

University of Houston - Biomedical Engineering Seminar

Friday, April 14, 2023, 12 noon, Rm 105 SEC

Evolving Fluorescent Indicators to Monitor Neuronal Voltage Dynamics *in vivo*



François St-Pierre, Ph.D.

Abstract

A longstanding goal in neuroscience is understanding how spatiotemporal patterns of neuronal electrical activity underlie brain function, from sensory representations to decision-making. Genetically Encoded Voltage Indicators (GEVIs) — light-emitting protein indicators whose brightness is modulated by voltage is a method for monitoring electrical dynamics. GEVIs are tools for monitoring voltage dynamics at high spatiotemporal resolution in genetically defined cell types. We use our novel high-throughput screening platform to develop novel indicators that are faster, brighter, and more sensitive and photostable. These new GEVIs enable the noninvasive recording of rapid voltage transients for extended durations and in deep cortical layers in awake behaving mice. We anticipate that our sensors will encourage neuroscientists —including those more familiar with calcium imaging— to exploit the unique advantages of voltage optical recording to decipher neuronal computations with millisecond-timescale resolution and cell type specificity.

Biosketch

Dr. François St-Pierre hacks proteins, nucleic acids, and microscopes to create tools for neuroscientists. His B.A. and M.A. are from Cambridge and his Ph.D. was in Computational and Systems Biology at MIT with Drew Endy. He developed novel protein-based brain activity sensors during his postdoc with Michael Li at Stanford. In 2015 he joined Baylor and Rice as an adjunct professor in ECE. His laboratory focuses on developing fluorescent indicators of neural activity, optogenetic tools to silence neurons, synthetic gene circuits for precise protein expression, and novel methods for high-throughput screening. His work has been published in *Cell*, *Nature Neuroscience*, *Nature Methods*, and *Science Advances*. His funding is from the NIH, NSF, CPRIT, and the Dunn and Welch Foundations. Dr. St-Pierre is a Scholar of the McNair Medication Institute, a Fellow of the Klingenstein-Simons Foundation, and has been recognized with an Innovation Award from the National Science Foundation. He recently co-founded Imagen Bioworks to commercialize inventions from his lab.