



Master intern, PhD, and Postdoc Positions Theory of mechano-genetic interactions in stem cell aggregates

Matthias Merkel

[Self-organization in living systems](#)

Turing Center for Living Systems (CENTURI)

Marseille

We are looking for master interns, PhD students, and postdocs in theoretical biophysics and applied mathematics within an ERC-funded project on rotational symmetry breaking in stem cell aggregates.

Embryonic stem cells can self-organize into 3D aggregates called embryonic organoids. Initially, these aggregates are spherically symmetric, but they later break rotational symmetry with polarized expression patterns of key proteins, in a way that parallels the formation of the head-to-tail axis in mammals.

We want to identify the mechanisms leading to this symmetry breaking. Preliminary data indicates that it is driven by several processes, which include cell differentiation, motion of individual cells, large-scale tissue flows, and cell division. To understand how precisely these processes interact with each other, we will develop and study effective physical theories integrating imaging data, mechanical measurements, and transcriptomics data.

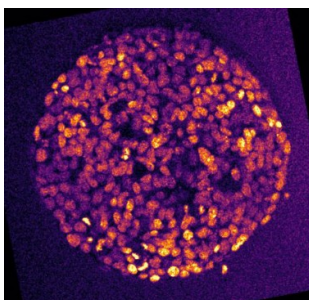
The project is funded by the ERC-funded BREAKDANCE consortium, which reunites the Merkel lab (theoretical physics) with the experimental labs of [Vikas Trivedi](#) (European Molecular Biology Laboratory, EMBL, Barcelona), [Verena Ruprecht](#) (Center for Genomic Regulation, CRG, Barcelona), and [Pierre-Fran ois Lenne](#) (Institute for Developmental Biology, IBDM, Marseille). The project will be carried out in Marseille, with the possibility of regular visits to Barcelona.

Expected profile: Bio- or soft-matter physics, computer science/bio-informatics, or applied mathematics

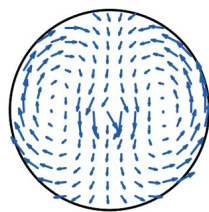
To apply: We invite applicants to submit to matthias.merkel@univ-amu.fr:

- a CV,
- a letter covering prior research experience and professional interests (1 page), and
- contact information of 2-3 references.

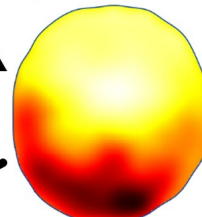
Informal inquiries are welcome.



recirculating flow



polarization



48h - RNA velocity

