



Neural Prosthesis Seminar

"Optogenetics and Other Tools For Analyzing and Engineering Neural Circuits"

Friday, March 23, 2012 • 8:30 AM Biomedical Research Building • BRB 105 Case Western Reserve University



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Abstract:

Understanding how neural circuits work together to implement brain functions, and how these computations go awry in brain disorders, is a top priority for neuroscience. Over the last several years we have discovered and developed a rapidly-expanding suite of genetically-encoded reagents (e.g., ChR2, Halo, Arch, Mac, ArchT, ChR65, Halo57, and others) that, when expressed in specific neuron types in the nervous system, enable their activities to be powerfully and precisely activated and silenced in response to pulses of light. These tools are in widespread use for analyzing the causal role of defined cell types in normal and pathological brain functions. In this talk I will give a brief overview of these tools, and discuss a number of new tools for neural activation and silencing that we are developing, including new molecules with augmented amplitudes, improved safety profiles, novel color and light-sensitivity capabilities, and unique new capabilities. We have begun to develop hardware to enable complex and distributed neural circuits to be precisely controlled, and for the network-wide impact of a neural control event to be measured using distributed electrodes and fMRI. We explore how these tools can be used to enable systematic analysis of neural circuit functions in the fields of emotion, sensation, and movement, and in neurological and psychiatric disorders. Finally, we discuss our preclinical work on translation of such tools to support novel ultraprecise neuromodulation therapies for human patients.

For more information, please contact Cathy Naples at (216) 707-6490.

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