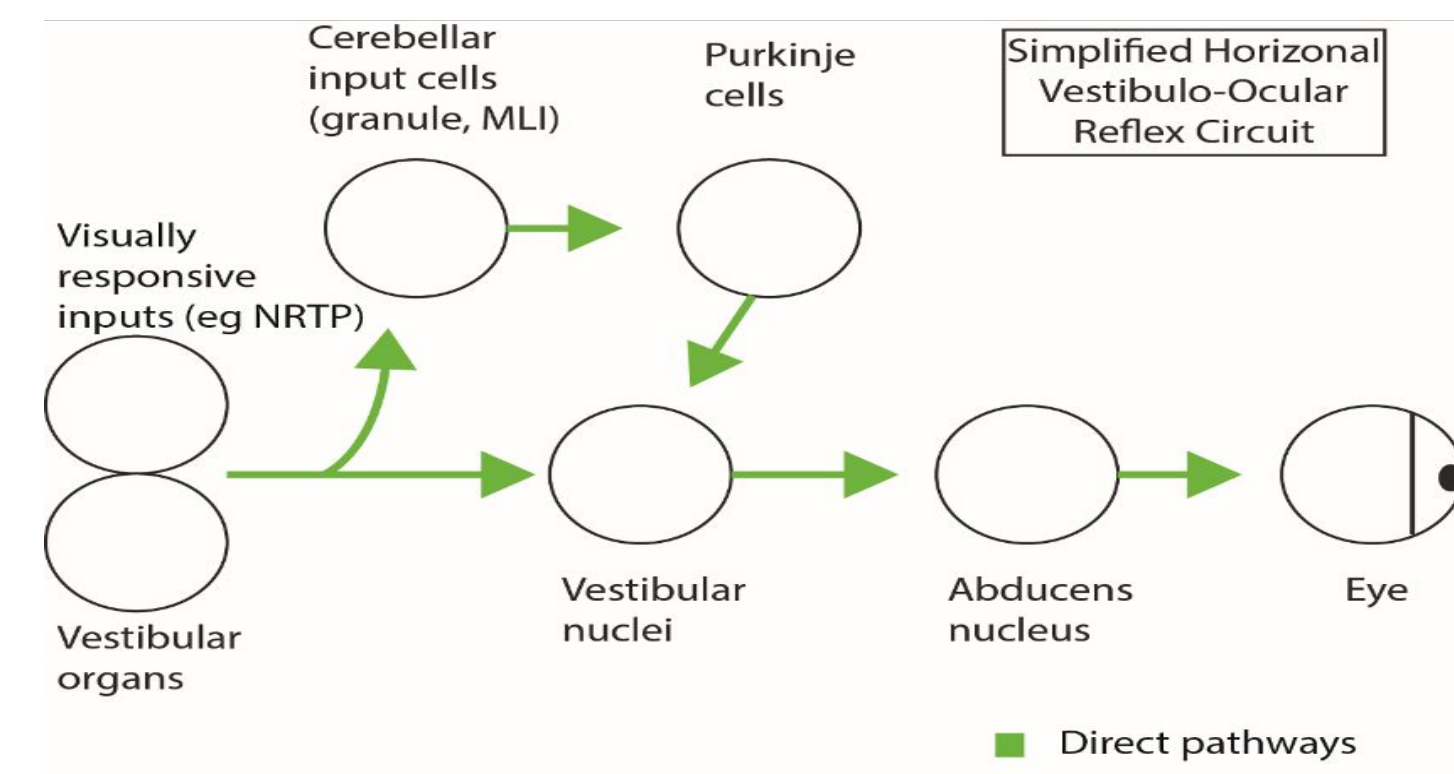
