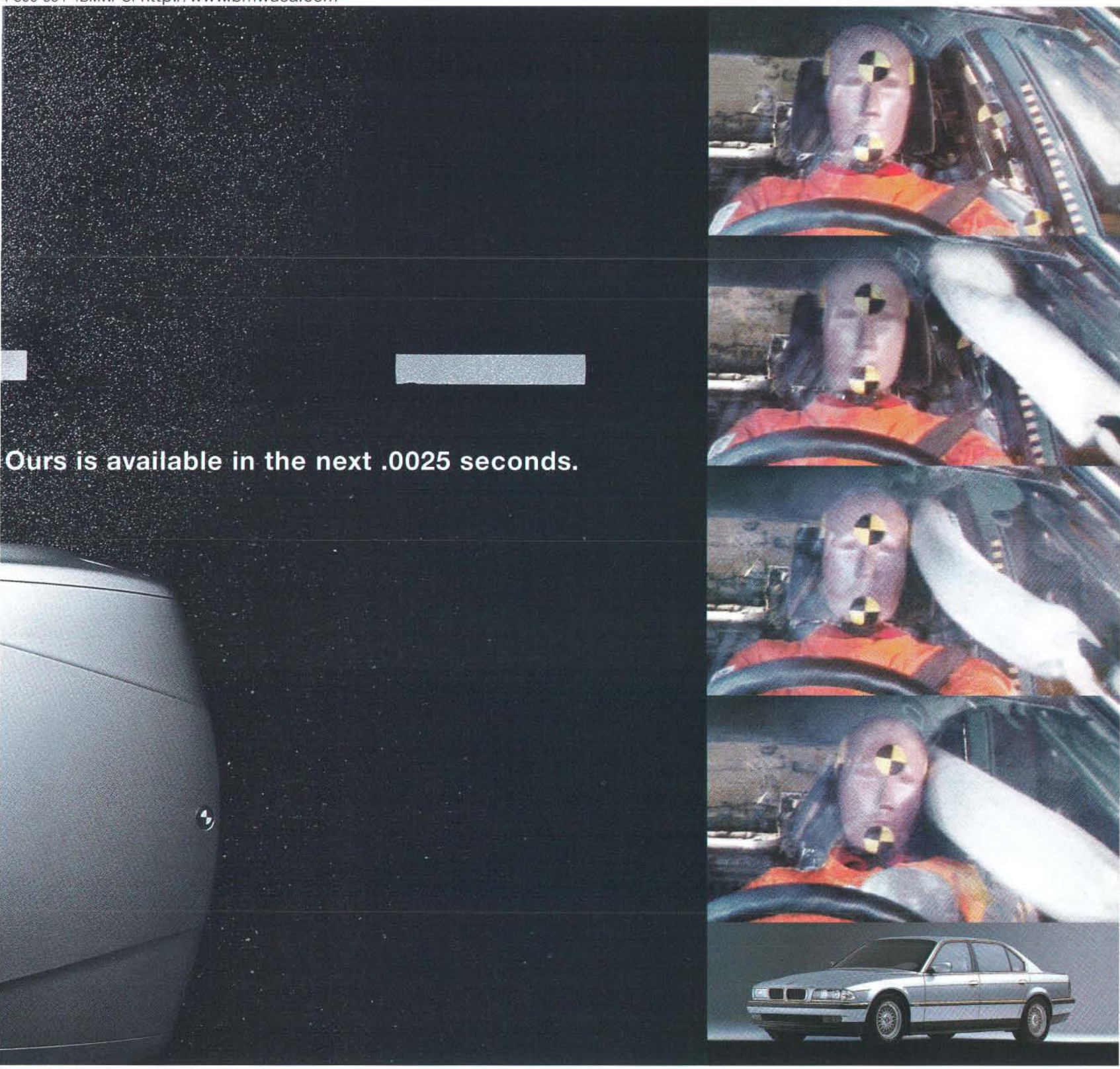


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## Peering into The Well

I enjoyed the epic history of The Well, if that is the right description for something that ultimately left me rather depressed, albeit soaked in nostalgia ("The World's Most Influential Online Community (And It's Not AOL)," *Wired* 5.05, page 98). If I only had Katie Hafner's article to go on, I'd assume that The Well was a thing of the past, which it most definitely is not.

I could have also done with less lengthy quotes from postings, but OTOH those are the essence of The Well, so what the hey.

All in all, despite the things not covered in the article – which, by definition, would have to be most things in The Well's history – I thought Hafner's article was one of the better things *Wired* has run in some time. Sure begs to be a book.

**Jay Kinney**
**jay@well.com**

It's kind of weird to have been so involved with The Well for so many years, to know so much about so many folks, yet to have been sort of unreal, too, because I live in Austin, Texas – far from the action.

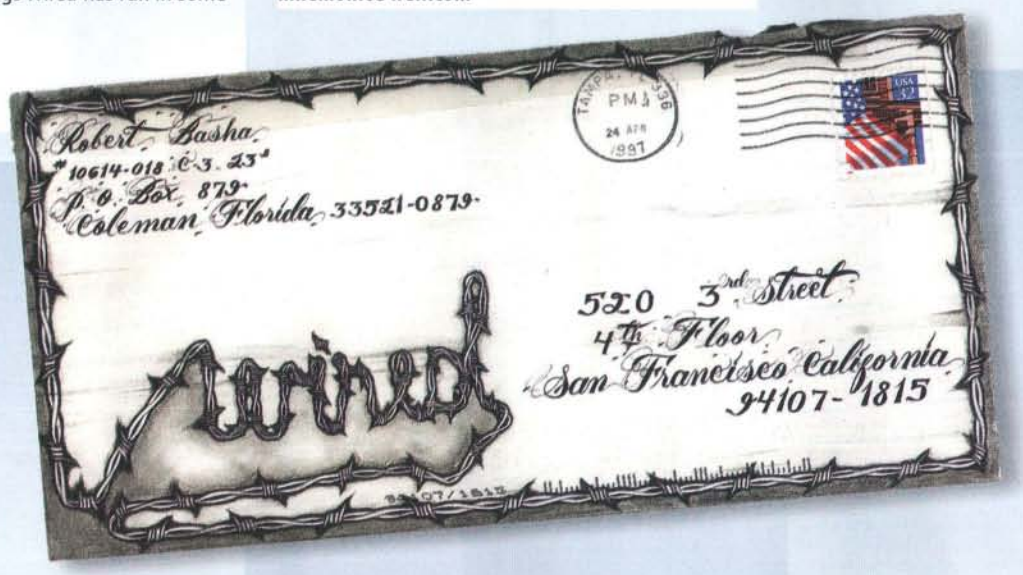
The face-to-face component will always be most important. The Well folks with whom I've had the closest relationships are all people that I already knew or eventually met face to face.

Some Well Beings and Net denizens think f2f is unnecessary for community, and others disagree. Maybe it's not that f2f is necessary for community, but that it changes the character of community and gives it real depth.

**Jon Lebkowsky**
**jonl@well.com**

For me, Tom Mandel was the essence of free speech online. All the good and all the bad aspects of that freedom were so tightly coiled in Tom that I sometimes mused that no one could contemplate Tom Mandel without understanding the nature of free speech a bit better. Tom's positive *and* negative contributions to the discourse on The Well were so clearly a net positive; he single-handedly stretched the digital spaces so that they allowed for greater variety of thought and expression than most other systems truly tolerate. Tom demonstrated again and again that the richness of our public conversations is directly proportional to their tolerance for passionate, and even angry, disagreement. Sometimes Tom was the dissenter – other times he was the voice of the orthodoxy. What he invariably did was demonstrate the ways one could be a human being on The Well.

**Mike Godwin**
**mnemonic@well.com**




I'd been telling myself I'd get a Well account since 1993, but still hadn't done it. So there I was sitting on an old, ratty couch at an ISP in San Marcos, Texas. I'd read about halfway through "The World's Most Influential Online Community" and I thought, "AOL for people with brains? I think I need another email address." So I scrambled over to one of the dual Pentium Pro 200s, telnetted into well.com, and registered. Voilà.

I think the article made its mark, which was to educate people as to what The Well is and was, and to remind the folks who knew but hadn't bothered to go spelunking down it. Contrary to some Well worries, I don't think the community's population will explode; rather, people who should have been here in the first place will arrive. I'm looking forward to exploring this ASCII utopia.

**Jeff Kramer**
**jeffk@well.com**

Nothing can describe The Well better than a random selection of, say, 50 consecutive posts. It's all there, from the ridiculous to the sublime; personalities, rivalries, ancient histories, psychology, sociology, the needy and the greedy and the giving … as newcomers can easily see.

**David S. Jackson**
**davidj@well.com**

## Inside the Hothouse at Sun Microsystems

It is clear from reading David Diamond's "Hothouse Flowers" that he has been sadly misled about the role of distinguished engineers at Sun Microsystems ("Corporate Rebels," *Wired* 5.05, page 170). In my experience the typical DE parachutes uninvited into the midst of an engineering project with which he – they are almost all male – has had no previous involvement. The DE informs the development team that whatever they are doing is wrong, because they are not doing it the way he did it the last time he personally developed anything, which was generally a long time ago. He then catches a flight to the next drop zone, leaving a trail of chaos and demoralization in his wake.

Over time, this behavior has tended to reward risk avoidance rather than risk taking in less-senior engineers, who perceive correctly that maverick behavior is more likely to earn them a visit from their friendly neighborhood DE. Promotion to DE is based on a vote of the DE community, further reducing an engineer's incentive to engage in nonconformist thinking that might make a DE unhappy. Those few who still take chances eventually find themselves frozen out

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of the exclusive club, however worthy their accomplishments may be. In this way, DEs ensure that only those who think like them become DEs, and the cycle continues.

**A senior engineer at Sun Microsystems who aspires to be a distinguished engineer**

### Make Threats, Not Bombs

I read John Carlin's "A Farewell to Arms" (*Wired* 5.05, page 51) with interest. The article emphasized the disruption of an infrastructure by digital means, but in the United Kingdom we have already started to witness a variation on this theme. For years, the IRA has threatened our major cities, especially London, with the promise of bombs planted in sensitive areas. In the past, emphasis seemed to be on specific places and buildings.

In the months leading up to the parliamentary election on May 1, we saw the regular disruption of major highways and rail and commuter networks; with such rerouting of people, travel across the city became nearly impossible. Bomb warnings at multiple places locked down major parts of the country. This very morning, Heathrow, Gatwick, and some of the major Underground and rail stations were threatened.

The use of actual bombs is not necessary to effectively destroy our infrastructure. Information alone – in the form of bomb warnings – does the job.

**Martyn Jeffries**
**martyn@mad.scientist.com**

### Web Waste

I enjoyed Steven Alan Edwards's "It's Alive" (*Wired* 5.04, page 110). However, I don't believe nature grows efficiently or evolves until it is put into adverse situations. The clogging up and "polluting" of the Internet may be a necessary step in its evolution.

All his examples point to the fact that no matter what the system – whether it be the human body, an ecosystem, or a large bureaucratic corporation – there is always lots of waste product. Perhaps it is just natural that we need this excess and waste to function?

The Internet is growing and mutating at a fast rate, sending out tendrils to test the environment. Seeing what works and what doesn't. The Net is millions of sensory points, each inputting its own life-cycle pattern. Many individuals and groups will die so that others can flourish. Survival of the fittest. The Net will grow and evolve.

Let the Internet run wild – when it can grow no further, then it will be time to put our husbandry skills into practice to develop the hybrid from the vast amount of building material that will have become available.

**Will Roy**
**will@omen.com.au**

### Grading Belgrade

David Bennahum's article on the use of the Net by Serbian dissidents ("The Internet Revolution," *Wired* 5.04, page 122) was gripping, thoughtful, and elegantly written. But perhaps unintentionally, he comes close to perpetuating a dangerous misconception about technology. Although Bennahum is initially wary of the idea that the Net is inherently democratizing, his experience in Belgrade fairly convinces him that "access to the Internet is incompatible with authoritarianism."

The Net can be a great tool for organizing, but Bennahum's statement reflects a technological determinism that downplays the role of human will and action in the Serbian conflict. Isn't the Net flexible enough that it can mean different things in different contexts – depending on how it is used? Repressive governments and corporations, for example, can use the Net as a sophisticated surveillance tool. And even well-meaning netizens can get so caught up in cyberspace that they ignore the social and political problems of their nonvirtual communities.

While I hope Bennahum is right in predicting that the wired Serbian democrats will emerge victorious, events of the last few weeks show the protest movement in disarray and dictator Slobodan Milosevic consolidating power. This, of course, creates an uncomfortable situation for the *real* hardcore determinist: if the dissidents have Net access, why does authoritarianism prevail? One answer is that technology doesn't determine politics, people do.

**Andrew L. Shapiro**
**ashapiro@interport.net**

Belgrade's "Internet Revolution" was a positive happening in the wired world. But the fragility of this revolution was demonstrated by the Western embargo against Serbia during the war. As a side effect, Serbia and other parts of the former Yugoslavia were cut off from the Internet for several years. According to people in the University of Belgrade's computer department, being offline was a major obstacle in communicating with the world and generating foreign support.

So it seems quite blue-eyed to praise the "Internet Revolution" without recognizing that blocking Yugoslavia's Net connection limited the people's access to information uncensored by the government.

Just another crack in the fairy tale of an indestructible global Internet. As long as there are backbones, there is the ability to block Net communication and isolate whole countries or movements from international information exchange.

**Marcus Polke**
**Berlin, Germany**

This fascinating article presents an aspect of the Serbian upheavals that would be difficult to find in other print accounts. It raises a central issue: whether access to information provided by the Internet necessarily furthers democratic efforts around the world.

Nevertheless, I found the article remarkably naïve. Reading this account, one would think that the political situation could be simply described as the totalitarians versus the democrats, opaque information versus transparent information, brutish police thugs (some of the same people responsible, as you assert, for the genocide in Bosnia-Herzegovina) versus free-spirited and cosmopolitan intellectuals. There is no mention of the leaders of the opposition, whose complicated ideological backgrounds are by no means "transparently" democratic. Subsequent developments in the opposition (including Vuk Draskovic's apparent support for a restoration of the monarchy) don't convince me that digital democracy necessarily overlaps so neatly with antitotalitarian movements.

**Susan Erickson**
**signeben@aol.com**

### Dear PTT, PS

Nicholas Negroponte's open letter to the national departments of posts, telephones, and telegraphs echoes the sentiments of Internet users around the world ("Dear PTT," *Wired* 5.04, page 192).

Outside the US, many people are deprived of the opportunity to join the information society, burdened with expensive access costs, thanks to short-sighted local politicians blessing high monopoly tariffs and backward-looking entrepreneurs running national phone companies. In many countries, only campuses, publicly funded institutions, and private companies offer unrestricted Net access. The situation reminds me of the 19th century, when only the wealthy could afford to buy books, and the majority depended on public libraries.

You're correct that online penetration in Germany has been stunted by Deutsche Telekom's high tariffs, which are the major reason for the slow development of the German consumer market. What would be considered typical Net usage in the US would easily cost the equivalent of US$200 to $300 a month in Germany. With some US phone companies now considering metering access to ISPs, economists should study the German case carefully.

**Hermann R. Neus**
**hneus@ibm.net**

Nicholas Negroponte's article on privatizing government-owned telcos does not stand up on logic. He explains in detail what governments could spend their money on, but somehow skips any good reason for selling them in the first place.

In Australia, the publicly owned corporation Telstra is destined for a market offering this year. Though it does not have a monopoly anymore and several foreign start-ups are poised to enter the market, Telstra is – and will likely remain – a license to print money.

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And as the Internet and future interactive services become more a part of our lives, virtual monopolies of telecommunications infrastructure can only increase in value.

Governments in the fortunate position of owning companies whose value can only skyrocket should hang on to them and use the enormous profits to fund education and other essential services, rather than handing the rewards to big business.

**Nick Moraitis**
**tcn@worldkids.net**

### Hamming It Up

As a licensed amateur radio operator, I've studied spectrum charts many times, but have never enjoyed one as much as "The Manhattan of Spectrum Real Estate" ("Get Wireless," *Wired* 5.04, page 142).

We ham operators are paranoid that big business is going to gobble up our radio playground. After all, we are goofing around with billions of dollars' worth of bandspace. So far, we've only had a few inches shaved off here and there, thanks to heavy lobbying by the American Radio Relay League.

But the ARRL is also part of the problem. It's dominated by geezers who cling to Morse code, are suspicious of the younger generation, and don't want to push the technological envelope – which is why amateur radio was started.

The good news is that the really cool bands – 902 and 1240 MHz – are wide open for innovation. The bad news is that if we don't use them, they'll be given away to private industry as a political favor. We desperately need the next generation to start innovating again.

**Craig A. Hallman**
**everyknee@juno.com**

### Libraries Are Wonderful ...

The "Push!" cover story (*Wired* 5.03) referred to the Web as a "*wonderful* library." A library is a place where information is not only stored, but organized. The library has been set up to make it easier to find the information you need without slogging through reams of possibly fascinating, but irrelevant material. If you have trouble, an information specialist will assist you.

The World Wide Web is a vast, broad – not always very deep – often useful, sometimes delightfully esoteric archive. A library it is not.

**Sandy Malloy**
**Oakland, California**

### Generation Y

I am speaking as a member of Generation Y, the almost forgotten generation of 14- to 16-year-olds who – goddamnit – want some attention. What we *don't* want is more nonsense that girl games must include pink, lace, makeup, shopping, and boys. I am a 15-year-old girl who is sick and tired of wearing pink so that I can fit society's portrait of a young lady.

After reading Jon Katz's "Birth of a Digital Nation" (*Wired* 5.04, page 49), I was shouting "hurrah" at his description of the next generation of model citizens, citizens without stereotypes. Then I read "Girl Games" (page 98) and was so disgusted by the game industry that I could have spit. Girls my age have worked hard for the freedom to say what we damn well please and the ability to speak to elders without our heads down and eyes averted. The makers of girl games need to wake up and realize that not everyone without a penis must wear makeup and chase blond surfers named Ken.

**Janie Porche**
**netracer01@aol.com**

I read Jon Katz's article with interest. I, too, have been impressed by the virtues Net users display, including their defense of free speech, lack of cant, and no-bullshit worldview.

However, our wired generation has some obvious flaws: a rudimentary-at-best knowledge of history and poor reading habits. While well informed about much of the digital world, we're often woefully uninformed about the rest of the planet.

The Net can be as cliquish and exclusionary as any other human institution. Katz acknowledges this, but fails to see it as a serious hindrance to the Net generation's impact on politics and the society at large.

Let's not fool ourselves. We're no better or smarter than anyone else. If we can remember that, rather than celebrate our virtues in a triumphalist fashion, we are more likely to have a positive impact on the world.

**Daniel Calto**
**dcalto@smtplink.mssm.edu**

### Psychedelia or Psychosis

I was disappointed to see the glib assessment of Steve Speer's emotional torture of a friend as simply a "plan for modern psychedelia" ("Speer's Head," *Wired* 5.04, page 136). I have never been taken by the notion that artists should live by a different set of standards for social interaction. This tacit assumption leads us to view instances of grotesque or reprehensible behavior as mere foibles.

I have no trouble separating the artist from the art. I have viewed much of Speer's work and find it brilliant. I encourage *Wired* to praise his work, but perhaps – in the interest of accuracy – the editors would consider changing the heading of the first section from "Steve Speer's plan for modern psychedelia, part one" to "Steve Speer has the capacity to be a great big asshole, an example."

All this aside, I find your publication fascinating.

**Chris Petrauskas**
**cpetrauskas@usa.net**

### A Pirate Is a Pirate

Those who will be the leaders of the 21st century quite probably read *Wired*. They will be the lawmakers, the standard setters, and the "experts" who will inevitably face the task of updating copyright law. Not many of them know enough about software piracy; unfortunately, now they *think* they do ("Warez Wars," *Wired* 5.04, page 132).

I'm sure that some self-respecting "pirates" across the globe have already ranted about David McCandless's misguided and utterly myopic treatment of the warez world, so I won't repeat what I'm sure has already been said.

What troubled me the most was the generalization of pirates and their motives: "They don't need this Java Development Kit tool, or that Photoshop plug-in ... [They] toy absentmindedly with its toolbars and palettes before tucking it away and never running it again." This is truly insulting. I don't pirate software for the fun of it! I most certainly need, and use, pirated software. I need to do extracurricular research so I can get into graduate school. One Microsoft developer's kit costs US$499; the best competing product weighs in at a mere $795. Without one of them, I'm spinning my wheels, stuck in neutral, my research at a standstill. Yet I simply do not have the money.

A pirate is a pirate is a pirate, from the MIS for a Fortune 500 company, scouring FTP warez sites for that app he desperately needs to make his deadline, to the sysop of a commercial warez group HQ bulletin board, to Usenet warez redistributors. But they are *not* all the same. They represent vastly different sections of the warez society. Sections that, for the most part, McCandless has ignored.

**Joe Soroka**
**jsoroka@infomatch.com**

### Undo

Well, Well: A photo caption in "The World's Most Influential Online Community (And It's Not AOL)" (*Wired* 5.05, page 98) misidentified the server beside sysop David Hawkins as a Sequent; as readers with sharp eyesight can see, the machine was a VAX. In addition, better-belated-than-never thanks go to Judy Bunce for letting us use her photos in the collage of Well members. ▪ Feedback: The Force FX joystick (Fetish, *Wired* 5.04, page 56) is made by CH Products, not Immersion. ▪ Czech Up: Prague's Terminal Bar (Updata, *Wired* 5.03, page 108) can be found on the Web at *www.terminal.cz/*. ▪ Freudian Strip: The Houston Ship Channel is a polluted waterway; the "Houston Strip Channel" (Raw Data, *Wired* 5.04, page 78) is probably on cable.

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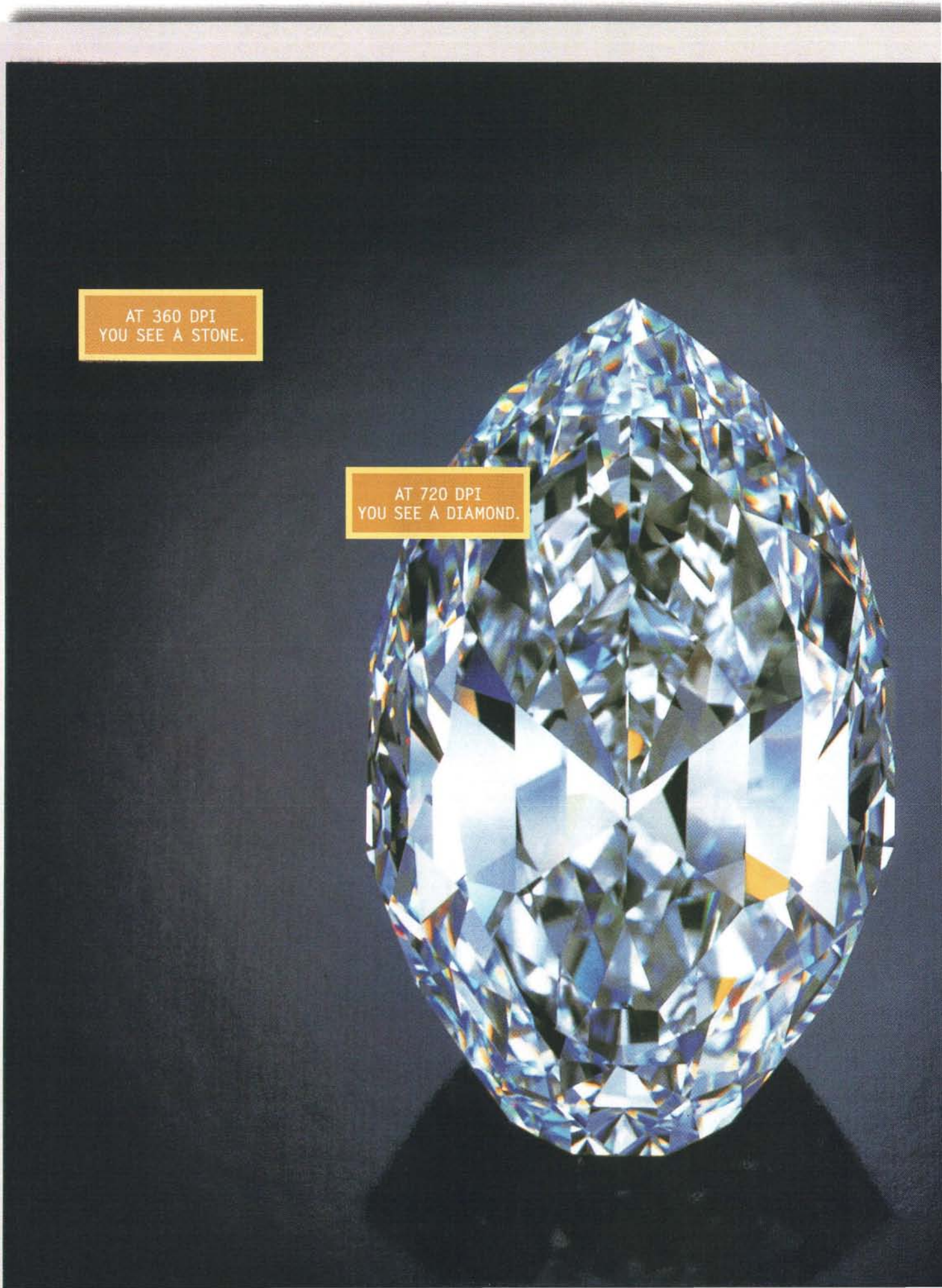


The National Software Testing Laboratory, Inc. (NSTL) found the EPSON Stylus Color 600 outperforms avg. speeds of the HP DeskJet 694C by 31% and the Canon BJC-4200 by 38%. The EPSON Stylus Color 800 outperforms avg. speeds of the HP DeskJet 870Cxi by 25%. Print speeds tested with Windows 95 and Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Adobe PageMaker and Adobe Photoshop. Prices may vary. EPSON and EPSON Stylus are registered trademarks of Seiko Epson Corp. Micro Piezo is a trademark of Epson America, Inc. © 1997 Epson America, Inc.

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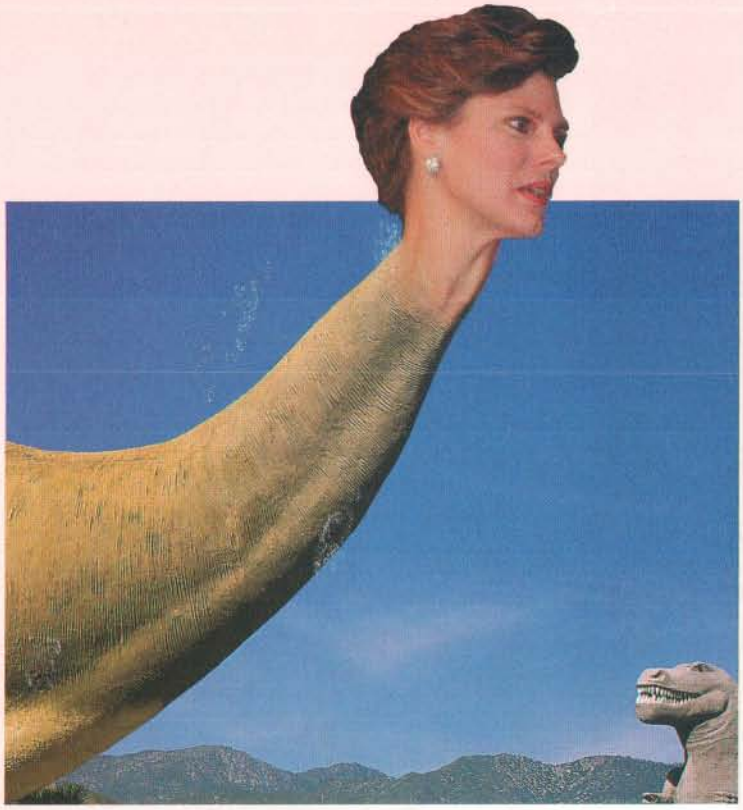


## Net to Cokie: Drop Dead

While old-media dinosaurs like Cokie and Steven Roberts bash the Web as a threat to representative democracy, netizens are proving them wrong at democracy.net.

With a mission to foster new avenues of civic participation, democracy.net is dragging the art of politics into cyberspace – think C-Span interactive. Cobbled together on a shoestring budget, the site is the latest joint venture between Voters Telecommunications Watch and the Center for Democracy and Technology (CDT).

Democracy.net is already creating a stir – among elected officials and netizens. A recent cybercast of congressional hearings on cryptography underscores the promise of new-media politics: whereas only 100 people could fit into the well-appointed room in the Senate's Russell Building, more than 700 gathered online. Representatives Rick White (R-Washington) and Anna Eshoo (D-California) and FCC chair Reed Hundt have all hosted RealAudio chats.

"TV doesn't allow interaction," says CDT's Jonah Seiger. "The Net provides an opportunity to create government without walls." – *Spencer E. Ante*

# E L E C T R I C W O R D

## Spectrum Wants to Be (Almost) Free

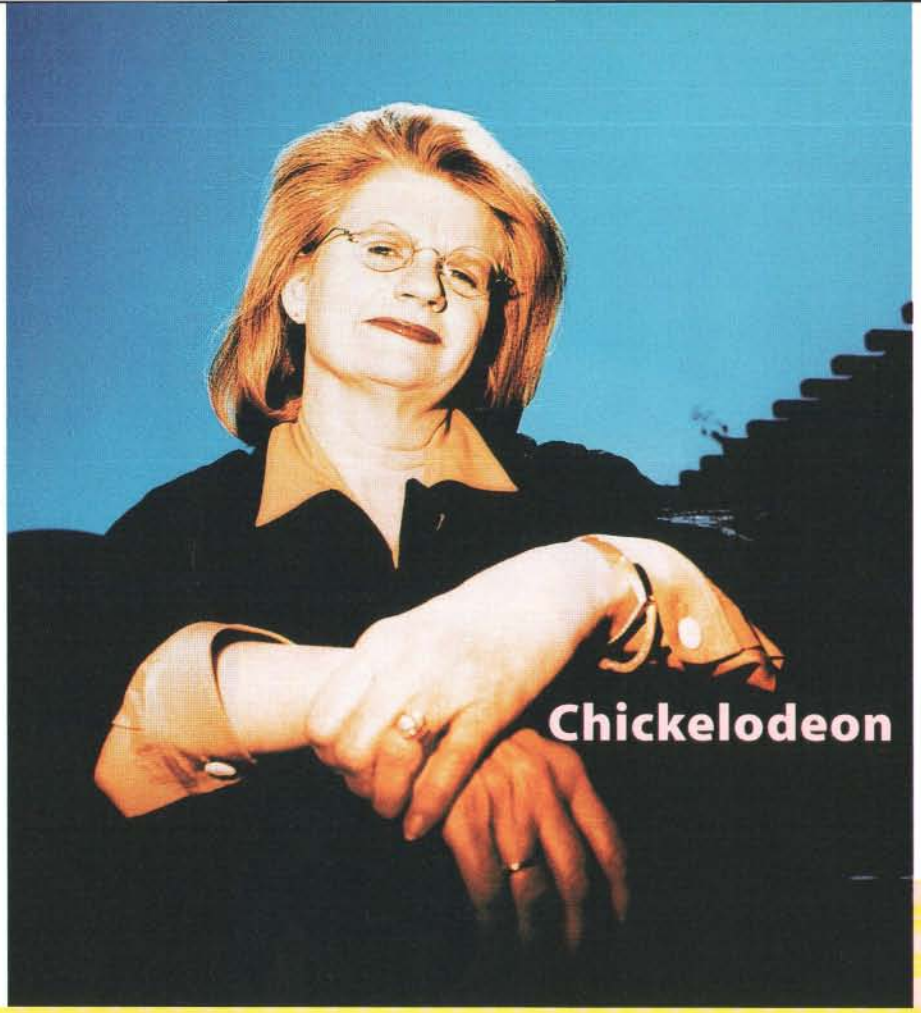
**"Everything for a buck" might have been the slogan for the latest auction of wireless spectrum by the Federal Communications Commission. The agency's April sale raised US$13.6 million of an expected $1.8 billion – a 99.24 percent shortfall.**

**Anticipating returns similar to 1995's $7.7 billion PCS auction, Congress fast-tracked the sale so proceeds could be applied to the budget deficit. Then, the FCC fumbled its pitch by not stressing the strengths of the 2.3-GHz blocks, which are good for fixed wireless service. As a result, most big telecom companies didn't show. The few bidders who did failed to make the auction competitive. Licenses in Milwaukee and Minneapolis sold for a measly $1 apiece; Coloma Wireless walked away with a San Francisco license for $6.**

**"No one was moving in on the low bids," glows Scott Donohue of Coloma. "It was extraordinary."**

**The fate of future spectrum auctions now lies on Capitol Hill. But selling more spectrum when the PCS licenses have yet to be used, let alone paid for, is called "flooding the market." Communications companies go bankrupt, Congress gets stiffed, and consumers are left without choices. – *Tim Barkow***

IMAGE ABOVE: ROBERTS: AP/WORLDWIDE; DINOSAUR: FLIP CHARFANT/IMAGE BANK
PHOTO BELOW: FPG INTERNATIONAL



## Chickelodeon

Geraldine Laybourne knows how far a light touch can go on cable TV. During her 15-plus years at Nickelodeon, she helped launch some of the coolest kids' shows of the '80s and gave reruns hipster cachet.

Now as president of Disney/ABC Cable Networks, her latest challenge is that outpost of estrogen on the cable dial, Lifetime Television. "I would like to see a sense of humor," says Laybourne, reflecting on a network that isn't exactly famous for its laugh-a-minute pace. "There's a lot that's funny about women's lives."

So far, she's shaken up Friday nights with a block of programs referred to as "The Place." Viewers can tune in to such non-Valerie Bertinelli fare as *Three Blind Dates* – a kind of *Singled Out* meets *The Real World* but with less hooting – or *The Dish*, a buffet of pop culture that's as breezy as an IKEA ad.

"At my very first board meeting my words were, 'If it ain't broke, fix it anyway,'" Laybourne recalls. "Lifetime earned the place it's in. It has an audience. Now we can afford to do more original programming." The generation that grew up watching Nick at Nite eagerly awaits. – *Mary Elizabeth Williams*

**≡III Someone Gets It at ABC:** Believe it or not, there are signs of intelligent life on the network that led its Heaven's Gate coverage with correspondent Gina Smith doing an AltaVista search on "Satanic." A real gem recently surfaced on *World News Now*. In an April Fools' segment of *World News Then*, ABC spoofed the media's relentless The-Internet-Is-Evil-Incarnate meme. The script went like this: "Egypt's emerging papyrus technology continues to alarm parents and law enforcement. A new bill introduced today would let the government regulate material found on papyrus. Legislators said paperspace, as it is known to so-called 'writers,' is becoming a haven for monotheists, con artists, and worse hoping to prey on the young and gullible. A little bit later in this broadcast we will have some tips on how to shield your children from offensive and dangerous material found on the dangerous papyrus." ≡III ►

## DVD's World (And Welcome to It)

In the World According to DVD – that's digital versatile disc, for those out of step with the Next Big Thing in consumer electronics – the globe is neatly divided into six zones, and a format that works in one won't work in another. Not exactly a business plan for a global economy.

But apparently this is the best solution media and hardware companies could come up with to combat illegal copying. Having learned the hard way through rampant unauthorized reproduction of videotapes and computer software, leading electronics outfits figure that with the differentiation, counterfeiters will have less incentive to crank out their wares. China, where piracy is almost a national sport, is a DVD zone unto itself.

Meanwhile, a consortium of 10 DVD companies has agreed on a DVD-R design to allow recording. Let's hope this format – which is for your PC, not your TV – will play in any country. – *David Lazarus*

PHOTO ABOVE: DANIELA SCHMIDT

# John Graham's Secret Weapon

John Graham, ponytailed founder and chair of Graham Technology Solutions, wants to become the Ted Turner of the Web. Along with cofounder Mike Fuller and the staff of his Cupertino, California-based start-up, Graham (above) plans to leapfrog the efforts of the likes of Progressive Networks, Microsoft, and Intel by creating a true netcast network.

Graham's first secret weapon is a proprietary server technology that can grab, compress, and feed live audio and video to the Net from any source – including broadcast TV. His second is a network of proxy servers, which can stream a single feed across the Internet backbone, split it, and deliver it to anyone using a Web browser. Think of "us as a distribution channel like any satellite or cable TV company," says Graham president Steve Adelman. CNN Headline News is among the firm's first partners.

Unlike its competitors, claims John Graham, the company has "no plug-in or firewall issues." For users, this means no software to download. "We're making things happen that shouldn't be possible," Graham declares. – *Chip Bayers*

PHOTO: MICHAEL SEXTON

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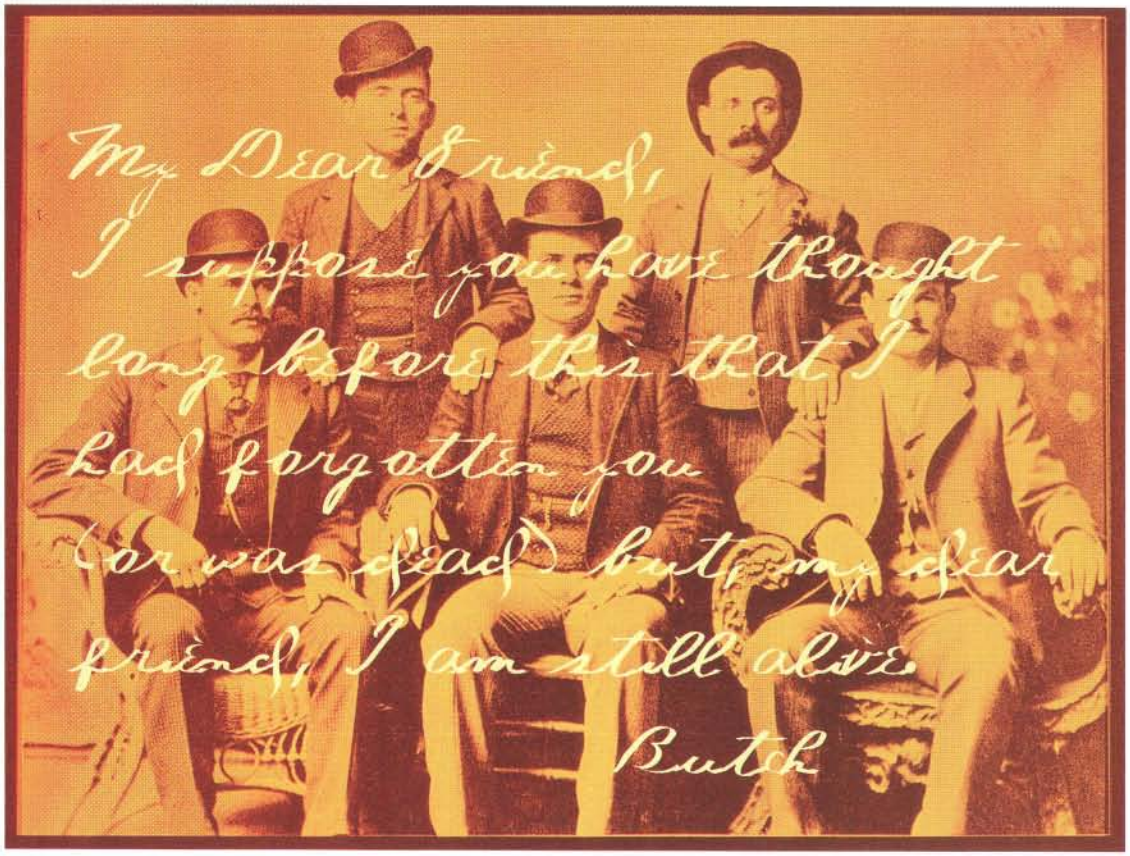



## Killing Words

**Hate your job? Fire off a resignation letter in Jack the Ripper's handwriting. Feeling mischievous? Print your correspondence in Lee Harvey Oswald's scrawl.**

**Following in the keystrokes of other custom font makers, Stuart Shapiro, a producer of independent films, created Killer Fonts *(www.killerfonts.com/)*. Teamed with fontographer Ted Ollier, Shapiro culled letters, manuscripts, and books for handwriting samples from various murderous sorts. The roster covers the Zodiac Killer, Butch Cassidy, Lizzie Borden, and Genghis Khan. "My Number One request is O. J. Simpson," Shapiro says, "but we're not doing it."**

**Humans aren't the only killers inspiring Shapiro's product line: "We're thinking of making fonts out of the molecular structure of diseases." – *Dave Cravotta***

► **Net Telephony Takes a Bite:** A consulting firm in London claims that the giant German telco Deutsche Telekom will lose at least US$173 million in revenues by 2001 due to Internet telephony. ☰ **Poor America Online:** We may beat up on AOL a lot, but we're willing to admit when the online Goliath has been treated unfairly. Consider the recent spate of email outages that have plagued MSN, CompuServe, IBM, and other Net providers. Some of these breakdowns have been just as serious as AOL's, and they certainly suggest that AOL is not alone in bungling the exponential growth of online services. But no one is jumping on Microsoft or IBM with front-page headlines or class-action suits. It ain't easy being the biggest.

☰ **Unwired Top 10:** *Iconocast*, an Internet advertising news- ►

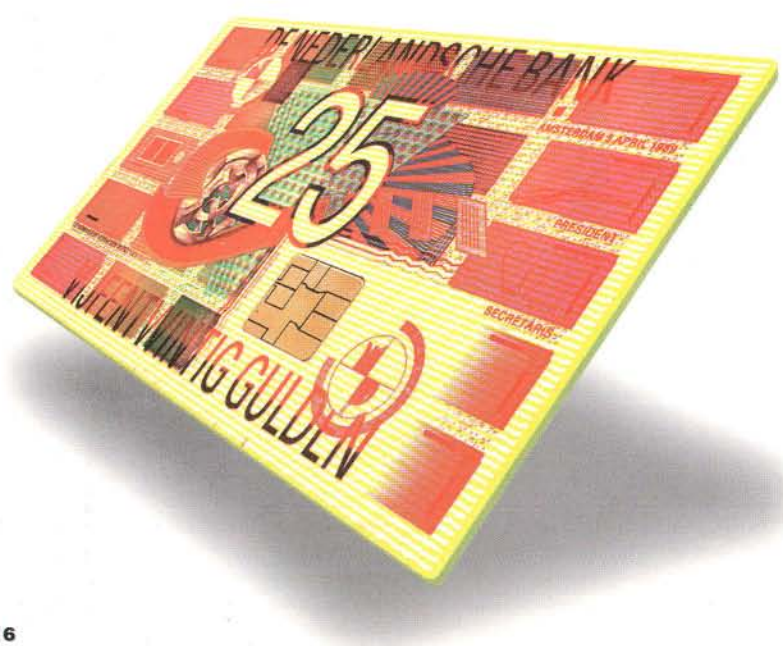
## Emoney Gets Real

Despite the hype about smartcards, few implementations extend beyond phone calls. Banks in The Netherlands are changing that, however, rolling out the largest initiative anywhere in the world. Since last fall, Dutch banks have issued more than 4 million cards equipped with a *chipknip*, Dutch for "electronic purse." Now, banking giant Postbank is getting in on the act.

Postbank's Chipper platform functions like a normal debit card but can also store cash on an embedded chip. Short on guilders? Upload some more at a public pay phone by inserting the card in a reader and dialing up your bank.

Shops, parking meters, and public transportation are gearing up to accept the cards. And eventually, readers will be installed in all phones and PCs for Net commerce. Unused capacity on the chip could hold medical information and telephone numbers, or be used by a vendor to store coupons and the like.

About 20,000 businesses now accept the cards. But with Postbank's plunge, the concept is poised to really take off, probably just in time to make another switch – this time to the euro.
– *Jeffrey Mann*



| TIRED | WIRED |
|---|---|
| Webmaster | Admaster |
| Let's Go | Underbelly |
| Java OS | Inferno |
| BeBox | Yellow Box |
| Complaining about spam | alt.revenge |
| *The Lost World: Jurassic Park* | *Turok: Dinosaur Hunter* |
| WAV and MIDI | Mute checkbox |
| Hemp clothes | Hemp beer |
| Time-division multiplexing | Wave-division multiplexing |
| Tamagotchi | KinderSurprise |

# Web Rustling

On the freewheeling Net, it's irrelevant that information wants to be free – it's there for the taking.

"People on the Net have a weak sense of property," says Jim Heard, CEO of Buoyant, a New York design company ready to do battle with Singapore-based Thru Eyes Web Design Studio. "There're a lot of cattle rustlers out there."

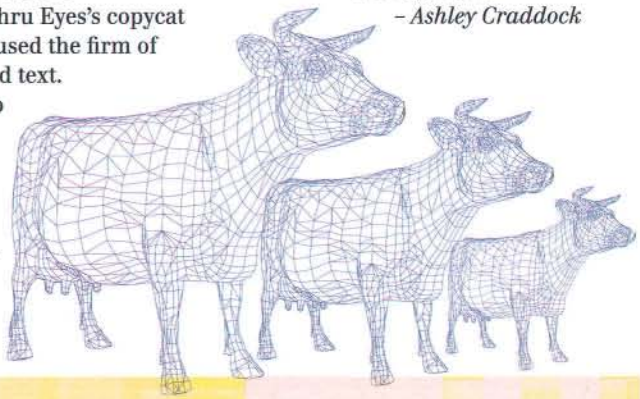
After finding Thru Eyes's copycat site, Buoyant accused the firm of lifting its code and text.

When alerted to the apparent ripoff, Thru Eyes's director removed the material, attributing it to a "freelance student."

Heard, however, is considering legal action despite the difficulty of suing a firm in Singapore.

Web theft is worsening, Heard claims. "Smaller companies can be swallowed up by copying," he says. "Intellectual property law is supposed to protect garage geniuses, but what garage genius can afford the legal bill?"

– *Ashley Craddock*



► letter, looked at the top 10 television advertisers (by spending) during one week in February. Of the 10, only one, Saturn, was on the Web.

≡Ili A Match Made in Heaven: If it won't sell in the US ... export it to China! That's the apparent thinking inside Prodigy Inc., which recently announced a deal to create an online service based in Shanghai. Information will be filtered according to the Chinese government's wishes – no problem! Prodigy used to be known as a family online service, remember? With China, it's back to basics. "All the stuff will be screened," Prodigy chair Greg Carr told *The Wall Street Journal* and Reuters. "We want to be good citizens, we don't want the government to come ►

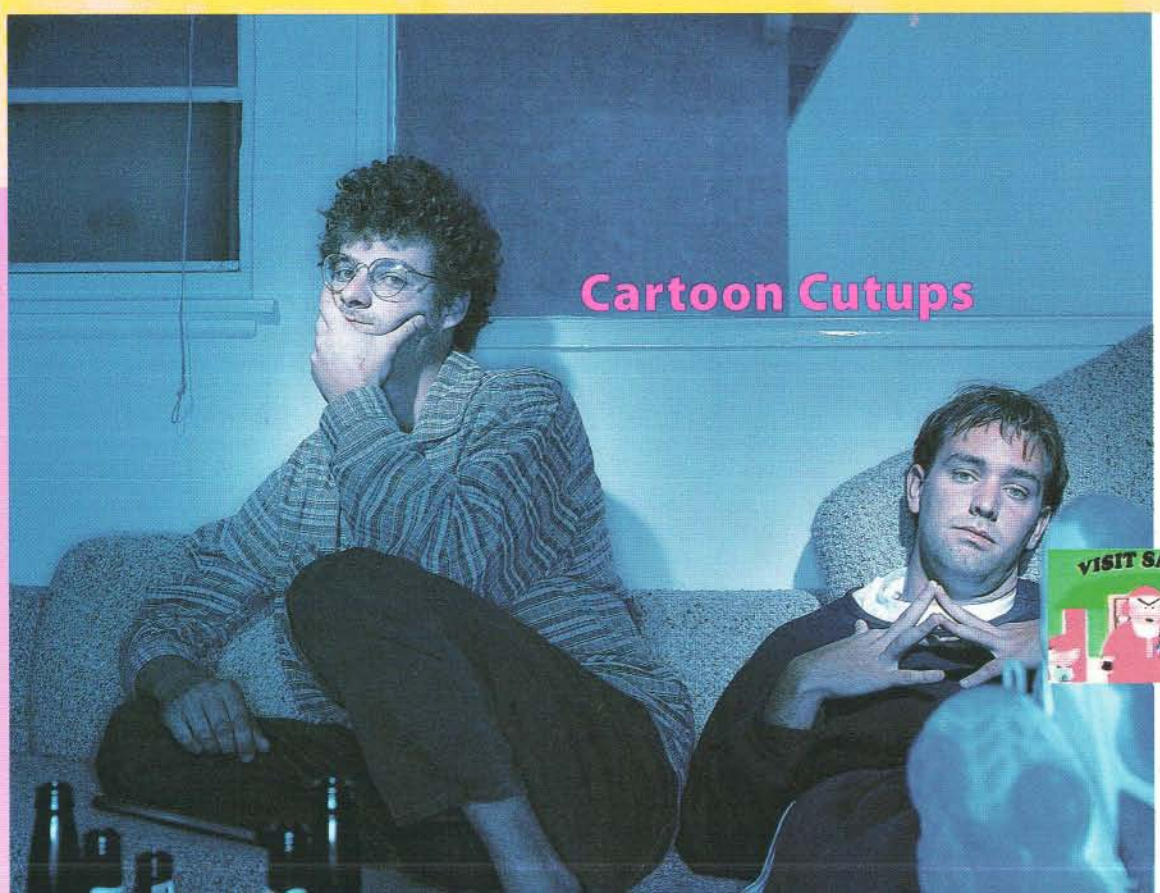


IMAGE ABOVE: VIEWPOINT DATALABS; PHOTO BELOW: ERIC TUCKER

## Cartoon Cutups

When a Fox Broadcasting executive wanted a catchy Christmas card, he tapped two college grads to create an animated video. In their Quentin Tarantino-meets-Rankin Bass-style short, Christ comes down from heaven to kick Santa's butt for ruining his birthday.

"We kept our names off it because we thought it was too controversial," says cocreator Matt Stone (far left). "This worked to our advantage, because in Hollywood that drives people crazy." After a flurry of offers, Stone and partner Trey Parker landed a show, *South Park*, that débuts on Comedy Central in August.

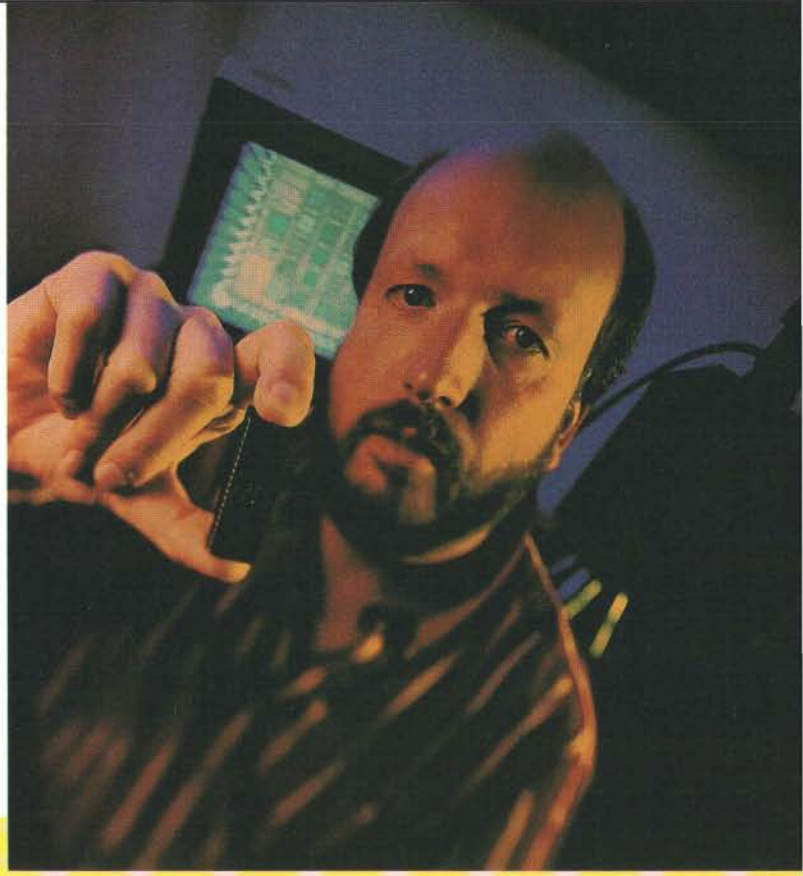
"We love to push the edge," says Stone. "To shy away from bad taste is a shame. It's leaving something unexplored." – *Paula Parisi*

# Critters on a Chip

Look out. A half-organic, half-synthetic computer chip has been bred at the Oak Ridge National Laboratory in Tennessee. The bioluminescent bioreporter integrated circuit, which researchers Mike Simpson (pictured) and Gary Sayler call Critters on a Chip, is designed to detect pollutants, explosives, and chemicals in soil and water.

Here's how it works: The outer layer of the silicon chip contains bacteria suspended in a polymer substrate. These genetically engineered critters glow when exposed to certain pollutants or chemicals. The integrated circuit senses photons, converts them into electrical voltages, and transmits that information to environmental investigators.

So far, experiments with the prototype chip have gone swimmingly. Sayler and Simpson have encountered only one major problem: the bacteria die within a few days. While many potential apps won't require extended life spans, the scientists have devised a solution. They plan to build a reservoir of water and nutrients that will be pumped onto the bacteria – resulting in a true microcosm on a microchip. – *Jesse Freund*



► round and spank us. We'll block it as much as we have to to keep our friends happy."

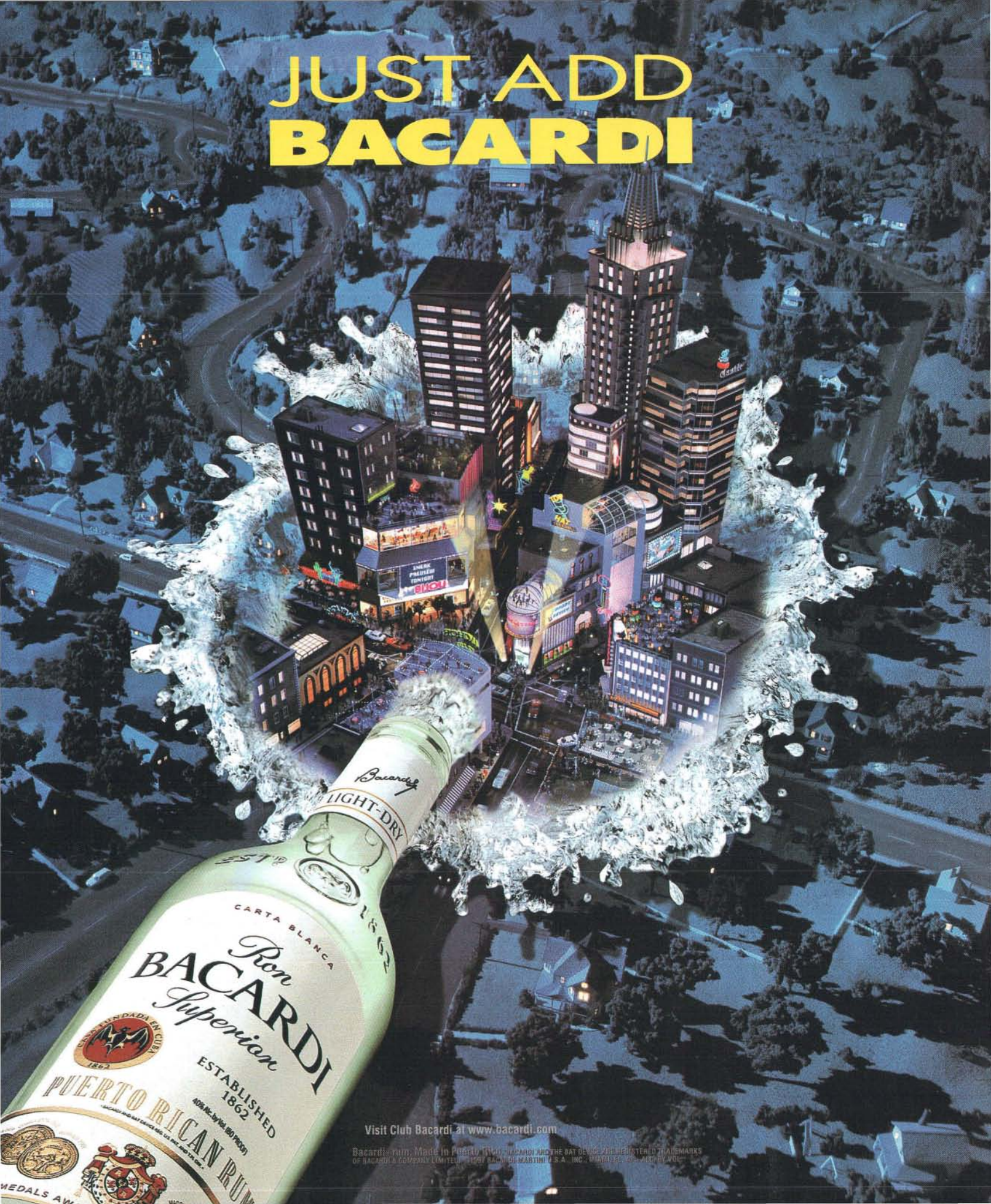
Joy joy. ☰III ZDTV, The Sequel: Producers in New York must be seething. Ziff-Davis's recent announcement that its US$100 million, 24-hour service, ZDTV: Your Computer Channel, will be located in San Francisco may make the city a true television mecca. ☰III Make It Stop!: Web browsers are succumbing to the dreaded Bloat Disease, and a backlash is building against forthcoming 4.0 versions from Microsoft and Netscape. They take up too much space, try to do too many things, and are far too top-down, complain netizens in the know. Upgrades "are not an excuse for engineers at Microsoft, Netscape, and Sun to rewrite rules on how I use my computer," writes cybercolumnist Dave Winer. Suddenly 3.0 browsers are looking almost sexy. ☰III

# Infinitely Wearable Computing

**The future may soon find Harley-Davidson geeks with calculators embedded in their forearms. Inventor Andrew Singer, however, had medical uses in mind for his recent patent, a programmable "tattoo." The chip implant's LCD readout is visible through the skin. "Medical biosensing," says Singer, "is increasingly practical for chronic and acute conditions" such as diabetes, where the device could read insulin levels. "This could save precious time in an emergency."**

**So when can you get one? No time soon, says Singer's employer, Interval Research. A secretive R&D firm owned by Paul Allen, Interval claims no commercial aspirations for the patent. "We study about 20 to 25 high tech areas, one of which is wearable computers," shrugged a company spokesperson. – *Bob Parks***

PHOTO ABOVE: MATHEW BARNES; IMAGE BELOW: ARM: JENNY BUTLER; CALCULATOR: SUPERSTOCK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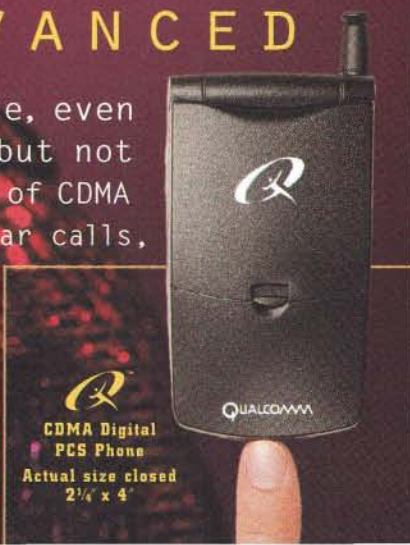


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# The Integrationist vs. The Separatists

**Fortunately for the New Economy, Larry Summers – Clinton's point man on trade and international finance – not only gets it, he's actually being helpful.**

**By John Heilemann**

www.wired.com/5.07/netizen/

When it first became clear that the Mexican peso was going down the tubes, Robert Rubin was in the Caribbean, casting for bonefish, while Larry Summers was on the line, talking apocalypse. It was Christmastime 1994, a couple of weeks before Rubin would take over his new job as Secretary of the Treasury, with Summers – then Treasury's undersecretary for international affairs – as his point man on all matters global. For months, officials like Summers had been warning the Mexican government that it was headed for trouble, and now trouble had materialized in the form of a full-scale financial crisis. With doubts growing about Mexico's political and economic stability, the peso was plummeting, and the foreign capital that had once flooded the country was fleeing. Suddenly, Mexico was on the brink of bankruptcy.

With capital markets increasingly international, linked by T1 lines and ruled by traders both stateless and sleepless, a collapse in investor confidence in Mexico could trigger a similar collapse in developing countries all over the world, and this in turn would threaten the democratization and pro-market reforms that are the very building blocks of the global economy.

