“Multicomponent molecular mechanisms of actin dynamics in living cells”

Shashank Shekhar, PhD
Postdoctoral Researcher
Brandeis University

Thursday, February 28
2:45 – 3:45 PM
Brauer Hall, Room 12

Abstract
Living cells employ self-assembly to build intracellular structures orders of magnitude larger than their individual constituent units. One such example is the actin cytoskeleton, formed from polymerization of actin monomers into linear filaments. Cells use actin polymerization to generate forces required for cell movement and to sense their mechanical environment. Although the key proteins required for actin remodeling have been identified, how they act in concert remains a mystery. The overarching goal of my work is to investigate multicomponent molecular mechanisms that are required to achieve physiological rates of actin dynamics using in-vitro assays. In my work, I employ a range of quantitative experimental biophysical approaches such as microfluidics, multispectral single-molecule and single-filament imaging. First, I will show how a dynamic interplay between enhancers (formin) and inhibitors (capping protein) of actin polymerization leads to tunable control of actin assembly. Second, I will present a novel multicomponent mechanism comprising of two actin disassembly factors resulting in over 250 fold enhancement of actin depolymerization. These results illustrate how the interplay between molecular components and mechanical forces leads to complex cytoskeleton dynamics. My research exemplifies the power of synthetic biological approaches to dissect fundamental molecular mechanisms in living cells.

Biography
Shashank Shekhar is a postdoctoral researcher in biophysics at Brandeis University jointly mentored by Profs. Bruce Goode, Jeff Gelles and Jané Kondev. His research interests in biological self-assembly lie at the interface of physics, biology and biochemistry. He is the recipient of several awards including the Whitman Early Career Award at the Marine Biological Laboratory, HHMI Interfaces Scholar Award and Provost Innovator Inquiry Award at Brandeis University, and the Grand advances in Biology Prize from the French Academy of Sciences. He received his PhD from the University of Twente (The Netherlands) in experimental cell biophysics. He earned his master’s in Nanoscience and Molecular Bioengineering from TU Delft (Netherlands) and TU Dresden (Germany) and undergraduate degree in Physics in India. For more information, please visit: http://www.sshekhar.com

Faculty, students, and the general public are invited. A light reception will follow the seminar outside of Brauer 12.