“From Psychedelics to Opioids: Imagining and Restoring Synapses with Chemical Tools”

Abstract: In this lecture I will discuss the pursuit of two interconnected long-term goals in our laboratories: visualization and repair of synaptic function with chemical tools. First, I will review the development of cell/synapse-targeted imaging agents and sensors, including fluorescent false neurotransmitters (FFNs). FFN probes as fluorescent tracers of endogenous neurotransmitters enable microscopic imaging of neurotransmitter release from individual presynaptic sites, and form the basis of experimental platforms that afford new insights into functional properties of synapses and effects of drugs (for example, discovery of silent monoamine synapses and effects of psychostimulants on synaptic release). As the second major topic, I will describe how three structurally distinct psychoactive compounds, with remarkable clinical effects and neuro-remodeling effects in preclinical studies (ibogaine, tianeptine, and mitragynine), led us to the opioid receptors and their signaling. An update on synthetic, pharmacological, micro-anatomical, and behavioral projects will be provided. The discussed research advances in our laboratory will be placed in the context of current and historical impact of psychoactive substances on science, medicine, culture, and society.