

# Mind controls a robot arm

By David Templeton  
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With mind control, a monkey fed itself marshmallows with a robotic arm. Then one year ago, in a moment spiked with emotion, a man with quadriplegia reached out with a robotic arm to touch his girlfriend's hand.

Now the mind-controlled robotic-arm technology developed at the University of Pittsburgh has reached another milestone, again sparking lots of emotion. A study published online today in *The Lancet* describes how a 52-year-old woman — a quadriplegic for nine years — has spent the past 10 months learning to maneuver the robotic arm with her thoughts, allowing her to pick up objects of various shapes, shake hands, and even grasping a chocolate bar and taking a bite.

The fact is, Jan Scheuermann used the arm and hand to consume the entire chocolate bar.

Her accomplishments, resulting from decades of Pitt research, heighten the promise of people with quadriplegia or arm amputations to use mind-controlled robotic arms to perform daily tasks independently. The study also marks an important step in the goal of wiring the brain around spine damage to arm and leg muscles to restore limb function.

"It was pretty spectacular," said Andrew B. Schwartz, the research team leader, expressing pride that the breakthrough occurred in Pittsburgh and describing Ms. Scheuermann, as articulate, intelligent and exuberant.

"When she has a really good day, we're all on cloud nine," he said, noting that the research proves that using a robotic arm to perform daily tasks is feasible. Further advances and refinements are necessary before the technology is available for general use, which could take five years or longer. "I've been working on this for 25 to 30 years," he said. "And to see her do this made me say, 'Damn, it really works.'"

The research team this morning will hold a news conference involving Ms. Scheuermann and Tim Hemmes of Connoquenessing Township, Butler County, who was the first to operate the robotic arm with his mind. He had a motorcycle accident eight years ago that left him with quadriplegia, but he underwent a surgical procedure to place a computer chip against his brain that, with training, allowed him to reach out and touch his girlfriend Katie Schaffer's outstretched hand last year.

The news conference also will include a video of Ms. Scheuermann's success with the robotic arm.

The Pitt professor of neurobiology described how the mind-controlled arm works:

# A quadriplegic moves robot arm with mind control

*Pitt team inserts computer chip in brain so a person's thoughts can instigate motion*

**ARM,** FROM PAGE B-1

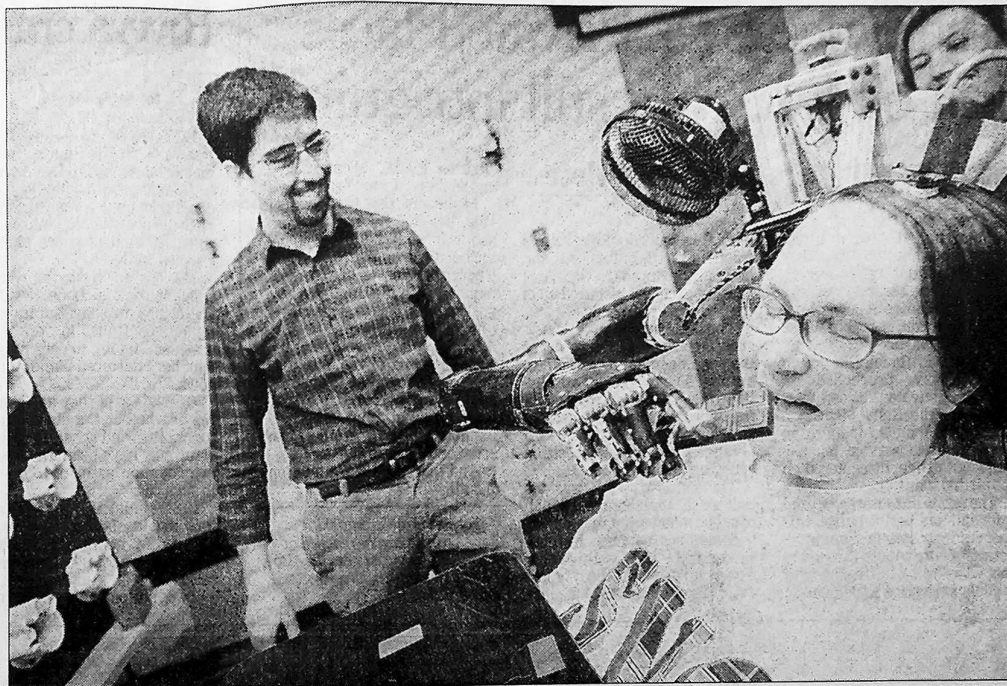
The team embedded a computer chip with 200 needles into Ms. Scheuermann's brain, each one stationed near a small group of neurons known to control a particular arm or hand motion. The computer translates the signals, then makes the robotic arm perform the intended task.

Researchers made technological advances in the past 10 months. Ms. Scheuermann, who has had the computer chip imbedded in her brain since February, was able to train quickly to operate the arm, making it easier to reach a target or perform a task. She continues using the device in the year-long trial that initially was scheduled to end in February. But the U.S. Food and Drug Administration has granted permission to extend it beyond the initial one-year limit, if necessary.

The study says Ms. Scheuermann achieved seven degrees of freedom in arm and hand motions, including moving it in the three dimensions of space while also using three different wrist movements

and a grasping motion with all the fingers. She learned how to focus on a task, with the arm and hand doing the rest. It reflects how the brain really works. When we decide to pick up a glass, for example, the hand goes to the glass and grasps it. We need not think about bending the shoulder, elbow, wrist and hands at various angles to make it happen. Since the latest study was published, Ms. Scheuermann has progressed to 10 degrees of freedom that allow more detailed use of the hand and fingers.

Initially, Ms. Scheuermann told researchers her goal was simple. She hoped for the first time in nine years to grasp a chocolate bar and eat it without anyone's help. In the lab, with a student holding the chocolate, she reached and grasped it, then brought it to her mouth and took a bite, then another and still others until the chocolate bar was gone. She also grasped and ate string cheese and pieces of red pepper. Able to shake hands, she also did a fist bump and grabbed a cup and did a pouring motion.



UPMC photo

Jan Scheuermann, who has quadriplegia, takes a bite out of a chocolate bar she has guided into her mouth with a thought-controlled robot arm as research assistants Brian Wodlinger and Dr. Elke Brown watch.

Jennifer Collinger, the Pitt doctor of bioengineering who wrote the study, said Ms. Scheuermann moved the arm smoothly, quickly and with consistent control, almost with the speed and grace of a real arm.

"I feel lucky to be part of this," she said. "I want to develop this and see it used

by lots of people as a result of these two dedicated and selfless people," she said, referring to Ms. Scheuermann and Mr. Hemmes. "There were lots of emotional moments when we laughed and cried in the lab, and it's really been lots of fun."

Lawrence C. Vogel, president of the American Spinal

Injury Association and chief of pediatrics at the Chicago Shriners Hospital for Children, described the news as "very exciting" and "incredible."

He also said he's been a strong proponent of Pittsburgh researchers who are doing "super work" on behalf of people with disabilities.

"I think they are doing

really cutting-edge research to improve the lives of people with spinal cord injuries," Dr. Vogel said. "This research will translate into allowing people to do more with their lives."

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