Society for Integrative and Comparative Biology

2014 Annual Meeting

Meeting Abstract

58.1 Sunday, Jan. 5 13:30 **Multisensory Control of Locomotion in Weakly Electric Fish** *SUTTON, E.E.*; STAMPER, S.A.; DEMIR, A.; MITCHELL, T.R.; FORTUNE, E.S.; COWAN, N.J.; Johns Hopkins Univ.; Johns Hopkins Univ.; Johns Hopkins Univ.; Campbell Univ.; New Jersey Institute of Technology; Johns Hopkins Univ.* esutton5@jhu.edu

While crucial to understanding neural control, few studies investigate multisensory integration during locomotion, especially in freely behaving animals. Here, we show that *Eigenmannia virescens* integrates sensory information from conflicting cues according to the saliency and reliability of the cues. Our apparatus enables the independent manipulation of visual and electrosensory motion stimuli during natural, untrained refuge-tracking in these fish. The electrosensory cue is a moving refuge, and the visual cue is a moving light pattern projected onto the refuge. We establish a general method for estimating the ratio of open-loop sensorimotor gains from two modalities. Specifically, we show that an appropriate pair of closed-loop gains for each sensory modality can be used to determine the *open-loop* gain ratio of the two modalities under certain conditions. This analysis requires pairs of trials in which the frequencies of conflicting probe stimuli in the two experiments are interchanged. In our case, the electrosensory and visual stimuli consisted of a common low-frequency, high-amplitude component and conflicting low-amplitude probe components at 0.45 Hz for the visual stimulus and 0.55 Hz for the electrosensory (and the reverse for the paired trial). Additionally, we used sum-of-sine stimuli to determine the gain ratio across a range of frequencies. Gain ratios were evaluated as a function of conductivity (200 and 600 μs/cm) and probe stimulus amplitude. We found the ratio of visual to electrosensory gains increased with increased conductivity, likely because high conductivity decreases electrosensory salience. Also, we found that fish track the modality with the lower amplitude, likely because it is perceived as more reliable.