

Session/Poster#

Presenter

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### **Computational Model of the Ventral Posteromedial Thalamic Circuit**

Studies on the thalamus have long hypothesized its role in the preprocessing of information, acting as a gateway that regulates the information relayed to the cortex. Recent experimental studies provided new insights about the thalamic connectivity and how the network changes during different perturbations (Lam et al, 2010-11; Hirai et al, 2018); and detailed reconstructions of the neuronal projections allowed us to uncover new pathways of information flow and integration between different brain regions and cell classes (Shepherd & Yamawaki, 2021). This led to many new questions and opened an avenue for computational models, which can investigate cellular and network mechanisms not accessible via experiments. Here, our goal is to test if these alternative pathways are capable of explaining the mechanism behind experimental observations that are not yet fully explained in the literature. This includes the effect of modulatory corticothalamic projections from layer 6 of the cortex (L6 CT), which have an inhibitory effect on thalamic relay cells at lower frequencies (0.1 Hz) and excitatory at higher frequencies (10 Hz) (Crandall et al, 2015), and the influence of direct cortico-thalamic feedback in the regulation of network excitability (Hirai et al, 2018). For that, we will build a biophysically detailed model of the mouse whisker-related thalamocortical circuitry, including neurons from the Ventral Posteromedial (VPM) and Reticular (TRN) nuclei of the thalamus, and L6 CT neurons of the barrel cortex. We will constrain circuit connectivity based on the latest scientific data available for these cell classes. The goal is to achieve a model that reproduces the network dynamics mentioned above and identify their key mechanisms. We expect this study will provide insights into the mechanisms involved in the regulation of thalamocortical excitability and how the interactions between L6 CT neurons and thalamus can shape the sensory information arriving at the cortex.