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**The brain does the writing**

Technology at state lab, 30 years in making, to be featured Sunday  
 By Claire Hughes  
 Updated 7:46 am Sunday, June 30, 2013

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Andrew Wilkinson wears an electro-cap to write a message with his brain waves while sitting in front of a computer at The Laboratory of Neural Injury and Repair at the Wadsworth Center on Thursday, June 27, 2013 in Albany, N.Y. Lab chief, Jonathan Wolpaw, M.D. explains the process at right. (Lori Van Buren / Times Union)



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*Albany*

Andrew Wilkinson, 17, looked like he was doing nothing — zoned out in front of a computer screen, inexplicably donning a multicolored cap.

In fact, his mind was intensely active, focused on controlling the word processing program before him with brain waves. In 35 minutes, he was able to produce this message while remaining as still as a yogi in deep meditation:

"Today is Wednesday and my name is Andrew. I am typing this message with a brain computer interface."

What once could only be imagined by science fiction writers is now reality at the state Health Department's Wadsworth Center. Scientists have worked nearly 30 years to develop

technology that allows paralyzed people to send e-mails, read Internet news or watch YouTube videos using only electrical activity from their brains.

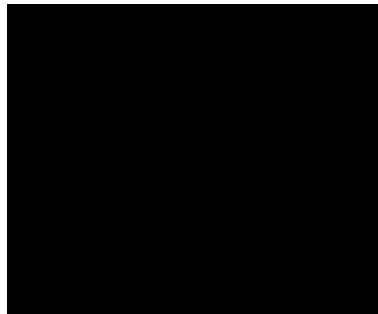
"The communication is being produced completely by brain activity," said Jonathon Wolpaw, a pioneer of BCI who leads the team at Wadsworth.

The center's work will be highlighted for about three minutes Sunday evening during the Smithsonian Channel series "The Real Story." This week's episode, the launch of a new season, looks at the real-life science foreseen in the TV series "Star Trek."

Wilkinson, a recent graduate of Bethlehem High School who works at the lab, demonstrated

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the technology for the [Times Union](#). The cap on his head was fitted with electrodes, which were filled with gel to conduct the brain's electrical activity through wires running to an amplifier and computer. On the screen in front of him were a standard blank page and a grid with the alphabet, numbers and other items. Groups of half a dozen items flashed in rapid succession. Another screen showed Wilkinson's brain waves, which were recorded through electroencephalography, or EEG.

Wilkinson paid attention to the letter he wanted, and 300 milliseconds after it flashed, the EEG registered a change in his brain waves as an "aha!" moment. After several of these changes were recorded, the chosen letter would appear on the page. Then Wilkinson moved his attention to the next desired letter.

The pace might seem glacial to someone used to shooting off a text or e-mail. But Wolpaw said intended users are not deterred by the lack of speed, but encouraged by the technology's existence. ALS, spinal cord injuries, strokes or other conditions have destroyed their ability to communicate with the outside world. They are not able to use other assistive technologies that require even slight movements of the head.

"They are people who are essentially locked into their bodies," Wolpaw said.

One user in Pennsylvania, abused by a spouse, used BCI to write a two-page letter to state officials that resulted in getting his custody transferred to his parents, Wolpaw said. A professor at the University at Pennsylvania, mentally agile but stripped of mobility by ALS, runs his laboratory with BCI.

The seed of the idea for BCI was planted in 1985 by former state Health Commissioner [David Axelrod](#), who asked Wolpaw if he could imagine creating a way to use only brain waves to complete tasks. IBM was interested in the concept, and a collaboration began. At the time, Wolpaw's lab was the only one working on BCI, he said. Now hundreds of researchers are engaged in the field.

Some others' work involves placing electrodes in the brain. But the BCI hardware at Wadsworth is used exclusively outside the skull.

"We're the flagship noninvasive approach," Wolpaw said.

The system has been tested by 40 users and is in many ways ready for widespread use, said Wolpaw and [Theresa Vaughan](#), the project's clinical director. But it requires significant professional support — and that is prohibiting broad distribution. While the software and hardware to operate the programs would cost about \$5,000, the value of professional time for training and trouble-shooting is immeasurable. BCI users are usually unable to leave their beds or wheelchairs, and medical complications make each of their settings unique.

When a new user gets a system, researchers travel to their homes. They experiment with machine setup, including screen position. They train caregivers in how to fill and place the electrode cap correctly, read the EEG and recognize signs of poor functioning. Ideally, with a new user, a researcher visits the home every couple of weeks for several months, Wolpaw said.

The Wadsworth BCI lab is currently supported by grants from [the National Institutes of Health](#) and the U.S. Department of Veterans Affairs. The 11 current users, from New York to Ohio, are educated people with tremendous motivation, committed caregivers and generous insurance coverage, researchers said.

Walpaw expressed frustration over the challenges of getting the technology to more users. He compared BCI to orphan drugs developed for rare diseases, for which there are not enough potential users to make their manufacture profitable.

"This is really at this point an orphan technology," Wolpaw said.

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