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MPI-NAT SEMINAR SERIES

Siegfried Musser

Cell Biology and Genetics
Texas A&M University School of Medicine

Investigating Nucleocytoplasmic Transport via 3D Super-Resolution Single-Molecule Microscopy

Nuclear pore complexes (NPCs) embedded within the nuclear envelope mediate rapid, selective, and bidirectional traffic between the cytoplasm and the nucleoplasm. Hundreds of largely intrinsically disordered polypeptides attached to the NPC scaffold generate the permeability barrier and provide binding sites for cargo complexes undergoing transport. Deciphering the mechanism and dynamics of cargo translocation is challenged by the need for high spatial and temporal resolution. We recently developed a multi-color imaging strategy that enables direct 3D visualization of cargo transport trajectories relative to a super-resolved double-ring structure of the NPC scaffold. The success of this approach is enabled by the high positional stability of NPCs within permeabilized cells. Hourglass-shaped translocation conduits for two nuclear transport receptor (NTR) pathways indicates rapid migration through the permeability barrier on or near the NPC scaffold. Binding sites for cargo complexes extend over 100 nm from the pore openings, consistent with a wide distribution of the FG-polypeptides that bind NTRs. Most strongly bound Imp β molecules are found at the periphery of the pore exits rather than within the central permeability barrier. These findings indicate that the disordered polypeptide network within the NPC contains regions with distinct functional properties.

Monday, 13.02.2023, 1:00 pm

Host: Dirk Görlich

Ludwig Prandtl Hall
Fassberg Campus

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