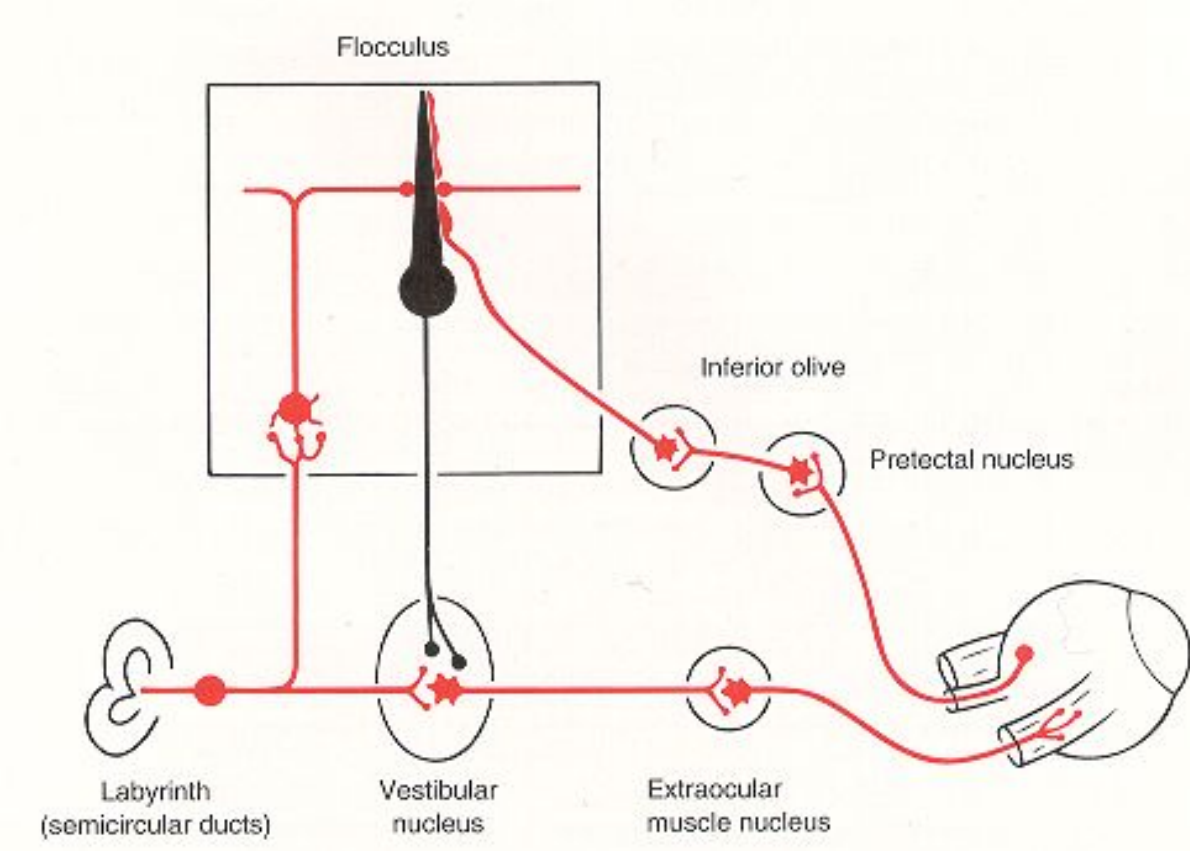


