

[Print this Page](#)

Presentation Abstract

Program#/Poster#: 493.4/UU25

Title: A scalable toolbox for systematic, cell-specific optical control of entire 3-D neural circuits in the intact mammalian brain

Location: Hall A-C

Presentation Time: Monday, Nov 17, 2008, 4:00 PM - 5:00 PM

Authors: ***M. A. HENNINGER**, J. BERNSTEIN, E. KO, A. STRELZOFF, S. C. Y. CHAN, V. GIDWANEY, E. STICKGOLD, A. M. TENTORI, J. MCCONNELL, A. RODRIGUEZ, P. MONAHAN, G. TALEI FRANZESI, X. HAN, X. QIAN, E. S. BOYDEN;
MIT, Cambridge, MA

Abstract: The use of channelrhodopsin-2 (ChR2), halorhodopsin (Halo/NpHR), and other optically sensitive molecules to make neurons sensitive to being activated, silenced, and perturbed for milliseconds at a time, is beginning to open up new frontiers in the investigation of how the brain computes. These technologies also may enable novel therapies to remedy intractable neurological and psychiatric disorders. However, the spatiotemporally precise delivery of light to arbitrary sets of neural targets is a big challenge. Clearly the ability to modulate neural activity in specific cells, within desired brain regions, in a temporally-precise fashion, would be of great value to the investigation of the full brain, in its three-dimensional complexity, and in behavioral and clinical contexts. Here we reveal the elements of a complete, inexpensive, easy-to-use toolbox comprising: implantable hardware (optical fibers, LEDs, and electrodes), computational hardware (LED driver circuits), and control software for enabling specific cells, in specific sets of brain regions, to flexibly yet precisely be controlled from an ordinary computer. These inventions will be released under an open source license, accompanied by synthesis tools to enable investigators to target specific sets of cells and brain regions in vivo. We demonstrate the functionality and flexibility of this toolbox in the brain of the awake behaving mouse. Many thanks to M.H. for sponsoring this poster for J.B., who led the work.

Disclosures: **M.A. Henninger** , None; **J. Bernstein**, None; **E. Ko**, None; **A. Strelzoff**, None; **S.C.Y. Chan**, None; **V. Gidwaney**, None; **E. Stickgold**, None; **A.M. Tentori**, None; **J. McConnell**, None; **A. Rodriguez**, None; **P. Monahan**, None; **G. Talei Franzesi**, None; **X. Han**, None; **X. qian**, None; **E.S. Boyden**, None.

Support: NIH Director's Innovator Award DP2 OD002002-01

Society for Neuroscience RAIN Award

NARSAD Young Investigator Grant

Wallace H. Coulter Foundation, Alfred P. Sloan Foundation, Jerry Burnett Foundation, MIT Alumni Class Funds, Department of Defense, Benesse Foundation, McGovern Institute for Brain Research

MIT Media Lab Consortia

[Authors]. [Abstract Title]. Program No. XXX.XX. 2008 Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2008. Online.

2008 Copyright by the Society for Neuroscience all rights reserved. Permission to republish any abstract or part of any abstract in any form must be obtained in writing by SfN office prior to publication.