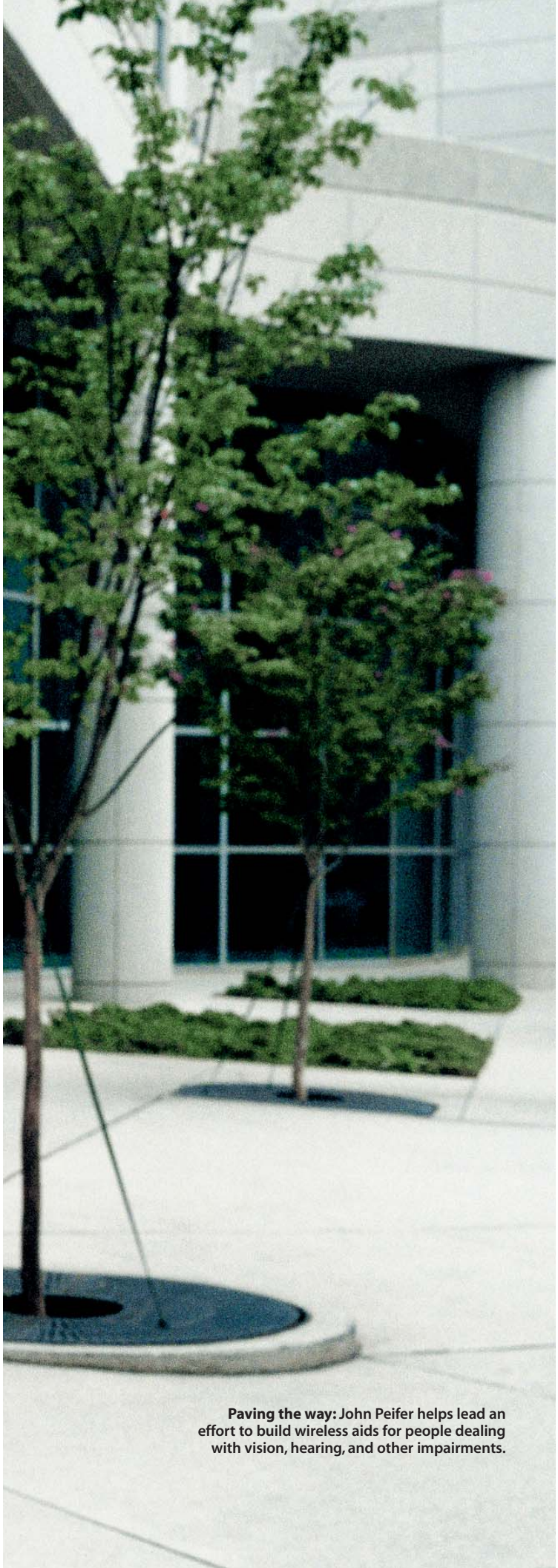


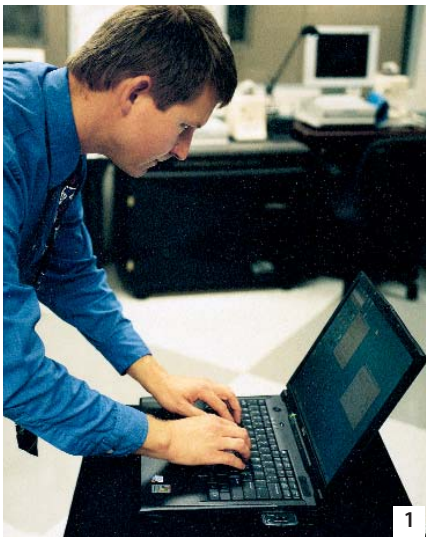
Paving the way: John Peifer helps lead an effort to build wireless aids for people dealing with vision, hearing, and other impairments.

WIRELESS FOR THE DISABLED

Mathematician and computer scientist John Peifer and his team at the Georgia Institute of Technology are adapting wireless technology to aid millions of disabled people worldwide.

