Grenoble Alliance for Integrated Structural & Cell Biology

INTERNSHIP PROPOSAL

Institute and Group: **BIG:** Laboratoire de Physiologie Cellulaire et Végétal (LPCV)

Supervisor: Robert Blanvillain **Phone:** 04 38 78 34 84

Email: Robert.blanvillain@cea.fr

Research project title: Nuclear control of chloroplast biogenesis by PAPs

5 Keywords to describe the project: Light signalling, Plastid encoded polymerase (PEP), protein subcellular trafficking

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

The greening of plants occurs after germination during a developmental program called photomorphogenesis. This program, which supports the acquisition of photo-autotrophy, is induced in Angiosperms by the perception of light. Hence chloroplast biogenesis is triggered and photosynthesis becomes operational. At the molecular level, the formation of chloroplasts requires the activity of a chimeric plastid transcriptional complex (PEP) composed of a prokaryotic core, encoded in the plastid genome, and decorated with 12 eukaryotic proteins (PAP1-12). The PEP complex triggers plastid gene expression for building the photosynthetic apparatus. In our lab we study the *pap* mutants that develop an albino syndrome with a total carbon heterotrophy. Our work shows that 5 PAPs are localized both in plastids and in the nucleus where they interact. Our aim is to elucidate the intracellular trafficking of PAPs, isolate the nuclear complex and understand its role in chloroplasts biogenesis. We surmise that PAPs participate in the retrograde signal to inform the nucleus of the state of its plastids. Using integrated molecular genetics (functional complementation, chloroplast labeling) as well as biochemistry and large-scale biology, our long-term goal is to elucidate the structure/function of PAP complexes in chloroplasts and the nucleus.

We are seeking candidates with background in recombinant DNA technology and molecular genetics with strong interest in plant biology using the model plant Arabidopsis thaliana.

Justification that the internship's subject fits with the general theme of GRAL (3 lines):

The internship project is integrated from molecular structures to the whole organism thanks to a strong collaboration with researchers from IBS for structural biology (Contact David Cobessi) within a consortium financed by the ANR.

Relevant publications of the team (3 max):

- Pfannschmidt T, Blanvillain R, Merendino L, Courtois F, Chevalier F, Liebers M, Grübler B, Hommel E, Lerbs-Mache S. Plastid RNA polymerases: orchestration of enzymes with different evolutionary origins controls chloroplast biogenesis during the plant life cycle. J. Exp. Bot. (2015) 66(22): 6957-73 (Review)

- Blanvillain R. et al., (2011) Stress tolerance to stress escape in plants: role of the OXS2 zinc-finger transcription factor family. EMBO J. 30(18): 3812-22

- Steiner S. Schroter Y., Pfalz J., & Pfannschmidt T. (2011) Identification of Essential Subunits in the Plastid-Encoded RNA Polymerase Complex Reveals Building Blocks for Proper Plastid Development. Plant Phys. 157: 1-13