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Uncovering the aerodynamics of the smallest insects using numerical and physical models LAURA MILLER — A vast body of research has described the complexity of flight in insects ranging from the fruit fly, *Drosophila melanogaster*, to the hawk moth, *Manduca sexta*. The smallest flying insects have received far less attention, although previous work has shown that flight kinematics and aerodynamics can be significantly different. In this presentation, three-dimensional direct numerical simulations are used to compute the lift and drag forces generated by flexible wings to reveal the aerodynamics of these tiny fliers. Results are validated against dynamically scaled physical models. At the lowest Reynolds numbers relevant to insect flight, the relative forces required to rotate the wings and fling them apart become substantially greater. Wing flexibility can reduce these forces and improve efficiency in some situations.

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