Fall 2010 TAM 6170/PHYS 7617
Biological Fluid Dynamics

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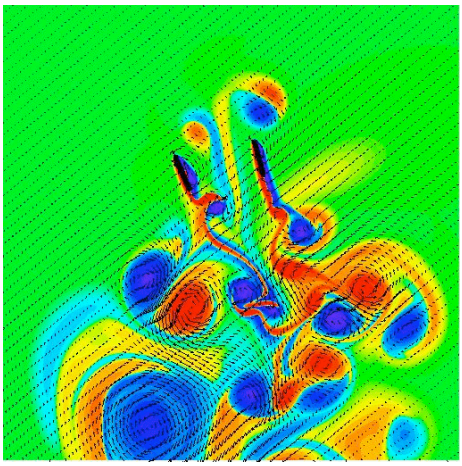

TR02:55PM - 04:10PM Thurson 202

The course will cover three topics in locomotion in fluids: life at low Reynolds numbers (swimming of micro-organisms in Stokes flow), life at intermediate range of Reynolds numbers (passive and active flight in unsteady flows), and the dynamics of organisms which have solved the problem of locomotion well: flagellated cells, fruit flies, dragonflies, hummingbirds, bats, and fish.

Each topic is organized around puzzles. We will start from classical theories and progress toward the current research. The student will work on a semester-long project for the course, in addition to home works.

Audience: interested graduate students and upper level undergraduate students. Some knowledge of fluid dynamics is assumed, but the topics in fluids relevant to the course will be reviewed in class.

Key words: physics of locomotion, unsteady aerodynamics, energetics, stability and control, mathematical and computational modeling of complex dynamics.

References (not required):

on locomotion:

Lighthill, M.J., Mathematical Biological Fluid Dynamics
Childress, S., Mechanics of Swimming and Flying
Taylor, G. I., Analyses of Flagella and Swimming Sheet
Purcell, Life at Low Reynolds numbers
Berg, H.C., E. Coli in Motion
Wang, Z. J.,Dissecting Insect Flight

on fluid dynamics:

Acheson, D.J.: Elementary Fluid Dynamics
Batchelor, G.K.: An Introduction to Fluid Dynamics
Glauert, H.: The Elements of Aerofoil and Airscrew Theory
Landau, L.D., Lifshitz, E.M.: Fluid Mechanics
Prandtl, L. The Essentials of Fluid Dynamics
Tritton, D.J.: Physical Fluid Dynamics