Photographs by Beth Perkins

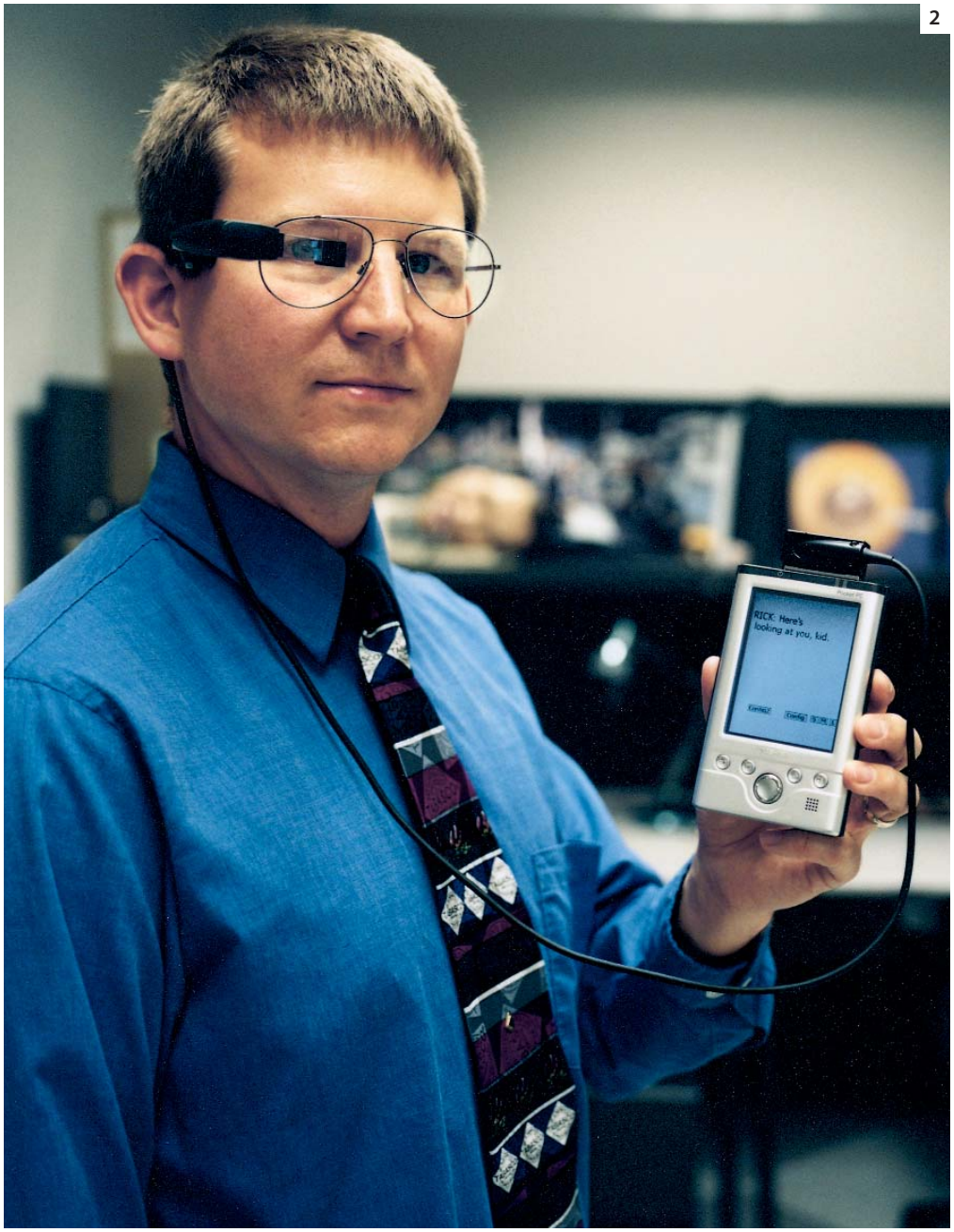
THE WIRELESS EXPLOSION has made cell phones, personal digital assistants, and other devices ubiquitous and has changed the way people communicate and work. It also offers the possibility of changing the lives of disabled people, by helping them overcome or cope with their impairments. The 25 researchers at the Rehabilitation Engineering Research Center on Mobile Wireless Technologies for Persons with Disabilities at the Georgia Institute of Technology have made it their mission to realize that possibility. The center is designing wireless aids that target a variety of disabilities, including mobility, vision, and hearing impairments. The researchers use off-the-shelf components to build these systems "so that they're affordable and available," says John Peifer, the center's codirector. The center is also trying to influence wireless-device manufacturers to make their existing products more accessible to people with disabilities and to adopt new applications with the needs of the disabled in mind. "Mobile wireless is going to be a big part of the future. There's a concern that people with disabilities would be left out," says Peifer. He and his colleagues showed *Technology Review* associate editor Corie Lok a few of their prototypes.



