



## Sensorimotor calibration in optic flow processing circuits

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Exploratory animals structure their behavior to maximize gaze stability, thereby facilitating the acquisition of visual and spatial information while minimizing retinal slip. Such gaze control depends on multisensory integration, but the circuit mechanisms underlying precise multimodal calibration during locomotion remain unclear. Partially, this is because of the highly distributed nature of sensorimotor circuits, making it challenging to identify circuits involved in goal-directed gaze control.

Here we take advantage of *Drosophila melanogaster*'s compact Central Nervous System to examine multimodal calibration during exploratory walking. We tested whether flies maintain gaze stability under visual perturbations by immersing them in a virtual world and subjected them to constant rotations of this world. Flies adjusted their velocity to preserve gaze stability, underscoring visuomotor recalibration. To begin to understand the neural underpinnings of such recalibration, we adapted this paradigm to head-fixed flies walking on a spherical treadmill to record neural activity simultaneously from a population of genetically identified neurons involved in gaze control. The GABAergic bIPS cells receive multimodal information from integrative brain regions and the VNC (the insect analogue of the spinal cord), providing an anatomical substrate for calibration. Recordings from bIPS in walking flies showed that they congruently combine retinal and extra-retinal signals. Moreover, this congruent multimodal combination sharpens the neuron's sensitivity to the body's translation and rotation. Ongoing experiments are testing the activity of bIPS under visual perturbations to examine recalibration at the level of bIPS activity.

Together, our data underscores the properties of an integrative inhibitory hub involved in steering during locomotion. Future work leveraging the EM connectomics datasets will test the mechanisms by which bIPS combine and calibrate multimodal information for gaze control in the context of exploration

**sensorimotor integration, sensorimotor adaptation, visual processing, calcium imaging**

