Department of Biomedical Engineering
香港城市大學
City University of Hong Kong

Unlocking Drug Discovery with Nucleic Acid Origami Bio-Nanotechnology

2 April 2025
3:00 – 4:00 p.m.
B6619, 6/F, Yeung Kin Man Academic Building

Dr. Yang WANG
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Abstract:
My research focuses on DNA origami nanotechnology as a powerful tool for drug discovery and therapeutic development. By leveraging the precision of self-assembling DNA nanostructures, I have developed nanoscale ligand patterning systems that regulate cellular signaling, control drug activation, and enhance targeted therapy. One of my key discoveries is that precise spatial arrangement of ligands on DNA scaffolds can trigger receptor clustering, effectively modulating biological pathways such as apoptosis. Using this principle, I designed a stimuli-responsive DNA nanorobot capable of autonomously switching between inactive and active states based on microenvironmental cues. This nanorobot remains inert under physiological conditions but selectively activates apoptosis pathways in the acidic tumor microenvironment, significantly reducing tumor growth in preclinical models. Beyond ligand presentation, my work also explores DNA origami-based drug delivery systems, where nanostructures act as programmable carriers to enhance the specificity and efficacy of therapeutic molecules. By integrating biophysical design principles with molecular programming, these DNA-based platforms offer a new level of precision in drug targeting and controlled release. This seminar will present my research on DNA origami bio-nanotechnology, highlighting its potential to transform drug discovery. By combining structural DNA nanotechnology with targeted therapeutic strategies, these approaches pave the way for next-generation precision medicine with enhanced efficacy and minimal off-target effects.

Biography:
Dr. Yang Wang is a Research Fellow at Harvard University (Harvard Medical School and Dana-Farber Cancer Institute), specializing in DNA origami nanotechnology, synthetic biology, and immunology. He earned his PhD from Karolinska Institutet, Sweden, where he focused on molecular patterning and programmable nanostructures. His current research integrates DNA nanotechnology with synthetic biology to develop advanced therapeutic platforms for targeted drug delivery and immunotherapy.