

# TATA INSTITUTE OF FUNDAMENTAL RESEARCH

Homi Bhabha Road, Mumbai-400 005

December 19, 2017

## ASET Colloquium

**Speaker** : Prof. Sivaraj Sivaramakrishnan (*University of Minnesota, USA*)

**Title** : **Bridging the information transfer gap: How weak protein interactions shape signal transduction**

**Date & Time** : **Friday 22 December 2017 at 16:00 hrs.**

**Venue** : **Lecture Theater (AG-66.)**

### Abstract :

Cell signaling emerges from an ensemble of dynamic, transient, protein-protein interactions in crowded cellular environments. Aberrant protein-protein interactions in signaling pathways are very often implicated in many debilitating or fatal diseases such as diabetes, neurodegenerative diseases, and cancer. However, established structural and cell biological techniques are mostly limited to examining the function of stable protein complexes, and do not address emergent behavior stemming from multiple transient interactions. My research program centers on the concept that protein interaction networks in cells have evolved to harness multi-protein interactions, requiring in cell biochemical measurements of cellular processes and in vitro reconstitution of transient multi-protein assemblies. We use a genetically encoded technique called Systematic Protein Affinity Strength Modulation (SPASM) that allows us to control protein interactions both in vitro and in cells to dissect the molecular mechanisms that dictate context-dependent specificity in signaling pathways. I will present recent work on G protein-coupled receptors (GPCRs) and kinases that highlight the importance of weak interactions in shaping cellular signaling cascades.

### Brief Bio

Sivaraj (Shiv) Sivaramakrishnan is an Associate Professor in the Department of Genetics, Cell and Developmental Biology at the University of Minnesota, Twin-Cities. He obtained his Bachelor's in Mechanical Engineering from the College of Engineering Pune followed by a Master's in Mechanical Engineering at the University of Illinois Urbana-Champaign. Following a brief stint as a computational fluid dynamics engineer at Fluent Inc., he obtained his Ph.D. in Biomedical Engineering at Northwestern University (advisors Karen Ridge and Robert Goldman) where he researched the effects of shear stress on the mechanical properties of alveolar epithelial cells, and the signaling pathways that mediate remodeling of the intermediate filament cytoskeleton. Subsequently, he trained with Dr. James Spudich (Stanford University) where he researched the mechanical coordination in myosin motor ensembles and developed a genetically encoded technique to probe and monitor protein interactions in cells. In January 2011, he began his independent research career as an Assistant Professor at the Department of Cell and Developmental Biology at the University of Michigan Medical School and in July 2015 was recruited with tenure to the Cellular Biophysics faculty cluster at the University of Minnesota, Twin-Cities. He leads the Protein Acrobatics Lab to use DNA nanotechnology scaffolds and protein engineering in live cells to understand the emergent function in cellular macrocomplexes with emphasis on myosin molecular motors, G protein-coupled receptors, and kinases. He has published 48 peer-reviewed manuscripts many of which are in high-profile journals. He is the recipient of several awards including the American Cancer Society Postdoctoral Fellowship, NIH Director's New Innovator award, and the American Heart Association Scientist Development Grant award. He serves as an Editor on Nature Scientific Reports and Cytoskeleton.



Dr. Satyanarayana Bheesette

(Coordinator, ASET Forum)