

# Technology for the Disabled: *Who cares?*

By JP Schnapper-Casteras

**F**eatures

*Why should technology for the disabled matter to you? Are you disabled? [No] Do you have any close friends or family who are disabled? [Probably not] Dubious? Don't be. Here are some reasons why you should care:*

## 1) IT'S MORALLY RIGHT

It's morally correct to provide physical access to stores via ramps and buildings via Braille labels. By extension, it is only right to provide equal access to software, computers, and other Electronic and Information Technology products. It may cost money and take more time to design accessible technology, but no one said equality was free or easy. If you believe in equal access to health care and other government services, racial equality, equality in the workplace, or equal opportunity, you should support equal access to technology.

One project at Stanford that works towards equal access to technology is Project Archimedes (<http://archimedes.stanford.edu/>), which "studies barriers to accessing and using information, computers, and information appliances and identifies and designs innovative solutions that provide universal access to and use of information and control of one's environment"<sup>1</sup>. The group's primary creation is an intelligent Total Access Port (iTAP) for computerized appliances and personal computers that allows users to control and use devices in a customized, efficient, and natural fashion (e.g., asking your coffee maker to turn itself on).

## 2) IT BENEFITS EVERYONE

Technology for persons with disabilities benefits both disabled and non-disabled citizens alike. Just as ramps help FedEx employees and reduce accidents on stairs, accessible cellular phones let you to dial without looking (via the little bump on the "5" key or between the 5 and 8) and alert you to incoming calls without ringing (via "Vi-

brate" mode). Accessible web pages – made "readable" for the blind or enlarged for those with low-vision – will soon let you browse the web from your car (while looking at the road, hopefully) or from your small cell phone screen (with magnified, repaginated text).

A good example of such technology exists right here at Stanford: John Bravman was one of the first professors at Stanford University to experi-



All photos courtesy VA Rehab R&D

**Ralph the fingerspelling hand: an electromechanical hand that signs letters according to the American One-Hand Manual Alphabet (a special form of sign language). This device aids deaf-blind users and can accept and sign data from multiple sources such as a computer, a voice recognition system, or a closed caption television decoder.**

ment with speech recognition technology in the classroom to aid students with disabilities. Working with the Disability Resource Center in 2002, he used speech recognition software and a microphone to turn his words into text. In the future Bravman hopes to project a real-time transcript onto a screen in the front of the room, thereby providing a dynamic lecture transcript for students. The system may counteract many types of disabilities, including moderate to severe hearing problems and mild cognitive disabilities. Furthermore, it's a prime example of how technology originally intended for users with disabilities also assists the non-disabled. Students who misheard a word, lost focus for a moment, or could not write notes quickly enough benefit as well.

### 3) YOU'RE GONNA GROW OLD

In this lifetime it's highly likely you'll become disabled in some capacity or another. You'll break your arm or break your glasses when you're young. You may lose hearing and mobility when you're older. So it makes sense to care about and examine technology for the disabled now (e.g., cell phones that can work with hearing aids or electronic shoes that help you keep your balance).

The VA Rehab R&D Center<sup>2</sup> engages in biomedical research focused on developing innovative clinical treatments and assistive devices for veterans with physical disabilities in order to increase their independence and improve their quality of life. The VA Rehab R&D Center's projects seek to benefit veterans with "neurologic and musculoskeletal impairments to regain the use of their limbs [and] ...understand the way in which the nerves, muscles, and skeletons of the healthy individual are coordinated to accomplish such everyday tasks as standing, walking, reaching, and grasping, and the ways in which this coordination is disrupted in persons with mobility impairments"<sup>3</sup>.

A recent device developed at the Center is the Handbike, a hand-powered bicycle for people with lower limb



**[Above] Handbike: an arm-powered, two-wheeled bicycle designed for people with lower limb disabilities. Two smaller wheels automatically touch down and prevent the bike from leaning over too much or from falling over.**



**[Above] Ultrasonic Head Controlled Wheelchair Interface: a device that allows quadriplegics to wirelessly control their wheelchair. It is used similarly to a joystick: tilting the head forward moves the wheelchair forward, tilting left, right, or backwards moves the wheelchair in that respective direction.**

disabilities<sup>4</sup>. Other projects include the Ralph Fingerspelling Hand, a "computer controlled electromechanical hand that serves as a tactile display for persons who are deaf and blind" and the Ultrasonic Head-controlled Wheelchair Interface, a device that allows quadriplegic users to control their powered wheelchair by tilting their heads in the desired direction of movement.<sup>5</sup>

### 4) IT'S A CHALLENGE

Making technology is one thing, but making it work for many different types of users is another. It's challenging and rewarding (see 1-3). Take the Blind Navigator<sup>6</sup> for example; if the device is successful, it will let visually-impaired users understand and explore the physical spaces that surround them. It will analyze video camera input in order to discern the encompassing space, instantly (in "real-time") generating sound effects and acoustic cues to guide the user. In this way Blind Navigator will create an acoustic map of the user's environment. Likewise, chirping cross walks are increasingly commonplace and help visually-impaired users cross the street more easily. Blind Navigator plans to utilize similar audio prompts and warnings to assist users in any space they might encounter. In all,

the project hopes to “offer an affordable and superior alternative to dog guides and/or canes” but is still in its early stages<sup>7</sup>.

## 5) IT YIELDS MORE USABLE TECHNOLOGY

If an Electronic or Information Technology product works well for someone who is disabled, chances are it will work much better and in a wider variety of ways for non-disabled users. If you care about making good products, designing with accessibility in mind is an extremely rewarding tactic.

