

Post-doctoral Position
“3D mechanics of cells in complex fibrous media”

Characteristics of the position:

Functions/ features	Young researcher – Post-Doctoral position
Employment type (referens III)	BAP C Sciences de l'Ingénieur et instrumentation scientifique Ingénieur Recherche C1B42
Category	A
Body	Young researcher
Quotas	100%

Assignment:

The successful candidate will be hosted by the Laboratoire Interdisciplinaire de Physique (LIPHY) - Grenoble, France (www-liphy.univ-grenoble-alpes.fr/) in the MC² team and by the Laboratoire Sols, Solides, Structures, Risques (3SR) - Grenoble, France (www.3sr-grenoble.fr/) in the CoMHet team.

The candidate will be employed under a 16-month fixed-term contract at the University of Grenoble Alpes.

Context and work environment

Structure description

The partner laboratories (LIPhy and 3SR) are part of the Tec21 laboratory of excellence (LabEx Tec 21), which is financing this project.

The Interdisciplinary Physics Laboratory (UMR5588 CNRS and UGA) has a staff of about 200 people. Physics is seen at LIPhy as a general method of approaching complex phenomena in various disciplines. Within it, the team Mechanics of Cells in Complex Environments (MC2) carries out interdisciplinary research based on mechanical and physical approaches to the dynamics of living or biomimetic systems and materials (biological fluids, cells and capsules, tissues). The experimental, theoretical and numerical skills allow us to address different biological and bioinspired systems that have in common the fact that they present complex physical interactions at different scales.

The 3SR laboratory comprises 120 people conducting cutting-edge research in solid mechanics, research that affects the fields of structural engineering, structures and materials for civil engineering, transport, manufacturing industry or health. The CoMHet team develops research work centred on Multiscale Mechanics and Multiphysical Couplings of Heterogeneous Media. The common objective of this work is to characterise, understand and model the microstructures, physics and mechanics of divided (fibrous, powdery) and porous media.

Team description (N+1 and colleagues) : under the authority of Team composed of X agents (X A, X B, X C...)

He/she will work under the supervision of Dr. V. Laurent, Dr. C. Verdier at LIPhy and Dr. L. Bailly and Dr. Bouzidou at the 3SR laboratory. The candidate will be assigned to LIPHY. Missions to the 3SR laboratory are foreseen in order to complete the experiments and to make associated modalisations.

Position's mission and main activities

Mission: 3D mechanics of cells in complex fibrous media

The project has a duration of 16 months from the date of recruitment in February 2023.

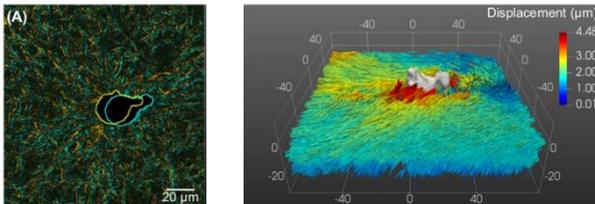
The forces generated by cells in complex environments play a key role in various physiological/pathological phenomena such as wound healing, cancer metastasis or embryogenesis. The objective of this project is to study cell migration in biological environments by studying the interactions between cells and the surrounding fibrous medium.

Main activities:

The person recruited will be in charge of:

- the morphological characterization of several collagen networks at different concentrations, imaged with a confocal microscope, and at rest in a first step (e.g. quantification of the initial orientation and the volume fraction of the fibres).
- Mechanical characterisation of the studied media using micromechanical tests (compression/shear) coupled with confocal microscopy. The deformation mechanisms of the fibrous networks will be studied using kinematic field measurements (DVC image correlation) and microstructure analyses. The mechanical behaviour of the different media will also be characterised using a nanoindenter and an AFM.
- analysis of cell migration in the different networks (quantification of fibre deformations during the different migration phases).

This project will benefit from an existing collaboration between researchers in the physics of biological systems, in imaging and in experimental and theoretical mechanics.



Contour of a migrating cell in a collagen network (left picture) and associated displacement field of collagen fibres (right picture)

Restriction or constraints related to the position

- Interaction with another laboratory (3SR) (on-site travel)
- Respect of the internal regulations of both laboratories (LIPhy/3SR).
- Work partly in a L2 type laboratory.
- Work on microscopes.

Desired profile

Expected skills (priority) :

- **Trade skills/ expertise**

The candidate should have an academic background in cell biophysics and mechanobiology, and/or biomechanics of fibrous media with a strong motivation to work at the interface between physics and biology. Specific skills in microscopic imaging, structural characterisation of fibrous media and/or experimental mechanics of (bio)materials/soft gels will be highly appreciated.

- **Personal skills**

- Ability to communicate/interact with researchers and engineers
- Liaise with the 3SR laboratory.

Supervisory mission: Yes No

Desired professional experience : beginner 2 to 5 years

Previous formation, diplomas:

The candidate must hold a PhD at the physics/biology/mechanics interface.

General information

The gross salary is 2656 euros/month, equivalent to a net salary of 2134 euros/month.

Contact for job-related questions:

Interested candidates are invited to send their CV and letter of application to :

Valérie LAURENT, Professor - Assistant UGA :

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Application deadline: **31/12/2022**