In a matter of weeks, America would come to the rescue. Facing down nationalist-isolationist congressional critics and pusillanimous Europeans at the International Monetary Fund, Bill Clinton would stitch together a US$20 billion loan package to keep Mexico solvent. Pulling the strings behind the scenes (badgering the IMF, lobbying Congress, sucking down a case of Diet Coke a day while pulling all-nighters at Treasury) was Summers, who feared that the immediate dangers of Mexico going belly up – a surge in illegal immigration, a threat to tens of thousands of American jobs dependent on exporting goods south of the border – paled beside what might come next.

Transnational in scope, driven by information technology, and a sign of the relative impotence of politicians and central bankers, the near cataclysm in Mexico was, in the words of IMF head Michel Camdessus, "the first financial crisis of the 21st century." Summers, a fast-rising young economist with a penchant for *pronunciamento* and a capacity for controversy nearly equal to his capacity for insight, had recently spearheaded the international community's support for Russia and played an important role in the passage of Nafta. By all accounts, especially those of his peers in academia, Summers is one of the most gifted economic minds of his generation. His career has been ▸

*John Heilemann is national affairs editor at* Wired.

that of a purebred prodigy. Both of his parents are economists, and two of his uncles, Kenneth Arrow and Paul Samuelson, are Nobel laureates. Summers was a domestic policy economist for the Council of Economic Advisers in his 20s, became the youngest tenured professor in Harvard's history at 28, was named chief economist of the World Bank in his late 30s, and, a few months after the Mexican crisis and a year shy of his 40th birthday, was promoted by Clinton to deputy secretary of the Treasury.

On Clinton's economic team, Rubin, who spent 26 years as the biggest of bigwigs at Goldman Sachs, brings street – or, rather, Street – smarts, while Summers provides the raw intellect. At home, the two of them have urged the president toward fiscal restraint, and hence toward political rehabilitation. They have been a consistent force for internationalism on questions of free trade and foreign aid, with Summers in particular speaking out against the chorus of antiglobalist ranting led by author William Greider and House Minority Leader Richard Gephardt. At the international level, too, the Rubin-Summers double act has left its mark. After the Mexican fiasco, it was they who pushed successfully for policies to prepare for, reduce the possibilities of, and maybe even prevent international financial crises. And in late June of this year, when the leaders of the industrialized nations trek to Denver for their annual Group of Seven summit, they will for the first time discuss the policy implications of emoney and e-commerce – issues that landed on the agenda largely at Summers' insistence.

**The greatest challenge for the United States is to build a constituency for American leadership and internationalism in a world where we no longer have the Communist threat as a rationale.**

An outsized figure both physically and mentally, Summers is known as a man whose regard for his own candlepower is almost as impressive as the candlepower itself. "Larry Summers is to humility what Madonna is to chastity," *Wall Street Journal* columnist Paul Gigot once wrote. On two occasions recently, Summers sat down with *Wired*'s John Heilemann to talk about everything from the aftermath of Mexico and the volatility of a financial system gone cyber to the question of whether the global economy is rendering policymakers like him more or less irrelevant. Summers was, as ever, confident to the point of cockiness, but the quality of his conversation made complaints about his arrogance seem ... well, small-minded. Besides, he has a fine sense of humor about himself. After reading Gigot's barb, Summers quipped to his wife, "Well, it's not as bad as it could've been: he could've said that I'm to chastity what Madonna is to humility."

**Wired: In the past few months, the critics of global economic integration – people like William Greider and Richard Gephardt – have been making their case quite forcefully. You've been trying to take them on. Explain the debate as you see it.**

**Summers:** The place to start is with a comparison of the 1920s and the late 1940s, two periods that were in many respects similar to today. Both times America was coming off the end of a conflict. Both times people were weary. Both times people were internally preoccupied. Both times there was some resistance to foreign entanglements. Both times there was some sense that middle-class families were not doing as well as they would like to have been doing. Sound familiar?

In the 1920s, what the United States did was move away from internationalism. We were party to the punitive collection of debts in Germany. We didn't join or support the League of Nations. We passed the Smoot-Hawley Tariff. And we made no effort to provide global leadership. What followed was maybe the 20 darkest years in modern human history – the Depression, hyperinflation in Germany, World War II, the Holocaust. But after World War II, we learned a very different lesson. We focused on leadership. We passed the GI Bill and the Marshall Plan. We created the architecture of international financial institutions. We worked as a consistent force in favor of world markets and more international integration for 50 years. And despite all the terrible things that have happened, it's been 50 years of remarkable peace and prosperity.

The overwhelming historical lesson is that progress requires American leadership. History also gives an indication of the stakes involved, which go far, far beyond questions of the mercantile advantage and really go to America's role in the world, and to the prospects for the world to stay at peace. Asia today is in many ways like Europe before World War I, with a number of rising powers that are wary of one another. Europe still has tremendous tension over unification that has yet to be resolved. Who would have thought there would be ethnic slaughter in Europe in the 1990s? There are profound challenges that depend on US leadership, and US leadership in the economic area is a part of US security – just as it was in the 1940s and the 1920s.

That's what I like to call the integrationist position. On the other side, you have what I call the separatist position, which offers, I think, three broad arguments against the integrationist position. The first is that somehow this will impoverish Americans; that basically the economic success of others comes at our expense. But the evidence is overwhelming that this is wrong. The reason wages are lower in other countries is because productivity is lower. We have much more to worry about economically from Germany, where ►



ILLUSTRATION BY SCOTT MENCHIN

wages are higher than here, than we do from Bangladesh, where wages are lower. If you ask what the change has been in the content of trade that comes from less developed countries, it's only 1 percent of GNP in the last 15 years, so it's hard to believe that this has a lot to do with the tectonic shifts that we have seen in our wage structure. In any event, whatever changes have been associated with globalization have not been due primarily to trade agreements. The country where people have the greatest economic fears is China, and we haven't had any trade agreements with China. Meanwhile, in every trade agreement we have entered, foreign trade barriers have come down by far more than American trade barriers; with Nafta, the ratio was five to one. There just isn't evidence to suggest that trade agreements have had an adverse effect on the prosperity of individual Americans. And if you look around the world, you see that those with protectionist policies have not prospered, to put it mildly.

**In 1982, the Fed could get 20 major bankers in a room and they'd work something out. You can't do that with thousands of separate holders of emerging-markets mutual funds.**

The second argument that separatists make is that capitalist economics is a Western affectation, and that we have to understand that cultures are different, and that the attempt to export the Western economic consensus will produce a backlash. But I think it's extraordinarily difficult to rely on cultural arguments. It was only a quarter of a century ago that many sophisticated cultural observers, including Nobel prize winner Gunnar Myrdal, were certain that Asia would suffer a Malthusian famine by the late 1980s; a judgment had been made that a Confucian culture was fundamentally inimical to economic growth. Careful studies comparing rapidly growing countries in Asia with less rapidly growing countries in South America and Africa reveal that what's common to sustained economic growth are economic fundamentals: saving, a price system that works, an outward orientation, the availability of capital for entrepreneurs, the existence of a secure system of property rights, education.

There is a tremendous receptiveness around the world to Western economic thinking. It would be a tragedy, just at the moment when these ideas are gaining currency, if there were to be some kind of pullback. There is every bit as much potential ethnic hatred between the Chinese and the Malays in Malaysia as there is between ethnic groups in Africa. The reason that has not resulted in mass slaughter in Malaysia is that people have seen their living standards double in 10 years, and then double in 10 years, and then double in 10 years, and look forward to vastly better lives for their children. It's *that*, and not some mythical cultural solution, that offers the best prospect for stability and peace. Now, all you have to do is to look at the savings-and-loan crisis, or at rising wage inequality here, or at the Japanese banking failures, or at levels of unemployment in Europe, to understand that we by no means have all the answers. We're not at the end of economics. We're not at the end of the business cycle. But I think there are some directional tendencies for this era that we have identified and are fairly universal.

The third separatist critique is that America can't afford to be globalist. George Bush was never more wrong than when he said, "We have more will than wallet." We're saving nearly a hundred billion dollars because the Cold War is over, relative to what we were spending on defense. It's hard to believe we couldn't have invested $3 billion in responding to forward challenges in the international arena, like AIDS, or the global environment, or narcotics. But in fact, nonmilitary foreign affairs spending has fallen *nearly by half* in real terms in the last 10 years. I think the greatest challenge for all of us is to build a constituency for American leadership and internationalism in a world where we no longer have the Communist threat as a rationale.

**You say that the integrationist position is "under siege" by separatism. In what sense?**

You see globalism under siege in the United States' failure to meet its obligations to the international financial institutions and the UN; in the questions that are raised as to whether the president will be able to get the authority to negotiate further trade agreements; in European attitudes toward foreign television and movies; in the reluctance in some quarters in Japan to permit the stationing of American troops in Okinawa; in the strengthening nationalist movements in Russia and a number of other countries in the former Soviet Union. And the list could go on.

What are the stakes? It's very difficult to lay out the scenarios. But I think it's worth remembering how remote a prospect World War I would have looked in 1910, and how remote a prospect World War II would have looked in 1934.

**It's now more than two years since the peso crisis. At the time, you guys in the administration – and you personally – took a lot of heat for the Mexican bailout. Do you feel vindicated by history?**

I think if we had not acted and Mexico had been allowed to default, there is a real chance you would have seen the same kind of effects that followed the Mexican default in the early 1980s. It would have meant a cessation of flow of capital for many years to many developing countries.

It would also have meant – and this may have been the more profound point – a renunciation of the 182►

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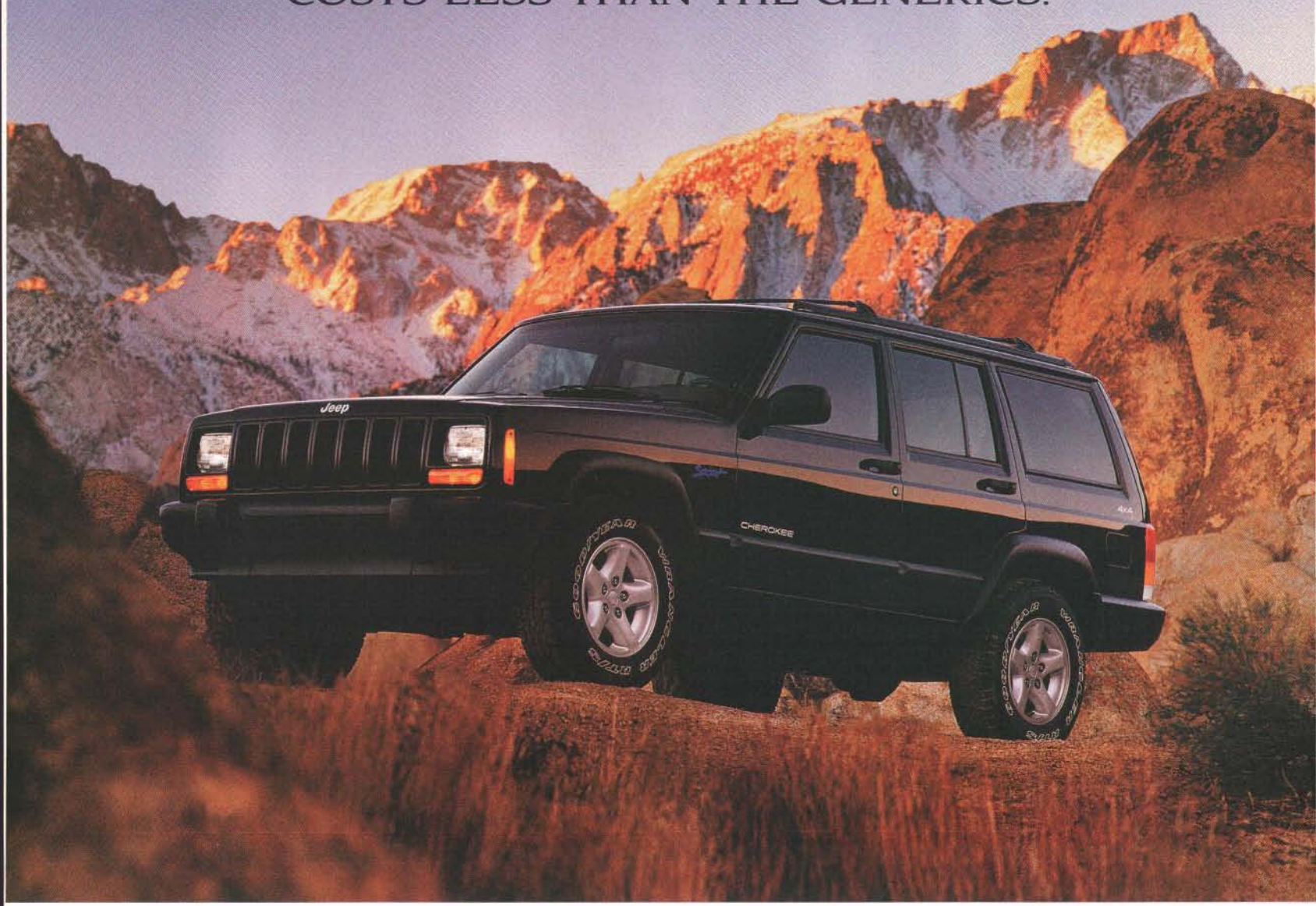


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# FETISH

Edited by Tim Barkow

### Aliens

Smartcards come and smartcards go, but you can never underestimate the value of a good calumet. The Silver Palm Leaf is the size of a credit card and its neopagan icon looks like a cult symbol, but, really, it's a pipe. The patented "pipeless" design of this svelte silver sucker allows 12 inches of smoke to travel within a 3-inch body through the use of an innovative network of crop-circle corridors. Just remember, it's for smoking tobacco only. Silver Palm Leaf smoking pipe: US$30 to $40. Silver Palm Leaf: +1 (415) 487 7810, on the Web at www.silverpalmleaf.com/.

### Newt Boy

Games from Tiger always tended to follow the high tech pack, settling for simple, LCD-based titles that underwhelmed in the face of glitzier competition. That's why game.com is a bit of a surprise. Tiger melds the Game Boy and Newton, combining a stylus and touchscreen with a stable of cartridges based on popular game titles and built-in personal organizer software. It's even got an optional modem cartridge for accessing email and the Net (text only). Maybe the revolution really is ubiquitous now. game.com: US$69.99. Tiger Electronics: +1 (847) 913 8100.

### Astroboy

Miniaturization seems to be a force of nature in the digital age, but it does exact a toll. Let's face it, the diminution of G.I. Joe was a crime. But Hasbro is making restitution with a classic collection of action figures. Appropriately, the Mercury Astronaut stands tall – 12 inches – and comes complete with suit, helmet, gloves, and, yes, dog tags. Other figurines include the Tuskegee Fighter Pilot, General Patton, and a female Joe – the US Army Helicopter Pilot. Mercury Astronaut: US$29.99. Hasbro Inc.: +1 (401) 431 8697.

### Coins

If there's one person who's got a good shot at making a splash in networked gaming, it's Nolan Bushnell (Atari notwithstanding). And his company, PlayNet Technologies, may do just that. The PlayNet Web terminal supports voice-activated chat, multiplayer games, dating and personals software, as well as Web browsing and email. The pay-per-play system is currently wooing the hospitality market, but the system could pave the way for a revolution in the gambling segment of gaming. PlayNet Web: games start at US25 cents; Web browsing $12 per hour. PlayNet Technologies Inc.: +1 (212) 586 2400.

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### Cat

In the quest for ergonomic bliss, there's always room for another input device. Felix combines aspects of trackballs, mouses, and touchpads to make a pointing device unlike any you've seen. Essentially a mouse you drive with your finger, this tool roams a 1-inch-square area. It also automatically adjusts to the size of your monitor, so you're always in control. Let your fingers do the walking. Felix: US$69.95 (Windows 3.1 or 95 only). Altra: +1 (307) 328 1342, on the Web at www.altra.com/.

### UFO

Yesteryear's remote-controlled helicopters were always too noisy, and the ones attached to lines always seemed too wimpy. The Engager GS III is neither. It's battery-powered and contains a piezoelectric oscillation gyro that controls the chopper's movement, making it easier for novices to fly. Because of the battery, the Engager is light, but it flies only up to three minutes at a time – keep extra batteries on hand. The Engager also comes with a four-channel transmitter and extra rotor sets. Engager GS III E-770: ¥57,000 (US$465). Keyence Corp.: email hobby@keyence.co.jp, on the Web at www.keyence.co.jp/hobby/hobbye.html.

### Primary

Known in some circles as The Cube, RadioShack's portable AM/FM radio has its own agenda. Primary colors and easy-to-use dials mock the sleek curves and miniaturized design of other wireless receivers. Every inch of the 12-208 seems a minor miracle as it emits a surprisingly rich sound. Light and smallish, this little fella travels where you travel and probably further. The 12-208 comes with a 12-inch antenna and a carrying handle so cute you won't be able to let the darn thing go. 12-208 AM/FM radio: US$14.99. RadioShack: (800) 843 7422.

### Classic

Slowly but surely, those Polaroid Land Cameras have become collector's items. And now the company's taken that original design and added an electronic flash, an automatic variable speed and shutter system, and autofocus. Pop in a pack of Polaroid 600 High Definition film, and you'll see how clear the 690's lens is. This single-lens reflex camera folds to a slim 1.16 inches, and if that's not enough, affix the close-up attachment for some one-to-one instant gratification. Polaroid 690: US$399; close-up attachment $49.95. Polaroid Corporation: (800) 343 5000, on the Web at www.polaroid.com/.

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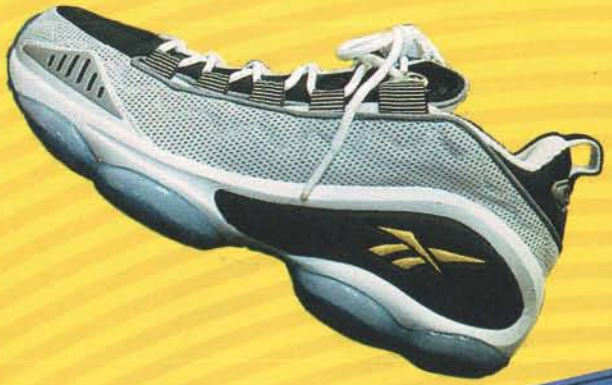
### Mite

Smaller than a subcompact, yet spacious, practical, and able to leap small curbs in a single bound, the A-Class is Mercedes's new vision of the auto. The car combines aspects of the compact and mini-van classes, while offering plenty of safety features and high tech assistance. Its unique sandwich chassis is designed to accommodate batteries and fuel cells in future drive systems. Too bad you'll only find it in Europe. A-Class: Price not available. Mercedes-Benz: on the Web at www.mercedes-benz.com/.

### Compression

Digital cameras are convenient, but adding a little video can be extremely complicated, especially if you want to shoot outside. Well, Hitachi's got an MPEG camera that will shoot up to 20 minutes of MPEG-1 full-motion video at a resolution of 352-by-240 pixels. The MP-EG1A will also take about 3,000 JPEG stills (704 by 480 pixels). And everything's stored on a 260-Mbyte PC card. If this takes off, Web pages will be rife with video, and we'll have some real bandwidth problems. MP-EG1A: US$2,499.95. Hitachi Home Electronics: +1 (770) 279 5600, on the Web at www.mpegcam.net/.



### Step

You got the Nike waffle and air soles. You got your cross trainer and your odor-eaters. Now you got Reebok. The DMX Run shoe has a 10-chamber cushioning system in the sole that pushes air between the forefoot and heel, when and where you need it. The heel's impact forces air into the forefoot; as it comes down, the air is pushed back to the heel. Expect to see a lot of this shoe, even if you spend most of your time exercising your TV remote. DMX Run: US$110. Reebok International Ltd.: on the Web at www.reebok.com/.

### Fist

Every joystick is different. Not better, really – just built for another subset of games and gamers. The Glove offers a more immersive controller, one that forces you to get your body into the action. It fastens to the right hand and inputs button combinations from all five fingers. The Glove also employs a proprietary wrist-sensing technology to measure x and y axis movement. The Glove is being offered for PlayStation, N64, and Saturn. The Glove: US$89.95. Reality Quest Corporation: +1 (303) 772 2334, on the Web at www.theglove.com/.

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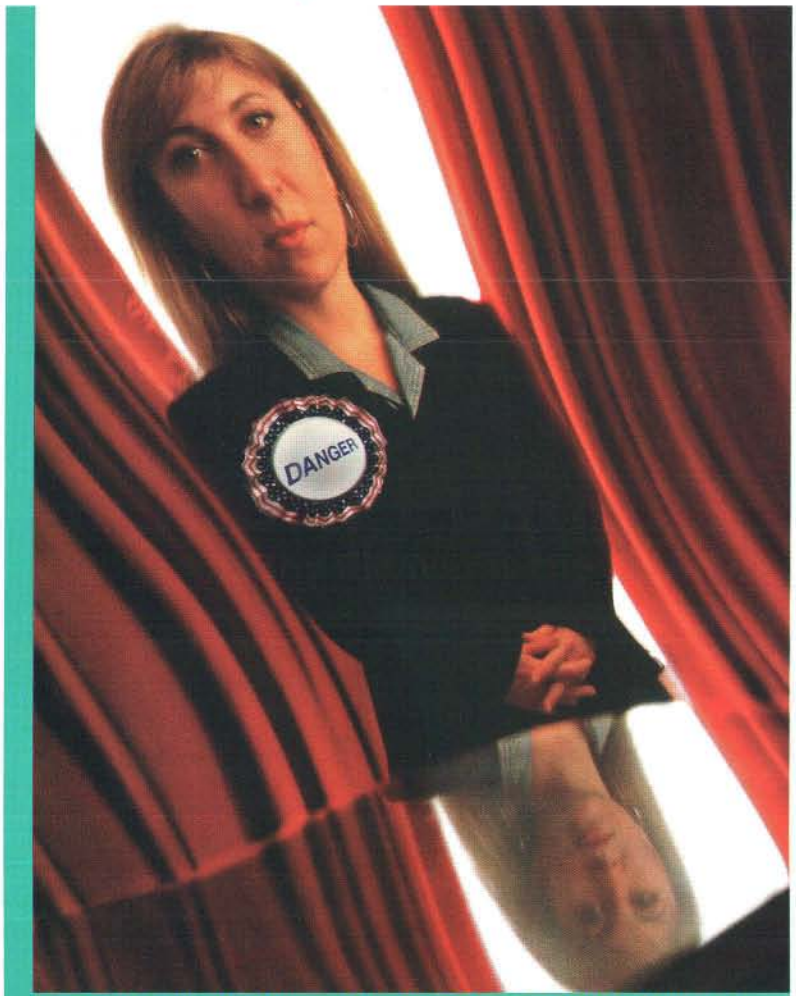
# Antiporn Pusher

## Cathy Cleaver is the all-American censor next door.




The media-savvy crusader wears her reputation like a badge of honor.

"Last year the Boston Coalition for Freedom of Expression gave me a lifetime achievement award for being a danger to free speech," says Cathy Cleaver. "I thought that was sort of cool. I'm happy that people aren't dismissing me out of hand."

Cleaver hardly personifies the classic image of Big Brother. She's poised, articulate, and media savvy, possessing a well-crafted mix of plainspoken approachability and all-American blond good looks. And for the last two years, she's been putting that lethal combination to work as director of legal policy for the Family Research Council – a Washington, DC-based advocacy group devoted to promoting "the traditional family unit and the Judeo-Christian value system upon which it is built." In the process, the council has moved to the forefront of the crusade to support and defend the Communications Decency Act, and Cathy Cleaver has become one of the most recognizable champions of Internet censorship – cropping up on CNN, *Firing Line*, and elsewhere, as the woman who wants to protect our kids from porn. When the Supreme Court rules on the constitutionality of the CDA in the weeks ahead, Cleaver will be making the rounds to spin her "family values" interpretation of the decision for millions of TV news viewers.

Her soothing persona makes her perfect for the job. "I'm not off-putting," Cleaver admits matter-of-factly. Indeed, Jesse Helms she ain't. If her demeanor suggests more of a soft-spoken Southern belle than an inside-the-Beltway pundit, chalk it up to her upbringing in Saint Petersburg, Florida, where Cleaver first formed the ideology that has made her one of the most influential opinion shapers in the country.

It was later, she says, that her antipornography views began to take hold. "I got interested in porn after I saw it nearly ruin people's lives," she says. "I've seen marriages break up when men became obsessed with porn. I've seen men whose use of porn landed them in jail. I've seen women who've suffered because they've been compared to airbrushed nudes."

Cleaver's style is an obvious asset to her cause – her healthy golden looks make it all but impossible for critics to trace the roots of her antiporn sentiment to a lack of personal allure. Cleaver seems to understand the importance of that perception, emphasizing that she's no schoolmarm. "People who are against porn are not against sex," she proclaims. "Sex is a good thing!"

Her brand of conservatism may be warm and friendly, but there are plenty of Internet users who aren't buying her shtick. "I've been called every name in the book," Cleaver says. "I've been called a Nazi, a censor, and a prude." Yet despite the criticism, she insists she's doing the right thing. "It seems almost silly to have to say that I believe in free speech," she says. "I'm not doing anything to harm the First Amendment." Later this summer, the US Supreme Court will decide whether she's right. – *Mary Elizabeth Williams*

**Her conservatism may be warm and friendly, but plenty of Internet users aren't buying it.**

PHOTO: AARON GOODMAN

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## Face the Muzak

**Thought Muzak met a grisly death in an elevator shaft? No such luck. Muzak, the 62-year-old company famous for foisting "101 Strings" on helpless dental patients, has made the leap to cyberspace. But online, the violins have been jettisoned, and Muzak's Enso Audio Imaging division is carrying the company into the future.**

**Enso's MusicServer *(www.muzak.com/enso/)* provides RealAudio promotional samples – from Tanya Tucker to Marilyn Manson – for online music retailers like CDNow, Tower Records, and Microsoft Music Central. Enso division president Bill Koenig says a process of "identifying the hooks" isolates 30 seconds of music to offer "the best possible sense of what the song is about."**

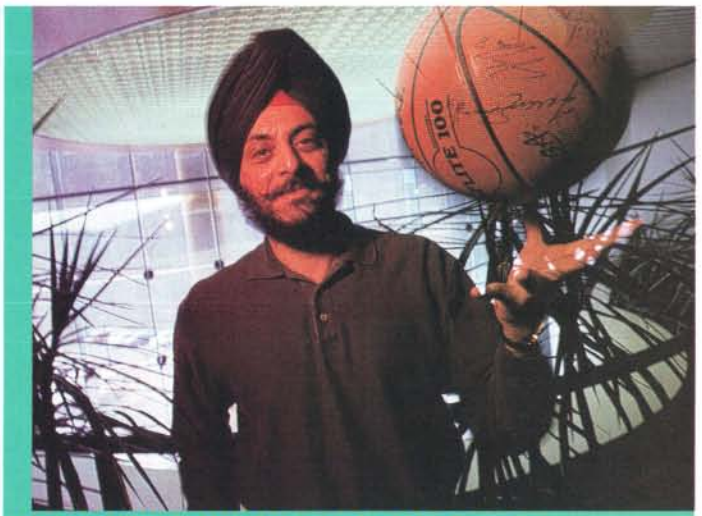
**Online or off, Muzak isn't likely to disappear any time soon, so you might as well point, click, and succumb. – *Brangien Davis***

# Most Valuable Programmer

Inderpal Bhandari grew up in Calcutta, where the kids play cricket, not basketball. But today, the IBM researcher has become an NBA superstar by transforming the way coaches prep for games.

Bhandari's brainchild is a data-mining application called Advanced Scout that works like a coach's Magic Eight Ball. Ask the software a question – any question – and an answer appears from the murky depths of raw statistics. Queries can be general, such as "Under what circumstances do the Chicago Bulls outscore the New York Knicks?" The program cooks up an answer by mining for patterns in mountains of play-by-play data. On January 21, for example, the Bulls beat the Knicks by one point. But the Bulls outscored the Knicks by 23 points when Brown, Jordan, Pippen, Kukoc, Oakley, and Ewing were on the floor. Coaches can then view CD-ROM videoclips to determine why the combination proved so deadly. Turns out, the key factor was the Bulls' smaller, quicker lineup, with Brown at point guard and Kukoc at power forward.

In 1995, two NBA teams used Advanced Scout. By the end of this season, 18 teams were using it, and the rest now say they intend to incorporate it into their training routine. (IBM is an NBA sponsor, so coaches get the software free.) "It's hard to just look at a statistic and understand why it's important," says Sacramento Kings video coordinator Chris Marek. "Advanced Scout lets us see specifically why we had an advantage or why we were at a disadvantage."



Inderpal Bhandari has the game plan at his fingertips.

**Advanced Scout data-mining software is like a Magic Eight Ball for NBA coaches.**

Bhandari's software has also become a source of entertainment for fans. "Beyond the Box Score" on the NBA homepage makes predictions about upcoming games based on Advanced Scout data. He's also developing a simplified version of the program for television announcers. From there, he plans to move onto the ice – IBM is working with the NHL to design a version of Advanced Scout for hockey.

Ultimately, Bhandari wants to bring data-mining to the masses. "The underlying algorithm is generic," he says. "It's applicable to other domains, such as manufacturing, insurance, or retail companies." – *Michele Glode*

## Jargon Watch

**Anacronym** An acronym so old that no one knows what it stands for anymore. Common examples include ASCII, NKVD, SPQR.

**Cobots** Collaborative robots designed to work alongside human operators. Prototype cobots are being used on automobile assembly lines to help guide heavy components like seats and dashboards into cars so they don't damage auto body parts as workers install them.

**Salinger Syndrome** A tendency to believe everything you read on the Internet. Coined soon after former presidential press secretary Pierre Salinger came forward with information he retrieved from the Internet purporting that TWA Flight 800 was downed by a US Navy missile.

**SUVurbs** Middle-class neighborhoods that contain high concentrations of trendy four-wheel-drive sport utility vehicles (SUVs).

**Voice Novel** A voicemail message that goes on forever.

*Tip o' the cat in the hat to Gerry DeSeve, Laura Mitchell, and Eric Sjogren.*

– *Gareth Branwyn* (jargon@wired.com)

PHOTO ABOVE: TUCKER: MCAFEE/SHOOTING STAR; MANSON: MICHAEL LAVINE/OUTLINE; ELEVATOR: MARC CONTRERAS; PHOTO BELOW: STEVEN FUGIKAWA

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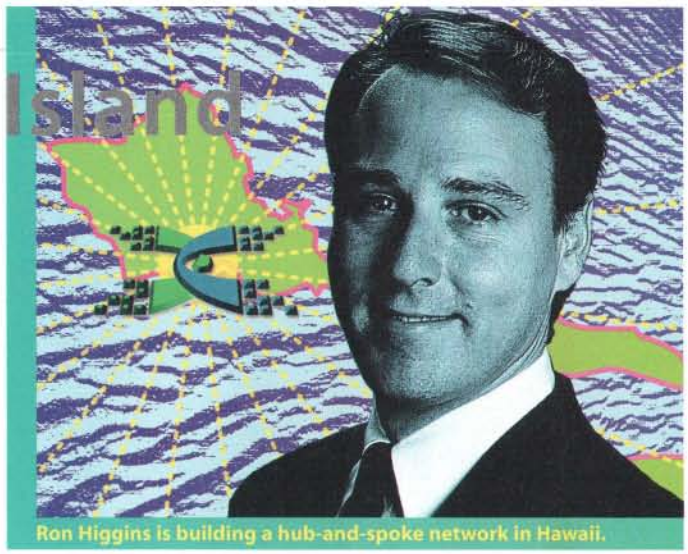
# Nonstop to Fiber Island


Ron Higgins is building a hub-and-spoke network in Hawaii.

Ron Higgins wants to send your data on a fast Hawaiian vacation. A Silicon Valley start-up specialist whose credits include Radius and General Parametrics, Higgins has created an alternative Internet backbone that exploits underutilized fiber bandwidth to directly link ISPs in prominent business locales. Called Digital Island, the system offers one-hop data transmission between local ISPs via a server hub based in Honolulu.

Why Hawaii? The Internet's forest of routers can be maddeningly slow, with the worst bottlenecks occurring at network access points (NAPs) in the continental United States. Hawaii is an ideal spot to bypass the NAPs because plenty of transoceanic fiber passes through the Aloha State – in no small part because the region is a staging area for US military forces in the Pacific. Hawaii also enjoys the protection of US intellectual property laws, something that appeals to multinationals. Finally, Hawaii's geographic location – 12 hours behind Europe, 6 hours behind New York, 3 hours behind San Francisco, and 6 hours ahead of Tokyo – neatly staggers peak usage times.

Designed to serve corporations that need to move bits quickly, Digital Island aspires to become the FedEx of networking by expediting data transmission and providing logistics services. Data vaults, I-phone connections, Web sites with heavy international traffic, and secure e-commerce are likely applications, but the possibilities remain wide open. Higgins is betting that big companies will pay big bucks for Digital Island's high-speed performance guarantee and promises of superior service.

**Digital Island is designed to expedite data transmission between local ISPs.**

Higgins & Co. already have a few big fans. Vanguard Venture Partners has invested in the project, and Digital Island chief technology officer Allan Leinwand is a former engineer at Cisco Systems. Cisco itself signed on as the first customer in late 1996.

Higgins's play is no sure thing. Competitors could duplicate his operation in a similarly fiber-rich environment like Guam. Worldwide, Internet backbone upgrades could boost overall network performance and diminish Digital Island's competitive advantage. And unlike bigger carriers, Digital Island doesn't own its infrastructure. Yet Higgins is undeterred. "Our main advantage is that we're first to market," he says. "From the day the long distance companies decide to decide, it'll be years until they actually turn on their network." – *Alex Salkever*

## Wired Top 10

**Most requested bridal songs at weddings**

1. "Because You Loved Me," Celine Dion
2. "I Swear," John M. Montgomery/All-4-One
3. "Everything I Do," Bryan Adams
4. "Have I Told You Lately," Rod Stewart/Van Morrison
5. "Keeper of the Stars," Tracy Byrd
   "Wonderful Tonight," Eric Clapton
7. "Unchained Melody," Righteous Brothers
8. "Can't Help Falling in Love," Elvis Presley
9. "I Cross My Heart," George Strait
10. "Power of Love," Celine Dion

Note: Current as of March 10, 1997.
Source: Determined by a vote of disc jockeys who read *Mobile Beat: The DJ Magazine (www.mobilebeat.com/)*.

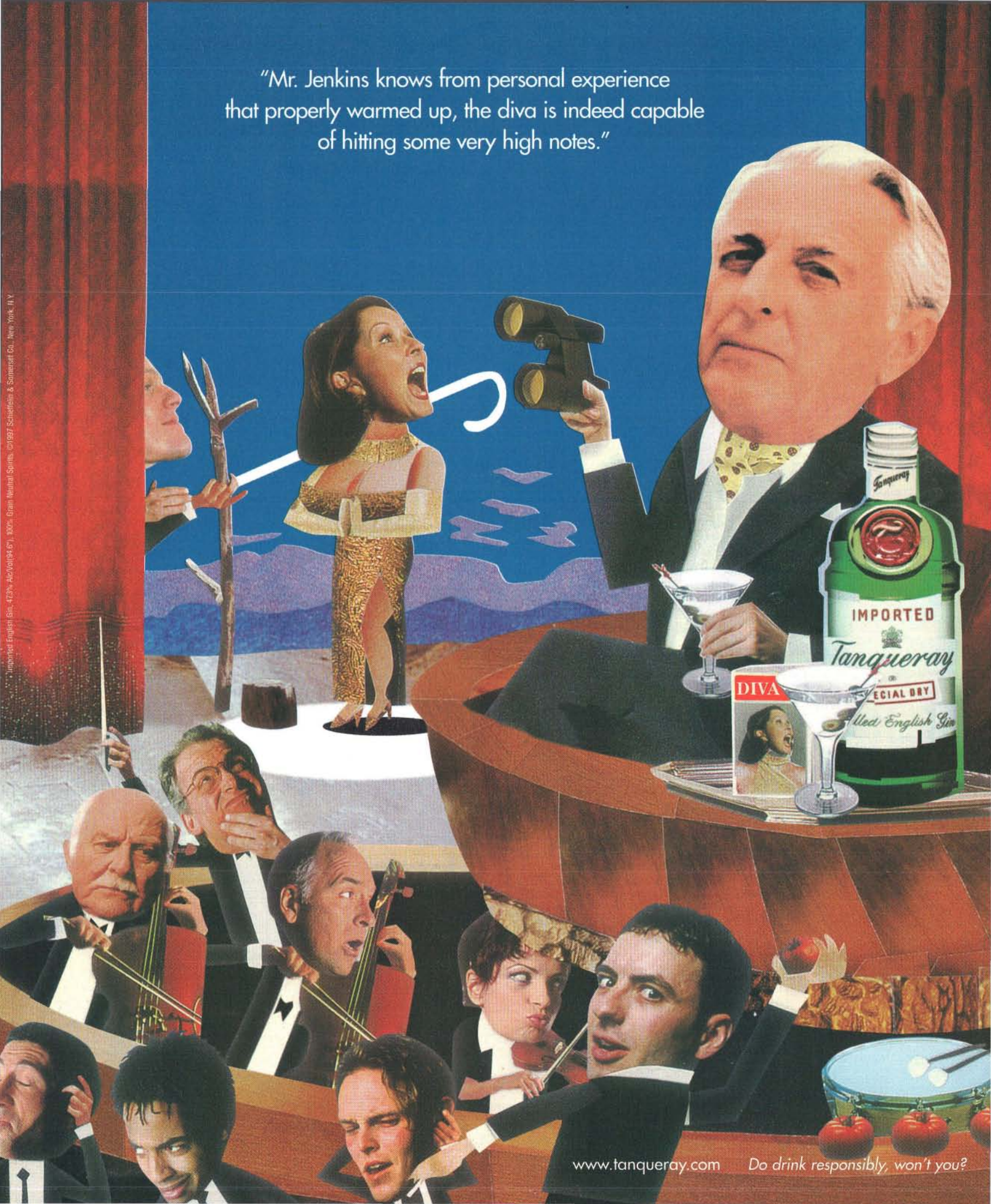
– *Gareth Branwyn*

## Home Video Oscars

**Home video has always been a crude, oddball medium, but Hollywood is a town where innovation often comes from strange places. At the Visions of US video contest sponsored by the American Film Institute and Sony Electronics, Tinseltown mavens go looking for creative geniuses trapped in low-end technology.**

**The work may be done on the cheap, but champion Visions videos have kicked off successful careers. In 1985, an obscure comic named Tim Allen won the grand prize for an 11-minute comedy about a family's fight to save its lakeside home from big business. This year's panel of judges includes Francis Ford Coppola and Kathleen Kennedy, so fast forward to *www.afionline.org /visions/97/visions.home.html* in August to meet their home video favorites for 1997. – *Steven Kotler***

PHOTO BELOW: ARCHIVE PHOTOS

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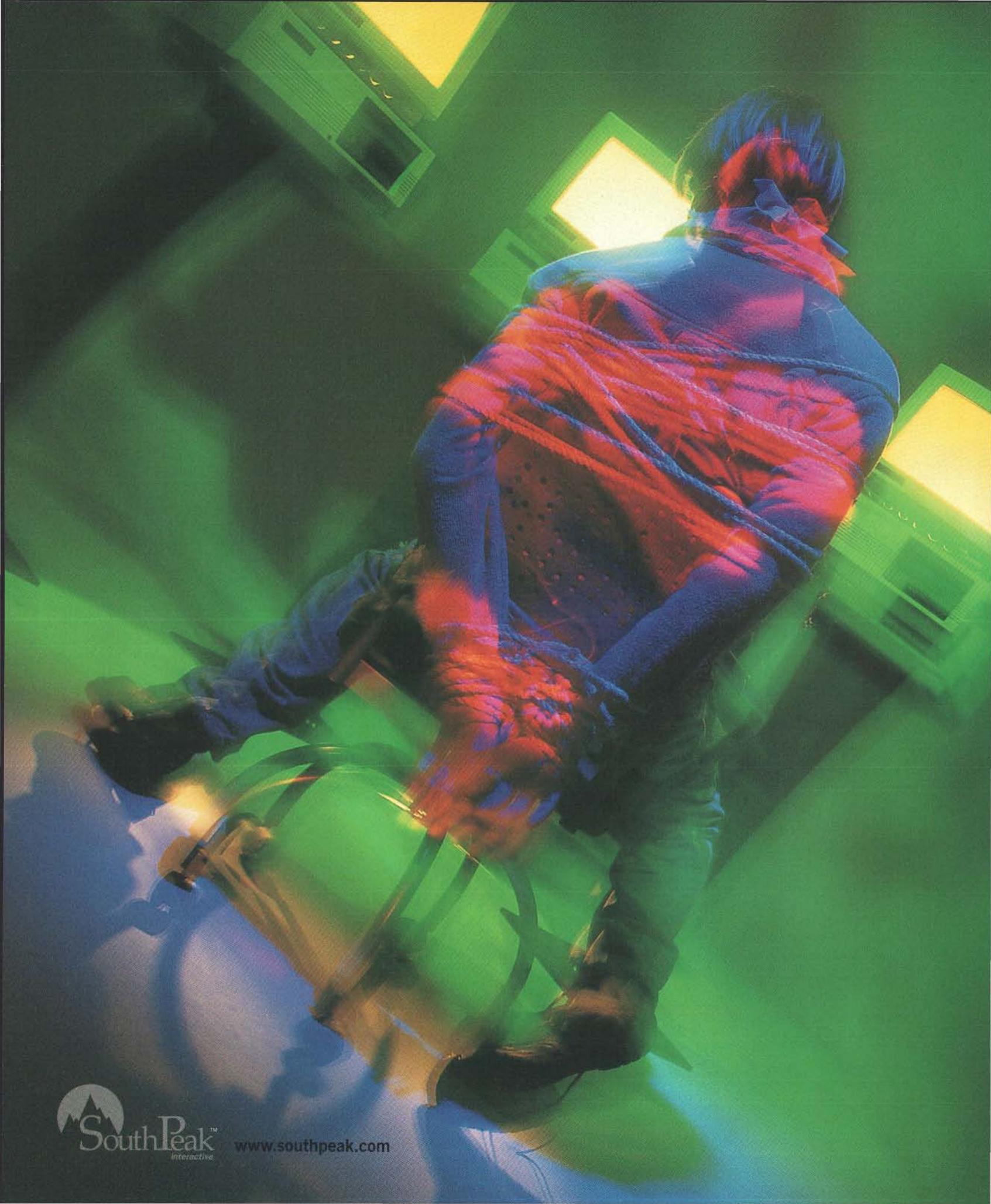
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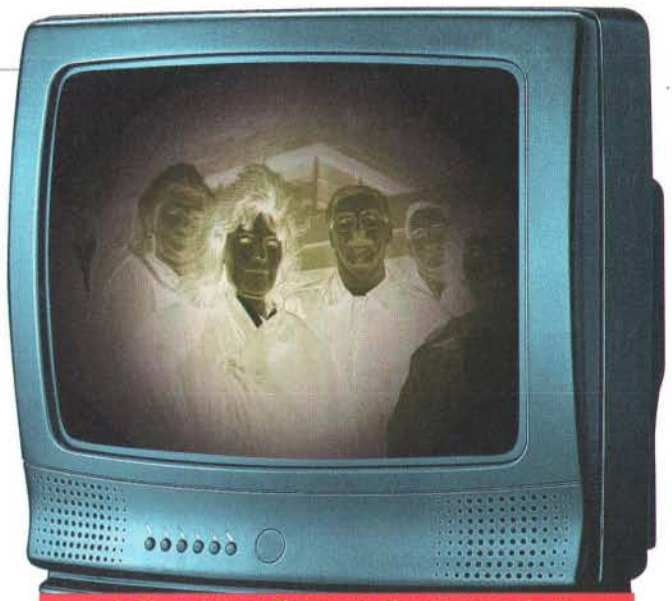
# Fade to Black



Turned off: workers at Thomson's Bloomington plant.

**The world's oldest and largest color television factory closes its doors on April Fools' Day, 1998.**

The television age is coming to an end in Bloomington, Indiana. Raised on sweet corn and pot roast, the down-home Midwesterners who work at the local RCA plant could be the parents of the cutting-edge kids in Silicon Valley. And like the limestone under their feet, these working class Hoosiers have dissolved into the American landscape through the labor of their hands: the more than 65 million RCA televisions they've assembled at the factory on South Rogers Street.

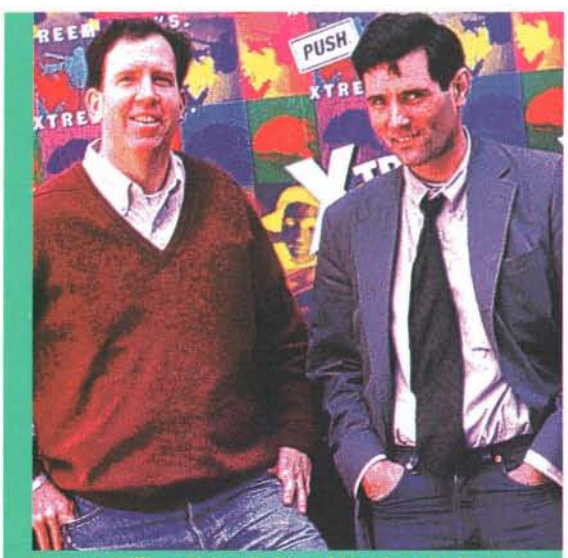
Bloomington's TV assembly line – the world's first color television manufacturing facility and still the largest on the planet – first came to life 57 years ago. More recently, as their wages crept ever higher, the factory's 1,100 workers began to think of themselves as high tech assembly operators – until they became the most highly paid television makers in the United States.

But the blue-collar dream ended last February, when Thomson Consumer Electronics (which makes the RCA product line) announced that the Bloomington factory will move to Juarez, Mexico, on April 1, 1998. On April Fools' Day, fully 2 percent of the town's workforce will walk off the set of a drama that has aired in Bloomington for generations. Many, like 51-year-old Kenneth Wagner, have worked the same job for more than 30 years. "I started at RCA on November 15, 1965," Wagner recalls. Now a father of four, he has seen friends retire from the same factory where they'd worked since high school.

Things have been shaky at the plant since 1986, when RCA was purchased by General Electric. The following year, GE's consumer electronics brands were bought by Thomson SA, based in France. Despite accumulating some 20 percent of the US television market, Thomson never managed to make its new acquisition profitable. Squeezed between mounting debt and political pressure within France, Thomson was forced to cut costs. With a US$17 differential in hourly wages between Bloomington and Juarez, the company decided to head south.

"The largest single factor is labor costs," says David Hakala, vice president of American manufacturing operations for Thomson, noting that the move will save $350 million over the next 10 years.

"I'm going to miss the people, and maybe the job too," says Wagner. "It's going to be hard to find a job at 52, but things'll work out. They always do." – *Joe Nickell*




Rogues: William Fisher (left) and Matthew Lederman.

# Bearish on Madonna

**Bored by blue chips? Instead, try stocking up on Sharon Stone or cornering the market on Tiger Woods. And be sure to unload your shares in Howard Stern before he fades from the limelight.**

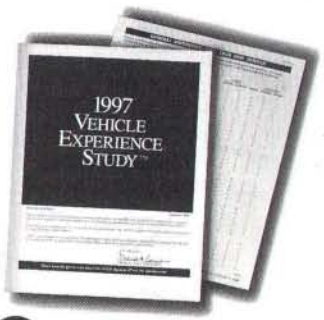
**Your brokers are William Fisher and Matthew Lederman, co-creators of Rogue Market *(www.roguemarket.com/)*, where Wall Street meets *Entertainment Tonight*. Rogue Market starts players with US$10,000 in funny money and invites them to buy and sell shares in more than a thousand public figures, including athletes, actors, elected officials, and authors.**

**Share prices rise and fall with demand. Madonna's stock skyrocketed before the release of *Evita* and fell precipitously when the film did poorly at the box office. "People take it seriously, and they're fanatical about their holdings," says Fisher. Launched in January, Rogue Market now boasts 9,000 regular traders. Meanwhile, Fisher and Lederman hope to cash in by selling banner ads on the site. – *Matt Richtel***

PHOTO ABOVE: JOE NICKELL

# Beauty.

# Full.

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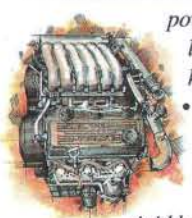

*Strategic Vision recently found that the '97 Avenger tied for first place in its class:* This 1997 Total Quality Award™ for Best Ownership Experience is strong evidence of Avenger's overall appeal.*

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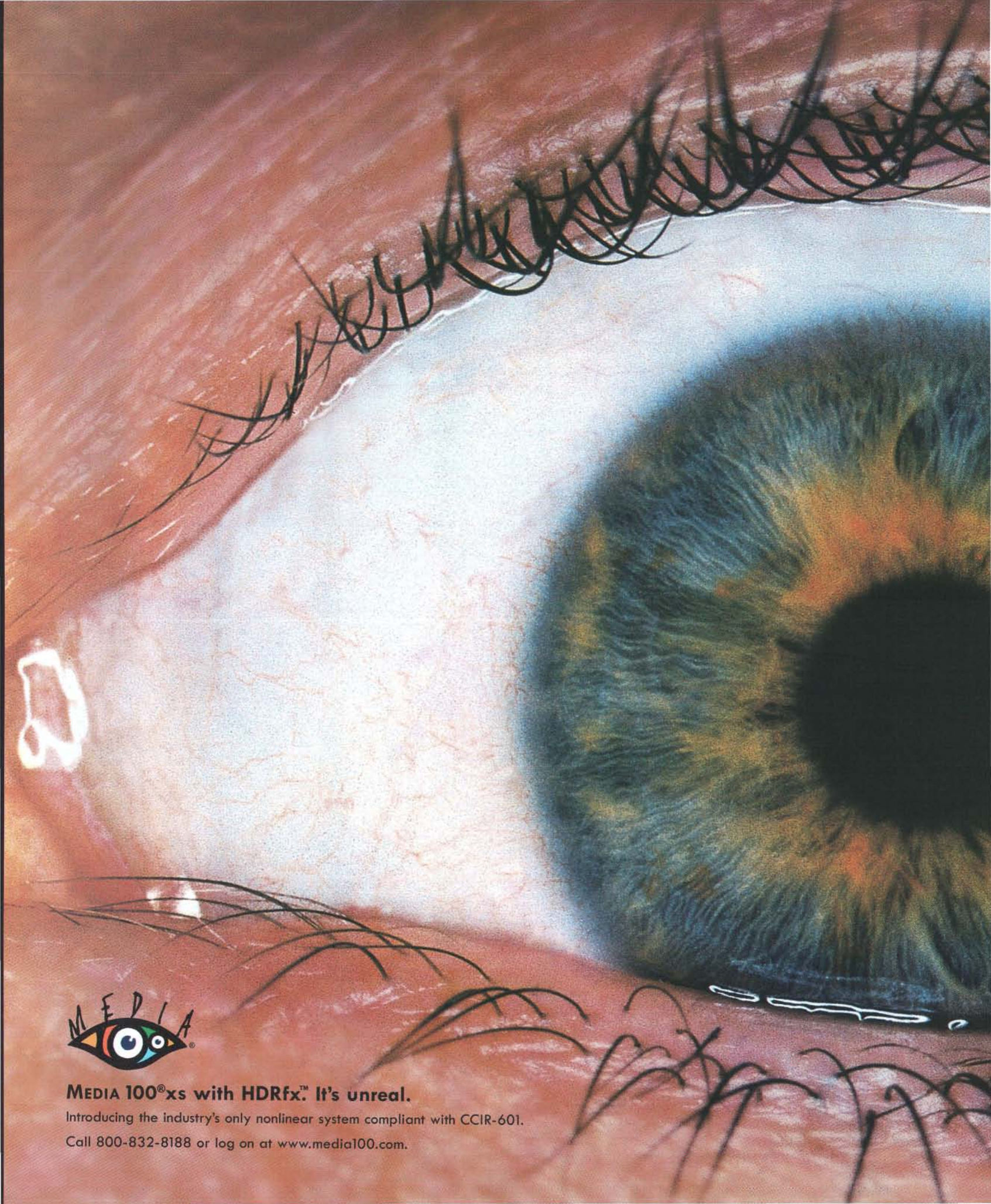


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# The Future of Radio

**You've heard the hype. We asked the experts. Here's the *real* timetable.**

**In 1895, Guglielmo Marconi made the first mile-long radio transmission with his wireless telegraph, opening tremendous new possibilities for communication. A century later, Terry Gross informs us from one end of the dial while Howard Stern insults us from the other. The average American listens to broadcast radio approximately 3 hours and 45 minutes every weekday. Radio is everywhere, and targeting an audience is simply a matter of choosing the right beat or words. No, video didn't kill the radio star. *Wired* asked five experts to tune in to the future of radio.**

| | Digital Audio Broadcasting Catches On | Internet Radio Eclipses Traditional Radio | Pirate Radio Legalized | The Death of Radio |
|---|---|---|---|---|
| Mellgren | 2000 | unlikely | unlikely | unlikely |
| Sakai | 2003 | 2012 | unlikely | unlikely |
| Whitaker | 2005 | 2002 | 2007 | unlikely |
| Williams | unlikely | 1998 | unlikely | unlikely |
| Yoder | 2020 | unlikely | unlikely | unlikely |
| Bottom Line | 2011 | 2007 | unlikely | unlikely |

**Ken Mellgren**
manager of affiliate relations for AP All News Radio

**Dean Sakai**
station resource manager for ElectricVillage

**Rodney A. Whitaker**
director of Internet services for KSJO/KUFX/KBAY

**David Williams**
director of engineering for San Francisco Bay area ARS stations

**Andrew Yoder**
author of *Pirate Radio: The Incredible Saga of America's Underground, Illegal Broadcasters*

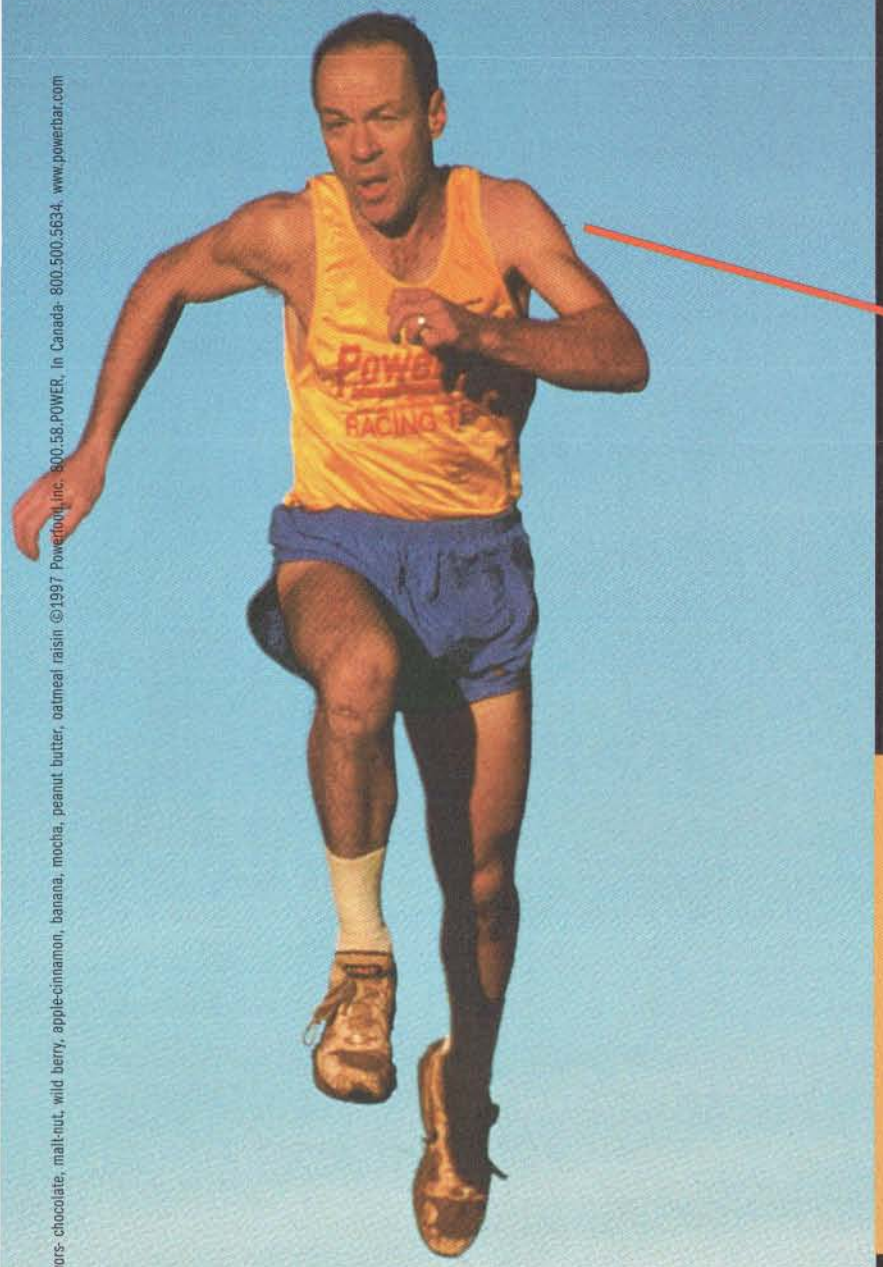
The FCC proudly promises us digital television by 2006, but what about CD-quality radio? "It's the chicken-and-egg scenario," Whitaker says. "Once manufacturers build the digital receiving capability into every receiver, and it is not a premium price feature, it will catch on." Indeed, Yoder comments, "most people are happy with FM-quality audio, so it will be the manufacturers, not the listeners, who make digital broadcasting a reality." But even then, Williams says, the ball will be in the broadcasters' court. "Bitching, complaining, moaning and groaning by the broadcasters' powerful radio and television political action committees could send digital audio broadcasting in the same direction as AM stereo – a technology that was too little, too late."

With the availability of online audio streaming technology, it's easy to play DJ. Is anyone listening? Not during drive time. But more and more people will be clicking rather than tuning in at the home or office, says Williams. According to Sakai, Internet radio and traditional radio will eventually merge: "Radio will become digital, and the receivers (clients) will make pulls through cellular technology." Meanwhile, Mellgren believes that Internet radio will remain a niche format, "appealing to those who want to listen to sporting events, local hometown radio shows, specific personalities, or topics not otherwise available." Besides, Yoder points out, "radios are cheap; computers aren't. And computers involve a learning curve; radios don't."

Currently, micropower "pirate radio" operators can't get a license even if they'd like to. The FCC does not grant licenses for stations broadcasting less than 100 watts, and pirate operators risk fines of up to US$10,000 for each day they broadcast and possible criminal sanctions of up to $100,000. So what? asks Williams. "Frankly, I don't see the legalization of pirate radio as having merit that outweighs problems with the idea itself or the regulation of it." What's a media hacker to do? Stay underground, it seems. "Overall, FM frequency space is tight and the major broadcasting organizations will be sure that any push for low-power, unlicensed radio is squashed," Yoder says. As a result, Sakai thinks, "these enterprising people are not bothering with trying to change existing rules but are forging ahead on the Internet."

Fifty years after TV hit our living rooms, the AM and FM bands are still thriving. While our experts point out that technological advancements may alter the economics of broadcasting and program distribution, they also agree with Mellgren, who says that "if we provide programming and audio product that people really want, there will always be a market and a way to profit from providing it." Even if radio does eventually die as a source of commercial income in the United States, Yoder has faith that the medium will always exist as the voice of the people. "Internet access is easy to restrict, and newspapers, magazines, and zines can be destroyed, but radio can pass any boundary for hundreds or thousands of miles," he says. "It's unstoppable."

