University Carlos III de Madrid

invites to apply for the following

Postdoctoral position (PD)

at the Department of Continuum Mechanics and Structural Analysis

Modelling the extracellular matrix for vibrational information transfer between living cells

(**Ref. HFSP-ECM-PD**)

Overall description of the project: Can cells use small motions to transmit information among themselves? We will focus on fibroblasts, specialized cells that are important components of connective tissue and are essential for wound healing, tissue repair and growth, and other functions. Fibroblast cells live within a bed of fibers and liquid known as a matrix, which has the potential to transmit motions through its network to other cells. We know that fibroblast cells can generate forces, but we don't know if they transmit information through oscillations that vary over time.

Our project aims to study the generation of these dynamic motions, how they move through the matrix where the cells are embedded, and how the cells respond to these tiny motions. We will do this by drawing together expertise from across biology and engineering, combining cutting-edge experimental techniques to measure cell-driven motions, and using computer modelling to understand how cells generate and interact with these tiny motions.

Together, the project will give important insights into whether fibroblasts make use of motions for information. This is important for understanding how fibroblasts can influence and coordinate each other during important processes such as wound healing, inflammation, regulating the heartbeat, and other important medical applications.

The project team consists of four laboratories from prestigious universities: **Tel Aviv University**, **University of Oxford**, **Washington University in St. Louis**, and **University Carlos III of Madrid**.

Role of PD in the project: The PD will be responsible for conducting the following research activities:

- Development of a Finite Element Code for the response of the extracellular matrix (ECM), accounting for large deformations of the collagen network due to prestress, wave propagation, and viscous effects of the surrounding gel matrix.
- Development of an algorithm to produce an Representative Volume Elements (RVE) of collagen networks with controlled connectivity, orientation and density.
- Perform repeated random sampling to obtain numerical results from a variety of RVEs in order to identify trends in the propagation of vibrational information, not linked to a specific fibrous network configuration.

- Coupling the ECM model with a mechanobiological cell model developed by other partners in the HFSP project.
- Finally, understand how cells respond to vibratory signals transmitted across the ECM.
- Help at supervising PhD and MSc students.

The successful candidate will join the **Department of Continuum Mechanics and Structural Analysis** of UC3M, within the recently granted HFSP project "Vibrational information transfer between living cells in the extracellular matrix" (Ref. RGP016/2024).

Desired background and skills:

- Outstanding academic record.
- PhD holder (or close to get the PhD) in the fields of Computational Mechanical.
- Written and spoken English (particularly scientific language).
- Critical thinking, and ability to cope with innovation and interdisciplinarity.

What we offer:

- Total duration: 3 years, through renewable 1-year contracts. Possible extension to a fourth year.
- Opportunity to carry out international research stays with researchers of the HFSP project team (see above).
- Become part of a young, dynamic, highly qualified, collaborative team.
- Flexible working environment and schedule.
- Opportunity to travel to international conferences to present research activities.
- Health coverage under the National Health System.
- For details on the annual gross salary, please contact PI Ramón Zaera Polo through the application process.

How to apply:

Interested candidates must send their applications to ramon.zaera@uc3m.es indicating in the e-mail subject **HFSP-ECM-PD**, including in a single pdf file:

- CV (max. 3 pages), including relevant professional experience and knowledge.
- Certificate of BSc and MSc marks.
- A motivation letter of experience, interests, and research goals (max. 1 page).
- 2 professional or academics recommendation letters. Alternatively, the contact information can be provided instead.

Submission of applications is due by **August 15th, 2024** (though early applications are strongly encouraged, and later applications will be considered until the vacancy is filled). The contract will begin in October 2024, though later start date can be agreed.