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Wing attachment position of fruit fly minimizes flight cost

ROBERT NOEST, JANE WANG, Cornell University — Flight is energetically costly which means insects need to find ways to reduce their energy expenditure during sustained flight. Previous work has shown that insect muscles can recover some of the energy used for producing flapping motion. Moreover the form of flapping motions are efficient for generating the required force to balance the weight. In this talk, we show that one of the morphological parameters, the wing attachment point on a fly, is suitably located to further reduce the cost for flight, while allowing the fly to be close to stable. We investigate why this is the case and attempt to find a general rule for the optimal location of the wing hinge. Our analysis is based on computations of flapping free flight together with the Floquet stability analysis of periodic flight for descending, hovering and ascending cases.

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