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Vortex wake dynamics: the surprising connections between bat flight and tidal energy harvesting

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ABSTRACT:

Strong vortices shed into the wake by thin, compliant structures are characteristic of a wide variety of high Reynolds number flows. In this talk I will describe three configurations dominated by strong vortical wakes. To kick things off, I will provide a sampling from our long-term effort to characterize, understand and model the aeromechanics that underpin the incredibly agile and maneuverable flight of bats. This work has inspired two other research threads that have become prominent in recent years, Firstly, I will show measurements that support a model for a universal scaling of the growth of the leading-edge vortex from the sharp leading edge of a compliant plate. Lastly I will describe our work on hydrokinetic energy harvesting that harness the unsteady dynamics of the leading-edge vortex.

BIOGRAPHY:

Kenny Breuer received his ScB from Brown and his MSc and PhD from MIT. He spent nine years on the faculty of MIT in the department of Aeronautics and Astronautics, before returning to Brown in 1999. His research interests are in Fluid Mechanics covering a wide range of topics, including the physics of flows at micron and nanometer scales, animal flight (bat flight in particular), energy harvesting, and the physics and control of turbulent flows. He is author of over one hundred refereed technical publications, has edited and co-authored several books, including "Microscale Diagnostic Techniques", "A Gallery of Fluid Motion" and "Multimedia Fluid Mechanics". He is a fellow of the APS, ASME and Associate Fellow of AIAA.