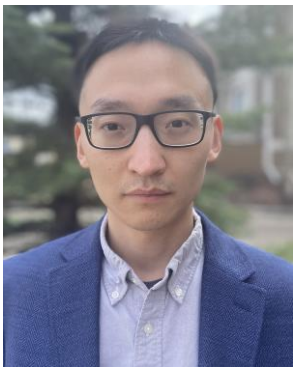
香港大學 機械工程系
Department of Mechanical Engineering
THE UNIVERSITY OF HONG KONG

Revised

SEMINAR

Macrotransport theory for active matter



Date: 21 April, 2026 (Tuesday)
Time: 2:00 p.m. – 4:00 p.m.
Venue: Room 7-35
Haking Wong Building
HKU

Speaker: Professor Zhiweng Peng
Assistant Professor
Department of Chemical and Materials Engineering
University of Alberta
Canada

Abstract:

Active matter is a novel class of soft materials that are composed of active or self-propelled "particles". Active particles span a wide range of length scales, from molecular motors, motile bacteria, to schools of fish and flocks of birds. Because self-propulsion requires continuous consumption of energy, active matter is inherently out of thermal equilibrium. As such, active matter can exhibit exotic behaviors that are forbidden by equilibrium physics. In this talk I will discuss our recent work on the development of a macrotransport theory for active matter. This theory allows us to characterize the transport and dispersion of active matter in periodic geometries. I will discuss how one can use this theory to explain the upstream swimming of active matter in Poiseuille flow, geometry-induced rectification, and flow-induced non-monotonic dispersion. Leveraging the macrotransport theory, I will show that one can design a catheter tube that can hinder bacteria upstream infection using geometry-induced rectification and disturbance flow.

Biography:

Zhiwei Peng is an Assistant Professor in the Department of Chemical and Materials Engineering at the University of Alberta. He received his Ph.D. in Chemical Engineering from Caltech. After his postdoctoral research in chemical physics at the University of Toronto, he joined U of A in 2024. His research sits at the intersection of fluid mechanics and statistical mechanics, focusing on the theoretical and computational modeling of soft and active matter. In 2025, he was awarded the Erskine Fellowship at University of Canterbury in New Zealand and served as a foreign expert under the Global Initiative of Academic Networks program, awarded by the Government of India's Ministry of Education.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. A.C.H. Tsang at 3917 1505.