

Felix Rico

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PhD position in biophysics of protein condensates

We have an open PhD position to work on experimental biophysics of protein condensates at DyNaMo lab UMR1325 Inserm, Aix-Marseille University in France.

The PhD project is part of the XXL project "Organization and Dynamics of NHEJ DNA repair condensates" funded by the ANR.

XXL project

The XLF, XRCC4 and DNA Ligase 4 proteins of the non-homologous end joining (NHEJ) DNA repair pathway interact in a dynamic disorder-based multivalent network that drives phase separation in vitro. These XXL phase condensates are potent catalysts of DNA end ligation and recruit client NHEJ proteins. The XXL project proposes to combine biochemical, biophysical, structural and genetical methods to unravel how XXL condensates control NHEJ and other pathways in space and time in vitro and at DNA damage sites in cells.

The aim of the PhD project is to experimentally investigate the interaction and viscoelastic properties of individual proteins and protein condensates using high-speed atomic force microscopy (HS-AFM). The project will be supervised by Prof. Felix Rico (DyNaMo) and Prof. Mauro Modesti (CRCM).

Research groups

DyNaMo is a recently created research laboratory specialized in AFM at the INSERM, Aix-Marseille University (AMU). The lab is one of the international leaders in the application of AFM, in particular of high-speed AFM, to biological samples, from single molecules to cells and tissues. The lab is attached to the Life Sciences and Physics doctoral schools of AMU. INSERM is a public institution devoted exclusively to human health and biomedical research. Aix-Marseille University is the largest French university and is dedicated to education and research. The lab is part of the Centuri Institute, an interdisciplinary consortium of 16 research groups, supporting collaborative research and mentoring projects within the labs through a common interest to quantitative biology. The Luminy campus provides access to multiple facilities and techniques such as electron microscopy, focused ion beam, and advanced optical microscopy among many others within an optimal academic environment.

Eroles et al. *Nanoscale*, 2023; Rico et al. *PNAS*, 2019; Rigato A, et al. *Nat Phys*, 2017; Rico et al. *Science*, 2013

The **Homologous Recombination, NHEJ and Maintenance of Genomic Integrity team** led by Mauro Modesti is part of the Cancer Research Centre of Marseille (CRCM). The team focuses on understanding the mechanisms of DNA double-strand break repair systems at the molecular level, including repair by Homologous Recombination and Non-Homologous End Joining. We exploit classical ensemble biochemical assays and cell biology to investigate these mechanisms. In addition, we also use "single-molecule" methods that allow visualization and monitoring of the dynamic behavior of repair proteins acting on single DNA molecules. To this purpose we are using optical tweezers to tether and manipulate single DNA molecules, and fluorescence microscopy to observe in real-time fluorescently labeled proteins interacting with the DNA substrate.

Requirements

Research Field: Physics » Biophysics

Education Level: Master Degree or equivalent

Skills/Qualifications

We are looking for a highly motivated candidate with a Master degree in physics, chemistry, or engineering and strong interest in biophysics, physics of soft matter and nanotechnology. Expertise in atomic force microscopy is welcome. We expect dedication and enthusiasm for experimental research, combined with openness and curiosity, and the ability and willingness to team work in an interdisciplinary and international environment. Skills in instrument development, data analysis and in programming (e.g. Python, Labview, Matlab etc) are appreciated.

Additional Information

Appointment and enrolment in a PhD programme

The successful candidate will be employed by Inserm. The contract period will be for 36 months.

The candidates will be enrolled in the doctoral school of Life Sciences of Aix-Marseille university, under the supervision of Profs. Felix Rico and Mauro Modesti.

How to apply

The applicant must send the following documents (in pdf format, included in a single zipped file attachment) to Prof. Felix Rico (felix.rico@inserm.fr) by April 8, 2024:

- 1) an updated CV;
- 2) a personal motivation letter;
- 3) at least 2 reference contacts; at least one of them from a former supervisor and/or lecturer;
- 4) a scanned copy of the degree (usually the Master degree), which would formally entitle him/her to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the researcher will be recruited.
- 5) a document indicating his/her ranking and marks within his/her last year at his/her Master degree, 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.

We are devoted to promote gender equality and diversity and encourages female researchers to apply.

Assessment criteria

Applications must be written 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 XXL research project

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

For more information, contact Prof. **Felix Rico** (felix.rico@inserm.fr)

Website: <https://sites.google.com/view/fm4b-lab/home>