**OIST Seminar**

Date: Tuesday, Jan 23, 2023

Time: 14:00 – 15:00

Location: Seminar Room L4F01

Speaker:

Lukas Schmitt, Ph.D.

Team Leader, Laboratory for Distributed Cognitive Processing

RIKEN Center for Brain Science

Title: Thalamic Networks Coordinate Dynamic Updating of Cortical Representations to Enable Perceptual Inference

Abstract:

Although information that reaches the brain from the senses is often ambiguous and disconnected, our perception of the world (internal model) is stable and continuous. To create this stable, connected internal model, the brain must continuously extract and incorporate patterns across previously encountered sensory inputs (sensory-history). Although how such an internal model could be created and updated remains poorly understood, previous investigations suggest that “higher-order” thalamic nuclei might play a key role by stabilizing short-term representations (Schmitt et al. 2017). Here I present electrophysiological and optogenetic results demonstrating that thalamocortical interactions between the posterior parietal cortex (PPC) and its’ thalamic counterpart, the pulvinar (PUL) are necessary for maintenance and updating of short-term representations that underlie perceptual inference. Using a combination of multi-area recordings and optogenetic manipulations, we uncover a mechanism by which input from the PUL stabilizes representations within the PPC to maintain a representation of past stimuli. In addition, we find that the structure of the network formed between the PUL and the thalamic reticular nucleus (TRN), the primary source of inhibitory input to the thalamus, allows it to act as a comparator to detect whether current stimuli match the previous dominant inputs. By selectively stabilizing cortical representations when inputs match the prevalent pattern in the recent sensory history, the PUL coordinates selective maintenance or updating of PPC representations, a computation consistent with previous findings suggesting that activity in the PUL reflects confidence in perceptual decision-making (Komura et al. 2013). In addition to identifying a novel circuit interaction involved in inference-based decision-making, these findings suggest mechanisms by which thalamocortical interactions may be broadly relevant to maintenance and dynamic updating of short-term representations necessary for many brain functions.