

Motor Control Science Club, March 31, 2025, 05:15 PM CEST

The lecture is open to everybody

Illuminating the brain: New tools to decipher how neuronal circuits generate complex behaviors

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Understanding how neuronal networks generate complex behavior is one of the central goals of neuroscience. Neurotransmitters and neuromodulators play a crucial role in information flow between neurons, and deciphering their dynamics as well as their effects on neuronal activity is key to understanding their behavioral relevance.

In this talk, I will introduce PinkyCaMP, a new red-shifted genetically encoded calcium indicator (GECI) based on mScarlet. PinkyCaMP outperforms existing red-shifted calcium sensors in brightness, photostability, and optogenetic compatibility. It is well tolerated by neurons, showing no toxicity or aggregation, both in culture and in vivo.

Additionally, I will present sDarken, a novel family of genetically encoded serotonin (5-HT) sensors based on the native 5-HT_{1A} receptor and circularly permuted GFP (Kubitschke et al., 2022). sDarken sensors exhibit high fluorescence in the unbound state and decrease fluorescence upon 5-HT binding. Variants with different serotonin affinities enhance versatility in serotonin imaging. These sensors demonstrate excellent membrane expression, high specificity, and a superior signal-to-noise ratio, enabling detection of endogenous serotonin release and in vivo imaging. To overcome the limitations of intensity-based fluorescent measurements, we are now implementing fluorescence lifetime imaging (FLIM) as a novel readout for serotonin dynamics.

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