

## **SPONTANEOUS AND STABILIZING HEAD MOVEMENTS IN WILDTYPE AND OPTOMOTOR BLIND DROSOPHILA**

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Head movements of *Drosophila*, effecting a stabilization of the eyes relative to the surroundings, have been studied by macro-videography. *Drosophila*, like other diptera, can turn its head in all directions: yaw  $\pm 25^\circ$ , pitch  $\pm 35^\circ$ , and roll  $\pm 120^\circ$ . In flight, compared to rest, the head is endogeneously pitched downwards by  $23.0^\circ \pm 7.5^\circ \text{SD}$ . This compensates, at least partly, for the increased body elevation at average flight speeds (walking:  $15.0^\circ \pm 4.2^\circ \text{SD}$ , flying  $45.5^\circ \pm 13.0^\circ \text{SD}$ ).

Resting *Drosophilae* hold their head still, when not stimulated but during walking and flight they move their head spontaneously in a characteristic manner in all directions. Since flies do not respond to gravity in flight, *Drosophila* can be mounted in arbitrary orientations in the center of a striped drum to elicit head/eye movements in different directions. When the pattern is moving back and forth (pattern speed:  $24^\circ/\text{s}$ , spatial wavelength:  $24^\circ$ ) *Drosophila* turns its head in the same direction, reducing the apparent pattern velocity on the eyes by about 65% in flying and by about 80% in resting flies.

This stabilization of the fly's head and eyes relative to the surroundings reduces motion blurring and other visual disturbances, and thus prevents degradation of visual perception.

Wildtype flies have, in the third visual neurophile (lobula plate), two prominent groups of interneurons (HS, VS) which are thought to respond directionally specific to widefield coherent pattern motion. Their signals are believed to contribute to the control of turning reactions. In the mutant "optomotor blind 1131" these neurons are not developed (Heisenberg et al., 1978), and the flies show largely reduced optomotor turning responses during walking and flight (Blondeau and Heisenberg 1982). Mutant *Drosophila* flies (omb H31) have normal head mobility, turn their head spontaneously and pitch their head downwards at flight start very much like wildtype flies. Hence their neckjoint, muscles, motoneurons and motor coordination seem to be largely unaffected by the mutation omb H31. The flies lack, however, completely the head turning responses, elicited in wildtype by widefield pattern motion. These findings extend the description of the phenotype of the mutant "optomotor blind H31" and corroborate the notion that HS- and VS-neurons are essential for the control of various turning responses that are elicited by widefield visual motion.

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