



Grenoble Alliance for Integrated  
Structural & Cell Biology

## GRAL MSc RESEARCH SCHOLARSHIP 2020-2021 RESEARCH INTERNSHIP PROPOSAL

### Institute / Group

IRIG / PCV – LPM

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### Research Project Title

Exploring the molecular and structural consequences of UV-B illumination in microalgae using bioimaging techniques

### Description of the project

Although less visible than plants, phytoplankton is performing half of the primary carbon fixation via photosynthesis. This process depends on light not only as an energy source, but also as a signal perceived by specific photoreceptors, which affects both the activity and the structure of the photosynthetic apparatus. These structural changes can be visualized either through classic electron microscopy, or via electron tomography and 3D reconstruction<sup>1,2</sup>.

Recent data indicate that UV-B regulate photosynthesis in the fresh water microalgae *Chlamydomonas reinhardtii* via the UV-B photoreceptor UVR8<sup>3</sup>. Preliminary data suggest that this could occur thanks to changes in the architecture of the photosynthetic membranes. An UVR8 homologue has been identified in the diatom *Phaeodactylum tricornutum* (PtUVR8-like). Mutants of this photoreceptor have been generated in this alga by Crisper Cas9<sup>4</sup>. During this M2 internship, we will compare UV-B responses of WT and mutants in *C. reinhardtii* and *P. tricornutum* measuring photosynthetic activity (photophysiology) and modifications of the photosynthetic apparatus (biochemistry, FIB-SEM). We aim at testifying the hypothesis that UV-B acclimation occurs via changes in the 3D architecture of the photosynthetic machinery, and explain the reasons for this link. For this project, we require a background in plant physiology, molecular biology, biochemistry and imaging.

<sup>1</sup>Flori et al. *Methods Mol Biol.* 2018 1829:113-122. <sup>2</sup>Flori et al. *Nat Commun.* 2017 8:15885. <sup>3</sup>Allorent et al. *PNAS* 2016 113:14864-14869.

<sup>4</sup>Allorent et al. *Methods Mol Biol.* 2018 1829:367-378

### Keywords

UV-B, microalgae, microscopy, thylakoid, photophysiology

### Relevant publications of the team

Flori S, Jouneau PH, Bailleul B, Gallet B, Estrozi LF, Moriscot C, Bastien O, Eicke S, Schober A, Bártulos CR, Maréchal E, Kroth PG, Petroustos D, Zeeman S, Breyton C, Schoehn G, Falconet D, Finazzi G. Plastid thylakoid architecture optimizes photosynthesis in diatoms. *Nat Commun.* 2017 8:15885.

Allorent G, Lefebvre-Legendre L, Chappuis R, Kuntz M, Truong TB, Niyogi KK, Ulm R, Goldschmidt-Clermont M. UV-B photoreceptor-mediated protection of the photosynthetic machinery in *Chlamydomonas reinhardtii*. *PNAS.* 2016 113:14864-14869.

Allorent G, Guglielmino E, Giustini C, Courtois F. Generation of Mutants of Nuclear-Encoded Plastid Proteins Using CRISPR/Cas9 in the Diatom *Phaeodactylum tricornutum*. *Methods Mol Biol.* 2018 1829:367-378.

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