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

Development of transparent oxygen sensing films for measuring the O_2 concentration around adherent cells

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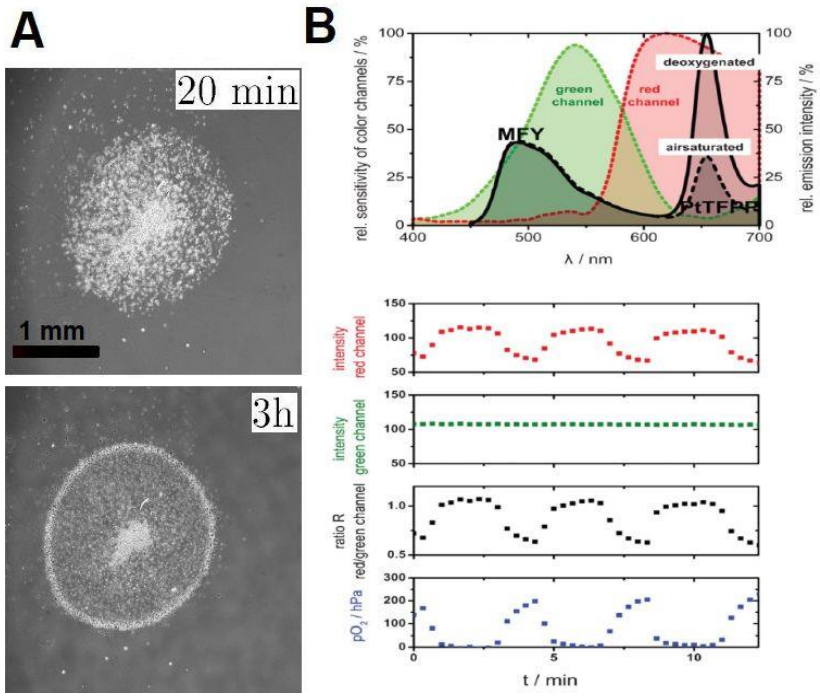
It has long been known that bacteria move to oxygen a mechanism called aerotaxis [1]. The social amoeba *Dictyostelium discoideum* also displays a spectacular phenotype when cells consumed their O_2 (Fig. A)*:* after covering an initial dense spot of cells (20 min) by a coverglass non permeable to O_2, 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, it is necessary to measure meantime the oxygen concentration and the cell behaviour. We plan to create thin polymer films with luminsescent dyes for oxygen sensing based on the ratio of two fluorescent dyes: the first one is O_2 sensitive and the second one is not (Fig. B, [2]). This kind of ratio imaging technique enables to avoid any film inhomogeneity for quantitative measurements.



The intern will participate to all steps of this project: (1) film fabrication in the NanoLyon clean room, (2) characterization by profilometer and fluorescence microscopy calibration, (3) cell culture and videomicroscopy, (4) image analysis (cell trajectories and O_2 gradient superimposition).

[1] Micha Alder et al. “Studies of bacterial aerotaxis in a microfluidic device. Lab Chip,12 (2012) 4835
[2] B Ungerbock et al. « Microfluidic oxygen imaging using integrated optical sensor layers and a color camera». Lab Chip, 13 (2013) 1593