



**ECU LaserTAG &  
ECU Research and Creative Achievement Week**  
**present**

*A Capturing the Art of Science Seminar*

with



**Ryohei Yasuda, Ph.D.**

Scientific Director, Max Planck Florida Institute

**Biochemical Signal Computation in Synaptic Plasticity**

Activity-dependent changes in synaptic strength and structure are crucial for acquiring, storing, and retrieving information in the brain. These changes are orchestrated by a complex cascade of biochemical reactions involving hundreds of intracellular and extracellular signaling proteins at the synapse. To elucidate the operational principles of these signaling networks, we have developed innovative 2-photon fluorescence lifetime imaging (2pFLIM)-based techniques, enabling visualization of the spatiotemporal dynamics of protein activity with single-synapse resolution. To bridge the gap between behavioral plasticity and signaling dynamics, we employed miniature 2-photon fluorescence lifetime imaging microscopy (mini-2pFLIM), allowing us to image signal transduction in freely behaving animals. Additionally, we have developed various optogenetic and chemogenetic enzyme inhibitors targeting key kinases, such as CaMKII and PKC. This approach has allowed us to correlate the temporal dynamics of enzymes within synapses to behavioral plasticity. Our techniques have provided unprecedented insights into the mechanisms underlying synaptic plasticity, circuit function, and behavioral adaptations.

**Thursday, April 3, 2025**

**11 AM - Noon**

**MAIN CAMPUS STUDENT CENTER**

**Black Box Theater**