



**The Chinese University of Hong Kong
Department of Biomedical Engineering**

**Active and Precise Microfluidic Systems for Single-Cell
Multi-Omic Analysis and Molecular Diagnostics**



Dr. Guangyao CHENG

Postdoctoral Researcher
King's Phase Technologies

Date: 6 February 2026 (Fri)

Time: 11:00 am – 12:00 nn

Venue: ERB1122 (William M.W. Mong Engineering Building, CUHK)

Abstract

Discovering cellular heterogeneity is fundamental to the understanding of complex biological systems and advancing precision medicine. Capturing the cellular diversity requires multi-omic frameworks capable of both precise single-cell manipulation and high-fidelity data acquisition. Microfluidics has emerged as the premier tool for single-cell analysis, offering isolated droplet micro-reactors for individual cells and continuous flow environments for standardized investigation of cell populations. This seminar will present the advancement of active and precise microfluidic platforms to address these needs. Firstly, a novel technique for light-driven manipulation of “smart” droplets stabilized by a photo-responsive fluorosurfactant will be presented, followed by the subsequent development on an accelerated photothermal ddPCR platform for fast, point-of-care molecular diagnostics. Furthermore, a platform termed MusTer will be presented for the investigation of single-cell epigenomics of plant cells by integrating high-throughput droplet manipulation technologies. A recent advancement on RT-DC for standardized single-cell mechanomics will also be discussed. The potential of linking mechanotype-based sorting with other omic layers will be highlighted. This development is envisioned to provide a multi-dimensional investigation of cellular functions, providing a robust technological foundation for mechanomedicine.

Biography

Dr. Guangyao CHENG earned his Ph.D. in Biomedical Engineering from The Chinese University of Hong Kong in 2022 and his B.E. from Sun Yat-Sen University in 2018. His research focuses on developing active and precise microfluidic systems to address challenges in high-throughput droplet manipulation and deformability cytometry, enabling advanced applications in single-cell multi-omics and point-of-care diagnostics. He has published journal articles in high-impact venues such as Advanced Materials, Chemical Society Reviews, Small, Microsystems & Nanoengineering, and ACS Applied Materials & Interfaces. Dr. CHENG was also honored with the CBMS Young Researcher Award at the 25th μ TAS conference.

**** ALL ARE WELCOME ****

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