THE CHINESE UNIVERSITY OF HONG KONG

Department of Physics

COLLOQUIUM

Mechanics of Complex Materials: From Particulate Suspensions to Bacterial Colonies

by

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Time: 10:00 - 11:00 a.m.
Join ZOOM Meeting: https://bit.ly/3uncwxI

ALL INTERESTED ARE WELCOME
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Abstract

We live in a world of systems far from equilibrium: from the splash of a liquid droplet to the global weather system, from a pile of sand to earth's crust, from a single living cell to a school of fish, and to all forms of life. Although such systems are ubiquitous, our understanding of their rich and complex dynamics is still highly limited. In this talk, I will introduce my previous research on two of such systems: particulate suspensions and bacterial colonies. They both show mechanical properties that do not exist in normal solids or liquids, which lead to exciting new physics.

Particulate suspensions are mixtures of solid particles and a liquid. As a non-Newtonian fluid, its viscosity changes as a function of the external force applied. When the concentration of particles reaches a certain threshold, the system can even make a dynamic fluid-solid transition under impact or shear. In the first part of my talk, I will briefly introduce the recent development in the field of suspension rheology. I will then show my work on measuring the transient flows in such optically opaque materials with ultrasound and using transient flows to characterize the rheological properties of concentrated particulate suspensions, which is not achievable with standard techniques.

Active matter is a material where each of its component can draw energy from a power source to generate forces or locomotion. Although bacteria have evolved complex signaling and sensing mechanisms and can do countless amazing things, in many cases their behaviors can be understood as an active matter governed by simpler physical laws. In the second part of my talk, I will introduce some interesting behaviors of a soil-dwelling bacterium *Myxococcus xanthus* and my efforts to probe the mechanical properties of its colonies using traction force microscopy and understand their collective motion.

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