Contribution ID: **104** Type: **Oral Presentation**

A quantitative and systems approach to vertebrate forebrain and heart morphogenesis

Monday, 9 July 2018 11:00 (30 minutes)

Understanding how 3D organ morphology is achieved during development is one of the ultimate goals in biology. This is important not only for pure scientific interests but also for potential medical applications for controlling and designing functional organs. To achieve these goals, it is essential to clarify the quantitative relationships between microscopic molecular/cellular activities and organ-level tissue deformation dynamics. While the former has been studied for several decades, the latter - macroscopic geometrical information about physical tissue deformation - has been lacking. One reason for this lack of information is the difficulty in measurement at high resolution. We recently proposed a Bayesian method to precisely reconstruct global deformation patterns for three-dimensional morphogenesis of curved epithelial sheets using positional data from sparsely-labeled cells with limited resolution [1]. The applications of the method to early development of chick forebrain and heart revealed that globally aligned anisotropic deformation (i.e., biased tissue stretching), rather than local area growth, is the predominant morphogenetic mechanism in both cases (specifically, for optic vesicle formation and C-looping, respectively) [2]. Comparing the reconstructed tissue deformation patterns and cellular behaviours, we quantitatively revealed the contributions of each cellular process (e.g., division, size/shape change, and rearrangement) to the anisotropic tissue deformation. In this talk, we would also like to introduce our attempt to build continuum mechanical models to reproduce observed morphologies and deformation patterns.

[1] Morishita *et al.*, Nat. Commun., 2017
[2] Kawahira *et al.*, under review

Primary authors: MORISHITA, Yoshihiro (RIKEN Quantitative Biology Center); Dr OHTSUKA, Daisuke (RIKEN Quantitative Biology Center); Mr KAWAHIRA, Naofumi (Kyoto University)

Presenter: MORISHITA, Yoshihiro (RIKEN Quantitative Biology Center)

Session Classification: Interdisciplinary approaches in developmental biology

Track Classification: Minsymposium: Interdisciplinary approaches in developmental biology