

# Master's internship at Institut Pasteur

## INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: Physical Microfluidics & Bio-engineering  
CNRS identification code:  
Internship director's surname: Charles BAROUD  
e-mail: Charles.baroud@pasteur.fr Phone number: 01.56.68.86.62  
Web page: <https://research.pasteur.fr/fr/team/physical-microfluidics-bioengineering/>  
Internship location: Institut Pasteur, Paris.

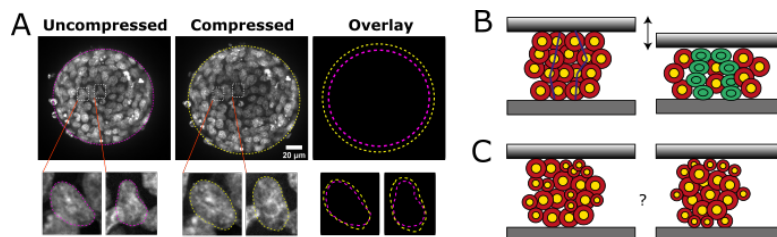
Thesis possibility after internship: YES  
Funding: Internship is funded but we will look for funding for PhD

### Exploring the interactions between mechanics and biology in organoids

As living beings move, breathe, or eat, the tissues within them are subject to mechanical forces that couple back on the way the cells are structured and on their biological function. Although the link between mechanics and biology is a rapidly growing field of investigation, the multicellular nature of tissues adds a major complexity to the problem. Treating this complexity requires a multiscale approach to link the mechanics of heterogeneous multicellular media in 3D with the mechano-biology of individual cells.

In this project we will study the two-way interaction between mechanical forcing and modification of cell phenotypes in 3D cellular aggregates on short and long-time scales. The main focus will be to study cancer biology in this way, in order to distinguish the properties and response of cancerous cells compared with non-cancerous tissues. What is learned from these experiments can have an impact on the diagnosis of cancer in patients.

The experiments will use a microfluidic platform that we have developed to deform cancer or non-cancer spheroids in a controlled manner. The intern will make single-cell measurements of cell position, shape and molecular signature, while cycling the *squeezing* of the spheroid. The analysis and modeling of these data will then allow us to infer the transmission of forces within 3D aggregates, similarly to what has been done for granular materials or foams.



The project will take place in our multidisciplinary group, which is affiliated with Ecole Polytechnique and Institut Pasteur. The group includes biologists, physicists, and engineers, and the internship will be co-supervised by a biophysicist post-doc. Our work always involves both experimental and theoretical aspects. The ideal candidate will be comfortable running complex experiments while doing advanced data analysis and potentially some modeling.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Soft Matter and Biological Physics:

**YES**