**Mechanobiological understanding of neurulation during zebrafish embryogenesis.**

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Large-scale and coordinated morphogenetic movements organize cells into the embryonic axis and form the primitive embryonic tissues. These movements are guided by morphogenic gradients and cell-cell interactions but the role of mechanical forces in organizing and folding the embryonic tissues is very poorly understood. To detect and quantify tissue deformation pattern during morphogenesis requires that we track the movements of all cells in the embryo. The main challenge to understand these large scale tissue mechanics lies with the technological limitation of large scale 3D thick tissue imaging with good spatio-temporal resolution, 3D image processing and digital quantification. Towards this, I have developed a Multiview Digital Scanned Light Sheet Microscope for 3D live tissue imaging and high end image processing algorithms that enable quantitative analysis at the tissue level. To improve background rejection and to obtain a 3-D image devoid of light scattering, I have developed a new technique called ‘3D-HiLo’, which achieves combination of two processed HiLo images from orthogonal directions to reconstruct the improved 3D image of the tissue under observation. To understand the fundamental mechanism of tissue deformation and consequent neuronal tube formation (neurulation) from a layer of cells during zebra fish embryogenesis, velocity-maps, strain-maps and shear-maps were also generated at different time points from the trajectories of individual cells obtained by 3D imaging. Large scale 3D tissue imaging and the time evolution of 3D tissue deformation maps in each stages of development is providing us insight of biomechanics of neurulation in Zebrafish embryogenesis.