The Media X Network<sup>8</sup> believes that accessible and usable interactions are integrally linked. Media X is a campus-wide research network that facilitates and coordinates investigations of interactive technology. Keith Devlin, ex-



[Above] Dr. Keith Devlin: Professor Devlin is the Executive Director of CSLI and a Consulting Professor in the Department of Mathematics. He is a member of the Executive Committee of the Stanford Media X Research Network – a program he helped design.

ecutive director of both Media X and the Center for the Study for Language and Information (CSLI)<sup>9</sup> states:

“Once we have learned how to truly design good interactions, the impact on both the third world and on individuals with disabilities will be immense. Interaction is something humans (and many other species) have been doing for millions of years (going back long before we *were* humans, in fact). Interactions are extremely powerful, natural, smooth, and often unconscious.”

“They do not require any special learning, such as language, and [c]an [sic] be done despite various disabilities. When you can communicate and provide access to the fruits of hundreds of years of science, technology, medicine, and other forms of learning in a fashion that is not restricted to people with full physical capacities who have learned to read and write (or type), then you can change the world - for everyone. This is one of the main things Media X is about.”

Devlin adds that the rubric of ‘interactive technology’ includes projects aimed at assisting students and other users with disabilities.

## 6) IT MAKES FOR GOOD BUSINESS

Thanks to Section 508 of the Rehabilitation Act, federal agencies and their suppliers require accessible Electronic or Information Technology. So if you want to sell your products to the biggest buyer in the world (the

U.S. Government), they need to be accessible, as defined by regulation<sup>10</sup>. Imagine retrofitting your product to be 508-compliant after the fact, or learning about the regulations in the final stages of production. It’s much better

(and cheaper) to design your product with disability in mind than to haphazardly incorporate poor solutions later.

## BUT DOES STANFORD UNIVERSITY CARE?

So if there are so many reasons why technology for the disabled is important, why haven’t I heard anything about it at Stanford? [Good question]

Technology for the disabled is, for all intents and purposes, a nonentity on Stanford campus. There’s little research, and a patent lack of classes concerning Disability Studies. In contrast Berkeley offers a class on Assistive Technology<sup>11</sup>, University of Wisconsin Madison has a prominent center and well-known projects on the subjects, as do the Georgia Institute of Technology<sup>12</sup> and the University of Washington<sup>13</sup>. Several universities also have graduate programs in Disability Studies.

At Stanford, those departments responsible for the introduction and diffusion of communication and other interactive technologies – Product Design, ME, CS – should emphasize disability-aware design. There need to be classes on the subject, and professors should encourage class projects to consider use by disabled persons.

Furthermore, as the need for disability studies extends beyond the School of Engineering, the Humanities and Social Sciences warrant their own criticism. The art or music departments could use technology to make performance, visual, and audio works more accessible. The public policy or political science departments could offer classes on the Americans with Disabilities or Rehabilitation Act.

Stanford is one of the most progressive, wealthy, and prestigious universities in the world. There’s simply no excuse for the minimal presence of disability studies and technology for persons with disabilities. Technology for the disabled should matter to the University, and it should matter to you.





Zooming downhill on the Handbike.

## FURTHER READING

1 <http://archimedes.stanford.edu/>; Several other articles describe the precise origins and activities of the project  
<http://archimedes.stanford.edu/press.html>

2 The VA Palo Alto Health Care System's Rehabilitation Research and Development Center of Excellence on Mobility - also known as the Rehab R&D Center - is affiliated with Stanford University's Schools of Engineering and Medicine and has strong ties to the Departments of Functional Restoration and Mechanical Engineering

<http://guide.stanford.edu/resources/overview.html>

3 <http://guide.stanford.edu/Projects/Proj.html>

4 <http://guide.stanford.edu/Projects/2kprojects/atech3.html>

5 <http://guide.stanford.edu/Projects/2kprojects/atech5.html>, <http://guide.stanford.edu/Projects/2kprojects/atech7.html>

6 [http://dart.stanford.edu:8080/sparrow\\_2.0/pages/teams/BlindNavigator.html](http://dart.stanford.edu:8080/sparrow_2.0/pages/teams/BlindNavigator.html)

7 <http://dart.stanford.edu:88/Get/File-2769/blindnavigator.pdf>, p.1

8 <http://mediax.stanford.edu/>

9 Interview with Keith Devlin [devlin@csl.stanford.edu], conducted via e-mail. <http://www-csl.stanford.edu/~devlin/devlin.html>

10 These are generalizations of the laws and regulations; see <http://section508.gov/> for more information on Section 508.

11 <http://guir.berkeley.edu/courses/assistive-tech/spring2002/>

12 <http://www.tracecenter.org>  
<http://www.catea.org/>

13 <http://uwctds.washington.edu/>  
<http://depts.washington.edu/cdpr/>

## CONTACTS

If you're interested in trying to increase the presence of assistive technology, disability policy research, or the notion of Disability Studies, please contact JP Schnapper-Casteras at [jpsc@stanford.edu](mailto:jpsc@stanford.edu).

For more information on the VA Rehab R&D Center or related topics, contact David L. Jaffe, Research Biomedical Engineer at the VA Rehab R&D Center: [jaffe@roses.stanford.edu](mailto:jaffe@roses.stanford.edu)  
<http://guide.stanford.edu/People/jaffe/jaffe.html>