



Innovative Training Networks (ITN)
Call: H2020-MSCA-ITN-2018

Phys2BioMed

Biomechanics in health and disease: advanced physical tools for innovative early diagnosis

Start date of the project: 01/01/2019
Duration: 48 months

Two positions available for Early Stage Researchers (ESRs) at the Institute for Bioengineering of Catalonia, Barcelona Spain.

The positions are part of a Marie Skłodowska-Curie ITN European Training Network involving 15 ESRs as PhD students (Phys2BioMed).

Description of the ESRs' Projects

The two positions opened to carry out interdisciplinary research at the Institute for Bioengineering of Catalonia (IBEC) jointly with the School of Medicine and Health Sciences of the University of Barcelona (UBar). The research is aimed at studying mechanobiology of lung and heart in health and disease, under the supervision of Prof. [Daniel Navajas](#) (IBEC - UBar), and Prof. [Ramon Farré](#) (UBar).

Project of fellow ESR7

Project Title. Tissue and extracellular matrix rheology in lung diseases assessed by AFM

Start date: April 2019.

Objectives. To study viscoelastic properties of tissue and extracellular matrix (ECM) in murine models of lung diseases by means of AFM.

Expected Results. Murine models of lung diseases for the study of the mechanical properties of fresh parenchymal tissue and ECM de-cellularised samples. Standardised protocols to de-cellularize lung tissue to obtain acellular ECM samples for mechanical measurements. Standardised protocols for immobilisation tissue samples for AFM testing. Characterisation of the viscoelastic properties of fresh parenchymal tissue and acellular ECM in healthy and diseased lung regions. Viscoelastic models of ECM and tissues. This ESR is shared with INSERM in a pilot joint doctorate project.

Planned secondments. 1. Uni Bremen, M. Radmacher. Standardised procedures for AFM frequency measurements. 2. TMT-C2RC, M.-C. Copin. Preparation of samples for the AFM analysis. 3. UMIL, A. Podestà. AFM rheological measurements on ECM samples by means of custom colloidal probes. 4. INSERM, F. Rico. Models of tissue rheology. 5. FAU, W. Goldmann. Correlation between mechanics of cells by AFM grown on micro-patterns of varying size and mechanics of suspended cells using microfluidics.

ESR7 is a joint PhD project (IBEC/INSERM).

Project of fellow ESR8

Project Title. Tissue and ECM mechanical fingerprints of lung cancer

Start date: April 2019.

Objectives. To define differential mechanical properties of tissue and extracellular matrix (ECM) of lung tissues samples obtained from lung cancer.

Expected Results. The study will be carried out in tissue samples obtained from different murine models and from patients. Standardised protocols for preparation of lung tissue samples obtained from biopsies for AFM measurements. Characterisation of viscoelastic properties of normal and cancer lung ECM and tissue. Mechanical heterogeneity of normal and cancer lung tissues. Correlation between mechanical properties, molecular composition and structure of ECM of normal and cancer lung tissues. Mechanical fingerprints of parenchymal tissue and acellular ECM in lung cancer.

Planned secondments. 1. WWU, H. Schillers. Methods to immobilise tissue samples for mechanical tests. 2. CNRS, F. Lafont. Technical approaches to correlate mechanical and structural data. 3. O11, N. Rjinveld. Techniques to measure tissue rheology for clinical applications; 4. IFJPAN, M. Lekka. Standardise AFM measurements in cancer samples.