3-D DATA SET COURTESY VERMONT



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in Berkeley, California
-on his way to meeting
in Chicago

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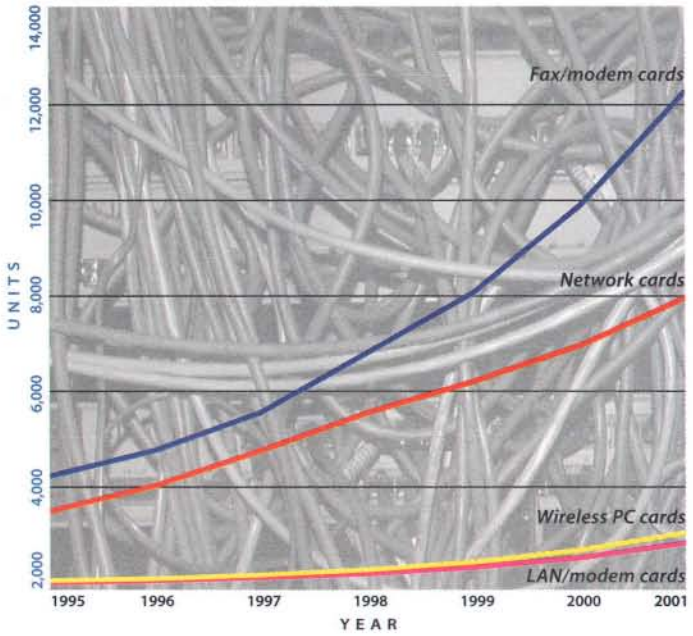
## Wireless LANs

**Despite the postulated potential of wireless LAN equipment, it's unlikely that corporate computer networks will forgo wires. Although this Yankee Group research was conducted in 1996, before the FCC enacted the much-hyped U-NII unlicensed wireless band, that doesn't change the fact that integrators are experts at wires, while wireless presents a whole new set of problems.**

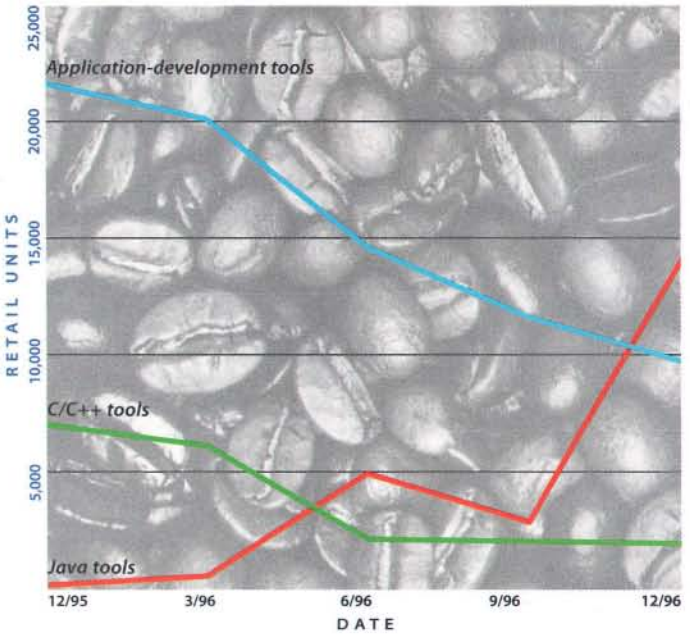
SOURCE: THE YANKEE GROUP *(WWW.YANKEEGROUP.COM/)*




## Java's Development

**Although it's still only being felt on the Web through animations and scrolling text, everyone's talking Java. And slowly but surely, you should begin to see it in action. The language has quickly eclipsed both C/C++ programming tools and application-development tools like Visual Basic. The only question left is whether anyone will build a Java app that's truly killer.**

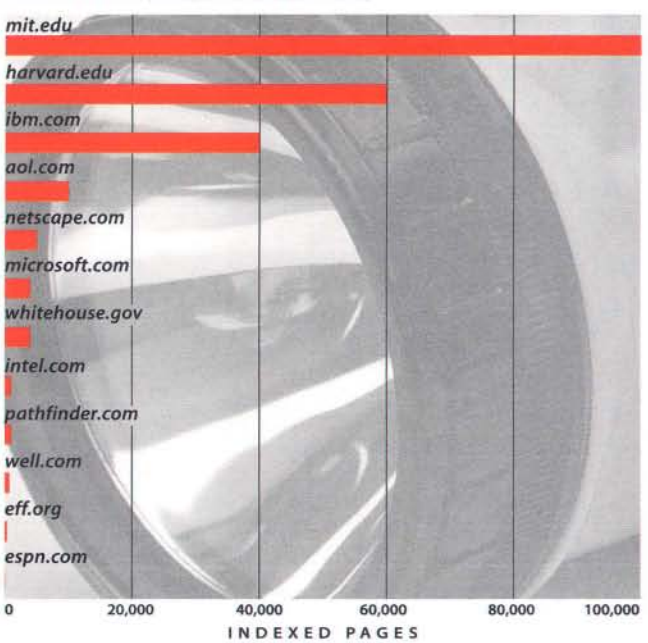
SOURCE: PC DATA




## Searching for a Search Engine

**The only way to navigate the Web is with one of the many search engines that each tout an index of millions of pages. But not everything gets included – and many of the things you'd expect to find, you won't. A search on AltaVista reveals the discrepancies. Sites with static content have a larger number of indexed pages than sites like *espn.com*, which change daily.**

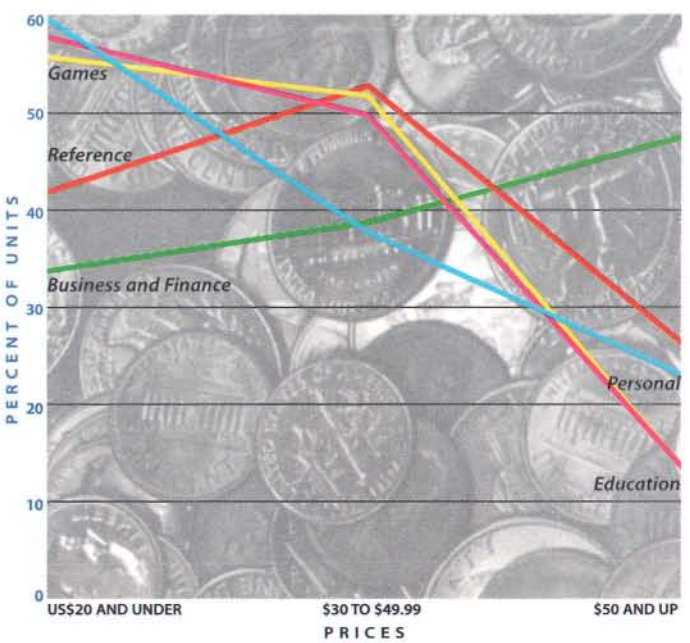
SOURCE: ALTAVISTA *(WWW.ALTAVISTA.DIGITAL.COM/)*




## Software Sales

**What are you paying for your software? The cost of different types of software is still fluctuating, but the general shift is downward. Reference, personal, and educational titles all saw major price drops in 1996, while games – after previously leading the way in reductions – remained flat. Business titles are hanging tough at higher prices, thanks to deep corporate pockets.**

SOURCE: PC DATA



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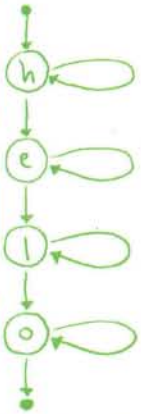
# Teaching Computers to Listen

## Hidden Markov models and pattern recognition.

By Matt Jones

We spend much of our lives processing patterns – listening to speech and music, interpreting scrawled notes, spotting cues in someone's body language. But even with all this expertise, it's extremely difficult to express those patterns in words. Just try to write a straightforward description of how you sign your name – you'll find it nearly impossible. Unfortunately, the difficulties in recognizing these types of patterns have limited the capability of computers to make sense of our world. Patterns cannot be explicitly coded. Not even in Java.

If we look at patterns with a mathematical eye, however, things get much easier. This insight was inspired by work carried out long before the digital era. About 100 years ago, Andrei Andreyevich Markov, a professor of mathematics at Saint Petersburg University in Russia, laid the foundation for a class of expressive computational paradigms called hidden Markov models.




In this "hello" model, each state models part of the phonemes sound. Transitions link back to the current state until the phoneme is fully modeled and then link to the next state.

Say "hello." Now say it again. And again. Ask others to say it as well. You have just generated several examples of one pattern type. Let's ignore the fact that real people produced these patterns and instead take a Markov-oriented view.

Imagine that a model generates the sound sequence "hello." Assume, too, that the model captures all the subtle variations in how the word's phonemes can be spoken. Our model consists of two types of components: states and transitions. One state exists for each of the word's phonemes – \h\, \e\, \l\, and \o\ – and transitions link the states together. The model works simply, generating a small piece of the pattern – a sound bite lasting about 10 milliseconds – from the current state and making a transition to another state. These steps are then repeated until the entire word has been pronounced.

Since these are mathematical models, each chunk of the final output is represented by a set of numbers called a vector. Each number relates to a distinct feature of the pattern. For speech applications, vectors measure features such as loudness, pitch, and frequency. But hidden Markov models are not dumb, digital recorders or synthesizers. Each state is capable of generating a wide range of vectors. For example, if we activate the first state often enough, it will produce vectors for all the ways in which \h\ can be pronounced.

Probability theory is what makes this model work. To help understand this process, we can "visualize" the speech. Imagine that you write the word "hello" several thousand times and cut out the letter *h* in each word. If you were to organize similar-looking *h*s into various groups, you would find that some piles are larger than others. Now assume that you put the cutout letters into a bag, closed your eyes, and removed one piece of paper at a time. You would soon notice that the more common forms of *h* appear more frequently than the rare scrawls.

States generate their output from a "bag" of vectors, based on the probabilities of those vectors. Similarly, each feature of a vector also has a probability density function. These probability functions use two statistics – mean and variance – to capture the typical range in values for a feature. When these parameters are plugged into a standard distribution formula, a vector value is produced – 10 milliseconds of the phoneme \h\.

So, states describe the features of the chunks of a pattern. What about the transitions? In our model, two transitions can result from each state. First, there's the link to the next distinct state – from \h\ to \e\, for example. This kind of transition models the relationship between the states.

Less intuitively, there's also a self-transition, in which the model returns to the state it just left. The need for the self-transition makes sense if you remember that each piece of output is extremely short (10 milliseconds) and if you take into account that some people speak more slowly than others. To describe slower examples, our model has to generate more than one output from a state. So, when we run our model the first time, it might follow the self-transition from the \h\ state 10 times, producing 10 \h\ vectors for a drawled "hello." For a very quick utterance, it might only produce three vectors in the \h\ state.

The amount of time the model spends in any state is governed by probability theory, too. All transitions have a probability – the likelihood that one particular transition is selected when the model has to make a move. If most "hellos" had a short \h\, the model would be more likely to make the \h\-to-\e\ transition than the self-transition.

All the probability statistics we've been considering – for both vectors and transitions – are computed in a training phase. For our "hello" model, we would have collected lots of examples of people saying "hello." The examples are then converted into sequences of Markov model-friendly vectors, and these values are used to repeatedly refine the model's statistics.

Trained hidden Markov models can be used to generate patterns in the ways we've seen. However, they are much more widely used in pattern recognition. Let's assume that our "hello" model is part of a large set of word models. In current speech-recognition research *(svr-www.eng.cam.ac.uk/)*, this set is huge – tens of thousands of words are modeled.

In this case, when a person speaks, to identify the word they've spoken, we calculate the probability of each model to generate the unidentified speech pattern. Imagine that the word spoken was "wired." However many times we activate the "hello" model, it will never generate anything that comes close to the "wired" pattern, and its probability matching score will be very low. After we process the models in this way, the highest-scoring one is taken as the match for the pattern. It's a simple process, but it uses plenty of processor cycles.

Speech recognition is not the only application of hidden Markov models. By choosing appropriate state numbers and transitions and carefully selecting vector features, we can apply the modeling framework to an amazing range of pattern types. If you haven't already run across computers that can turn your handwriting into text, recognize your face, and even spot when you're tired, you'll soon do so. And that's just the beginning. ■ ■ ■

*Matt Jones* (m.jones@mdx.ac.uk) *works for the Computing Science Interaction Design Centre, Middlesex University, London* (www.cs.mdx.ac.uk/).

# Jonathan Karl (29-year-old CNN news correspondent and all-around nice guy.)

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# Market Corrections

By Michael Murphy

Although I expected a serious correction this year, I thought trouble would come in the old economy – industrial and mass-production consumer stocks – not in the technology sector. The market's volume and momentum at the end of 1996 convinced me that I wouldn't need to buy protective puts until the second half of the year.

Right idea, wrong time. The Nasdaq 100 rallied over 12 percent in the first few weeks of 1997, then proceeded to tumble 15.3 percent to a bottom on April 2, before climbing again. The correction came earlier than I'd expected. Caught off-guard, I asked myself three questions:

Why did it happen?

Should I change my investing process?

Is there a way to take advantage of the situation?

The last thing an investor should do is distill rules from recent experience and blindly apply them to the future – this is rearview-mirror investing. In analyzing market history, you can always find *some* investment strategy that worked. And just as you do, it stops working.

## First, ask why?

The market entered 1997 with PC-related stocks – computers, software, data storage, semiconductors, and semiconductor equipment – very undervalued. Only the largest companies like Intel, Microsoft, Adobe, and Applied Materials were rallying. I knew PC sales were strong and expected most PC-related companies to report sequentially better March and June quarters. In fact, I still predict a strong year for sales – growing close to 20 percent over last year.

In contrast, communications stocks entered 1997 grossly overvalued and in decline. Most of the tech stocks selling at 100 times earnings or 20 times sales were in communications and the Internet. I thought these stocks would have soft March and June quarters due to weak foreign markets. Many companies preannounced poor quarters and took a beating.

How did the communications sector drag down PC-related stocks? Momentum mutual funds suffered sharp drops when their 100-times-earnings stocks plummeted. When investors started redeeming shares, managers who had been running with little or no cash had to sell anything they could – including PC stocks.

My second mistake goes back to the recovery following the market sell-off last July; large stocks in most industries rallied early, while small stocks stalled. One-third of the entire gain in the Nasdaq 100 index for 1995 and 1996 was accounted for by three stocks: Intel, Microsoft, and Cisco. That phenomenon intensified in the last half of 1996, as mutual fund investors responded to the midyear decline by choosing index funds over actively managed funds. Microsoft gets 19 cents out of every dollar invested in a Nasdaq 100 index fund; Intel gets 19 cents, Cisco 5 cents, Oracle 4 cents, and MCI 3 cents. So more than 50 cents out of every dollar invested in these funds goes into five stocks.

I should have seen this coming when a well-known aggressive fund manager described his funds by saying, "This one buys large and mid-cap stocks, but that one only buys small-cap stocks – under $1 billion."

Under $1 billion! For years I bought stocks with market capitalizations of $35 to $70 million, confident that as the companies progressed and the market cap passed $100 million, the institutions would come piling in. I snickered at the $1 billion cutoff point when I should have been listening harder. What this seemingly bizarre statement meant is that the institutions are managing so much money, they cannot afford to look at stocks with market capitalizations under $200 or $300 million. A whole class of stocks have been abandoned to the retail network, left to independent brokers and individuals. And I owned too many of those stocks.

## Next, question your investing process

The inflows to professional money managers have been gigantic over the last five years. Demographics suggest there will be no slowdown in the next five. While I'm not ready to call a $1 billion company a small-cap stock, I am raising the bar to about $100 million. Stocks in the TWIT$ portfolio meet the new minimum.

## Finally, take advantage of the situation

While technical questions about Intel's production capacity remain, earnings at Intel, Seagate, and Microsoft show that business is strong. The underlying truth is that PC sales are good and will improve as the year progresses. Semiconductor sales, excluding DRAM chips, will do well. Communications will resume its 30 percent growth rate in 1998.

The long-term picture for technology has not changed. The massive shift from a mass-production consumer economy based on oil to a technology economy based on semiconductors will continue to generate major investment opportunities for years to come. This is a correction; nasty but transient. Ultimately, it will mean very little to your long-term rate of return. Take advantage of the reduced prices of TWIT$ stocks to the extent that you can; that is the intelligent investor's response to a correction. Believe it or not, before long people will be griping because they did not buy when they had the chance.

## TWIT$

I am going 100 percent invested by buying 24,000 shares of Informix, the leader in object relational database management systems. The market capitalization is more than $1.10 billion and the stock is down 77 percent from its high last September. ■ ■ ■

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*Michael Murphy is a money manager who publishes the* California Technology Stock Letter *in Half Moon Bay, California.*

**The Wired Interactive Technology Fund (TWIT$)**

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| Diamond Multimedia | Multimedia hw | DIMD | 7,000 | 6 ⅞ | – 1 ⅜ | hold |
| Informix Corporation | Database sw | IFMX | 6,675 | 7 ¼ | – 2 ²¹⁄₃₂ | buy |
| Intel Corporation | Microchips | INTC | 1,500 | 153 ¾ | + 14 ⁷⁄₁₆ | hold |
| LSI Logic Corporation | Semiconductors | LSI | 7,800 | 39 ¾ | + 4 ¼ | hold |
| Macromedia Inc. | Multimedia sw | MACR | 14,000 | 7 ³⁄₁₆ | – 1 ¹³⁄₁₆ | hold |
| Mattson Technology | Semiconductor equip. | MTSN | 30,000 | 8 | – 1 | hold |
| Octel Communications | Voice hw/sw | OCTL | 5,800 | 17 | – 1 ⅛ | hold |
| Premisys Communication Inc. | Telecom equip. | PRMS | 17,000 | 9 ¹¹⁄₁₆ | + 1 ¹¹⁄₁₆ | hold |
| Sequana Therapeutics Inc. | Biotech | SQNA | 10,000 | 12 ⅛ | – ¹⁵⁄₁₆ | hold |
| Cash Holding | 0 | | | | | |
| Portfolio Value | $1,788,484.38 | (+78.85% overall) | | | + 2.93% | |

Legend: This fund started with US$1 million on December 1, 1994. We are trading on a monthly basis, so profits and losses will be reflected monthly, with profits reinvested in the fund or in new stocks.

TWIT$ is a model established by *Wired*, not an officially traded portfolio. Michael Murphy is a professional money manager who may have a personal interest in stocks listed in TWIT$ or mentioned in this column. *Wired* readers who use this information for investment decisions do so at their own risk.

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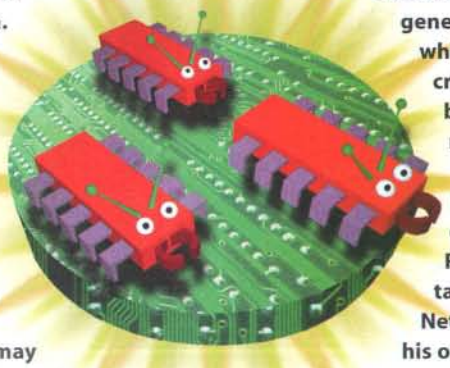
# Neo-Cambrianism

## Digital space life-forms.

**Five hundred fifty million years ago, during a sudden evolutionary event known as the Cambrian explosion, single-cell life saw a burst of biological diversity, and complex multicellular organisms appeared. Many scholars view the Cambrian milestone as a one-shot deal. Others believe evolution periodically undergoes these jump starts.**

**We have entered such an era of rapid expansion, according to the organizers of Digital Burgess, held in Banff, Alberta. They see humans as potential hosts for a wide-ranging class of artificial beings that have already colonized digital worlds. "Life may be entering the digital space using humanity as a surrogate," says organizer Bruce Damer. "Life in digital space will be freed from the confines of slow molecular recombination, free to travel at the speed of light and off the planet – as long as there is a receptor out there somewhere."**



**With speeches by leading-edge evolutionists and demonstrations of artificial worlds, this first-time event seeks to answer three questions: How did life on Earth evolve? What are the prospects for our future given the mass extinctions perpetrated by humanity? And will bona fide life evolve in digital ecosystems?**

**Tackling these questions is keynote speaker Richard Dawkins, who has long promoted the idea that human beings, much like digital beings, are mere vehicles for information: we carry DNA and propagate genetic data, while artificial critters house binary information.**

**Also on hand is biologist Tom Ray, who will talk about The Network Tierra, his online digital ecosystem. An evolvable machine, Tierra acts like a living organism. With its mutating code and recombining programs, the system actually improves over time, thanks to natural – um, artificial – selection. Take a trip to Banff and glimpse the Cambrian age of tomorrow.**

Registration: US$495. Contact: +1 (403) 762 6180, email *arts_info@banffcentre.ab.ca*, on the Web at *www.biota.org/*.

**The Current Roundup** (see *Wired* 5.06)
**July 13-16** From Printing Press to Computer: The Future of Faith Communities in the Information Age; Cambridge, Massachusetts. **July 17-19** Trendwatch: Technology, Society, and Values; San Francisco. ▪ **July 28-31** European Conference on Artificial Life; Brighton, England. ▪ **August 3-8** Siggraph; Los Angeles. ▪ **August 8-10** Beyond Hackers on Planet Earth; New York. ▪ **August 13-14** Online Advertising II; New York.

**August 29-September 1** **Digital Burgess; Banff, Alberta**
See information at left.

**September 8-14** **Telecom Interactive 97; Geneva** This annual confab unites top government officials and industry professionals to discuss issues affecting the telecom industry – such as broadband services, online public institutions, and the growth of international electronic commerce. Sponsored by the International Telecommunication Union, a group that dates back to the telegraph days, this event heralds a coming of age for the nascent global village. Registration: price unavailable. Contact: +41 (22) 730 6161, on the Web at *www.itu.ch/telecom/*.

**September 10-12** **PCS 97; Dallas** Within the next 12 to 18 months, most of the personal communications services infrastructure will be up and running. Broadband PCS. Paging. Cellular telephone. Mobile computing. A slew of applications dot the wireless horizon. This event, sponsored by the Personal Communications Industry Association, will mix exhibits and hands-on workshops in an attempt to demystify wireless technologies. Registration: US$695 through August 15, $845 after. Contact: +1 (805) 654 1397, on the Web at *www.pcia.com/*.

**September 11-12** **InfoWarCon 7; Tysons Corner, Virginia**
Organized by digital warrior Winn Schwartau and the National Computer Security Association, this conference is intended for law enforcement officials and corporate security professionals alike. If you want to know how to detect and combat computer crime, or learn how cyberterrorists plan to respond, this antiguerrilla gala is for you. Registration: US$695. Contact: +1 (717) 241 3209, email *conferences@ncsa.com*, on the Web at *www.ncsa.com/warcon7.html*.

**September 14-18** **ACM Sigcomm '97; Cannes, France** Join Xerox PARCers, Bellcore types, and like-minded academics at the preeminent research conference for data communications professionals. Discussions include the first paper presented on IP multicast and another on self-similar data traffic. Registration: price unavailable. Contact: +33 (4) 93 65 78 25, email *christophe.diot@sophia.inria.fr*.

**September 15** **The Third Advanced Surveillance Technologies Conference: Cryptography and Internet Privacy; Brussels**
If you believe that law enforcement and intelligence agencies have supported draconian rules and agreements that inhibit tools of privacy such as cryptography and anonymous digital cash, then this freedomfest should ring true. Become an Internet rebel – or learn how to nab them – at this Electronic Privacy Information Center-sponsored event, featuring speeches by privacy provocateurs David Banisar and Simon Davies. Registration: US$250. Contact: +1 (202) 544 9240, email *ast3@privacy.org*, on the Web at *www.privacy.org/pi/conference/brussels/*.

**Out on the Range**
**September 23-26** TED Technotainment; New York. Contact: email *wurman@ted.com*. ▪ **October 11-13** Mixed Messages: Images, Text, and Technology; Charlotte, North Carolina. Contact: email *tcspain@email.uncc.edu*. ▪ **October 12-17** IEEE Conference on Universal Personal Communications; San Diego. Contact: email *icupc97@cwc.ucsd.edu*.

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## Fossil Fuel for Thought

The Burgess Shale is a rock formation high in the Canadian Rockies. More than half a billion years old, the fossils found here were discovered in 1909 by Charles D. Walcott. Today, it's a premier paleontological research area, offering a pristine slice of life from the Cambrian explosion.

This high mountain pass was once submerged near the equator on the continental margin of North America. Buried during an underwater avalanche, the Shale's fossil bed was preserved under fine mud and anoxic conditions. As a result, the remarkably detailed remnants depict a clear snapshot of the evolution of multicellular organisms. The Burgess Shale houses the skeletons of precursors to all major lifeforms – including the chordate ancestors of primates.

Appropriately, Digital Burgess conference organizers have planned a field trip to the Shale fossil beds, where no collecting is permitted and travelers must be accompanied by a guide. If you're averse to strenuous hiking, don't worry: an alternate trip to a local museum will unearth plenty of paleontologically interesting artifacts. – *Jesse Freund.*

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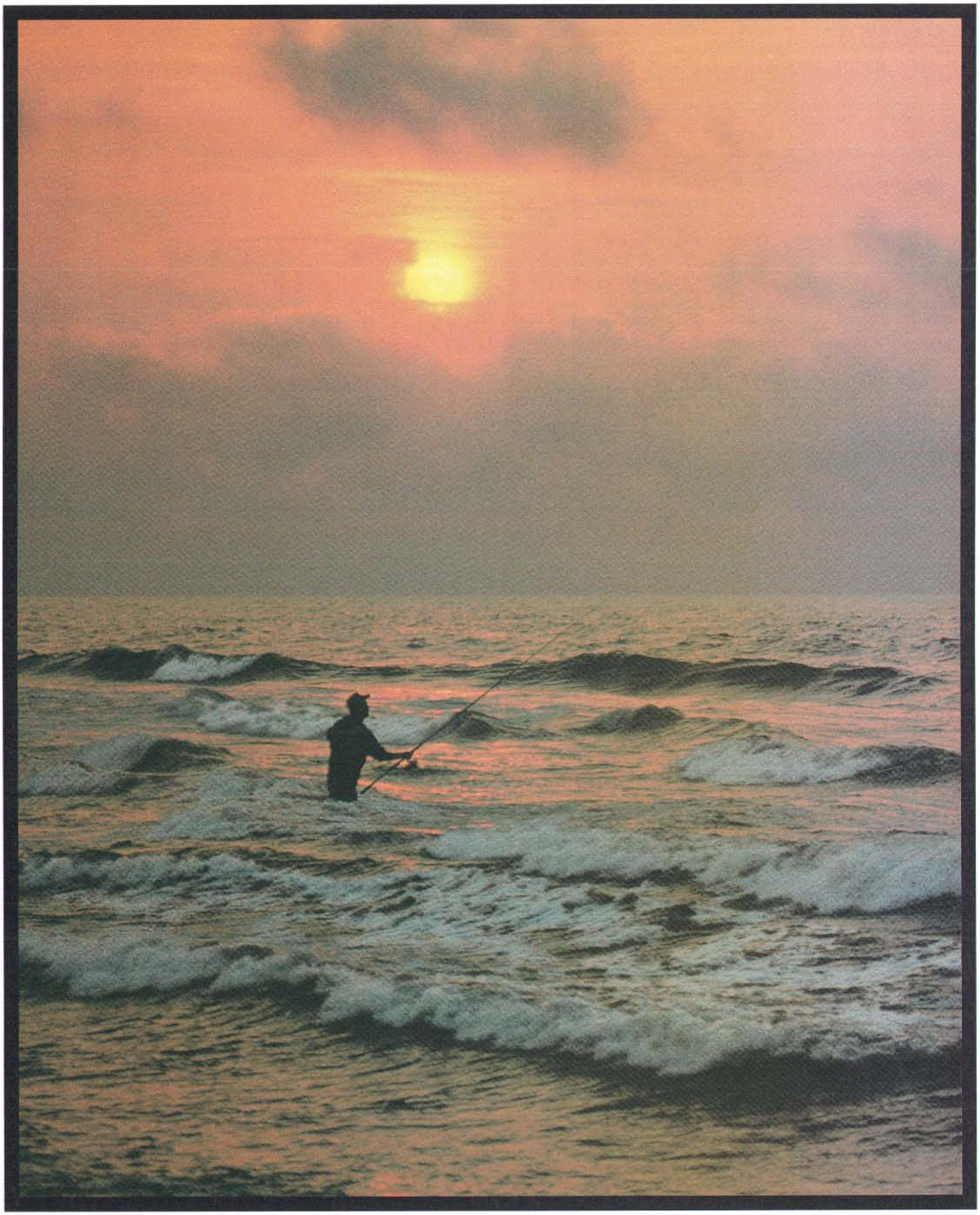

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# The Human Genome Controversy

**Charles Platt reported from the front lines of the "Evolution Revolution" in *Wired* 5.01 (page 158). Now a new battle is brewing in the trenches. While the Human Genome Project attempts to map "the" chromosomal master key using gene sequences from a small group of primarily North American and western European donors, the Human Genome Diversity Project, an international group still in its early stages, proposes to account for a broader spectrum of genetic variety by collecting DNA samples from about 500 of the world's ethnic groups.**

**But so far, the diversity project has been "more controversy than project," according to Henry Greely, chair of the ethics subcommittee for the group's North American branch. Just as the HGDP was getting off the ground, the National Institutes of Health, an unrelated organization, received a patent on a cell line of a virus derived from the blood sample of a Papua New Guinea man. Although no human DNA was actually patented – in fact, the patent was later terminated – indigenous rights groups were alarmed by the very possibility and suspicious of the HGDP agenda. The Rural Advancement Foundation International (RAFI) even accused the diversity project of biocolonialism, declaring that "the thin veneer of the HGDP as an academic, noncommercial exercise has been shattered by the US government patenting an indigenous person."**

**That the HGDP had no patent aspirations was lost in the ensuing outcry. Greely complains that the foundation "has blamed us for everything from acne to nuclear war." In an attempt to clear its name and clarify its mission, the diversity project issued its "Model Ethical Protocol for Collecting DNA Samples," a document that limits patenting and tackles issues of informed consent. Those wishing to access the HGDP genetic database must sign a contract binding them to terms set by the donor population.**

**But the ethical protocol has not allayed the foundation's fears that once samples have been collected and the information has been made available, it will be easy for anyone to patent the sequences – and sell the genetic material to biotech companies or, more sinisterly, create population-targeted "gene bombs" as a weapon of biowarfare.**

**Jean Christie, RAFI's director of international liaisons, insists that given the international policy vacuum on the subject of genetic patenting, the diversity project should be shelved until the world community agrees to ban the patenting of human genetic material. And without international laws to enforce it, argues foundation officer Edward Hammond, even the well-meaning ethical protocol is "too little too late." The foundation will lobby the UN General Assembly this summer in an effort to win support for a World Court ruling on the patenting issue.**

**Meanwhile, a National Research Council report due out this summer may render the question of the Human Genome Diversity Project's viability irrelevant. An unfavorable assessment means "the North American branch of the project is pretty much over," says Greely.**

**Either way, concern over population genetics studies and challenges to human gene patenting will continue to evolve. – *Jonas Broth***

## Mach This

Last fall, we profiled Craig Breedlove as he was gearing up to break the land speed record ("The Fast American Hero," *Wired* 4.11, page 184). This September, Breedlove and his rivals – the *Thrust SSC* team led by British world record holder Richard Noble – will meet head-to-head at Black Rock. Both plan to top Noble's 633.47 mph milestone, and both hope to go supersonic – approximately 765 mph.

The 60-year-old Breedlove will rebuild and race his third-generation *Spirit of America*, powered by a General Electric J-79 Series 8 jet engine. Noble's metallic black *Thrust SSC* will be driven by fighter pilot Andy Green. Powered by twin Rolls-Royce Spey afterburning turbofan jets, the 10-ton, 106,000-horsepower beast is believed capable of 850 mph – if it manages to stay on the ground.

Meanwhile, both racers face stiff competition from Rosco McGlashan's *Aussie Invader III* and the *North American Eagle* team of Rick Kikes, Les Shockley, and Ed Shadle, either of which could capture the world speed record if Breedlove and Noble crash. And so the quest for Mach 1 continues.

## Insecurity in the Valley

Remember Bill Lerach, the "Bloodsucking Scumbag" (*Wired* 4.11, page 134) behind Proposition 211? Well, that ballot measure, which would have made California a haven for securities fraud lawsuits, went down in flames last fall. Now the high tech industry, victorious against 211, has thrown its weight behind proposed federal legislation.

The movement for uniform standards legislation – aka preemption legislation – would force most securities fraud class actions out of the state courts and into the federal system, where the Private Securities Litigation Reform Act of 1995 already limits shareholder lawsuits by imposing higher pleading and discovery standards.

The legislation has been sponsored by US Representatives Anna Eshoo (D-California) and Joseph Kennedy (D-Massachusetts).

Preemption supporters cite the research of Stanford law professors Joseph Grundfest and Michael Perino, whose report calls for "a systematic review of the preemption issue" (full text at *securities.stanford.edu/report*).

An April SEC report, on the other hand, concluded that it is too early to gauge the effects of the reform act and that the proposed legislative changes are premature. Plaintiffs' attorneys describe the draft legislation as just another attempt to keep the little guy in the dark by, in Lerach's words, "eliminating the ability of defrauded investors to file suit in state court." Of course, the new law would also eliminate Lerach's ability to rake in millions suing Silicon Valley companies for securities fraud.

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GT Interactive Software

# Tyranny in the Infrastructure

## The CDA was bad – but PICS may be worse.

By Lawrence Lessig

In a few weeks, the Supreme Court is expected to strike down the Communications Decency Act in the name of the First Amendment. No doubt the victory will prompt a great deal of celebration. Yet I wonder if we'll be happy in the world the decision will leave behind. While many think that efforts to "regulate" speech in cyberspace will be crippled after the CDA goes down, the Court's ruling may have the opposite effect.

Washington pundits expect Congress to propose a "Son of CDA" soon after the Court issues its decision. But instead of trying to restrict access to a specific category of speech – "indecency" or "pornography" – CDA II will likely mandate the deployment of technologies that allow parents to select the types of speech they want to block. By shifting the burden of censorship from online publishers to individual users, the legal code won't be the censor anymore; instead, software code will do the censorial dirty work.

This alternative is often praised as a "private" or "user-empowering" solution to the indecency problem. URL-blocking software such as SurfWatch or Cybersitter, which works by restricting access to specific addresses, was the first version of this idea. More recently, in response to cyberporn hysteria, the World Wide Web Consortium has developed a sophisticated technology called the Platform for Internet Content Selection, or PICS. Blocking software is bad enough – but in my view, PICS is the devil.

PICS is an HTML standard that makes it possible to filter material on the Net. It is not a filtering technology; rather, PICS is a labeling standard that establishes a consistent way to rate and block online content. PICS doesn't target any particular category of speech. Instead, private agencies will use PICS to develop their own content rating schemes. The Christian Coalition, for example, could have a rating system, as could the ACLU. Parents would then select the content rating systems they want to use. In this way, PICS is viewpoint-"neutral." It doesn't discriminate among filters or rating systems; it supports the Nazi Party as much as the Jewish Defense League.

However, no technology is truly neutral, and PICS *will* have an effect. (See "Put on the Red Light," *Wired* 5.03, page 127.) The PICS filter can be imposed at any level of the distribution chain – at the level of the individual user, the proxy server, the ISP, or the nation-state. "Neutral" or not, PICS will have a devastating effect on free speech all over the world.

As part of the Web's infrastructure, PICS will be an extremely versatile and robust censorship tool – not just for parents who want to protect their kids, but for censors of any sort. PICS will make it easier for countries like China or Singapore to "clean up" the Net; it makes it easier for companies to control what their employees can see; it makes it easier for libraries or schools to prevent patrons from viewing controversial sites. PICS makes censorship easy because it embeds the tools of censorship into the root architecture of online publishing. As HotWired columnist Simson Garfinkel has described it, PICS is "the most effective global censorship technology ever designed."

This kind of talk makes cyberactivists uneasy. For the most part, their efforts have focused on government-sponsored Internet regulation schemes. Yet they have overlooked the most troubling form of online regulation: that imposed by changing the architecture of the Net. Software code – more than law – defines the true parameters of freedom in cyberspace. And like law, software is not value-neutral.

The same point could be made about other cyber rights issues. While Bruce Lehman's efforts to expand the legal rights of online copyright holders are currently in limbo, technologists such as Mark Stefik from Xerox PARC now predict that the Net is moving toward the use of "trusted systems" – architectures that facilitate perfect control over the online use and distribution of copyrighted material. But what then happens to the fair-use rights the law now guarantees? The question is not whether law will do enough to protect intellectual property, but whether code will do too much. This has prompted University of Pittsburgh law professor Julie Cohen to pen what others have called the Cohen theorem: One has a right to hack trusted systems in order to defend traditional rights of fair use.

I don't take issue with the values inherent in any one particular system of code. My criticism is directed against those who think about cyber regulation solely in terms of "law." Laws affect the pace of technological change, but the strictures of software can do even more to curtail freedom. In the long run, the shackles built by programmers may well constrain us most. ■ ■ ■

*Lawrence Lessig* (lessig@pobox.com) *is a professor at the University of Chicago Law School.*

### Preemptive Blocking

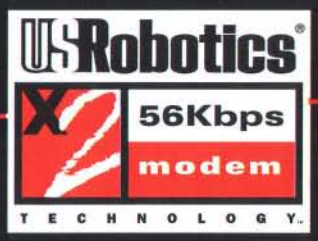
Even before the Supreme Court issues its CDA ruling, Representative Joseph McDade (R-Pennsylvania) has introduced HR 1180, the Family-Friendly Internet Access Act of 1997. The bill would require ISPs to provide content-screening software "to permit the customer to limit access to material that is unsuitable for children," adding that "such software shall be provided either at no charge or for a fee that does not exceed the cost of such software to such provider." Meanwhile, Texas is considering a similar measure that would apply only to ISPs operating within the Lone Star State.

### For 007 Only

America's crypto policy may be a mess, but Britain's is a disaster. The latest UK encryption proposal makes it clear that the British government doesn't want its citizens using crypto technology. Section 72 of the plan would "prohibit an organization from offering or providing encryption services to the UK public without a license … irrespective of whether a charge is made for such services," adding that "it may be necessary to place restrictions on the advertising and marketing of such services." Read all about it at *www.dti.gov.uk/pubs/*.

### Promoting Privacy

After a long silence, the Clinton administration has released a policy paper that considers ways in which Uncle Sam can help protect privacy in cyberspace. The report, "Options for Promoting Privacy on the National Information Infrastructure" *(www.iitf.nist.gov/ipc/privacy.htm)* evaluates proposals that seek to "maintain an optimal balance between personal privacy and freedom of information." (Strangely, the study never mentions the word "encryption.") Public input is welcome – send comments to *bernstein_m@a1.eop.gov* by June 27.

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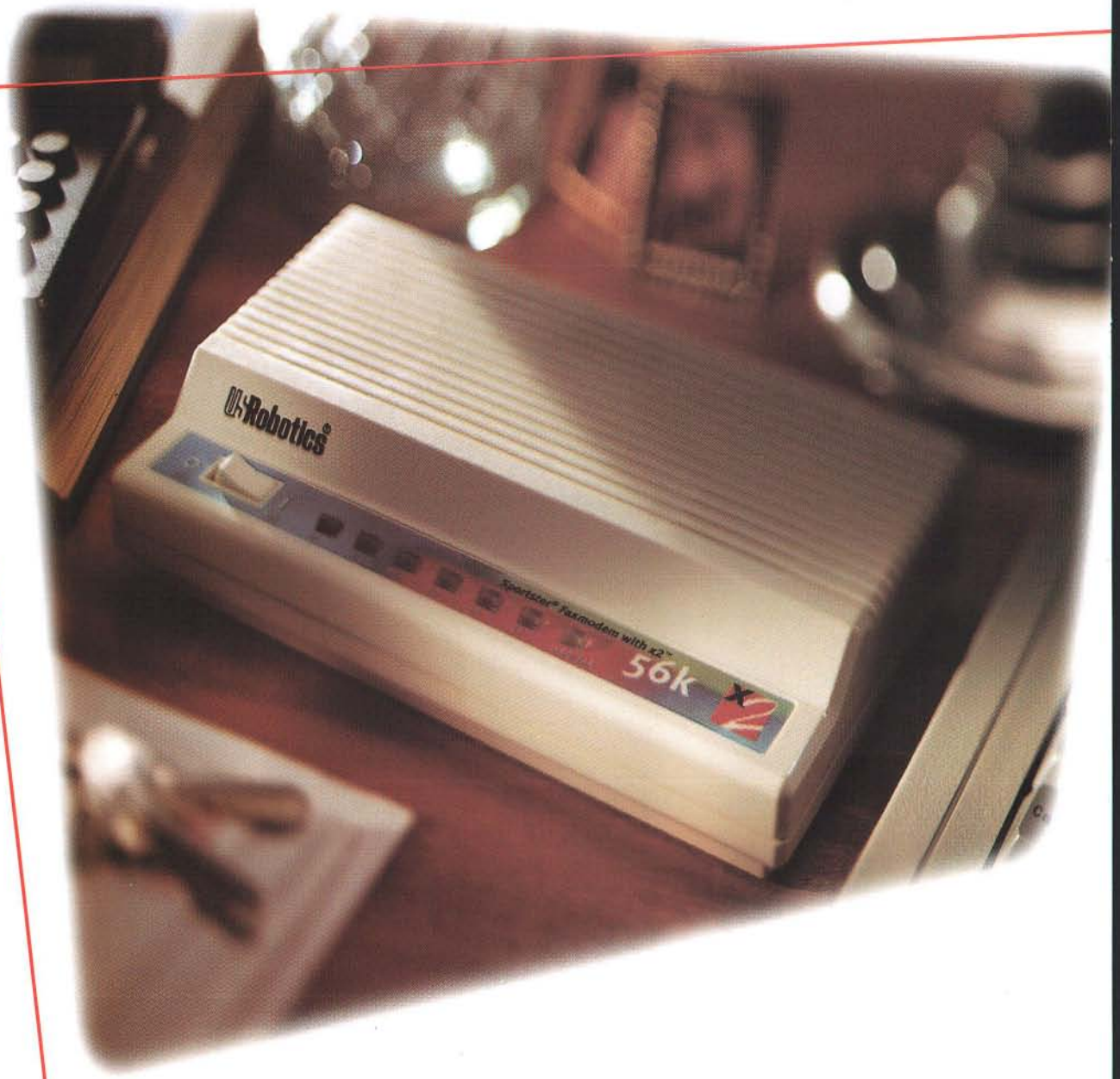


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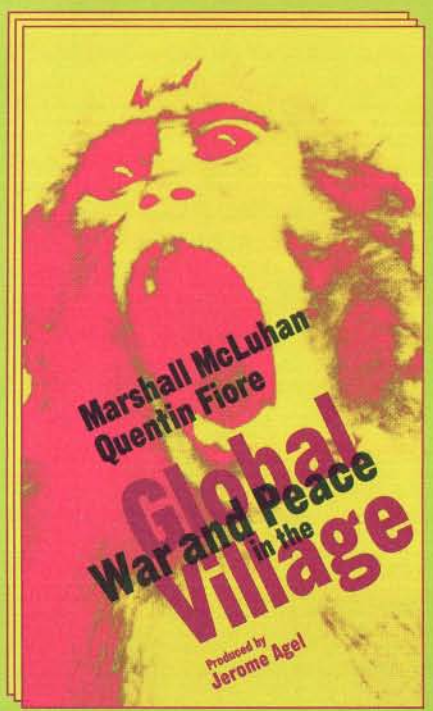


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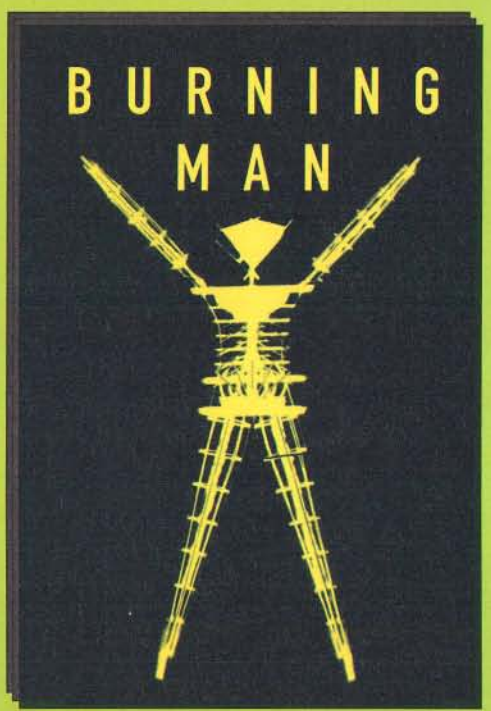


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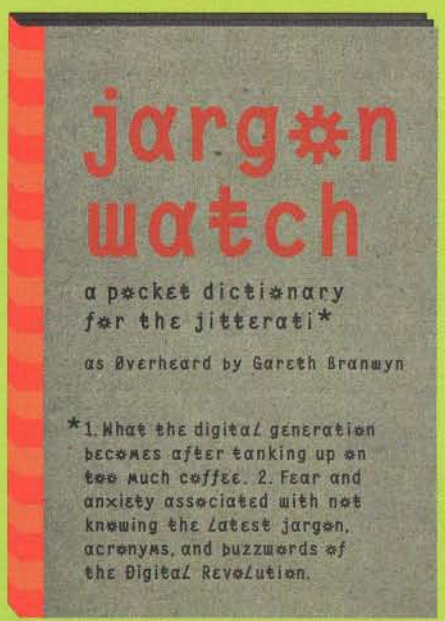


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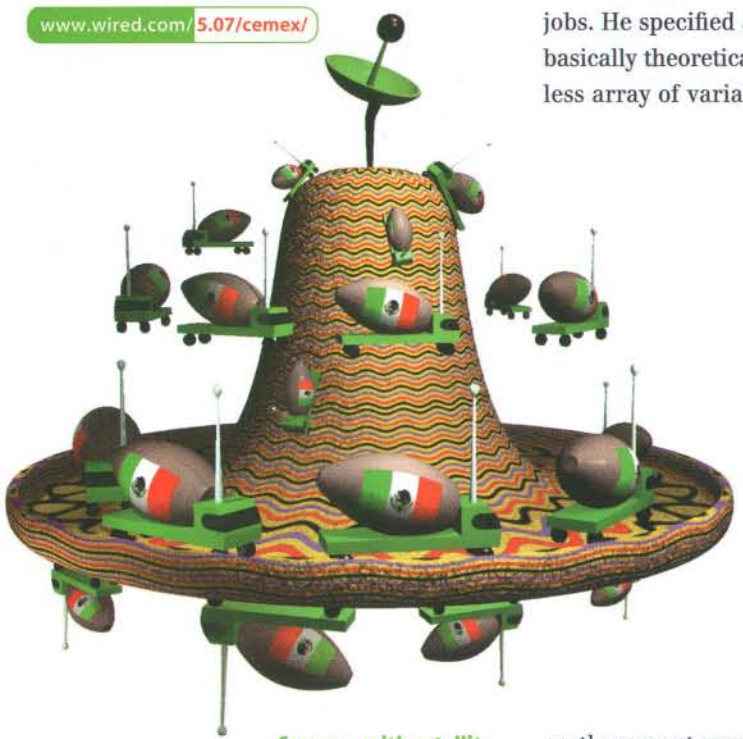
# Bordering on Chaos

There are stranger places to see the latest in complexity theory in action, but delivering cement in Mexico is a pretty good start.

By Peter Katel

www.wired.com/5.07/cemex/



Cemex – with satellite links, expert systems, and a computer in every truck – is confounding old ideas about the lines that separate the world's info haves and have-nots.

Here's how the cement business worked in Mexico's second-largest city, Guadalajara, only a couple of years ago:

A builder telephoned in an order a day or so ahead, two days in advance for big jobs. He specified a time, knowing it was basically theoretical, depending on an endless array of variables – weather, traffic, a missing receipt, the number of other orders the plant had to try to fill. Trucks got lost – up to 140 might be on the road at a time – walkie-talkies conked out, ill-financed projects shut down with their foundations half poured. Penalties or not, on delivery day half of the customers canceled or rescheduled their orders. The bottom line: tons of costly cement rumbling around town with nowhere to go, even as builders were lucky to get delivery the right day, let alone the right hour. "You tried to stay on top, but something would always get by," recalls Alejandro Contreras, a veteran dispatcher with the local subsidiary of Cementos Mexicanos – Cemex for short. "When the phone rang, it was usually someone who was upset. You had to sit there and take it – let the customer blow off steam – then try to negotiate a solution. *Hijole!* Oh, man! When the phone rang, sometimes I wanted to just not answer it."

Here's how things worked in the same city one afternoon this March:

In an air-conditioned operations room on the top floor of a two-story office, Contreras and Oscar Suárez are manning their stations. The ambience is ops-room generic, with five screens – including a 19-incher with a glowing map of the city – and half a dozen phone sets.

It's half past twelve, and Contreras is fielding a request: a load of ready-mix in 40 minutes for a new gas station. *No hay problema.* A satellite-linked GPS system pinpoints three Cemex trucks on the road, one of them right in range. Still talking, Contreras does a quick check on the customer's billing status. Then he taps a few keys, the instructions go out to the onboard computer in a truck near the site, and the concrete is on its way.

Over on Suárez's side, *Alarma* flashes onscreen in white letters: a delivery is due in 30 minutes, but the customer hasn't called to confirm. Suárez glances at the city map, then goes back to some paperwork: If the builder calls, there's a truck available. If he doesn't, the plant will automatically be notified to cut back the rest of the day's production. Any dispute? The customer's welcome to come by and listen to a Teac digital recorder play back not only his original phone conversations with the dispatchers, but – like a cockpit voice recorder – everything said in the operations room. On the other hand, if a truck is more than 20 minutes late, it's 20 pesos (about US$2.50) off for each cubic meter, about a 20 percent discount. To promote the offer, Cemex has even printed miniature pizza boxes labeled with a slogan that pokes a little fun at the local Domino's franchise: "Now, the concrete is faster than the pizza."

IMAGE: JOHN HERSEY

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There are probably stranger places to see the latest in complexity theory in action, but delivering cement in Mexico is a pretty good start. Cemex is a company on a high tech roll that has carried it in scarcely a decade from a sleepy perch in northern Mexico to its place as the world's third-largest cement company. Its 20,000-plus people, 486 plants, thousands of vehicles, and fleet of freight ships move more than 50 million tons of the stuff annually in 60 countries – including places that make Guadalajara look like Geneva. And in doing so, Cemex is confounding ideas about the lines that supposedly separate the info haves of the world from people like Alejandro Contreras and Oscar Suárez.

Cemex has its First World operations – through astute acquisitions, it's now Spain's top cement supplier and has a US subsidiary based in New Braunfels, Texas. But it specializes in places that lack highly developed road systems, solid telephone networks, and legions of well-educated workers – where surviving in the construction business is like keeping one's head above water in a raging sea. Where equipment breaks down, workers can't get to the site, and exchange-rate fluctuations jack up supply costs. Where competing becomes a matter of showing customers that you can save them from uncertainty. Where reliable information has real scarcity value.

A lot of that is Information Technology 101. A data network that uses a combination of local and international carriers, plus Cemex's own satellite system, hooks up every plant and office, providing streams of real-time data on everything from daily sales and output to truck oil-change schedules. Technical flying squads get newly acquired subsidiaries online in only a few months. There's a private satellite TV network for in-house training and videoconferencing. A local call from virtually anywhere on the planet hooks traveling executives directly into the companywide international phone system.

But what has happened in the Guadalajara control room goes past all that. What Cemex is looking for now are ways to adapt global technology to the developing world's essentially limitless range of local problems. Complexity theory is one answer – systems that take uncertainty for granted and allow solutions to evolve, rather than trying to rigidly engineer them. Ad hoc options in place of schedules. On-the-spot decision-making instead of hierarchies. Those kinds of strategies are not unknown in the mainstream corporate world – companies like GM and Citicorp use complexity-based systems for everything from streamlining manufacturing to keeping financial portfolios abreast of market waves. Cemex's leap is to apply them to parts of the world where complexity – if not outright chaos – is the defining characteristic. And where the rewards for creating order can be great.

**In parts of the world where complexity – if not outright chaos – is the defining characteristic, the rewards for creating order can be great.**

### Amazing quiet

Cemex executives will dutifully tell you that the idea of going high tech came from chair and CEO Lorenzo Zambrano, a 53-year-old Stanford MBA whose grandfather consolidated Cemex as a modern company in the 1920s. Company lore portrays Zambrano as a cyber whiz who goes through his Lotus-Notes email while he flies, then jacks in his IBM ThinkPad to check on his far-flung operations wherever he touches down.

In fact, Cemex had basically no choice but to go global – and fast. Even before NAFTA applied the coup de grâce three years ago, Mexico's centuries-old protectionist walls were crumbling, exposing its comfortable old oligopolies to sharp-edged foreign competitors. Added to that was hair-raising economic instability – the kind of roller coaster that, in 1995, sent Cemex's home-market sales plummeting 50 percent. Fortunately by then, more than 60 percent of the company's revenues were coming from abroad, including Europe, the Caribbean, and South America. Any doubts about the wisdom of spreading the risk through globalization fell away.

The problem was keeping control, especially in a company used to being run on a short leash from its Monterrey headquarters. "Lorenzo is one of those people who sits up at the top and believes if he screams loud enough he'll get results," says Kenneth Massey, a 55-year-old American who began his career south of the border two decades ago as head of the University of Monterrey's Department of Information Sciences, later jumped to private industry, and eventually joined Cemex in 1992. "He was getting the idea that he couldn't shout much louder and that he couldn't believe everything people were telling him."

Massey and Zambrano were well aware information technology was the only way to keep control of a company with global horizons and revenues growing 20-plus percent a year. To keep growing in a commodity business, where you compete on price and service, computers had to be deployed as more than industrial-strength calculators. But Zambrano also homed in on one of Massey's pet ideas: the importance of a system that enables employees to make – and keep – commitments. "He asked me what kind of promise I was ready to make. I said, 'I'll return my salary and waive any indemnization, and I'll sign that in blood.' He said, 'You don't have to sign anything in blood. *Pero yo tengo larga memoria*. (But I have a long memory).'"

Shortly after Massey joined Cemex, he took a dozen company executives on an eye-popping trip to the Memphis headquarters of another company facing delivery problems: FedEx. There, along with the flashy logistics, was a deeper message: the value of delivering perfect service, what came

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to be known at Cemex as "impeccability."

They also paid a visit to what seemed to be an odder choice: the fire-ambulance division of Houston's 911 operation. "We were amazed at how quiet it was," says Homero Resendez Saleh, a slender, baby-faced computer scientist who heads Cemex's Center for Business Processes. "We wondered, 'How can they be dealing with emergencies?' The answer was that what was an emergency for us was routine for them." Lessons? The system got the necessary information from people quickly. It pinpointed available resources in real time. And it gave operators on the spot – not distant managers – the authority to respond instantly.

Massey, who left Cemex amicably last year to go into private consulting, also expanded on the idea he had broached with Zambrano: the paramount importance of commitments as a way to cut through chaos and uncertainty. To back up that concept, he brought in Business Design Associates, an Alameda, California-based consulting firm whose ideas were starting to circulate through the business-process subculture. BDA's Chilean-born founder, Fernando Flores, has the perfect background for offsetting fears of *yanqui* high-handedness: the economics minister in Salvador Allende's ill-fated Socialist government at age 30, he spent three years in a military prison, then went into exile, ending up pursuing a self-designed PhD in management, linguistics, and philosophy at UC Berkeley. The core of Flores's message: successful systems are driven by loops of people working to fulfill commitments – say, getting a truckload of ready-mix concrete to a certain building site at 1:35 p.m.

"No machine can make commitments," Flores says. "Only a free man can make commitments." And one with a clear picture of what's going on.

### The conversation

For all the money Cemex has spent on information technology – an estimated 1 percent of its US$3 billion annual revenue – the first thing its executives want to say is that none of this is really about 19-inch monitors or digitized truck schedules. Raul Prieto de la Fuente, part of the company's internal consulting branch, even disses computers as "*fierros*." Simply translated, it means "hardware," but the word is more archaic – a term you'd use for horseshoes or pipes or guns. The point made is that the Guadalajara ops center's machines might as well be a pile of rusted-out filing cabinets for all the importance that Cemex's philosopher-engineers attach to them when they are deep into what they call "the conversation."

In one guise or another, the conversation – an ongoing process of top-to-bottom self-examination – is standard-issue late-20th-century consultant-speak. But the idea has clearly struck an eager chord with Cemex's cadre of information warriors. Indeed, sitting around a table at one of Guadalajara's power-breakfast haunts, Prieto de la Fuente and his colleagues radiate the sort of intellectual energy and engagement that one expects from scientists or university professors or political activists.

**Cemex's infowarriors radiate the sort of intellectual energy and engagement that one expects from scientists or university professors or political activists.**

"Conversations," Prieto de la Fuente tosses out, "are where things are invented." I look at him quizzically. "People conversing about what they do and what they can do better. That's how you find out where you need to focus your efforts."

Francisco Pérez Madero, operations manager in Guadalajara, chimes in: "We had six to eight months of conversations. We realized that we had to reinterpret what we were doing." Resendez adds, "We started by asking, What is it we want?" Prieto de la Fuente says, "We were searching for anomalies and examining our conventional wisdom: 'We have to schedule deliveries one day ahead of time.' Why? 'Because that's the way you do it.'"

### Alarm bells

Ask a Mexican to pick a likely city for innovation and Guadalajara won't be the first choice. Perhaps Mexico City, the country's power center, or Monterrey, home to Cemex and a host of other powerful corporations – places embodying capitalist force and state might. As for Guadalajara and the surrounding state of Jalisco, they are, by Mexican law, the source of all tequila.

But there was another reason Guadalajara was the perfect laboratory for Cemex. Business is down 60 percent since the '94 crash. Some 50,000 new houses sit empty. The 140-truck fleet Cemex once had on the road has shrunk to 20. In this climate, every customer and every order counts. But if a radical new project goes horribly wrong, it's not a company killer.

The mission in Guadalajara was to build a system that could surf the complexity by making each ready-mix truck as independent as possible – in effect, an autonomous agent cruising the city, waiting for orders. Instead of stationing an order taker at each plant, Cemex would have just one central ops room for the whole city. Most important, instead of struggling hopelessly to keep to a fixed schedule, the goal would be to keep enough options open to handle any likely request. Says Massey: "If I can predict where the orders are coming from and can maintain random distribution of trucks, I should always be able to have one close to where it's needed. If I can have a chaotic distribution of vehicles, then I'm really trying not to control chaos, but to use it to my advantage."

The foundation for what Cemex calls its *Sincronización Dinámica de Operaciones* is a set of business-process software and

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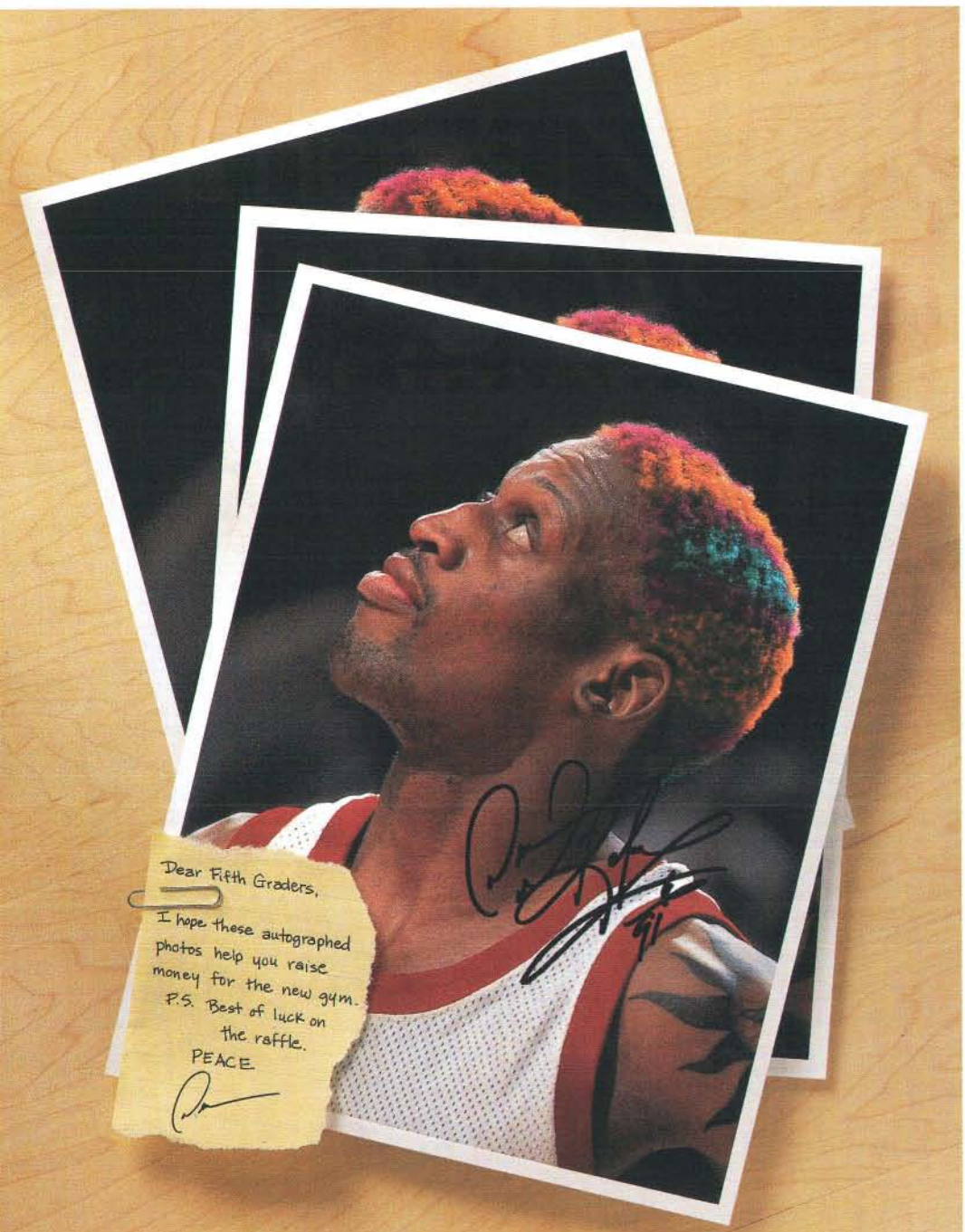


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expert programs painstakingly gleaned by a team of Cemex specialists during nearly a year of meetings – Suárez counted 40 in all – in which the Guadalajara crew were grilled on the realities of their jobs: Thursdays and Fridays are busier because builders like to let concrete set over a weekend. The summertime's afternoon rains mean more morning deliveries. "You throw linear programming out the window," says Massey. "The time it takes to go from point A to point B is a function of experience. What you're putting together is a world of judgments, not a world of facts."

