SUMMER SEMESTER 2024

RTG 2756 CYTAC SEMINAR SERIES

TUESDAY, JUNE 4
17:00 IN HS5

CYTAC
RTG 2756

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University of Göttingen

THE MECHANICS OF LIFE:

PROBING CELLULAR DYNAMICS THROUGH PHYSICAL LAWS

Many biological systems rely on fundamental physical principles for their proper function. Here, mechanical processes such as force generation and adaptation of stiffness and viscosity have been very successfully used to explain complex biomedical questions with physical concepts. Such advances have been largely driven by new methods that allow the quantification of biological processes and the construction of theoretical models with high predictive power. I will present our recent approaches that allow us to study active force generation and mobility in different biological systems over several length scales. Starting with a general introduction to the problem of mechanical measurements on the micro and nanoscale inside living objects, I will provide several examples where these approaches could successfully describe the motion of particles inside living cells, the physical fluidification of the cytosol during cell division, and provide a general mechanical fingerprint to classify different cell types. To generalize this approach even further, we introduce a new observable, which we call mean-back relaxation. This observable is related to the well-known mean squared displacement but offers the possibility to detect non-equilibrium processes even in situations where other trajectory-based analyses cannot access the non-equilibrium components. We show that this new quantity can not only provide a measure of activity in controlled experimental situations but also when analyzing the particle motion inside complex materials, such as living cells.