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TIME

INVENTIONS 2000

537 VOTES

BUSH'S NEW MARGIN

GORE'S LEGAL CHALLENGES

After Sunday's certification, it's on to the courts

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perimental GM battery-powered electric car that in turn evolved into the electric EV-1 auto, which GM is leasing to customers in California and Arizona.

Another collaboration, with the Department of Defense, has produced a surveillance micro-aircraft with a wingspan of only 6 in. Equipped with a camera, 1998 flew to an altitude of 80,400 ft., higher than any propeller plane has ever flown. The Centurion, a successor model with an enormous wingspan of 206 ft., is using solar cells, and, says MacCready, "we're expecting to fly it to 100,000 ft. in late spring." The ultimate descendant of these craft, the Helios, will have a

thinks about the "big picture and what the world needs" and turns his ideas over to his 150-person, highly trained work force, which designs and creates electronic and mechanical devices, largely for government agencies and industry. Some of his initial creative work is done at home, with "crude tools and some duct

tric models. Of his newer gadgets he seems most proud of Technalegs, a strap-on contraption with little, jointed, lockable, telescoping "intelligent canes" that can support as much as three-quarters of the weight of a hiker and his backpack. "You can carry your wife on your back all day without getting tired," he jokes.

Indeed, MacCready thinks that a number of legged devices could be more efficient than wheels for moving about. "You could make a wheelchair that can go up and down stairs," he muses.

Pause. Eureka! MacCready reaches for his notebook. That restless brain is at work again. ■

REPLACING THE BOOK

Rich Gold's experimental-documents group aims to make us read faster and better

JOHN CLARK FOR TIME

TEAM XEROX

BY CHRIS TAYLOR

TAKE A LOOK AT WHAT YOUR EYES are doing right now. It's known as saccadic jumping—the way they skip across the page from left to right before some unseen hand comes in and pushes them to the start of the next line, like the ball on an old typewriter. It's something you've done your whole life. But is it really the most efficient way to read?

Now imagine this: you're sitting at a computer equipped with a steering wheel, gas pedal, brake and stick shift. Words appear on the screen at a speed you determine by applying the pedals. Your eyes don't waste time with saccadic jumps, since there's never more than one word on the screen at a time. The wheel steers you between chapters; the stick shift takes you to the next book. Before you know it, your brain has become some kind of jet-powered Maserati. Reading regular text, you're considered fleet of eye if you hit 400 words a minute; on this device, known as the Speed-

er Reader, test subjects have been known to manage 2,000 words a minute.

Which doesn't mean we're all going to spend the 21st century treating books like NASCAR racetracks. But as an effective tool for cramming large chunks of information (the technology it is based on is already a big hit with law students), Speeder Reader is proof positive that we also don't have to treat books like slabs of paper that sit on shelves anymore. Printed text, which has remained basically unchanged since Gutenberg first got his fingers inky, is about to bloom into a thousand different forms. The one you use will increasingly depend on what you need to use it for. "The tyranny of the static book is over," says Rich Gold, head of the Research on Experimental Documents (RED) team at Xerox PARC. "The digital revolution can incorporate radical new visions of reading."