Fed with streams of day-to-day data – customer orders, production, traffic problems, roadwork in progress, even changing weather conditions – the result is what software designers call an adaptive system, one that actually gets smarter the longer it runs. Operating over a PC-based LAN, its only really unusual *fierros* are the book-sized onboard computers and GPS relays that sit by each driver. The machines, made by the California-based firm Distributed Networks, have a screen for ops center messages and customized buttons: "Leaving plant" or "Arrived at site," plus a laconic "Customer not ready." The data meshes seamlessly with the rest of the system. "If a route normally takes 15 minutes, and after 15 minutes the driver isn't there, we'll get an alarm," says Suárez.

The result is three integrated systems: one for taking orders, another for checking a customer's financial profile, and the last for tracking software the ops room dispatchers use. And the whole thing is accessible from any of the 30 PCs spread throughout the Guadalajara headquarters – sales, accounting, maintenance – as well as through Cemex's global WAN by any staffer armed with the right passwords.

Does it work? That is, does it work every day, in the field? Francisco "Paco" Rivera, a Cemex programmer and troubleshooter visiting the Guadalajara ops room, jacks in his IBM ThinkPad and calls up Cemex's South America network. In the first half of March, the company's low tech Venezuela operation made 771 deliveries, 34.4 percent on time. By contrast, in Guadalajara in March of last year – with the system barely six months old – 97.63 percent of 1,365 deliveries were on time, within 10 minutes of the promised hour. This year, with business creeping back toward normal and the number of deliveries doubled, the on-time percentage is even higher – 98.15 percent. And plans are already being made to expand the Guadalajara experiment to Monterrey and Mexico City.

Not everyone is entirely enthusiastic. Héctor Javiér Arenas Novoa, a grizzled driver and local union chief, says that if customers are happy, they order more concrete and everybody benefits, but some of the younger guys have complained: Why does the company have to know where I am every single minute? But as he waits for a new load in his air-conditioned eight-wheeler, Arena Novoa makes it clear that he isn't about to call any strikes over that. The 16 Cemex trucks typically on the road in Guadalajara are already at least five fewer than would have been needed before. And for anyone who asks whether that's a good idea in a country where 40 percent of the breadwinners are jobless or barely working, the answer is blunt: If we're not competitive, some foreign corporation is going to come in and eat our lunch.

**Forget about paving paradise to put up a parking lot: in Chiapas, in Peru's squatter cities, in the open-sewer slums of Port-au-Prince, cement is the stuff of dreams.**

### Hello, Ross Perot

Competition is the reality that Cemex's top people deal with from their perch in Monterrey. The city doesn't get extensive treatment in guidebooks; people visit Monterrey for business, not Kodak moments. It's not popular, either, among Mexico City's chattering class, for whom northern Mexico has always been viewed with suspicion as a sort of 51st US state run by corporate types who wish that the border were moved south. Such people do exist, but if any lurk in Cemex, they don't set the tone.

Gelacio Iñiguez Jáuregui, Cemex's vice president of information technology, is as polished as any Mexico City sophisticate – a product of an old-fashioned private school system that believes in turning out well-rounded leaders. A gourmet cook and a connoisseur of Colorado's ski slopes, he's spent his entire career designing and running information systems – always for Mexican-owned companies. Were Cemex swallowed up by a foreign competitor, he says, "you're opening up an opportunity for Mexicans to works for *maquiladoras*" – border-area assembly plants. "That's not what I want to do." It's something Ross Perot might keep in mind: free trade is a lot scarier south of the Rio Grande.

Iñiguez's idealism may sound odd in a business that, for First Worlders, conjures hard-hatted guys paving paradise to put up a parking lot. But in Cemex country, cement and concrete mean roads, hospitals, sewers, power plants, and water systems. In Chiapas, in Peru's squatter cities, in the open-sewer slums of Port-au-Prince, cement is the stuff of dreams.

A lot of Cemex's know-how originated north of the border, but in the transnational era now upon us, it's also clear the so-called developed world is losing its once-exclusive claim on innovation and efficiency. Cemex's phone net shames most global media companies. The self-contained technologies that have been developed in Guadalajara will work in places where many First World companies would be scared to make a sales call. Who better, after all, to confront chaos and inefficiency than those who've grown up with it? "Most Europeans and Americans don't distinguish Chile from Chiapas," Flores says. "And yet in big companies, even

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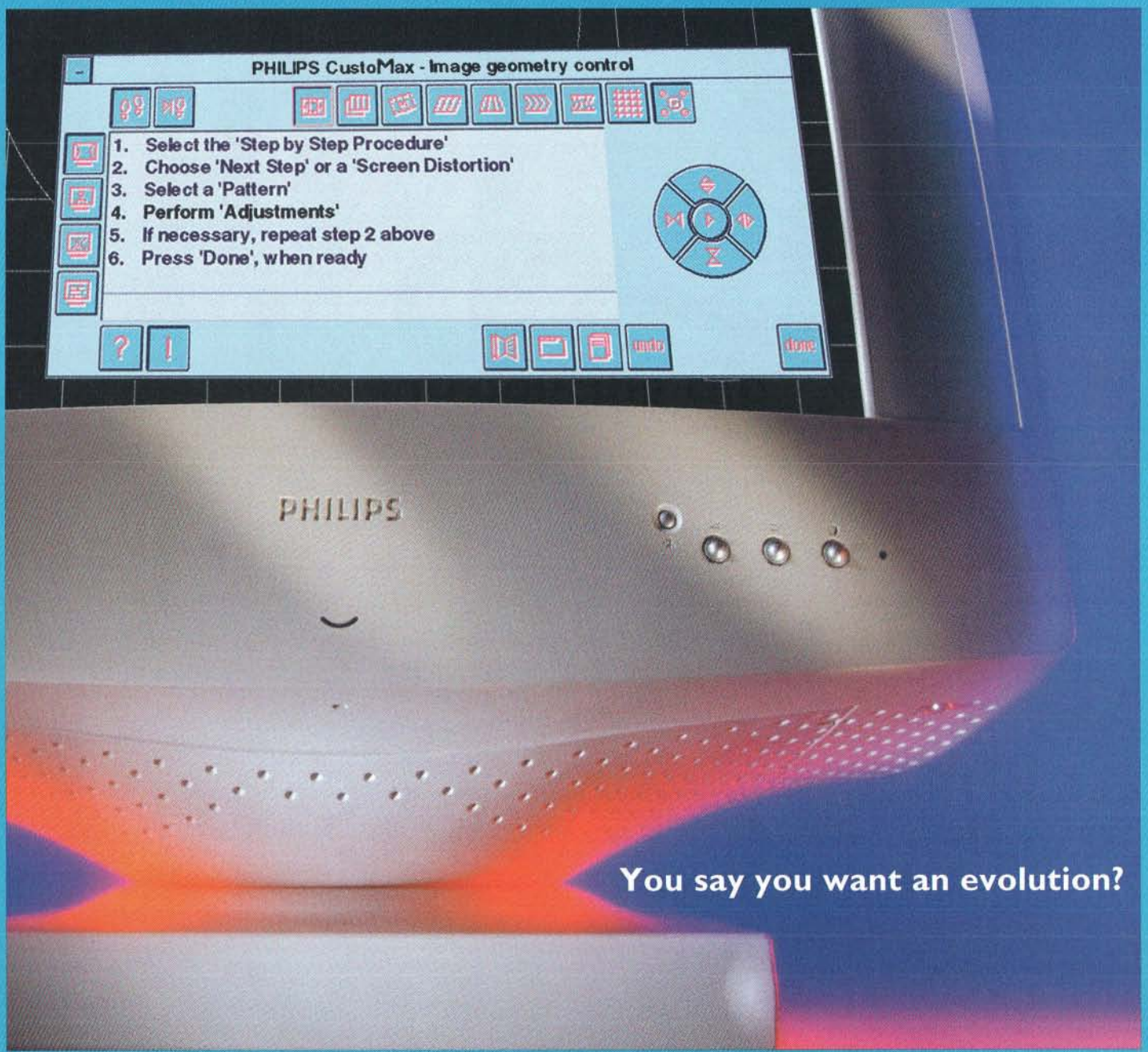

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in Germany – or Switzerland, where they have a reputation for punctuality and rules – they hire me, a Latin American. And you know what? They bring me for impeccability. That's a major transformation."

As PointCast headlines flutter by on his office monitor, Iñiguez talks about how in Mexico, fathers and children are more like partners these days. Only a couple of decades ago, he says, children didn't have real conversations with their fathers. Now, with kids often a step or two ahead in manipulating technology, parents and children are on a more equal footing. It would be tempting to sketch out a thesis about the decline of patriarchy in Latin America, but I'd had virtually the same conversation three weeks earlier with my oldest friend, a New York-born computer marketing executive with no Latin blood. "I'm like a pal to my kids," he mused.

But change is real, and if companies like Cemex are to stay in the game, they need to cultivate people other than the well-rounded private school graduates who run everything important in Mexico. Everybody knows that: In the Guadalajara ops room, both Oscar Suárez and Alejandro Contreras – thirtysomethings whose schooling stopped after high school – are getting university degrees at night on Cemex scholarships. At a ready-mix plant a few miles away works Javiér Esparza, a 33-year-old who started out with Cemex changing oil. His schooling ended when he was 15. Now he's an integrated systems manager making sure that all trucks in Cemex's Pacific region are up-to-date in their maintenance schedule. As part of the deal, he's back in school too.

From ratcheting off oil pans to tapping a keyboard is not a bad career path. But something deeper is at work as well, centered on what William A. Orme Jr., a long-time American writer on Mexico, calls the "cult of the *licenciado*." Literally, the word means someone with a college degree. In practice, it signifies someone who can make things happen, usually from behind a desk. Traditionally, all information goes to the *licenciado* and all decisions come from him. Or don't, which is where the classic bureaucratic morass starts.

What Cemex is doing – giving employees the knowledge that they need and the authority to use it, to make and keep those commitments – turns that hoary old tradition upside down. Cemex people like to use the English word "empowerment." North of the border, this term may have lost some of its freshness, but in Mexico it still has the ring of a call to arms. People such as Suárez, Contreras, and Esparza may indeed someday become *licenciados* – but they already have the power to make real decisions, which is shocking enough.

So the revolution spreads, even to places as unlikely as the cement business in Mexico. Iñiguez, hardly a rabble-rouser, has the fervor of a permanent revolutionary. "IT" – he pronounces the letters in English – "that locks in business-as-usual is simply using new technology for old principles. Automation is not the essential point; the philosophy is not to try to control everything. What we do is an architecture of human styles of behavior. Of course, tomorrow someone could invent another conversation, one that could take us out of the running. So you have to learn how to make distinctions among conversations – and understand how the world is transforming itself."

A load of ready-mix, anyone? ■ ■ ■

**North of the border, the word "empowerment" may have lost some of its freshness, but in Mexico it still has the ring of a call to arms.**

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*Peter Katel* (pkatel@nwnet.newsweek.com) *is a correspondent in* Newsweek's *Miami bureau.*



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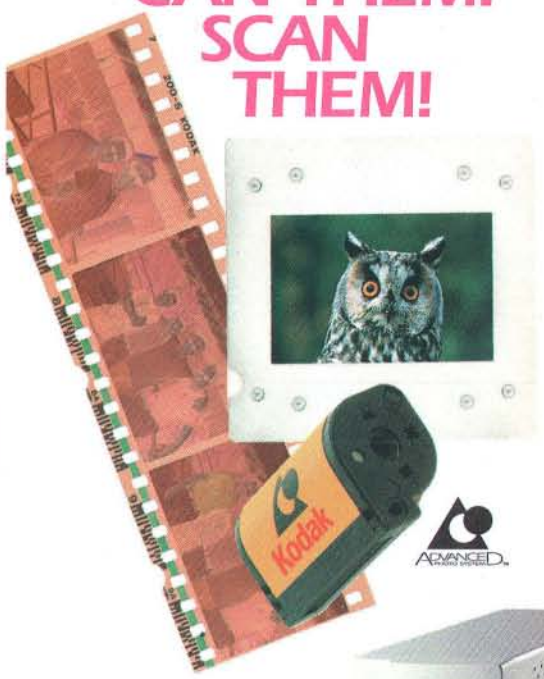


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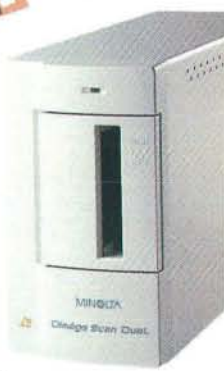


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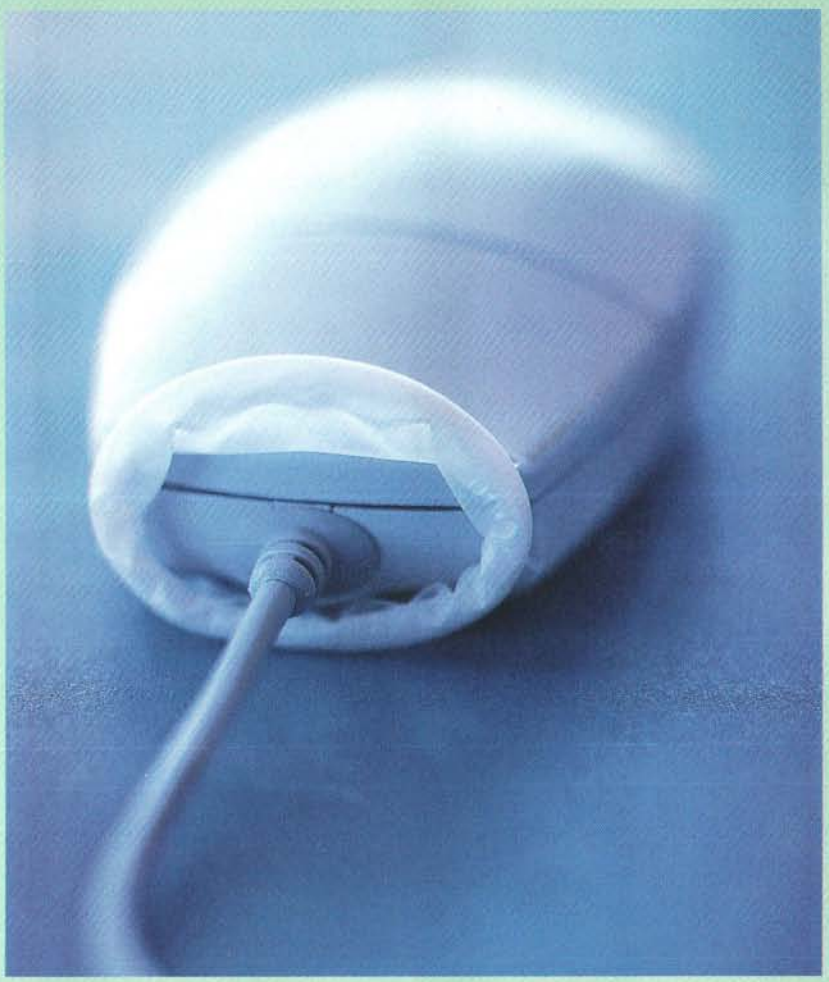

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# The Shame of Java

By Dave Winer

The technology press seems to know only three stories: Apple is dead, Microsoft is evil, and Java is the future. And reporters ask only two follow-up questions: Is Apple still dead? Is Microsoft still evil? Let's ask the third.

Microsoft is a brick wall. Like so many others in the past, Sun Microsystems has decided to throw itself against the wall as hard as it can, hoping to break through with Java. Here's what the wall looks like. Microsoft has deals with virtually every PC hardware manufacturer. Microsoft makes money on each computer they sell. This is a multibillion-dollar business for Microsoft. It would be very natural for PC makers to license their Java Virtual Machine from Microsoft instead of Sun. Microsoft knows how to play this game. Microsoft owns this game.

If you're a Java developer or licensee, in other words, you're the stuff between two slices of bread. The slices are Sun's and Microsoft's virtual machines.

But Sun's not telling all about Java. There are secrets. What are the terms of the license agreements Sun has struck with Netscape, Apple, Oracle, IBM, et cetera? They're confidential.

Let's say you want to license Java. Get out the checkbook and start writing. Add another zero. Add another. Next year, more millions. Add it up. JavaSoft has 400 employees. That's a big burn rate. So what do you get for those millions? There's a feedback system, the company says. Sun listens first to licensees, then to the general world. Pay us money, and we'll implement your ideas. I suspect that the more money you pay, the more they listen.

The shame of Java is that it's being used to serve Sun's corporate purposes, to keep the stock price up. Java is owned, not free. And while it made sense for Sun to own Java for a time, that time is gone.

Sun CEO Scott McNealy seems to agree: "You don't have to own English to be a writer." Eventually Sun will set Java free. But will this be before or after it destroys the entrepreneurial energy of the Internet?

Java was a vote for the geeks. A necessary balance to the world of easy-to-use software. Java was also love at first sight. Like the happy start-up icon that greets Mac users, Java loves the world, and the world loves Java.

But does Java really have an answer to the security problem? No. There's no smartness to the Java sandbox, no way to move stuff over the firewall. Java is a world unto itself, which means users will store stuff there they don't want to lose, and that stuff can fall victim to viruses, just like ActiveX or FTP downloads.

And is there any value in Java's cross-platform promise? Mac users don't want software that doesn't look and behave like Mac software. Same goes for users of Windows, and, I suspect, Solaris. Java has to

"Systemwide alarm signals go off quickly when the informational sphere is even mildly questioned."
– *Herbert I. Schiller*

# Technostalgia

By Roberto Tietzmann

Shoot a street scene with a Cinématographe and it will take your city back 100 years. Shoot it in super-8 and you will be magically transported to the 1960s. Indeed, just as the constraints of moving picture technology define the look of an era, the design of any graphical interface shapes our view of history. Which makes Mosaic the Net's Lumière camera, our first window to the Web. And no matter what is shown, anything seen with the venerable Mosaic 1.0.3 will forever be stamped 1994. As time goes by, expect to see old browsers become collector's items, a stylish means of looking backward as you ride the infobahn for nostalgia's sake.

*Roberto Tietzmann* (rtietz@cesup.ufrgs.br) *is a multimedia developer and researcher living in southern Brazil.*

# Cross-Platform Technology

By Jock Gill

The two major political parties – with their reliance on top-down, legacy media branding and communications structures – are failing to produce useful solutions to tomorrow's problems. Is it any wonder that citizen participation is so sadly reduced? The Internet, on the other hand, has created great excitement about one-to-one and relationship marketing and mass customization. Yet using the Net to create a plebiscite form of government is a bad idea. Just ask businesses whether they would like to be run by instant polling of their customer base and see how fast they say no.

A better approach is fusion, or cross-nomination, which allows two or more parties to nominate the same candidate on separate ballots. The Populists and other parties used fusion to great effect in the 19th century. The major parties responded by outlawing the practice almost everywhere.

While the Supreme Court recently upheld the right of states to ban cross-nomination outright, the Internet process is far more compatible with approaches like fusion than with the current system. Fusion can break the stranglehold of strict party lines.

*Jock Gill* (jgill@penfield-gill.com) *is a consultant specializing in new media.*

find a niche where people don't already use software. In the mainstream market there's no time to catch up.

All of which raises the real questions the tech press ignores: When will Silicon Valley get the message that great software is created by people, not companies? When will Silicon Valley's financiers set up corporate systems that serve the products, instead of vice versa? And when will creative engineers stop selling their babies to the miserable, petty agendas of small-thinking corporate credit-takers?

The future is not Java – it's still the Web. It's the platform without the platform vendor. It's yours and mine as much as Sun's.

Yes, you can build new things with Java, but you can do that with other languages and in more complete environments. In other words, if you have an idea, there's no need to wait for Java to catch up with you.

*Dave Winer* (dwiner@well.com) *writes Web essays and editorial software. This piece contains excerpts from a series of essays he wrote about Java in April* (www.scripting.com/specials/wiredJuly.html).

# Conspicuous Conservation

By Talin

Perhaps only the rich can afford to be truly frugal. The wealthy have always needed something to separate themselves from the masses. When resources were scarce, the well-to-do would deliberately waste them, just to show they could. But in this age of plenty, most of us in the industrialized world live as no medieval kings could ever have dreamed.

Hyperefficiency, however, is still a scarcity. And, ironically, even those who live simply by necessity have lost their edge when it comes to economizing. Well-designed and expensive state-of-the-art machinery, from thermodynamically efficient washer/dryers and fuel-saving hybrid electric cars to resource-conscious smart homes, can easily outscrimp less advanced tools. Thus the concept of conspicuous conservation – being frugal in high style.

*Talin* (talin@acm.org) *is a researcher and toolsmith at PostLinear Entertainment.*

# The Power to Consume

By James Ogilvy

A massive paradox plagues contemporary economics. On the one hand, we insist that macroeconomic growth demands increases in productivity. On the other hand, at the microeconomic level firms try to raise productivity by reengineering to reduce employment, which then affects the macroeconomy by reducing unemployed workers' ability to consume what has been produced.

In the past, increases in productivity did not lead to overcapacity because foreign markets could be found for excess goods. National economies were open systems that could export. But the global economy is a closed system for which increases in production must ultimately be balanced by increases in consumption. In other words, increases in productivity (production per worker per hour) must be matched by increases in consumptivity (consumption per consumer per hour).

Consider three components of consumptivity: first, the ability to consume; second, the will to consume; third, the knowledge of how to consume cleanly, wisely, and without waste.

The ability to consume is a function of the ability to acquire – that is, purchasing power – and the ability to use. What is the difference between raw consumption and consumptivity? We all know how to add; we don't all know how to use a computer. We all know how to use a phone; we don't all know how to use the advanced functionality available over a T1 line. So the ability to consume demands not only the cash one gets from a good job, but also the knowledge to take advantage of what one buys.

Consider, for example, the difference between the wino and the

"As has been said in various ways, men are noisy, narrowband devices, but their nervous systems have very many parallel and simultaneously active channels."
– *J. C. R. Licklider*

"The problems that will plague millennial man require that we restore the idea of evil, the idea of the sacred, to the center of political life."
– *Jacques Attali*

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wine connoisseur. The wino may drink more wine, but the connoisseur does more for the economy through the ripple effect, employing more people, including vintners, wine stewards, and food journalists. While the wino's absolute consumption may be higher, the connoisseur's consumptivity is higher.

If we want the economy (rather than the state) to do the job of raising purchasing power, then we need to find a way to accelerate the velocity of exchange by raising consumptivity. Yet raising consumptivity requires not only purchasing power, but also the will to consume – namely, desire.

In addressing this second component of consumptivity, we have to acknowledge that plenty of people simply don't want much. Even if they have the purchasing power, you can't get them to buy more consumer goods, or experiences, or services. Yet this nonconsumption reduces the velocity of money and restrains the wealth-enhancing capacity of the economy. Forget about the argument that such behavior helps the economy by increasing savings rates and investment in productive capacity. What good does it do to produce more goods that don't get consumed? Such productivity merely builds inventory and induces overcapacity, leading to subsequent plant shutdowns, fallow fields, unemployment, wage reduction, and a decline in the power to consume.

Beyond the ability and the will to consume, there is the knowledge of how to do so cleanly and wisely. The classic environmentalist protest to consumer-driven economic growth takes the form of this question: What if every family in China buys a car? The earth lacks the carrying capacity to allow overpopulated, underdeveloped countries to grow along the path laid down by consumers in developed economies. Such growth is ecologically unsustainable.

A new understanding of consumption, however, needs to be situated in the context of the transition from industrial economy to information economy. This third condition, the requirement for benign consumption, helps save consumptivity from attacks against base consumerism. It is a call for the sublimation of desire from materialism to etherealism – fewer durables, more intangibles: experiences, entertainment, knowledge, wisdom. Fortunately, this higher order of consumption does not obey the law of constant conservation of mass and energy. The sublime is not a zero-sum game. Consequently, increasing consumptivity can accelerate the velocity of money, create jobs, and enhance purchasing power.

Enhancing consumptivity in the economics of the sublime means educating our passions, refining our tastes, raising our appreciation for the finer things in life. Think of laughter as the consumption of a joke, and a better sense of humor as a higher level of consumptivity. Likewise, think of better health as higher consumptivity in the health care industry. Now translate that model to the rest of your desires.

*James Ogilvy* (ogilvy@well.com), *cofounder and vice president of Global Business Network, is the author of* Living Without a Goal: Finding the Freedom to Live a Creative and Innovative Life.

"Frightened by the accelerating speed of technological change, distressed by the loss of disposable income, worried about a future without jobs, and angry at the government, the electronic self oscillates between fear and rage."
– *Arthur and Marilouise Kroker*

## You Own Your Own (S)Words

By G. Beato

Despite the success of multiplayer mayhemfests like *Duke Nukem*, game developers need to ask themselves how long they can milk motivation from the same old mutant-zombies-attack formula. Well before "fast, free, guiltless killing" was a warm twitch in some SegaSoft marketing exec's loins, the wrath, vengeance, fury, rage, and madness promised by the HEAT gaming network already had bubbled over in other digital realms. The Well, for example. So why not combine the two in a bulletin board (sorry, conferencing) system where you can rationally discuss both esoterica and important issues of the day – and, when you just can't take it any more, blow opponents like the Always Right Leftist and the Flippant Fop into tiny shreds of deintellectualized meat. This would certainly make a more innovative – and compelling – kind of language game.

*G. Beato* (www.soundbitten.com/) *is a San Francisco-based freelance writer.*

"The fault lines between civilizations will be the battle lines of the future."
– *Samuel Huntington*

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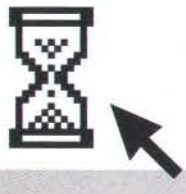

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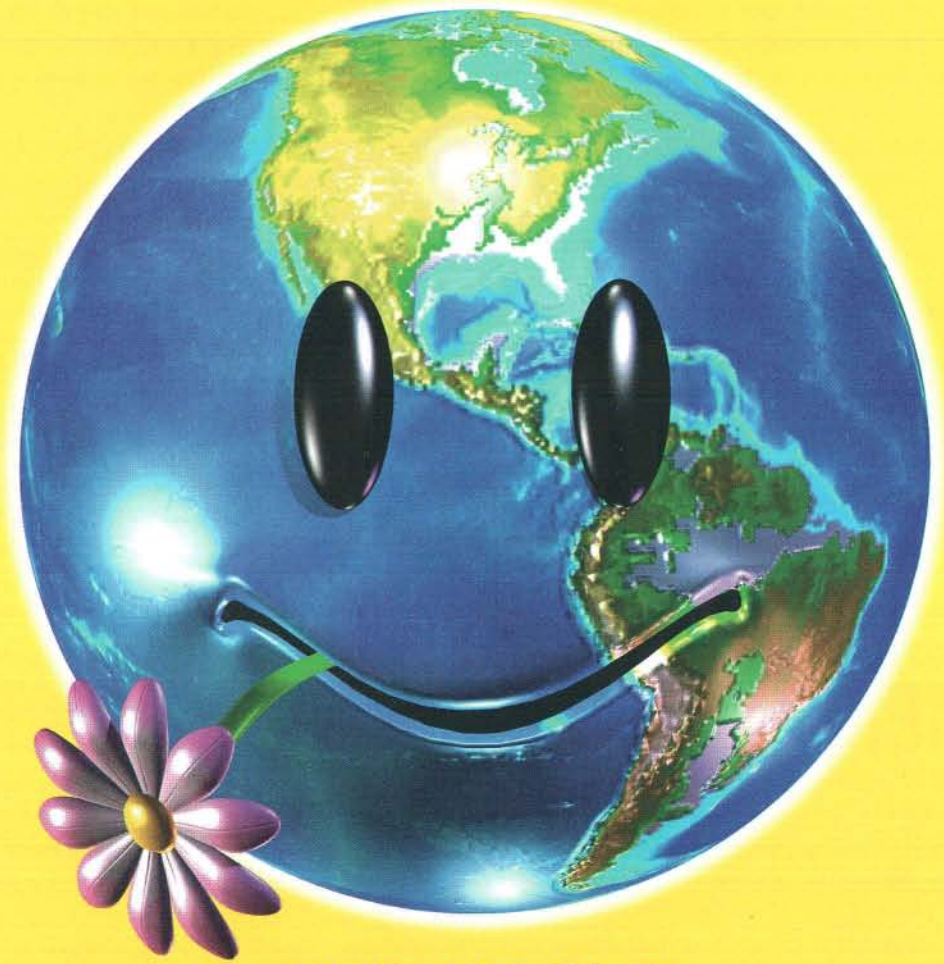
# THE LONG BOOM



A HISTORY OF THE FUTURE 1980-2020

BY PETER SCHWARTZ AND PETER LEYDEN

**WE'RE FACING 25 YEARS OF PROSPERITY, FREEDOM, AND A BETTER ENVIRONMENT FOR THE WHOLE WORLD.**

**YOU GOT A PROBLEM WITH THAT?**

www.wired.com/5.07/longboom/

IMAGE: MICHA KLEIN

## A BAD MEME – a contagious idea – began spreading through the United States in the 1980s: America is in decline, the world is going to hell, and our children's lives will be worse than our own. The particulars are now familiar: Good jobs are disappearing, working people are falling into poverty, the underclass is swelling, crime is out of control. The post-Cold War world is fragmenting, and conflicts are erupting all over the planet. The environment is imploding – with global warming and ozone depletion, we'll all either die of cancer or live in *Waterworld*. As for our kids, the collapsing educational system is producing either gun-toting gangsters or burger-flipping dopes who can't read.

By the late 1990s, another meme began to gain ground. Borne of the surging stock market and an economy that won't die down, this one is more positive: America is finally getting its economic act together, the world is not such a dangerous place after all, and our kids just might lead tolerable lives. Yet the good times will come only to a privileged few, no more than a fortunate fifth of our society. The vast majority in the United States and the world face a dire future of increasingly desperate poverty. And the environment? It's a lost cause.

## BUT THERE'S A NEW, VERY DIFFERENT MEME, A RADICALLY OPTIMISTIC MEME: We are watching the beginnings of a global economic boom on a scale never experienced before. We have entered a period of sustained growth that could eventually double the world's economy every dozen years and bring increasing prosperity for – quite literally – billions of people on the planet. We are riding the early waves of a 25-year run of a greatly expanding economy that will do much to solve seemingly intractable problems like poverty and to ease tensions throughout the world. And we'll do it without blowing the lid off the environment.

If this holds true, historians will look back on our era as an extraordinary moment. They will chronicle the 40-year period from 1980 to 2020 as the key years of a remarkable transformation. In the developed countries of the West, new technology will lead to big productivity increases that will cause high economic growth – actually, waves of technology will continue to roll out through the early part of the 21st century. And then the relentless process of globalization, the opening up of national economies and the integration of markets, will drive the growth through much of the rest of the world. An unprecedented alignment of an ascendent Asia, a revitalized America, and a reintegrated greater Europe – including a recovered Russia – together will create an economic juggernaut that pulls along most other regions of the planet. These two metatrends – fundamental technological change and a new ethos of openness – will transform our world into the beginnings of a global civilization, a new civilization of civilizations, that will blossom through the coming century.

Think back to the era following World War II, the 40-year span from 1940 to 1980 that immediately precedes our own. First, the US economy was flooded with an array of new technologies that had been stopped up by the war effort: mainframe computers, atomic energy, rockets, commercial aircraft, automobiles, and television. Second, a new integrated market was devised for half the world – the so-called free world – in part through the creation of institutions like the World Bank and the International Monetary Fund. With the technology and the enhanced system of international trade in place by the end of the 1940s, the US economy roared through the 1950s, and the world economy joined in through the 1960s, only to flame out in the 1970s with high inflation – partly a sign of growth that came too fast. From 1950 to 1973, the world economy grew at an average 4.9 percent – a rate not matched since, well, right about now. On the backs of that roaring economy and increasing prosperity came social, cultural, and political repercussions. It's no coincidence that the 1960s were called revolutionary. With spreading affluence came great pressure from disenfranchised races and other interest groups for social reform, even overt political revolution.

Strikingly similar – if not still more powerful – forces are in motion today. The end of the military state of readiness in the 1980s, as in the 1940s, unleashed an array of new technologies, not the least of which is the Internet. The end of the Cold War also saw the triumph of a set of ideas long championed by the United States: those of the free-market economy and, to some extent, liberal democracy. This cleared the way for the creation of a truly global economy, one integrated market. Not half the world, the free world. Not one large colonial empire. Everybody on the planet in the same economy. This is historically unprecedented, with unprecedented consequences to follow. In the 1990s, the United States is experiencing a booming economy much like it did in the 1950s. But look ahead to the next decade, our parallel to the 1960s. We may be entering a relentless economic expansion, a truly global economic boom, the long boom.

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*Peter Schwartz* (schwartz@gbn.org) *is cofounder and chair of Global Business Network and author of* The Art of the Long View. *Peter Leyden* (leyden@wired.com) *is a features editor at* Wired.

IMAGE: MICHA KLEIN

We are watching the beginnings of a global economic boom on a scale never experienced before. We have entered a period of sustained growth that could eventually double the world's economy every dozen years and bring increasing prosperity for – quite literally – billions of people on the planet. We are riding the early waves of a 25-year run of a greatly expanding economy that will do much to solve seemingly intractable problems like poverty and to ease tensions throughout the world. And we'll do it without blowing the lid off the environment.

Sitting here in the late 1990s, it's possible to see how all the pieces could fall into place. It's possible to construct a scenario that could bring us to a truly better world by 2020. It's not a prediction, but a scenario, one that's both positive and plausible. Why plausible? The basic science is now in place for five great waves of technology – personal computers, telecommunications, biotechnology, nanotechnology, and alternative energy – that could rapidly grow the economy without destroying the environment. This scenario doesn't rely on a scientific breakthrough, such as cold fusion, to feed our energy needs. Also, enough unassailable trends – call them predetermined factors – are in motion to plausibly predict their outcome. The rise of Asia, for example, simply can't be stopped. This is not to say that there aren't some huge unknowns, the critical uncertainties, such as how the United States handles its key role as world leader.

Why a positive scenario? During the global standoff of the Cold War, people clung to the original ideological visions of a pure form of communism or capitalism. A positive scenario too often amounted to little more than surviving nuclear war. Today, without the old visions, it's easy enough to see how the world might unravel into chaos. It's much more difficult to see how it could all weave together into something better. But without an expansive vision of the future, people tend to get shortsighted and mean-spirited, looking out only for themselves. A positive scenario can inspire us through what will inevitably be traumatic times ahead.

So suspend your disbelief. Open up to the possibilities. Try to think like one of those future historians, marveling at the changes that took place in the 40-year period that straddled the new millennium. Sit back and read through the future history of the world.

## THE BOOM'S BIG BANG

From a historical vantage point, two developments start around 1980 that will have profound consequences for the US economy, the Western economy, then the global economy at large. One is the introduction of personal computers. The other is the breakup of the Bell System. These events trigger two of the five great waves of technological change that will eventually help fuel the long boom.

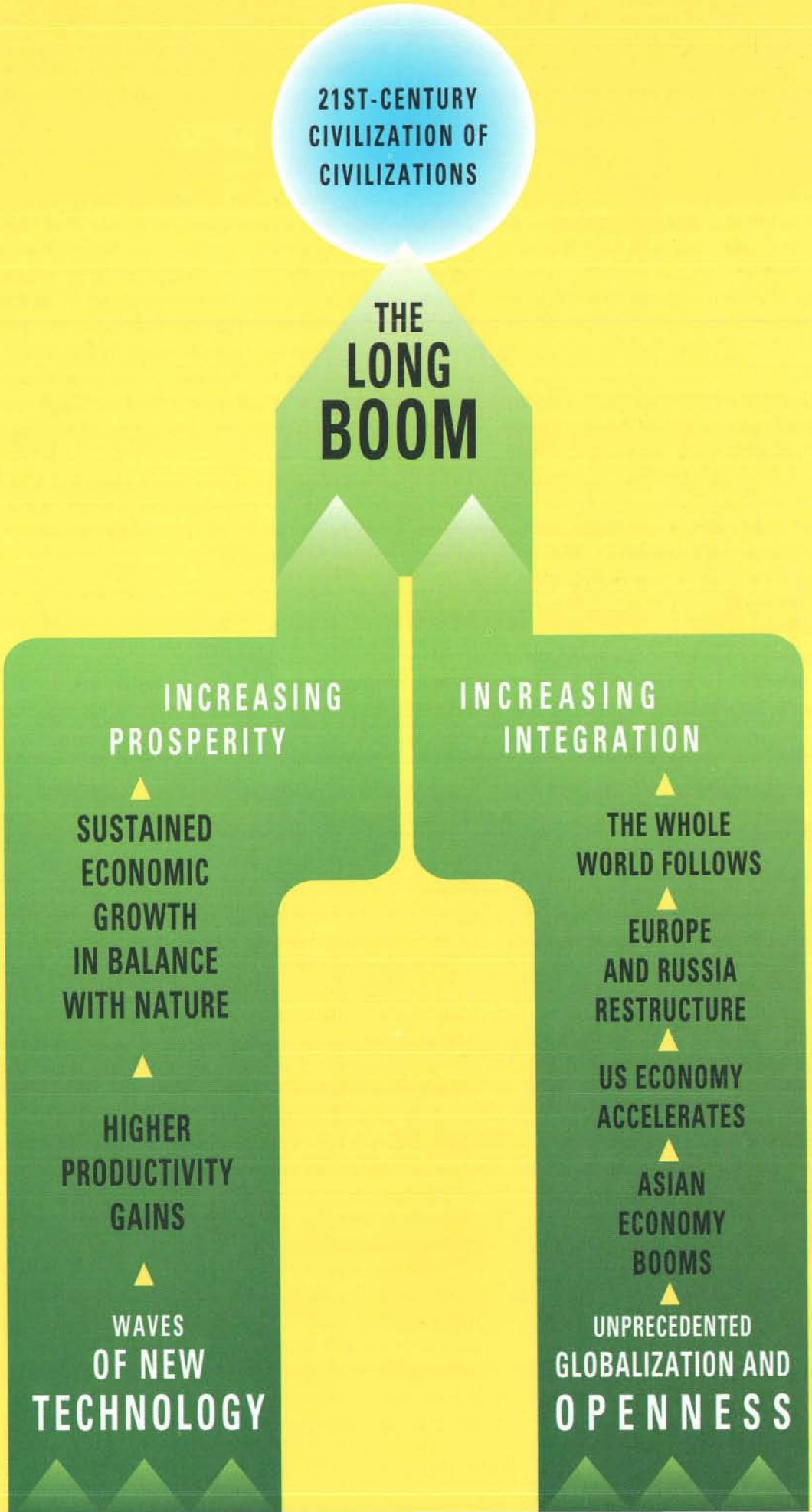
The full impact can be seen in the sweep of decades. In the first 10 years, personal computers are steadily adopted by businesses. By 1990, they begin to enter the home, and the microprocessor is being embedded in many other tools and products, such as cars. By the turn of the century, with the power of computer chips still roughly doubling every 18 months, everything comes with a small, cheap silicon brain. Tasks like handwriting recognition become a breeze. Around 2010, Intel builds a chip with a billion transistors – 100 times the complexity of the most advanced integrated circuits being designed in the late 1990s. By 2015, reliable simultaneous language translation has been cracked – with immediate consequences for the multilingual world.

The trajectory for the telecommunications wave follows much the same arc. The breakup of Ma Bell, initiated in 1982, triggers a frenzy of entrepreneurial activity as nascent companies like MCI and Sprint race to build fiber-optic networks across the country. By the early 1990s, these companies shift from moving voice to moving data as a new phenomenon seems to come out of nowhere: the Internet. Computers and communications become inextricably linked, each feeding the phenomenal growth of the other. By the late 1990s, telecom goes wireless. Mobile phone systems and all-purpose personal communications services arrive first with vast antennae networks on the ground. Soon after, the big satellite projects come online. By 1998, the Iridium global phone network is complete. By 2002, Teledesic's global Internet network is operational. These projects, among others, allow seamless connection to the information infrastructure anywhere on the planet by early in the century. By about 2005, high-bandwidth connections that can easily move video have become common in developed countries, and videophones finally catch on.

The symbiotic relationship between these technology sectors leads to a major economic discontinuity right around 1995, generally attributed to the explosive growth of the Internet. It's the long boom's Big Bang – immediately fueling economic growth in the traditional sense of direct job creation but also stimulating growth in less direct ways. On the most obvious level, hardware and infrastructure companies experience exponential growth, as building the new information network becomes one of the great global business opportunities around the turn of the century.

A new media industry also explodes onto the scene to take advantage of the network's unique capabilities, such as interactivity and individual customization. Start-ups plunge into the field, and traditional media companies lumber in this direction. By the late 1990s, the titans of the media industry are in a high-stakes struggle over control of the evolving medium. Relative newcomers like Disney and Microsoft ace out the old-guard television networks in a monumental struggle over digital TV. After a few fits and starts, the Net becomes the main medium of the 21st century.

The development of online commerce quickly follows on new media's heels. First come the entrepreneurs who figure out how to encrypt messages, conduct safe financial transactions in cyberspace, and advertise one to one. Electronic cash, a key milestone, gains acceptance around 1998. Then come businesses selling everyday consumer goods. First it's high tech products such as software, then true information products like securities. Soon everything begins to be sold in cyberspace. By 2000, online




## THE LOGIC OF THE LONG BOOM

**Two major forces – fundamental technological change and a new ethos of openness – are driving through our era, forces that could bring about the long boom, a 25-year global expansion with all its consequences.**

**Five waves of technology – computers, telecommunications, biotechnology, nanotechnology, and alternative energy – may bring about big productivity increases that lead to high rates of economic growth, in balance with nature.**

**Meanwhile, we're seeing unprecedented global integration. For the first time ever, all regions of the world are interlocking their economies and becoming increasingly interdependent.**

**Soon we may see a fortuitous alignment: Asia continues its amazing economic boom. America accelerates its tech-led economy. Europe reintegrates and recovers from its chronic economic slump. Russia breaks through in its transition to capitalism. And the rest of the world eventually follows the lead of the major powers.**

**These two metadevelopments lead to increasing integration and prosperity worldwide, which lays the groundwork for a more open global society and a civilization of civilizations in the 21st century. At least, that's the gist of the long boom argument.**

sales hit US$10 billion, still small by overall retail standards. Around 2005, 20 percent of Americans teleshop for groceries.

Alongside the migration of the traditional retail world into cyberspace, completely new types of work are created. Many had speculated that computer networks would lead to disintermediation – the growing irrelevance of the middleman in commerce. Certainly the old-style go-betweens are sideswiped, but new types of intermediaries arise to connect buyers to sellers. And with the friction taken out of the distribution system, the savings can be channeled into new ventures, which create new work.

## THE BIRTH OF THE NETWORKED ECONOMY

New technologies have an impact much bigger than what literally takes place online. On a more fundamental level, the networked economy is born. Starting with the recession of 1990-91, American businesses begin going through a wrenching process of reengineering, variously described at the time as downsizing, outsourcing, and creating the virtual corporation. In fact, they are actually taking advantage of new information technologies to create the smaller, more versatile economic units of the coming era.

Businesses, as well as most organizations outside the business world, begin to shift from hierarchical processes to networked ones. People working in all kinds of fields – the professions, education, government, the arts – begin pushing the applications of networked computers. Nearly every facet of human activity is transformed in some way by the emergent fabric of interconnection. This reorganization leads to dramatic improvements in efficiency and productivity.

Productivity, as it happens, becomes one of the great quandaries stumping economists throughout the 1990s. Despite billions invested in new technologies, traditional government economic statistics reflect little impact on productivity or growth. This is not an academic point – it drives to the heart of the new economy. Businesses invest in new technology to boost the productivity of their workers. That increased productivity is what adds value to the economy – it is the key to sustained economic growth.

Research by a few economists, like Stanford University's Paul Romer, suggests that fundamentally new technologies generally don't become productive until a generation after their introduction, the time it takes for people to really learn how to use them in new ways. Sure enough, about a generation after the introduction of personal computers in the workplace, work processes begin mutating enough to take full advantage of the tool. Soon after, economists figure out how to accurately measure the true gains in productivity – and take into account the nebulous concept of improvement in quality rather than just quantity.

By 2000, the US government adopts a new information-age standard of measuring economic growth. Unsurprisingly, actual growth rates are higher than what had registered on the industrial-age meter. The US economy is growing at sustained rates of around 4 percent – rates not seen since the 1960s.

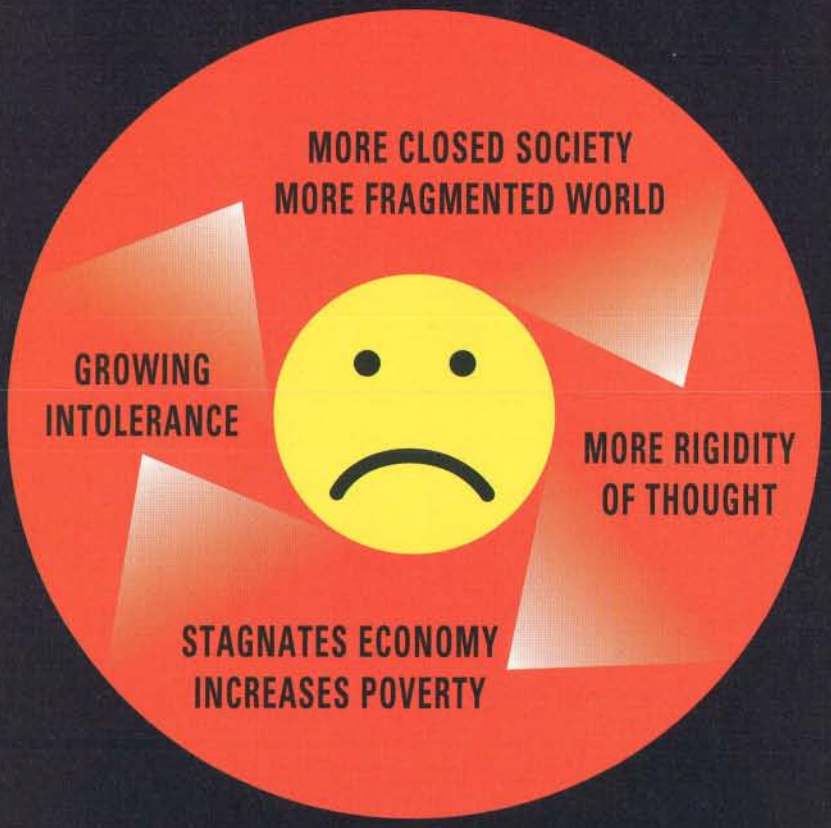
The turn of the century marks another major shift in government policy, as the hidebound analysis of inflation is finally abandoned in light of the behavior of the new economy. While the Vietnam War, oil shocks, and relatively closed national labor markets had caused genuine inflationary pressures that wreaked havoc on the economy through the 1970s, the tight monetary policies of the 1980s soon harness the inflation rate and lead to a solid decade with essentially no wage or price rises. By the 1990s, globalization and international competition add to the downward pressure. By 2000, policymakers finally come around to the idea that you can grow the economy at much higher rates and still avoid the spiral of inflation. The millennium also marks a symbolic changing of the guard at the Federal Reserve Bank: Alan Greenspan retires, the Fed lifts its foot off the brake, and the US economy really begins to take off.

## MORE TECH WAVES

Right about the turn of the century, the third of the five waves of technology kicks in. After a couple false starts in the 1980s and 1990s, biotechnology begins to transform the medical field. One benchmark comes in 2001 with the completion of the Human Genome Project, the effort to map out all human genes. That understanding of our genetic makeup triggers a series of breakthroughs in stopping genetic disease. Around 2012, a gene therapy for cancer is perfected. Five years later, almost one-third of the 4,000 known genetic diseases can be avoided through genetic manipulation.

Throughout the early part of the century, the combination of a deeper understanding of genetics, human biology, and organic chemistry leads to a vast array of powerful medications and therapies. The health care system, having faced a crossroads in 1994 with President Clinton's proposed national plan, continues restructuring along the more decentralized, privatized model of HMOs. The industry is already booming when biotech advances begin clicking in the first decade of the century. It receives a further stimulus when the baby boomers begin retiring en masse in 2011. The industry becomes a big jobs provider for years to come.

The biotech revolution profoundly affects another economic sector – agriculture. The same deeper understanding of genetics leads to much more precise breeding of plants. By about 2007, most US produce is being genetically engineered by these new direct techniques. The same process takes place with livestock. In 1997, the cloning of sheep in the United Kingdom startles the world and kicks




THE VICIOUS CIRCLE

THE VIRTUOUS CIRCLE

## CHEAT SHEET FOR THE 21ST CENTURY: CLOSED, BAD. OPEN, GOOD.

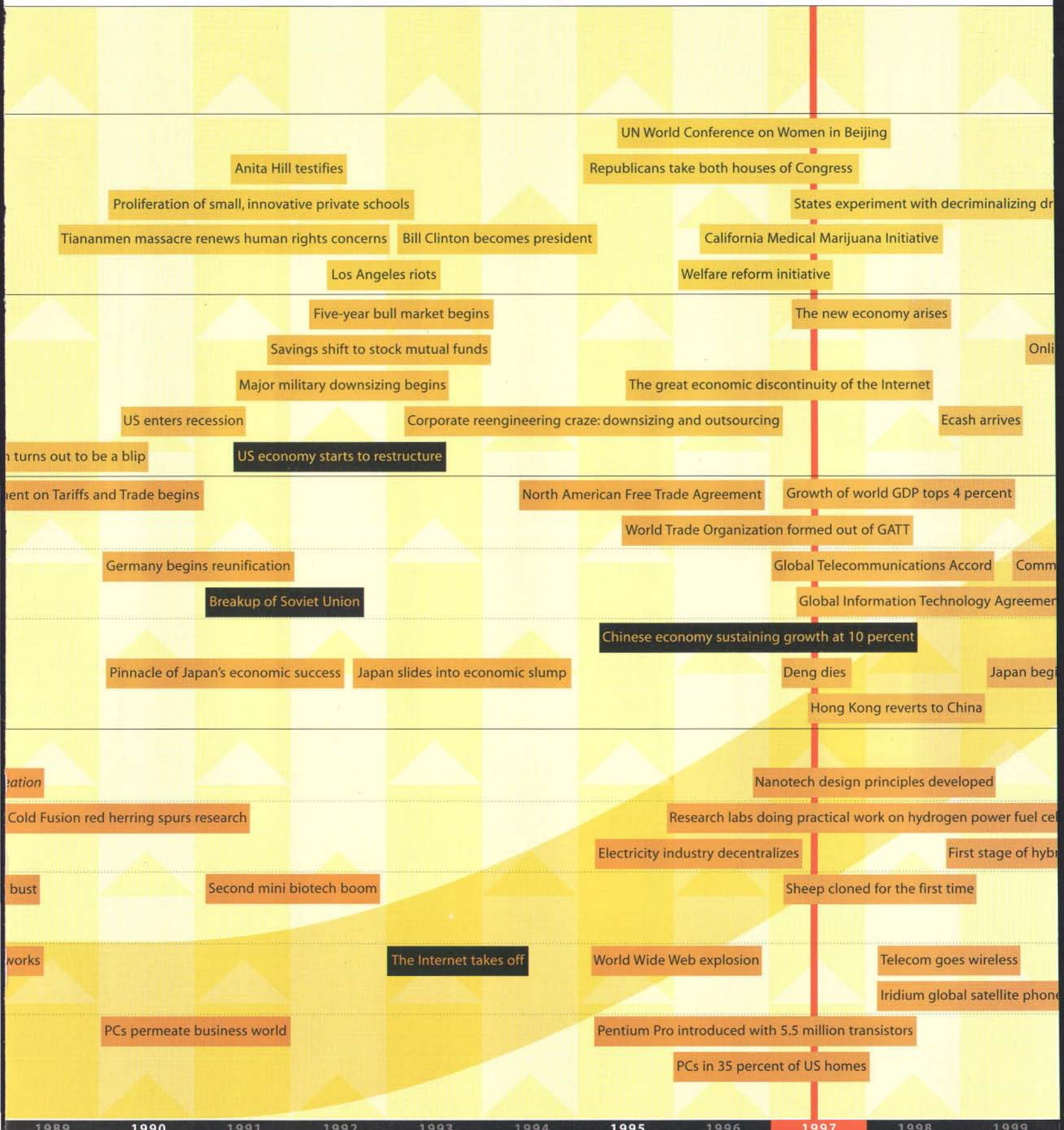
**Here's the formula for success in the coming era: Open, good. Closed, bad. Apply it to technology standards, to business strategies, to philosophies of life. That's the winning concept for individuals, for nations, for the global community in the years ahead.**

**If the world takes the closed route, it starts a vicious circle that swirls downward. Nations turn in on themselves. The world fragments into isolated blocs. This strengthens traditionalists and leads to rigidity of thought. This stagnates the economy and brings increasing poverty. This leads to conflicts and increasing intolerance, which brings about an even more closed society and a more fragmented world.**

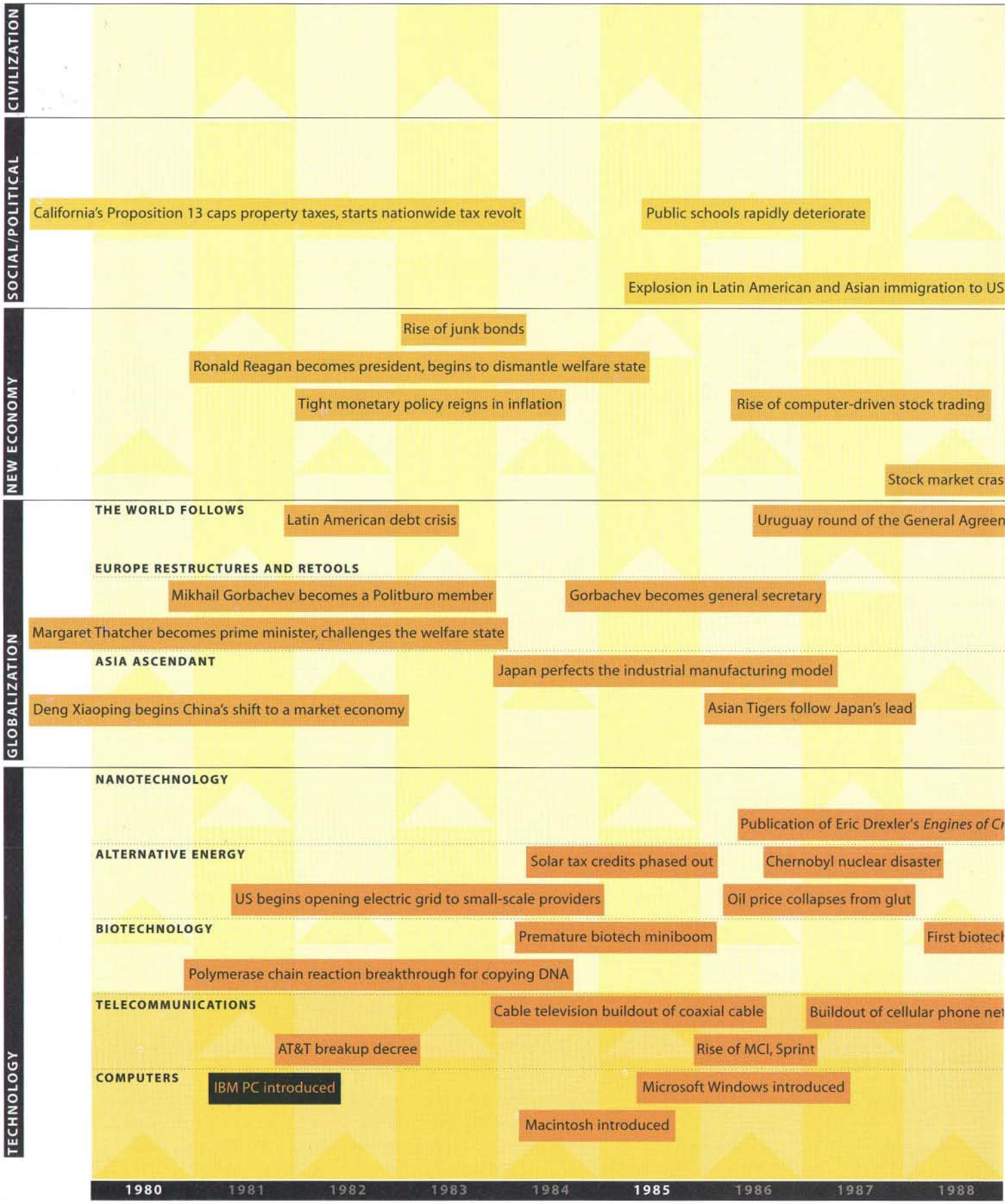
**If, on the other hand, the world adopts the open model, then a much different, virtuous circle opens up: open societies turn outward and strive to integrate into the world. This openness to change and exposure to new ideas leads to innovation and progress. This brings rising affluence for more people and a decrease in poverty. This leads to growing tolerance and appreciation of diversity, which brings us to a more open society and a more highly integrated world.**

# E FOR THE LONG BOOM

**Say we are in the midst of a 40-year millennial transition, a period that began right around 1980. Say we are on the front lip of a worldwide economic boom. Looking back, we can identify early signs of the forces that have gathered strength over the last 15 years and are now driving through our lives.**



# THE FUTURE HISTORY OF THE WORLD: A TIME LINE



off a flurry of activity in this field. By the turn of the century, prize livestock is being genetically tweaked as often as traditionally bred. By about 2005, animals are used for developing organs that can be donated to humans. Superproductive animals and ultrahardy, high-yielding plants bring another veritable green revolution to countries sustaining large populations.

By the end of the transitional era, around 2020, real advances begin to be made in the field of biological computation, where billions of relatively slow computations, done at the level of DNA, can be run simultaneously and brought together in the aggregate to create the ultimate in parallel processing. So-called DNA computing looks as though it will bring about big advances in the speed of processing sometime after 2025 – certainly by the middle of the century.

Then comes the fourth technology wave – nanotechnology. Once the realm of science fiction, this microscopic method of construction becomes a reality in 2015. Scientists and engineers figure out reliable methods to construct objects one atom at a time. Among the first commercially viable products are tiny sensors that can enter a person's bloodstream and bring back information about its composition. By 2018, these micromachines are able to do basic cell repair. However, nanotechnology promises to have a much more profound impact on traditional manufacturing as the century rolls on. Theoretically, most products could be produced much more efficiently through nanotech techniques. By 2025, the theory is still far from proven, but small desktop factories for producing simple products arrive.

By about 2015, nanotech techniques begin to be applied to the development of computing at the atomic level. Quantum computing, rather than DNA computing, proves to be the heir to microprocessors in the short run. In working up to the billion-transistor microprocessor in 2010, engineers seem to hit insurmountable technical barriers: the scale of integrated circuits has shrunk so small that optical-lithography techniques fail to function. Fortunately, just as the pace of microprocessing power begins to wane, quantum computing clicks in. Frequent increases in computing power once again promise to continue unabated for the foreseeable future.

## THE EARTH SAVER

All four waves of technology coursing through this era – computers, telecom, biotech, and nanotech – contribute to a surge of economic activity. In the industrial era, a booming economy would have put a severe strain on the environment: basically everything we made, we cooked, and such high-temperature cooking creates a lot of waste byproducts. The logic of the era also tended toward larger and larger factories, which created pollution at even greater scales.

Biotech, on the other hand, uses more moderate temperature realms and emulates the processes of nature, creating much less pollution. Infotech, which moves information electronically rather than physically, also makes much less impact on the natural world. Moving information across the United States through the relatively simple infotechnology of the fax, for example, proves to be seven times more energy efficient than sending it through Federal Express. Furthermore, these technologies are on an escalating track of constant refinement, with each new generation becoming more and more energy efficient, with lower and lower environmental impact. Even so, these increasing efficiencies are not enough to counteract the juggernaut of a booming global economy.

