Abstract:

In mammalian brains, the cerebral cortex is well appreciated by its unsurpassed discrimination capability. For example, individual neurons in the visual cortex selectively react to different orientation angles and motion directions, fundamental properties underlying visual processing and coding. Such visual information is essential for the visual cortex to guide behaviors. However, the circuit mechanisms of this cortical function remain unclear. To gain insight into these mechanisms, I studied optokinetic reflex (OKR), an involuntary ocular behavior that stabilizes images on the retina when an animal moves. Although mediated by the brainstem circuits, the OKR can be adaptive modulated by the visual cortex. This cortical modulation of OKR relies on the corticofugal projection pathway that connect the visual cortex directly with the OKR circuit in the brainstem. To understand the roles of the corticofugal projection in modulating OKR behavior, I did a series of experiments to picture the anatomy of this pathway and visual information carried by it. With virus based retrograde tracing, first I found that specific visual areas project to the brainstem. Secondly, with functional imaging method, I demonstrated that the projecting cortical neurons share similar functional properties with recipients in the brainstem. More interestingly, this visual information is functionally relevant to OKR behavior. Taken together, the cortical modulation of behaviors results from delivering specific and relevant information from sensory cortex to the brainstem.

Bio:

I am currently a PhD candidate at Liu lab in the department of Cell and Systems of Biology at the University of Toronto Mississauga. I got my bachelor’s degree from Tianjin University. I worked as a technician at ShanghaiTech University after graduate to study neural circuit of body temperature regulation with optogenetics and fiber photometry calcium imaging. In 2018, I joined Dr. Liu’s lab to study circuit mechanisms of cortical modulation with two-photon calcium imaging.