Background



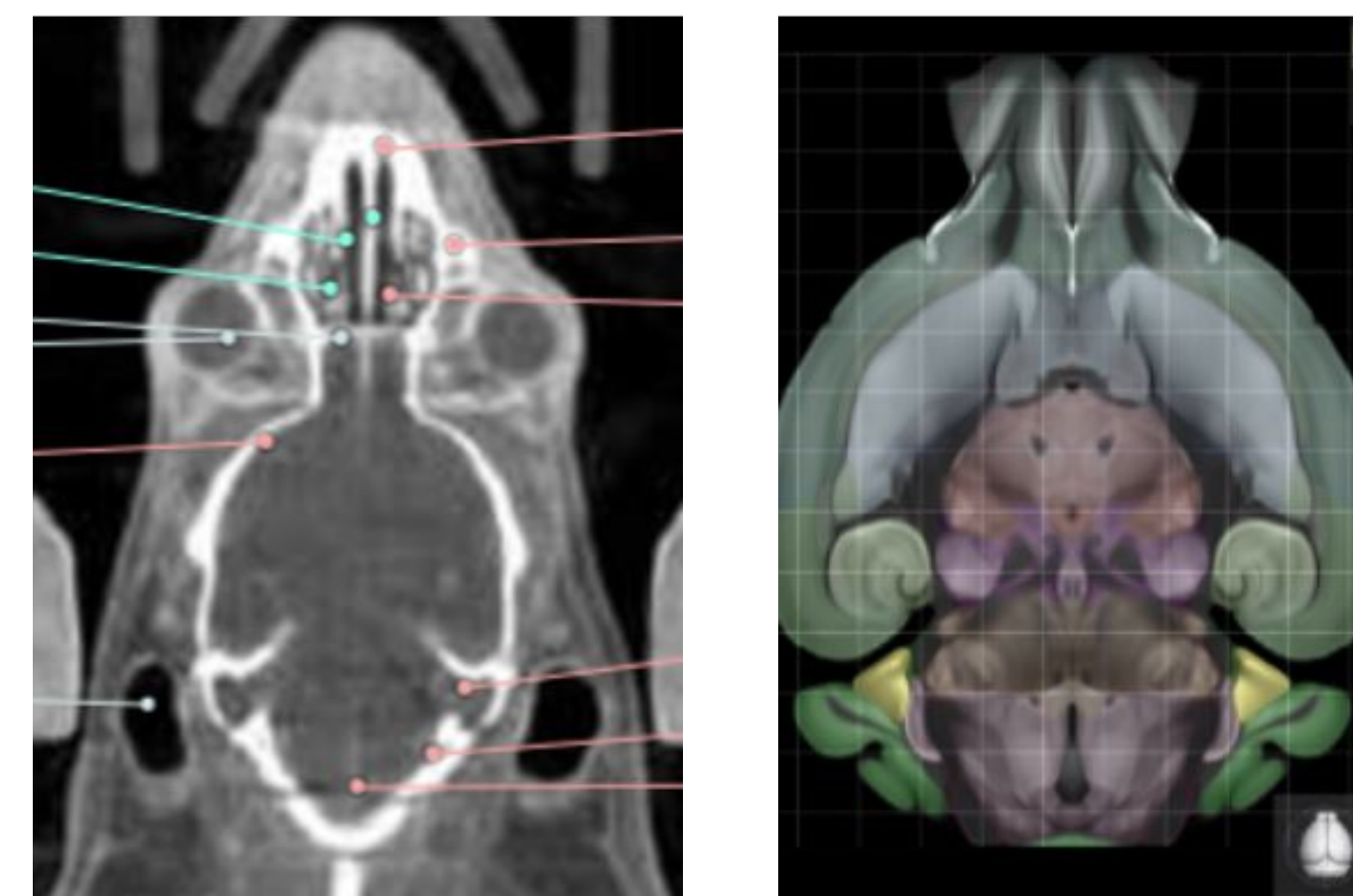
The vestibular ocular reflex (VOR) functions to keep the eyes stable during head movement. Previous studies have suggested that output from Purkinje cells of the flocculus called HGVP's modify motor neurons that control the VOR (Kahlon and Lisberger, 2000). (below, Kan, *University of Wisconsin*)