Fortunately, the fifth wave of new technology – alternative energy – arrives right around the turn of the century with the introduction of the hybrid electric car. Stage one begins in the late 1990s when automobile companies such as Toyota roll out vehicles using small diesel- or gasoline-fueled internal-combustion engines to power an onboard generator that then drives small electric motors at each wheel. The car runs on electric power at low RPMs but uses the internal-combustion engine at highway speeds, avoiding the problem of completely battery-powered electric vehicles that run out of juice after 60 miles. The early hybrids are also much more efficient than regular gas-powered cars, often getting 80 miles to a gallon.

Stage two quickly follows, this time spurred by aerospace companies such as Allied Signal, which leverage their knowledge of jet engines to build hybrids powered by gas turbines. By 2005, technology previously confined to aircraft's onboard electric systems successfully migrates to automobiles. These cars use natural gas to power the onboard generators, which then drive the electric motors at the wheels. They also make use of superstrong, ultralight new materials that take the place of steel and allow big savings on mileage.

Then comes the third and final stage: hybrids using hydrogen fuel cells. The simplest and most abundant atom in the universe, hydrogen becomes the source of power for electric generators – with the only waste product being water. No exhaust. No carbon monoxide. Just water. The basic hydrogen-power technology had been developed as far back as the Apollo space program, though then it was still extremely expensive and had a nasty tendency to

THE FUTURE HISTORY OF THE WORLD

A TIME LINE FOR THE LONG BOOM

**Say we are in the midst of a 40-year millennial transition, a period that began right around 1980. Say we are on the front lip of a worldwide economic boom.**

**Looking back, we can identify early signs of the forces that have gathered strength over the last 15 years and are now driving through our lives. By following that forward motion, we can rough out possible developments in the next couple decades.**

**These are not outright predictions, but informed projections. They help give shape to a positive scenario of the future, the long boom.**

blow up. By the late 1990s, research labs such as British Columbia-based Ballard Power Systems are steadily developing the technology with little public fanfare. Within 10 years, there are transitional hydrogen car models that extract fuel from ordinary gasoline, using the existing network of pumps. By 2010, hydrogen is being processed in refinery-like plants and loaded onto cars that can go thousands of miles – and many months – before refueling. The technology is vastly cheaper and safer than in the 1960s and well on its way to widespread use.

These technological developments drive nothing less than a wholesale transformation of the automobile industry through the first quarter of the new century. Initially prodded by government decrees such as California's zero-emission mandate – which called for 10 percent of new cars sold to have zero emissions by 2003 – the industrial behemoths begin to pick up speed when an actual market for hybrid cars opens up. People buy them not because they are the environmentally correct option but because they're sporty, fast, and fun. And the auto companies build them because executives see green – as in money, not trees.

This 10- to 15-year industrial retooling sends reverberations throughout the global economy. The petrochemical giants begin switching from maintaining vast networks that bring oil from remote Middle Eastern deserts to building similarly vast networks that supply the new elements of electrical power. Fossil fuels will continue to be a primary source of power into the middle of the 21st century – but they will be clean fossil fuels. By 2020, almost all new cars are hybrid vehicles, mostly using hydrogen power. That development alone defuses much of the pressure on the global environment. The world may be able to support quite a few additional automobile drivers – including nearly 2 billion Chinese.

## ASIA ASCENDANT

While the end of the Cold War initiates the waves of technology rippling through our 40-year era, that's only half the story. The other half has to do with an equally powerful force: globalization. While it is spurred by new technologies, the emergence of an interconnected planet is propelled more by the power of an idea – the idea of an open society.

From a historical vantage point, globalization also begins right around 1980. One of the souls who best articulates this idea of the open society is Mikhail Gorbachev. It's Gorbachev who helps bring about some of its most dramatic manifestations: the fall of the Wall, the collapse of the Soviet empire, the end of the Cold War. He helps inititate a vast wave of political change that includes the democratization of eastern Europe and Russia itself. To kick it off, Gorbachev introduces two key concepts to his pals in the Politburo in 1985, two ideas that will resonate not just in the Soviet Union but through all the world. One is *glasnost*. The other is *perestroika*. Openness and restructuring – the formula for the age, the key ingredients of the long boom.

An equally important character is China's Deng Xiaoping. His actions don't bring about the same dramatic political change, but right around the same time as Gorbachev, Deng initiates a similarly profound shift of policies, applying the concepts of openness and restructuring to the economy. This process of opening up – creating free trade and free markets – ultimately makes just as large a global impact. No place is this more apparent than in Asia.

Japan grasps the gist of this economic formula long before the buzz begins, pulling a group of Asian early adopter countries in its wake. By the 1980s, Japan has nearly perfected the industrial-age manufacturing economy. But by 1990, the rules of the global economy have changed to favor more nimble, innovative processes, rather than meticulous, methodical economies of scale. Many of the attributes that favored Japan in the previous era, such as a commitment to lifelong employment and protected domestic markets, work against the country this time around. Japan enters the long slump of the 1990s. By the end of the decade, Japan has watched the United States crack the formula for success in the networked economy and begins to adopt the model in earnest. In 2000, it radically liberalizes many of its previously protected domestic markets – a big stimulus for the world economy at large.

Japan's rise, however, is but a prelude to the ascendance of China. In 1978, Deng takes the first steps toward liberalizing the communist economy. China slowly gathers force through the 1980s, until the annual growth in the gross national product consistently tops 10 percent. By the 1990s, the economy is growing at a torrid pace, with the entire coast of China convulsed with business activity and boomtowns sprouting all over the place. Nineteen ninety-seven – a year marked by both the death of Deng and the long-awaited return of Hong Kong – symbolizes the end of China's ideological transition and the birth of a real economic world power.

The first decade of the new century poses many

along the time line. For example, a breakthrough in technology will – look up – affect the economy. As the economy shifts, social and political repercussions – look up again – almost certainly will follow. Finally, there are civilization-level changes, the megachanges that develop over the long haul. The civilization track is best viewed in the context of the entire 21st century. What you see here is just the start.

WIRED

By following that forward motion, we can rough out possible developments in the next couple decades. These are not outright predictions, but informed projections. They give shape to a positive scenario of the future, the long boom.

The layered tracks in the chart below show how key forces interrelate. The most fundamental has to do with the waves of technology rolling through the era. Almost equally important is the relentless process of globalization. The progression in these two tracks drives many of the changes in the economy. That's why the chart should be read from the bottom up as much as left to right

problems for China domestically – and for the rest of the world. The overheated economy puts severe strain on the fabric of Chinese society, particularly between the increasingly affluent urban areas on the coast and the 800 million impoverished peasants in the interior. The nation's relatively low tech smokestack economy also threatens to single-handedly push the global environment over the edge. The Chinese initially do little to reduce their level of dependence on coal, which in the late 1990s still supplies three-quarters of the country's energy needs. Only sustained efforts by the rest of the world to ensure that China has access to the very best transportation and industrial technology avert an environmental catastrophe. Occasionally using draconian measures, China manages to avoid severe internal disturbance. By 2010, the sense of crisis has dissipated. China is generally acknowledged to be on a path toward more democratic politics – though not in the image of the West.

With the reemergence of China's economic might, the 3,500-year-old civilization begins to assert itself and play a larger part in shaping the world. Chinese clan-based culture happens to work very well within the fluid demands of the networked global economy. Singapore and Hong Kong prove the point through the 1980s and 1990s, when the two city-states with almost no land mass or natural resources become economic powers through pure human capital, primarily brainpower.

For years, Chinese expatriates have established intricate financial networks throughout Western countries, but especially in Asia. Many Southeast Asian economies – if not governments – are completely dominated by the overseas Chinese. By about 2005, the mainland Chinese decide to capitalize on this by formalizing the Chinese diaspora. Though the entity has no legal status vis-à-vis other governments, it has substantial economic clout. That date also marks the absorption of Taiwan into China proper.

By 2020, the Chinese economy has grown to be the largest in the world. Though the US economy is more technologically sophisticated, and its population more affluent, China and the United States are basically on a par. China has also drawn much of Asia in its economic wake – Hong Kong and Shanghai are the key financial nodes for this intricate Asian world.

Asia is jammed with countries that are economic powerhouses in their own right. India builds on its top-notch technical training and mastery of the lingua franca of the high tech world, English, to challenge many Western countries in software development. Malaysia's audacious attempt to jump-start an indigenous high tech sector through massive investments in a multimedia supercorridor pays off. The former communist countries Vietnam and Cambodia turn out to be among the most adept at capitalism. The entire region – from the reunited Koreas to Indonesia to the subcontinent – is booming. In just 20 years, 2 billion people have made the transition into what can be considered a middle-class lifestyle. In the space of one full 80-year life span, Asia has gone from almost uninterrupted poverty to widespread wealth.

## THE EUROPEAN SHUFFLE

Meanwhile, on the other side of the planet, the new principles of openness and restructuring are applied first in politics, then economics. In the aftermath of the spectacular implosion of the Soviet Union, most energy is spent promoting democracy and dismantling the vestiges of the Cold War. With time, an equal amount of energy is applied to restructuring and retooling economies – in some obvious and not so obvious ways.

First, Europe at large has to reintegrate itself, both economically and politically. Much of the 1990s is spent trying to integrate eastern and western Europe. All eyes first focus on the new Germany, which powers through the process on the basis of sheer financial might. Next the more advanced of the eastern European countries – Poland, Hungary, the Czech Republic – get integrated, first into NATO, with formal acceptance in 2000, and then into the European Union in 2002. The more problematic countries of eastern Europe aren't accepted into the union for another couple years. Alongside this East-West integration comes a more subtle integration between the western European countries. With fits and starts, Europe moves toward the establishment of one truly integrated entity. The European currency – the euro – is adopted in 1999, with a few laggards, like Britain, holding out a few more years.

Though the UK may have dragged its feet on the European currency measure, in an overall sense it's far ahead of the pack. The economic imperative of the era is not just to integrate externally but to restructure internally. Right around 1980, Margaret Thatcher and Ronald Reagan begin putting together the formula that eventually leads toward the new economy. At the time it looks brutal: busting unions, selling off state-owned industries, and dismantling the welfare state. In hindsight, the pain pays off. By the mid-1990s, the US unemployment rate is near 5 percent, and the British rate has dropped to almost 6 percent. In contrast, unemployment on the European continent hovers at 11 percent, with some individual countries even higher.

Indeed, through the 1990s, the rest of Europe remains trapped in the legacy of its welfare states, which maintain their political attractiveness long after they outlive their economic worth. By 2000, chronic unemployment and mounting government deficits finally force leaders on the continent to act. Despite widespread popular protests, especially in France, Europe goes through a painful economic restructuring much like the United States did a decade before. As part of this perestroika, it retools its

economy using the new information technologies. This restructuring, both of corporations and governments, has much the same effect it had on the US economy. The European economy begins to surge and create many new jobs. By about 2005, Europe – particularly in the northern countries like Germany – even has the beginnings of a serious labor shortage as aging populations begin to retire.

Then the Russian economy kicks in. For 15 years, Russia had been stumbling along in its transition to a capitalist economy, periodically frightening the West with overtures that it might return to its old militaristic ways. But after almost two decades of wide-open Mafia-style capitalism, Russia emerges in about 2005 with the basic underpinnings of a solid economy. Enough people are invested in the new system, and enough of the population has absorbed the new work ethic, that the economy can function quite well – with few reasons to fear a retrenchment. This normalization finally spurs massive foreign investment that helps the Russians exploit their immense natural resources, and the skills of a highly educated populace. These people also provide a huge market for Europe and the rest of the world.

## THE GLOBAL STAMPEDE

By the close of the 20th century, the more developed Western nations are forging ahead on a path of technology-led growth, and booming Asia is showing the unambiguous benefits of developing market economies and free trade. The path for the rest of the world seems clear. Openness and restructuring. Restructuring and openness. Individually, nations begin adopting the formula of deregulating, privatizing, opening up to foreign investment, and cutting government deficits. Collectively, they sign onto international agreements that accelerate the process of global integration – and fuel the long boom.

Two milestones come in 1997: the Information Technology Agreement, in which almost all countries trading in IT agree to abolish tariffs by 2000, and the Global Telecommunications Accord, in which almost 70 leading nations agree to rapidly deregulate their domestic telecom markets. These two developments quickly spread the two key technologies of the era: computers and telecommunications.

Everyone benefits, particularly the underdeveloped economies, which take advantage of the leapfrog effect, adopting the newest, cheapest, best technology rather than settling for obsolete junk. IT creates a remarkable dynamic that brings increasing power, performance, and quality to each new generation of the technology – plus big drops in price. Also, wireless telecommunications allow countries to avoid the huge effort and expense of building wired infrastructures through crowded 168 ►

## TEN SCENARIO SPOILERS

**The long boom is a scenario, one possible future. It's built upon the convergence of many big forces and even more little pieces falling into place – all of them with a positive twist. The future, of course, could turn out to be very different – particularly if a few of those big pieces go haywire. Here are 10 things that could cut short the long boom:**

**1.**
**Tensions between China and the US escalate into a new Cold War – bordering on a hot one.**

**2.**
**New technologies turn out to be a bust. They simply don't bring the expected productivity increases or the big economic boosts.**

**3.**
**Russia devolves into a kleptocracy run by a mafia or retreats into quasicommunist nationalism that threatens Europe.**

**4.**
**Europe's integration process grinds to a halt. Eastern and western Europe can't finesse a reunification, and even the European Union process breaks down.**

**5.**
**Major ecological crisis causes a global climate change that, among other things, disrupts the food supply – causing big price increases everywhere and sporadic famines.**

**6.**
**Major rise in crime and terrorism forces the world to pull back in fear. People who constantly feel they could be blown up or ripped off are not in the mood to reach out and open up.**

**7.**
**The cumulative escalation in pollution causes a dramatic increase in cancer, which overwhelms the ill-prepared health system.**

**8.**
**Energy prices go through the roof. Convulsions in the Middle East disrupt the oil supply, and alternative energy sources fail to materialize.**

**9.**
**An uncontrollable plague – a modern-day influenza epidemic or its equivalent – takes off like wildfire, killing upward of 200 million people.**

**10.**
**A social and cultural backlash stops progress dead in its tracks. Human beings need to choose to move forward. They just may not ...**

# Contrarian Libertarian

Carl Malamud, defender of civil liberties, wants more – not less – government on the Internet.

By Lynn Ginsburg

**Wired: You've been in the unusual position of advocating more freedom of speech – as well as more government involvement – on the Internet. Is that a paradox?**

**Malamud:** It's really fashionable now to say that government belongs in the "real" world and that cyberspace is a new and different world, and therefore government really has no role to play in cyberspace. But if that's the way we look at it, we'll eventually end up with actual anarchy, as opposed to what the Internet is today, which is just kind of chaotic. I don't really understand where that antigovernment belief system comes from. Technology in itself is no guarantee of freedom of speech.

**What could government do to guarantee our freedoms?**

Our personal freedoms can be protected by cryptography like PGP. But patents have turned the fundamental technology behind cryptography, which we all need to use every day, into private property. The government needs to get involved and reclaim those technologies for all people.

**But the government is doing the opposite, trying to prevent the spread of strong crypto – unless law enforcement has a key to eavesdrop.**

That's just a naïve few in the government looking for some kind of magic bullet. The FBI's saying, "Well, gee, it would be great if we had the key to every conversation. We could just turn on our magic little machine and – boom – we'd have them." But that's not real police work, and that's not forensic science. Not having the magic key to the front door isn't going to make much of a difference to any investigation.

That's exactly why I think people have to be involved with government. Around the world, governments are defining the rules for the Internet now. If we don't speak up and make our views known, then we end up with misguided legislation like the key escrow and digital telephony bills and Exon amendments.

**Are there any regulations you'd like to see introduced?**

Yes, spamming and mailbombing definitely ought to be crimes. If you knowingly transmit 10,000 mail messages in a one-hour period to a particular host, I ought to be able to call the police and have you arrested.

**Won't more government and more regulation choke development of the Internet?**

There's all sorts of different degrees of government, and if all you think about is a US federal government that's doing regulation, that's a really naïve view of government. Obviously, government does many other things – especially at the local level. Working with the government at the local level builds community, and the Internet is about building community. I think we need some true public-works projects, and they might be funded by a local government group or a nonprofit funded by corporate donations. But we need to build large-scale Internet presences in the places they haven't been before.

**So government has a role in building the Internet?**

If you look at how other infrastructures were deployed, everything from electricity to radio, you'll see that what we're going through now with the Internet isn't really that much different than what we've been going through for the last 100 years. Sometimes the public loses the fight. In some places we end up with the city infrastructure planning going dreadfully awry, with strip malls and huge freeways, and no public transit and no parks. Now the Internet is another infrastructure that has to be put into that mix.

**Can government help solve Internet brownouts?**

There will always be traffic jams. You fools, it's under construction! And it always will be under construction, and you always will get those problems. But if it gets bad enough – if service providers are providing really bad service and there isn't an alternative – then maybe the government's going to have to step in and figure it out.

**Where else should we apply public money?**

We must continue encouraging Net-oriented R&D – some government, some corporate. It's critical that we keep pushing the R&D envelope, because the standards that end up coming out of that work – the World Wide Web being the best example – are the result of a long-term strategy. There was a very long beta development period for Tim Berners-Lee and the World Wide Web.

**We've talked about government. Does the Internet foster more participatory democracy?**

I don't think the Internet has ever been the kind of happy global collective where everyone did the best thing for everyone else. This is not the Rainbow Tribe. But it is an interdependent life – if I screw up my mail system, then I screw up your computer, because all my mail bounces to you and fills up your temp drive.

That may be the key aspect of the Internet – that what I do can really affect you, and because we're neighbors we damn well better learn how to work together. We may not like each other, but I'll certainly say hi when I see you on the road, because otherwise you might get pissed off and let your dog loose in my yard. ■ ■ ■

**While many Internet pioneers have turned their attention toward getting rich, Carl Malamud has remained focused on the public interest. A passionate proponent of the public's right to access government documents, the pugnacious Malamud goaded the Securities and Exchange Commission to make its data available online. He founded the Internet Multicasting Service, a nonprofit research group that was in effect the first Net radio station, transmitting live coverage from the floor of Congress. Malamud also was the force behind the Internet 1996 World Exposition, wresting cooperation from governments and big businesses worldwide to lay down a new international pipeline and set up a "Central Park" megaserver – in line with his vision of making free public spaces available on the Web. His book on the exposition, *A World's Fair for the Global Village*, will be published in September. *Wired* spoke with Malamud, who is now a visiting scientist at the MIT Media Lab, about government's role on the Net.**

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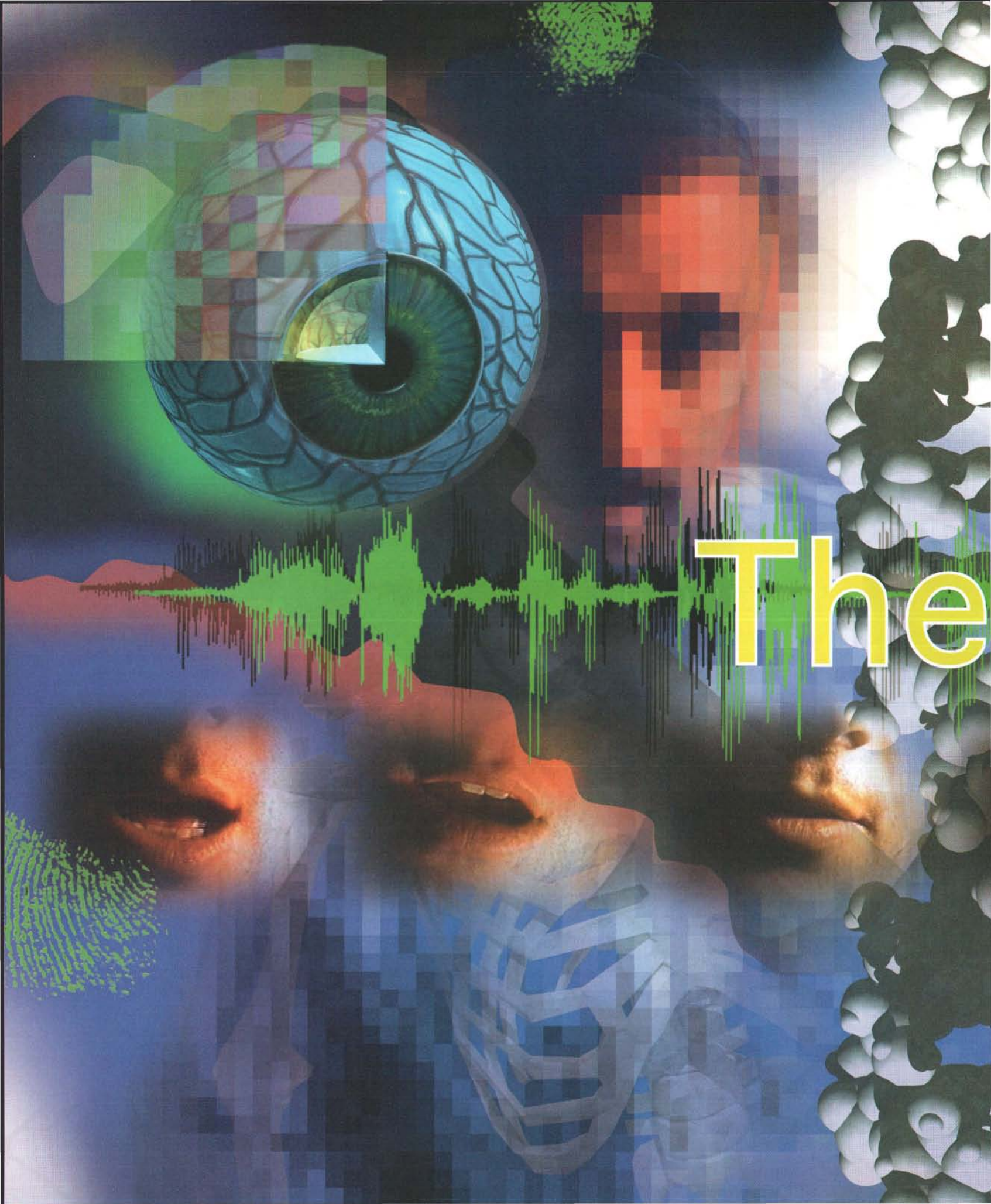
*Lynn Ginsburg* (ginsburg@ares.csd.net) *is a frequent contributor to various print and Web publications, including* Wired, *HotWired*, NetGuide, *and CNET.*

PHOTO: ASIA KEPKA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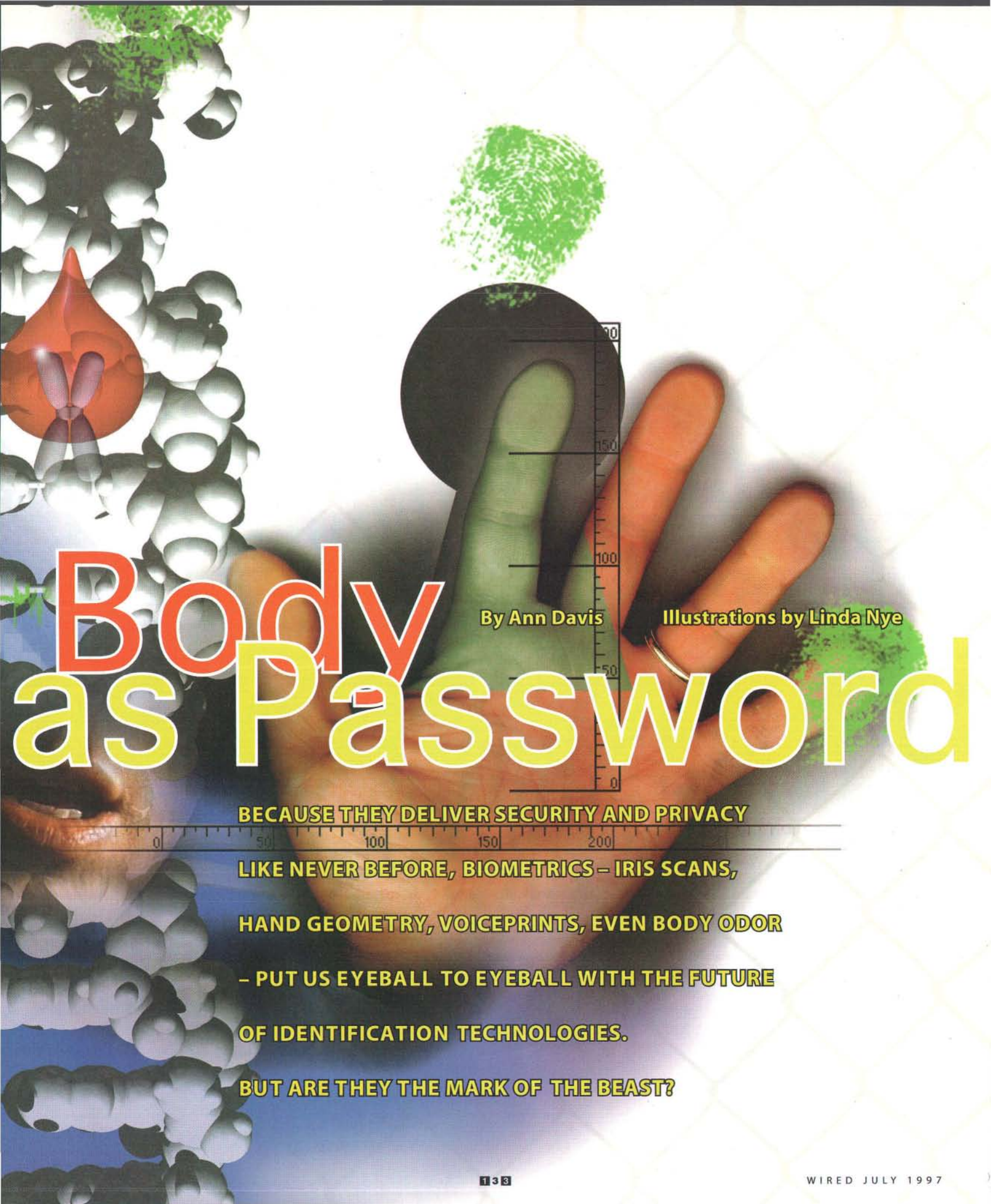


# Body as Password

By Ann Davis  Illustrations by Linda Nye

**BECAUSE THEY DELIVER SECURITY AND PRIVACY LIKE NEVER BEFORE, BIOMETRICS – IRIS SCANS, HAND GEOMETRY, VOICEPRINTS, EVEN BODY ODOR – PUT US EYEBALL TO EYEBALL WITH THE FUTURE OF IDENTIFICATION TECHNOLOGIES. BUT ARE THEY THE MARK OF THE BEAST?**

Doubters call the digital age dehumanizing, but the joke is on them: the human body lies at the heart of plans to wire banks, streamline government handouts, secure the workplace, even protect your PC. Driver's licenses, credit cards, and office keys as we know them are dinosaurs; the age of the body-part password, or *biometric*, is upon us. Our unique biological characteristics – hand geometry, eye structure, fingerprints, voice patterns, even the way we smell – are being mapped and digitized as part of a booming new industry.

www.wired.com/5.07/biometrics/

**ARE WE READY FOR THIS FORM OF BEING DIGITAL, TO HAVE PARTS OF OUR BODY AND SPEECH TRADED LIKE COMMODITIES BY BOTH DIRECT MARKETERS AND THE FEDS?**

Biometric technology operates much like the gadgets in spy flicks such as *Mission: Impossible* – computerized scanners confirm a person's identity by examining a biological feature, then matching it with a digital file containing those exact characteristics. Identifiable traits can be physical, such as hand contours or retina patterns. They can be behavioral, such as voice modulation or keystroke typing rhythms. And some can seem a little outlandish: features being tested for singularity among the planet's 6 billion people include knuckle creases, body odors, even acoustic head resonances.

So, are we ready for this form of being digital – to have parts of our fingers, eyes, and speech stored in central databases and traded like commodities by direct marketers, insurance companies, and government agencies? The smartcard and financial services industries are talking up biometrics as privacy's friend, and experts say biometric IDs are unmatched for security – you can't forge or, presumably, steal someone's body part. Come the millennium, we may be feeding pieces of ourselves into an ever-expanding array of computerized banking files, credit card registries, and state and federal databanks.

Body parts already are used as passwords in various systems, public and private: Inmates must submit to retinal scanning in Cook County, Illinois, coming and going from jail to court appearances. Connecticut and Pennsylvania are two of several states that now use digitized finger imaging to match welfare records with recipients. Frequent travelers crossing into Canada from Montana can zip through an automated voice-verification system run by the US Immigration and Naturalization Service. In the private sector, Lotus employees pass through a hand-geometry scanner to pick up their children from in-house day care. Coca-Cola is using hand geometry at the time clock to prevent workers from "buddy punching" a late colleague's time card.

Just how big is this market? There are now more than 10,000 locations – from bank vaults to blood banks – where you have to present a body part to walk in the door or access a file. The organizers of the CardTech/SecurTech trade show, an annual event since 1990 now attended by 7,000 participants, say industry revenues are expected to more than triple from almost US$16 million in 1996 to $50 million by 1999. The number of biometric devices in use is expected to jump from 8,550 in 1996 to more than to 50,000 by the end of decade.

Several products are still in their infancy, and vendors are known to exaggerate the reliability of their machines. But industry leaders claim the free market will eliminate underperformers. In the meantime, lab coats continue to search from head to toe for that elusive unerring yet nonintrusive biometric.

## BIOMETRICS: A BLUEPRINT

Enrolling your eye in an IriScan computer is like watching the opening credits of Alfred Hitchcock's *Vertigo*: your giant pupil peers out from the monitor, lashes batting, tear ducts leaking. High-resolution cameras capture the visible surface of the iris from 10 to 12 inches away, then register a 512-byte IrisCode composed of a 15- or 20-line string of numbers and letters that varies each time you look into the lens.

IriScan Inc. of Mount Laurel, New Jersey, markets its technology as "the friendly biometric." Boasting that the iris is "the most unique feature displayed on the human body," IriScan is attracting customers worldwide. Researchers at the National Institutes of Health talked to IriScan about using its machine on lab animals to alleviate the problem of pairing the wrong data with the wrong animal. Tokyo's OKI Electric Industry Company, a leading supplier of automatic teller machines, recently contracted with Sensar Inc. for $41 million to use IriScan's patented process in developing iris identification for a fleet of Japanese banks.

The next frontier, company gurus say, is computer security. IriScan is developing cameralike eyes that will sit atop a PC or behind the screen, checking at preset intervals whether the person at your keyboard is indeed sporting your iris, with all its distinctive fibers, furrows, coronas, crypts, freckles, rifts, and pits.

Another company wants to do the same with faces. "Your face is your PIN," declares the slogan for the product One-on-One, made by Identification Technologies International in Coral Gables, Florida. The system maps facial contours, recording them as digital codes. A single unit, which runs $2,000 to $3,000, includes software and is compatible with a standard PC.

Faces puffy with hangovers or water retention won't trip up One-on-One, claims Identification Technologies spokesperson Kenneth Weiss, but it may be confused by beards, glasses, or similar disguises. Citicorp is testing

*Ann Davis* (72722.1176@compuserve.com) *is a New York-based legal affairs writer.*

the system for use at its bank machines.

Moving down the body, hands and fingers hold even more promise. The market for digital finger imaging is well-developed because of a strong demand from law enforcement. Identicator, a leader in the field of digital finger imaging based in San Bruno, California, sells its fingerprint scanners for $400 to $1,000. But Identicator president Oscar Pieper hopes to mass-market his machines for $30 to $50 within a few years. Already, MasterCard is running television commercials featuring Identicator scanners. "Since the last thing you need is one more number to remember, MasterCard is developing the single-digit PIN code," the ad proclaims. "Someday a computer chip in your card will recognize your unique mark."

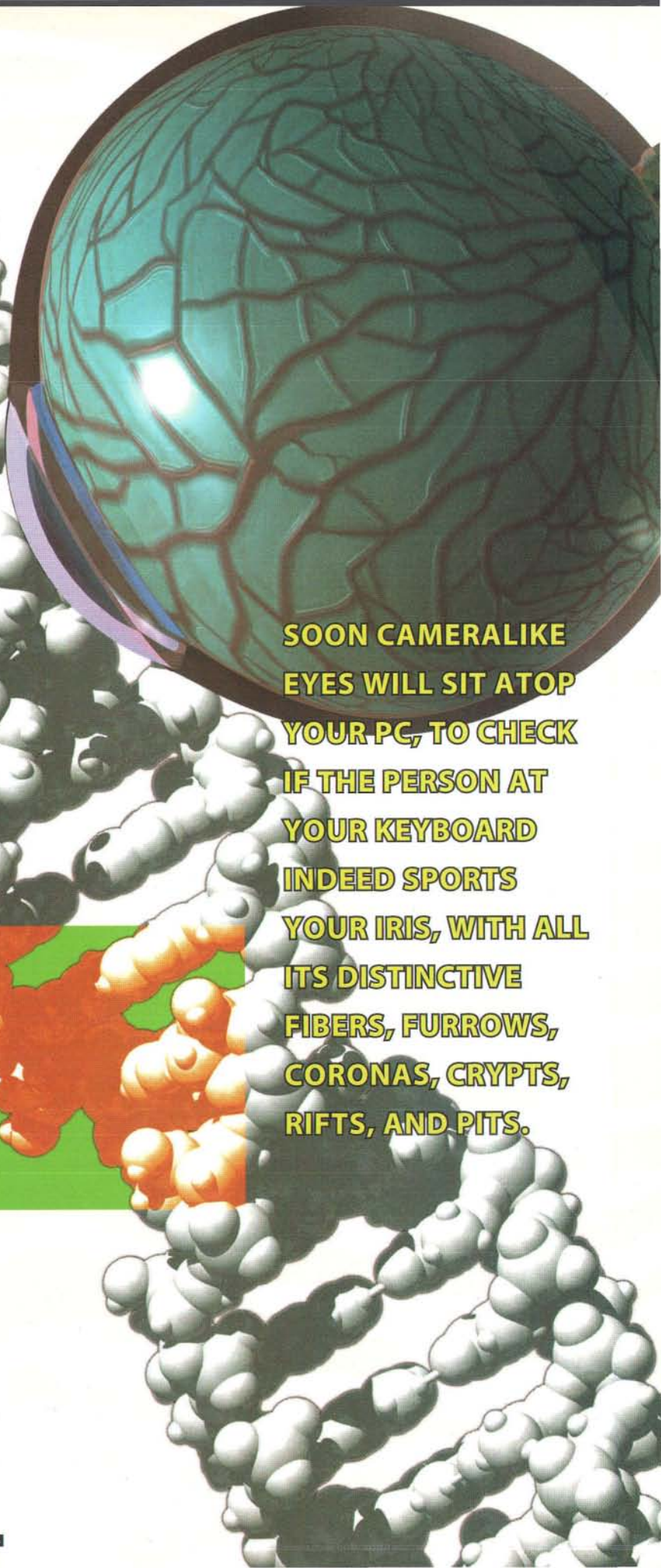
Another technology exploiting the uniqueness of our digits is finger geometry. Scanning the dimensions of one or more digits, these machines typically cost about $1,500. In 1995, The Walt Disney Company contracted with the Swiss firm BioMet Partners to test a 3-D, two-finger geometry device – the Digi-2 – at entrance turnstiles for holders of season passes to Walt Disney World in Orlando, Florida.

The first modern biometric device, which débuted more than 20 years ago at the Shearson Hamill investment bank on Wall Street, was a hand-geometry reader that measured finger length. Since then, a best-seller has emerged: the ID-3D Handkey from Recognition Systems Inc. The device scans fingers plus the tops and sides of the hand with a video camera, then converts the data with compression algorithms. Nearly 4,000 of the machines were sold in 1996. They're used at immigration checkpoints at San Francisco International Airport, for access to the Colombian legislature, and to verify the identity of donors at sperm banks.

Some vendors think the answer is not at your fingertips, but on the tip of your tongue. Voice verification is already one of the most reliable biometrics, say government researchers at the National Security Agency, which monitors its use in numerous federal computer facilities. Several states use voice recognition for parolees on home detention.

Mirroring its system in place on the Canadian border, the Immigration and Naturalization Service has conceived of a commuter lane with a "voice box" into which frequent travelers across the Mexican border will speak a phrase of their choice. (When it dawned on the Feds that a drive-through voice checkpoint might miss illegal aliens hiding in vehicle freight compartments, the INS asked a federal research lab to develop sensors that can detect heartbeats hidden in a cargo hold.)

According to *Personal Identification News*, a respected industry newsletter, major corporations, including Martin Marietta, GM, and Hertz, are protecting their computer facilities with voice technology. Voice systems also guard private estates from Silicon Valley to Latin America. 174 ►



**SOON CAMERALIKE EYES WILL SIT ATOP YOUR PC, TO CHECK IF THE PERSON AT YOUR KEYBOARD INDEED SPORTS YOUR IRIS, WITH ALL ITS DISTINCTIVE FIBERS, FURROWS, CORONAS, CRYPTS, RIFTS, AND PITS.**

# GUNN CLUB

**Tech talk show host Moira Gunn on clueless politicians,**

**Ten years ago, Moira Gunn cleared her throat, leaned into a microphone at KUSF in San Francisco, and began the first broadcast of *Tech Nation ... Americans & Technology*, an innovative weekly program that explores the way technology reshapes our lives. After 400 interviews with everyone from Edward Teller to Scott Adams, Gunn, a former NASA computer scientist, remains the grand dame of tech talk, broadcasting over PBS to nearly 100 domestic radio stations and to millions of listeners throughout the world over Armed Forces Radio.**

**Wired: When you started, computer shows were pretty rare. Now we're overrun. Do you find it hard to compete, particularly with the influx of splashy tech TV programs?**

**Gunn:** Not really. To me, radio and TV are both visual mediums. On the radio, I'm having a private conversation with my listeners in which I try to draw pictures with my words. And this gives me many advantages over TV. We had Carolyn Huntoon, director of NASA Johnson Space Center, for instance, and she was telling a great story about what happens to astronauts when they're in space for long periods – loss of bone mass, things like that. Her voice, in isolation, was absolutely mesmerizing. But her face didn't move. On a television screen, she would have been dead meat. So I don't see the TV competition as bad. Right now, we're trying to make sense of an overwhelming wave of life-changing technology. People are desperate to make sense of it. There are so many computer shows out there because there's an underlying panic.

**Panic about what?**

Fundamental changes in the business world, for instance. The corporation as we know it is dying. There weren't a lot of great corporations before the industrial age, because they couldn't communicate plans up and down. Napoleon's army showed how to organize a big group of people to do anything. The key was command and control. You couldn't tell the whole plan to everyone, so you'd communicate only the part that was needed to get the job done. The first modern corporations modeled themselves on this. But now that doesn't work; all the data is networked and available to everybody. Decisions can be made at a far lower point in the organization. But people in their hearts still want to act like Napoleon.

**How about on a societal level? Where can adjustments be made?**

We can start by clearly differentiating between public information, which should be available to everybody, and private information, which should be available to no one. Information technology sometimes makes our lives a sieve. You should have to give permission before somebody like TRW starts selling information about your private life. My fear is that we're spreading a lot of wrong information. Just because it's online doesn't make it true. We're heading toward something called the Pierre Salinger syndrome, which is endemic to people who have not hung around the new technology and are fooled by its shortfalls.

**Looking back, what promising technologies turned out to be the biggest disappointment?**

I don't believe there are any dead-end technologies. It's just that their time hasn't come; they require other technologies to bloom. Twenty-five years ago, color graphics seemed to be the hottest thing ever. Everybody got real excited. But there just wasn't enough computing power around, there weren't enough applications, and so it didn't make practical sense. Today color monitors are a dime a dozen. Artificial intelligence hasn't died – its time hasn't come.

**If you squint into the future, who is going to be on your 20th-anniversary show?**

Definitely politicians, because they're so blatantly uninformed, both specifically and conceptually about technology and its impact. They need to be forward-thinking and visionary. I'm not talking about command-and-control leadership so much as leadership about where we're going. What we can really do, how we can foster a society that is really good for everybody.

**So you were not impressed by Bill Clinton and Al Gore yanking coax cable through a few high schools for NetDay?**

Please. Don't come out here with your polo shirts and string wire through these schools when there are no computers to hook them to, when we're letting teachers go. It's insulting. I didn't hear enough philosophy of education or enough sense of where they're going to send these kids.

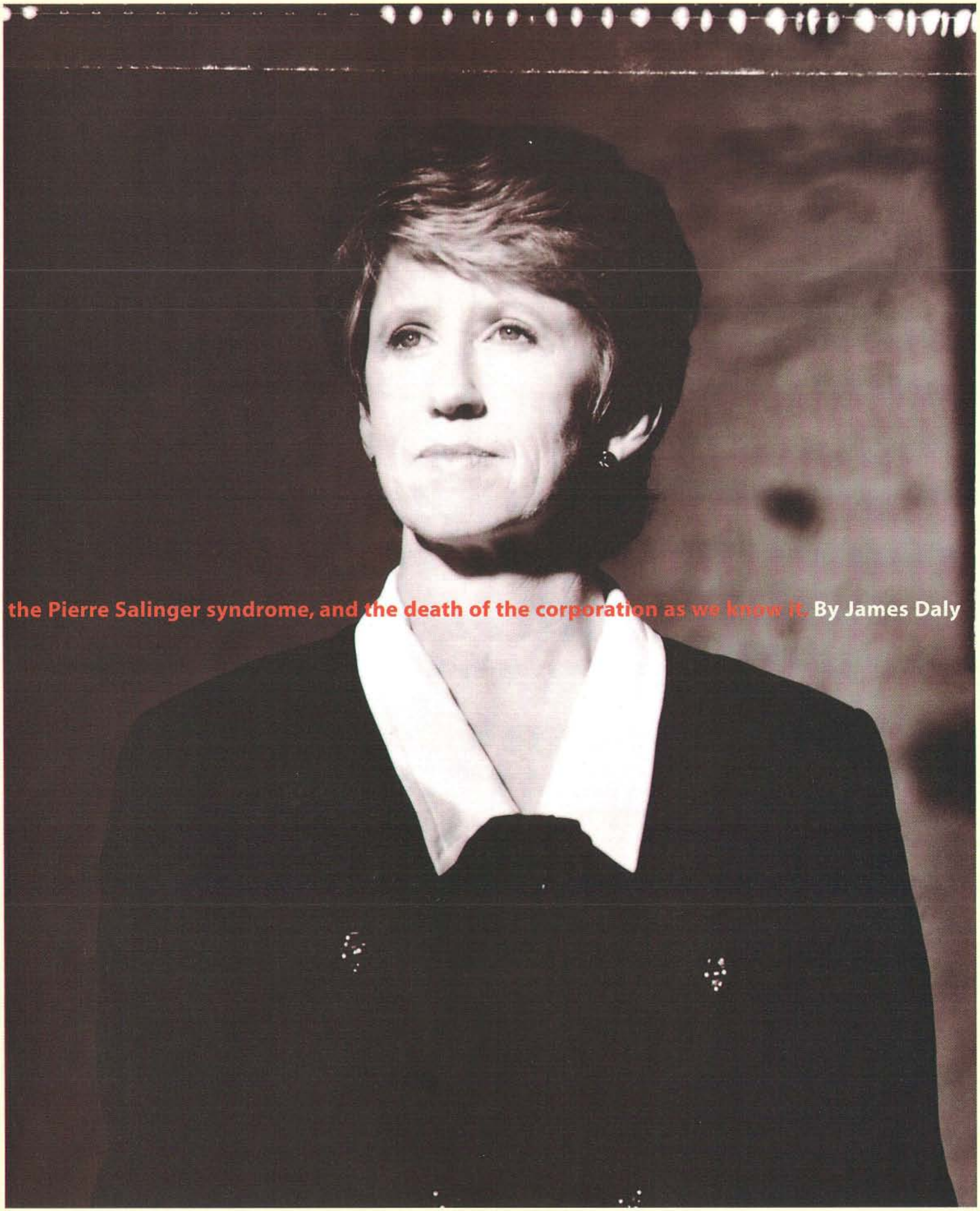
**Any guests who stand out over the years?**

Charlie Trimble, who invented one of the first handheld GPS devices, told me about traveling in Africa on the road coming north out of Nairobi. There's a big setup there – souvenir stands, food, a big sign saying you've reached the equator. Charlie's friends are taking a picture of him with the new GPS when he looks down and discovers they're not at the equator! The GPS is showing that it's up the road. So they find the mayor of this little hamlet, and they explain about these satellites going around the earth and everything and tell him that the real equator is a mile up the road. The guy says: Oh, we knew that. But the parking up there is terrible. ■ ■ ■

*James Daly* (jdaly@wired.com) *is a features editor at* Wired.

**Chat with Moira Gunn live Wednesday, June 25, at 6 p.m. PDT in the Wired Talk room at *www.talk.com/*.**

PHOTO: JOHN WESLEY LEMON



the Pierre Salinger syndrome, and the death of the corporation as we know it. By James Daly

# LOCO MOTION

California comic book artist Mark Landman seems to unscrew a cap on the top of his head and plunge a probe into his brain – a probe that draws out his religious fervor and alien sense of humor, then renders the mutated archetypes to his SGI workstation. Influenced by Chester Gould ("Wonderfully sadistic stuff; how they allowed *Dick Tracy* to be published in the paper I'll never know"), Landman recently finished a new comic called *Blue Loco* – think *Toy Story* written by Philip K. Dick and directed by Salvador Dali. – *Mark Frauenfelder*

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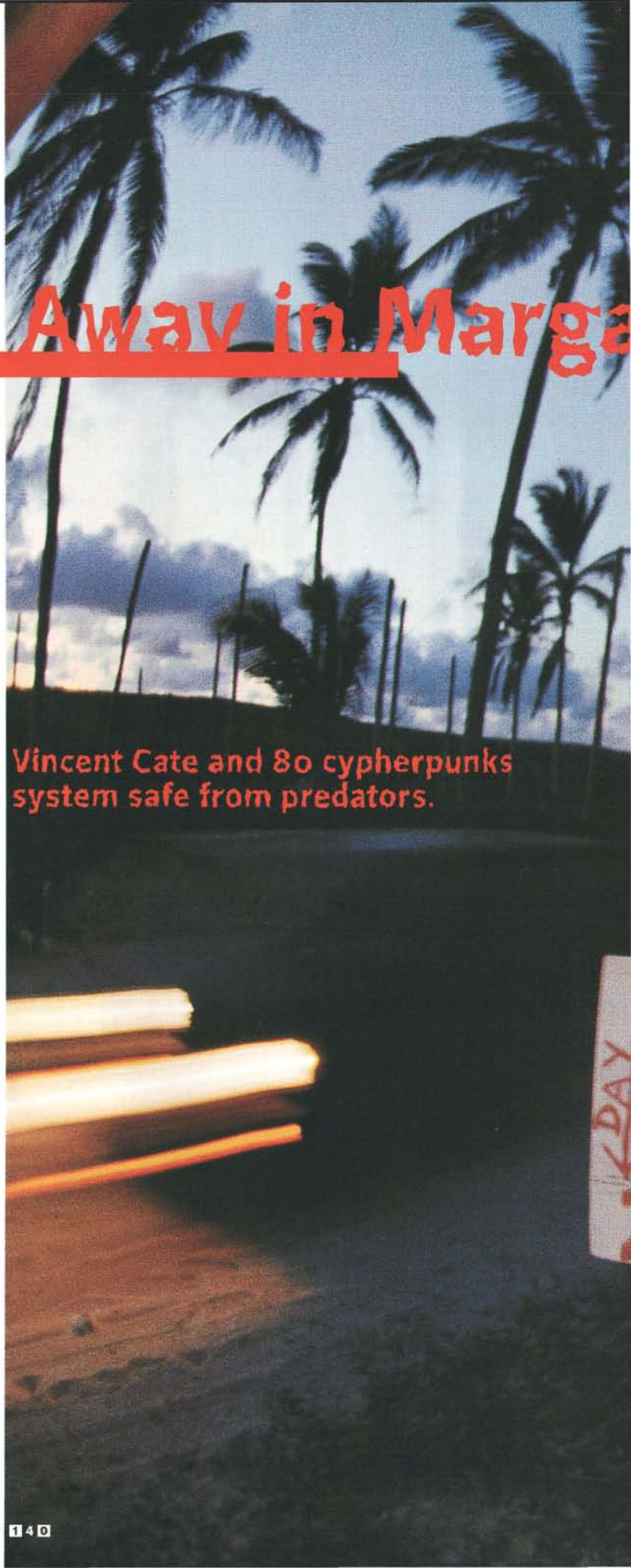
*Mark Frauenfelder* (mark@wired.com) *has his tentacles dipped into many Wired Ventures pies.*

# Plotting Away in Marga

By Charles Platt



**On a steamy Caribbean island, Vincent Cate and 80 cypherpunks gathered to make the global financial system safe from predators. Including governments.**

Monday night in Anguilla. The ceiling fan makes an oil-starved groaning sound while blood-drunk mosquitoes dance in the churning air. My hotel room has an impoverished look, with doors hacked out of plywood and bumpy walls daubed with latex white. There's no chair, no table, no phone, no TV, not even a lock on the door – just two creaky old twin beds and a bureau that might have been salvaged from a yard sale. To switch on the bathroom light I must tighten a bare bulb in an antique porcelain wall fixture that dangles from one screw; when I run water into the sink, much of it leaks from the waste pipe onto my feet. Of course, for US$35 a night I wasn't expecting a mint on my pillow – but here I'm more likely to find a stray gecko.

Outside, a car approaches on South Hill Road, a narrow strip of unmarked, eroded asphalt that runs the length of this island in the British West Indies. The car stops, a door slams, and snatches of manic chatter float through the heavy air: "... differential fault analysis ... hash functions ... TCP/IP on a proxy server ... export licenses for triple-DES under ITAR...."

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*Charles Platt* (cp@panix.com) *wrote "Digital Ink" in* Wired *5.05.*

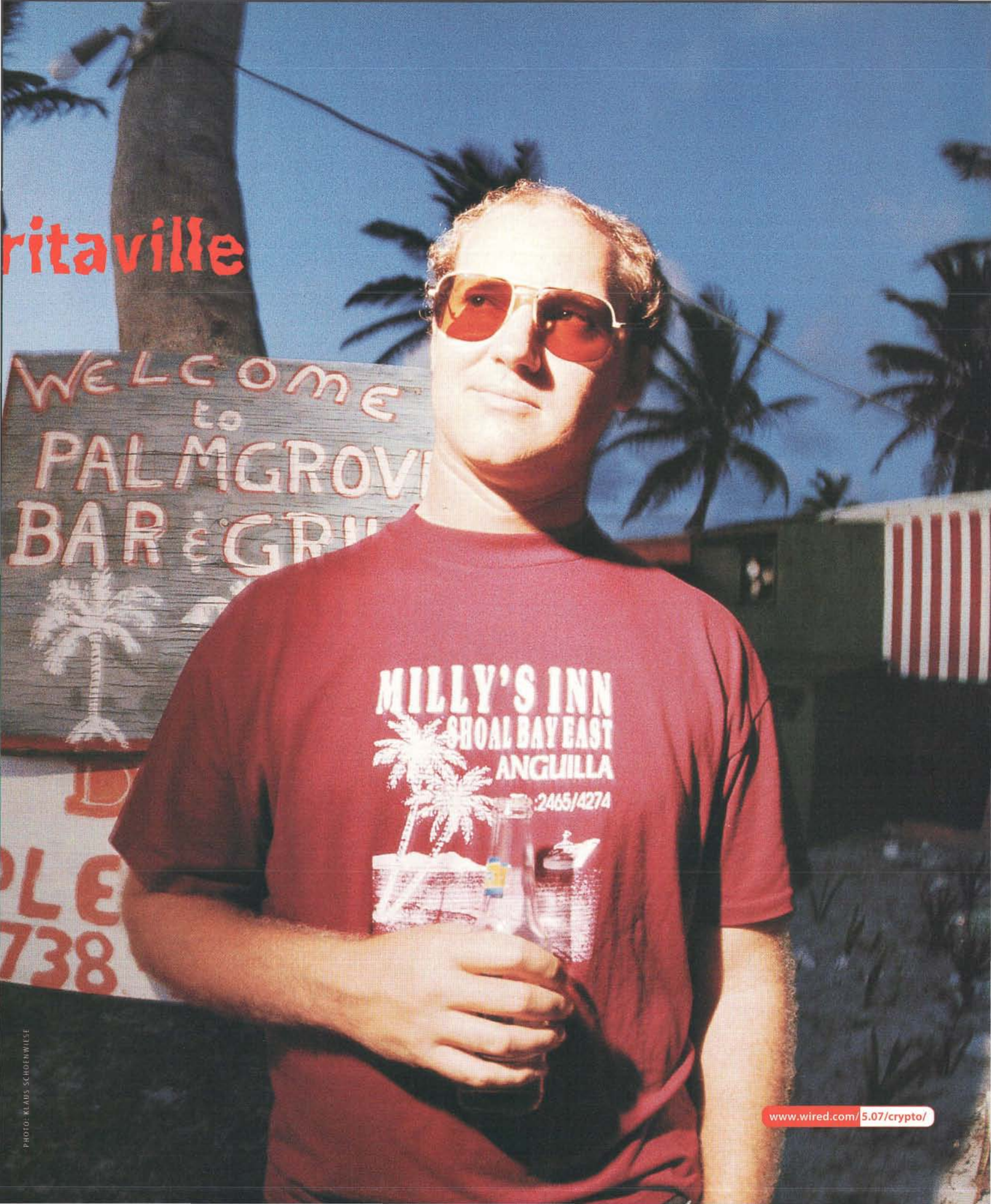



PHOTO: KLAUS SCHOENWIESE

Their voices build to an excited torrent of acronyms, then fade as the geeks enter the hotel lobby.

Nerds in Anguilla? Indeed, almost 80 of them. From the United States, Canada, Britain, Germany, France, Mexico, Hong Kong, and parts unknown they have congregated like squirrels scenting food at a picnic. Together they constitute a singular event: FC97, the First International Conference on Financial Cryptography – five days in February of relentlessly technical tutorials in this, um, tropical vacation paradise.

### Room with a view of the future

*Financial cryptography?* It sounds dull and incomprehensible. Still, if you spend money, it's likely to change your life.

This is a crucial time, when giddy prophecies about electronic commerce may soon be fulfilled. With electronic money online from DigiCash to Cybercash, and soon from Digital ... smart-card schemes from Mondex and Hewlett-Packard ... an e-commerce announcement expected from Microsoft ... a whole new financial-transaction operating system based on Java ... within a few years millions of people should be making purchases, paying bills, trading stocks, even obtaining loans via the Net.

How much this will all be worth remains educated guesswork. Suppose we have 10 million Net users each making an average of $10 in online purchases every month; that's already more than $1 billion of annual cash flow. Suppose people start settling credit card accounts and utility bills electronically. Suppose emoney takes off faster than email – suddenly everyone has an account. IDC, the Boston-based research house, estimates that online commerce will be worth $119 billion by 2000.

**It's a crucial time when giddy prophecies about e-commerce may soon be fulfilled.**

However, this can happen only if systems are secure – *very* secure – which means strong encryption. US financial institutions are allowed to use strong code for international transactions, but the Clinton administration has waged a ferocious, tenacious campaign to discourage everyone else, supposedly to protect us from "the terrorist threat." Earlier this year, a platoon of Clintonites visited several cities across the US to make presentations to audiences of local skeptics and argue the case for the policy now known derisively among cypherpunks as GAK (government access to keys).

But are coded messages among terrorists really what worries the government? The crypto that hides criminal communications is no different from that which can hide everyday consumer transactions; if the flow of money among citizens becomes invisible in this way, currency regulations become unenforceable and taxes are uncollectible. Thus, unrestricted encryption could seriously undermine the powers of government – which may be the main reason France, China, Belgium, Russia, and Israel have restricted citizens' ability to encrypt messages.

Still, a loose-knit coalition continues to fight back. It includes academics, who have laid the seemingly innocent theoretical foundations of cryptography, and cypherpunks, mostly anarchists and libertarians, who won't rest till every Net user is immune to government surveillance.

Perhaps it seems far-fetched that socially dysfunctional, long-haired computer geeks could render governments impotent or financial institutions obsolete. Yet PGP – Pretty Good Privacy, the "people's encryption software" – was developed by just one antiauthoritarian agitator, Phil Zimmermann. After PGP was distributed free across the Net, federal prosecutors began investigating Zimmermann in 1993, threatening him with a possible 52 months in prison for allowing the export of a "munition." Almost three years later, the investigation was dropped, and PGP has now become a viable commercial product. Score: Zimmermann 1, State Department 0.

The message? Don't underrate academics and cypherpunks. But why have they chosen to have a summit meeting on an obscure Caribbean island where there seems to be more goats than people? Two reasons: 1) Anguilla is a tax haven with a Bahamian-style banking system, and 2) Vincent Cate lives here.

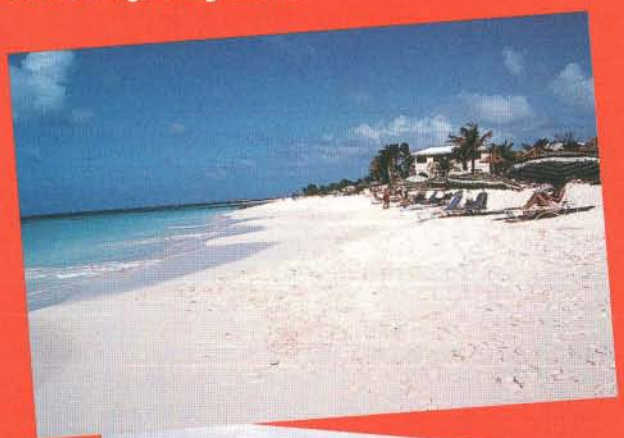
When Cate was a grad student at Carnegie Mellon University, for his PhD thesis he devised a radically improved system built on top of FTP, to make files on the Net as easily accessible as those on your hard drive. Then the World Wide Web clicked and FTP was forgotten, prompting Cate to abandon his thesis, quit college, and think about getting into Net commerce. As a serious libertarian, he resented paying half his income to the government, so he went shopping for a country that would demand less while being friendly and safe.

Late in 1994, around the time of his 31st birthday, he ended up 200 miles east of Puerto Rico, in Anguilla, where there are no income or corporate taxes. Or sales tax.

"It's a $500-a-month rental with a million-dollar view," he says with contagious positivism as he stands in his living room, gazing out the windows. I see a rutted dirt road, some power lines, and boxy little houses made from concrete blocks scattered across a hillside of dry scrub. But beyond these dissatisfying details, ah, *there* is the view – a strip of sparkling ocean and the mysterious, gray, mountainous silhouette of Saint Marten, a neighboring island straight out of a swashbuckling Robert Louis Stevenson novel.

Inside, Cate seems less concerned with visual perfection. He rents the place furnished, complete with a flower-patterned couch and a black-velvet painting of native islanders against a lurid sunset. Instead of doing anything about this suburban traditional decor, in typical nerd fashion he's simply layered the place with books, papers, computers, and cabling.

**When 80 nerds piled on to the rustic island of Anguilla, it felt like home away from home – codeheads are notoriously indifferent to creature comforts. The five-day crypto conference kept them embroiled each morning in high tech powwows, but afternoons they were free to roam the beaches or knock back cocktails at Willie's Inn (above). At departure, all agreed it had been a tough assignment.**



PHOTOS: CHARLES PLATT

This is the kind of home where you don't hesitate to put your feet up on the couch, and Cate does exactly that as he starts reminiscing about his early days in Anguilla. "I wanted to start an Internet bank," he says. "I would take money in with credit cards, hold it for 90 days to guard against cancellations, then issue the electronic cash. But the local banks didn't like the idea of me accepting credit card numbers over the Internet, and I was forced to deal with them, because Visa and MasterCard require merchants and their banks to be in the same country so they're under the same laws."

As a fallback, he started offering Net access to local residents via a single phone line. People could dial in, download their email, read it offline, then upload their replies.

Cate now maintains a Web server that hosts pages for businesses wanting to operate from a tax-free location, and he has many more ideas for the future, such as an information exchange listing potential sellers and buyers of stocks online. The SEC wouldn't like this, but in Anguilla it might be possible.

Wearing a Matt Groening "Life in Hell" T-shirt, black denim shorts, and leather sandals, Cate toys with a Rubik's cube and speaks abstractedly, as if his brain is multitasking during our conversation.

But when I ask him about the bigger picture online, he pulls himself into a sitting position and gets serious. "I believe that if there is widespread use of encryption," he says, "the Internet is going to drastically change society. You'll be able to do your business offshore, with complete privacy, and many forms of taxation won't really be possible. Ten years from now, well over 50 percent of pure Internet businesses will be incorporated in tax havens and will have their Web pages in tax havens. They'll be able to keep all their money instead of just half, and they'll have none of the paperwork hassles that you have in the United States."

