Eugene Wigner Colloquium

joint event of GRK 1558 and SFB 910

SFB 910

Prof. Felix Höfling

FU Berlin

"Anomalous transport in heterogeneous environments and crowded cells"

Anomalous, slow transport is widely observed for tracer particles in heterogeneous host matrices; such structures can emerge from (quasi-)arrested liquids and are typically found in hierarchical porous materials, ion-conducting glass formers, and approximately in densely crowded cellular fluids. Diffusion is strongly suppressed upon increasing either the size of the tracer or the excluded volume, which can result in a localisation transition. The paradigm for classical localisation in such host structures is provided by the Lorentz model, where a point tracer explores the void space between randomly placed, possibly overlapping hard spheres. Here, the localisation transition is due to an underlying percolation phenomenon, giving rise to a divergent correlation length of the host structure and entailing critical slowing down of the tracer dynamics, visible as subdiffusion at criticality.

Guided by large-scale simulations for the Lorentz model, we have developed an elaborate scaling description of the anomalous transport. I will make connections to random resistor networks and to the"ant in the labyrinth", and also consider correlated obstacle matrices and tracers that perform Brownian motion. Eventually, I will apply the obtained insight to biological cells, where, for example, proteins diffuse in a highly heterogeneous landscape. I will demonstrate how the anomalous transport due to macromolecular crowding can be measured on a spatio-temporal level by variable-lengthscale fluorescence correlation spectroscopy.

GRK1558 research training group

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