

Special Program in Applied Mathematics and Applied Mechanics

Life in moving fluids: Nature's challenges and solutions

2013 - 05 - 15 (Wed.)

15:00 - 18:00

308, Mathematics Research Center Building (ori. New Math. Bldg.)

All organisms live in a fluid, air or water, so their physical interactions with the fluid environment inevitably shape their forms, functioning, and adaptation. In this talk, I will present some challenges animals may encounter during predating and mating in the fluids, and provide examples of solutions and strategies developed in Nature. To search for food or mate, some animals rely on chemical traces to target the source. Generally viewed as a chemical sense, smelling (olfaction) also requires physical processes, fast convection and slow diffusion, to transport odorants to the sensors. I will review the effects of sniffing on the flow in both internal (e.g. nose of human or fish) and external olfactory systems (e.g. antenna of insect or crustacean), and present our findings in shark nose and hermit crab antennule. To move toward food or mate, the animals have to exert momentum to the environment while maintaining stability and efficiency during locomotion. I will share our progress on the mechanisms for controlling the stability using silk in jumping spiders, and the wing deformation using the inertia of a specialized structure in dragonflies. Finally, I will introduce the challenges of attachment for catching food or mate underwater, and present ongoing work in aquatic insects.



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