Post-doc position available (start: April 1, 2019)

Modeling visco-elastic properties of human hepatocellular carcinoma collagen fibrils by polarimetric second-harmonic generation microscopy

Context

The recruited Post-Doc fellow will join the project entitled "**Impact of phenotypic fluidity in the heterogeneity and progression of hepatocellular carcinoma"** funded by the French National Institute for Cancer. Hepatocellular carcinoma (HCC) is the 3rd cause of cancer death worldwide and its heterogeneity challenges patient management. Recent results have suggested that hepatic tumor progression is characterized by a continuum drift between cell differentiation and proliferation, that is impacted by microenvironment plasticity and energy metabolism. We aim to gain insight into the mechanisms governing HCC heterogeneity bringing together multi-disciplinary expertise in molecular pathology, cell biology, genomics, proteomics, statistics and biophysics.

Work to be achieved

The physical strains resulting from cell - extracellular matrix (ECM) interactions affect the cell fate (differentiation/proliferation) through mechanotransduction. Alteration in liver stiffness is likely a driving mechanism in tumor progression. Since collagens play a central role in the formation of fibril networks involved in tissue architecture, the physical compressive and tensile strains generated by cell traction are key mechanisms involved in the long-range ordering and remodeling of collagen fibrils in ECM. 3D ordering of collagen fibrils in ECM is one of the major determinants of physical strains and can be detected by polarized second harmonic generation (P-SHG). We have shown that P-SHG is extremely performant for imaging human liver fibrosis, and we have recently developed a modeling approach that enables conversion of P-SHG images at pixel-resolution level into a simple geometric organization of collagen fibrils [1, 2].

The major goal of this work will be to convert P-SHG images into fields of mechanical forces through modeling approaches. The recruited Post-Doc fellow will actively contribute to (i) experimental P-SHG imaging and analysis (ii) modeling of physical strains from collagen fibrillar organization. The results will be integrated into the global multidisciplinary approach of the project.

Required scientific and technical skills

The candidate will perform her/his research work at the Physical Institute of Rennes (IPR) at the University of Rennes 1, France. She/he will have skills in the field of nonlinear optics, SHG microscopy, and a background in general physics. Programming skills in Matlab and an interest for multidisciplinary approach would be an additional advantage.

Type of contract: Post-Doctoral contract. Employer: University of Rennes 1. Start: April 1st, 2019. Duration: 2 years. Net salary: 1950 - 2400 Euros.

Location: IPR, Campus de Beaulieu, University of Rennes 1, France.

Send CV and two recommendation letters to Denis ROUEDE, Institut de Physique de Rennes (IPR), Bat. 11A, Campus de Beaulieu, Université de Rennes 1, 263 AVE du Général Leclerc, 35042 RENNES CEDEX - FRANCE

Email: denis.rouede@univ-rennes1.fr

Personal website: https://perso.univ-rennes1.fr/denis.rouede/

1. Rouede, D., et al., *Linear least square (LLS) method for pixel-resolution analysis of polarization dependent SHG images of collagen fibrils.* Opt Express, 2015. **23**(10): p. 13309-19.
2. Rouede, D., et al., *Determination of extracellular matrix collagen fibril architectures and pathological remodeling by polarization dependent second harmonic microscopy.* Sci Rep, 2017. **7**(1): p. 12197.