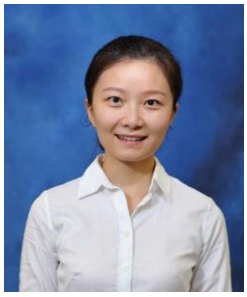
The Chinese University of Hong Kong
Department of Biomedical Engineering

Date: 18 April 2024 (Thu)

Time: 2:00pm Venue: LT1, Lee Shau Kee Building (LSK) (on LG Floor)

Lighting the Path to Discovery and Therapeutics: Optogenetics for Organelle Mechanobiology and Neuroprotection



Prof. DUAN Liting

Assistant Professor
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Abstract

Optogenetics, a powerful biotechnology that uses light to regulate biological processes with precision and high spatiotemporal resolution, has significantly advanced research across diverse fields. Our laboratory has been dedicated to expanding the frontiers of optogenetics in two primary areas: unraveling fundamental cellular mechanisms and developing new therapeutic approaches. (1) Addressing a long-standing methodological challenge in cell biology, we have engineered light-gated mechanostimulators, which, for the first time, can apply mechanical forces directly to intracellular organelles. Despite extensive research on the roles of the plasma membrane and cytoskeleton in cellular mechanosensing and mechanotransduction, we found that intracellular organelles, including the ER and mitochondria, are also capable of sensing and responding to mechanical forces, thereby presenting them as novel players in the map of mechanotransduction. (2) To explore the therapeutic possibilities of optogenetics, we have devised methods to control TrkB signaling optically — a pathway essential for cell survival, growth, and proliferation. Our research has demonstrated that activating TrkB signaling with light can protect Retinal ganglion cells (RGCs) — the neurons that relay visual information from the eye to the brain — in mouse models of ocular diseases, thus opening new avenues for optogenetics-based neuroprotective treatments for RGC-related injuries and diseases.

Biography

Dr. Liting Duan received her B.S. in Chemistry at Renmin University of China in 2010 and her Ph.D. in Chemistry at Stanford University in 2016. She undertook postdoctoral training at Stanford University from 2016 to 2018. In July 2018, she started her independent career as an Assistant Professor at the Department of Biomedical Engineering at CUHK. Her lab has been dedicated to pioneering the application of optogenetics in tackling fundamental biological questions and disease treatment, with results published in Developmental Cell, PNAS, Cell Chemical Biology, and Journal of Molecular Biology. Dr. Duan has been invited to introduce her work at multiple international conferences, such as the Neurotrophic Mechanisms in Health and Disease Gordon Research Conference. Dr. Duan has secured multiple competitive grants as the principal investigator, including the Young Collaborative Research Grant and the National Natural Science Foundation of China/Hong Kong Research Grants Council Joint Research Scheme. She received the Best Teacher Award in Biomedical Engineering and the Faculty of Engineering Dean's Exemplary Teaching Award in 2021. She has been serving on different committees, including as the chair of the departmental publicity committee. In addition, she spearheaded the construction of a new floor with approximately 500 m^2 lab space for the department.

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

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