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Multi-sensory integration in a small brain RUBEN GEPNER[1], JASON WOLK, MARC GERSHOW, NYU — Understanding how fluctuating multisensory stimuli are integrated and transformed in neural circuits has proved a difficult task. To address this question, we study the sensori-motor transformations happening in the brain of the Drosophila larva, a tractable model system with about 10,000 neurons. Using genetic tools that allow us to manipulate the activity of individual brain cells through their transparent body, we observe the stochastic decisions made by freely-behaving animals as their visual and olfactory environments fluctuate independently. We then use simple linear-nonlinear models to correlate outputs with relevant features in the inputs, and adaptive filtering processes to track changes in these relevant parameters used by the larva's brain to make decisions. We show how these techniques allow us to probe how statistics of stimuli from different sensory modalities combine to affect behavior, and can potentially guide our understanding of how neural circuits are anatomically and functionally integrated.

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