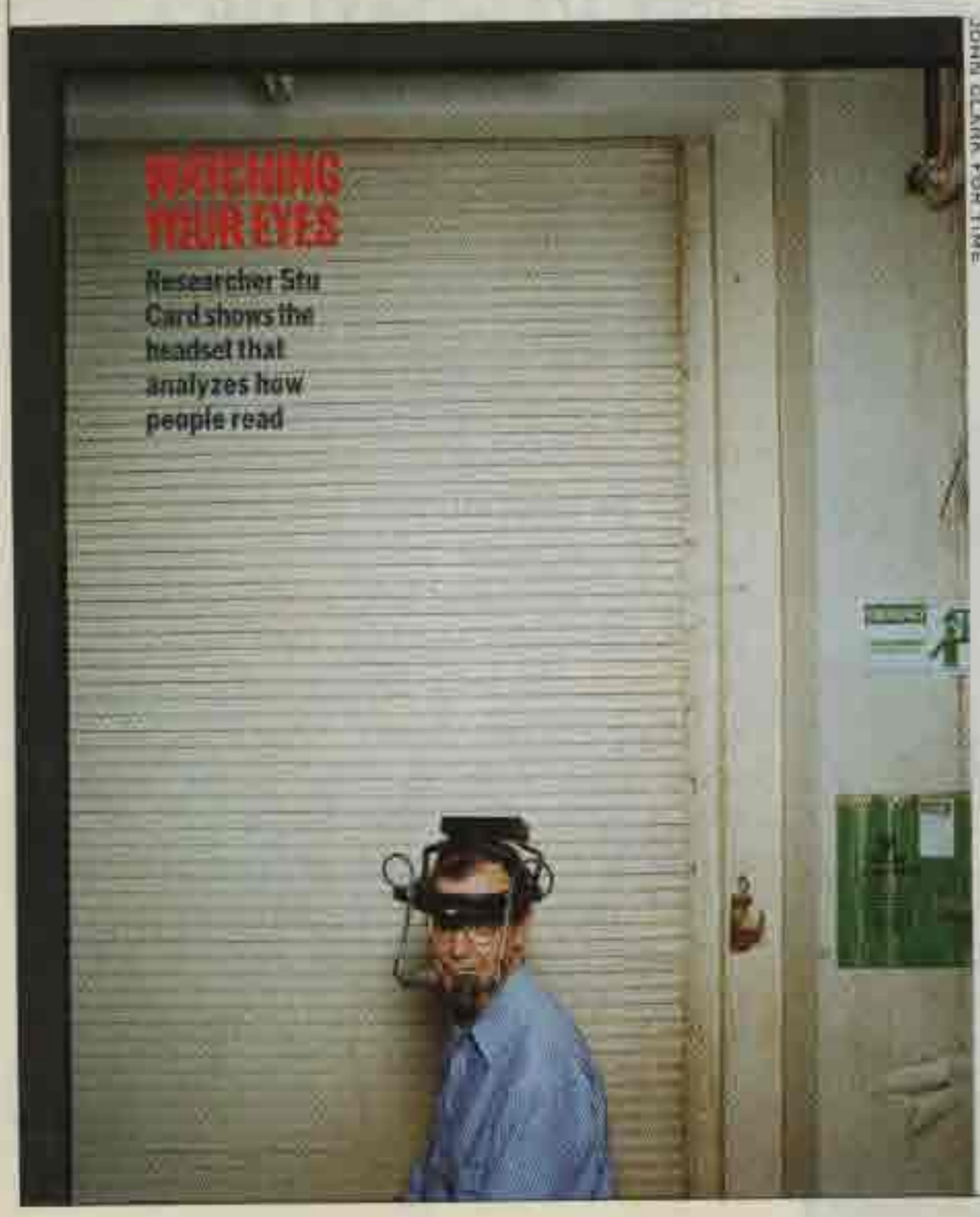
Reinventing the book? It's not the kind of thing you'd expect to find preoccupying even the most eccentric inventor's mind. Yet Xerox PARC (it stands for Palo Alto Research Center) is the kind of place that prides itself on overturning assumptions. For one, there are no lone nuts tinkering away in silent labs. Teamwork takes priority here—and as history suggests, there's nothing more powerful than the feedback effect of inventors riffing off one another's work.

The PARC has a pretty good track record when it comes to radical new visions, even if its record of holding onto them has been spotty at best. The mouse, the GUI (graphical user interface, like Windows) and arguably the PC itself were all born in this hothouse of Silicon Valley R. and D.; they ended up making a lot of money for Apple and Microsoft. Xerox has got a lot of prestige but little cash out of the PARC, which is why the beleaguered copier giant intimated in October that it would put its crown jewel up for sale to help stem billion-dollar losses.

While its future ownership is in doubt, the buttoned-down brain trust at PARC has lost none of the anything-goes enthusiasm that made it famous in the first place.

"The book form we know looks less and less sacred."

It's a place where experts from entirely different academic disciplines mind-meld furiously, then run off in pursuit of the most challenging technological problems they can come up with. And right now, at the dawn of the Internet age, PARC scientists are most motivated by the question of how we digest our increasingly bloated diet of data. After all, they say, your total potential reading matter increased by a factor of 10,000 during the 1990s. "In a world where information is abundant, the scarce resource is attention," says Stu Card of PARC's User Interface research team. "That's what we're trying to do—manage user attention."



JOHN CLARK FOR TIME

Both Gold and Card have this aim in mind, but there the similarities end. Gold is deeply tanned, ponytailed and fast talking, with a background in experimental music and toy design. His group has spent the past couple of years dreaming up utterly outlandish text-display inventions like Speeder Reader. There's the Tilty Table, a vast and thin computer screen on shock absorbers that you tilt in any direction to scroll through a document that would in real life be 30 ft. across; Listen Reader, which uses tiny embedded computer chips to produce different ambient sounds on each page of a children's book; and the Reading-Eye Dog, a robotic pet that uses a text-to-voice synthesizer to read out anything you care to put in front of it (making it fetch the paper as well as read it to you may take a little while longer).

