Πανεπιστήμιο Κύπρου

The Department of Physics at the University of Cyprus
is organizing a seminar on

Thursday, 15th of June 2017, time 5:00 p.m.

Room B228, Building 13, New Campus

Speaker:

Elgin Korkmazhan
Department of Physics
Harvard University, USA

"A Soap Operon: 'SOME JUST GET TOO ATTACHED,' starring mRNAs and the membrane"

Unlike their eukaryotic counterparts, bacterial cells have little to no internal compartmentalization. This allows many rapidly diffusing macromolecules, such as proteins and mRNAs, to be evenly distributed in the cell. Important exceptions are proteins embedded in the cell membrane, which transport material and information across the membrane. Often these proteins attach to the membrane before their translation is complete, anchoring their mRNAs to the vicinity of the membrane.

This coupling between translation and localization suggests that the dynamics of translation may shape the spatial organization. In this work a canonical model of non-equilibrium statistical physics is employed to characterize this connection, and show how tunable kinetic properties allow the cell to regulate the spatial organization of both mRNAs and proteins. I show that a combination of the rate of translation initiation, the availability of secretory apparatuses, and the composition of the coding region determines the abundance of mRNAs near the membrane, as well as their residence time. I discuss implications to regulation of mRNA levels in the cell and to couplings with chromatin dynamics. In the light of my results, I propose and justify a novel mechanism for the formation and regulation of membrane protein clusters and membrane domains enriched in proteins, through the association of proteins that are translated from a single mRNA during a single stay near the membrane. Once verified experimentally, such a mechanism could pave the path to a better understanding of bacterial regulation and bacterial membrane organization as well as to an effective way of synthetically manipulating protein organization in bacterial membranes, which has been relatively out of reach in biology so far.

For more information please contact:
Department of Physics, telephone: 22892826