Redefining the term "user-friendly"

When automobiles first came into general use, you had to be a mechanic to run one. The day is fast coming when computers will be as habit-forming and easy to use as today's motorcars.

By Philip E. Ross

YOU HAVEN'T SEEN anything yet. Within a decade computers will have flat screens that display sharper images than the ones on this page, notepads that read even a doctor's handwriting and software that responds to your voice and talks back to you.

Who needs it? Who needed cars with self-starters or radios? It's the logic of technology to make things easier to use and thus expand their markets. We are not talking about gee-whiz features as the latest excuse to get you to trade up to a new machine. We are talking about interfaces between you and the computer that will make its use second nature to everyone.

With dramatic consequences. Let me elaborate. Until recently a good education included the ability to do arithmetic, spell and produce cursive writing. Those skills are already fading and could be hobbies rather than necessities in a decade or so. Why bother to learn long division if a $5 calculator will do it for you? Spend the time and energy on something else. Why bother to master the spelling absurdities of the English language when spell-checkers will do the grunt work for you?

Literacy is not irrelevant, but skill
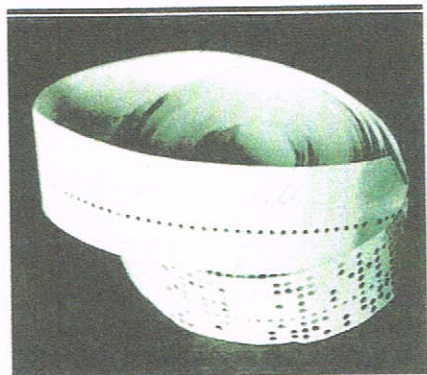
Clockwise from above: paper-punched programs and computer control console from the 1950s; Microsoft's Bob and Apple's Newton **Computers are trying to make themselves more accessible.**

Room With A View

Almaden Research Center Paperless Office Prototype

in reading is becoming less important. Computers can already read out loud very competently, and you can instruct your PC to talk double-fast. It's a convenience to be able to read quickly, but it is fast ceasing to be a necessity (good news for dyslexics). You don't even have to be good at skimming to get ahead; software is already out that does a fairly good job of summarizing long documents.

Penmanship? Forget it. Teach your children touch-typing instead. Hey, even typing is destined to become less important. Computers are getting better by the day at understanding and even translating spoken language *(see box, p. 256)*. The day could come when schoolteachers consider reading and writing less important skills than an ability to surf the Internet or program in hypertext markup language.

It's already time to rethink whether foreign-language study ought to be required in a high school curriculum. Why invest a lot of time in a skill that computers are beginning to master? There are other things to learn that will be more economically useful for most people.

This doesn't mean that people won't still want to read for pleasure or speak foreign languages if they reside or travel abroad. But it means that reading skills and foreign languages will become optional rather than required subjects in mass education. Think of it as being like equitation. Riding horses, training them and caring for them are not vanished skills, but are now done for pleasure. You no longer have to learn to ride if you want to go somewhere. Or—going farther back—hunting. Lots of people still enjoy it, but it's not something you need to know how to do if you want meat on the table.

And cars. Great-grandpa had to be a mechanic to keep one running. Today we expect our cars to be almost maintenance-free. That does not mean people can't tinker if they want. But you can drive without knowing a lot more than where to put the ignition key and the rules of the road.