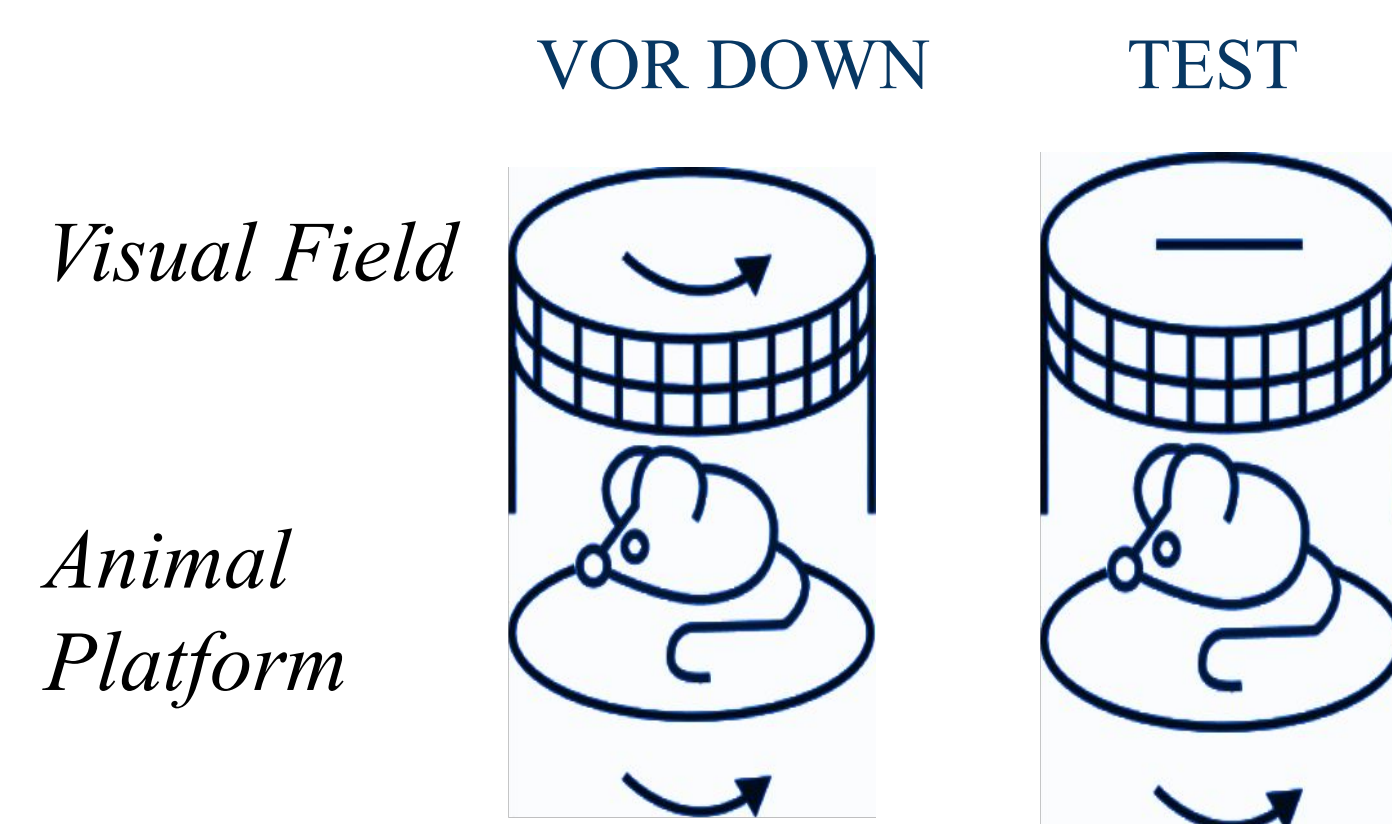
We hypothesize that there will be a change of HGVP's firing rate which will be significantly different than the change of cerebellar granule cells' firing rate after VOR training.

