

ANALYTICAL SEMINAR

Single Molecule Imaging of Chromatin Motion and Structures in Human Cells

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For decades, chromosomes were considered less mobile or immobile over long distances ($>4\mu\text{m}$). This opinion was only changed in the 1990/2000s when the motion of single genomic locus was observed in live cells. In practice, chromatin motion, i.e. the temporal and spatial organization of chromatin, plays a fundamental and critical role in determining intranuclear activities and gene stability. The nanoscale motion of chromatin may modulate the interaction of DNA with regulatory molecules, including chromatin effectors, transcription factors and non-coding RNAs, thus impacting the global patterns of gene expression. We have been working on the imaging of chromatin motion since 2012, and have developed a serial of imaging systems, biophysical models, and artificial intelligence (AI)-based bioimage informatics strategies to measure the chromatin motion across multiple spatial and temporal scales. This presentation will first describe the technology advancement of live-cell image analysis; particularly, I will discuss the utilization of AI to improve the spatial and temporal resolution of chromatin imaging. Following that, I will introduce our investigation on the role of chromatin motion in DNA damage and repair, epigenetic modifications, and transcriptional regulations. Finally, I will discuss some other on-going projects in my lab about the mechanical regulation of chromatin motion. We expect that the exploration of the spatiotemporal dynamics in live cells will facilitate the diagnosis, treatment, and prevention of cancers.



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3:30 pm



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