

INTERNSHIP PROPOSAL

Institute and Group: Biosciences and biotechnologies Institute of Grenoble/Laboratoire de Physiologie Cellulaire Végétale/ Groupe Plantes, Stress et Métaux et Groupe Lumière, Photosynthèse et Métabolisme

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Research project title:

Characterization of the photosynthesis in green microalgae living in an extreme environment

5 Keywords to describe the project:

Microalgae, photosynthesis, growth, stress, detoxification

**Description of the project (aims, experimental techniques, recommended background):
10 to 15 lines:**

A new green microalga isolated from the cooling pool of a nuclear reactor was shown to possess exceptional radioresistance properties and strongly concentrate some pollutants. These specificities make it an organism of choice for novel biotechnologies for the depollution of environmental waters and of industrial effluents. Controlling the growth of this microalga is essential for any biotechnology application. In its original biotope, the microalga is submitted to a strong nutritive stress as the pool contains deionized water. Photosynthesis is at the basis of the growth of this phototrophically grown microalga.

The aim of the project is to decipher the function of the photosynthetic apparatus of this microalga under different growth conditions. The student will (I) optimize the growth medium after analysing the elemental composition of the microalga grown in different conditions, (II) compare the function of photosynthesis in classical/optimal conditions, and (III) seek for the presence of the protein complexes of photosystem in this peculiar microalga in these conditions.

Experimental techniques: Microalgae cultivation, *in vivo* spectroscopic and fluorimetric (chlorophyll fluorescence) measurement of photosynthesis, polarography, Western Blot, elemental analysis by inductively coupled plasma-mass spectrometry.

Recommended background: Microbiology, biochemistry, interest in plant biology

Justification that the internship's subject fits with the general theme

of GRAL (3 lines):

This subject lies within axis 2 of the labex GRAL insofar as it aims to decipher the functioning of the chloroplast of this peculiar microalga and thus to understand the processes underlying its adaptation to stress originating from its growth conditions. It will open the way to novel biotechnologies for environmental remediation.

Relevant publications of the team (3 max):

Rivasseau C., Farhi E., Compagnon E., de Gouvion Saint Cyr D., van Lis R., Falconet D., Kuntz M., Atteia A., Couté A. (2016) *Coccomyxa actinabiotis* sp. nov. (Trebouxiophyceae, Chlorophyta), a new green microalga living in the spent fuel cooling pool of a nuclear reactor. *J. Phycol.* 52:689-703.

Leonardo T., Farhi E., Pouget S., Motellier S., Boisson A.M., Banerjee D., Rébeillé F., den Auwer C., Rivasseau C. (2016) Silver accumulation in the green microalga *Coccomyxa actinabiotis*: toxicity, *in situ* speciation and localization. *Environmental Science and Technology.* 50, 359-367.

Petroutsos D, Tokutsu R, Maruyama S, Flori S, Greiner A, Magneschi L, Cusant L, Kottke T, Mittag M, Hegemann P, Finazzi G, Minagawa J. (2016) A blue-light photoreceptor mediates the feedback regulation of photosynthesis. *Nature.* Sep 22;537(7621):563-566.