BP 13: Posters - Anomalous Diffusion in Complex Environments

Time: Monday 17:30–19:30 Location: Poster C

BP 13.1 Mon 17:30 Poster C

Spatially Inhomogeneous Search Strategies for Intracellular Transport — •Anne Hafner and Heiko Rieger — Theoretical Physics, Saarland University, Saarbrücken, Germany

Intracellular transport is vital for the proper functioning and survival of a cell. Cargo (proteins, vesicles, organelles, etc.) is transferred from its place of creation to its target locations via molecular motor assisted transport along cytoskeletal filaments. The transport efficiency is strongly affected by the spatial organization of the cytoskeleton, which constitutes an inhomogeneous, complex network. In cells with a centrosome microtubules grow radially from the central microtubule organizing center towards the cell periphery whereas actin filaments form a dense meshwork, the actin cortex, underneath the cell membrane with a broad range of orientations. The emerging ballistic motion along filaments is frequently interrupted due to constricting intersection nodes or cycles of detachment and reattachment processes in the crowded cytoplasm. In oder to investigate the efficiency of search strategies established by the cell's specific spatial organization of the cytoskeleton we formulate a random velocity model with intermittent arrest states. With extensive computer simulations we analyze the dependence of the mean first passage times for different search problems on the structural characteristics of the cytoskeleton, the motor properties and the fraction of time spent in each state.

BP 13.2 Mon 17:30 Poster C

Subcellular Organization of Eukaryotes during Mitosis — Nisha Pawar, •Claudia Donth, and Matthias Weiss — Universität Bayreuth, Experimentalphysik 1

Eukaryotic cells undergo major structural changes at the onset and during mitosis. This includes nuclear envelope breakdown, the formation of a mitotic spindle, disassembly of the Golgi apparatus and a transition of the endoplasmic reticulum from netlike to sheetlike structure.

Using spatially resolved FCS measurements we were able to show that the contiguous fluid of former cytoplasm and nucleoplasm features an anisotropically varying diffusion characteristics in the mitotic spindle area [1]. This affects the preferential direction of long-time diffusion as well as the distribution of nucleocytoplasmic constituents throughout the spindle region.

While being functionally closely related in interphase, ER and Golgi apparatus were found to be inherited separately: After its disassembly, Golgi components are spread throughout the whole cell, while the ER takes on a sheetlike structure that is excluded from the mitotic spindle region. Starting from an unmixed state of ER and Golgi components, Golgi reassembly after cytokinesis appears to be independent of the ER.

[1] N. Pawar, C. Donth and M. Weiss; Curr. Biol. 24, 16, 1905-1908 (2014)