Methods

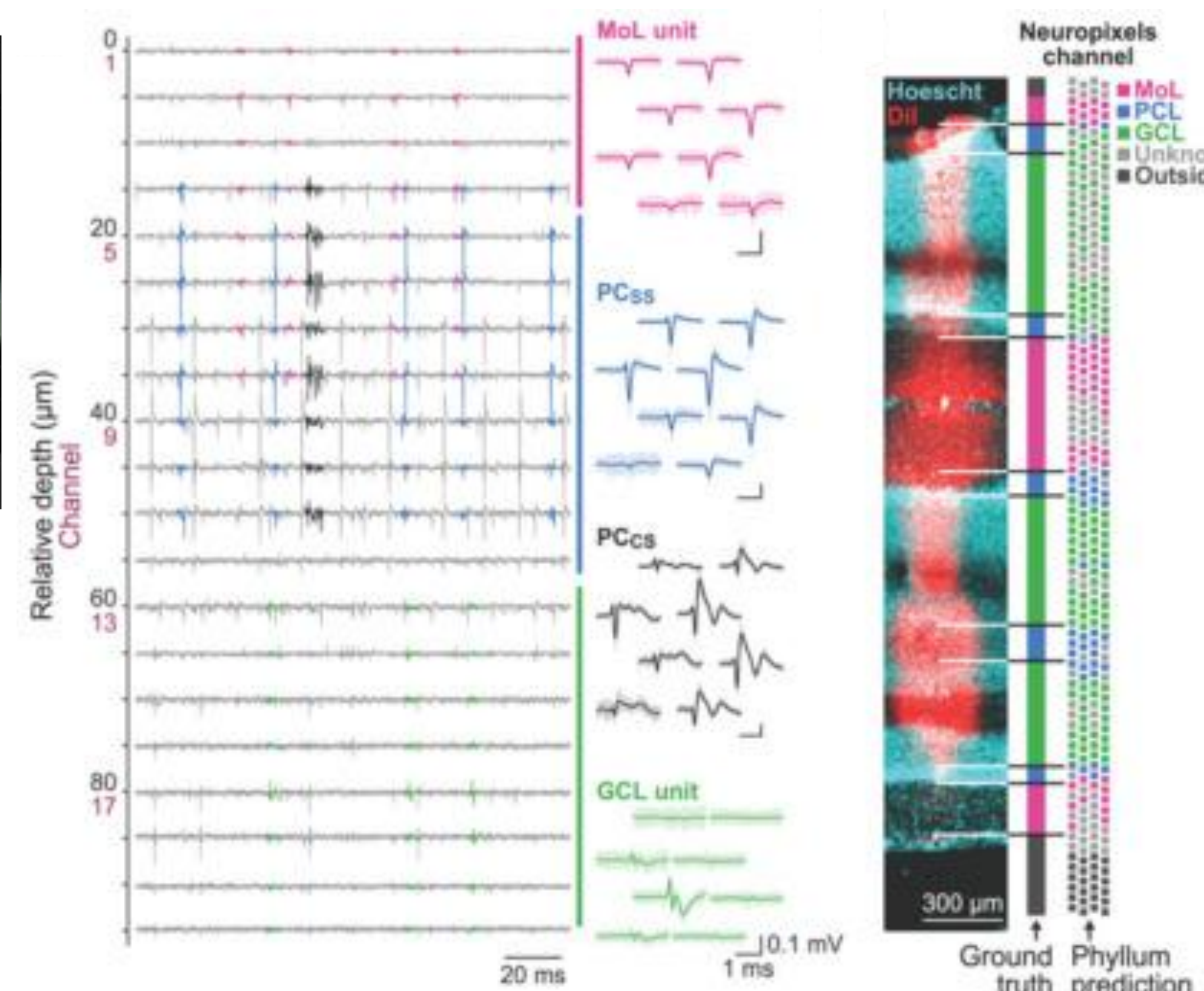
We will apply standard VOR adaptation protocols which involve male and female C57BL/6J 6-week to 9-months old mice on inverted light cycle. We will perform awake *in-vivo* electrophysiology from these mice before, during, and after the adaptation training.



Dorsal view of mouse brain, highlighting the flocculus (yellow)



Above shows awake *in-vivo* adaptation training apparatus used to track eye movement.



Voltage recording of multiple channels which show a single cell's firing properties, separated by cell type. HGVP cells are in blue and granule cells are in green (left figure). Histology of where cell populations are in comparison to neural pixel channels (right figure) (Beau et al., *bioRxiv*, 2024).

Conclusions

There are three possible outcomes from this study, some of which may happen concurrently:

- 1) One outcome is the discovery of new firing properties in Purkinje cell pathways which modify the VOR.
- 2) Another outcome is that there is a change in the firing properties of the granule cell population.
- 3) A third outcome could be that our discoveries do not correlate with previously established discoveries; this would require further testing

