Interdisciplinary Post-doctoral position in optics and biology

Polarbio: Polarimetric orthogonally breaking imagery
applied to the study of the dynamics of intracellular architecture

Research Laboratories: IGDR / Institut FOTON

Heads of the Scientific Project: Sébastien Huet / Julien Fade

Polarbio is a multidisciplinary project joining the expertises of the DOP team (laser Dynamics, microwave photonics, and Polarization) of the Institut FOTON (http://foton.cnrs.fr/v2016/spip.php?rubrique111&lang=en), the Institute of Genetics and Development of Rennes (https://igdr.univ-rennes1.fr/en) and the imaging facility for life sciences of the Rennes 1 University (https://microscopie.univ-rennes1.fr/FLUO). The objective of this project is to investigate the capacities of a new polarimetric sensing modality developed by the Institut FOTON for the imaging of biological samples.

The collaboration between the members of the IGDR and Institut FOTON labs has allowed to set up a polarimetric confocal microscope based on the DSOB (Depolarization / Dichroism Sensing by Orthogonality Breaking) approach [1,2], which relies on the original illumination of samples by a dual-frequency dual-polarization laser light beam, and the detection of polarimetric signature through a single measurement involving demodulation of light at radiofrequencies. Initial "orthogonality-breaking" polarimetric images of living cells were recently acquired with this system [3].

First, the post-doctoral fellow will be in charge of establishing acquisition sequences able to assess specific polarimetric properties of the living tissues: diattenuation, depolarization, birefringence... These imaging modes will be set-up to allow acquisitions at high frame rates, which will be essential to characterize the dynamics of living tissues with optimal time-resolution.

Second, using the dual imaging capabilities of the setup which can be used simultaneously for fluorescence and polarimetric imaging, the post-doctoral fellow will image living cells tagged for specific structures such as the cytoskeleton or the chromatin. This will allow to precisely establish the polarimetric signatures of each of these different subcellular structures. Once this step completed, the post-doctoral fellow will analyze at high time resolution the dynamics of the chromatin architecture in untagged living samples. This structure, whose role in the maintenance of genome integrity has been studied by the IGDR team [4,5], is altered in many cancer cells and some specific alterations are already used for diagnostics in different types of cancer [6]. Using polarimetric imaging, the post-doctoral fellow will characterize the chromatin architecture without the need for specific labeling, with the objective of identifying new characteristic structural parameters that could be used as diagnostic tools.

[1] M. Alouini et J. Fade, Patent FR11.55527, 23/06/2011.

[2] J. Fade and M. Alouini, Phys. Rev. Lett., 109, 043901 (2012).

[3] M. Alouini *et al.*, Quantitative BioImaging (QBI) Conference, Rennes (2019).

[4] H. Sellou *et al.* Mol. Biol. Cell, 27, 3791–3799. (2016)

[5] R. Smith et al. (2018) Nucleic Acids Res., 10.1093/nar/gky334. (2018).

[6] D. Zink, A. H. Fischer, J. A. Nickerson, Nat. Rev. Cancer. 4, 677–687. (2004).

Offer type: postdoctoral researcher (fixed term contract, 2 years).

Required Profile:

Doctor (PhD) in optics or in biophysics. A proven experience in the development of optical imaging setups is a prerequisite. Good knowledge in image processing will also be strongly appreciated. Candidates should also demonstrate a genuine interest in the cell biology field.

Candidates should not have spent more than 18 months in France during the last 3 years and should not have supported their thesis in the hiring institution.

Hiring Institution: Université de Rennes 1

How to apply: Please send the following documents by email to Julien Fade (julien.fade@univ-rennes1.fr) and Sébastien Huet (sebastien.huet@univ-rennes1.fr) with copy to UBL (recherche@u-bretagneloire.fr)

- Short Curriculum Vitae and a cover letter showing your interest and especially addressing your professional project
- A list of your major works (2 pages max.) : scientific publications, patents and others scientific productions
- Contact details for three professional referees
- A copy of your PhD diploma

Application deadline: March 15th 2019

Job Starting Date: before May 31st 2019