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Drosophila **photo-taxis and odor-taxis are mediated by a shared computational pathway** MIRNA MIHOVILOVIC SKANATA, RUBEN GEPNER, NATALIE BERNAT, MARGARITA KAPLOW, MARC GERSHOW, New York University — In natural environments, the Drosophila larva makes navigational decisions based on variable and conflicting sensory inputs. How larvae respond to multi-modal stimuli and how their neural circuits integrate and prioritize multisensory information remains unknown. To identify larval navigational computations we developed a high-throughput reverse-correlation assay. We provided larvae with visual and optogenetically induced fictive olfactory stimuli and measured the correlation between the presented stimulus and evoked turn decisions. We used this technique to fit parameters of a Linear-Nonlinear-Poisson model describing computations underlying turn decisions. For uni-modal inputs, the parameterized model allowed us to predict the behavior of populations of larvae responding to novel stimulus presentations. For multi-modal inputs, our assay showed that larvae linearly combine olfactory and visual signals upstream of the decision to turn. We verified this prediction using controlled combinations of stimuli. We studied other navigational decisions that determine the size and directions of turns and found that larvae integrated odor and light according to the same rule in all cases. These results suggest that photo-taxis and odor-taxis are mediated by a shared computational pathway.

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