No surprise, then, that when a cypherpunk named Robert Hettinga suggested a conference on financial cryptography, and MIT academic Rafael Hirschfeld agreed to recruit participants using his status as an emoney researcher, Cate agreed to host the event. It was timely, it was vital, it might turn a profit, and it should attract some interesting people.

The scheme worked: He has more visitors than he knows what to do with, including a half dozen cryptoanarchists who have eschewed hotels and are using his home as a crash pad. Cate, however, is literally above it all. He's very civilized, very polite, and at 6 foot 4 he always seems to be looking over people's heads, toward something that only he sees. Perhaps it's another million-dollar view – not of the landscape outside his window but of the Net's future. The immediate prospects may be somewhat dissatisfying, like the hillside of scrub below his terrace, but beyond that ... ah, *there* lies the vista of Internet commerce.

### Remote possibilities

The conference schedule is a killer: six or seven highly technical presentations every day, from 8:30 a.m. till 12:30 p.m. In the afternoons, though, there's nothing at all, because Cate and Hettinga assume that everyone will want to be on the beach.

Here we are at a scenic cove where pirates, rum smugglers, and slave traders once made landfall, and the ocean's vivid

azure looks artificially enhanced. At sunset, in a colorfully painted shack on the white sand, a cocktail party is hosted by Lynwood Bell, a stern but hearty character who projects an image of corporate respectability that is entirely appropriate, since he owns Hansa Bank, based here on the island.

"Anguilla used to have a large number of offshore banks," he says. "But several years ago a British commission reviewed their records – and today only mine remains."

Yes, Anguilla still has colonial status, with both a governor and some pressure from Britain to maintain a respectable image. Bell says he values the stability that this encourages, because "it would be much harder to corrupt the government here than in some other Caribbean countries." (He won't say, but he's probably thinking of Antigua or Saint Kitts and Nevis, where there have been memorable scandals.)

To what extent does his bank assure privacy? "Anguilla has strong secrecy laws," he says, sounding cautious. "But we do *not* provide secrecy from money laundering and fraud."

Bell used to be the Canadian staff sales manager for IBM, so he has no trouble seeing "an expanse of possibilities" to be opened up by the Internet, and his vision sounds remarkably similar to Cate's: "Companies are going to want to set up their business on the Internet in a country where they get freedom from taxation." In fact, he already has an agreement with Internet service provider UUNet Canada to provide "location-optimized commerce on the Internet."

But suppose I form a corporation in Anguilla, put up a Web page on Cate's server, and open an account at Bell's bank while I remain physically in the US. Does that really exempt me from American corporate taxes?

"Quite possible," Bell claims. "Tax authorities always ask if there is 'mind, management, and substance' in a country, or just nominees doing things. A server here, with transactions going through it, adds to the mind, management, and substance. If an offer is made on Vince's Web site, under British common law, the offer was made in Anguilla. If the offer is accepted, I define that as where we check the person's credit. We do the credit check from here – electronically, of course."

So, Bell has his niche market carefully mapped out, and now he's just waiting for Net businesses to realize what a deal they're missing. (He isn't interested in individuals wanting private bank accounts; only corporate customers.)

Meanwhile, also at the party is the Honorable Victor F. Banks, minister of finance, planning, and economic development in the Anguilla government. He's a barrel-chested, hardy man who's treating all the guests with scrupulous respect – even the hairiest types who look really twisted and paranoid. For all he knows, they may be architects of online commerce, and Anguilla wants a piece of it.

**Anguilla still has British colonial status.**

Banks gives me a straight sales pitch for his country. "Here in Anguilla we are well situated for Internet commerce. Our banks are well regulated, clean, secure; we are very vigilant against criminal activity; we have strong rules against money laundering and traffic in illegal drugs. We have mutual legal assistance with the US that allows it to get information from us about any clientele involved in criminal activity, although it can't go on fishing expeditions to find out about tax avoidance."

Fine – except that this sales pitch is designed for the wrong audience. Most cypherpunks don't give a damn about money laundering or illegal drugs; they tend to view government as an archaic encumbrance ripe for demolition. Banks seems naïvely unaware of this, and I can't help wondering how his government will react when it learns the truly subversive nature of Internet activism.

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## BULLET PROOF

"The three great elements of modern civilization," said Jean Paul Richter, "are gunpowder, printing, and the Protestant religion." Each of these emerges from Robert The's series of Bible guns, a sly synthesis of Western history, the American soul, and a certain skill with a scroll saw. The Illinois artist says he prefers to work with Gideon Bibles from used bookstores, because someone had to steal them in the first place. In The's hands, the Word ends with a bang, not a whimper.

For more irreverent texts, set your sights on *www.enteract.com/~the/bookgun.htm.* – *Tom Claburn*

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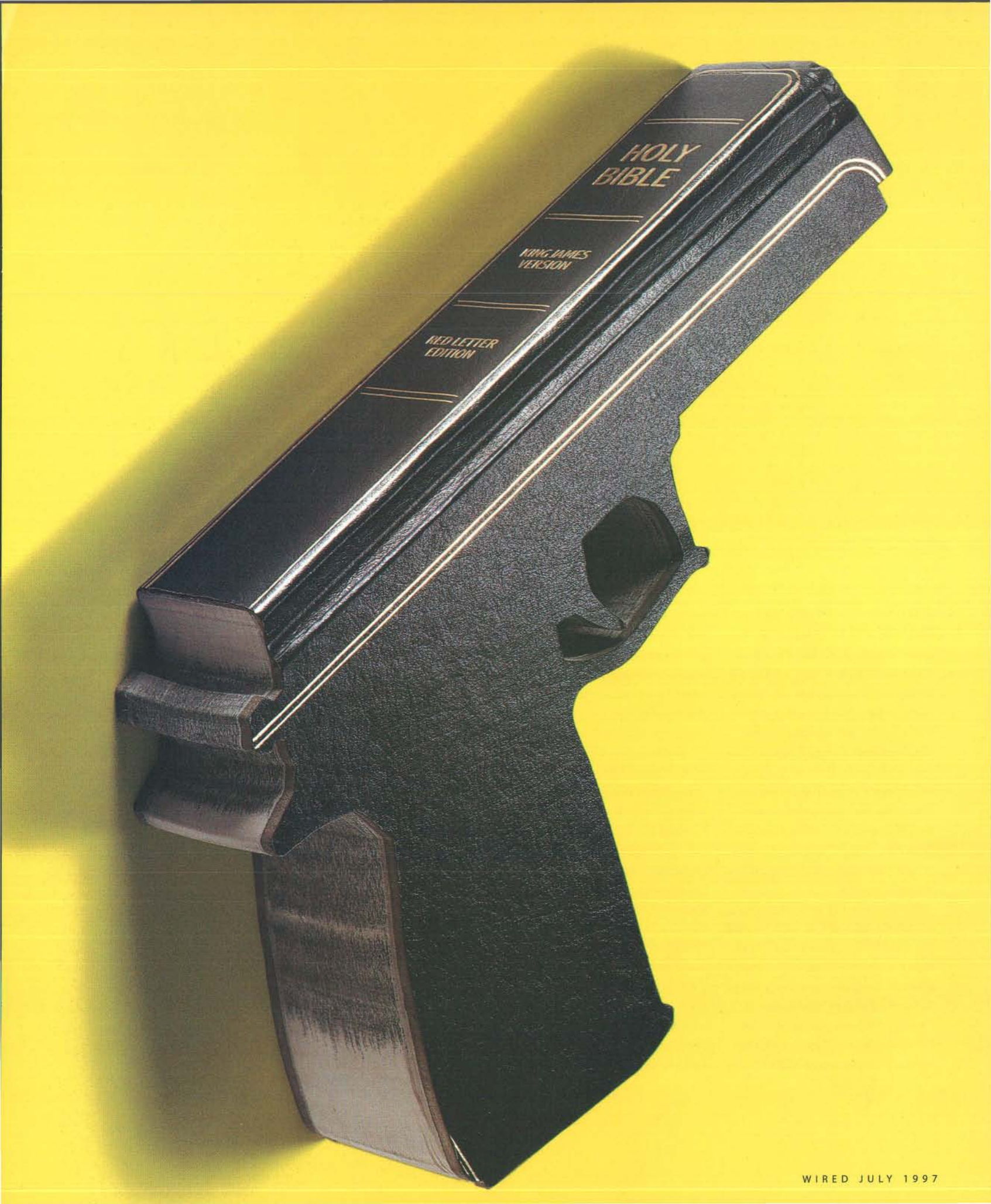
*Tom Claburn is production coordinator at* Wired.

PHOTO: WENDI NORDECK


HOLY
BIBLE
KING JAMES
VERSION
RED LETTER
EDITION

# AFTER LIFE

## WHERE COMPUTERS GO TO DIE.

**ONLY TWO TOOLS ARE NECESSARY TO DISASSEMBLE A COMPUTER: A PHILLIPS-HEAD SCREWDRIVER AND THE FLOOR.** Almost everything comes apart with screws, but once in a while you have to get tough and use the floor tool. James Burgett illustrates. He grabs hold of the beige PC chassis I've been working on, lifts it up, and drops the whole fucking business on the concrete with a big crash. "You can't break it," Burgett explains gently. "It's already broken!"

Burgett is a big bear of a man with tight coils of hair held behind his head by a rubber band. We're fixing broken and obsolete equipment at Computer and Technology Resource Centers International, a nonprofit business he founded four years ago in San Rafael, California, 15 miles north of San Francisco. Today, the place is a huge warehouse stuffed with a jumble of PC parts in the middle of upscale Marin County. After turning up one of his favorite songs – "Mean Machine" by The Cramps – Burgett's ready to give me the grand tour.

First stop: a rubber trash can with piles of motherboards, VGA cards, and Ethernet cards spilling over the top. The container is waiting for one of the center's more advanced interns – say, someone who can discern a serial connector from a Centronics connector – to come along and sort the circuitry into the wooden bins that line the workshop walls.

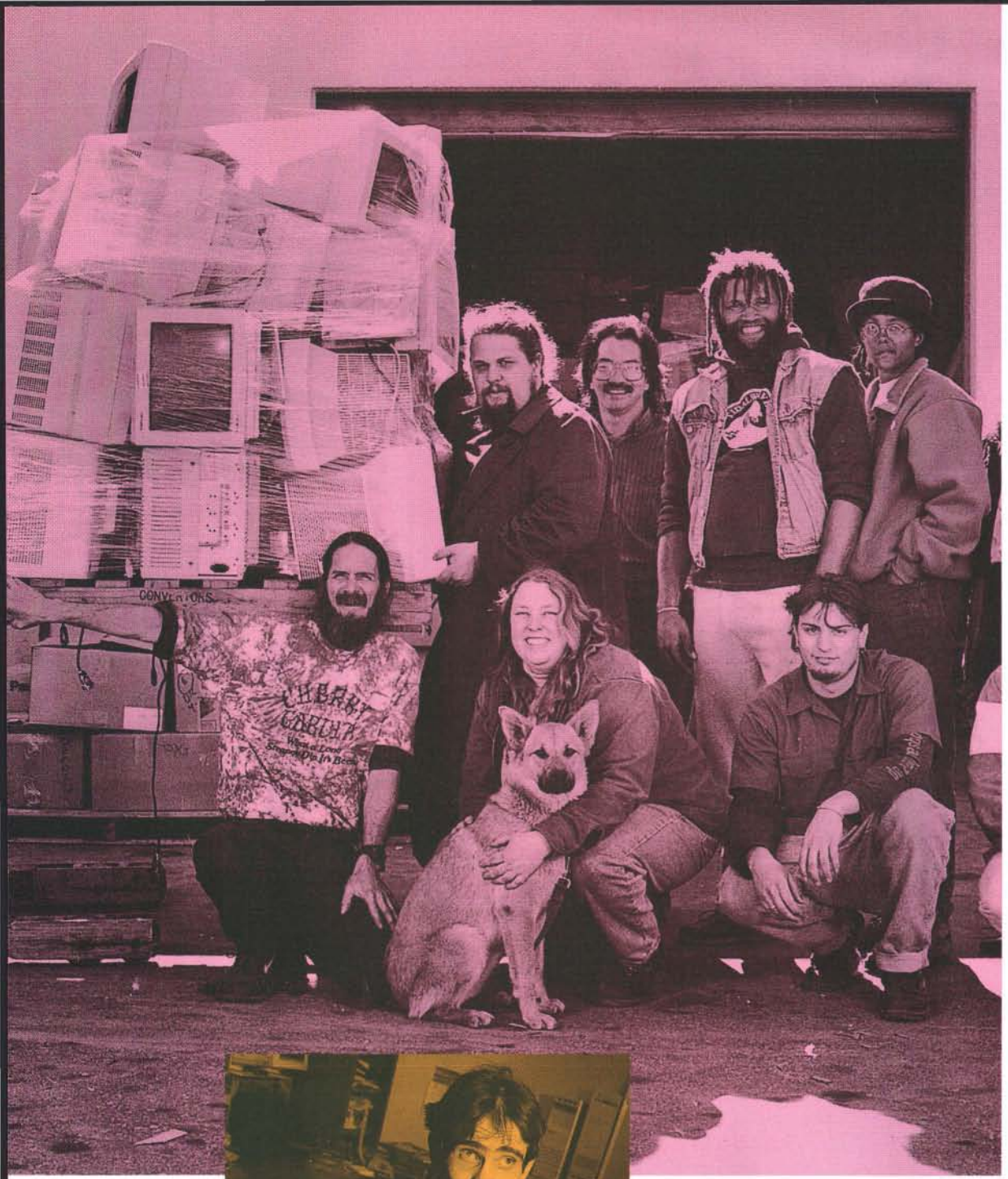
Burgett pulls a hard drive from a scrap heap and, like Hamlet holding aloft a skull, says, "Here's a 40-megabyte C8 251. Used to be the standard of the industry at the end of the XT era and the beginning of the 286. Now it's almost worthless, except as scrap." Alas, poor Yorick indeed.

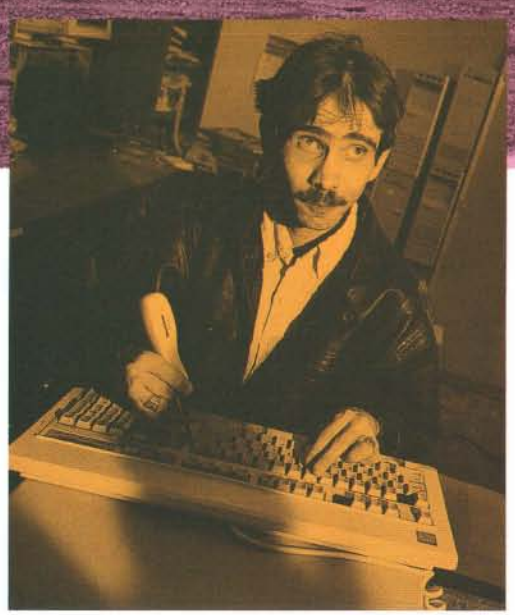
While some of the equipment is pure junk, much of it will eventually go into fully functioning machines destined for schools and charities. Burgett's center gives away 40 to 50 free computers a month, each with a one-year guarantee. On one shelf, there's a neat stack of a dozen 2400-baud modems bound for a human rights organization in Guatemala. The phone lines there can't handle high bandwidth, so these slow modems will be perfect. On another shelf, cannibalized floppy drives wait to be swapped into machines with busted ones. Over at his workbench, Burgett has a discarded computer tower with no CPU. To stretch its budget a little further, The Dixie School, a local K-5, is paying the center a few hundred dollars to install a new Pentium chip.

There is plenty of outdated gear to go around, plenty to be dropped on the ground, still more to be thrown away. Computers don't die anymore – they become obsolete. Drives and monitors sometimes fail but can always be replaced. As for the electronics, even Intel can't really say how long its processors last. And there's no market incentive to figure it out, either, since the chips will probably outlive the machine's moving parts. Besides, anyone who tries to study the life span of an integrated circuit probably won't be around to see the results – we may be talking centuries. More often than not, the machines in Burgett's warehouse run fine, but simply couldn't keep pace with the demands placed upon them.

BY BOB PARKS  PHOTOGRAPHS BY JOHN HARDING

BY YEAR'S END, 110 MILLION COMPUTERS WILL HAVE BEEN RETIRED FROM THEIR PRIMARY EXISTENCE, CLIMBING TO 42 MILLION PCS PER ANNUM BY 1999. THANKS TO PEOPLE LIKE JAMES BURGETT, NONPROFIT RECYCLING CENTERS SHOVEL NEW LIFE INTO THOUSANDS OF MACHINES LEFT FOR DEAD.





www.wired.com/5.07/afterlife/

AT BURGETT'S 5,000-SQUARE-FOOT WAREHOUSE, A TEAM OF TRAILING-EDGE TECHNICIANS AND VOLUNTEERS DISASSEMBLE COMPUTERS BY THE TRUCKLOAD. CHRISTIAN JAUREGUITO (LEFT) IS BLIND – BURGETT GAVE HIM A SCREWDRIVER, AND NOW JAUREGUITO STRIPS PCS AS FAST AS ANYONE.

**Computers are becoming obsolete more and more quickly, filling up warehouses and recycling trucks at an astonishing rate. When Gordon Moore calculated that each new chip contains twice as much capacity as one made 18 months before, he didn't mention that his law also has an inverse: in theory, hardware sold six years ago has one-sixteenth the processing power of machines sold today. Industry analysts say most computers are now bought and retired in three to five years, and that life span is actually dropping – a phenomenon Thomas Rhinelander of Forrester Research attributes not only to the advent of new operating systems like Windows 95 and NT, but also to new applications developed by corporations in-house.**

**Like the stages of a rocket, the old, beige boxes in James Burgett's warehouse have followed digital technology's precipitous rise over the last two decades, fueled its momentum, then fallen off somewhere in deep space. Now they're floating around in limbo. The Gartner Group estimates that worldwide 79 million computers had been retired from their primary lives by 1996. This year another 31 million PCs will join them, a number that will climb to 42 million in 1999. Rather than helping us reach escape velocity with the speed of their processors, old computers have instead contributed to our immanence – by tracing the vapor trail of Moore's Law, obsolete machines keep us rooted to the earth with piles of dusty cases.**

**But if old equipment doesn't just disappear, where does it go? Fewer computers are ending up in landfills, since businesses are starting to understand their value in terms of refurbishing and scrap. Sixty-five percent of corporate computers simply become "closetfill," according**

to the Gartner Group – and whether that means they end up in warehouses, empty offices, or under desks is anyone's guess. Another 15 percent are trashed, scrapped, or recycled, 15 percent are resold, and 5 percent are shipped off to schools, charities, or nonprofits.

With so much burdensome machinery lying around, it's tempting to wonder why more corporations aren't making charitable donations. Some firms worry that proprietary data might accidentally go out the door on an old hard disk, or that the monitors – considered toxic waste because of the lead they contain – might improperly end up in a landfill with the company's serial numbers on them. Even if they're hoping to get a healthy tax write-off by donating used equipment to charity, many companies are reluctant to face the administrative nightmare of culling broken hardware and finding a worthy recipient.

Nonprofit recyclers tackle these problems by serving as middlemen, creating a paper trail for each computer, wiping out data on the hard disk, and fixing up old machines, often with a one-year guarantee.

And gradually, businesses are waking up to the fact that they can garner both tax advantages and good publicity by donating old machines to nonprofit refurbishers. The main benefactors of Burgett's work are big companies such as Visa, Cellular One, Wells Fargo, and Autodesk. Last year, in return for a US$150,000 deduction, IBM donated 1,000 top-notch machines to Gifts in Kind, a Virginia-based group that will divide them among 1,000 charities. "The computers were on a depreciation schedule, where the book value of each machine was about $150," explains Dave Berman, an IBM spokesperson. "Two or three years ago these machines were state of the art, but now they're not useful to our business. We can either give them away or junk them and pay to have someone take them away."

Two or three years may seem like a short turnover period, but then again, high tech firms have faster churn than your average bank or insurance house. Intel – which has donated 486s and even Pentiums to the largest nonprofit refurbisher in the US, the Detwiler Foundation's Computers for Schools Program – realized it needed better machines to move its employees to the Windows NT operating system. Bill Gates is not famous for his philanthropy, but Microsoft's bloated software has nevertheless resulted in a pleasant windfall for nonprofit computer recyclers.

Even given the small percentage of donated machines, organizations like Burgett's can hardly keep up with the supply of PCs ready for recycling. The output of the hundred or so nonprofit refurbishing centers around the US is well under 50,000 units per year, but many caretakers of trailing-edge technology work in makeshift ways and unlikely circumstances. When James Burgett started fixing computers for charity in his spare bedroom in 1994, for example, he had no idea his operation would eventually fill a 5,000-square-foot warehouse. But as a freelance consultant, he was the only nerd willing to transform a truckload of ancient IBMs into something useful for a nearby school. Look where it got him.

It's a spectacularly bright weekday in San Rafael, with the green and brown contours of Mount Tamalpais looming off in the distance. In front of the enormous aluminum doors at Computer and Technology Resource Centers International, truckloads of antiquated machines pour in all day long. Today's shipment, a donation from the University of California at San Francisco Medical Center, consists mostly of old IBM-compatibles and dusty monitors. After we unload the machines fire-brigade style from truck to pavement, they sit in an 8-foot pile with other donations: PCs on one side, Macs on the other. It's just one morning's hoard, but there's already a jumble of broken cases, weird configurations, and antiquated equipment that faded from memory 10 years ago – IBM XTs, PCs, and ATs; Apple IIes; Mac 512s and SE/30s.

Burgett, the center's cofounder and guru of obsolete technology, walks around the pile like a connoisseur. "I was in love with these machines when they first came out," he says, pointing to an Apple II. Then, the skeleton of a server catches his eye, and Burgett sticks his fingers into its guts. "See, it comes with two 1-gig SCSI ports. They're obsolete and generally unpleasant. But if it weren't for us, this machine wouldn't go anywhere."

A few hours later I'm knee-deep in old hardware, trying to avoid the teeth of a speeding forklift. For a while, I help sort machines by processor and stack them on pallets, cordwood-style, in the sunshine. Rob Young, the network supervisor, wraps the stacks in sheets of industrial plastic wrap, like a spider saving his dinner. With the forklift, he piles the mummified gear 40 feet high in the cavernous warehouse, where it will wait until interns get a chance to test each machine, fix it, or break it down into parts. Everything goes through the facility in less than a month, and every piece of the animal is used. Whole, the machines would sell for about 8 cents a pound. But there's more money to be made by stripping off circuit boards, copper wire, and steel than by selling them in one piece.

The center supports itself on sales of scrap and weird equipment – like dumb line printers – and by hawking a few machines retail every month. But most of the working computers go to charities and underfunded schools. One nearby recipient, The Marin AIDS Project, uses a few dozen 386s and 486s to help shut-ins surf the Web to access data about the disease. "When you have AIDS, you have a level of fatigue that makes it really hard to get out of the house," explains Richard Lawson, a volunteer coordinator for the program. The Internet lets AIDS Project members link to the National Heath Center, various support groups, the Bulletin of Experimental Treatments for AIDS, and alternative medicine sites. Tony Sewell, who publishes *IntroPoz*, a newsletter of personal ads for people with AIDS, is just one of many using machines provided by Burgett and company.

Although the AIDS Project gets mostly higher-end stuff, old dinosaurs have their uses, too. The Cambodian Defenders Project, for instance, employs XT and 386 machines from the San Rafael center as simple wordprocessors. The international group found that typed statements, when sub-

*Bob Parks* (bobparks@wired.com) *is an editorial assistant at HotWired.*

mitted to Cambodian courtrooms, have a much better success rate in springing innocent detainees from jail. Since then, the seven old computers Burgett shipped to that country have contributed to the legal defense of 500 people – with a third of them receiving acquittal.

Back at the San Rafael warehouse, the interns are playing a game. They've discovered that the aircraft-quality aluminum rings used in large mainframe hard drives are fun to throw against the wall. Usually the 10-inch discs make a brassy clang when they hit the ground. But once in a while, they'll stick in the drywall with a satisfying thunk. Many people try, but only the sinewy, tattooed Rob Young can seem to make them stick. On a more rambunctious day, Burgett and his troops wheel two mainframes – originally worth hundreds of thousands of dollars – toward each other at high speeds until they collide. Burgett says they're trying to find a correlation between the original value of the white elephants and their kinetic impact. So far, the findings are inconclusive.

Still, there's a method to Burgett's madness, and a reason behind his irreverence. His brand of hands-on training makes interns feel comfortable working around unfamiliar technology. One of them, Christian Jaureguito, is a blind man who arrived at the center a year ago thinking he might answer the phones or do office work. Instead, Burgett handed him a screwdriver and a PC. Jaureguito started by unscrewing everything he could feel on the case, and now he can strip a PC as fast as any sighted person. There's also Katy, a well-to-do woman who thought that working with computers might be fun – even though she was initially too intimidated to open the box. And then there's me, the clueless journalist, mincing my way through my first PC. I certainly didn't feel comfortable among the green circuit boards inside, encircled by a maze of ribbon wiring, switches, and jumpers – all identified only by a chaos of letters and numbers.

Working in an environment where it's impossible to break anything comes as a relief to people like Mark Keithley, an enthusiastic guy in his early 30s with a deep tan and leathery skin. Keithley's heard just the opposite during much of his life – that he's likely to fuck things up no matter what he does. Last year the state gave him $21,000 for three years' back Social Security payments, withheld because of a paperwork blunder. "Never hand a junkie 21 grand and say, 'Here, go get your life together,'" Keithley says. The money vanished, and he got six months probation for driving without a license.

Keithley worked off some of his community service hours fixing machines for Burgett, and in the process, he learned a new trade – now he's a full-time computer technician with the center. He's probably not sober 24-7 yet, but even so, he's gotten a chance at a new life. In an industry where practical experience and a firm grasp of computer argot is half the battle, Keithley now tosses off blasé appraisals with the best of them: "God, man, working with a Zenith drive is about as much fun as bowel surgery," he groans. "It's all proprietary."

Most of the refurbishing outfits around the country – the "chip pickers," as they're known by industry analysts – have an intern-and-trainee component, so they benefit the world twice: sending good computers out the door and giving people the skills to fix them. Computer and Technology Resource Centers International could certainly use a few more interns, but Burgett stubbornly won't consider grant money. "It always comes with a leash," he complains.

The Detwiler Foundation, on the other hand, has helped channel $10 million in state funds to computer repair facilities and works with 52 vocational centers in California, including 13 state prisons. In 1996, they fitted a thousand of PacBell's old 386 machines with Pentium chips donated by Intel, and last November they reconstructed an additional 3,000 machines with 133-MHz Pentium chips. These topflight boxes went to schools all over the San Francisco Bay area. To expand the program nationally, Detwiler just received half a million dollars from AT&T to begin working with the state and federal prison systems. Yet Detwiler is just an administrative headquarters coordinating the task. It has no warehouse and no workshops of its own – which means it's missing half the fun.

Even so, things have been looking grim for Burgett & Co. One of their main hardware sources, Autodesk, dried up when the Sausalito-based firm grew miffed that Burgett wasn't placing donations with charities the company had chosen. Instead, Autodesk went to Renew Computers, a for-profit recycling business.

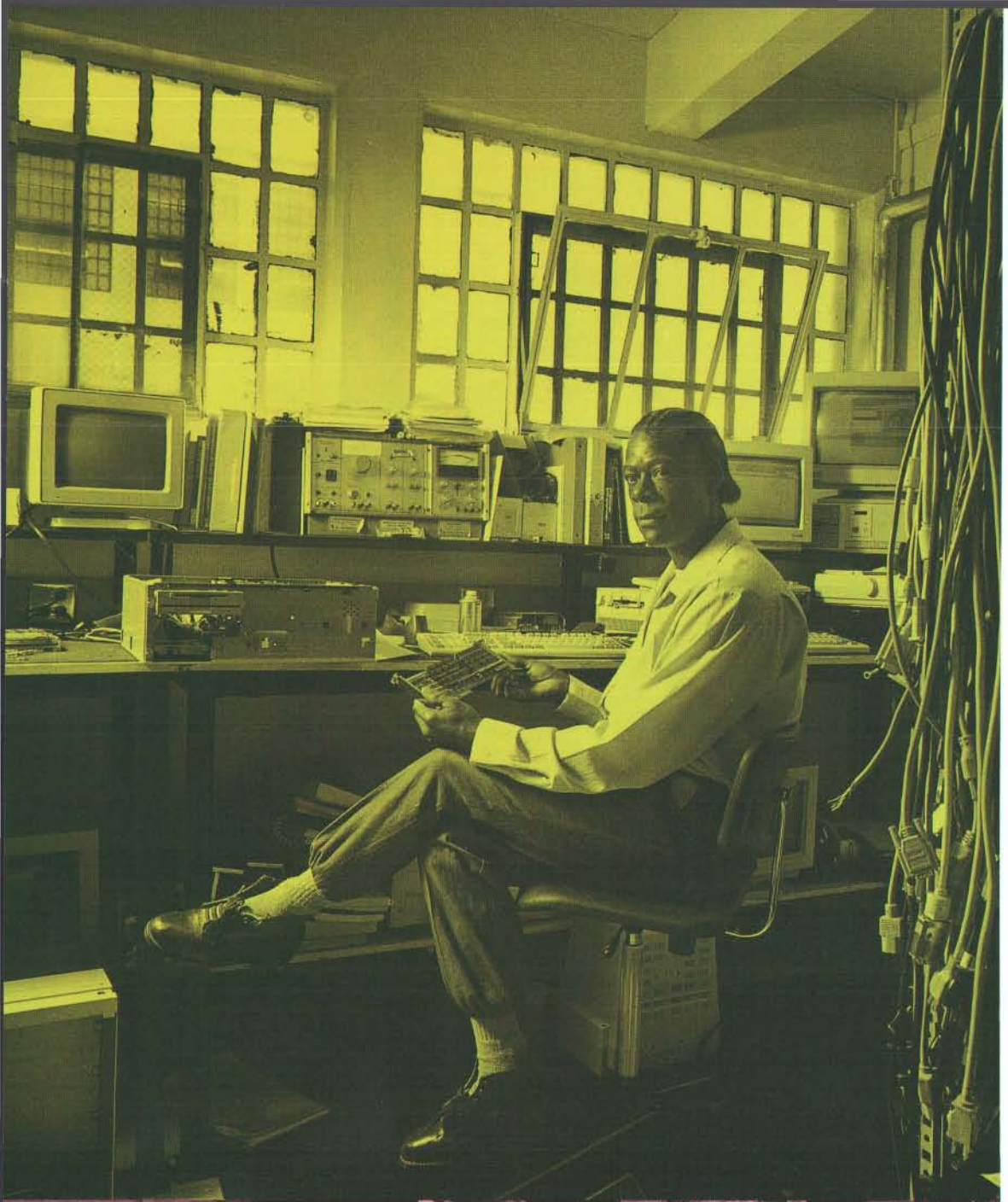
Burgett's also been a little down about a delayed collaboration between his organization and a homeless advocacy group named Homeward Bound. With Homeward Bound's help, Burgett wants to set up a huge processing operation and expand the warehouse space by 10,000 square feet. At a remodeled military base in northern Marin, homeless people would learn skills under Mark Keithley's tutelage. But Homeward Bound has put the plan on hold for at least a year, and – more ominously – the group has started working with Renew as well.

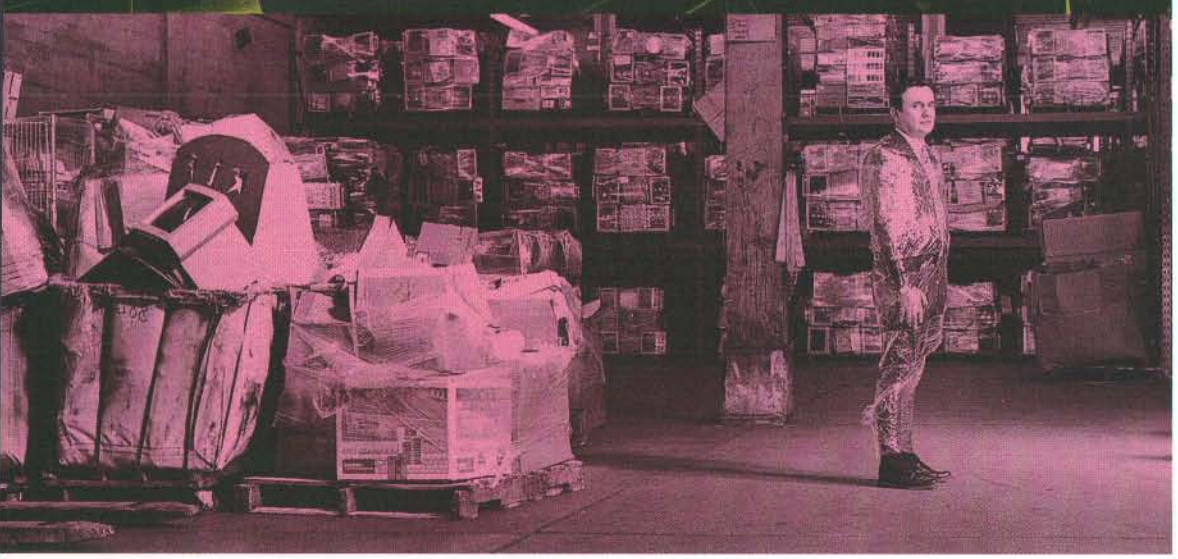
Though Burgett has a heart of gold, he doesn't have the PR skills to persuade the corporate world to donate better machines and help the center's operations grow. He left home at 14, was homeless for long periods, even dealt heroin for a time – his arms still bear a user's scars. Eventually he moved to Marin, figuring that life there might be easier and gentler.

After the move, Burgett stopped dealing drugs and started running Dungeons & Dragons-type fantasy games for local twenty-somethings in exchange for room and board. A lifetime techie and hacker, he finally got on his feet doing freelance computer repair work.

All this gives him an unsurpassed ability to work with the people for whom he can do a lot of good, but it can't touch the business savvy of the high-profile Detwiler Foundation – a group that has recruited Gayle Wilson, wife of California's governor, as a spokesperson. No one at Burgett's outfit can deliver a comparable hard sell to Fortune 500 firms. At the end of the day, Computer and Technology Resource Centers International remains eight groovy people and a few interns working behind two big garage doors in a former ice-cream factory.

Of course, there's no shortage of machines ready to be put XXX ►





THE DETWILER FOUNDATION HAS HELPED CHANNEL $10 MILLION TO CALIFORNIA COMPUTER REPAIR FACILITIES AND VOCATIONAL CENTERS, INCLUDING 13 STATE PRISONS SUCH AS SOLEDAD (LEFT).

HMR'S CHRIS JANKOS (BOTTOM LEFT) SOLICITS CORPORATIONS FOR JUNK COMPUTERS; HIS FIRM MOVES A MILLION POUNDS OF ELECTRONICS GEAR EACH MONTH, 70 PERCENT OF IT BOUND FOR ASIA.

KIP CROSBY (BELOW), OF THE COMPUTER HISTORY ASSOCIATION OF CALIFORNIA, SHOWS OFF PART OF THE COLLECTION, WHICH IS STORED IN CARGO CONTAINERS IN A SILICON VALLEY PARKING LOT.

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## Short Attention Span Theater

The troubles holding up DVD – bickering among the technology, entertainment, and electronics industries over copyright, encryption, and regional codes – have been more or less ironed out. The first digital-versatile-disc players for TV hit the market mid-March. Only last year's conflicts have led to a depressing dearth of film releases for the format.

Enter the Venice, California-based *Short cinema journal*. DVD – with its high pixel resolution, vivid detail, and multiple channels – lends itself to a magazine format, and this slick publication exclusively devoted to short-form

**DVD turns on.**

cinema fills a void.

The début issue is hot, if uneven. A droning monolog by boorish director Michael Apted, for example, is a misguided choice. But then *journal* redeems itself with a marvelous animated segment called "The Big Story with Pencil Test." A handful of shorts come in each issue.

For the past year, the 20-some staff members of *Short cinema journal* have made the film festival rounds searching for original content. The number and quality of works here reflects their effort. This short-attention-span journal is a couch potato's dream. – *Rita Johnson*

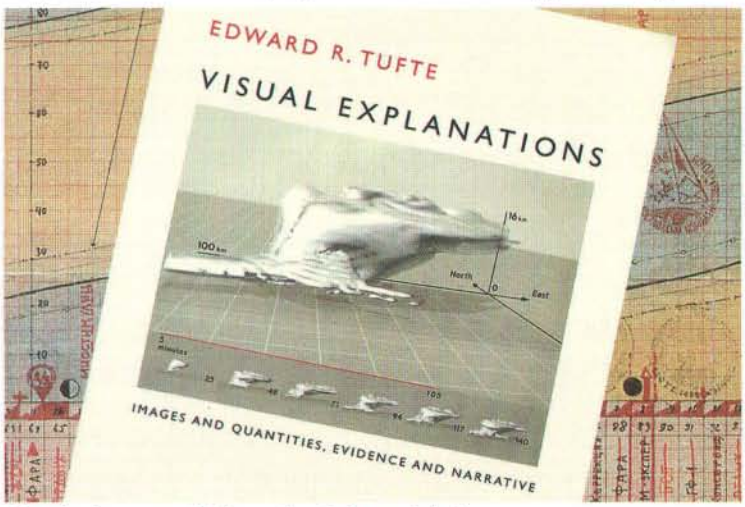
*Short cinema journal*: US$25.95 monthly; on the Web at *www.shortcinema.com/*.

## Visualize Tufte

Few teachers are as accomplished as Edward Tufte when it comes to demonstrating why good design matters in the world. Tufte, a Yale professor and the reigning guru of information design, has just published *Visual Explanations*, the third installment of an acclaimed trilogy. Like its predecessors, this latest book is a knockout.

The philosophy is that clarity and excellence in the display of data almost inevitably leads to clarity and excellence in thinking. Tufte is big on show-and-tell: he presents dozens of illustrations from both the "do" and "don't" categories of information design, and then explains in his straightforward and often witty voice why they succeed or fail.

Tufte tells of a mid-19th-century cholera outbreak in London, and how the medical investigator John Snow discovered the cause. By meticulously mapping the location of each of the disease-related deaths in an affected neighborhood, Snow was able to determine that a single well on London's Broad Street was responsible for the epidemic. (Incidentally, Snow's map also revealed a curious anomaly: residents near the tainted well somehow avoided contracting cholera. Upon investigation, he discovered these people worked at a brewery, which supplied




**The reigning guru of information design weighs in.**

them with free malt liquor – thus they had little use for the well.)

The most compelling example of bad information design involves the infamous crash of *Challenger*. Surveying documents that the engineers at Morton Thiokol and NASA used to analyze the launching of space shuttles in cold weather, Tufte demonstrates how data about the potential for catastrophic O-ring damage should have been presented. The results are startling. If the engineers had constructed a simple scatterplot that showed how cold weather had corresponded with corroded O-rings, they almost certainly would have nixed *Challenger*'s launch.

*Visual Explanations* is packed with other such vivid examples: how tacky carpet patterns can make stairways treacherous, why the design of the Surgeon General's warning on cigarette packages is deliberately tough to read, how graphical user interfaces can be built to maximize the amount of information conveyed on each screen.

*Visual Explanations* is for anyone who believes that information design is essential to solving real-world problems. "As for a picture," says artist Ad Reinhardt, quoted in Tufte's book, "if it isn't worth a thousand words, the hell with it." – *Scott Kirsner*

*Visual Explanations: Images and Quantities, Evidence and Narrative*, by Edward R. Tufte: US$45. Graphics Press: (800) 822 2454.

## The Underbelly of a Business

*Temp Slave* is a zine for anyone who's ever washed dishes until 3 a.m. or answered phones for 10 hours straight. Any disgruntled employee will appreciate these true-life tales of terror from secretaries, cashiers, and others in the ever-growing temporary workforce.

Editor and temp veteran Keffo publishes a collection of stories written by pink-collar employees who are ignored, ridiculed, and abused by clueless managers. Issue 10 tells of an office temp who breaks her ankle on the way to work and still carries out her duties the rest of the day. An American in Paris laments the difficulties of holding down a job in France, and a former writer for the infamous San Francisco magazine *The Nose* gives a breakdown of the publication's demise due to poor management.

**Temporary rebellion.**

Plenty of contributors rant as if attending a meeting of Disgruntled Anonymous, but others offer advice on how to regain self-esteem. One decidedly unmodel but contented employee calls friends in other countries from the office phone.

Try *Temp Slave* on your next coffee break for an empowering fix. – *Bonnie J. Burton*

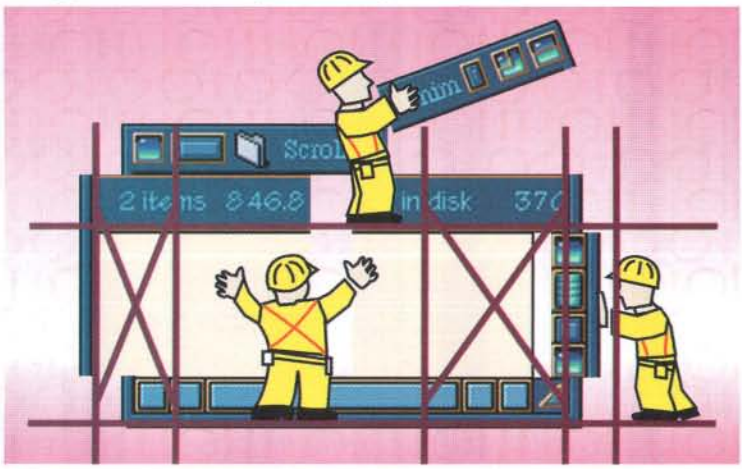
*Temp Slave*: US$3. Keffo: PO Box 8284, Madison, Wisconsin 53708-8284.

## The Interface Hackers

Among the most popular Mac downloads on the Net are several apps and extensions written by Greg Landweber. You may not recognize the name of this Harvard math grad student, bassoonist, and part-time shareware developer. But you probably have heard of Aaron, the extension that subtly modifies the Mac interface to look like Apple's promised System 8. And you might have come across BeView, which makes your Mac look like the forthcoming BeOS.

Recently Landweber, with friends Ed Voas and Fred Bass, released Kaleidoscope, a souped-up version of Aaron that offers an array of colorful interfaces such as Onyx and Ice. So far, most of the schemes are pretty tacky. Sherbet Classic, for example, turns the Close Window button into a yucky little pink sphere. But unlike Aaron, Kaleidoscope opens the door for developers to write their own interfaces. Some promising third-party designs, such as Star Wars, are already popping up.

Kaleidoscope doesn't add practical function to the Mac – it adds something else that has been vastly underrated: a fun, in some cases beautiful, improvement to the interface. The infant Mac gave us icons, pulldown menus, windows, and mouse pointing. But Apple's fallen asleep at the wheel. Fortunately Landweber, Voas, and Bass are keeping alive the Apple tradition of ingenious design.



**Building a revolutionary new look for the Mac – and it's not from Apple.**

If you are hungry for function, Greg's Browser offers a simple but innovative way to access the contents of your computer. Your monitor's screen is divided into three or four panes to let you to run up and down file hierarchies quickly and logically while keeping several directories in view at once – you can find files fast without opening a lot of windows. You also can drag up to eight icons into slots at the top of the screen for instant access; I have my desktop, my local hard drive, and three local network servers up there.

The best thing about this browser is that it allows you to dive into compressed Stuffit archives as though they were regular folders. You can unstuff any document as quickly as you can open an unstuffed file on your hard drive.

While Apple fusses with its next-generation OS – Rhapsody is now promised in 1998 – Landweber lets us test-drive interfaces of the future today. The Cupertino crowd, however, still knows a good thing when it sees it. The company recently snatched up Ed Voas, codeveloper of Aaron, to lead Apple's software design division. – *Aaron Belz*

Aaron: US$10 per single user, $100 per site. BeView: $10 per single user, $100 per site. Kaleidoscope: $20 per single user, $200 per site. Greg's Browser: $20 per single user, $200 per site. Greg's Shareware: on the Web at *greg.math.harvard.edu/*.

## Flame Wars with Louis XIV

**Louis XIV of France, known as the Sun King, symbolizes the zenith of monarchy. He centralized governing authority under his rule and turned his court at Versailles into a spectacle of power, a staggeringly extravagant display intended to convince a cowed populace that he was divinely appointed to rule over them, or, as he wrote in his diary in 1668, that "we are the head of the body of which they are the members." Nice work if you can get it.**

**Now, British artists Jason White and Richard Wright have produced *Heliocentrum*, an unusual short film about *le roi soleil*. Made on desktop PCs, this is not the sort of documentary you might find on PBS, but more a piece of history for the MTV generation.**

**Using trippy computer graphics, blended with news footage and clips from silent movies, the result is both fun and an amazingly effective way of showing how a sovereign manipulated power. Accompanied by an electronic soundtrack that starts as a synthetic minuet, then ramps up into thumping techno, it's also the only history documentary I've ever seen that you could dance to in a nightclub.**

History you can dance to.

***Heliocentrum* (meaning "sun-centered") opens on a shot of the Sun King's head, surrounded by swirling flames, towering over the French countryside. This sets the tone for a whistle-stop tour of Versailles, whose baroque interiors come alive, filigree decorations twirling around in a complicated meshwork, reminiscent (if you're a baroque groupie) of Leibniz's description of a clockwork universe. We get a peek at the bored, bitchy court, and are treated to a few choice thoughts from the Grand Monarch about how to hold onto power. Louis saw himself as an omniscient eye, imperiously seeing into the hearts and minds of his subjects. This thought is eerily updated with the use of surveillance camera footage. As a subject warns the king of civil unrest, we see the London poll tax riots of 1990. With its peculiar blend of rave graphics and historical insight, *Heliocentrum* reminds the viewer that the outlook of the Sun King was not so different from that of today's presidents and prime ministers. *Plus ça change, plus ça reste la même chose*, as the French say. – *Hari Kunzru***

Richard Wright: +44 (171) 320 1809, email *sfp@dig-lgu.demon.co.uk*.

AARON ILLUSTRATION: MARC CONTRERAS

## Putonghua for Laowai

Say headquarters has transferred you to Shanghai, or maybe you are traveling to Beijing. Or perhaps you're just hot to hang out in the "new" Hong Kong. If you need to learn a bit of *putonghua* (Mandarin) in a hurry, you need Power Chinese. Developed by the same company that brought you Power Japanese (see *Wired* 1.3, page 32), this is the answer to a language learner's prayers.

Chinese is a difficult tonal tongue: each character can be pronounced four different ways (seven in Cantonese). If you're not careful you can wind up calling someone's mother *(mā)* a horse *(mǎ)*. Accordingly, Power Chinese

**New word order.**

offers pronunciation drills as well as exercises in grammar. Sample sentences are displayed in Chinese characters *(hanzi)* to force familiarity with the written language, but the Pinyin romanized versions come up with a Shift-Click. A Control-Click brings up the character stroke order.

Cultural notes and practical dialog come as part of the package. You won't necessarily be striking megadollar deals in Hong Kong as a result, but you'll certainly understand what's going down a whole lot better. – *David Voss*

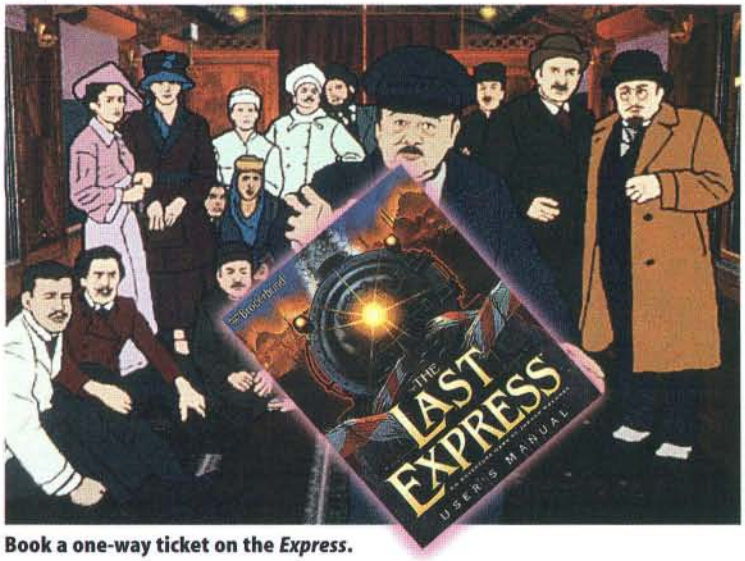
Power Chinese CD-ROM for Windows: US$159. Transparent Language Inc.: +1 (603) 465 2230, fax +1 (603) 465 2779, on the Web at *www.transparent.com/*.

## Death by Broderbund

It's 1914, and your friend Tyler has summoned you to join him on a transcontinental train departing from Paris. Hitches in your reunion plans begin when you're late to the station and have to board by running alongside with a motorcycle and hopping on, unticketed. But then your trouble worsens when you discover your friend has been murdered in his compartment. Think fast – somebody is a killer, and you've got precious few minutes before a snoopy clerk finds you alone with the body and you get 20-to-life.

*The Last Express* is an animated mystery game with several hooks. First, the story takes place aboard a classic *Orient Express*-style train, with no room to maneuver and many, many rooms in which a murderer can hide. Not knowing what or who lies behind any door keeps you on teeth-grinding edge.

Second, Broderbund eschews clinical polygons or cheesy full-motion video in favor of hand-drawn period animation. The alternating first-, second-, and third-person points of view imbue scenes with a lifelikeness both elegant and creepy. Passengers murmur conversations, watching you with unreadable expressions; conductors walk briskly up to




**Book a one-way ticket on the *Express*.**

you, sticking their faces right up to yours, only to say "Excuse me" and continue on their way. Through it all, you can hear the constant rattle and clank of the endless rails carrying you toward the end of the line – for the train and, perhaps, for you.

The final hook – and this is the killer – is that all interactions are real time and simultaneous: while you're busy fretting over your next brilliant move, more than 30 major characters are walking and talking around you with their own agendas. Failure to act can be just as damning as doing something actively stupid.

*The Last Express* is a good game and a *great* piece of mood. Seemingly random first-person angles, especially early on, can be a little disorienting, but overall the game has a cozy-yet-tense whodunit feel, and easily compressed animation means you get more gameplay, instead of three compact discs' worth of crappy full-mo-video acting.

If you're a mystery fan, book a ticket aboard *The Last Express* – just read all the newspapers, trust no one, and be sure to keep your compartment door locked. – *Chris Hudak*

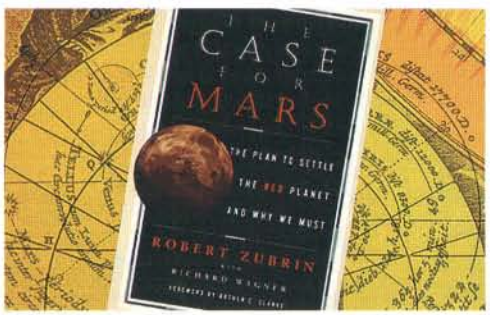
*The Last Express* for PC and Mac: US$39. Broderbund: +1 (415) 382 4700, on the Web at *www.lastexpress.com/*.

## Red Planet Looms Large

**We need a new frontier to reinvigorate civilization, says Robert Zubrin, and that frontier is Mars. In his book *The Case for Mars: The Plan to Settle the Red Planet and Why We Must*, Zubrin describes how to put the first humans on the Red Planet within a decade, using present-day technology. The cost? About US$20 billion, or 10 percent of NASA's budget spread out over 20 years (developing hardware the first decade, flying missions the next). NASA has a long-range goal to send people to Mars someday, but the agency has scheduled only a series of orbiters and robotic landers, the first of which should touch down on July 4, 1997.**

**Zubrin, at the request of House Speaker Newt Gingrich, has also worked out a proposal for a federally financed $20 billion award payable to the first private organization to put people on the Red Planet and return them safely to Earth.**

**He's no mere wild-eyed schemer, however: Zubrin designed interplanetary missions as a senior engineer at Lockheed Martin and now is president of Pioneer Astronautics of Indian Hills, Colorado, doing**




Humans to Mars!

**space technology research for NASA. His book, with a foreword by Arthur C. Clarke, is written for a general audience but doesn't skimp on the details about how to get to Mars, find water, grow food, and, eventually, terraform the planet to create Earth-like conditions.**

**Indeed, a central point of *The Case for Mars* is that human settlers will live off the land, rather than bring all their necessities from Earth. Before the pioneers set foot on the Red Planet, a robotic spacecraft will have already arrived to produce fuel from indigenous resources for surface exploration and the return trip. Zubrin details how to build habitats from Martian bricks and techniques to extract materials such as copper for electrical wiring and silicon for solar power panels.**

**Humans to Mars in 10 years? My bags are packed. – *Dave Cravotta***

*The Case for Mars: The Plan to Settle the Red Planet and Why We Must*, by Robert Zubrin: US$25. The Free Press: (800) 223 2348. "The Significance of the Martian Frontier" and other papers by Robert Zubrin: on the Web at *www.magick.net/mars/*.

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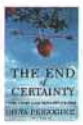



**Chaotic Times** **Ilya Prigogine challenges Einstein and Newton in her new book, *The End of Certainty*. According to the author, quantum mechanics works swimmingly in a deterministic universe, where fixed rules govern nature. But those laws of nature break down under time's chaotic influence, proving that the only sure thing, as Heisenberg observed, is uncertainty.** *Release: August. The Free Press: +1 (212) 632 4994.*

**Online and Out Loud** **Yoyodyne Entertainment has developed a multiplayer chat-game engine that scales to 250,000 users. In *Snowball Fight* combatants cut deals and form alliances, hoping to avoid the icy sting of a wintertime projectile.** *Release: Summer. Yoyodyne Entertainment: +1 (914) 591 9696.*

**The Big Picture** **VDOLive is streaming video software that adjusts to available bandwidth. Version 3.0 will reach the television standard of full-screen video delivered at 30 frames per second using 512 Kbps of bandwidth. For a 28.8 modem, that translates to about 12 frames per second.** *Release: July. VDOnet: +1 (415) 802 1850.*

**Local Loop** **Residents of the new HighPoint development in Romeoville, near Chicago, can now enjoy the benefits of fiber-to-the-curb. Housing units – and even local businesses – are connected to a complexwide LAN. With throughput promised in the 10 Mbps range, happy homemakers can order pastrami sandwiches from the local deli on the quick.** *Release: June. HighPoint: +1 (815) 293 3001.*

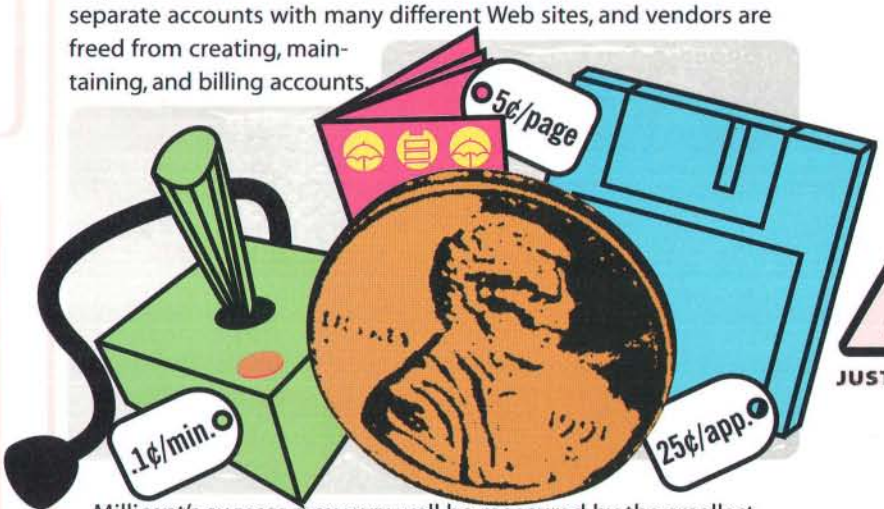
**Singapore Sling** **Kuala Lumpur's officials must've decided that proxy servers are passé – not to mention futile. The new censorship strategy: Singapore One, a government-built and -managed intranet – which promises fast service freed from the Net's clogged pipes, and, not surprisingly, plenty of whitewashed content shackled by the country's perverse sense of decency.** *Release: Summer. Singapore One: on the Web at* www.s-one.gov.sg/.

**They're Crafty** **Blizzard Entertainment, developer of the popular strategy games *Warcraft I* and *II*, is readying the intergalactic version. In *Starcraft*, three outer-space species vie for control of a faraway universe, and, as commander of the Terrans, the Protoss, or the Zerg, you must forge civilization through interplanetary conquest.** *Release: Summer. Blizzard: +1 (310) 793-0600.*

## So Low It's Insanely Great

E-commerce evangelists predict that minuscule charges for small-scale electronic transactions known as micropayments will open up a host of new businesses, such as Java applet rentals, metered online gaming, and per-article magazine subscriptions. Micropayment service providers, however, must first figure out how to minimize overhead costs before they can offer true nanoscale commerce.

Digital Equipment Corp., the Maynard, Massachusetts, computing giant, is readying release of the most promising microcommerce scheme to date. The key to the company's service, punnily called Millicent, is the use of third-party brokers. Here's the scenario: Shoppers buy scrip from certified brokers and trade the funny money for products touted at Web sites. Online vendors, in turn, swap scrip for cold cash with the same brokers. Shoppers need not create separate accounts with many different Web sites, and vendors are freed from creating, maintaining, and billing accounts.




Millicent's success may very well be measured by the smallest transaction it supports, and Digital believes that using brokers will help streamline its service. The company plans to allow for transactions of as little as one-tenth of a cent, with processing costs expected to total one "millicent" for every penny spent.

To win consumer trust and attract big-name Web sites, Digital must first negotiate trustworthy partnerships with respected banks and credit card companies. If that happens, microtransactions have great potential.

