Abstract: Neurological and psychiatric disorders affect about one billion people worldwide, and cost over $2.5 billion annually. My lab is interested in understanding the neural circuit mechanisms of neurological and psychiatric disorders, with the ultimate goal of deriving network principles for designing new generation, network based therapies. In this talk, I will describe our recent effort on understanding oscillation dynamics within the cortical basal ganglion network that are relevant for Parkinson’s disease and deep brain stimulation therapy. In addition, I will describe some recent techniques that we have developed to better interrogate neural networks, such as a DNA nanoparticle based novel uncaging technique that allow rapidly delivery of arbitrary bioactive molecules, and a microRNA based gene targeting technique that can enable gene expression in cortical inhibitory neurons using viral vectors.