Addendum to: Duistermars BJ, Chow DM, Frye MA. Flies require bilateral sensory input to track odor gradients in flight. Curr Biol 2009; 19:1301–7; PMID: 19576769; DOI: 10.1016/j.cub.2009.06.022.
pre-motor interneurons that relay information from the brain to the thoracic motor centers. This suggests that olfactory information follows an indirect route to influence flight behavior, a route possibly mapped by the peculiar requirement of the wind sensing mechanosensory system for olfactory orientation in flight.

Flying Drosophila readily fly upwind, a behavior mediated through hundreds of stretch sensitive neurons housed in the second antennal segment (a2) known collectively as the Johnston’s organ (JO). JO neurons encode the rotation of a3 relative to a2 induced by external wind, gravity and sound and project to defined stimulus specific regions of the antennal motor and mechanosensory centers (ammc). Removing input to the left JO, for example, by immobilizing the left a3 relative to a2, impairs upwind orientation to the left. Based on this study and existing neural models for wind sensation we speculate that wind mediated saccades to the left are elicited by the passive clockwise rotation of the a3s by wind (Fig. 2B-1) and the resulting activation of zones C and E of the ammc ipsilateral and contralateral to the wind, respectively (Fig. 2B-2). The requirement of the JO ipsilateral to a wind stimulus suggests that the activation of zone C by JO neurons and possibly through the subsequent activation of pre-motor interneurons arising in the ammc, triggers directed saccades (Fig. 2B-3). Likewise, we found that immobilizing the left JO abolishes leftward olfactory orientation in the absence of wind (Fig. 1C), suggesting that the olfactory system recruits the wind sensing mechanosensory system to initiate olfactory driven saccades. We propose that the active olfactory recruitment of this system is mediated through a class of neurons found in the Drosophila brain which appear to connect the axon terminals of PNs in the ventral LH to possible regions of interneurons arising from the ammc and terminate in muscles in the a2s where the activation of zones C and E of the ammc ipsilateral to a wind stimulus suggests that, despite their unknown polarity, this dependence is due to a class of neurons in Drosophila that connect the

![Figure 1](image-url)
The idea that each sensory modality influences behavior independent of one another via separate and parallel descending tracts, our results are converging upon the notion that olfactory orientation, whether in the wild or in the kitchen, relies heavily on tightly integrated multi-modal reflexes.

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