

EuReCa International PhD Program  
**PhD thesis project**  
2022 Call for application

**Plasma membrane mechanics during the formation  
of the first mammalian epithelium**

General information

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<b>Call</b>	2022
<b>Reference</b>	2022-10-MAITRE
<b>Keyword(s)</b>	Morphogenesis; Cell and tissue; Mechanics; Preimplantation development.

Director(s) and team

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<b>Thesis director(s)</b>	Jean-Léon Maître
<b>Research team</b>	<a href="#">Mechanics of mammalian development</a>
<b>Research department</b>	<a href="#">U934/UMR3215 – Genetics and Developmental Biology</a>

Description of the PhD thesis project

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During pre-implantation development, the mammalian embryo forms the blastocyst. The architecture of the blastocyst is essential to the specification of the first mammalian lineages and to the implantation of the embryo. Consisting of an epithelium enveloping a fluid-filled lumen and the inner cell mass, the blastocyst is sculpted by a succession of morphogenetic events. These deformations result from the changes in the forces and mechanical properties of the tissue composing the embryo. Combining microscopy, image analysis, biophysical tools and genetics, we study the mechanical and cellular changes leading to the formation of the blastocyst.

This PhD project will focus on the contribution of the plasma membrane to shaping the first mammalian epithelium.

International, interdisciplinary & intersectoral aspects of the project

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Projects in the lab run at the interface between cell and developmental biology and biophysics. This project will be developed in collaboration with the Barcelona-based company Impetux and will benefit from interactions with biophysics labs located in France and abroad.



## Recent publications

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1. Özgüç Ö, de Plater L, Kappor V, Tortorelli AF, **Maître JL**. Zygotic contractility awakening during mouse preimplantation development. *bioRxiv*, 2021.
2. Schliffka MF, Tortorelli AF, Özgüç Ö, de Plater L, Polzer O, Pelzer D, **Maître JL**. Multiscale analysis of single and double maternal-zygotic Myh9 and Myh10 mutants during mouse preimplantation development. *eLife*, 2021.
3. Dumortier JG, Le Verge-Serandour M, Tortorelli AF, Mielke A, de Plater L, Turlier H, **Maître JL**. Hydraulic fracturing and active coarsening position the lumen of the mouse blastocyst. *Science*, 2019.
4. **Maître JL**, Turlier H, Illukkumbura R, Eismann B, Niwayama R, Nédélec F, Hiirahi T. Asymmetric division of contractile domains couples cell positioning and fate specification. *Nature*, 2016.
5. **Maître JL**, Niwayama R, Turlier H, Nédélec F, Hiirahi T. Pulsatile cell-autonomous contractility drives compaction in the mouse embryo. *Nat Cell Biol*, 2015.

## Expected profile of the candidate

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Applicants should have a strong desire to explore cell biological phenomena in an in vivo context, and should show solid capacity for independent and creative thinking. Background in cell biology, developmental biology and/or biophysics is strongly recommended. The project highly relies on microscopy and live imaging techniques, for which the applicant should have either experience or a strong motivation to learn.