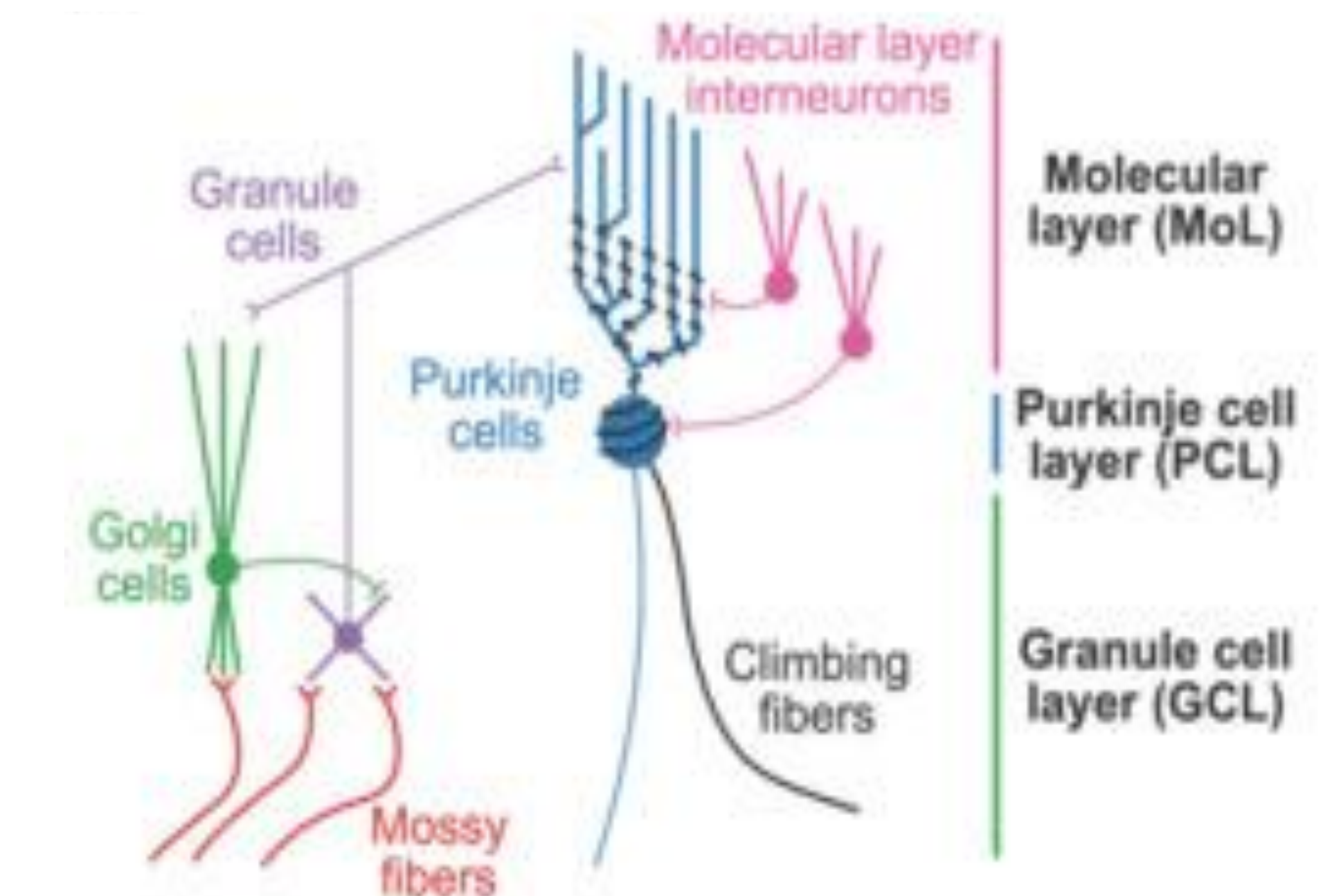
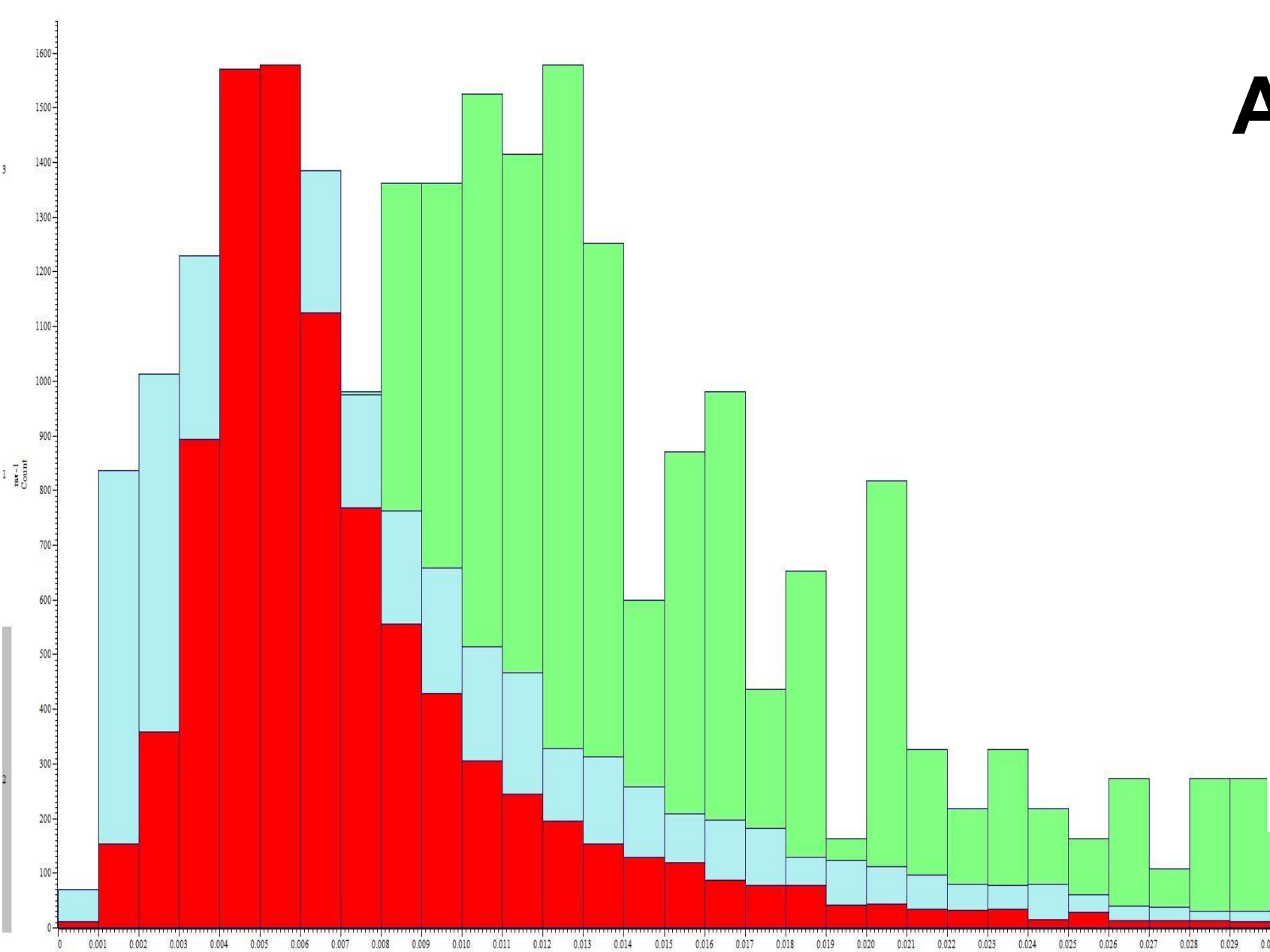
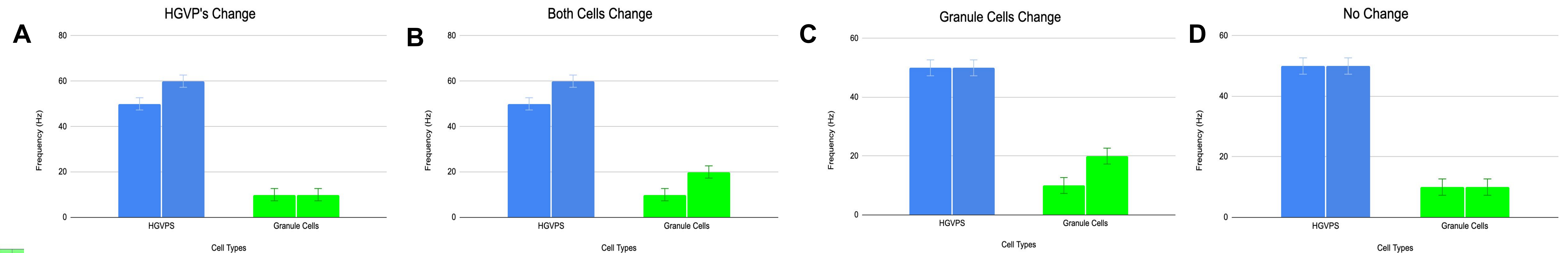


Image of VOR cell populations (Beau et al., *bioRxiv*, 2024).

Possible Results



Firing rate distribution of HGVP's from a previously conducted experiment. Change in this distribution is one property we are investigating.



Shown above is potential data. The left bar indicates firing pattern frequency (measured in Hz) before training. The right bar indicates firing pattern following training. Average frequency of HGVPs purkinje cells before training could potentially be 50 ± 2.7 Hz. Average frequency of granule cells before training could be 10 ± 2.7 Hz (Ruigrok et al, 2011). (A) HGVPs cells could increase in firing by 10 Hz while granule cells remain constant. (B) HGVPs cells and granule cell populations could both increase in firing by 10 Hz. (C) HGVPs could not increase and granule cell populations could increase by 10 Hz. (D) None of the analyzed cells could change, all remained constant.