



Quantitative Biology > Neurons and Cognition

Optogenetic control of genetically-targeted pyramidal neuron activity in prefrontal cortex

Michael V. Baratta, Shinya Nakamura, Peter Dobelis, Matthew B. Pomrenze, Samuel D. Dolzani, Donald C. Cooper

(Submitted on 3 Apr 2012)

A salient feature of prefrontal cortex organization is the vast diversity of cell types that support the temporal integration of events required for sculpting future responses. A major obstacle in understanding the routing of information among prefrontal neuronal subtypes is the inability to manipulate the electrical activity of genetically defined cell types over behaviorally relevant timescales and activity patterns. To address these constraints, we present here a simple approach for selective activation of prefrontal excitatory neurons in both in vitro and in vivo preparations. Rat prelimbic pyramidal neurons were genetically targeted to express a light-activated nonselective cation channel, channelrhodopsin-2, or a light-driven inward chloride pump, halorhodopsin, which enabled them to be rapidly and reversibly activated or inhibited by pulses of light. These light responsive tools provide a spatially and temporally precise means of studying how different cell types contribute to information processing in cortical circuits. Our customized optrodes and optical commutators for in vivo recording allow for efficient light delivery and recording and can be requested at www.neuro-cloud.net/nature-precedings/baratta.

Comments: 2 pages, 2 figures Posted on [this http URL](#)

Subjects: **Neurons and Cognition (q-bio.NC)**; Cell Behavior (q-bio.CB)

DOI: [10.1038/npre.2012.7102.1](https://doi.org/10.1038/npre.2012.7102.1)

Cite as: [arXiv:1204.0710v1 \[q-bio.NC\]](#)

Submission history

From: Donald Cooper Ph.D. [[view email](#)]

[v1] Tue, 3 Apr 2012 15:26:53 GMT (461kb)

[Which authors of this paper are endorsers?](#)

Link back to: [arXiv](#), [form interface](#), [contact](#).

Download:

- [PDF only](#)

Current browse context:

q-bio.NC

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1204](#)

Change to browse by:

[q-bio](#)

[q-bio.CB](#)

References & Citations

- [NASA ADS](#)

Bookmark (what is this?)

