UNSW SYDNEY | Australia's Global University

School of Medical Sciences Seminar Series

Wednesday 13th of May 2020

3:00 – 4:00pm Microsoft Teams

We ask all attendees to please mute and turn of the video

Dr Ethan Scott "Whole-brain imaging of sensory processing in larval zebrafish"

Bio: Dr. Scott has a Bachelor of Science from the University of North Carolina - Chapel Hill, where he studied molecular genetics. His PhD, from Stanford University under the mentorship of Liqun Luo, was based on the development of genetic techniques for studying the nervous system, and on the use of those techniques to study neurodevelopment and neuroanatomy. As a postdoctoral fellow at the University of California - San Francisco in the lab of Herwig Baier, Dr. Scott developed novel genetic approaches for describing the anatomy, connectivity, physiology, and behavioural relevance of neural circuits in zebrafish. Since 2007, Dr. Scott has been a Lecturer, Senior Lecturer, ARC Future Fellow, and Associate Professor in the School of Biomedical Sciences at the University of Queensland, where he now works at the Queensland Brain Institute. At UQ, he has continued his work of using genetic and transgenic techniques to study the structure and behavioural function of the nervous system at the cellular and circuit level.

Talk: Traditionally, neural activity has been monitored in great detail for one or a few cells (as in electrophysiology) or brain-wide by methods that do not provide single-cell resolution (such as functional MRI). The gap between these techniques has made it difficult to observe activity across large populations of neurons while regarding them as individual units. Because the nervous system is, ultimately, a highly interconnected network of neurons, this represents a major blind spot in our ability to describe the functioning brain.

Ethan Scott's group is interested in the neural mechanisms by which sensory stimuli are encoded and interpreted, and in how inputs from different sensory modalities are integrated in the brain. To address the problem described above, they have adopted optogenetic and microscopic techniques that allow calcium imaging across the entire zebrafish larval brain at single-cell resolution. In the work presented here, they have applied sensory stimuli to intact, alert larvae while observing the genetically-encoded calcium indicator GCaMP6. With house-built selective plane illumination microscopes (SPIM), they have observed large populations of neurons representing nearly the entire brain.

This presentation will provide an overview of this approach, including its strengths and limitations. Examples of recent work will include descriptions of the neural processing underlying vision, audition, vestibular perception, and water-flow detection, as well as the neural integration of stimuli across these modalities. It will also include the Scott lab's preliminary work using this approach to study sensory processing in models of psychiatric disease, using fmr1 mutant zebrafish as an example.