

INTERNSHIP PROPOSAL

Institute and Group: BIG/LPCV/Sensing and Signalling in Microalgae

Supervisor: Dimitris Petroutsos

Phone: 04 38 78 41 84

Email: dimitris.petroutsos@cea.fr

Research project title: Linking cilia-based motility with regulation of photosynthesis

5 Keywords to describe the project: Gene expression regulation, photosynthetic microalgae, light signalling, flagella, excess light.

Description of the project (aims, experimental techniques, recommended background):

The unicellular green alga *Chlamydomonas reinhardtii* (hereafter *Chlamydomonas*) has been a long-standing model system for studying photosynthesis. *Chlamydomonas* has two flagella that allow it to swim towards optimal light conditions. Although *Chlamydomonas* and mammals are separated by 1 billion years of evolution, *Chlamydomonas* flagella are amazingly similar in structure and function to mammalian flagella (cilia) and have been used to study human developmental disorders and diseases of the lung, kidney, and eye, all of which contain cilia. In our lab we have recently discovered that the blue-light sensor phototropin, localized in the flagella and plasma membrane, regulates photosynthesis under conditions of excess light. The proposed project will focus on exploring the potential signalling role of flagella in the response to excess light and aims to establish a novel link between flagella and photosynthesis regulation. This will be achieved by combining complementary techniques such as: genetics (flagella-less mutants), biochemistry (immunoblotting), gene expression (qPCR) and single-cell subcellular targeted laser excitation.

Justification that the internship's subject fits with the general theme of GRAL:

The project fits the goals of the GRAL Labex as it integrates information at different levels of resolution (from subcellular- to single-cell- to population level) to unveil novel types of regulation of chloroplast function. It is a follow-up study of ANR-10-LABX-49-01 ChlamyPHOT.

Relevant publications of the team:

- Petroutsos, D., Tokutsu, R., Maruyama, S., Flori, S., Greiner, A., Magneschi, L., et al. (2016). A blue-light photoreceptor mediates the feedback regulation of photosynthesis. *Nature*, 537(7621), 563–566. <http://doi.org/10.1038/nature19358>
- Allorent, G., & Petroutsos, D. (2017). Photoreceptor-dependent regulation of photoprotection. *Current Opinion in Plant Biology*, 37, 102–108. <http://doi.org/10.1016/j.pbi.2017.03.016>