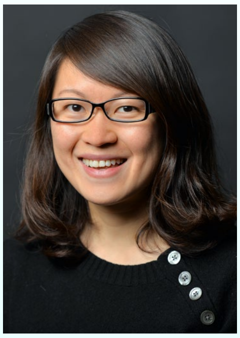
Department of Biomedical Engineering
The Chinese University of Hong Kong

Micro-surgical Tools for Dissecting Cells and Tissues



Sindy K. Y. Tang, PhD
Associate Professor of Mechanical Engineering
and by courtesy of Bioengineering and Radiology
(Precision Health and Integrated Diagnostics)
Stanford University

Date	:	29 July 2026 (Wednesday)
Time	:	2:30 pm
Venue	:	Room 1122, William M W Mong Engineering Building, CUHK

Abstract

Wound healing is a fundamental capability of living systems and is increasingly recognized even at the level of single cells. However, our understanding of single-cell wound healing remains limited, in part because many commonly studied cells cannot survive wounds larger than a few percent of their membrane area. In contrast, the giant ciliate Stentor coeruleus is a remarkable model organism capable of robust healing and regeneration after extreme injury. Here, we leverage microfluidic microsurgery to investigate the interplay between wound size, cell size, and healing capacity in Stentor. Remarkably, across all cell sizes tested, Stentor survives wounds removing up to ~60% of its membrane area, far exceeding what has been reported in other single-cell systems. This critical wound size corresponds to a simple geometric constraint: the point at which the remaining membrane area equals the minimum surface area required to enclose the cell volume (that of a sphere). These results highlight how single cells can operate as mechanical systems whose geometry and membrane reserves set fundamental limits on survival and repair. Building on these ideas, we are developing a new class of micro-surgical tools that extend from single cells to multicellular tissues. In particular, we introduce the μDicer, a microscale tissue dissection platform that dices tissue into micro-voxels with defined geometry. This capability enables new experimental workflows at the interface of tissue engineering and spatial biology. We illustrate two emerging applications: (1) the controlled dissection of live tumors to generate organoids that preserve the tumor immune microenvironment for testing immunotherapies, and (2) the voxelization of fixed tissues to enable spatially resolved molecular analysis. Together, these tools aim to establish a scalable framework for microsurgery across scales, enabling precise physical manipulation of biological systems from single cells to complex tissues.

Biography

Prof. Sindy K.Y. Tang is the Kenneth and Barbara Oshman Faculty Scholar and Associate Professor of Mechanical Engineering, with courtesy appointments in Bioengineering and Radiology (Precision Health and Integrated Diagnostics) at Stanford University. Her research group aims to develop engineering platforms that measure biological systems and convert these measurements into quantitative datasets, enabling both mechanistic insight and data-driven discovery. Current work focuses on experimental systems that probe biological processes across cellular and tissue scales, particularly how physical context—geometry, mechanics, and spatial organization—shapes biological function. By creating new measurement infrastructure for biology, her work aims to advance understanding of immune responses, spatial tissue organization, and cellular self-repair. Website: http://web.stanford.edu/group/tanglab/

***** ALL ARE WELCOME *****

For enquiries, please contact Ms. Joyce Chan, Department of Biomedical Engineering at 3943 8278