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(I) The hydrodynamics of active matter in inhomogeneous environments

Active matter is a term used to describe matter that is composed of a large number of self-propelled active 'particles' that individually convert stored or ambient energy into systematic motion. Examples include a flock of birds, a school of fish, or at smaller scales a suspension of bacteria or even the collective motion within a human cell. When viewed collectively, active matter is an out-of-equilibrium material. This talk focuses on active matter systems where the active particles are very small, for example bacteria or chemically active colloidal particles, such that the inertia of the particles and the fluid flows that they generate is negligible. The motion of small active particles in homogeneous Newtonian fluids has received considerable attention, with interest ranging from phoretic propulsion to biological locomotion, whereas studies on active bodies immersed in inhomogeneous fluids are comparatively scarce. In this talk I will show how the dynamics of active particles can be dramatically altered by the introduction of fluid inhomogeneity, and discuss the effects of spatial variations of fluid density, viscosity, and other fluid complexity in the context of biological locomotion.

Bio:
Gwynn Elfring is an Associate Professor in the Department of Mechanical Engineering and the Institute of Applied Mathematics at the University of British Columbia. His group at UBC conducts research on the fluid mechanics of soft matter systems, including cell locomotion, the mechanics of (active) suspensions, interfacial and membrane rheology, and non-Newtonian flow physics. Previously, he completed a Ph.D. at the University of California San Diego under the supervision of Eric Lauga and postdoctoral studies with L. Gary Leal and Todd M. Squires at the University of California Santa Barbara and was recently a Visiting Associate at the California Institute of Technology.

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