We've come a long way since the days of computers with bodies as big as a dinosaur and brains as small as a pea. Most of that pea was reserved for sheer problem-solving, with little left
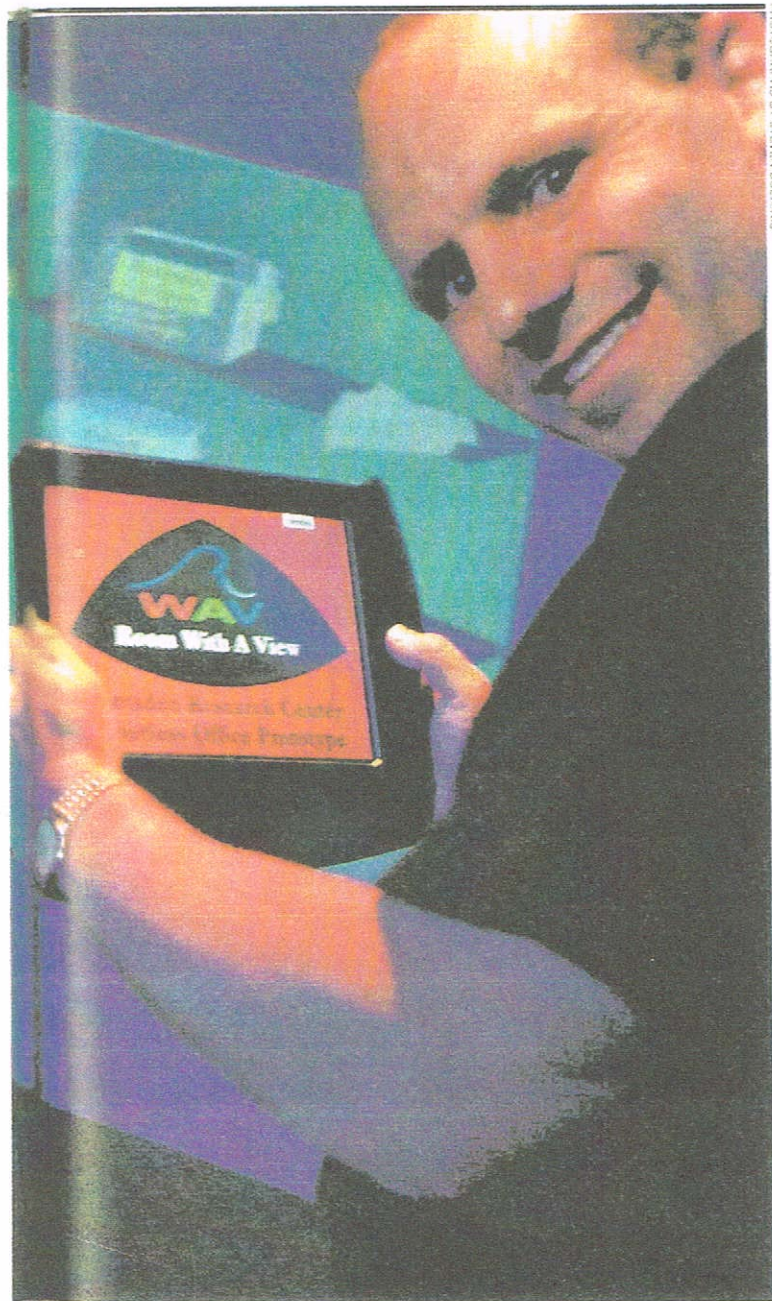
IBM's Edwin Selker with glow-in-the-dark office **Point the monitor at the shelves to read a book, at a globe to access the Web. Click to browse your beloved clutter; click again to neaten up.**

which invented an early version of the graphical interface. "I'd guess the early GUI took up 33%, and today's would have about 66%."

Tomorrow's will have even more, as computing power gets even cheaper. Displays will be different because we know exactly what people want them to be: light and crisp. We also know for certain that we will get both qualities—soon—because the display elements, or pixels, are made of semiconductor material. They therefore move along the same curve that

Nils Klarlund of AT&T Labs entering text by dictating and cursor commands by moving a foot pedal
Look, no hands!

over for understanding the questions or delivering the answers in human-friendly terms. But though we've come a long way since those early days, it's not half as far as we are going to go. The cheap power found on the microprocessor today gives computer designers the slack they need to accommodate human tastes. Over the next ten years this trend will intensify, and the computer will begin to shed the image of a tool and take on that of a fellow worker.

"In the era before the graphical user interface [GUI], less than 5% of total computing power was devoted to managing the [human] interface," says Ramana Rao, chief technology officer of InXight Software, a spinoff of Xerox's Palo Alto Research Center,

Gordon Moore outlined for microchips decades ago: cheaper and cheaper still.

"You want both high resolution and a huge gray scale," says Malcolm Thompson, chief executive of Dpix, another spinoff of Xerox. "We have a flat-panel display with 7 million pixels, which compares with the 200,000 to 500,000 on your screen today," Thompson says. "It's about 13½ inches diagonal and gives image quality that's even better than you get on paper—even magazine stock. It looks photographic, but, of course, it can also carry video."

