**Talk title: Towards empirical testing of integrated information theory of consciousness: What is the timescale of consciousness?**

**Authors: Angus Leung, Dror Cohen, Bruno van Swinderen**

**Abstract:**

The integrated information theory of consciousness (IIT) proposes a structure of integrated information (Φ) as potentially isomorphic to consciousness. However, its most up-to-date and theoretically attractive version, Φ3.0, is difficult to apply to biological networks. Here, we developed a method to apply Φ3.0 to multi-channel neural recordings from wakeful and anesthetised flies, and compared the classification performance between wakeful and anesthetised flies among various measures, including Φ3.0, power and coherence, etc. Isoflurane anesthesia reduced Φ3.0 magnitude, and classification accuracy based on Φ3.0 improved as the number of channels of neural recording increased from 2 to 5. Classification accuracy between awake and anesthesia conditions was better in Φ3.0  than other measures. Critically, Φ3.0 magnitudes are found to increase and reaches to maximum at a particular scale of coarse graining the signal. In particular, along the temporal dimension, computing integrated information over a longer period (>20 ms) than a shorter period (<10ms) improves the estimate of integrated information. According to the ‘exclusion’ axiom of IIT, this suggests that the appropriate “moment” of conscious experience for fly is not too short (<10ms) but longer, which affords more determinate and effective causal interactions across neural population.  These results offer a promising route for further empirical testing of Φ3.0.