



Looking for motivated candidates for a

Fully funded  
1+2 years  
postdoc position

Start date  
(flexible)

January  
2025

## Abstract

### Computational Fluid Dynamics to decipher the mechanics of tissue morphogenesis

During development, the sculpting of living organisms requires the coordinated interplay of **growth**, internal **active stresses** and **mechanical properties**. While the combined effect of growth and active stresses on morphogenesis has been described [1], the potential of mechanical properties to shape active materials has been largely overlooked. Yet there is growing experimental evidence that **tunable mechanical properties play an important role in various morphogenetic processes** [2]. In this project, **we will determine how mechanical properties can shape cellular tissues, using high-performance computational fluid dynamics (CFD) simulations** [3] coupling complex rheology, growth and active stresses. The recruited postdoc will work in close collaboration with other theorists and several experimental groups in Marseille and Barcelona, in particular on the question of axis formation of embryonic organoids [4]. This work will help us to better understand the fundamental mechanisms governing in-vivo tissue development and provide new insights for tissue engineering.

[1] Jülicher et al., 2018, Reports on Progress in Physics, doi:[10.1088/1361-6633/aab6bb](https://doi.org/10.1088/1361-6633/aab6bb)

[2] Lenne and Trivedi, 2022, Nature Communications, doi:[10.1038/s41467-022-28151-9](https://doi.org/10.1038/s41467-022-28151-9)

[3] Gsell et al., 2021, Journal of Computational Physics, doi:[10.1016/j.jcp.2020.109943](https://doi.org/10.1016/j.jcp.2020.109943)

[4] Gsell, Tlili et al., bioRxiv, doi:[10.1101/2023.09.22.559003](https://doi.org/10.1101/2023.09.22.559003)

## Candidate profile

Background in **physics**, **mechanics** or **applied mathematics**, with experience in **programming** and **numerical modeling**. Biological background is not required, but applicants should have a **strong motivation to study living systems and to develop inter-disciplinary research**.

## Host environment

The research will take place in Marseille, France, at the **IRPHE** institute. IRPHE is closely connected to 3 other mechanics labs on the campus through the **IMI institute**, and offers a very dynamic research environment in **soft matter physics**, **fluid mechanics** and **engineering**. Marseille is also a highly valuable area to develop **inter-disciplinary research on living systems** as a postdoc, especially through the **CENTURI institute**.

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