As this ultracrisp screen moves from the laboratory to the workplace, it will at first be limited to the desktop because it requires a backlight
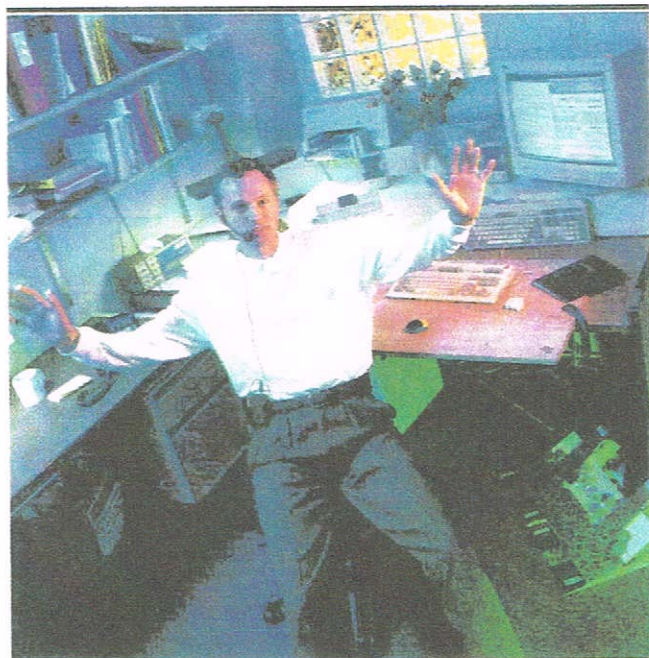
that consumes more power than laptop batteries can provide. Most of the buyers will be software design houses and others prepared to spend tens of thousands of dollars for each device. But the rule of thumb in Silicon Valley is that whatever exists today in prototype will be on the mass market within ten years at the most. Thompson hopes to get the price down to $1,500 in three years and to lose the backlight not long after. If so, expect to be able to curl up with a really good electronic movie by 2007.

Watching these movies won't require a great deal of literacy. And for generations brought up on films and television they will seem a lot more compelling than most novels could ever be. Of course, all this will make us computer-dependent. That's how a consumer society works. You use persuasion and ease of access to get people hooked today on what were luxuries only yesterday.

"If you ask, 'What should computers do?' you could do a hell of a lot worse than say, 'Win friends and influence people,'" says Clifford Nass, a computer scientist at Stanford University. Nass says that even when designers do not intentionally make their machines seem human, users anthropomorphize them anyway—while vehemently denying that they are doing so.

For instance, many people conveniently forget to use their spell-checkers because they don't like being corrected. But throw in a little positive reinforcement—say, by having the checker say "Excellent! No misspellings!"—and people get a warm and fuzzy feeling about their checker and rely on it more. Even engineers, it turns out, prefer oscilloscopes that display polite error messages—say, "There is a problem"—to the traditional accusatory version: "You have made error number 207."

The next step, now under experimentation, is to vary the computer's communication according to the rules of human discourse. For instance, people with dominant personalities dislike computers that take

Hal is almost here

THE TALKING COMPUTER, that staple of science fiction, is already upon us. You can try this out if you subscribe to America Online, by calling up its "speak text" function. But synthesized speech—which sounds strangely like English with a Swedish accent—tends to grate on the ear. Don't you ever feel like throttling the stilted, phonily cheerful voice that thanks you for using whatever it is you just used?

"One sentence of crappy synthesized speech is enough to put off the user," says Juergen Schroeter, a speech researcher at AT&T Labs. "Improve the sound, though, and people say that even the accompanying video simulation seems better."

In five years, Schroeter predicts, you'll no longer be able to distinguish synthesized speech from recordings of actors' voices. You'll even be able
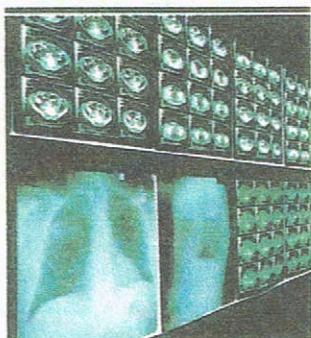
Memorial Sloan-Kettering radiologist Lawrence Schwartz dictating a report using IBM's $4,395 dictation software MedSpeak (right); Joern Ostermann of AT&T with voice simulator and avatars (below)

