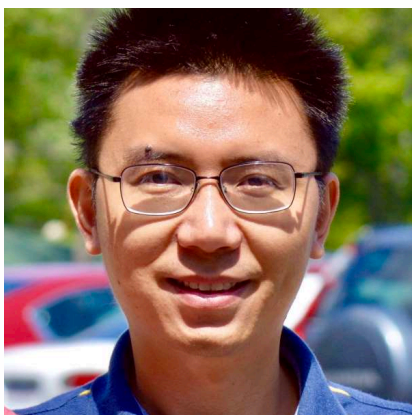


CMB SEMINAR

Monday, April 24th at 12PM
Lily 1-117



Hosted By:
Qing Deng



Department of Biological Sciences

Yubin Zhou, Ph.D.

Institute of Biosciences and Technology, Texas
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"Optogenetic engineering for biomedical applications"

We describe herein a series of non-opsin based optogenetic tools tailored for remote control of calcium signaling in both excitable and non-excitable tissues. Existing tools are either derived from engineered channelrhodopsin variants without strict calcium selectivity or based on engineered GPCRs that might crosstalk with other signaling pathways. We introduce three different approaches to confer photosensitivity to STIM1 and ORAI as the two essential components for the calcium release-activated (CRAC) channel. These genetically-encoded calcium channels or actuators (GECAs) display biophysical features reminiscent of the ORAI1 channel, which enables precise optical control over Ca^{2+} signals and hallmark calcium-dependent physiological responses. GECAs can be further coupled with upconversion nanoparticles to enable wireless optogenetics in vivo, a technology that obviates the need of optical fiber implantation for optogenetic applications in living animals. We demonstrate the use of GECAs to modulate anti-cancer immune response and intervene in neurodegeneration in a *Drosophila* model of amyloidosis. If time allowed, I will also briefly present several new chemical biology and synthetic biology tools designed for remote interrogation of cell signaling.