Subject proposal for Master internship (M1 or M2)

"Study of cell migration within confined environment".

Supervisor/Contact:

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Laboratory and location:

The internship will take place between ILM and INL, Léon Brillouin building – UCBL campus (Villeurbanne).

Key words: Microsystem, cancer cells, cell tracking, culture cells

Possible to continue with a phD : no (the candidate could be presented for ministry funding)

Context:

We propose to elucidate the cellular mechanisms underlying one critical step in tumor progression: the **endothelial transmigration**. Indeed, when entering (intravasation) and exiting (extravasation) the vascular vessels, cancer cells need to transmigrate across the endothelial layer of the blood vessel walls which **stiffness and geometric confinement** creates serious challenges to the cancer cells, requiring them to sustain drastic deformations.

Internship work

Therefore, the aim of this internship is to study the *in vitro* transmigration of cancer cell lines with different metastatic characteristics in microsystems mimicking blood vessels interstices. To do so microfluidic devices implementing networks of micro-pillars and micro-channels have been developed (Figure 1).

Two main aspects will be varied in order to model the *in vivo* environment associated with the endothelial barrier: the pore geometry and the pore stiffness.

The candidate will then study the behavior of the cancerous cells in such microsystems molded in rigid or soft materials. Several parameters will be investigated such as typical deformation undergone by cells, trajectories, transit time and minimum pore size crossed.

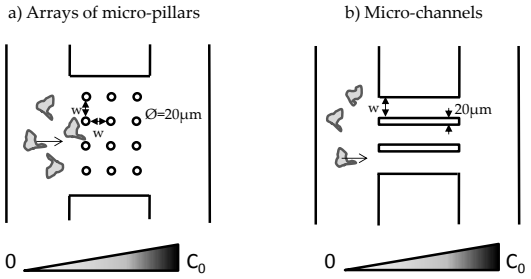

Figure 1: Microsystem for analysis of cancer cell migration. a) Configuration with arrays of micro-pillars. b) Configuration with micro-channels. The cells are injected in the left part of the device and encouraged to cross the pores section by the application of a chemical gradient of attractant.

The research will be done between Institut des Nanotechnologies de Lyon and Institut Lumière Matière (Lyon, France); the two laboratories are located in the same building on the scientific campus of La Doua. The candidate will benefit from the microfluidic facilities provided by INL (50m² clean room) and the cell culture and bio manipulation space provided by ILM. He/She will also work in close collaboration with researchers from the Research Center of Cancer of Lyon (CRCL).

The internship will allow training in various areas including: biophysics, clean room technologies, microfluidic system fabrication, cell culture, time-lapse video-microscopy and image analysis.