Spécialité de Master « Optique, Matière, Paris »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / *internship supervisor*:

Nom / *name*: Dehoux — Prénom/ *first name* : Thomas

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Courriel / *mail*: Thomas.dehoux@univ-lyon1.fr

Nom du Laboratoire / *laboratory name*:

Code d'identification : UMR5306 — Organisme : CNRS

Site Internet / *web site*: http://ilm.univ-lyon1.fr/index.php

Adresse / *address:* Université Lyon 1, campus de la Doua / Bâtiment Brillouin / 6 rue Ada Byron / 69622 Villeurbanne Cedex

Lieu du stage / *internship place*: ILM, Villeurbanne

Titre du stage / *internship title*: **Development of a Brillouin spectrometer for ultra-fast imaging of biological tissues**

Résumé / *summary*

The SOPRANO and the Biophysics teams from the Institut Lumière Matière propose an intership aiming at developing imaging of biological tissues by micro-Brillouin spectroscopy. This technique allows characterizing the viscoelastic properties by measuring the hypersonic waves propagating within the tissue. This non-invasive optical method has recently been used successfully to study the effect of osmotic shocks in single cells, or to map a mouse eye [1,2]. These recent results have been obtained using a new type of spectrometer called VIPA (virtual image phased array) allowing to realize cartographies in a few minutes.

The SOPRANO and Biophysics teams have recently started the same type of study using a Fabry-Perot Tandem spectrometer, enabling a very high spectral resolution , whereby providing essential information on the viscosity of the material. However, this spectral quality is obtained at the expense of the acquisition time (> 100sec per spectrum), thus limiting the production of wide field images, which are essential for the dynamic study of biological samples.

The objective of this internship will be to design, build and characterize a VIPA spectrometer that will complement the existing Fabry-Pérot spectrometer. During his internship the student will have to carry out the optical assembly and then implement the acquisition of the mapping of biological tissues models. Finally, the two spectrometers will be coupled on the same microscope in order to compare their respective potentials (spectral resolution, rapidity, etc.) on real biological systems designed in the laboratory. This work will be based on the photonics and biophysics skills of the host teams. The immense potential of use in biology as well as future technological developments will alow continuation of this subject in PhD.

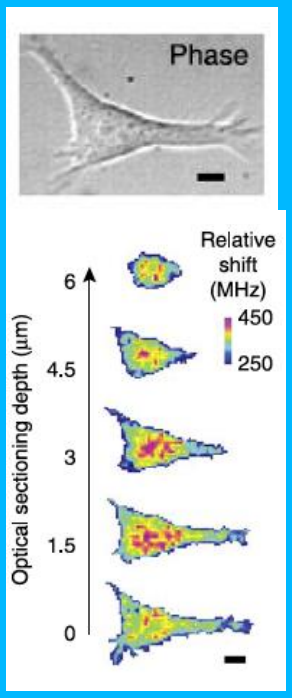

Figure 1 : Example of a fast 3D Brillouin imaging of a single cell (ref 1)

Required skills: optics, photonics, taste for interdisciplinarity

Bibliography

1. Scarcelli, G. *et al.* Noncontact three-dimensional mapping of intracellular hydromechanical properties by Brillouin microscopy. *Nat. Methods* **12,** 1132–1134 (2015).
2. Scarcelli, G. & Yun, S. H. Confocal Brillouin microscopy for three-dimensional mechanical imaging. *Nat. Photonics* **2,** 39–43 (2008).

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

Ce stage pourra-t-il se prolonger en thèse ? *Possibility of a PhD* **? : Yes**

Si oui, financement de thèse envisagé/ *financial support for the PhD***: bourse doctorale**

Lumière, Matière, Interactions	**X**	Lasers, Optique, Matière	**X**

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