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Dragonfly's Righting Reflex[1] Z. JANE WANG, JAMES MELFI JR, Cornell University, ANTHONY LEONARDO, Janelia Research Campus, HHMI
— Insects must right themselves in air so as not to fall. Exactly how insects manage to right themselves via a succession of neural-motor actions is a large mystery in neural behavior of animals. The goal of our work is to find clues about their internal actions through careful measurements and analyses of their aerial acrobatics, in the case of a dragonfly. A dragonfly falling upside down can right itself in about 200ms. During this brief episode, not only it has to sense its perilous condition, it also has to respond with proper muscle actions so to modulate the flapping wing motions such that to generate enough aerodynamic torque in order to correct its orientation. Here, we measure the intricate wing modulations of all four wings that a dragonfly employs to make such a maneuver. We further develop a computational model to simulate the righting maneuver so to tease out the key wing asymmetry that leads to a successful recovery. By analyzing the falling trajectory, we calculate the muscle torque dragonfly used to drive the body rotation. We further conjecture a sensory motor pathway during the dragonflys righting reflex in response to the perceived horizon.

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