For one, publishers will discover intriguing new revenue models. Given a weekly business magazine's typical newsstand price, a one-page article should cost about five cents, a feature article a quarter, and a cartoon or photo about a penny. If sold on the Internet, columns and captions could reap a pretty penny – even collected one cent at a time. – *Jennifer Sullivan*

*Release: Late summer. Digital: +1 (508) 493 5111.*

JUST OUTTA BETA

## Various Artists

*The Alan Lomax Collection: Southern Journey Volumes 1-6*

**Rounder**

**Alan Lomax began recording folk sounds with his father in the 1930s for the Library of Congress and remains one of the most important archivists in US musical history. Among his discoveries while traveling the country's backwaters were guitar legend Leadbelly, blues player Son House, and Hobart Smith, a multi-instrumentalist virtuoso. These discs mark the first six releases in an ambitious collection of more than 100 CDs of folk music gathered from around the world.**

**Lomax collected material for *Southern Journey* in the American South between 1958 and 1960, when a dazzling array of musical styles coexisted in the same backyard. Delta blues are exemplified by Mississippi Fred McDowell, a guitarist who learned to play slide with a steak bone: "61 Highway Blues" is a gritty song in which McDowell demonstrates**

**an old slide style of letting the guitar finish each lyrical line. Spirituals were abundant in the South: "Tribulations," a song by Estil Ball based on the Book of Revelation, is performed with gentle guitars and a lilting, sweet vocal harmony describing the damnation awaiting the less than righteous. Chain-gang songs like "Tom Devil" – a story of frustration, dreams, and hope sung by Ed Lewis and prisoners at the Mississippi State Penitentiary – are moving not only because of their stark performance, but because they stir memories of a brutal penal age.**

**Lomax's dedication preserved the music of a place outside time. Forty years later, the influence of what he saw is pervasive: the angst of prison songs can be heard in hip hop; McDowell echoes through Bonnie Raitt and Ben Harper; the Pogues have covered "Jesse James"; Maya Angelou sings "Little Sally Walker" on *Sesame Street*. This collection shows how vital musical history can be. – *Peter L. Herb***

## The Congos

*Natty Dread Rise Again*

**Ras Records**

*Rise Again* is a remarkably apt title, since The Congos have returned 20 years after the classic release *Heart of the Congos*, produced by Lee Perry. These days, all that's left of the band is lead singer Cedric Myton, and as you might expect, his vocal octane isn't quite as high as it was. Yet Myton can still hit his clear trademark falsetto, and the songs and arrangements on this disc illustrate the conscious roots reggae revival, tempered with more than a touch of soul, a vibe that offers one love, and a lasting classic in "Rock of Gibraltar." Not a crucial disc, maybe, but definitely a timely one. – *Chris Nickson*

## Jose Missamou

*Montuno ya Congo*

**Rythmo-Disc**

While traditional salsa struggles on its home turf – under fire since the early '80s by saccharine *salsa romantica* – its spirit thrives further afield. Witness Japan's Orquesta de la Luz, Ricardo Lemvo's sparkling Cuban/*soukous* fusion, or this disc. Missamou's croon is delightfully redolent of his Congolese home, as are complex rhythms laid down by percussionist Anga Valdes. But Luis Manresa is the star here: his ebullient arrangements evoke Latin music's golden age without lapsing into imitation, and his jazzy, playful piano proves that a *salsero* can earn impeccable chops far from the Caribbean or NYC. – *Eamon Dolan*

## Archer Prewitt

*In the Sun*

**Carrot Top**

Archer Prewitt is the sworn traditionalist of the loose, experimental Chicago scene. A core member of The Sea and Cake and the defunct Coctails, Prewitt solo eschews the latter's musical frivolity for the sober orchestrations of Scott Walker and Nick Drake. Though his lyrics are occasionally downcast ("I'm All You Know"), the title *In the Sun* generally matches his clean, bright compositions. Some cuts parallel the implied equator-hopping of The Sea and Cake: "Work," for instance, jumps like juju. Transcending style, recordings this good have blessed Chicago with a bumper crop of indie pop. – *James Sullivan*

## Lenny White

*Renderers of Spirit*

**Hip Bop**

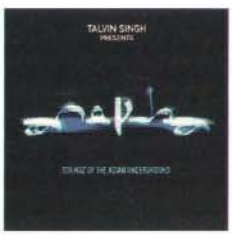
Much music has flowed since the late '60s, when Lenny White drummed Chick Corea and Return to Forever into history. Now, as a producer, White combines his areas of expertise and presents his own hard-driving, exquisitely produced albums. Typically, *Renderers* defies the odds of the smooth jazz airwaves by not insulting one's intelligence with formula performances. Drawing on a pool of players seminal to the fusion movement at its badass best (George Duke, Stanley Clarke, Bennie Maupin), White stokes the fire under a number of compelling R&B- and funk-based instrumentals and vocals. – *James Rozzi*

## The Black Widows

*Death by Guitar*

**Vital Gesture**

Take the most provocative parts of biker-chick movies, surf music, and spaghetti-Western scores, spin them together, and you'll have approximated the melodicism of LA's Black Widows. Guitarist Dr. Vibe spurns traditional nostalgia-fixated retro categories, preferring instead to describe his outfit as purveyors of "instrumental spider rock." That's right: there isn't even a hint of vocals on the 17-track *Death by Guitar*, but you won't miss those lyrics for a second. Capture the Widows live if you have the chance, because their pantomime cabaret, in all its arachnid-costumed glory, is outta this web. – *Andrew Lentz*




## Various Artists

*Anokha – Soundz of the Asian Underground*

**Omni/Quango**

*Anokha* is the fruit of Talvin Singh's commitment to create, expose, and fuse traditional Indian and contemporary UK club styles. This is no Enigma-esque cultural hijacking; rather, the compilation contains a whole new sound from Anglo-Asians brought up on hip hop and house music. Drum and bass rhythms dominate the material with manipulated sitars, speed freak tablas, and breathtaking vocals delicately layered and interwoven. The curator's own "Jaan," along with State of Bengal's "Chitagong Chill" and K-Ascendant's "Kingsuk Biswas," highlight this potent collection. – *Scott Taves*

## Sugar Plant

*After After Hours*

**World Domination**

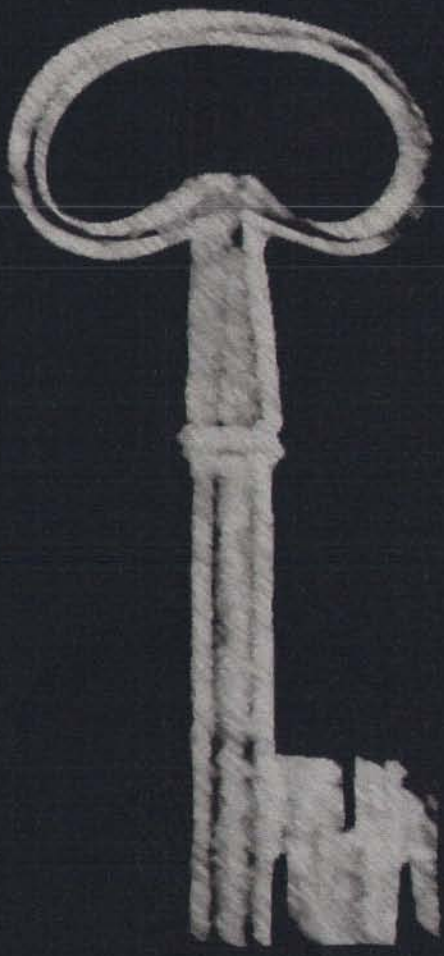
Sugar Plant's understated sound is based on a rock construct that has been mutating for decades. While you might inhale this stuff for a creamy, dreamy buzz of soft female vocals and neo-'90s psychedelia, the Japanese duo also satisfies those craving a flashback of '60s jingle-jangle. Cellular and synthetic, Sugar's music is fraught with chasms of sonic tension and shuddering release. Shin'ichi Ogawa and Chinatsu Shoyama also tightrope nicely between traditional guitar syntax and quasi-ambient improv. With a mantra steeped in narcotic pop and lustrous drone, the sweet weed is intoxicating. Take a puff. – *Mitch Myers*

## Various Artists

*Audio Alchemy: Experiments in Beat Reconstruction*

**Ubiquity**

San Francisco's Ubiquity label, a boutique-sized imprint best known for its rare funk and adventurous jazz albums, confronts a new area with this collection of pieces influenced most directly by the turntable's cut-and-paste aesthetic. The quiet mastery of "Layered Laird" from up-and-coming producer Cut Chemist beautifully demonstrates the DJ's vibe throughout the whole collection (using only records as source material), while man-meets-machine collaborations such as Skyjuice with Terra Deva or Bugs bring life and spirit to the album. This is the new face of free-form jazz. – *Tamara Palmer*



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## The Spirit of '76

To someone whose musical tastes took root in the disco decade, *Interstate '76* is a dream come true, an adrenaline-pumped video-game with a funk soundtrack straight out of Studio 54.

*Interstate '76* takes place in an alternate-universe version of The Year of Our Bell-Bottoms, where a gang of auto mercenaries are trying to destroy the largest oil reserve in the US and leave the country at the mercy of nefarious OPEC bosses. You play Groove Champion, a reluctant vigilante fighting the mercs. Accompanied by Taurus, an ace driver blessed with a most massive Afro, you battle in the shifting sands of

**Groo-oooovy!**

the Southwest, brandishing guns, mines, and missiles, and executing spectacular leaps over cliffs and canyons.

The wonderful graphics move swiftly and smoothly – which they better, since this game runs only on Pentium PCs – and the car's controls feel like a dream. After you battle your way through the challenging (but never unfair) single-player story, there's a multiplayer mode in which up to eight players can bring out da noise, bring out da rocket launchers over the Net.

Conjuring up state-of-the-art gameplay, *Interstate '76* pays tribute to the spirit of two eras. – *Zach Meston*

*Interstate '76*: US$49.95. Activision: +1 (310) 473 9200, on the Web at *www.activision.com/*.

## Hall of Half-Baked Ideas

Philanthropy and genius come together full throttle in the touring exhibit *Masterpieces from The Pierpont Morgan Library*. Financier J. P. Morgan established the New York landmark back in 1924, making his personal trophies "permanently available for the instruction and pleasure of American people." As for the genius, everyone's there. Chaucer, da Vinci, Shakespeare, Newton, Einstein, Beethoven, Zola, Eliot, Steinbeck – names cemented into history.

The distractions are overwhelming as you roam through the exhibit's dimly lit rooms. I didn't even get to the architectural drawings or the artwork after three visits to the show in San Francisco. But I did see the Gutenberg Bible – the library owns three of them. And how about centuries-old texts from the Near East? Steinbeck's personal diaries? The only surviving manuscript of Milton's *Paradise Lost*? A symphony written by Mozart at the age of 5? You can scrutinize the handwriting and revel in the irony that some of the great contemporaries are trapped under the same displays together.

Creative endeavor is all over this show, and it's not without its paradoxes. While museums are generally bursting with fine-tuned masterpieces, ready to face the world, there's a whiff of dirty laundry here. Ugly rough drafts. Theories half-baked. Privately scribbled notes of anguish. Everything's in a wonderful visible state of transformation –

**Witness the transformation of genius.**

something of a diminishing return in our do-it-on-screen-now-and-don't-forget-to-clean-up-your-hard-drive times. There's barely a trace anymore of how we got from here to *there*. Imagine the museums of the 21st century, email printouts and immaculate drafts on display instead of exquisite handwritten letters. Just a thought!

This exhibit turns art appreciation on its head. It's the treacherous journey, not the arrival, that counts. The more revisions you see, the more tangible the creative process becomes, and the more difficult it is to separate the artists from their work. You come across Oscar Wilde's original draft of *The Picture of Dorian Gray*, for instance, and wonder if he had any sense of the vilification that would follow its publication. "Poisonous but perfect" was Wilde's response to Victorian dogma.

The other great takeaway, apart from a spontaneous urge to take your head out of the business pages and back into the classics, is the chance to take a breather and reflect on the forces behind other great eras. As we race full tilt into the next millennium, it's good to remember that the future's just an upgrade of the past running on a faster chip. – *Jackie Bennion*

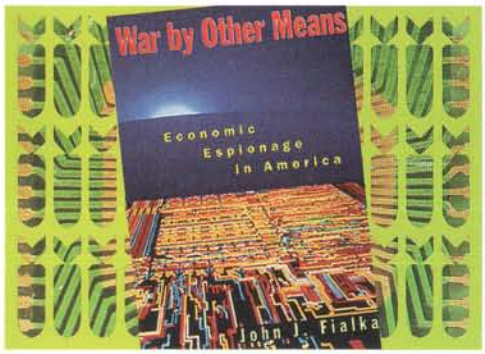
*Masterpieces from The Pierpont Morgan Library*: at the High Museum of Art in Atlanta July 1 through September 28, on the Web at *www.jpmorgan.com/CorpInfo/Perspectives/PML/Masterpieces.html*. *The Collection of The Pierpont Morgan Library* catalog: US$29.95. The Pierpont Morgan Library: +1 (212) 685 0610.

## Economic Espionage

**Some people just can't let go of the good old days when We were the good guys and They were the bad guys. In *War by Other Means: Economic Espionage in America*, John Fialka writes an account of economic espionage – They (Chinese, Japanese, Germans, French, et cetera) are treacherously stealing Our (American) technology and jobs. That Chinese student down the hall is not some hard-working slob trying to get ahead, but a tool of Beijing, exploiting America's openness. Instead of a commie under every rock, this time it's an industrial spy.**

**No doubt most of the stories in this admittedly riveting read are true. Corporations often go to unsavory lengths to get hold of technology – even American companies, although arguably on a lesser scale. In Fialka's view, the foreign devils aren't just competing, they're siphoning off jobs, Truth, Justice, and the American Way. Trying to get an edge on overseas competitors is a national security issue, not just a commercial one.**

**Hogwash! Every marketplace is inherently global these days, no matter how much cold warriors like**




The machinery of 21st-century business.

**Fialka want to think otherwise. Foreign corporations are just as unlikely to stay home as American ones. Competing in a global marketplace means, well, competing. Or cooperating. Nowhere does the book mention the possibility of investing in firms around the world, or setting up joint ventures where Their success is also Our success. Luckily, many business leaders already have clued into this potential, so it's difficult these days to identify companies like Unilever, Ford, News Corporation, or Sony with just one nation.**

**The primary value of this book is educating executives in what it's like in the real world. It ain't smart to dump trade secrets in the trash, or talk about sensitive subjects on a cell phone. Forget the xenophobic crap about revoking visas and erecting tariff walls, however. Leave dumb ideas like these where they belong – in the museum. – *Jeff Mann***

*War by Other Means: Economic Espionage in America*, by John J. Fialka: US$25. W. W. Norton & Company: +1 (212) 354 5500, on the Web at *web.wwnorton.com/*.

## Straight up, with a Twist

With this three-axis joystick, James Bond could readily dominate an endless variety of aircraft and vehicles. Here's a controller with a twist that puts it deep into first for the flight-sim sophisticate: real objects have three degrees of rotational freedom, and for the first time in popular-priced computerdom, so does a joystick.

The plurality of buttons that freckle the base and shaft are commonplace. Game designers *expect* that you can glance around while maneuvering a ship at light speed through the guts of a gargantuan space monster. There are buttons for every joint on your hand to operate (with learning curves as steep as an F-18's climb on afterburners). But the Sidewinder 3D Pro has a

**Big stick envy.**

throttle lever and buttons for your left hand (you need four controls to fly: roll, pitch, yaw, and throttle).

Its secret weapon is the third axis, operated by twisting the stick. Twist to the left, the fighter yaws left without changing its flight path; you can make that shot others can't without crashing into the walls. Simulating the flight of a sailplane? You need rudder control to make those smoooooth turns.

The stick has none of that annoying "slop" in the center that keeps you from gaining exquisite control. Oh, yes, it comes from the last place in the world I would have looked to for something this sexy: Microsoft. – *Jef Raskin*

Sidewinder 3D Pro for Mac: US$94.95. Microsoft: +1 (206) 882 8080.

NEUMANN: JAMES SUGAR

## READ ME *On the bookshelves of the digerati*

**PAUL KRUGMAN**, *an economist at MIT, is a prolific author. Browse his column "The Dismal Scientist" on* Slate (www.slate.com/).
***Guns, Germs, and Steel: The Fates of Human Societies,* by Jared Diamond.** "This book covers the origins of civilization, why some societies overwhelmed others, and the influence of the environment on culture. Like another old favorite of mine – *Plagues and Peoples* – it says 'History is not what you thought it was about.' There are deeper forces at work, such as disease. Why did one culture predominate over another? Often, the successful people simply harbored more deadly germs. Diamond also gives a strong sense of the impact of environment on culture. There is a fascinating discussion of how the Polynesians diverged culturally as they spread across the Pacific, depending on what kind of environment they landed in."
***The Anubis Gates,* by Tim Powers.** "A really silly fantasy/science fiction novel. The plot includes Victorian poets and ancient Egyptians, all scrambled together. I have to read two silly books for every serious book or else I get overwhelmed."

**PETER G. NEUMANN**, *author of* Computer-Related Risks, *moderates the Risks Forum (comp.risks). (See "The Dean of Disaster,"* Wired *1.6, page 42.)*
***The Shipping News,* by Annie Proulx.** "I found many empathic connections: I'm a single parent; I enjoy living near water; I struggle with journalism and its deadlines, as does the agonized protagonist. Proulx's writing is beautiful, even when larded with 'Newfie-speak.'"

Paul Krugman

Peter G. Neumann

Kim Polese

***Piano Lessons: Music, Love, & True Adventures,* by Noah Adams.** "This is a book about a year in NPR commentator Adams's life. I was particularly interested in how much he had to struggle, because my next book is a bunch of piano compositions I've written that are intended to be playable by folks who aren't natural musicians. I've drawn on mathematics, software engineering, and other approaches to complexity to create pieces that are musically interesting but that are (I hope) relatively playable. Music can be very simple or very complex. As Einstein said, 'Everything should be as simple as possible but no simpler.' That's an inspiration in dealing with both computer systems and music."
"Reading **Anthony Burgess's *A Mouthful of Air*** was an outstanding adventure. It's an extraordinary book for people interested in language in general, English in particular, and how different languages compare and have developed over the ages. I attempt puns in multiple languages, as Risks readers may have noticed. So does Burgess."

**KIM POLESE**, *the Java goddess who left Sun Microsystems to found Marimba, reads what she has to to survive.*
"I don't have a favorite trade mag since they all have such different sensibilities and niches. But I get a quick hit every day from **CNET**. I always look for News.com stories by Jai Singh – he's plugged in and very smart."
***Tube: The Invention of Television,* by David Fisher and Marshall Jon Fisher.** "Actually I do have one book on my bed stand now – it's a history of the television. And it's an interesting parallel to the development of the Internet. Like early television, the Net is completely anarchic and uncontrollable and organic. And that's a beautiful thing."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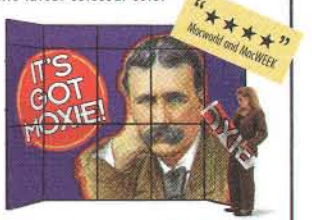


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**Return of the Set-Top Box**

Call it WebTV, DigitalTV, or Entertainment PC '98 – it still sounds like the set-top box hype we heard in '94, and it's going to fail for the same reasons. "Enhancing" TV always seems like a mighty straightforward proposition, but in practice it's about as easy as cleaning up landfill. That's why when Bill Gates demonstrates his vision of the PC/TV of the future, the best he can come up with is an electronic program guide that allows you to search for *Star Trek*. Maybe that will actually be useful once we get those 500 channels also promised back in '94.

**Corporate Fellows**

It sounds like something out of the 1940s, but the idea of "corporate fellows" is hot this year. For proof, just look at all the new Disney Fellows, including Danny Hillis and Alan Kay. Even tiny Seybold has hired developer gadfly Dave Winer as a Fellow. While they are bright people, it's not at all clear how much benefit these fellows really provide: like trophy wives, corporate fellows are primarily used for show. As IBM fellow Ted Selker once pointed out, "People end up losing their careers once they become a fellow. They get forced onto every company smorgasbord committee."

| This Month's Overhyped Memes | Hype Level | Position Last Month | Expected Lifetime |
|---|---|---|---|
| Return of the Set-Top Box | About to die | Meme on the rise | 4 months |
| Corporate Fellows | Meme on the rise | Embryonic meme | 12 months |
| Multifunction Smartcards | Embryonic meme | Embryonic meme | 6 months |
| Java Platform | About to die | Mass-media meme | 6 months |
| Groupware | Mass-media meme | Meme on the rise | 3 months |

Embryonic meme = Meme on the rise = Mass-media meme = About to die from overexposure

## HYPE LIST

**Multifunction Smartcards**

Seems every computer conference these days includes a session about the messianic coming of smartcards. Maybe that's no surprise: the thought of a disposable computer in every pocket is enough to make the most sober-headed hardware vendor drool. Now even the software guys want in, with multifunction smartcards that banks can customize to offer coupons and the like. Perhaps. But if there's one thing you don't want near your cash, it's third-party software.

**Java Platform**

When a history of Java is written, the March '97 JavaOne conference will be remembered as when the hype peaked. Contrary to simplified press reports, the real battle for the hearts and minds of developers has never been between Sun's Java and Microsoft's ActiveX. It's been between those who see Java as a platform – a white knight to unseat Windows – and those who see it as just a programming tool, albeit a very good one. But trying to make Java a platform takes us a step backward: what we end up with is something that looks a lot like Unix.

**Groupware**

The old joke that groupware should be known as "gropeware" – because we have no idea how to make it work – still rings true. Underneath Microsoft's and Netscape's hype about this next Net revolution is the inescapable fact that most attempts to implement group calendars and collaborative working environments have flopped. Even email is used as a CYA strategy: CC everyone to make it look like you're working. You can throw all the software smarts you want at the problem, but you're still not going to make people want to work together.

***– Steve G. Steinberg* (hype-list@wired.com)**

## Neverwhere You Want to Be

Richard Mayhew is Mister Average, living in London, working in a dull office job, engaged to bossy Jessica. Then one evening he finds an unconscious girl on the sidewalk and is dragged into the fantastical underside of London. This is a parallel city existing "in the cracks," a mythical place with its own associative fairy-tale logic – Neverwhere.

*Neverwhere* is the second novel by Neil Gaiman, known to millions as the cult-hero creator of the comic strip *Sandman*. Like *Sandman*, *Neverwhere* is darkly whimsical, the sort of novel Terry Pratchett might produce if he spent a month locked in a cellar with Franz Kafka.

Without pictures, Gaiman's prose can wear thin, and the characters (with a few exceptions, notably the cringeworthy baddies Croup and Vandemar) could have wandered in from any fantasy novel. That said, the narrative whips along at a breakneck pace, and *Neverwhere*'s failings are overshadowed by the lush evocation of its main character – the city itself. Here, time collapses into a strange fuzzy simultaneity, where lost Roman soldiers, feudal nobility, evil-smelling sewer dwellers, and talking rats coexist.

**Gaiman's tunnel vision.**

If you've spent time in London, there are plenty of laughs as geography takes on a mythical dimension and the Underground transforms into a house of mystery and imagination. You'll never look at the Tube the same way again. *– Hari Kunzru*

*Neverwhere*, by Neil Gaiman: US$24. Avon Books: +1 (212) 261 6883.

## Street Cred Contributors

**Aaron Belz** *(aaron@schwa.com)* is an interface designer at Schwa Digital Design *(www.schwa.com/)*, a company he cofounded in 1996. In his other life, he's a poet and book reviewer for *Publishers Weekly*.

**Bonnie Burton** is a Grrl *(www.grrl.com/)* who wishes she was the love child of pinup model Bettie Page and design guru Roger Black.

**Dave Cravotta** *(cravotta@kaiwan.com)* writes stories about science and other subjects. He is based in Orange County, California.

**Eamon Dolan** *(eamon.dolan@harpercollins.com)* edits books in New York and San Francisco.

**Peter L. Herb** *(plherb@aol.com)* is an attorney in New York City who writes and plays guitar when his kids are asleep.

**Rita M. Johnson** *(zymyatin@earthlink.net)* is a Missouri native presently residing in Los Angeles. Her writing has appeared in *LA Weekly*, *Sky*, *Dazed & Confused*, and *Request*.

**Scott Kirsner** is often referred to as the Marcel Proust of the two-line bio. He lives, writes, and devours madeleines in Boston's North End.

**Hari Kunzru** *(hari@dircon.co.uk)* is probably wandering around London's Soho looking for new brands of bottled beer. If you see him, remind him he has to work tomorrow.

**Andrew Lentz** is a freelance writer who just moved from Los Angeles to San Francisco. Whew.

**Jeffrey Mann** *(mannj@ibm.net)* lives in The Netherlands and France, works for the META Group of Stamford, Connecticut, and spends most of his time in airports.

**Zach Meston** *(vgzach@delphi.com)* recently moved from his lifelong home of Hawaii to Southern California. He still plays videogames for a living, which makes people insanely jealous, but no longer physically ill.

**Mitch Myers** *(comeback@mcs.com)* is a psychologist and a freelance writer. He lives in Chicago and Manhattan and spends a lot of time on the phone.

**Chris Nickson** *(cnicks@sprynet.com)* was born in England and now lives in Seattle. Please have pity on him.

**Tamara Palmer** *(trance@netcom.com)* is an aspiring turntablist currently stuck in Los Angeles.

**Jef Raskin** *(jefraskin@aol.com)*, best known for creating the Macintosh project at Apple, now consults on and designs post-GUI interfaces. Whatever that means.

**James Rozzi** *(jrozzi@gcedunet.gac.peachnet.edu)* has moved north to the home of Turner Field, where he hopes to someday play the national anthem on his saxophone.

**Steve G. Steinberg** *(steve@wired.com)* is a technology consultant and contributing editor at *Wired*.

**James Sullivan** *(onion65@aol.com)* is a regular contributor to a whole bunch of pop culture periodicals.

**Scott Taves** *(staves@interaccess.com)* is the US manager of B+W music and The Blue Room record labels and author of *A Pocket Tour of Games on the Internet*.


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# net surf

Edited by Kristine Kern

## Advertising's Other Face

About-Face *(www.about-face.org/)*, dedicated to combatting negative and distorted images of women in advertising and media, grasps the Net's contrarian nature and reminds us that political activism is keeping up with technology. The nonprofit group's online presence reflects the after-hours efforts of group founder Kathy Bruin.

Whether shilling clothes, cosmetics, perfume, or diet soda, women's ads often portray their subjects as undernourished zombies, victimized junkies, or underage sluts. Publications are not immune to this trend: *The New York Times Magazine* featured one skeletal trendsetter in a recent couture feature titled "Ethereal Girl." About-Face gives you the tools to confront this reality by offering various activist strategies, from organizing boycotts and writing letters to educating yourself and others about the ads' underlying messages.

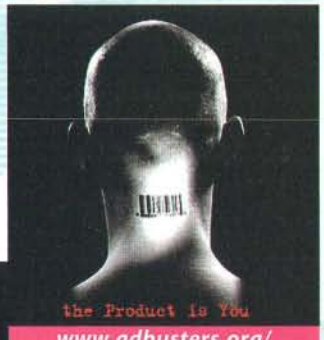
*www.riotgrrl.com/feed.htm*

Step into the "Gallery of Offenders" – a lion's den of advertising atrocities: the Gasoline jeanswear ad features a model groveling on a garage floor, clad in panties and denim shirt, legs splayed, pleading with her mechanic for ... some pants? Guess again! Or don't: Guess? girls vamp black-eye makeup and a just-been-battered coif. Versace poses its frail subjects falling down stairs. If the gallery gets you simmering, you can use the expansive list of contact information and sample letters to voice – to DKNY, say, or Request – your opinions of such misogynistic marketing.

A number of other sympathetic sites offer similar, often funny, takes on women's ads: a click to RiotGrrl delivers you to its "Feed the Super Model" animation page *(www.riotgrrl.com/feed.htm)*. It offers a daily waif – fresh from the pages of *W* or *Sports Illustrated*'s swimsuit issue – to tempt with pasta, burgers, or dessert. Before your eyes, each model morphs into a healthy, happy, normal-looking woman. Media Watch *(www.feminist.org/news/medwat.html)*, a California nonprofit founded by activist Ann Simonton, former top model and central foe of the Miss America pageant, links you to a bevy of like-minded pages.

The Media Foundation, a Canadian group that publishes *Adbusters* magazine, features a few "subvertisements" of its own on the magazine's online site *(www.adbusters.org/)*. Check out the gallery of Calvin Klein Obsession spoofs: one mimics the perfume campaign's sexy, soft-focus shot of a woman's back, but reveals her dry-heaving into a toilet; another finds a hunky CK male model obsessed with what's lurking in his BVDs.

While About-Face and its ilk seek to change American advertising, they also give props to a number of companies that are doing it right. Among these is Timberland, whose "Storm Brewing" ad *(www.about-face.org/highlight.html)* portrays the kind of image advocates have been demanding all along – a strong, powerful woman, beautiful in her ordinariness, and evidently not swayed by destructive, diminutive advertising trends. "She's not a model; she's a model person," reads the copy. This example marks a positive step for an industry that, were it not for offline and online activism, might actually think the masses believe in it. – *Colin Berry* (colin@wired.com)




*www.adbusters.org/*

## Break out of the Box

**Chuck your *TV Guide* and tune into this digital "network" – it'll keep you glued to your set. Post Tv takes the entertainment programming ethos to the next level of addictive, interactive terrain. Gorgeous and sound-soaked – it's a collaborative effort of Post Tool Design and Gravi-Tech Music – the site offers a playful variety: news, game "shows," the businessperson's guide to "How to Drink Like a Millionaire," a stand-up comedy routine delivered by an Internet-savvy alien, and seductive bedtime stories read by their female authors. Don't miss Joey Valley, the piano-playing lounge singer who has dubbed himself "King of the Web." That's a title this broadcast-bashing site is destined to maintain.**

***www.posttool.com/***

## Kablam! Splat! Take That!

Feel like throwing a brick at the television every time you see those annoying Spice Girls? The Brit-brat version of New Kids on the Block has conquered the UK with its brand of mindless sugar pop and has already wreaked havoc on the rest of the world.

***www.head-space.com/Urban75/spicebelt.html***

*Urban75*, a London-based zine whose motto is "Anger is an energy," has found a way to counterattack the invasion of the Girls. "Slap a Spice Girl" allows anyone with Internet access to take revenge. When a Girl's face pops up onscreen, click on her face and smack away à la Whack-A-Mole. For each hit, you earn one point and an audible "ouch!" Rack up 10 points for hitting Margaret Thatcher ("the original Spice Girl," according to *Urban75*), who surfaces occasionally. Satisfying.

## Asiaphile

***www.channela.com/***

**A hip guide to most things Asian, Channel A offers the modern generation's perspective on traditional food, art, and health practices of East Asia. Take the tea quiz ("Where did Orange Pekoe get its name?") or post your thoughts to a New Talk topic of the week like "Sex and Violence in Japanese Animation." More sophisticated types can browse for hot investment tips in the business section or, by scanning the Community page, investigate the fight for Asian Studies programs on college campuses. Channel A lets you major in this department – without the tuition.**

## Girl Talk

Web-based fears of insecure credit card transactions seem minor when compared with the specter of cross-dressed clairvoyants you meet at Internet Alfredo. They know what you're thinking – in real time, on the Internet. In a monthly installment of psychic drag queen cybercasts, a coterie of "girls" try out the latest Web technologies – live audio chats, CU-SeeMe, et cetera – as they engage in seductive acts of spiritual purification, fortune-telling, fetishism (psychic panties are coming soon), and, of course, dish. The mistress of this house of wig-wearing Web psychics is the perky Tara Limbaugh – "Rush's feminist daughter" – who started the project off with a 24-hour live event complete with more than 50 mind-reading drag queens, Allen Ginsberg, and William S. Burroughs in his first Net appearance. Old Bill taught the girls the history of transvestite shamanism, and they returned the favor with incisive fashion advice. Imagine what they can tell you.

***www.ina.com/***

## Doc Talk

Fans of the smart-alecky *Ask Dr. Science* radio show can now savor the sweet aroma of sarcasm online. Here, the good doctor tackles challenging queries with a scientist's best weapons: obfuscation and wiseass remarks. No paradox is too complex to be ridiculed, no theory too bold to be mocked. He is the ultimate know-it-all who, in fact, may know nothing. And yet we can't help but hang on his every word. After all, he's got a master's degree … in science!

*www.drscience.com/*

## Fantasy Threads from Down Under

**Old Celtic folk tales used the phrase "going under the hill" to refer to entering a supernatural spirit world just a dewdrop (or dream) away. Glass Wings presents a whimsical yet thoughtful passage to a land of fairy tales, gentle feminist-flavored erotica and science fiction. These text-intensive categories suggest something of the sensibility of the site's Australia-based creators, Andrew Pam and Yankee transplant Katherine Phelps. Their spirited idealism is a distillation of the best of '60s flower power filtered through present-day Down Under counterculture. And they're smart enough to offer a powerful travel story about a recent visit to a World War II concentration camp as a counterpoint to airy tales of sweetness and light.**

*www.glasswings.com.au/*

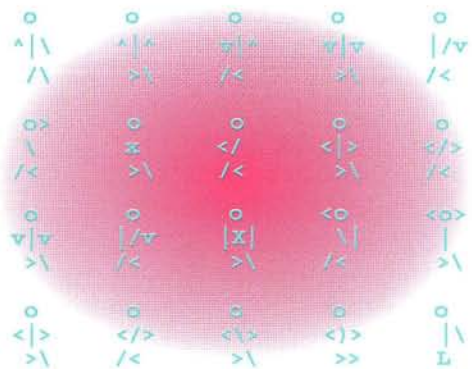
## Sucker Punching the Man

While many other Web sites grovel for approval, the good folks at annoy.com are lookin' to piss you off. They've assembled a hilarious, bile-drenched cache of intellectual weapons you can aim at everyone from Jesse Helms to the ACLU. A basic suite of Internet tools has been juiced up with plenty of fingernails-on-the-cultural-chalkboard content: swastikas, porn, racial epithets, and good ol' dirty words. While mauling the CDA crowd's delicate sensibilities is always a lark, annoy.com's real objective is to motivate First Amendment huggers. ("Avoid the brain flab that comes with complacency.") Whether this site's strategy is right or wrong, things should heat up now that the Feds are involved. This test case against the CDA's provision criminalizing communication with the "intent to annoy" may very well prove that the best defense is a good offense.

*www.annoy.com/*

### Random ASCII Art o' the Month

**Reason #173 to fear technology …**



**Mr. ASCII does the Macarena.**

## Thanks to the *Wired* 5.07 Surf Team

**Glen Helfand** *glen_h@sirius.com*
**Clare Kleinedler** *minori@addict.com*
**Colin Lingle** *cjlingle@bigink.com*
**Norman Weinstein** *nweinste@micron.net*

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◄ 129 cities and diffuse countrysides.

This all bodes well for the world economy. Through most of the 1970s, all the 1980s, and the early 1990s, the real growth rate in the world's gross domestic product averages 3 percent. By 1996, the rate tops a robust 4 percent. By 2005, it hits an astounding 6 percent. Continued growth at this rate will double the size of the world economy in just 12 years, doubling it twice in just 25 years. This level of growth surpasses the rates of the last global economic boom, the years following World War II, which averaged 4.9 percent from 1950 to 1973. And this growth comes off a much broader economic base, making it more remarkable still. Unlike the last time, almost every region of the planet, even in the undeveloped world, participates in the bonanza.

Latin America takes off. These countries, after experiencing the nightmare of debt in the 1980s, do much to vigorously restructure their economies in the 1990s. Chile and Argentina are particularly innovative, and Brazil builds on an extensive indigenous high tech sector. But the real boost from 2000 onward comes from capitalizing on Latin America's strategic location on the booming Pacific Rim and on its proximity to the United States. The region becomes increasingly drawn into the booming US economy. In 1994, the North American Free Trade Agreement formally links the United States to Mexico and Canada. By about 2002, an All American Free Trade Agreement is signed – integrating the entire hemisphere into one unified market.

The Middle East, meanwhile, enters crisis. Two main factors drive the region's problems. One, the fundamentalist Muslim mind-set is particularly unsuited to the fluid demands of the digital age. The new economy rewards experimentation, constant innovation, and challenging the status quo – these attributes, however, are shunned in many countries throughout the Middle East. Many actually get more traditional in response to the furious pace of change. The other factor driving the crisis is outside their control. The advent of hydrogen power clearly undermines the centrality of oil in the world economy. By 2008, with the auto industry in a mad dash to convert, the bottom falls out of the oil market. The Middle Eastern crisis comes to a head. Some of the old monarchies and religious régimes begin to topple.

An even more disturbing crisis hits Africa. While some parts of the continent, such as greater South Africa, are doing fine, central Africa devolves into a swirl of brutal ethnic conflict, desperate poverty, widespread famine and disease. In 2015 the introduction of biological weapons in an ethnic conflict, combined with the outbreak of a terrifying new natural disease, brings the death count to unimagined levels: an estimated 5 million people die in the space of six months – this on top of a cumulative death toll of roughly 100 million who perished prematurely over the previous two decades.

**By 2005, the world economic growth rate hits an astounding 6 percent – a rate that will double the size of the world economy in just 12 years.**

The contrast between such destitution and the spreading prosperity elsewhere finally prods the planet into collective action. Every nation, the world comes to understand, ultimately can only benefit from a thriving Africa, which will occupy economic niches that other nations are outgrowing. It makes as much practical as humanitarian sense. The regeneration of Africa becomes a prime global agenda item for the next quarter of the century.

## FUTURE AFTERSHOCKS

Riding the wave of the booming economy brings other major social and political repercussions. Fundamental shifts in technology and the means of production inevitably change the way the economy operates. And when the economy changes, it doesn't take long for the rest of society to adapt to the new realities. The classic example is the transformation of agricultural society into industrial society. A new tool – the motor – led to a new economic model – capitalism – that brought great social upheaval – urbanization and the creation of an affluent class – and ultimately profound political change – liberal democracy. While that's a crude summation of a complex historical transition, the same dynamic largely holds true in our shift to a networked economy based on digital technologies.

There's also a commonsense explanation. When an economy booms, money courses through society, people get rich quick, and almost everybody sees an opportunity to improve their station in life. Optimism abounds. Think back to that period following World War II. A booming economy buoyed a bold, optimistic view of the world: we can put a man on the Moon, we can build a Great Society, a racially integrated world. In our era, we can expect the same.

By about 2000, the United States economy is doing so well that the tax coffers begin to swell. This not only solves the deficit problem but gives the government ample resources to embark on new initiatives. No longer forced to nitpick over which government programs to cut, political leaders emerge with new initiatives to help solve seemingly intractable social problems, like drug addiction. No one talks about reverting to big government, but there's plenty of room for innovative approaches to applying the pooled resources of the entire society to benefit the public at large. And the government, in good conscience, can finally afford tax cuts.

A spirit of generosity returns. The vast majority of Americans who see their prospects rising with the expanding economy are genuinely sympathetic to the plight of those left behind. This kinder, gentler humanitarian urge is bolstered by a cold, hard fact. The bigger the network, the better. The more people in the network, the better for everyone. Wiring half a town is only marginally useful. If the entire town has phones, then the system really sings. Every person, every business, every organization directly benefits from a sys-

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tem in which you can pick up a phone and reach every individual rather than just a scattered few. That same principle true holds for the new networked computer technologies. It pays to get everyone tied into the new information grid. By 2000, this mentality sinks in. Almost everyone understands we're deep into a transition to a networked economy, a networked society. It makes sense to get everyone on board.

The welfare reform initiative of 1996 begins the process of drawing the poor into the economy at large. At the time, political leaders aren't talking about the network effect so much as eliminating a wasteful government program. Nevertheless, the shakeup of the welfare system coincides with the revving of the economy. Vast numbers of welfare recipients do get jobs, and the great majority eventually move up to more skilled professions. By 2002, the end of the initial five-year transitional period, welfare rolls are cut by more than half. Former welfare recipients are not the only ones benefiting from the new economy. The working poor hovering just above the poverty line also leverage their way up to more stable lives.

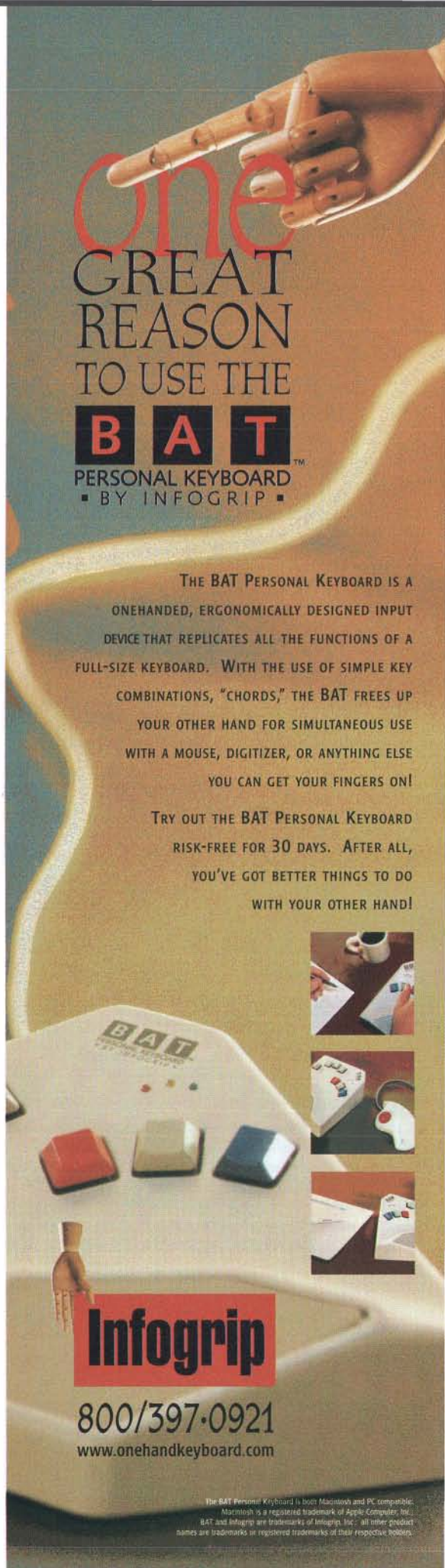
Even those from the hardened criminal underworld migrate toward the expanding supply of legitimate work. Over time, through the first decade of the century, this begins to have subtle secondary effects. The underclass, once thought to be a permanent fixture of American society, begins to break up. Social mobility goes up, crime rates go down. Though hard to draw direct linkages, many attribute the drop in crime to the rise in available work. Others point to a shift in drug policy. Starting with the passage of the California Medical Marijuana Initiative n 1996, various states begin experimenting with decriminalizing drug use. Alongside that, the failed war on drugs gets dismantled. Both initiatives are part of a general shift away from stiff law enforcement and toward more complex ways to deal with the roots of crime. One effect is to destroy the conditions that led to the rise of the inner-city drug economy. By the second decade of the century, the glorified gangsta is as much a part of history as the original gangsters in the days of Prohibition.

Immigrants also benefit from the booming economy. Attempts to stem immigration in the lean times of the early 1990s are largely foiled. By the late 1990s, immigrants are seen as valuable contributors who keep the economy humming – more able hands and brains. By the first decade of the century, government policy actively encourages immigration of knowledge workers – particularly in the software industry, which suffers from severe labor shortages. This influx of immigrants, coupled with Americans' changing attitudes toward them, brings a pleasant surprise: the revival of the family. The centrality of the family in Asian and Latino cultures, which form the bulk of these immigrants, is unquestioned. As these subcultures increasingly flow into the American mainstream, a subtle shift takes place in the general belief in the importance of family. It's not family in the nuclear-family sense but a more sprawling, amorphous, networked sense of family to fit the new times.

## THE BRAIN WAVE

Education is the next industrial-era institution to go through a complete overhaul – starting in earnest in 2000. The driving force here is not so much concern with enlightening young minds as economics. In an information age, the age of the knowledge worker, nothing matters as much as that worker's brain. By the end of the 1990s, it becomes clear that the existing public K-12 school system is simply not up to the task of preparing those brains. For decades the old system has ossified and been gutted by caps on property taxes. Various reform efforts gather steam only to peter out. First George Bush then Bill Clinton try to grab the mantle of "education president" – both fail. That changes in the 2000 election, when reinventing education becomes a central campaign issue. A strong school system is understood to be as as vital to the national interest as the military once was. The resulting popular mandate shifts some of the billions once earmarked for defense toward revitalizing education.

The renaissance of education in the early part of the century comes not from a task force of luminaries setting 170 ►



# The Long Boom

◄ 169 national standards in Washington, DC – the solutions flow from the hundreds of thousands of people throwing themselves at the problems across the country. The 1980s and 1990s see the emergence of small, innovative private schools that proliferate in urban areas where the public schools are most abysmal. Many focus on specific learning philosophies and experiment with new teaching techniques – including the use of new computer technologies. Beginning around 2001, the widespread use of vouchers triggers a rapid expansion in these types of schools and spurs an entrepreneurial market for education reminiscent of the can-do ethos of Silicon Valley. Many of the brightest young minds coming out of college are drawn to the wide-open possibilities in the field – starting new schools, creating new curricula, devising new teaching methods. They're inspired by the idea that they're building the 21st-century paradigm for learning.

The excitement spreads far beyond private schools, which by 2010 are teaching about a quarter of all students. Public schools reluctantly face up to the new competitive environment and begin reinventing themselves. In fact, private and public schools maintain a symbiotic relationship, with private schools doing much of the initial innovating, and public schools concentrating on making sure the new educational models reach all children in society.

Higher education, though slightly less in need of an overhaul, catches the spirit of radical reform – again driven largely by economics. The cost of four-year colleges and universities becomes absurd – in part because antiquated teaching methods based on lectures are so labor intensive. The vigorous adoption of networking technologies benefits undergraduate and graduate students even more than K-12 kids. In 2001, Project Gutenberg completes its task of putting 10,000 books online. Many of the world's leading universities begin carving off areas of expertise and assuming responsibility for the digitalization of all the literature in that field. Around 2010, all new books come out in electronic form. By 2015, relatively complete virtual libraries are up and running.

Despite earlier rhetoric, the key factor in making education work comes not from new technology, but from enshrining the value of learning. A dramatic reduction in the number of unskilled jobs makes clear that good education is a matter of survival. Indeed, nearly every organization in society puts learning at the core of its strategy for adapting to a fast-changing world. So begins the virtuous circle of the learning society. The booming economy provides the resources to overhaul education. The products of that revamped educational system enter the economy and improve its productivity. Eventually, education both sows and reaps the benefits of the long boom.

**By 2020, the great cross-fertilization of ideas, the never-ending planetary conversation, has begun.**

In the first decade of the century, Washington finally begins to really reinvent government. It's much the same process as the reengineering of corporations in the 1990s. The hierarchical bureaucracies of the 20th century are flattened and networked through the widespread adoption of new technologies. Some, like the IRS, experience spectacular failures, but eventually make the transition. In a more important sense, the entire approach to government is fundamentally reconsidered. The welfare and education systems are the first down that path. Driven by the imminent arrival of the first of many retiring baby boomers in 2011, Medicare and Social Security are next. Other governmental sectors soon follow.

The second decade of the century marks a more ambitious but amorphous project: making a multicultural society really work. Though the United States has the mechanics – such as the legal framework – of an integrated society in place, Americans need to learn how to accept social integration on a deeper level. The underpinnings of a booming economy make efforts to ease the tensions among various ethnic and interest groups much easier than before: people are more tolerant of others when their own livelihoods are not threatened. But people also come around to seeing diversity as a way to spark a creative edge. They realize that part of the key for success in the future is to remain open to differences, to stay exposed to alternative ways of thinking. And they recognize the rationality of building a society that draws on the strengths and creativity of all people.

Women spearhead many of the changes that help make the multicultural society work. As half the population, they are an exceptional "minority" that helps pave the way for the racial and ethnic minorities with fewer numbers. In the last global boom of the 1960s, the women's movement gained traction and helped promote the rise in the status of women. Through the 1970s and 1980s, women push against traditional barriers and work their way into business and government. By the 1990s, women have permeated the entire fabric of the economy and society. The needs, desires, and values of women increasingly begin to drive the political and business worlds – largely for the better. By the early part of the century, it becomes clear that the very skills most needed to make the networked society really hum are those that women have long practiced. Long before it became fashionable, women were developing the subtle abilities of maintaining networks, of remaining inclusive, of negotiating. These skills prove to be crucial to solving the very different challenges of this new world.

The effort to build a truly inclusive society does not just impact Americans. At the turn of the century, the United States is the closest thing the world has to a workable multicultural society. Almost all the cultures of the world have some representation, several in significant proportions. As the century moves on, it becomes clear to most people on the planet that all cultures must coexist in relative harmony on a global scale. On a meta level, it seems

that the world is heading toward a future that's prefaced by what's happening in the United States.

## A CIVILIZATION OF CIVILIZATIONS

In 2020, humans arrive on Mars. It's an extraordinary event by any measure, coming a half century after people first set foot on the Moon. The four astronauts touch down and beam their images back to the 11 billion people sharing in the moment. The expedition is a joint effort supported by virtually all nations on the planet, the culmination of a decade and a half of intense focus on a common goal. A remarkable enough technical achievement, the Mars landing is even more important for what it symbolizes.

As the global viewing audience stares at the image of a distant Earth, seen from a neighboring planet 35 million miles away, the point is made as never before: We are one world. All organisms crammed on the globe are intricately interdependent. Plants, animals, humans need to find a way to live together on that tiny little place. By 2020, most people are acting on that belief. The population has largely stabilized. The spreading prosperity nudged a large enough block of people into middle-class lifestyles to curtail high birth rates. In some pockets of the world large families are still highly valued, but most people strive only to replicate themselves, and no more. Just as important, the world economy has evolved to a point roughly in balance with nature. To be sure, the ecosystem is not in perfect equilibrium. More pollution enters the world than many would like. But the rates of contamination have been greatly reduced, and the trajectory of these trends looks promising. The regeneration of the global environment is in sight.

The images from Mars drive home another point: We're one global society, one human race. The divisions we impose on ourselves look ludicrous from afar. The concept of a planet of warring nations, a state of affairs that defined the previous century, makes no sense. Far better to channel the aspirations of the world's people into collectively pushing outward to the stars. Far better to turn our technologies not against one another but toward a joint effort that benefits all. And the artificial divisions we perpetuate between races and genders look strange as well. All humans stand on equal footing. They're not the same, but they're treated as equals and given equal opportunities to excel. In 2020, this point, only recently an empty platitude, is accepted by almost all.

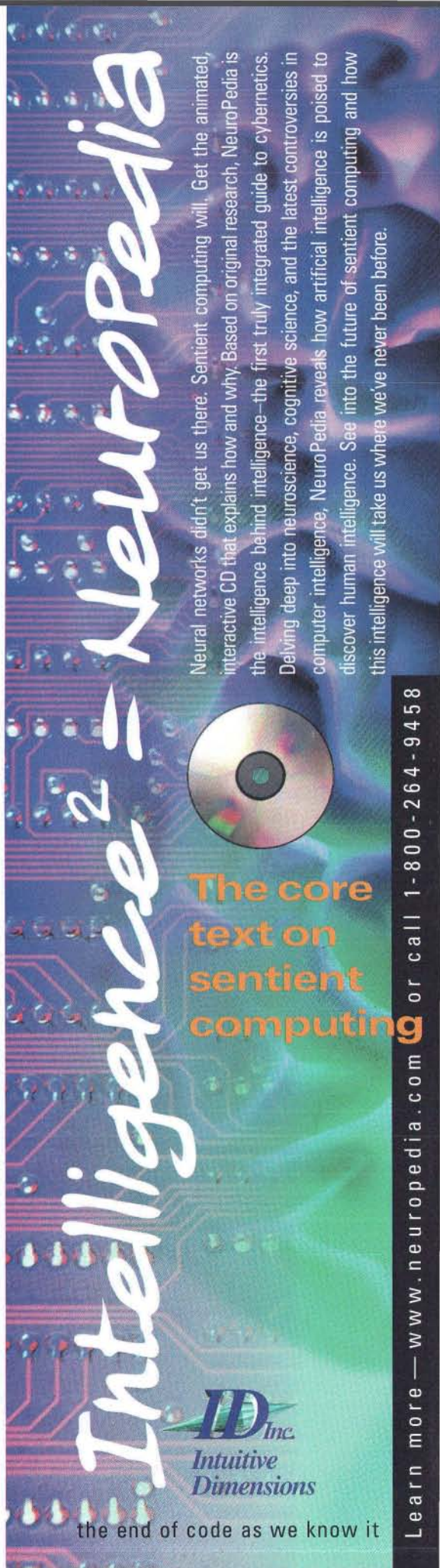
We're forming a new civilization, a global civilization, distinct from those that arose on the planet before. It's not just Western civilization writ large – one hegemonic culture forcing itself on others. It's not a resurgent Chinese civilization struggling to reassert itself after years of being thwarted. It's a strange blend of both – and the others. It's something different, something as yet being born. In 2020, information technologies have spread to every corner of the planet. Real-time language translation is reliable. The great cross-fertilization of ideas, the ongoing, never-ending planetary conversation has begun. From this, the new crossroads of all civilizations, the new civilization will emerge.

In many ways, it's a civilization of civilizations, to use a phrase coined by Samuel Huntington. We're building a framework where all the world's civilizations can exist side by side and thrive. Where the best attributes of each can stand out and make their unique contributions. Where the peculiarities are cherished and allowed to live on. We're entering an age where diversity is truly valued – the more options the better. Our ecosystem works best that way. Our market economy works best that way. Our civilization, the realm of our ideas, works best that way, too.

## THE MILLENNIAL GENERATION

By 2020, the world is about to go through a changeover in power. This happens not through force, but through natural succession, a generational transition. The aging baby boomers, born in the wake of World War II, at the beginning of the 20th century's 40-year global economic boom, are fading from their prominent 172 ►





# The Long Boom

◂ 171 positions of economic and moral leadership. The tough-minded, techno-savvy generation that trails them, the digital generation, has the new world wired. But these two generations have simply laid the groundwork, prepared the foundations for the society, the civilization that comes next.

The millennial generation is coming of age. These are the children born in the 1980s and 1990s, at the front end of this boom of all booms. These are the kids who have spent their entire lives steeped in the new technologies, living in a networked world. They have been educated in wired schools, they have taken their first jobs implicitly understanding computer technologies. Now they're doing the bulk of society's work. They are reaching their 40s and turning their attention to the next generation of problems that remain to be cracked.

These are higher-level concerns, the intractable problems – such as eradicating poverty on the planet – that people throughout history have believed impossible to solve. Yet this generation has witnessed an extraordinary spread of prosperity across the planet. They see no inherent barrier to keep them from extending that prosperity to – why not? – everyone. Then there's the environment. The millennial generation has inherited a planet that's not getting much worse. Now comes the more difficult problem of restoration, starting with the rain forests. Then there's governance. Americans can vote electronically from home starting with the presidential election of 2008. But e-voting is just an extension of the 250-year-old system of liberal democracy. Interactive technologies may allow radically new forms of participatory democracy on a scale never imagined. Many young people say that the end of the nation-state is in sight.

These ambitious projects will not be solved in a decade, or two, or even three. But the life span of this generation will stretch across the entire 21st century. Given the state of medical science, most members of the millennial generation will live 100 years. Over the course of their lifetimes, they confidently foresee the solutions to many seemingly intractable problems. And they fully expect to see some big surprises. Almost certainly there will be unexpected breakthroughs in the realm of science and technology. What will be the 21st-century equivalent of the discovery of the electron or DNA? What strange new ideas will emerge from the collective mind of billions of brains wired together throughout the planet? What will happen when members of this millennial generation possibly confront a new species of their own making: *Homo superior*? And what happens if after all the efforts to methodically scan the skies, they finally latch onto signs of intelligent life?

## JUST DO IT

Beam back down to Planet Earth. Get your head back to 1997, not even halfway through the transition of this 40-year era. We're still on the front edge of the great global boom, the long boom. Almost all the work remains before us. And a hell of a lot of things could go wrong.

This is only a scenario of the future, by no means an outright prediction of what is to come. We can be reasonably confident of the continuation of certain trends. Much of the long boom's technology is already in motion and almost inevitably will appear within that span. Asia is ascendant whether we like it or not. Barring some bizarre catastrophe, that large portion of the world will continue to boom. But there are many unknowns, all kinds of critical uncertainties. Will Europe summon the political will to make the transition to the new economy? Will Russia avoid a nationalist retrenchment and establish a healthy market economy – let alone democracy? Will China fully embrace capitalism and avoid causing a new cold – or hot – war? Will a rise in terrorism cause the world to pull back in constant fear? It's not technology or economics that pose the biggest challenges to the long boom. It's political factors, the ones dependent on strong leadership.

One hundred years ago, the world went through a similar process of technical innovation and unprecedented economic integration that led to a global boom. New transportation and communications technologies – railroads, telegraphs, and telephones – spread all over the planet, enabling a coordination of economic activity at a level never seen before. Indeed, the 1890s have many parallels to the 1990s – for better or worse. The potential of new technologies appeared boundless. An industrial revolution was spurring social and political revolution. It couldn't be long, it seemed, before a prosperous, egalitarian society arrived. It was a wildly optimistic time.

Of course, it all ended in catastrophe. The leaders of the world increasingly focused on narrow national agendas. The nations of the world broke from the path of increasing integration and lined up in competing factions. The result was World War I, with everyone using the new technologies to wage bigger, more efficient war. After the conflict, the continued pursuit of nationalist agendas severely punished the losers and consolidated colonial empires. The world went from wild optimism to – quite literally – depression, in a very short time.

The lessons of World War I contrast sharply with those of World War II. The move toward a closed economy and society after the first war led to global fragmentation as nations pulled back on themselves. In the aftermath of World War II, the impetus was toward an open economy and society – at least in half the world. This led down a path of continuing integration. World leaders had the foresight to establish an array of international institutions to manage the emerging global economy. They worked hard to rebuild their vanquished enemies, Germany and Japan, through generous initiatives like the Marshall Plan. This philosophical shift from closed to open societies came about through bold leadership, much of it coming from the United States. In the wake of World War I, American political and business leaders embraced isolationism – with severe consequences for the world. After World War II, they did the opposite – with very different results.

Today, the United States has a similarly crucial leadership role to play. There are purely practical reasons for this. The United States has the single largest economy in the world, a market with a big

influence on the flow of world trade. It has the biggest research and scientific establishment by far. Since the demise of the Soviet Union, no other country features a comparable array of university research facilities, corporate industrial labs, and nonprofit think tanks. That combination of a huge economy and a scientific élite gives the United States the world's strongest military; the country can develop the weapons and pay the bills. For the next 15 years at the very least, America will be the preeminent military power. These reasons alone ensure that the United States, regardless of the intentions of its leaders, will have a huge influence on any future scenario. But the role of the United States is more involved, more complicated than that.

The United States is the great innovator nation, the incubator of new ideas. Just as the new technologies of the early Industrial Revolution were born in England, the vast majority of innovations in the computer and telecommunications fields are happening now in the United States. Americans are fundamentally shaping the core technologies and infrastructure that will be at the foundation of the 21st century. Partly because of that, the US is the first country to transition to the new economy. American corporations are the first to adopt the new technologies and adapt to the changing economic realities. As a nation, the United States is figuring out how to finesse the new model of high economic growth driven by new technologies. The American people are feeling the first social and cultural effects. And the government is the first to come under the strain to change. The United States is paving the way for other developed nations and, eventually, the rest of the nations of the world.

Even more important, the United States serves as steward of the idea of an open society. The US is home to the core economic and political values that emerged from the 20th century – the free-market economy and democracy. But the idea of an open society is broader than that. Americans believe in the free flow of ideas, products, and people. Historically, this has taken the form of protecting speech, promoting trade, and welcoming immigrants. With the coming of a wired, global society, the concept of openness has never been more important. It's the linchpin that will make the new world work.

In a nutshell, the key formula for the coming age is this: Open, good. Closed, bad. Tattoo it on your forehead. Apply it to technology standards, to business strategies, to philosophies of life. It's the winning concept for individuals, for nations, for the global community in the years ahead. If the world takes the closed route, it starts a vicious circle: Nations turn inward. The world fragments into isolated blocs. This strengthens traditionalists and leads to rigidity of thought. This stagnates the economy and brings increasing poverty. This leads to conflicts and increasing intolerance, which promotes an even more closed society and a more fragmented world. If, on the other hand, the world adopts the open model, then a much different, virtuous circle begins: Open societies turn outward and strive to integrate into the world. This openness to change and exposure to new ideas leads to innovation and progress. This brings rising affluence and a decrease in poverty. This leads to growing tolerance and appreciation of diversity, which promotes a more open society and a more highly integrated world.

The United States, as first among equals, needs to live this concept in the coming decades. One of the first great tasks will be integrating its former communist adversaries China and Russia into the world community, in much the same way that it once did Japan and Germany. This will be the main geopolitical challenge of the next dozen years. We'll know if we made it by 2010. Then there's the need to create a complex fabric of new global economic and political institutions to fit the 21st century. Though these need not take the bureaucratic shape they did in the past, a certain level of coordination of global activities will continue to fall in the public sphere. In the technical realm, some body needs to mediate the setting of global technical standards and the allocation of what are, at the moment, scarce resources like airwaves. In the legal arena, we need to find ways to protect the rights of creators and consumers of intellectual property. In terms of the environment, the collective world community needs to get cracking on problems that endanger everyone: global climate change, loss of the ozone layer, and other cross-border problems like acid rain. And then there are the issues that fall under security. We spent decades in excruciating negotiation to disarm and limit nuclear proliferation. In an age of information warfare, we face a very different set of security concerns and a laborious process to find global solutions – starting with a workable accord on cryptography.

The vast array of problems to solve and the sheer magnitude of the changes that need to take place are enough to make any global organization give up, any nation back down, any reasonable person curl up in a ball. That's where Americans have one final contribution to make: optimism, that maddening can-do attitude that often drives foreigners insane. Americans don't understand limits. They have boundless confidence in their ability to solve problems. And they have an amazing capacity to think they really can change the world. A global transformation over the next quarter century inevitably will bring a tremendous amount of trauma. The world will run into a daunting number of problems as we transition to a networked economy and a global society. Apparent progress will be followed by setbacks. And all along the way the chorus of naysayers will insist it simply can't be done. We'll need some hefty doses of indefatigable optimism. We'll need an optimistic vision of what the future can be. ■ ■ ■

**With the coming wired, global society, openness has never been more important. It's the linchpin that makes everything work.**

**Talk with Peter Schwartz and Peter Leyden live Wednesday, July 9, at 6 p.m. PDT in the Wired Talk room at *www.talk.com/*.**

# Biometrics

◂ 135 The machines are so advanced, makers claim, they catch a cold with you.

Retinal scans, on the other hand, have proven as accurate or more so than voice verification, hand geometry, and digital fingerprinting in limited federal and state testing. Users place their eyes a few inches from an incandescent light beam that maps the vein patterns of the eyeball's innermost layer.

EyeDentify, the Baton Rouge, Louisiana-based outfit that holds the patent for retina scans, hasn't turned a profit since it was founded in 1976, though the firm has sold equipment to the military for years, says EyeDentify vice president Buddy Boyett. The company got some high-profile exposure by lending machines to the producers of *Mission: Impossible*, *True Lies*, and *Demolition Man*, among others. Now a doleful Boyett worries that over-the-top film gimmicks, like spiking a warden's eyeball on a pencil tip and holding it up to a retinal scanner, have hurt real-world business.

