# Research internship: Microfluidic study of the motility of unicellular algae submitted to predatory signals

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We propose a research internship at the physics department of ENS (LPENS) aiming to probe the dynamical response of unicellular algae (*Chlamydomonas reinhardtii*, a freshwater alga moving around using flagella, Fig 1a) to chemical signals revealing the presence of predators around. We will be especially interested in understanding and modelling the changes in statistical properties of the trajectories ("motility") as well as the potential self-chemotactic interactions appearing between the cells when sensing predation signals. This project is part of a study intending to describe the mechanisms involved in the aggregation of those same cells in the presence of predators. Such aggregative state provides the cells with protection against the predators because the multicellular clusters become too large to be ingested (Fig. 1).

Through this research project, the student will apply microfluidic techniques, from the design of microchips to their development and use, and will use video-microscopy and image analysis as well as statistical analysis of the experimental data. Therefore, it is preferable that the student already has some background in microfluidic, image analysis (Matlab, ImageJ, or else) and in physics (statistical physics, stochastic processes, hydrodynamics), as well as a certain interest for biology.

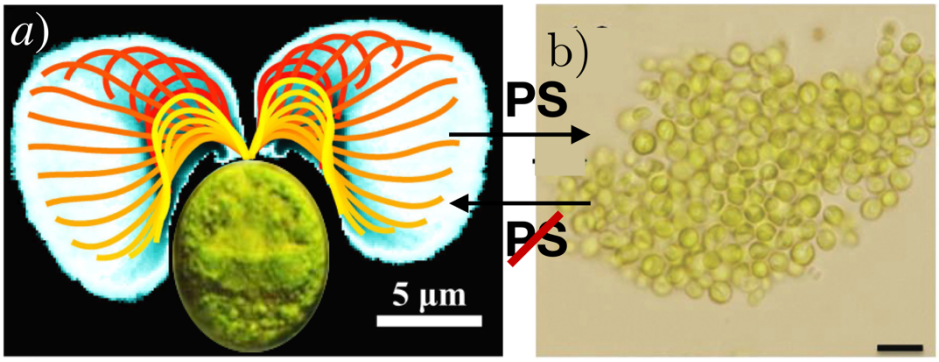


Fig. 1: a) Picture of a solitary *Chlamydomonas* cell with superimposed flagella beating cycle (breast-stroke). b) When submitted to chemical signals revealing the presence of predators around (PS: Predation Signal), those same algae aggregate in multicellular clusters of several hundreds of cells. This behaviour protects them against the predators, the clusters being too big to be ingested. Scale bar: 10µm.