

Building a Brain-Computer Connection

One of the bravest of new worlds, though, may be found in the laboratory of Andrew B. Schwartz, professor of neurobiology. Working with Michael L. Boninger, professor and chair of physical medicine and rehabilitation, Schwartz and colleagues are getting nearly \$7 million over the next three years from the NIH and the Defense Advanced Research Projects Agency to test a multifunctional prosthetic limb with spinal cord injury patients. The prostheses, mounted on wheelchairs, will be controlled by the patients' brains through implanted electrodes connected to a computer.

"There's a lot of work that we have to do, but the good thing is that we're pretty sure it's going to work," says Schwartz, whose confidence is perhaps understandable given a landmark 2008 *Nature* article he authored on the subject.

The newest trial will encompass three patients with different connectors. The first patient will have two, the second patient will have one, and the third patient will test a wireless telemetry version of the interface. In a companion project, additional patients will test an electrocorticography (ECoG) version of the interface using a grid placed on the surface of the motor cortex for up to 29 days. Neural activity captured by ECoG will be translated by a computer processor to allow the patient to control computer cursors, virtual hands, computer games, and assistive devices such as a prosthetic hand or a wheelchair.

"We want the patient to use the robotic arm to reach out, grab objects, and interact," says Schwartz, explaining that the sensory cortex of one patient's brain will also be stimulated by an implanted electrode array, allowing him or her to "feel what the robot hand is doing."

These examples only hint at

an intensity of neuroscience expertise that the University of Pittsburgh shares with few institutions. Arthur S. Levine, senior vice chancellor for the health sciences and dean of the School of Medicine, says he can envision the future development of a Neuroscience Research Institute similar to the current University of Pittsburgh Cancer Institute. Such a center could support, recruit, and focus the collaborative brain power of talented faculty to further reveal the organ that Luna calls "this wonderful machinery that holds the secret of who we are."



Andrew Schwartz (above), professor of neurobiology, and Michael L. Boninger, professor and chair of physical medicine and rehabilitation, are working with spinal cord injury patients to test a multifunctional prosthetic limb that is mounted on a wheelchair. The prostheses will be controlled by the patients' brains through implanted electrodes connected to a computer.