If facial or retinal scans seem intrusive, consider this: body odors, unique to each of us, can be digitally recorded and used with biometric security devices. And a hand, not an armpit, will suffice for a sample, according to British developer Mastiff Electronic Systems Ltd., which makes a new sensor called Scentinel. Senior engineer Stephen McMillan, however, says the product won't be ready for another three years. And the price still stinks: about £30,000 (US$48,600) for a test model. Even so, Mastiff engineers report interest from the British embassy in Buenos Aires, Saudi Arabia's National Guard, and private Indian and Japanese companies.

Demand for other technologies such as wrist-vein recognition, signature verification, and keystroke dynamics is developing more slowly. More than 100 patents have been issued in signature recognition, but credit card companies have been slow to buy such devices because false rejection rates aren't yet low enough. Keystroke dynamics (where a biometric device samples typing patterns a thousand times per second) has stalled in part because keyboards aren't adequately standardized. Analyst Erik Bowman, who writes for *Personal Identification News*, says some of these devices will range from $1,000 to $4,000 and are expected to be commercially viable by 1999.

## THE MARK OF THE BEAST

Even if biometric products become readily available, can we stomach them? Anyone who followed the scream sessions over the immigration reform bill in the 104th Congress remembers politicians disavowing national ID cards, retina scans, and tattoos to catalog the US workforce. "The government's thirst for personal data cannot be quenched," warned ACLU legislative counsel Gregory Nojeim in a 1995 testimony before the Senate Judiciary Committee. Representative Steve Chabot (R-Ohio) dubbed a proposal for a computerized worker registry "1-800-BIG BROTHER." Privacy advocates used the occasion to trot out statistics on the prostitution of the Social Security number by direct marketers.

**Forget Luddite hysteria – some big opposition to biometrics comes from religious groups preaching Apocalypse.**

While it is tempting to write off much of the opposition to biometrics as Luddite hysteria, some religious groups are preaching biometrics as the coming of the Apocalypse. In an October 9, 1995, segment titled "Biometrics: Chipping Away Your Rights?" on the Christian Broadcasting Network, televangelist Pat Robertson warned viewers of *The 700 Club*, "The Bible says the time is going to come that you cannot buy or sell except with a mark placed on your hand or on your forehead ... It is happening, ladies and gentlemen, exactly according to the Book of Revelation."

But the voices predicting doom are whispers compared with the shouts of biometrics' increasingly vocal backers. "We are eyeball to eyeball with a new, exciting technology that can make government programs more effective and efficient," says John Woodward, a former CIA officer currently researching legal and policy implications of biometrics as a student at Georgetown University Law Center. "Now is not the time to blink."

It may be time, however, to take a critical look at the move toward industry standards. Roughly 100 vendors sell patented biometric systems that cannot talk to each other. But as the technology infiltrates the market, manufacturers predict inevitable pressure for standardization to facilitate the aggregation of personal biometric files.

Vast storehouses of data have passed constitutional muster before. The US Supreme Court, in the 1977 decision *Whalen v. Roe*, upheld New York's right to record sensitive medical information in centralized databases, finding that the state had showed a proper concern for the protection of privacy. Since then, there have been numerous federal and state database schemes. In October 1995, the Federal Highway Administration awarded a $400,000 contract to San Jose State University's College of Engineering to develop standards for a "biometric identifier" on commercial driver's licenses and for use in a centralized national database.

At a biometrics conference for government officials last fall, Pennsylvania welfare official James Weaver told a packed hall that he plans to eventually share his state's digital fingerprint data with neighboring state welfare authorities to prevent recipients from collecting benefits in multiple states under assumed names. Florida state senator Bill Bankhead suggested that businesses will want to log on to his state's new database of benefits recipients, soon to include fingerprints. "We're talking about having as much as possible in a single file," he told conferencegoers at a CardTech trade show last year. "I think that many businesses would pay extra to have that information ... Maybe we can even make a profit."

The prospect of interoperable, even networked biometric databases raises a frightening specter: our body parts and prints could soon be bought and sold like Social Security numbers by direct marketers, government clerks, or medical providers. One "harmless" little retina scan, some opthalmologists warn, could indicate that a person has AIDS or abuses drugs. Woodward answers that federal, state, and even private administrators of central biometric data-

bases should prove they're not exploiting the data for a use that wasn't intended – say, sharing retina readings with Medicare providers who suspect drug use when the scan was gathered to prove a person was a legal immigrant.

Precisely to avoid the dangers of centralization and unauthorized disclosures, biometrics makers are pushing "one-to-one" matching systems. With one-to-one, a smartcard – not a database – holds the sensitive information. When ID is required, a biometric reader simply matches the particular body part with the data on the card. "You could come to the incorrect conclusion that biometrics are a potential threat to an individual's privacy," says Ben Miller, CardTech conference chair and publisher of *Personal Identification News*. "The fact is, they're probably the best and possibly the only tool that can guarantee the individual some control over personal information." Miller calls the one-to-one smartcard a "secure valet" for personal data.

Until then, while unregulated researchers race to develop a kinder, gentler biometric and various groups jockey for administrative control, sniping entrepreneurs freely dis their competitors. Most finger-imagers, for example, mock FingerMatrix for cleaning its scanner with a water-and-alcohol solution to improve scan resolution – these test conditions, they say, will likely never be reproduced in the real world. Retina and iris scanners are edgy rivals. Even Miller intimated that some less-than-forthcoming companies cleverly cook their books to keep error rates low.

Besides the technical bugs, more obstacles to large-scale use await, not least of which is the missing-body-part conundrum. "With any device, some portion of the population – 1 to 3 percent – doesn't have that biometric," says San Jose State University biometrics expert James Wayman, who spent a disappointing few years at the NSA trying to sell his colleagues on using head resonance as a biometric identifier.

**Boosters, for their part, say biometrics are the best tool to guarantee individual control over personal information.**

"And it makes no sense," he adds, "to have centralized databases for the day-to-day person."

### THE MISSING-BODY-PART CONUNDRUM

Currently housed at the National Security Agency, a working group of federal bureaucrats founded the Biometric Consortium in the early 1990s. Its 1995 charter promises to "promote the science and performance of biometrics" for the government.

Consortium members include state welfare agencies, driver's license bureaus, the Immigration and Naturalization Service, the Social Security Administration, and the Internal Revenue Service. Biometrics vendors are lobbying the consortium in the hopes of getting on its good side for the inevitable day the group morphs into a regulatory agency with power to evaluate and approve products. As is, the Biometric Consortium wants to police inflated claims of accuracy and will soon award a contract for the first-ever government evaluation center.

As Wayman explains, some people's fingerprints are scarred from years of bricklaying or chemical exposure, while sufferers of glaucoma or diabetes may give inconsistent eye and hand readings. Wayman's office at the San Jose Biometric Identification Research Institute, for example, controls access to its building with hand geometry readers. Two of 200 people who need regular access cannot pass the hand test. "One fellow is missing a finger," Wayman says. "The second fellow – nobody knows why – has a hand that's too variable." If the building converted to a fingerprint reader, one of Wayman's buddies couldn't visit. "He has a severe fungal infection on his hand that's incurable. It causes such cracking of his fingerprints that they are unreadable." For all his biometric expertise, the professor of engineering knows of only one solution: "If DNA testing ever gets to be real time and is not intrusive, then I think that would solve the problem," he muses. "Everyone seems to have DNA." ■ ■ ■

# Anguilla

◄ 144 **The long arm of Big Brother**

Through the bare lobby of the Inter-Island Hotel, past the kitchen, across an empty room where faded pictures of Louis Farrakhan and Nelson Mandela have been wrapped in plastic and pinned to the wall, we come to an unmarked plywood door. Entering, we're suddenly in the largest meeting hall in Anguilla, a modern, air-conditioned conference room big enough for maybe 80 attendees. Every morning, the cryptographers gather here clutching their laptops. Many of the presentations are uncompromisingly technical, so I hang out in the adjacent dining room, trying to convince cypherpunks that it's safe to speak to me.

Here I find Sameer Parekh, a prototypical online activist. He's frail and young, but there's a ferocious gleam in his eye, and he's been a rebel since his high school days in Libertyville, Illinois ("Tyrannyville," as he calls it), where he published a newsletter ranting about the abuses of government power. In his last year at high school, Parekh and his fellow students were asked to predict their future. "I said I would either be insanely rich, in jail, or followed by the CIA." He laughs happily. "I suppose one of those things is going to happen."

Today, after a troubled attempt at running an Internet service provider offering total anonymity to some dubious clients, Parekh has become a software publisher. Because of US export laws, Microsoft and Netscape are compelled to use weak encryption in server software that they sell overseas. Parekh takes advantage of the companies' weakness by marketing Stronghold, which adds powerful encryption to Apache, a piece of freeware that runs 45 percent of the Web sites in the world (more than Netscape and Microsoft combined). He avoids export regulations by shipping the software from England and doing his development overseas. "We don't reveal exactly where," he says, "because the US government has a special envoy on cryptography named David Aaron who goes around trying to persuade other countries to follow American policy, and we don't want to single out a particular country for special treat- 176 ►

# Anguilla

◂ 175 ment from this guy."

His company, C2Net, has launched another encryption product named SafePassage that does for client computers what Stronghold did for servers. "This will really make the government upset," Parekh says. "It's how we choose projects," he jokes. "We ask ourselves, how upset will this make the government?"

SafePassage adds its own layer of security to any browser – making it a useful tool because the versions of Netscape and Internet Explorer that people download within the US are generally crippled with export-level encryption.

Parekh instantly dismisses accusations that criminals will take advantage of secure encryption and instead flips the supposition around. "Without strong encryption, financial transactions online are vulnerable," he notes. "We need strong encryption so that the world won't be held hostage to criminals."

So this puts him on the side of law and order? "That's right." He nods earnestly, giving me a thumbs-up. "I'm a real law-and-order type."

### Ecash tussles

Actually there seem to be no bona fide law-enforcement personnel at the conference – at least, none I could identify. "Have you played Spot-the-Fed?" one cypherpunk asks another during lunch. "There has to be at least one, don't you think?"

"It would be an insult if there wasn't," his friend says.

If this sounds self-important, even melodramatic, maybe it's a reasonable response to the US government's unrelenting hard line on cryptography. Consider this case history: According to documents obtained by the Electronic Privacy Information Center in Washington, DC, when AT&T wanted to sell a telephone system with built-in DES algorithms to enable absolutely secure phone calls, the Feds bought 9,000 – almost the entire production run – using money acquired from civil forfeitures. You can buy other voice-encryption phone systems, but the manufacturers refuse to reveal functional details, so the systems cannot be verified and probably aren't truly secure.

Phil Zimmermann's PGPfone software gives Net users a way to chat online with total security, but the audio quality is terrible. Sensing a market opportunity, Eric Blossom has spent three years perfecting a state-of-the-art voice encryptor that he calls the GSP 8191. It's a modem-sized metal box that samples your voice digitally and processes it with triple-DES encryption. The internal architecture is fully documented so that users can verify its security, and each conversation between two GSP-equipped phones creates its own code keys in such a way that a third party cannot obtain the keys by listening in on the call.

**If smartcards become the dominant electronic substitute, won't this mean that the banking fraternity keeps control of the system?**

At Willie's Inn, a 1960s-style two-story white building on an Anguilla back road, I sit with Blossom on a balcony where almond trees, cedars, and hibiscus shade us from the tropical sun. He shows me his prototype, and I hold it in my hand, reminding myself that this harmless little metal box is classified as a munition under US law. Conceivably, Blossom could face five years in jail and a $1 million fine if he exported it without a license. The idea seems laughable – but so far as the Justice Department is concerned, it's no laughing matter.

About a year or so ago I spoke to Scott Charney, chief of the Computer Crime Unit at the Justice Department, who outlined his deep concerns about strong encryption. "If a judge says we can go into someone's home," he said, "this is to protect society. Our intrusion is a right for society at the expense of the individual. Suppose you buy a bigger lock; we bring a bigger sledgehammer. But cryptography is a lock so strong, society cannot penetrate it – even if everyone agrees the hidden information is very important, *and* will save many, many lives, *and* a court has authorized us after a neutral judicial review."

Consequently, Charney is a diehard believer in key escrow, whereby a third party (such as a government agency) holds the keys to all encrypted communications.

But consider a security expert's perspective: "All these systems advocating a trusted third party are ill conceived and naïve," says Marc Briceno, who worked as an ecash evangelist for DigiCash. "What did it take – $300,000 to compromise a CIA branch chief in the Aldrich Ames case, even when he knew that his revelations would cost people their lives? How much will it take to bribe the junior systems administrator who changes the backup tapes each night at the place where keys are stored?"

DigiCash offers the first and only system of electronic money to guarantee total user anonymity (although the company prefers the word "privacy"). The product prohibits anyone from profiling your spending habits or impersonating you to make purchases. Since this would eliminate huge annual losses in fraud, you'd think it would delight banks and credit card companies, but after two years, DigiCash is still struggling.

Briceno seems unconcerned. He's tall, amiable, short-haired (unlike many cypherpunks), and in a cream linen jacket and cotton pants, he's almost stylish, which puts him in a class of his own. He speaks in flawless but accented English, yet refuses to tell me where he grew up, saying with a shrug, "Like many cypherpunks, I am very protective of my privacy."

I sit with him outside the conference hotel on a bench nailed together from plywood sheets. A lizard basks on the wall behind us, and some roosters wander in from the adjacent lot where a woman hangs wash on a line.

"We signed up Deutsche Bank last year," Briceno says, when I suggest to him that few banks seem interested. "They are an international powerhouse, and one of the largest banks in Germany. We also signed up EUnet in Finland, and the largest banks in Norway and Austria, respectively, Den norske Bank and Bank

Austria. Beta software has been supplied to Advance Bank in Australia, that will go live within a matter of months."

More recently, Nomura Research Institute in Japan has licensed DigiCash for a scheme that allows employees and associates to make electronic payments.

Still, only about 2,500 consumers have opened electronic accounts in the US. Briceno blames this partly on regulations that force a bank to obtain a customer's signature before establishing an account. "This of course violates the first law of Internet commerce: Thou Shalt Not Make Thy Customer Get up from a Chair."

He finds it inexplicable that people are willing to continue trusting credit cards. "Data mining is on the increase," he says. "Many corporations are doing it. Last year, Citibank purchased a computer system for fraud detection via suspicious buying patterns – and also to predict future buying patterns of cardholders. Profiles are being built of who you are, what you buy, and what you are likely to buy in the future. Courts have ruled that transactional information is not your property – it can be bought and sold. The only way to avoid this is by paying cash or using DigiCash."

DigiCash is the brainchild of David Chaum, who conceived the idea of anonymized transactions in the 1970s as a grad student at UC Berkeley. Chaum acquired a master's and a PhD in computer science, then founded the International Association for Cryptologic Research before he decided to apply his concepts via DigiCash in 1990.

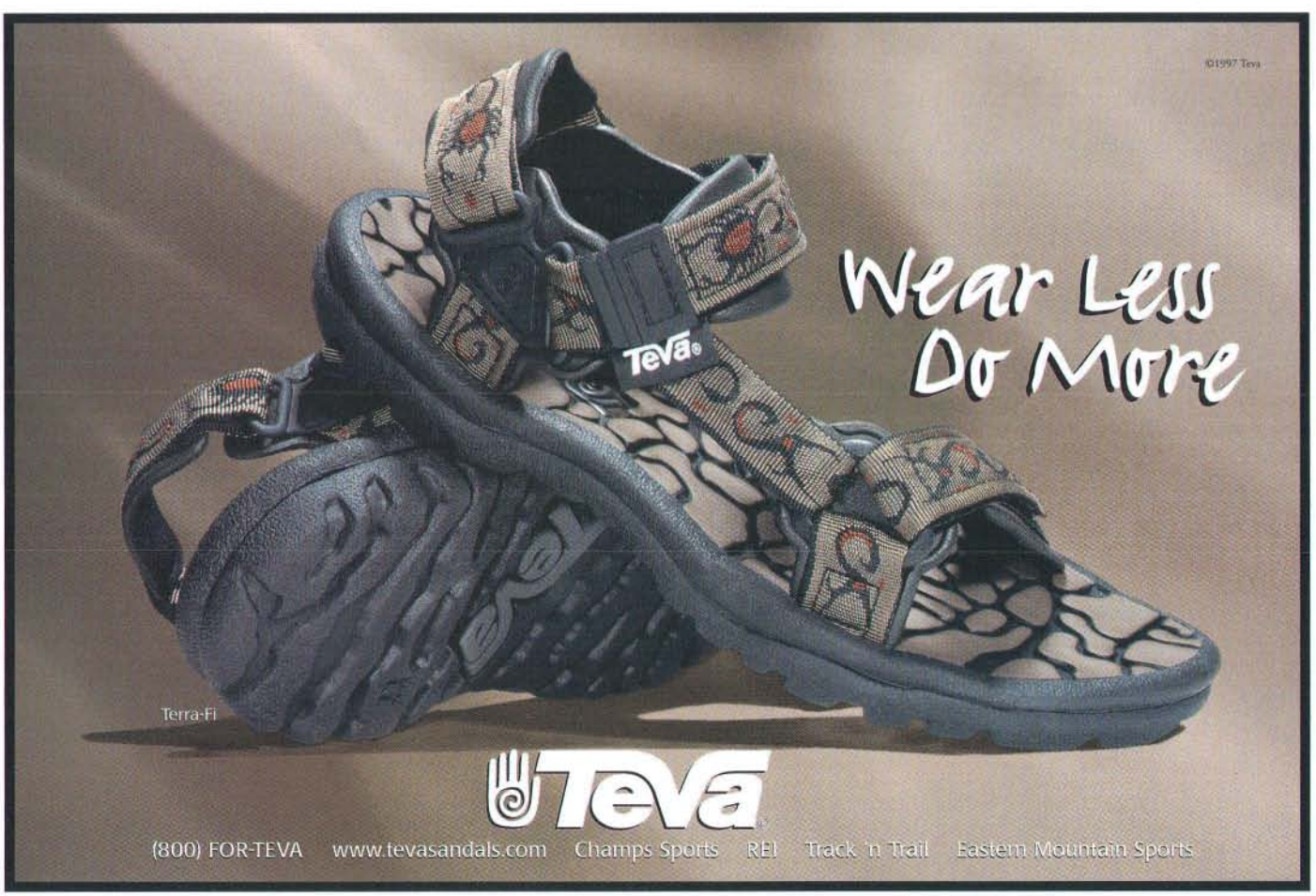
Chaum is revered among cypherpunks, yet some also blame him for bad business decisions. "He is a highly moral person," one cypherpunk tells me, "which is a pain in the neck because this is a cutthroat business. Banks are his competitors, and they don't want his product because it's so efficient, it will destroy the profits of ordinary payment systems. Also, banks don't care about privacy – in fact, they *like* to know what their customers are doing. There's a complete mismatch between what DigiCash is trying to do and what the banks want, yet Chaum refuses to sell licenses to anyone who isn't a mainstream bank. It's a very frustrating situation."

Briceno won't comment directly on this but since then DigiCash has hired a new CEO and policies may change in the future.

Meanwhile, Europeans already have an alternative: cash-value smartcards such as Mondex (the world's first), which was developed in Britain. When you insert the card into an ATM, value is transferred from your account and stored in the microchip embedded into the card. Later, at your local supermarket, you pay for groceries by inserting the card in a reader that subtracts the appropriate amount.

In 1996, Bellcore published a paper claiming that if you microwaved a smartcard to induce errors, you could reverse-engineer it. This turned out to be largely false, and in any case the Mondex encryption scheme has been changed since then to provide better security. MasterCard has since bought 51 percent of Mondex, for somewhere between $100 million and $150 million, and Mondex is now positioned to serve as a cash substitute in half a dozen countries.

David Birch runs a British consul- 178 ►



# Anguilla

◂ 177 tancy company named Hyperion that advises Mondex. "By the end of this year," he says, "there will be millions of people wandering around with smartcards in their pockets. All the crypto is on the cards, so they don't need a secure channel to communicate – which makes them perfect for the Internet." Consequently, according to Birch, we will buy our own card readers and plug them into our PCs – and *there* lies the future of electronic money.

But if cards become the dominant electronic substitute, won't this mean that the banking fraternity keeps control of the system? Not necessarily. Mondex is not a bank, but a private company largely owned by banks. In fact, it could be a first step toward cash systems that circumvent banks entirely. Anyone in the Netherlands can issue smartcards – although they need a "relationship" with a bank to handle cash flows. The British are more laissez-faire; they feel that open competition is inevitable. The only real holdouts are the Germans, who insist that smartcards can be issued only by banks.

Birch suggests that this debate is redundant because unregulated currency substitutes already exist. Frequent-flier miles, for instance, have value that is recognized by airlines, hotels, car rental companies, and long distance phone companies. What if the miles were stored on each user's smartcard instead of on a distant mainframe computer? Consumers could trade mileage among themselves using card-to-card transactions (which are permitted in the Mondex system), and suddenly we'd have a totally independent form of currency.

But Birch believes "there is no visible demand for absolute privacy in a payment system." He points out the ubiquity of magnetic-stripe "loyalty cards" in Britain, giving customers discounts at the big three supermarket chains while the stores track buying patterns. "The supermarket just wants to know what toothpaste you buy, not who you are. After three months they send you money-off vouchers for the toothpaste you didn't buy." Birch spreads his hands. "Who cares about that?"

In the US, there's more resistance to new payment systems. Still, last December, Microsoft started publishing specifications defining a Windows standard for smartcard handlers. It won't be alone.

Ted Goldstein has a thick, sandy beard and an amiable grin. He displays more warmth than your typical computer geek, but when he talks, the words are as meticulously organized as a computer program, creating a sense of relentless competence. At Sun Microsystems, he's leading an initiative to create a software "framework" for electronic commerce that will accept a new kind of Java program module he calls "cassettes."

Think back to the days when each word-processing package created its own kind of window. "Today windows are a standard feature of the operating system," says Goldstein. "We want to do the same for financial applications. Whether you're tracking investments or making payments, there'll be a consistent look and feel."

**Cypherpunks don't give a damn about money laundering and view government as an archaic encumberance ripe for demolition.**

A key feature of this vision is a Java wallet. On your screen you'll see a picture of a traditional wallet containing various cards, which you can click on to perform different transactions. "In a real wallet," says Goldstein, "no two of us will have the same set of cards. It will be the same in our system, as users plug different cassettes into the framework. The card-issuing institutions can be separate and independent – yet they can all conform to the standards of the framework."

Sometime this summer, Goldstein predicts that developers will be able to download the Java Commerce Toolkit from a Web page while consumers will get free copies of the Java wallet. Strong encryption will be included where it's permitted by law. Just to make things even more interesting, smartcards will be supported.

In fact, Goldstein has a stripped-down version of the Java language that fits in ROM on a smartcard, allowing programmers to write a Java applet using the card as a micromicrocomputer. Since a smartcard has only 512 bytes of RAM (that's *bytes*, not kilobytes), the system has severe limitations. But maybe there's a glimpse of the future here: a little piece of plastic that could ultimately carry as much computing power as a Pentium PC.

### The Net as an island

The crypto conference is a hit. The program is packed with useful content, and the cypherpunks seem totally at home in Anguilla. Of course, codeheads are notoriously indifferent to creature comforts, and I suspect that some normally live in conditions comparable to my hotel room, which makes the island seem like a home away from home.

On Thursday night, we head out along a dirt road to Rafe's, a barn with no walls, just a big peaked roof of corrugated iron resting on 10-foot wooden posts driven into the sandy ground. Who needs walls when the temperature is 80 degrees day and night? Reggae music pounds from under the roof and echoes away across the scrubby hillside. Our sandals crunch across a floor of stone chippings, and we plant ourselves around an orange-and-green picnic table. The cypherpunks start eating barbecued chicken and talking crypto, which attracts some speculative stares from locals. The nerds don't care, they've reached conversational critical mass. The acronyms flow as freely as the Caribbean beer.

I find myself next to a slightly drunk British programmer whose start-up company has written software to manage all the business of a regular stock exchange.

"Our system is totally secure," he tells me, "with public key encryption, and it could probably handle about 1,000 orders a day, running on single Pentium PCs. The cost per trade is around 30 cents. And we've already published the source code online so anyone can use it."

We leave Rafe's around 1 a.m. and walk

out under the stars. The trade winds are blowing, and there's a great feeling of simplicity and peace – now I finally understand why the cypherpunks feel so comfortable on this little island. It's undeveloped territory, like the Net. It's uncommercialized, virtually crime-free, informal, untaxed, and unregulated. Best of all, the local government is so small and unobtrusive, it creates a utopian feeling of freedom.

This, of course, leads us to the big question: Can the Net preserve *its* state of unregulated freedom as it matures into a vast worldwide society supporting all kinds of financial transactions?

Well, consider the current situation in most developed countries. Conventional monetary systems are so insecure, they don't just permit crime, they encourage it. People write bad checks, forge currency, and use stolen credit card numbers, and a huge web of regulations has evolved to cope with these problems. Laws must be enforced by police, while courts and prisons process the law breakers. Overall, insecure systems create a huge overhead of hidden costs.

Suppose that electronic cash is made so secure, it can virtually eliminate fraud. This changes the picture radically. If no one can cheat, whole sets of laws become unnecessary and the justice system can be downsized. In this vision, various forms of authentication would guarantee trust, and everyone would benefit.

**ADDITIONAL INFORMATION**

**Conference proceedings:**
***www.arraydev.com/commerce/JIBC/***

**Vincent Cate's site (including tax information):**
***www.offshore.com.ai***

**Hansa Bank in Anguilla:**
***www.offshore.com.ai/span-hansa/***

**C2Net general information:**
***www.c2.net***

**The Java wallet and Java Commerce Toolkit:**
***java.sun.com/commerce***

**See how much information your browser reveals about you:**
***www.anonymizer.com/***

**Introduction to DigiCash:**
***www.DigiCash.com/publish/ecash_intro***

**Learn about e-gold, a new form of electronic cash:**
***www.e-gold.com/***

**The Janus system:**
***www.bell-labs.com/project/janus/***

Unfortunately, we need to do more than merely provide people with the tools to make this happen. DigiCash already did that, and it hasn't worked. The costs of weak security and lack of privacy are not sufficiently obvious to consumers, and the benefits of strong security seem idealistic and theoretical. Consequently, people show little interest in paying for security and privacy.

But something Parekh said comes back to me: "People won't pay very much for privacy services – but they *will* pay for a software product that just happens to have security and privacy built into it."

This, then, is the urgent need: financial cryptography that is so simple, cheap, ubiquitous, and strong, that we can take it for granted. With rebellious determination, this is what many of the attendees in Anguilla hope to achieve – if they are allowed to do so. ■ ■ ■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**US Robotics** www.usr.com
**Vancouver Film School**
www.multimedia.edu/index.html
**Visa** www.visa.com

# Afterlife

◄ 151 to good use or scrapped for money. The center will survive. Lately, Burgett's been negotiating a deal to move a VAC 9000 mainframe to Russia for use in that country's space program. New opportunities always come up. And some corporate donors keep bringing him equipment, because they don't want publicity, or because they want to help a school or charity that's working only with the San Rafael center.

For the recipients of such free equipment, it's hard to lose. The nonprofit groups do a pretty good job matching the right computer with your needs, and the machines usually come set up and ready to go. Every recycler has a James Burgett figure somewhere back in the warehouse, someone who has lovingly restored each computer for reuse. Picking up old technology on the cheap is actually a pretty fair gamble. At worst, you choose a bum machine, waste a little time, and have to dispose of the junk yourself.

First-time owners, on the other hand, usually look for new computers, and they rely on the reputation of a national chain store or a manufacturer's warranty to feel comfortable. Brian Kushner of ReCompute in Austin, Texas, wants to change all that. Kushner had a brainstorm two years ago: he decided to standardize secondhand computers so that novices would feel confident enough to buy one. One of Kushner's models, for example, sells for about $899 – half the price of a new Pentium machine, including plenty of memory, a monitor, a warranty and service contract, and special start-up software for beginners thrown in. While most used computers are set up a few at a time in the back of some guy's fix-it shop, Kushner's store sells almost a thousand used 486s and Pentium machines a month, with four standard models to choose from.

Does Kushner worry that manufacturers will think he's moving in on their territory? On the contrary, the nearby Dell Computer factory is one of his biggest suppliers. When someone returns a Dell, the company regularly resells it to ReCompute. "We're expanding the market to users who wouldn't be able to buy a computer otherwise," says Kushner. "It's just like how the used car business propelled the new car industry in the 1950s."

**While some secondhand PCs live on in one piece, the end-of-the-line recyclers grind up whole machines for ferrous material.**

Ironically, it's the folks selling used computers for a living who have the tough job of convincing buyers that the old machines are really a good deal. To be sure, a few for-profit resellers do brisk business in surplus and refurbished machines – *The Wall Street Journal* notes that 2.4 million used computers were resold last year. And leasing companies such as Comdisco *(www.comdisco.com/)*, whose average contract lasts less than three years, are already starting to sell off old Pentiums by the thousands. Still, you get the sense that their customers are mostly people familiar with the technology; they know how to pick a good PC out of the pile, and they know what can go wrong. The Boston Computer Exchange, for example, has sold used machines since 1982 and is legendary among early adopters. The first used PC broker in the United States, the exchange is now one of the nation's largest, with annual sales of $36 million. Onsale *(www.onsale.com/)*, another reseller, handles as much or more in live auctions over the Net.

Some secondhand computers continue their lives in one piece, serving in schools, charities, and the homes and offices of bargain hunters. Thousands more leave nonprofit refurbishers and computer resellers as scrap. So what's the final resting place for a truly dead PC?

After places like Computer and Technology Resource Centers International decide they have no use for a piece of equipment, professional electronics recyclers squeeze out the last few cents of value. While recycling for charity is a recent phenomenon, the pros have been around since before the first IBM personal computer.

HMR, an Australian-based enterprise, recycles all kinds of electronic equipment. Down in a forsaken industrial wasteland in San Francisco, next to an electric power plant, abandoned piers, and shipyards, HMR's 100,000-square-foot warehouse is big enough to generate its own weather patterns on a foggy day. Squadrons of propane-fueled forklifts race around the floor, moving nearly a million pounds of electronic gear in and out each month. While most of the space in this leviathan facility is occupied by pallets of beige PC cabinets, computers don't end their lives here. This is just another waystation on the path to a more drawn-out demise.

Like James Burgett's center, HMR used to break down PCs to get fixable machines running again and separate out scrap. But the price of RAM chips has plummeted from $12 apiece to just a dollar; with more efficient manufacturing, the amount of precious metals in boards has decreased. Today, HMR buys bulk electronic equipment for between 4 and 10 cents a pound, culls what it can sell off immediately – working machines and equipment with a secondary life – and stuffs the rest into cargo containers bound for the Philippines. There, 400 overseas employees swap parts into old PCs to get them running; recycle gold, copper, and steel; and make electric regulators out of power supplies. All in all, 70 percent of HMR's San Francisco inventory sails to Asia each month.

There are also plenty of smaller players at this point in the food chain, scrappers and recyclers who take dead computers apart and separate them into circuit boards, plastic, and steel. Sometimes they grind up whole machines and separate them into ferrous and nonferrous material. The steel cases go to a metal recycler. Cables go through a refining process that removes the insulation and recovers the copper. The plastic is often landfilled or incinerated as fuel; only in the last year have some electronics recyclers found ways to process plastic.

"Industry people get into the high tech business because they think it's sexy and exciting," says Kelly Corbet, whose business, Corbet Consulting, helps manufacturers prepare their products for a computer's last days on earth by using recyclable plastics and designing for easy disassembly. "But they don't want to think of the end-of-life issues."

Cathode-ray tubes, for instance, are the bane of computer recycling. When you're in front of your screen, the monitor uses lead to keep you safe from radiation – so much lead that recycling centers can become toxic waste sites just by holding on to them. Most of the toxic glass tubes get sealed into landfills. Some CRT

screens, however, are crunched into shards and sent to a Canadian company called Noranda Metallurgy, where they're fed into a smelting furnace as flux to separate the copper from the nonvaluable material.

Gold-printed circuit boards follow a more tortuous path. First, they're hammered and chopped into dime-sized bits, then the fiberglass – the green material that gives an integrated circuit its structure – is melted off. The resulting metals go through a grinding process, and the gold is recovered by smelting the dust. Noranda is one of the biggest smelters around, so many of the parts in your computer may one day end up either at a lead smelter in New Brunswick or an even bigger facility in Rouyn-Noranda, a northern Quebec town named after its largest employer.

No one's going to melt down the SDS 930, however. That business with dropping computers on the floor, or feeding them into the hungry maw of a fiery smelter? Forget about it. A vintage mainframe, the Scientific Data Systems 930 was used during the Cold War to monitor nuclear test agreements and process satellite data. The computer still exists, but I can't tell you where it is. Only Kip Crosby, executive director of the Computer History Association of California, and Edwin Vivian El-Kareh, its "tactical director," know the exact location. Still in perfect working order, the relic is the crown jewel of the association's collection.

Crosby and I are slated to meet at the Santa Clara Saturday Sale, a weekly event organized by a nonprofit recycler named Computer Recycling. All the big hardware collectors in town – mostly potbellied old-timers and high tech retirees – come by to do a morning once-through. For many, the weekend ritual of rummaging through flea markets, swap meets, and electronics salvage stores is an infinite loop disguised as fun. One week, you may drop a few bucks to buy a Hewlett-Packard DeskJet printer. Next week, you'll go hunting for the software to drive it and the manuals to set it up. Inevitably, the thrill is in the chase, and the chase is never over.

Describing himself on the phone before the swap meet, Crosby says to look for a 50ish man with a gray cardigan, black jeans, a strawberry-red fanny pack, and two steel crutches. With particulars like that, it doesn't take much work to spot him in the crowd. Crosby is flanked by two young hipsters, just a few years out of college. One is Peter Washburn, an advisory board member of the history association; the other is Erich Schienke, who helps edit the association's journal. Having majored in topics involving the social history of technology and the physics of Tesla coils, Crosby's understudies are as passionate about conserving vintage machines as their mentor. This morning they're all looking for parts and pieces to round out the association's collection. But this swap meet turns up nothing, so we move on to another junk sale across the Valley.

The Computer History Association already owns a broad representation of the famous microcomputers made in the Golden State – Apple Lisa, Adam, Kaypro II, Processor Technology SOL-20, Xerox Alto, IMSAI, Osborne Ones, Osborne Executives, Osborne Vixens, et cetera – fine machines that will soon have a showcase in the San Francisco Computer Museum, an educational and conservation institute planned by Crosby and journalist Fred Davis. In the meantime, along with the SDS 930, these legends of California computing reside in cargo containers in a parking lot somewhere in Silicon Valley.

**Though PCs may be nothing like people, the soul of the computer is imparted through the resurrected form of the machine.**

Much of the collection was donated by readers of the association's journal, *Analytical Engine*. A well-written black-and-white desktop zine, it showcases contributors who get oddly aroused by such arcana as the ancestry of the desktop calculator, the birth of the Macintosh, and the special parts necessary to get obsolete equipment running. Some of Crosby's own writing positively anthropomorphizes computers. An article titled "De-Crufting a Power Supply Fan" begins: "The fan in the power supply of an average desktop computer leads a ghastly life. It survives on a diet of spiky wall voltage and dust-laden hot air." In other places Crosby is adamant that computers are dumber than dogs and nothing like people. In a draft of a mission statement for the museum, he says he wants to dispel the myth that computers can think like humans, or that artificial intelligence approaches anything like human reason.

These machines do, however, achieve a kind of transcendence. "Many computers don't die," Crosby allows. "What you end up with is a perfectly good computer as a doorstop. But you don't want to throw it out. There's something in the American psyche that rebels against throwing out a working computer."

When we arrive at the secret containers, the small corridor between the giant cargo boxes is quiet. Tactical director El-Kareh holds the keys and opens the doors. As they swing wide, tiny high-pitched, almost angelic sounds rise from the rusty hinges. Inside is a SDS 930, with all the original software, manuals, and documentation. It sits there, quiet but perfect, about two-thirds as long as the container. Boxes of software and books fill the rest of the space.

I'm beginning to understand. The soul of the machine isn't transcendent, like the one we learned about in catechism class. There is no computer heaven. Computers conform to an earlier creed, handed down to us by ancient Greeks like Aristotle. They occupy a plane where material existence – its formal configuration and its function – contribute to the soul's existence as much as notions of unseen spirits.

Though they've never met, both Kip Crosby from the Computer History Association and James Burgett from Computer and Technology Resource Centers International are preserving the life of the machine. With some luck, the SDS 930 will one day hum smoothly in an air-conditioned room of a new computer museum. Likewise, Burgett's refurbished beige boxes have been reborn into some school or charity office. The recycler may replace every part, and he may not treat them with much respect, but the soul of the computer is imparted to its next user through the resurrected form of the machine.

As Crosby describes the phenomenon in *Analytical Engine*, "It's hardly necessary to 'anthropomorphize' the microprocessor to recognize the trait it most shares with humanity – a rapacious and half-blind destiny to flow into any niche that might accommodate it, nudging any number of applecarts into chaos on the way." ■ ■ ■

◄ 56 kind of market-based model that developing countries were adopting. Mexico had become an exemplar of that model, and if Mexico had been allowed to fail, you would have seen that model coming under political attack in India, in Russia, in China.

**Rubin explained the crisis in terms of his "theory of interconnectedness." What does that mean?**

Capital markets are becoming more and more connected. There are many more investors involved with emerging markets. There are much more liquid markets in emerging-markets securities. The Mexican crisis came at a particular moment when emerging markets were a big but new idea – when people had first started grouping them all together. Frankly, one of the consequences of the Mexican crisis is that people now take a more differentiated view of emerging markets, looking at each of them separately. In the early stages of development of stock markets, there is often a "nifty 50" or some such, and money goes into all of those stocks en masse and moves out of them en masse. But then, over time, there comes to be a more differentiated view. I think something similar is happening in the global capital market.

**There is a tremendous receptiveness to Western economic thinking. It would be a tragedy, just at the moment when these ideas are gaining currency, if there were to be some kind of pullback.**

**Could there be another Mexico?**

The circumstances of Mexico were very special, but I certainly don't think we've seen the last financial crisis in a developing country. The four most dangerous words in markets are, "It's different this time." That said, one of the salutary effects of the Mexican crisis was that it became an important object lesson in what can go wrong when there's loss of confidence from abroad and countries don't respond by taking the steps necessary to restore confidence. Policymakers around the world have realized that if they don't respect the pressures the capital markets bring, they can get in serious trouble.

**Earlier this year, Thailand seemed to be on the brink of a Mexico-style financial crisis, and lots of people in government and in the markets were watching it very closely. Would a Thai meltdown – or a meltdown in Pakistan, or any other nation cited as "the next Mexico" – carry the same systemic risks?**

Thailand's policies were on a path that, without adjustments, could easily have been unsustainable, and could have called the health of its financial system into very serious question. But by making strong and dramatic policy adjustments – in terms of budget policy, in terms of policy toward financial institutions – the Thai authorities appear to have contained the situation.

Mexico was special to the United States because of the 2,000-mile border, because it was a large share of the total flow of capital into emerging markets at that time, and because it was a poster child of the Bretton Woods institutions (the IMF and World Bank). I don't think if the problem came in another emerging market it would have those three elements, and therefore I am inclined to think the danger it would spread throughout the emerging-market sector is slightly less than it was at the time of the Mexican situation. Crises will happen, capital can flow very quickly, spillovers are important. But there has been a maturing of the markets, and a reduction in those kinds of systemic risks.

**After the bailout of Mexico, you and your boss started working on a series of policy changes at the international level – at the G-7 level, at the IMF and the World Bank level. Tell me about the kinds of policies you put in place to lessen systemic risk.**

We've gone from a small-numbers problem to a large-numbers problem. In 1982, the chair of the Fed could get 20 major bankers in a room, remind them that he is their regulator, and they'd work something out together. You can't do that with thousands of separate holders of emerging-markets mutual funds.

There were two types of policy changes. The first was to try to prevent crises from happening, and the other was to deal with them if they happened. In terms of trying to prevent crises, the most important thing we did was, with the IMF, to put in place financial disclosure standards that countries can voluntarily submit to. Disclosure is at the heart of our own regulatory system in many respects. If investors in Mexico had understood, on a real-time basis, what was happening in Mexico, you wouldn't have had a crisis, or at least not a crisis of the same magnitude. Establishing these disclosure standards can have a large effect. One advantage is that there's more information for investors and they'll send warning signals. Equally important is that when you know you're going to have to publish everything, the temptation to slip and slide through is reduced, and this acts as a discipline on policymakers not to use their reserves in irresponsible ways or pursue inconsistent monetary and exchange-rate policies.

**What about the other category – dealing with crises if and when they happen?**

There, the main policy change is something called the "new agreements to borrow." This agreement brings about two dozen countries into an inner group of the international monetary system that provides a supplemental fund – a spare fuel tank, if you like – to help the IMF address a crisis, if it comes.

**Given interconnectedness and globalization, many people argue that governments don't possess the policy leverage they used to. Do you think multinational approaches to economic policy are becoming not just desirable but unavoidable?**

In some ways what the world economy is going through now is a little bit like the process the US went through in the early part of this century, when increasingly states had to cooperate, and increasingly there were responsibilities that had to be taken on at the federal level. While there are important differences, that analogy does say something about the direction in which the world is moving on everything from environmental questions to questions of financial regulation.

**Not long ago, *Wired* did an interview with former Citicorp CEO Walter Wriston ("The Future of Money," *Wired* 4.10,** 186 ►

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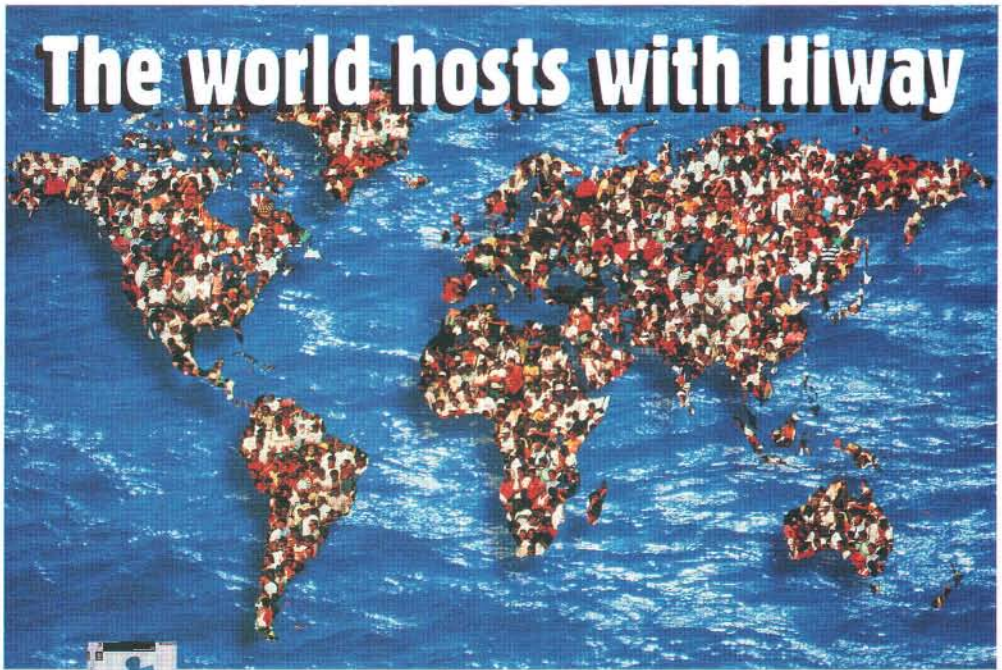

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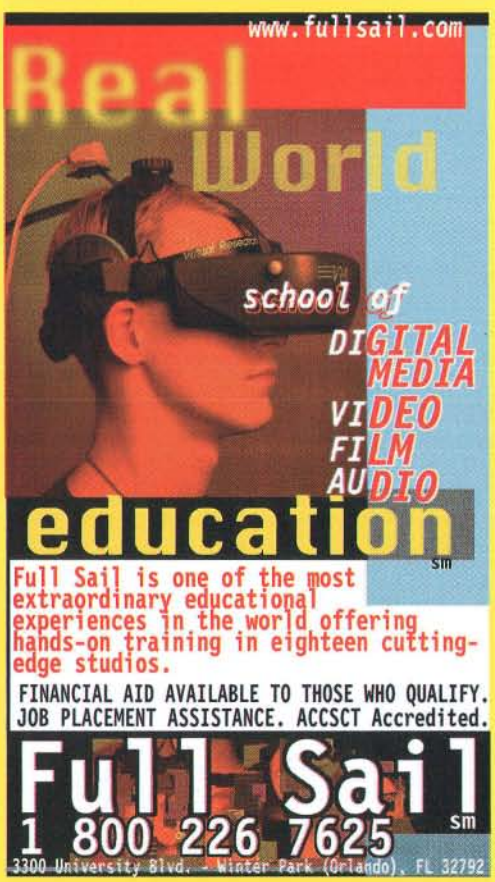


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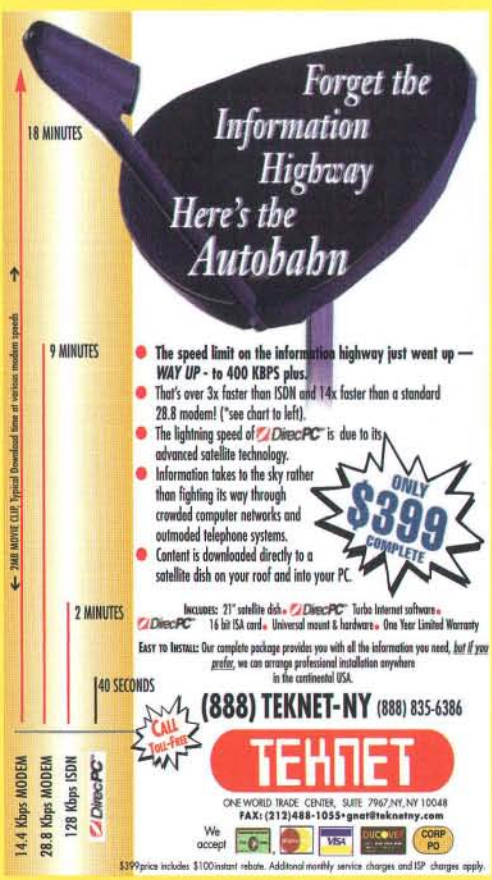

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◄ 182 **page 140), who said something provocative. He was talking about the Eurodollar market, and he said, "The Euromarkets are now the greatest mobile pool of capital in the world. Money goes where it is wanted, and stays where it is well treated, and that's all she wrote. This annoys government to no end. This huge pool of 'stateless money' is destabilizing. It can move instantly, and it does."**

**Is Wriston right? Is interconnectedness a force for instability and volatility, or the opposite?**

Your question poses a dichotomy that's much too simple. The invention of superhighways made transportation better and safer, overall. But it certainly also increased the risks of spectacular smash-ups. I think the development of modern financial markets and greater connectedness is very much like the development of the superhighway, or the invention of the jet airplane. A positive force. A force that overall increases safety and stability. But a force that has its own fragility associated with it, and one that carries certain risks.

**Wriston went on to say that all of this is "annoying to governments because the market isn't in any one place, geographically. It resides in cyberspace. London today is the center of the Euromarket trading. But if the British put on reserve requirements or other controls, Bahrain is waiting. In just a couple of keystrokes the whole market could be gone. Technology has overwhelmed public policy." True?**

Policy is more potent for good or for ill than it used to be. Good policy is more richly rewarded because more capital comes in. That's why this is the first time in human history that you see significant numbers of countries growing at over 5 percent a year. Countries like those in East Asia – that have focused on investment, on exports, and on educating their populations – have been richly rewarded with foreign investment that has carried with it large amounts of knowledge. They have been richly rewarded with investments in technology that have spread technological prowess to their citizens. And they've therefore been able to benefit more directly from things that the globe knows.

At the same time, bad policies are punished more severely than ever before, because capital can move out more easily. So I think that public policy is more potent, not less potent, than it used to be. I am confident there are more Fed watchers than there were 15 years ago, and that suggests, in some sense, that what the Fed does may be even more important than it used to be, or at least as important as it always has been. The range of sound policy choices may be more constricted, but making those choices wisely is even more important than it used to be.

**The laws of economics are more like the laws of physics than many people once supposed. You can't wish them away, and they don't change because of politics.**

**Implicit in what you're saying is the notion that there is an agreed understanding about what "good" economic policy is.**

The laws of economics are more like the laws of physics than many people once supposed. You can't wish them away, and they don't change because of politics. If governments print too much money, they will have inflation. If they expropriate – if they steal – they won't have foreign investment. If they lack well-developed financial markets, savers will earn low rates of return, and will therefore stay away. These are the realities that all countries, whatever their culture, have to confront if they want to prosper in today's world.

**The rise of global capital markets has been the most profound change to the world economy in the past 20 years. The rise of emoney could be the most profound change in the next 20. There's heated debate about what government should do, if anything, about it. How much regulation do you think is necessary?**

In many ways there is a lot to learn from the spread of credit cards, which are a profound innovation in the use of cash, in that basically you have the notion that you can give someone a plastic card and at 187 ►

## Colophon

***Wired* is designed and produced digitally.**

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◂ 186 the end of the day they will get credited money. Credit cards have raised important issues in the area of consumer protection and the area of fraud, and the credit card market is a much, much healthier market today because the Secret Service is involved in protecting against fraud; because there are restrictions limiting how much it can cost you if you lose your credit card. I think this is instructive, because it would have been easy to have either substantially underregulated or substantially overregulated credit card technology, and denied people its benefits. Like most things in public policy, the truth lies between the extremes.

**Taxation is one of your academic specialties, and it's an area you and others at Treasury have been thinking about with respect to ecash and e-commerce. You've put together a report on this in preparation for the discussions at the G-7 summit.**

The first thing the report says is that we are not going to introduce Internet taxes, or treat the Internet as a golden goose to be plucked. It does touch on three areas where the Internet requires us to think through traditional tax concepts, if we're not going to impede the development of this technology. One is the definition of property. In traditional economic thinking there is a very strong difference between a tangible good and an intangible property on which you can acquire royalties. When you think about software, there's nothing importantly different about a diskette versus a program that is downloaded through a modem. In each case it's really the information content that's crucial. Designing appropriate rules that can maintain neutrality in that situation is essential.

The second area is the question of international taxation – taxation where more than one jurisdiction is involved. Cyberspace resides in no one country, so you have to design appropriate tax concepts. What we favor are approaches that are residence-based, because with residence-based approaches you know who gets the income and you know where they reside. So one of the things being discussed in the international forum is, with intellectual property transferred from one country to another, how the profits should be taxed.

The third area that the paper touches on is the whole area of tax evasion. Just as we've got a variety of requirements and restrictions on the use of cash, we will also need ways, as various electronic funds transfers proliferate, to ensure that they don't become vehicles for escaping or avoiding tax. One of the things I've been struck by since I came to Treasury is the link between financial issues and law enforcement issues. Our IRS commissioner, Peggy Richardson, likes to say it took an accountant to catch Al Capone.

**You've said that the great challenge of the global economy is to lift the developing world out of poverty – to enable it to share in the prosperity of the West. Separatists claim that globalization hurts those countries even more than it hurts workers here. I know you disagree with that. Why?**

The evidence lies in what's happened in the developing world over the past 25 years, and what's been happening in an even pronounced way over the past five. It's only a generation ago that, in much of the world, one out of every five babies was dying before the age of 5; that number is now one in ten or less. That's still much too high, but it is vastly better. The elimination of all cancer in the United States would increase life expectancy by about two years; progress has been made in the developing world that has increased life expectancy by *nine* years in the last generation. There are enormous problems, but progress is being made, and it's being made more rapidly in places where market principles are being adopted. Compare South Korea and North Korea. Compare western Germany and eastern Germany. These are as good a pair of controlled experiments that the science of political economy will ever have, and the results are in, and they are clear, and they are surprising to a large number of people who in 1975 would have regarded the outcome as very much in doubt. John Kennedy, for one, believed as president that the Soviet Union would surpass the United States economically within the 20th century.

We have learned great lessons. It's a long way from the end of economics, but there is much that we know, and what we know carries with it staggering potential for human emancipation. ■ ■ ■

Message 49:
Date: 7.1.97
From: <nicholas@media.mit.edu>
To: <lr@wired.com>
Subject:

# Digital Obesity

Recently, I've been forced to look for new hardware and software and have since been suffering the indignity of updating myself. I cannot believe that manufacturers have gone so wildly astray while I wasn't looking – complexity is out of control.

I have spent much of my time in front of a keyboard and display in the past 30 years. People have joked about my dependence on email since 1970, and older flight attendants remember seeing me using a laptop since 1979. In fact, I don't know anyone more wired than me in his or her daily life. This is my way of saying I'm no piker.

But computers can be like ski boots. Old-timers are prone to keep their well-worn and comfortable equipment. Upgrading to the newest boot styles each year would raise hell with one's feet. Likewise, I am old-fashioned in my digital ways. I don't even use an email program but ride bareback on Unix instead.

But inevitably, there comes a time when those favorite, laced leather boots need to be exchanged for a new pair. That time arrived in early 1997, and the new, modern digital headaches I discovered still haven't subsided. Mind you, I'm lucky. I have the full and generous support of some of MIT's finest technical staff at my disposal. I wonder who the rest of society turns to.

## Overweight software

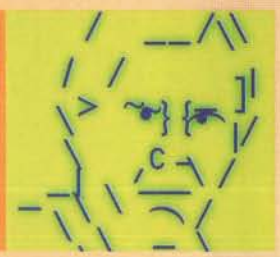
The problem displays itself as featuritis and bloated software systems. I am fond of quipping about how every time Andy makes a faster processor, Bill uses more of it. Turns out it's not so funny. Have you looked at the size and complexity of Microsoft Word recently?

Outrageous. And each successive version has gotten worse. It's to the point where most programs are almost unusable and run slower than what I used a decade ago. What is wrong with you Redmond folk? Maybe you'll learn something about ease of use from your recent purchase: WebTV.

My adult and professional life has been spent trying to make computers easier to use, starting as far back as 1965. In those early days, people thought only sissies needed graphics. In 1972, when we devoted 256K to storing images, most people wrote it off as just another indecency and MIT arrogance. Why would anybody in their right mind commit so much memory to the icing, not the cake?

Three decades later, we find a generation of kids who count memory not in Ks, but in Ms (and soon Gs). This is actually quite wonderful, but look at what we are using it for. The interface hasn't fundamentally changed since the introduction of the Macintosh more than a decade ago. It's just harder to use and obscenely obese. Someone needs a wake-up call.

**The world does not want a PC or an NC, but an SC. A scalable computer that can grow from low-cost box to high-end supercomputer.**



As a longtime devotee of Apple computers with a dozen active Macs currently in my life, I find myself extremely frustrated with the latest models. The little computer that greets you with a smiling face on start-up has become so complex that a Mac is now no simpler to use than a Wintel machine. So, like many, I decided it was time to switch platforms.

I made my first foray into Windows two months ago and was so appalled that I raced back to the Macintosh like someone returning to a smelly bus after trying the newer subway system. I am amazed that so many people use Windows 95 without complaint. I guess there is a grin-and-bear-it attitude because THERE IS NOTHING ELSE. Yes, I am yelling.

## Not PC or NC, but SC

People constantly ask what I think of the network computer. One result of that questioning is the appearance of headlines like "Negroponte calls Ellison a nutcake." Of course, the reporter forgot to quote what followed: "in the best sense of the word." Anything that makes our digital lives simpler is welcome. Larry Ellison gets in his own way with vituperous rhetoric about how the NC will obsolesce the PC and how Microsoft's evil empire will thus be crushed. Bill, for his part, had dismissed the NC with equal bravado until recently, when he jumped on the bandwagon with the Windows Terminal.

The sad fact is, NC or PC, they are both wrong – dead wrong. But you and I are going to do the dying for a while. We suddenly have no choice.

The world does not want a PC or an NC, but an SC – a scalable computer. In short, this is a modular machine that can be as simple as pie (and not cost much more) – as well as being able to grow from low-cost box to high-end supercomputer. Personally, I am most interested in the low end of this scale.

Why? Because there is no room for Windows 95 in Africa. Many other parts of the world also need affordable computing. I always thought this was a different problem from the one plaguing me. But suddenly I realize that even with so much of MIT's computing talent at my disposal and no care whatsoever for what things cost, I am no better off than peasants in Pakistan confronted with their very first computer. Today's machines are just too complex to be accessible.

But what is there to do about it – other than bitch? Is it time for a strike or a users' cartel? You bet it is. Whoever is guiding those young folks making the operating system and applications of tomorrow should put his or her foot down. It is time to lose weight. Stop making software that options you to death and start delivering simple, easy-to-use apps. The stuff you write is written by geeks, for geeks; why not try writing something for the rest of the world?

An interim solution or holding pattern might be to eschew those beastly apps and recommend beginners to the Internet – through an online system like AT&T WorldNet. But when I went to install it myself, the instructions' first words, printed right on the CD-ROM, were: "Turn off the virus-protection software using the extensions manager." What the hell does that mean to Mom and Dad? Then, perhaps out of spite, the installer crashed my system. ■ ■ ■

*Next Issue: RF Helps Marriage*

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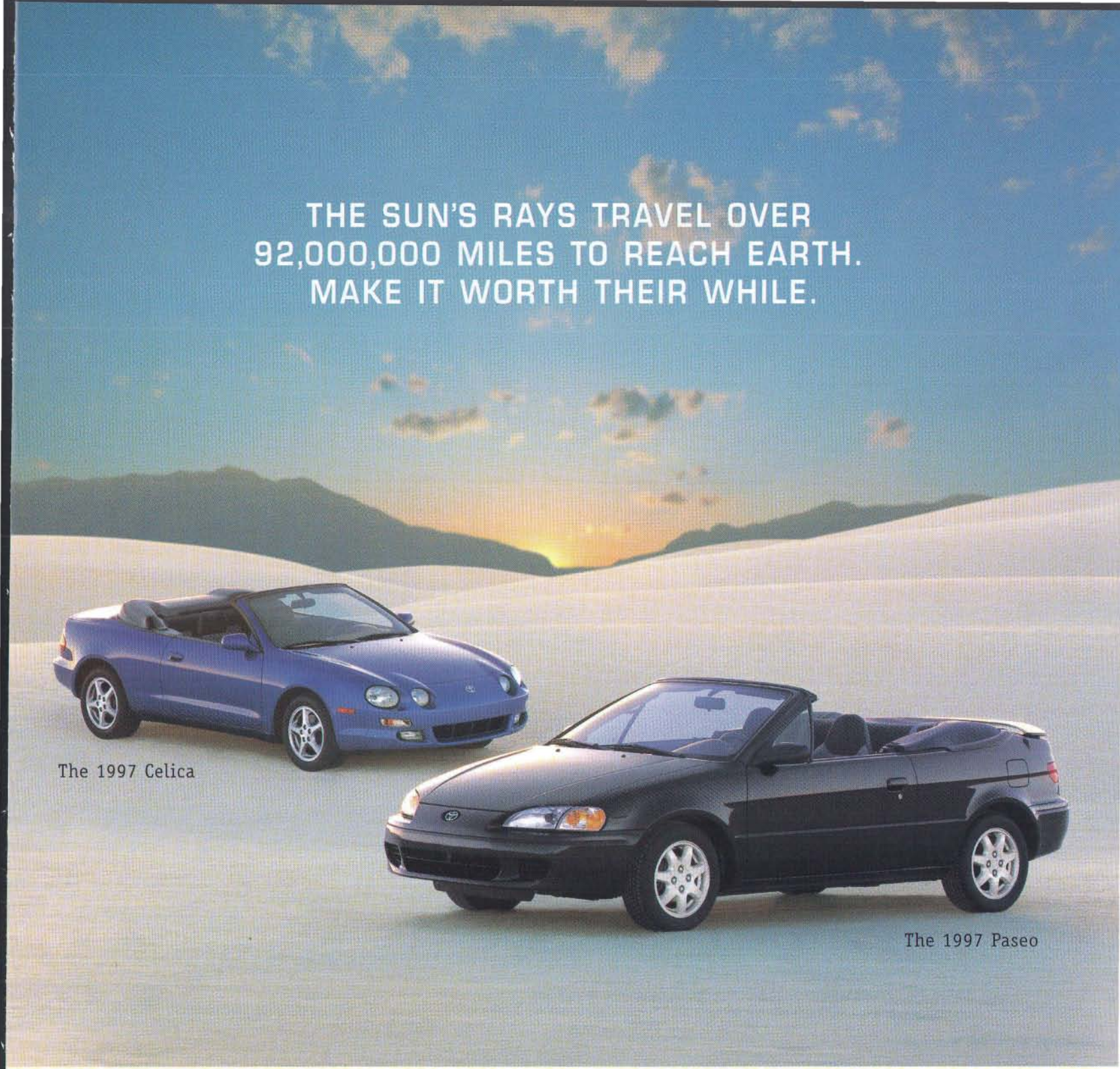

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