technology review
Published by MIT

Scientists Control Monkeys' Brains with Light

The new study, the first to demonstrate optogenetics in primate behavior, inches the technology closer to the clinic.

4 comments

SUSAN YOUNG
Thursday, July 26, 2012

Kasper Bosmans

For the first time, scientists have been able to affect the behavior of a primate using optogenetics—a technique by which genetically modified neurons are made to fire with light. The study, published today in the journal *Current Biology,* sets the stage for using this powerful new tool to study how the brain enables complex primate cognition and, more distantly, for using the technique to treat disease.

To control the electrical firing of a neuron, scientists use a virus to deliver a gene into brain cells. The gene is designed to produce a light-responsive protein (see "Brain Control"). Depending on the type of light-sensitive protein used, this genetic modification will either activate or silence a neuron in response to a specific color of light, delivered via optical fibers inserted into the brain.

The seven-year-old field of optogenetics has given neuroscientists a more precise tool to

New o

Why T
Seque

Can D
Comp
1 comm

Will A
Twitte

Paul F
Factor
25 com

How T
4 comm

More »

Techn

Techn

examine the connections between the groups of neurons that set up neuronal circuits. These brain circuits control behaviors such as movement and emotion and, when faulty, can lead to diseases ranging from depression to Parkinson's.

Scientists have already used optogenetics to control behaviors in mice (see "Scientists Control Sleep and Social Activity with Light"). While different groups, including one led by Edward Boyden, a neuroscientist at MIT and a co-inventor of optogenetics, have shown the technique could control neuronal activity in monkeys, no one had yet seen a behavioral effect.

"People were starting to wonder, is this going to be a challenge to get behavioral changes in a primate?" says Boyden, a collaborator on the new study. "That is very important if you want to study advanced cognition as well as if you want to think about potential clinical uses in humans," he says.

The behavior studied in today's published report is quite subtle: two monkeys were trained to purposefully move their eyes to a target on a screen when given a cue. But when the relevant optogenetically ready modified neurons were stimulated by light from optical fibers inserted into their brains, the neuronal circuit responsible was sped up, and the monkeys were able to complete this task faster.

"It's a simple task, but it is a cognitive task," says study senior author Wim Vanduffel, who splits his time between Harvard Medical School and the University of Leuven. "It's a stepping stone," he says, one that opens up new research into understanding brain function.

"[Optogenetics] may also become useful in the far future for therapeutic purposes, because if you can activate or deactivate very specific cell types, you can actually target particularly circuitries that are important in different diseases with much more precision than is possible at this moment with drugs or [electrical] stimulation," says Vanduffel. "But there is still a very long way to go before it gets there."

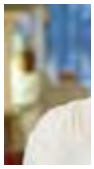
Susan Young Follow

Biomedicine Editor

I'm the biomedicine editor for *Technology Review*. I look for stories where technology stands to improve human health or advance our understanding of the human condition....

More » 4

JRRENTLY READING: **Scientists Control Monkeys' Brains with Light**



Read m

Explore