Research group

The Institute for Bioengineering of Catalonia (IBEC) is a research institute covering most bioengineering fields, from basic research to medical applications, aiming to act as an international reference in this field. Early diagnosis, new therapies based on regenerative medicine, better quality of life compatible with an ageing population, and technological advances to increase efficiency and make healthcare sustainable: these are some excellent examples of areas where IBEC can contribute with its cutting-edge research to generate new technological advances of key importance to innovation. The group of Prof. Navajas focuses its research on the study of the mechanical behavior of the respiratory system, and how it is altered in respiratory diseases. The main goal is to gain a deeper understanding of cellular and respiratory biomechanics to improve the diagnosis and treatment of respiratory diseases. We use basic and translational approaches in a multidisciplinary framework involving close cooperation with clinical groups. We apply atomic force microscopy and other cutting-edge biophysical and biological techniques to study the mechanical properties of the extracellular matrix and their impact in cell behavior. The group has a well-equipped lab to perform biomechanical studies including commercial and custom-built AFMs coupled to inverted confocal microscopes, and cell and molecular biology techniques and equipment to perform animal studies. IBEC provides comprehensive core facilities in nanobiotechnology and mechanobiology.

Candidate profiles

We are looking for excellent and highly motivated candidates with a degree in engineering or physics, and strong interest and experience in biophysics, bioengineering and related disciplines. Expertise in atomic force microscopy will be appreciated. We expect dedication and enthusiasm for experimental research, combined with openness and curiosity, and the ability and willingness to team work in an interdisciplinary environment. Skills in instrument development, data analysis and in scientific numerical environments (for example Python, Labview, Matlab etc) will be appreciated.

Appointment and enrolment in a PhD programme

The successful candidates will be employees of the Institute for Bioengineering of Catalonia and will be paid in accordance with the MSCA rules. The contract period will be for 36 months. The candidate will be enrolled in the PhD programme in Biomedicine (Biomedical Engineering track) of the School of Medicine and Health Sciences of the Universitat de Barcelona under the supervision of Prof. Daniel Navajas and Prof. Ramon Farré. Phys2BioMed aims at having the positions filled before the end of April 2019, but there is flexibility of an earlier or potentially slightly later start, if required by personal circumstances.

Admission criteria

- Students must have a Bachelor's Degree and a Master's Degree before the end of the call.
- Candidates can be of any nationality but need to demonstrate **transnational mobility**, i.e. must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation (Spain in this case) for more than 12 months in the 3 years immediately before the reference date. Compulsory national service and/or short stays such as holidays are not taken into account.
- The candidates must be in the first four years (full-time equivalent research experience) of their research careers, and have not been awarded a doctoral degree.
- Good proficiency in written and spoken English is required (level B2).

The suitability of the foreign academic qualifications in terms of content is appraised by the Evaluation Board constituted for admission to each PhD program, in compliance with the regulations in force in Spain and in the country in which the academic qualification was issued, and the international treaties or agreements pertaining to the conferment of qualifications for the continuation of studies.

How to apply

The applicant must send the following documents (in pdf format, included in a single zipped file attachment) by March 1st, 2019 to the attention of Prof. Daniel Navajas (jobs@ibebarcelona.eu) with subject "Phys2BioMed-ESRX" (X being the project number, 7 or 8); please send a copy of the document also to the coordinator Prof. Alessandro Podestà (alessandro.podesta@mi.infn.it):

- 1) an updated CV;
- 2) a personal motivation letter;
- 3) at least 2 reference letters (in English), at least one of them from one former supervisor and/or lecturer;
- 4) a scanned copy of the degrees, which would formally entitle him/her to embark on a doctorate in Spain.
- 5) a document indicating his/her ranking and marks at his/her Bachelor and Master Degrees, with a list of the courses/modules they have attended.
- 6) a copy, or a summary, of the Master Degree thesis, or a brief description of the past scientific activity.

Phys2BioMed is devoted to promote gender equality and diversity and encourages female researchers to apply.

Assessment criteria

Applications must be in English and will be evaluated against the following criteria:

- educational record;
- scientific quality of the applicant's CV;
- expected individual impact and benefit to the fellow and to the project.
- previous experience in the subject of Phys2BioMed research program.

Eligible candidates will be interviewed, possibly by means of web-conferencing tools.

For more information, contact Prof. Daniel Navajas at dnavajas@ub.edu and/or the Coordinator Prof. Alessandro Podestà at alessandro.podesta@mi.infn.it.