February 2026

Interdisciplinary Doctoral project on sea urchin embryo gastrulation

in the **RAUZI lab** and in the **MORPHEME lab**
at the University Côte d'Azur, Nice, FRANCE

Studying a morphogenetic wave driving gut formation during embryo development

The formation of epithelial tubes is essential to build organs responsible for directing vital factors outside in, inside-out or within animals (e.g., food and water through the gut, air through the lungs, or blood through the blood vessels). Therefore, tube formation is pivotal in multicellular life. Understanding the mechanisms and mechanics responsible for driving tube formation is key to understanding the emergence of complex life forms. This will provide new insights into how tubulogenesis disorders, that result from tube formation failure (e.g., spina bifida, polycystic kidney, tracheal atresia) may emerge.

To study the mechanisms driving epithelial tube formation, we will focus on the formation of the archenteron: a tubular epithelial structure that emerges from the inpocketing of the sea urchin embryo vegetal plate during gastrulation and that gives rise to the digestive tube of the sea urchin larva. Preliminary data from the Rauzi lab (based on an interdisciplinary approach) highlights a morphogenetic wave driving tissue inpocketing. Brachyury is a T-box transcription factor, which expression dynamically travels from cell-to-cell along concentric rings from the vegetal to the animal pole of the embryo during archenteron formation. Downregulation of Brachyury perturbs the formation of the animal gut. The PhD student will develop a comparative analysis between wild type and Brachyury perturbed embryos to characterize and test both the signaling and the morphometric wave. To that end the student will implement light-sheet in toto live imaging, molecular and laser manipulation and µ-aspiration to characterize and probe the inter-cell signaling dynamics, the underlying cytoskeletal remodeling, the tissue mechanics (supervision M. Rauzi - http://ibv.unice.fr/research-team/rauzi/) and the cell shape changes in 3D+t (supervision G. Malandain - https://team.inria.fr/morpheme/). This interdisciplinary project based on multi-modal and multidimensional analyses, will unveil new fundamental principles governing epithelial tube formation.

We are seeking a highly motivated and talented candidate to develop this interdisciplinary PhD project. Send a CV, a motivation letter, master scores/ranking and reference letters to matteo.rauzi@univ-cotedazur.fr

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