The interface has a face—and also ears and a mouth.

to have your computer speak in your own voice. No more having dinner interrupted by some idiot trying to sell you aluminum siding. He'll be told to buzz off in as profane a manner as you choose.
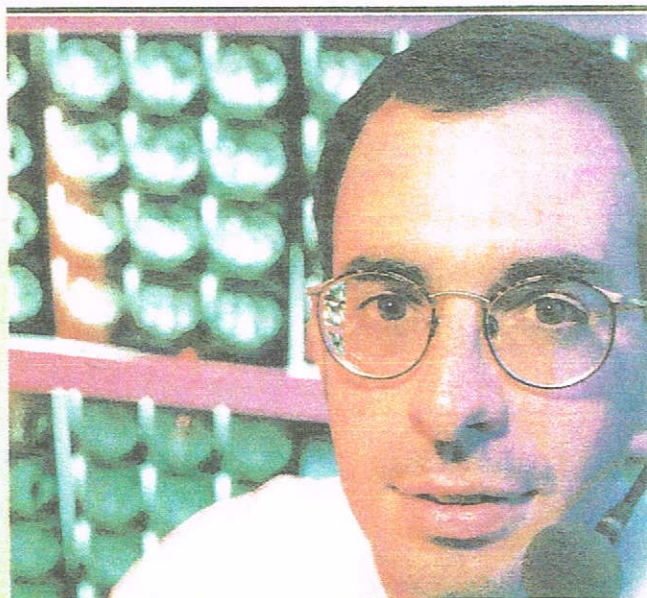
AT&T is working on a speech program that manages airline reservations; it's experimenting with software that translates from English to Mandarin and back again. So far it preserves meaning only 75% of the time, a hit rate that will rise.

Tightly limiting the verbal field greatly improves the computer's understanding of speech. To make the $4,395 package MedSpeak, the first commercial dictation software that allows users to speak naturally, IBM concentrated on the most obvious market it could think of: radiologists, who can't type on the job because they must keep their eyes on the X rays.

Lawrence H. Schwartz, a radiologist at New York's Memorial Sloan-Kettering Cancer Center, dictates a report that includes such jawbreakers as "mediastinal contour" and "pneumothorax." Of his 120 words, the computer's only error is to write "of which" rather than "for which," an error Schwartz corrects on his word processor.

Unfortunately it works only for radiology. When a visitor recites "Mary had a little lamb, her fleece was white," the program renders it as: "Very heavily laminectomies with widest."

Refinements to the software are in progress.

—P.E.R.
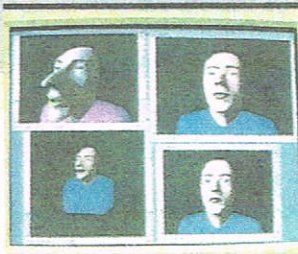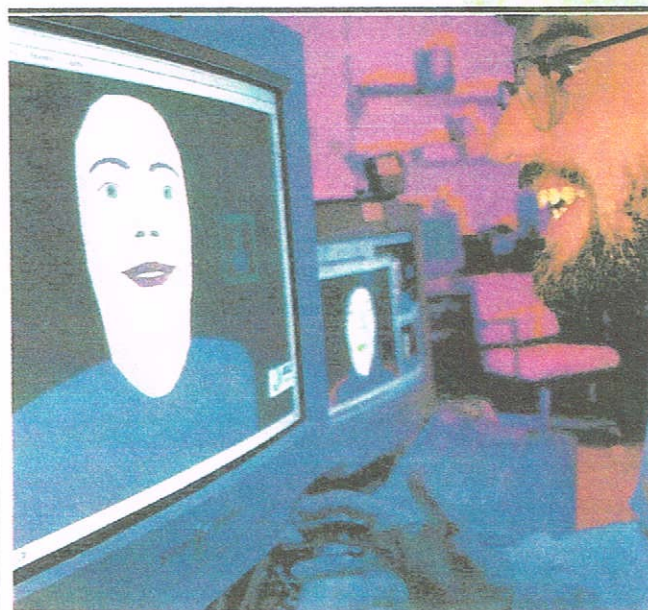
Up from GUI

THE GRAPHICAL USER interface made computers accessible to the nontechies among us. It freed users from the need to type in arcane commands—spelled exactly right—to get the computer to do something.

