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Using Light to Alter Neural Activity

Potential for Safe, Powerful New Tool for Neurological and Psychiatric Therapy

(Great Neck, N.Y. - May 26, 2009) — NARSAD Investigator Edward S. Boyden, Ph.D., and colleagues at the Massachusetts Institute of Technology, have demonstrated that optical methods can be used to manipulate neural activity in the nonhuman primate brain.

The research, reported in the journal *Neuron* on April 29, 2009, highlights a methodology for investigating the causal role of specific cell types and pathways in the nervous system; in neural computation, cognition and behavior. The findings, the authors stated, "open up the possibility of a new generation of ultraprecise neurological and psychiatric therapeutics via cell-type-specific optical neural control prosthetics" that may improve efficacy while reducing side effects.

"We anticipate that this work may lead to many novel therapies for blindness, Parkinson's, epilepsy, and other disorders, said Dr. Boyden, the recipient of a 2008 NARSAD Young Investigator Award.

To understand how brain states and behaviors are generated by neural circuits, the researchers used a slow-acting virus, called a lentivirus, to target a light-activated protein channel, called channelrhodopsin-2 (ChR2), specific to excitatory neurons of the macaque frontal cortex.

Using a laser-coupled optical fiber in conjunction with a recording microelectrode, the team showed that activation of excitatory neurons resulted in well-timed excitatory and suppressive influences on neocortical neural networks. ChR2 was safely expressed, and could mediate optical neuromodulation, in primate neocortex over many months.

(This article was adapted with permission from *Neuron*.)

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