Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : 08/10/2013

Responsable du stage / *internship supervisor*:

Nom / *name*: Débarre — Prénom/ *first name* : Delphine

Tél : 04 76 51 47 60 — Fax :

Courriel / *mail*: delphine.debarre@ujf-grenoble.fr

Nom du Laboratoire / *laboratory name*: Laboratoire Interdisciplinaire de Physique (LIPhy)

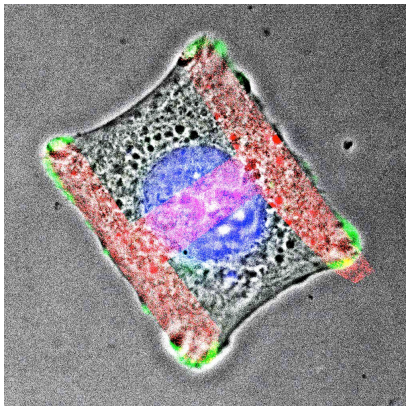
Code d'identification : UMR 5588 — Organisme : CNRS

Site Internet / *web site*: http://www-liphy.ujf-grenoble.fr/

Adresse / *address:* 140, rue de la Physique, 38402 Saint Martin d'Hères

Lieu du stage / *internship place*: LIPhy, Grenoble

Titre du stage / *internship title*: **Quantification of cell adhesion using RICM microscopy**



Cell on a H-shaped adhering pattern (in red)

Cell adhesion is a highly regulated process central in biological tissue properties. In particular, deregulation of adhesion is observed in most cancer cell lines and is associated with subsequent invasive processes leading to the development of metastasis. Nevertheless, little is still known on the regulation of these adhesion properties. In this context, our aim is **to improve the comprehension of cell adhesion mechanisms and to develop new cancer diagnosis tools** using a combination of advanced surface physico-chemistry and optical microscopy.

Our lab has recently developed "smart" patterned surfaces that permit controlling cell adhesion by use of polymer brushes that "push" under the adhered cell when a small temperature change is applied [1]. Quantification of cell adhesion, however, requires additionnal monitoring of the cell detachment process.

Reflection Interference Contrast Microscopy (RICM) is an imaging technique that permits measuring distances and movements of objects with sub-nanometer accuracy [2]. In particular, this method can be used to detect changes in cell morphology as well as the cell adhesive regions, without the need of staining.

The aim of this internship is to develop **quantitative RICM imaging of cells** adhering on patterned substrates using our existing home-built RICM microscope, which will permit the quantification of the adhesion energy of the cell. Using statistics on a large number of identical adhesive patterns, we will then assess the use of such measurements as a diagnostic tool for cancerous cell lines. The work will be conducted in collaboration with specialists of surface physico-chemistry (L. Bureau) and cell biology (M. Balland) within the lab as well as their students, offering a rich and lively working environment.

The work will include **optical developments** (e.g. implementation of multicolour imaging), **optical modelling** of cells and substrate based on and for the analysis of experimental data, and **introduction to cell biology and cell culture**. Depending on the interests of the student, particular emphasis can be put on one of these aspects, but *the candidate must have an interest in biophysics and interdisciplinary research*.

More information on the lab : http://www-liphy.ujf-grenoble.fr/

[1] K. Mandal, M. Balland and L. Bureau, *Thermoresponsive Micropatterned Substrates for Single Cell Studies*, PLOS One **7**, e37548, (2012).

[2] L. Limozin *et al.*, *Quantitative RICM in Soft Matter and Cell Adhesion*, Chem. Phys. Chem. **10**, 2752 (2009).

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***:** ED physique Grenoble, Labex Tec21

Lasers, Optique, Matière	✓	Lumière, Matière : Mesures Extrêmes	✓
Plasmas : de l'espace au laboratoire			