Seminar/Talk

Stochastic Kinetics of Transient Joints in Multi-component Molecular Machines: Fluctuating Force, Collective Behaviour and Emergent Chemo-Mechanics

Ghanti Dipanwita
Indian Institute of Technology, Kanpur

Host: Carl-Philipp Heisenberg

During cell division, chromosome segregation is done by a complex multicomponent machine known as spindle apparatus where microtubules (MTs) nucleate from the pole of the spindle and interact with different parts of the cell. During chromosome segregation in a mammalian cell, the bundle of MTs collectively exert a force on the sister chromosomes pulling these apart. We have developed a theoretical model of a bundle of parallel dynamic MTs where plus end of all the MTs in the bundle are permanently attached to a movable wall. In the absence of external force and direct lateral interactions between the MTs, collective dynamics and indirect interactions among the MTs give rise to the rich variety of motility states.Cell function is dependent on the formation and rupture of different kind of specific and nonspecific interactions. Strength and stability of these interactions can be studied by applying an external force on the attachment. The strength of the kinetochore-MT attachment can be investigated by applying an external tension that increases linearly with time until rupture occurs. Then we extend the model to mimic the kt-MT attachments where a bundle of parallel MTs can simultaneously attach to a single kt. Also, we have studied the strength and stability of another important attachment between MT and cortex wall. Our stochastic kinetic model reveals that the MT-cortex attachment behaves as a catch bond.In addition to these cytoskeletal motors and microtubule interaction, I will talk about the self-assembly of ribosome motor during initiation of translation. Our theoretical model for the assembly of ribosome captures all the major pathways and the key steps indicated by experiments. We obtain the distribution of first passage time and hence, mean first passage time for the assembly of a ribosome motor considering all the possible error during the assembly.

Tuesday, November 20, 2018 04:00pm - 05:30pm
Meeting room 3rd floor / Bertalanffy Bldg.

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