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CHEMICAL AND BIOLOGICAL ENGINEERING DEPARTMENT SEMINAR SERIES

Non-equilibrium microrheology of cytoskeletal networks in live cells

Presented by: Denis Wirtz, Dept Chemical and Biomolecular Engineering, Johns Hopkins University

Time: Wednesday, March 25; 3:15 – 4:30 pm

Location: Perlstein Hall Auditorium

Abstract

We will introduce the fundamentals of particle tracking microrheology in complex fluids and illustrate its applications in cell biology. We will focus on the functional interactions between nucleus and cytoskeleton in live cells. The nuclear envelope (NE) is composed of two lipid bilayers: the outer nuclear membrane, which is continuous with the rough endoplasmic reticulum (ER), and the inner nuclear membrane, which adheres to the nuclear lamina, a thin meshwork of intermediate filaments composed of A- and B-type lamins. Mutations scattered along Lmna, which encodes A-type lamins, have been associated with a broad range of human diseases, collectively called laminopathies. The recent characterization of the LINC complex, an evolutionary-conserved protein complex that spans the NE and interact both with the nuclear lamina and the cytoskeleton of mammalian cells suggest that nucleus and cytoskeleton are intimately connected. Here, using quantitative biophysical assays, we find that these connections play a critical role in physiological processes that drive nucleus dynamics, cytoskeleton re-arrangements, and cell polarization, migration, and shape. Disease-associated Lmna mutations and the disruption of the LINC complex alter these cellular processes.