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Pitt researchers expand limb work

Adding "hand" is meant to make the device more like a real limb.

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University of Pittsburgh neurobiologist Andrew Schwartz dazzled the scientific world last year when he demonstrated that a monkey could feed itself chunks of zucchini using a robotic arm powered by the animal's own brain signals.

But with its simple, claw-like gripper and limited range of motion, the robotic arm used in Schwartz's experiments was a crude facsimile of a device which someday could help amputees or severely paralyzed patients.

This fall, Schwartz's team will embark on a more ambitious project: developing the first brain-controlled arm and hand that performs, looks and feels like an actual limb.

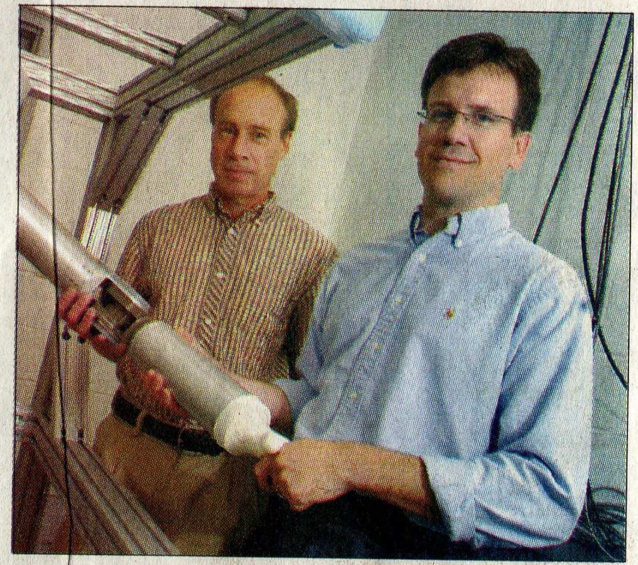
"We are going from something relatively simple to something very complex," said Schwartz, whose research is paid for by the National Institutes of Health and the Defense Advanced Research Projects Agency.

Schwartz is working in the burgeoning field of neural prosthetics, which aims to design mind-controlled systems to restore or supplement functions of the nervous system lost to disease or injury.

"There's been relatively few ways of treating central nervous system deficits," Schwartz said. "These technologies are trying to bypass those deficits, and things are really starting to work."

Massachusetts-based Cyberkinetics Neurotechnology Systems Inc. announced results last month from a pilot study that showed a patient unable to speak because of a brainstem stroke could control a computer cursor with thoughts to type messages.

The set-up for Schwartz's more lifelike arm and hand — with three fingers — essentially will be the same as in his previous studies.



James Knox/For The Valley Independent

Pitt neurobiologist Andrew Schwartz, left, and bioengineer Douglas Weber are working on developing a brain-controlled robotic arm the research team demonstrated last year.

Microelectrodes embedded in the monkey's brain feed nerve impulses from brain cells to a computer. A mathematical problem-solving formula called an algorithm interprets the monkey's desires from these electrical signals and sends information to the robotic arm and hand, connected by wires to tiny electrodes.

Schwartz faces scientific challenges in creating a more sophisticated system, including design of the prosthesis.

Former Carnegie Mellon University robotics professor Yoki Matsuoka, who recently moved to the University of Washington, is studying the biomechanics of the human hand in hopes of building a complex robotic version.

She is making engineering upgrades to a robotic hand she built several years ago that was able to type on a keyboard for seven hours a day for six weeks before breaking down. The new hand will be made of lighter, more durable materials to mimic tendons and better mechanical sheaths for the joints and ligaments, Matsuoka said.

A monkey using this type of neural prosthesis would be able to open a jar, reach in to grab an object and turn it in various directions, Matsuoka said.

"From my robotics point of view, the hands should be able to do everything a thumb, index finger and middle finger can do," she said.