Centre for Biosystems Science and Engineering

S E M I N A R

at 04:00 PM on April 10, 2017
MRDG Seminar Hall

Quantitative Biology of the Cytoskeleton during Division, Differentiation and Disease

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Biology is becoming increasingly more quantitative with the advent of a number of new techniques that make quantitation feasible. This advancement in the interpretation of biology has transformed it into a precise science that can help comprehend life, health and disease down to the level of the numbers of molecules. One component of the cell that is central to all these states is the cytoskeleton. The cytoskeleton, as its name suggests, is the determinant of cell shape and form. Re-organization of the cytoskeleton and its associated proteins follows major cell fate decisions such as cell division, differentiation and disease. Although qualitative studies on some of the changes underlying these states of cells have been described using biochemistry, molecular biology and static visualization techniques, the vivid dynamics of the cytoskeleton and the associated proteins and their interplay during these processes have remained elusive. So too, an estimate of the numbers and the spatial organization of the players is lost when conventional biology techniques are applied to answer questions relating to the cytoskeleton. The talk will be focused on the application of quantitative techniques to investigate the regulation of the motor protein cytoplasmic dynein in vivo, the role of the microtubules in determining cell fate and in mitochondrial dynamics. The speaker will also touch upon extension of these studies towards understanding of the role of the cytoskeleton and associated proteins during division, differentiation and disease.

About the speaker:

Vaishnavi Ananthanarayanan obtained her Ph.D. in Biophysics from the Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany, where she worked on the single-molecule observation of the motor protein dynein in vivo. Her work led to the discovery of the targeting mechanism of dynein from the cytoplasm to cortical anchors, as well as a novel mode of dynein regulation. Prior to her Ph.D., Vaishnavi pursued a dual degree in M.Sc. Biological Sciences and B.E. Computer Science at BITS, Pilani. Following her graduation from BITS, she had a stint at Microsoft Research India, where she developed a programming language for expressing Biology protocols. She was awarded the INSPIRE Faculty Award in 2014, the Innovative Young Biotechnologist Award in 2015 and SERB Early Career Research Award in 2016. She is currently an INSPIRE Facult Fellow at the Center for BioSystems Science and Engineering, where she continues to develop and employ microscopy and image processing techniques coupled with genetic manipulation in living cells to better understand processes mediated by the cytoskeleton and associated proteins.