

Master Thesis Project: Trachea development

The Computational Biology Group (Prof Dagmar Iber, www.cobi.bsse.ethz.ch) at D-BSSE, ETH Zurich is offering a Master project for an **experimentally trained Master student** in the field of Developmental Systems Biology. The student will combine **mouse organ cultures** and **state-of-the art imaging** to address the mechanism underlying the formation of tracheal rings during lung development. In collaboration with students in the group, the generated data will be used to evaluate candidate mechanisms with **image-based computational modelling** approaches. The project will be supervised both by experimental and computational team members.

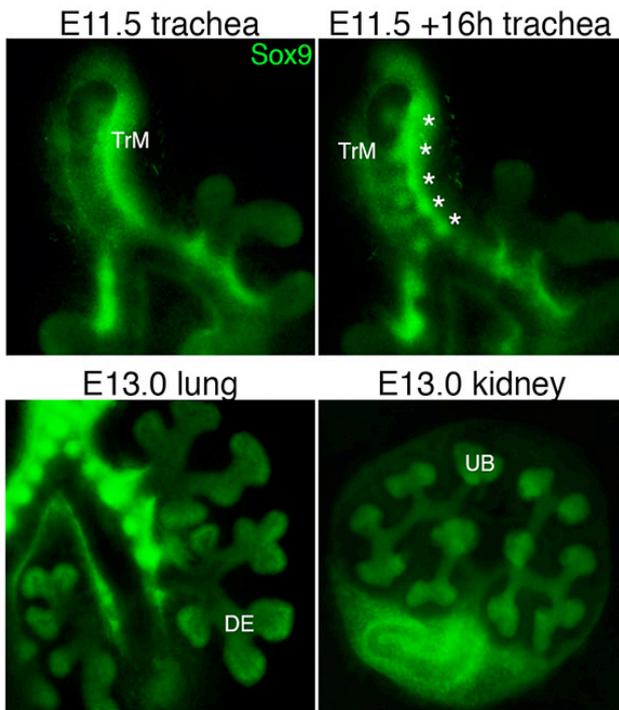


Figure: Sox9-GFP in developing lungs and kidneys. Top panel: Sox9-GFP in the upper airway. *Sox9* is initially expressed throughout the tracheal mesenchyme (TrM). After 16 hours in culture Sox9-GFP condensations appear (* asterisk, tracheal rings). Lower panel: *Sox9* is expressed by both the distal lung epithelium (DE) and the ureteric bud tips (UB).

The mechanisms that enable repetitive patterning in biology are still largely elusive. The emergence of tracheal rings during lung development presents an ideal model system to study such a repetitive patterning mechanism. Formation of tracheal rings is controlled by the transcription factor SOX9, and Sox9-GFP mice can therefore be used to follow tracheal ring formation in live microscopy of cultured lung bud rudiments. As we can observe the emergence of the rings in culture, we can perturb the process with signalling agonists and antagonists. The data from the culture experiments can finally be used to evaluate candidate mechanisms using image-based computational modelling.

Your tasks:

- Use Sox9-GFP mice to carry out live microscopy of developing, cultured lung bud rudiments in the presence of agonists, antagonists/inhibitors
- Use an established image analysis pipeline to segment the movies and quantify the impact of the perturbations on cartilage ring formation
- Collaborate with computational team members to test models for cartilage ring formation

Prerequisites:

- Experimental Master studies
- Strong interest in developmental biology & state-of-the art imaging
- Openness to interdisciplinary work / computational approaches

Contact:

If you are interested or have further questions, please contact Dr Odysse Michos (odysse.michos@bsse.ethz.ch) or Prof Dagmar Iber (dagmar.iber@bsse.ethz.ch).