Card, by contrast, is a soft-spoken, slightly geeky-looking psychologist and computer scientist; his group is involved in the more practical, down-to-earth business of making the Web more readable. He uses the jargon of Internet ecology, talking about the way we "forage" for information and hunt its "scent" to produce a balanced "diet." But that doesn't make his tools and results any less gee-whiz than Gold's. Step into Card's lab, and he will show you the device he uses on his test subjects, a metal headpiece with little cameras positioned in front of each eye. This scary-looking machine records your saccadic jumps while you hunt for information, and notes how long it takes for your pupils to dilate (that is, when you've found the particular scent you're looking for). His conclusion: "People tend to spend a lot more time skimming than reading."

You might think this would be a point in favor of hypertext links, those ubiquitous wormholes of the Web. Not so, says Card's team: its research shows the average user gets confused by blue underlined words, and that these links too often fail to communicate exactly where they're taking you. So what's the solution? Ask Card, and he will point to the screen shot of an enormous multisided shape his team jokingly refers to as the Death Star.

It's actually called the Perspective Wall, and it lets you navigate hundreds of Web pages at a time without having to lose sight of any of them. Move to the one you want, and it enlarges while the others shrink. With each page color coded for relevance, it's a skimmer's dream—and the online search result of the future. "Bar charts weren't invented 250 years ago," says Peter Pirolli, Card's fellow psychologist. "Now we take them for granted. The same thing is happening with the computer. We're becoming more visual." And therefore less literate? "It's a different kind of literate culture," Pirolli insists.

SKIMMING THE SURFACE

GOLD'S RED TEAM SEEMS TO HAVE REACHED the same conclusion: it's O.K. to skim, and it's O.K. to read pictures instead of text. Its Hyperbolic Reader (based on the hyperbolic tree, a Xerox PARC invention) tells a children's story in Perspective Wall style. Cartoons and speech bubbles grow large as you move a joystick over them, then shrink as you turn to another part of the story's tree. In Fluid Fiction (also created with PARC software), another children's story is told in just 24 sentences. But touch the end of any sentence, and the text parts, revealing a new set of sentence endings. Touch one, and you're down to the story's third layer. The device literally teaches kids to read between the lines.

But in all these inventions and the philosophy behind them, it's hard not to get a sobering sense of the impending death of traditional, text-based linear narrative. Will generations to come ever know the delights of picking up a good book and reading it from start to finish? Or will they rather skim through it on their tablet PCs, Speeder Reading what the computer has predetermined to be the best bits based on their previous preferences, choosing alternative endings, letting the robot dog finish it for them?

On the other hand, we should be glad they're reading at all. The RED team's inventions were a huge hit with the thousands of kids who packed the San Jose, Calif., Tech Museum of Innovation from March to October this year; so much so that the exhibit will tour the country in 2001. "Kids are very accepting of these new forms of reading," says RED researcher Maribeth Back. "We've made the book more responsive, in the same way other electronic appliances they know are. The book form we know starts to look less and less sacred."

Not that those lumps of paper on our shelves have been sacred in this form for very long. It's less than 200 years since the arrival of the novel, and less than 100 since the average best seller came with illustrations. The brave new world of reading under construction at Xerox PARC may be only the latest step in the book's evolution. The more forms it can mutate into, the more likely it is that one of those forms will survive in an age of intensive information foraging and visual literacy. And if that form happens to be Speeder Reader—well, at least you'll have fun teaching your grandchildren how to do saccadic jumps. ■

INVENTORS

SOAKING IN SUCCESS

BY TIMOTHY ROCHE

LONNIE JOHNSON HAD COME HOME to tinker again. In 1982 the young nuclear scientist spent his days developing advanced space systems for the Strategic Air Command. At night, while his wife and kids slept upstairs, he used mathematic and scientific formulas to launch his own dreams from the basement. He had built a model of a heat pump that used water instead of unfriendly Freon. Attaching a homemade nozzle to the end of tubing and connecting it to his bathroom sink, he carefully turned on the water. It shot out a stream so powerful that its air currents ruffled the curtains. "Eureka!" Johnson told himself. "This would make a great water gun."

The rest, as they say, is history. Johnson, a small-town prodigy called the Professor by his high school buddies, had wrought one of the best-selling toys ever: the Super Soaker, a pump-action water gun capable of streaming water 50 feet. In the 12 years since he first got U.S. Patent No. 4,591,071 for the "squirt gun," as it is listed in official government records, more than 200 million Super Soakers have been sold. Revenue estimates for the gun range as high as $400 million. "Lonnie is the American success story," says Dick Apley, director of independent inventor programs for the U.S. Patent Office.

The Super Soaker is just one of 62 patents (with an additional 18 pending approval) that Johnson has amassed since his basement days. He's had ideas for hair-drying rollers, a digital thermostat, a baby-diaper detector that activates musical nursery rhymes when wet, and a device that measures soil moisture and wa-

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