**Dynamics of focal adhesions under time varying stretch**

Rumi De

Department of Physical Sciences

Indian Institute of Science Education and Research Kolkata,

Mohanpur 741246, West Bengal, India

In recent years, it has been established that the biological cells are able to mechanically probe and feel their surrounding matrix, the presence of external forces and can actively respond to them in various ways by adjusting their contractile force, migratory activity, orientation, and differentiation. Understanding the active response of cells to mechanical forces is important for many cellular processes such as wound healing, muscle growth, tissue assembly and development. To get an insight into cellular mechanosensing, one needs to know how cells sense the mechanical forces and generate a contractile force pattern by regulating actin stress fibers and focal adhesions (FA) that connect cell to the extra cellular matrix (ECM). Focal adhesions are multimolecular protein assembly that act as mechanosensor and transmit forces to the extracellular matrix. It has been observed that cells continuously reorganize and reorient FA contacts in presence of time varying mechanical stretches. We construct a theoretical model to describe FA as a cluster of ligand-receptor bonds and study its dynamics to a sinusoidally varying applied stretch.. We model the adhesion cluster by coupling the elasticity of the cell-matrix system with the statistical behavior of bond breaking and rebinding process. Our model predicts the stability and growth of the adhesion cluster and its dependency on the stretching frequency and magnitude. We also address the puzzle related to the orientational response of FA in presence of static as well as dynamic stretches and compare with recent experimental observations.