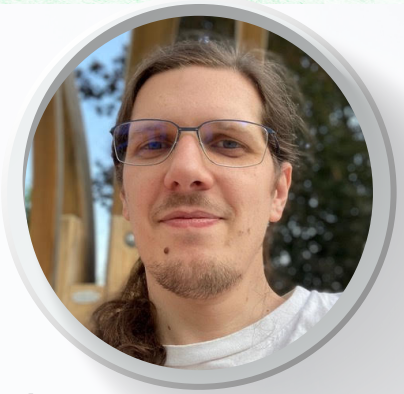
# ASHBi SEMINAR

## Controlled temporal variability facilitates spatial robustness in early mouse development


**Lecturer: Dimitri Fabrèges Ph.D.**

**Post-doc, Hubrecht Institute**

**Date** Thursday, 1 September 2022

**Time** 16:00 – 17:00 [JST]

**Venue** Zoom Online Meeting*

* Register via the right QR code


**Abstract:**

Living systems are noisy. Nonetheless, they achieve precision in form and function. How they do this and whether the variability has any role are fundamental yet open questions in biology. In this study, we use pre-implantation mouse embryos to measure and manipulate temporal as well as spatial variabilities and show that they are functionally linked and controlled to an optimal level facilitating robust morphogenesis and patterning. As we found that the timing of divisions of blastomeres desynchronized passively without compensation, we investigated the effect of the division asynchrony on cell packing. By using geometrical cell shape descriptors, we established a morphomap of embryogenesis, which shows that embryos converge to a certain 3D structure that cannot be explained by compaction alone. A physical model of the compacting 8-cell stage, based on surface tension minimization, recapitulates the geometrical convergence and revealed, both theoretically and experimentally, that noise generated by cortical contractility may be required to escape from local minimum and achieve topological transitions. On the other hand, experimental synchronization of cell divisions using Nocodazole generates a significantly higher number of spatially mis-allocated cells, suggesting that too much spatial noise is no good – the mitosis desynchronization reduces the spatial perturbations resulting from the divisions and allows the embryos reaching an optimal geometry and topology. Remarkably, the desynchronization rate was unique to species in mice, rabbits and monkeys, and may therefore be an important evolutionary treat to ensure developmental robustness.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