NUS National University of Singapore | Department of Biological Sciences Faculty of Science

SEMINAR

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Hosted by Assist. Prof Phua Siew Cheng

Pulvinar-Prefrontal inputs facilitate adaptive filtering through behavioral history to bias visual decision-making

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Our sensory landscape is constantly filtered through prior expectations and ongoing goals. Under greater uncertainty, perceptual processing becomes more susceptible to the influence of prior history, which can induce biases that compromise decision-making. The Anterior Cingulate Cortex (ACC) is a frontal region that integrates uncertainty for switch/stay decisions from diverse inputs including the pulvinar/lateral posterior nucleus (LP, rodent homolog), a higher-order visual thalamic nucleus. Pulvinar inputs to the frontal cortex has been implicated in visual decision-making, but information conveyed by this pathway has been challenging to resolve given the divergent projections of pulvinar neurons. Leveraging genetic tools available in rodent models, we performed projection-specific two-photon calcium imaging & optogenetic manipulations of LP-ACC axons in mice performing a random dot motion visual discrimination task. We show that LP-ACC visual stimulus representations were gated by task engagement, and encoded multiple task variables scaled by stimulus uncertainty. Importantly, we found that LP-ACC activity further reflected comparisons across stimulus history. Optogenetic activation of LP-ACC axons during stimulus evaluation impaired perceptual discrimination by altering interactions between current & previous trial information. Our findings demonstrate that the LP-ACC inputs support decision-making by providing a read-out of ongoing uncertainty, integrated over time with behavioral history, to adaptively tune neuronal responses and guide goal-directed behavior on a trial-to-trial basis.

About the Speaker

*Yi Ning Leow is a Postdoctoral Fellow working with Fu Yu at the Institute of Molecular and Cell Biology (IMCB), A*STAR. She completed her undergraduate studies in BSc Neuroscience at University College London (UCL), before embarking on PhD training at Massachusetts Institute of Technology (MIT) Department of Brain & Cognitive Sciences (BCS) working with Mriganka Sur. Ning's overarching research goal is to resolve neural circuit mechanisms regulating decision-making and motivated behaviors. Her PhD work combines in vivo neural recordings, computational modeling, as well as opto- & chemogenetic manipulations to dissect thalamo-cortical contributions to perceptual decisions.*