InXight, a software firm in Palo Alto, Calif., is taking the graphical interface to the next level. Goal: Make computer files easier to find by adding some perspective to the desktop shown on your computer screen. InXight has devised

a transparent three-dimensional interface it calls the Hyperbolic Tree. When the tree revolves, related files and documents come into the foreground without completely obscuring the others, which can be seen, in miniature, on the other side of the tree. It's like looking at a glass globe of the world, on which you can scrutinize North America while still keeping an eye on China.

Another InXight innovation, called the Perspective Wall, also makes use of three dimensions to help you keep track of what's on your PC. A giant wall appears to curve out at you from the upper-left-hand corner of your screen. It flattens out in the middle to give you an easily readable section, then bends off to the right again, producing a view of past, present and future work. Cards pinned to the wall represent accomplished or planned entries, together with the names of their creators. If you click on a future card, the wall rolls toward you.

Besides presenting certain data in more digestible form, three dimensions can also simulate reality better than two.

"There are plenty of businesses that would want to advertise their products in three dimensions," says Sasha Migdal, founder of Real Time Geometry, now owned by MetaCreations in Carpenteria, Calif. "Take food. I never could order food in a restaurant unless I saw what it looked like. Of course, there is no smell synthesizer so far, but you could rotate food on a screen, getting a perfect illusion of depth," Migdal says.

Edwin Selker, head of user interface research at IBM's Almaden Research Center, is working on a new concept in visualizing computer files, in which the user is made to feel that he is inside a room. "It looks like an old-fashioned office: books, a window, a card file, a pile of videotapes, a framed picture. On the desk are devices that look like clipboards; point one at the bookshelf projected on the wall and you can read whichever book you like. Click on a picture of the globe projected on the wall and you're on the Web." Cost of the prototype system, including 486 Intel microprocessors: $6,500.

Selker envisions a world in which many computer users organize their lives this way and proceed to communicate with one another through these displays. You could perhaps even work from home—without considering yourself at a far remove from your co-workers.   –P.E.R.

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a tentative tone of voice, whereas submissive personalities dislike a dominant voice. That's why Microsoft Office 97 offers a choice of computer "personalities" to guide the user through the software's mazes.

In the future computers will actively adapt to the personality and mood of the user. It will be a welcome change: There's nothing more infuriating than being greeted by a breezy, smiling computer first thing in the morning. "Have a nice day!" it chirps. Sometimes that makes you want to smash the damned thing. It will be a long time before a computer recognizes that you are hung over and offers sympathy, but Daniel T. Ling, director of Microsoft Research says: "A nearer-term thing is, does it

even know you're sitting in front of the screen looking at it?" he says. "If it knew you were there, reading the screen, it wouldn't pop up a screen saver."

Doesn't all that require human intelligence? No—and this is a fairly recent insight. Artificial intelligence researchers once aimed to make computers think as we do; today's programmers merely try to mimic human behavior by any nonhuman means that works.

It was this shift in emphasis that enabled IBM programmers to create a computer that could beat chess champion Garry Kasparov by searching, in a nonhuman way, through stupendously large numbers of possible game outcomes. Kasparov attributed

thought to it nonetheless. It did seem human—but it wasn't. Chalk up yet another example of treating machines as people.

To get a glimpse of tomorrow's controls, look at someone who can't use today's. Nils Klarlund, a software researcher at AT&T Labs, suffers from such bad tendinitis in his arms that he thought he might have to give up computer science. So he designed a system that integrates an off-the-shelf dictation program, to enter text and make simple commands, with a series of pedals to move his cursor around the screen. Klarlund plays his computer like an organ, while sitting back in his chair more comfortably than mousemanship will allow.

Even if you don't have orthopedic

Ling. "You'd 'feel' things your cursor was touching."

It will take time to refine all these gadgets, just as it took Hollywood time to learn how to use the camera creatively, varying pan shots and closeups and fadeouts. The first moving pictures overdid the motion, with Keystone Kops-like frenzy; the first talkies had incessant chattering; the first Technicolor movies had disgusting hues. Nowadays some directors are overdoing the computer-aided special effects. All these

IBM's Thomas Zimmerman with belt-mounted computer that lets him exchange business cards via handshake **You could even wear a computer in your shoe. Maxwell Smart was on to something.**

problems you might want a foot mouse, say, for heavy-duty editing of a document. "I think there will be a strong commercial demand for it among CAD/CAM operators," he says, referring to engineers who use software to design parts on a computer screen.

