

Research Theme: Neurosciece
Research Project Title: Defining the functional organization of cerebellar output circuits involve in motor and non-motor behaviors
Principal Investigator/Supervisor: Albert I. Chen
Co-supervisor/ Collaborator(s) (if any):
Project Description
<p>a) Background: Recent studies have uncovered circuits in the motor cortex, brainstem and spinal cord that mediate skilled limb movement and locomotion, but the contribution of the cerebellum is poorly understood. The precision of limb movements is thought to depend on integration of diverse motor and sensory information from internal and external sources by the cerebellum, however, the mechanisms through which neurons in the deep cerebellar nuclei (DCN) convey this presumed feedback information to higher brain regions has not been defined. The inability to selectively access specific cerebellar-mediated pathways has precluded a systematic anatomical, functional and molecular characterization of distinct subpopulations of output neurons in the DCN.</p> <p>b) Proposed work: Our lab recently discovered the utility of a number of mouse lines to label, monitor and manipulate discrete subsets of neurons in the DCN. The identification of neuronal subpopulations with unique anatomical, functional and electrophysiological properties supports the possibility that molecularly distinct neurons within each of the three major DCN serve dedicated roles in coordinating limb movement, and possibly regulating non-motor processes. This project takes a multidisciplinary approach to identify how cerebellar circuits solve the challenges of motor and non-motor control, taking advantage of genetic and viral tools, anatomical analysis, electrophysiological recording, imaging and detailed behavioral tests. By dissecting the molecular, anatomical and functional diversity of cerebellar pathways one element at a time, this project aims to pinpoint neural circuits and piece together the underpinnings of cerebellar control of motor and cognitive behaviors.</p>
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