Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **197** Type: **Invited Speaker / Conférencier(ère) invité(e)**

Bridging nano- and mesoscale nuclear organization with correlative single molecule lattice light sheet microscopy

Wednesday 11 June 2025 10:45 (30 minutes)

In the nucleus, essential biological processes rely on proteins diffusing through and interacting with a complex network of nucleic acid polymers. To better understand this dynamic interplay requires an advanced imaging platform that simultaneously tracks single-molecule dynamics and the local chromatin environment in live cells. In this talk, I will present our work that combines super-resolution imaging, novel fluorescent probes, and biophysical modeling and reveal that as chromatin density increases, nucleosomes exhibit distinct diffusion and packing behaviors, while the viscoelasticity and accessibility of the interchromatin space remain unchanged. Disrupting nuclear functions alters nucleosome dynamics in a manner dependent on both local chromatin density and relative location within the nucleus. Our findings support a model in which transcription stabilizes nucleosomes locally while facilitating the free exchange of nuclear proteins. Furthermore, we show that nuclear heterogeneity arises from both active and passive mechanisms, underscoring the importance of considering diverse organizational principles when modeling different chromatin environments.

Keyword-1

Nuclear organization

Keyword-2

light sheet microscopy

Keyword-3

Author: SHI, Yu (Western University, Physics and Astronomy)

Presenter: SHI, Yu (Western University, Physics and Astronomy)

Session Classification: (DPMB/DCMMP) W1-11 Soft Condensed Matter and Biological Physics | Matière condensée molle et physique biologique (DPMB/DPMCM)

Track Classification: Symposia Day (Wed June 11) / Journée de symposiums (Mercredi 11 juin): Symposia Day (DPMB/DCMMP - DPMB/DPMCM) Soft Condensed Matter and Biological Physics / Matière condensée molle et physique biologique