Expect smarter mice, too. Take the force-feedback joystick, whose vibrations tell kids that the simulated car in their videogame is mired in the mud. "People are already experimenting with putting a little force feedback into the mouse," says Microsoft's

ideas—like those of the interface—reach maturity only when you no longer notice them.

Tired of lugging that laptop with you wherever you go? That interface will improve, too. IBM scientists have developed a system for wearing computers. You might carry the computer, about the size of a thick credit card, in your wallet, or even in your shoe, as Maxwell Smart did for his secret-agent telephone. "Hey, there are good reasons to put computers in shoes," says the system's coinventor, Thomas Zimmerman, of

IBM's Almaden Research Center in San Jose, Calif. "There's a large area, room for lots of memory, and you can display the data on a wristwatch, without need of wires."

Zimmerman envisions that the shoe computer would broadcast at 300 kilohertz, an AM radio frequency, using a mini-antenna charged with an electric field one-thousandth the strength of the one you get when you comb your hair. The signal suffuses your body; to convey it farther, you simply touch another person or object.
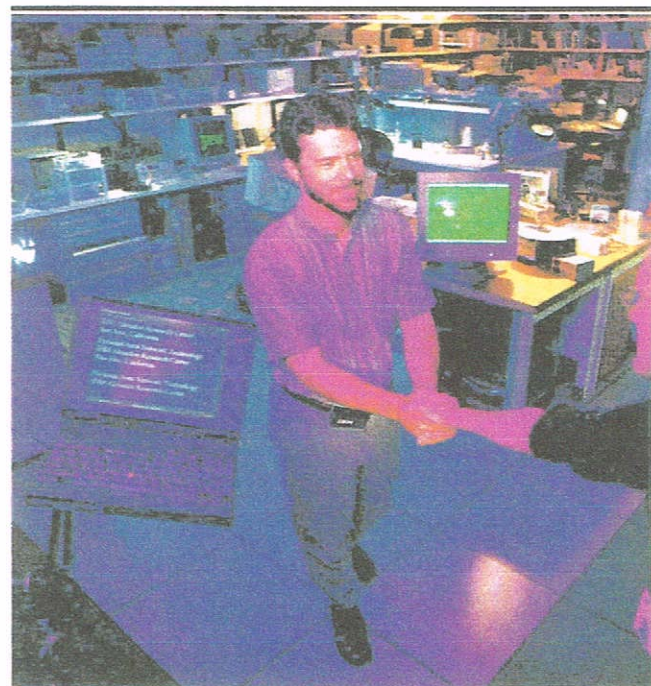
Why do it? Because it beats sitting down and programming every machine we come in contact with. "We're interacting with electronic machines more and more," Zimmerman notes, "and it's only polite for us to introduce ourselves to these machines. I mean, software agents will increasingly customize themselves to you, and for that to happen, the computer needs to know it's you. It does when you touch it—you are the wire, the extension cord."

Rather than fumble with a calling card at an airport pay phone, a traveler with one of these computers would simply pick up the phone and dial. Encrypted identification numbers would be built-in.
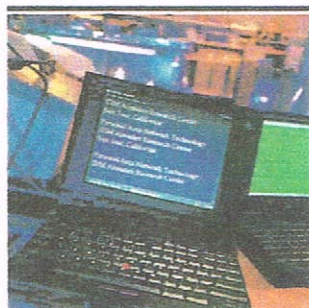
Nothing surprising in all this. It wasn't until the early 1920s that you could start a car without getting out and cranking the thing. Most FORBES readers learned to drive with an automatic shift, but a fair number can recall the days when they had to shift gears by the sound of the engine. Henry Ford tried to stop progress by refusing to move beyond the Model T, but the competition rolled over him.

Tomorrow's computers are going to be friendlier and more irresistible than today's. Count on it. The end result of smart computer interfaces is not necessarily that users can be dumb. Rather, it means that users will have to be smart in different ways. The brainpower freed up by not having to memorize spellings, do arithmetic or type can be applied to more creative tasks. ∎