Indian Institute of Science
Centre for BioSystems Science and Engineering
BSSE Seminar

11th December 2019 (Wednesday), 4:00 PM, Biological Sciences Auditorium, Biological Sciences Building

Mechano-Genomics: From Cell-Fate Decisions to Biomarkers

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ABOUT THE SPEAKER

Shivashankar is a principal investigator at the Mechanobiology Institute, National University of Singapore. Since 2014, he also heads a joint research laboratory with the FIRC Institute of Molecular Oncology (IFOM), Milan, Italy and is the IFOM-NUS Chair Professor. He carried out his PhD research at the Rockefeller University (1994-1999) and Postdoctoral research at NEC Research Institute, Princeton USA (1999-2000). He started his laboratory at the National Center for Biological Sciences, TIFR- Bangalore, India (2000-2009) before relocating to a tenured faculty position at the National University of Singapore in 2009. He was the Deputy Director of the Mechanobiology Institute (2011-2019). His scientific awards include the Birla Science Prize (2006), the Swarnajayanthi Fellowship (2007), and he was elected to the Indian Academy of Sciences (2010) and to the EMBO membership (2019). He will be relocating to a Full Professorship in Mechano-Genomics at ETH Zurich jointly with the Paul Scherrer Institute, Switzerland in January 2020.

ABSTRACT

Cells within the tissue microenvironment are highly heterogeneous and integrate both, biochemical and mechanical signals to maintain homeostasis. Using a multi-disciplinary approach, including single-cell imaging, functional genomics and machine learning, we study the coupling between cell mechanics and genome organization to regulate cell-fate decisions. Importantly, our studies have revealed novel mechano-genomic routes to nuclear reprogramming and cellular rejuvenation. Further, we show that subtle alterations in genome organization during cell-fate switching, detected using machine learning algorithms, can serve as mechano-genomic biomarkers for various diseases. Collectively, our studies aimed at understanding the mechanical regulation of genome programs have important implications in regenerative medicine and for early disease diagnostics.