Title: Monitoring plasticity-associated dendritic calcium dynamics during learning

Learning occurs when experience-dependent activity patterns in the brain induce changes in the strengths of connections between neurons (known as synapses), altering how future information travels through neuronal circuits. This process of synaptic plasticity underlies learning and memory and enables organisms to adapt to their environments. Calcium is a key signaling molecule that supports the transduction of electrical signaling to long-lasting changes in neuronal activity. Thus, the timing of calcium entry into the cytosol of neurons is critical in determining which synapses undergo plasticity. Most prior studies of calcium entry into the dendrites, where the majority of a neuron's synapses are located, focus on calcium conductance across the plasma membrane. However, extracellular sources of calcium alone may not drive sufficient local calcium flux for long-term plasticity. The endoplasmic reticulum (ER) is a major store of intracellular calcium and pervades the entire dendritic arbor. It has also been shown to release its highly concentrated calcium store in an activity-dependent manner. Thus, the ER is well-poised to support synaptic plasticity mechanisms. However, due to technical limitations, it is not known when the ER may release its calcium store in mammalian neurons *in vivo*. Here, I leverage *in vivo* two-photon imaging approaches in combination with a virtual-reality based navigational task to monitor ER calcium dynamics throughout the dendritic arbor of individual neurons while mice form new memories. This work has the potential to bridge significant gaps in our fundamental understanding of how new memories form in living animals and provide new avenues to investigate neurological diseases.