

Physikalisches Kolloquium

22.06.09

16:15 Uhr

Hörsaal H2

Prof. Dr. Ulrich Schwarz (Karlsruhe Institute of Technology (KIT))

“Stochastic dynamics of protein complexes”

Abstract:

Proteins are the working horses of biological cells, they are involved in virtually all cellular processes and typically act in concert with other proteins. Despite recent advances in our knowledge on the ensemble of all proteins inside cells (proteome), little is known on their collective behaviour in space and time. Using Langevin and master equation approaches from stochastic dynamics, we theoretically investigate how cooperativity arises through the interaction of different proteins.

For the assembly of small complexes, we show that the transport processes between binding reactions cannot be described by simple stochastic rates. Choosing viruses as an example, we find that intermediate values for the dissociation rates are optimal for efficient assembly.

For adhesion clusters, where protein-protein bonds function under mechanical load, we show that force leads to strong cooperativity, including rupture cascades, thresholds and bistability.