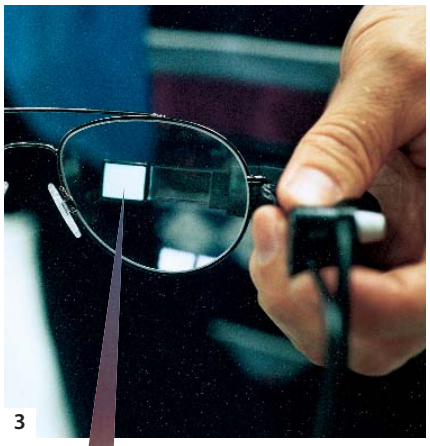
WEARABLE CAPTIONING

1. Research scientist Jack Wood starts by demonstrating a personal captioning device that could be worn by a hearing-impaired person in a movie theater, lecture hall, or meeting room. The system would make it possible for the user to follow along in real time when a sign-language translator wasn't available. "The venue would possess some sort of transmitter," to wirelessly beam captions to the user, Wood says. "Today that's being represented by a wireless-enabled laptop." He enters text into the computer as a stenographer might in a lecture hall; further down the road, speech-to-text software might be used to automatically convert a speaker's words to captions in real time. In a movie theater, the system would draw on the captions that normally come prepackaged with films, but which usually aren't displayed at public venues.

2. As the captions are being entered, the transmitter sends them to a PDA carried by the user. "We went with a PDA, because this way users can either use their own, go out and buy their own, or it's something cheap enough that the venues can buy and check it out to patrons," says Wood. The user can read the text right off the PDA screen or off of a 30-gram, commercially available mini monitor that clips on to his or her glasses.



3-4. With the mini monitor, the user can keep an eye on the action and read the captions at the same time. The captions, which take up only a small portion of the user's field of vision, appear to be floating in between the eye and what the user is looking at. Wood and his colleagues are looking for a company to commercialize this system. "The idea is that the company would license the technology and incorporate it into their own product line," says Peifer.



5

6

REMOTE GESTURE CONTROL

5. Down the hallway, Tracy Westeyn, a PhD student, has another prototype set up in a mock living room. She is working on a "gesture panel" that would allow a person who lacks the fine motor control necessary for manipulating small switches and buttons to control devices around the house with a simple wave of the hand. She demonstrates the idea by turning up the volume on the TV behind her. All it takes is moving a pointed finger upwards in front of the panel, which bears a grid of 72 infrared light-emitting diodes. A camera pointed at the panel detects breaks in the infrared beams as Westeyn's hand passes by and feeds the information to a laptop computer. The computer recognizes the gesture and translates it into a specific control command for a device—in this case the volume control for the TV—and can send the command via infrared or radio signals to the device. One of Westeyn's colleagues is working on another gesture-based system that can recognize sign language. "This could provide automatic translation for people who don't understand sign language," says Peifer.

AUDIO NAVIGATOR

6. The next stop on the tour is a visit with research scientist Jeff Wilson, who is working on a system that uses sound to guide blind people. Wilson dons a pair of headphones and a black bag that holds a wireless computer, which he controls via an attached handheld device. A GPS sensor on the bag's shoulder strap and a head-tracking sensor atop the headphones help the computer keep tabs on his position and orientation. To guide him along a pre-programmed route, the computer plays beeps over the headphones, modulating them so that the sound appears to be coming from one direction or another. Wilson follows the route by simply moving toward the apparent source of the sound. Using the computer and sensors, he can also "record" a new path as he walks. "This has great potential to help blind people get around and be more independent," says Peifer. Assessing the center's work as a whole, Peifer says he is optimistic that wireless technology can profoundly affect the lives of disabled people. "The technology now makes it possible for them to do things they couldn't do before," he says.