



Molecular kinetics of gene expression in live embryos



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Time : 2:30 pm
Venue : Room 506, Wu Ho Man Yuen Building, CUHK

Abstract

Biological processes are regulated across a broad range of spatial and temporal scales from nanometer scale molecular interactions lasting milliseconds to the millimeter scale patterning of tissues over hours and days. To address this challenge, we have developed and applied high-resolution fluorescence light-sheet microscopy, single-molecule tracking, and new computational approaches to link dynamic processes across these spatial and temporal scales in living embryos and cells. I will highlight how these methods have provided new insights on changes in nuclear organization and protein kinetics that regulate gene expression during embryonic development. Recognizing that the high cost, and complexity of current high-resolution light-sheet microscopes limit their widespread use, I will also present our development of a low-cost modular microscopy platform. I will describe how our modular design also enables rapid prototyping, integration of multiple microscope modalities, and facilitates prototyping of advanced microscope designs.

Biography

Dr. Mir received his PhD in Electrical Engineering in 2013 from the University of Illinois at Urbana-Champaign working with Gabriel Popescu. During his graduate work he developed microscopes that provide high resolution quantitative phase images of living cells. He applied these new microscopes to a variety of problems in medicine and the basic life sciences, ranging from clinical pathology of blood samples to single cell growth, and neuronal development. For his postdoctoral work Dr. Mir joined the labs of Xavier Darzacq and Robert Tjian at the University of California, Berkeley where he studied gene regulation in *Drosophila* embryos using a combination of advanced microscopy methods, biochemistry, and genomics. Dr. Mir built a customized Lattice-Light Sheet microscope to capture the first data on transcription factor dynamics within the nuclei of a living animal embryo. Dr. Mir started his independent lab at UPenn and CHOP in the Department of Cell and Developmental Biology in January 2021. His lab develops and applies advanced fluorescence microscopy and single molecule tracking methods to study gene regulation and nuclear organization during early embryonic development. Dr. Mir Received the NIH New Innovator Award in 2021 and was appointed as a Howard Hughes Medical Institute Freeman Hrabowski Scholar in 2023.

*** ALL ARE WELCOME ***

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