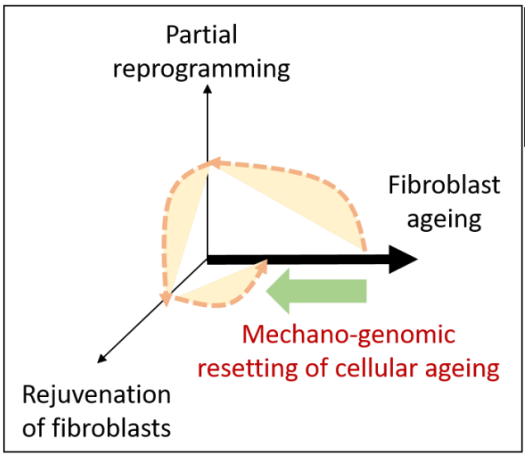
Multiple PhD and Postdoctoral positions available

Website: https://www.psi.ch/en/mgg/people/gv-shivashankar

The Mechano-Genomics Group was initiated with the recruitment of G.V.Shivashankar as a Full Professor to the Department of Health Sciences and Technology, ETH Zurich, jointly with the Paul Scherrer Institute (PSI). The research laboratory of the group is located at PSI and has started its activities in January 2020.

Research program:



Cellular ageing is inevitable, but the underlying mechanisms are still unclear. Importantly, a major unmet challenge is to rejuvenate ageing cells for applications in regenerative medicine. To address this challenge, our group focusses on understanding the mechano-genomic mechanisms underlying cellular ageing and how ageing cells can be partially reprogrammed and rejuvenated using non-genetic methods for robust therapeutic interventions. Over the years, our group has demonstrated that mechanical confinement of cells results in modular changes in nuclear mechanotransduction, 3D chromosome organization and gene expression. Based on these studies, we recently discovered that growth of fibroblast cells under sustained mechanical confinement results in their partial reprogramming. In addition, we showed that re-differentiation of such partially reprogrammed aged fibroblasts, under appropriate matrix stiffness, results in their rejuvenation to younger fibroblast cell states, providing novel avenues for tissue regeneration and repair. In these studies, we employ multi-scale correlative bio-imaging methods combined with bioengineered interfaces, functional genomics, and machine learning.

Major research themes of our group include:

- Probing the ultrastructure, mechanics, and dynamics of nuclear and chromatin states during cellular ageing, partial reprogramming, and rejuvenation
- Unraveling the nuclear mechanotransduction pathways and 3D genome regulation during cellular ageing, partial reprogramming, and rejuvenation
- Understanding the mechanical checkpoints during partial reprogramming and rejuvenation of ageing cells: implications to cell-fate decisions
- Implanting the mechanically reprogrammed cells into ageing tissue repair models, including wound healing, for applications in regenerative medicine
- Developing single-cell imaging-AI based analysis of functional chromatin states as biomarkers of cellular ageing and rejuvenation, and ageing associated diseases

To apply: Prospective applicants, with strong background in imaging or molecular and cell biology, or computational biology are encouraged to directly contact Shiva (gshivasha@ethz.ch).