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Probing nuclear dynamics and architecture using single-walled carbon nanotubes YOON JUNG, JUNANG LI, NIKTA FAKHRI, Department of Physics, Massachusetts Institute of Technology — Chromatin is a multiscale dynamic architecture that acts as a template for many biochemical processes such as transcription and DNA replication. Recent developments such as Hi-C technology enable an identification of chromatin interactions across an entire genome. However, a single cell dynamic view of chromatin organization is far from understood. We discuss a new live cell imaging technique to probe the dynamics of the nucleus at a single cell level using single-walled carbon nanotubes (SWNTs). SWNTs are non-perturbing rigid rods (diameter of 1 nm and length of roughly 100 nm) that fluoresce in the near infrared region. Due to their high aspect ratio, they can diffuse in tight spaces and report on the architecture and dynamics of the nucleoplasm. We develop 3D imaging and tracking of SWNTs in the volume of the nucleus using double helix point spread function microscopy (DH-PSF) and discuss the capabilities of the DH-PSF for inferring the 3D orientation of nanotubes based on vectorial diffraction theory.

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