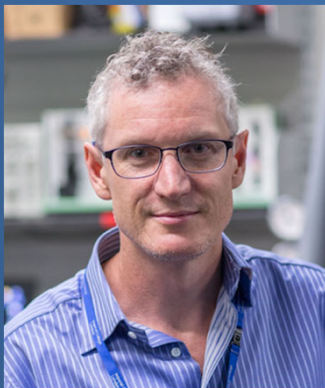


221st WPI-IIIS Seminar

Seeing memories through the looking glass: towards brain-wide imaging of memory circuits and their impairments

We have learned much about brain function over the past 100 years from the study of single neurons and small neural ensembles. However, making further progress on understanding systems level brain functions such as cognition and memory will require us to monitor the activity of neuronal circuits which span many widely distributed brain areas. Similarly, understanding how neurodegenerative disease leads to impairments in cognition will require large-scale, single-cell resolution brain imaging. In this talk, I will describe our work towards these goals. Firstly, I will describe our work using an air-lifted mouse behavioural platform to image calcium signals from populations of (hundreds of) neurons in hippocampal subregion CA1 while mice run around a circular track, in a familiar or novel environment. Examining a mouse model of Alzheimer's Disease (AD), we found that neurons in AD mice had elevated baseline firing during non-running periods, but were less able to increase their firing rates to respond to changes in spatial location or speed – they have a progressive (with age) impairment in dynamic range. I will also show an extension to a new head-fixed spatial working memory task we developed, which we find to be very sensitive to AD genotype and age; as well as showing information (bitrate) deficits in individual neurons, we see a special deficit in the performance of so-called “splitter cells”, which may play an important role in performing cognitive tasks, and which may be particularly vulnerable to circuit disruption. Finally, I will describe the current state of our attempts to scale our approach up by using mesoscopic two-photon microscopy to image the activity of many thousands of neurons across widespread brain areas simultaneously during cognitive tasks.



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Date: **Friday, March 7, 2025**

Time: **13:00 – 14:00**

Venue: **1F Auditorium, IIIS Building**

*** On-site participation only**



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