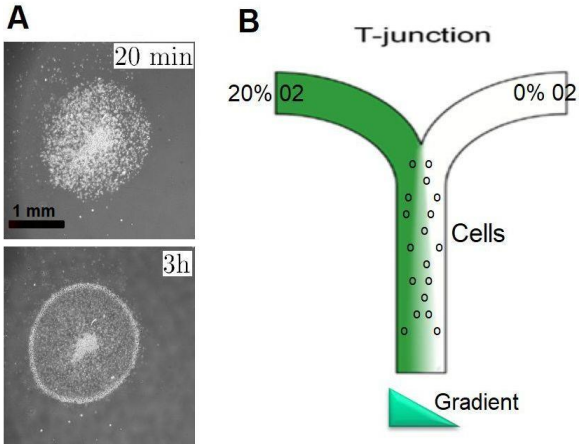
PROPOSAL for a L3-M1 Internship in Cell Biophysics and microfabrication

Biomicrofluidic devices for oxygen gradient control

Laboratory : Institut Lumière Matière (ILM), Equipe Biophysique, Université Claude Bernard Lyon1, 43 Boul. du 11 novembre, 69622 Villeurbanne
http://ilm.univ-lyon1.fr/biophysique

Supervisors: Christophe ANJARD, Jean-Paul RIEU
Email : jean-paul.rieu@univ-lyon1.fr

It has long been known that bacteria move to oxygen a mechanism called aerotaxis [1]. The social amoeba *Dictyostelium discoideum* also displays a spectacular phenotype when cells consumed their O_2 (Fig. A)*:* after covering an initial dense spot of cells (20 min) by a coverglass non permeable to O_2, peripheral cells exhibit a strong outward directional migration to escape hypoxia from the center of the colony and form an expending ring (3 h).
Although there is little doubt that the position of the ring is located at the interface between the rich and poor O_2 zones, we would like to create controlled gradient of O_2 and watch where cells initially plated will locate in presence of this gradient.



A simple microfluidic T-junction between an oxygenated and a degassed media (green and white channels in the Fig. B) arriving in a region where cells are plated presents a well-defined and measurable gradient region. We plan to control both spatial and temporal gradients with microfluidics by just changing temporally the flowrate in the two input channels. Cell trajectories will be followed by videomicroscopy [2]. Hence, information on the sensibility of cells to spatial quasi-stationary gradients will be determined.

Biomicrofluidic devices will be prepared from molds by PDMS replication using soft-lithography methods. All the equipment and microscopes are available in the Biophysics team of iLM and at NanoLyon clean room facility.

[1] Micha Alder et al. Studies of bacterial aerotaxis in a microfluidic device. Lab Chip,12(22) :4835_4847, November 2012.
[2] J. d'Alessandro, A. Solon, Y. Hayakawa, C. Anjard, F. Detcheverry, J.-P. Rieu, C. Rivière. « Contact enhancement of locomotion in spreading cell colonies». Nature Physics, 03 July 2017

Key words: Cell motility analysis (videomicroscopy, tracking, PIV…), micro-fabrication, hypoxia**.**