2022-2025 - PhD Project

Biogenesis of photosynthetic membranes: structural and dynamic role of galactolipid synthases

Photosynthesis is the process by which atmospheric CO2 “enters” the biosphere, producing glucose at the origin of all the organic molecules that make up living organisms. Light energy is captured by photosystems, inserted into photosynthetic membranes, called thylakoids, which form ‘solar panels’ stacked inside specific plant organelles, chloroplasts. Although photosystems have been studied for many years at the molecular level, **the mechanisms that govern the development of photosynthetic membranes, and their coordination at the cellular level, are still very poorly understood.** Enzymes are known, but how do they manage to produce such structured membranes with such dynamics? Our recent advances suggest membrane biogenesis by extremely rapid lipid phase transition.
The PhD project aims to better understand, from the molecular scale to its role in the plant, the functioning of a **primordial enzyme**, **MGDG synthase**, responsible for the **synthesis of a major lipid of chloroplast membranes, monogalactosyldiacylglycerol or MGDG**. This galactolipid, which constitutes nearly 50% of the lipids of thylakoid membranes, has particular physicochemical properties capable of creating lipid microdomains, which would form sites of predilection for the anchoring of MGDG synthase. Evidence show that this enzyme is regulated very finely by anionic lipids such as phosphatidic acid (PA). The project addresses two essential questions: 1/ What is the molecular mechanism of regulation by PA of MGDG synthase, and 2/ The importance of galactose for the properties of chloroplast membranes. The results that will be obtained will contribute to refining a model of biogenesis of photosynthetic membranes.

This is an **Integrative Cellular and Structural Biology** project. As such, the doctoral student will be trained in a very varied panel of techniques ranging from **structural biochemistry/enzymology to functional tests in planta**. The project involves two laboratories located at Grenoble: CERMAV (https://cermav.cnrs.fr/) and LPCV (https://www.lpcv.fr). The candidate will share the thesis time between the 2 laboratories and will be directly supervised by C. Breton and E. Maréchal. The two supervisors have been collaborating for more than 10 years on this subject of the role of galactolipids in the biogenesis of chloroplasts.

We are looking for highly motivated and competitive Master's degree holders with a background in the following fields: **biochemistry**, **molecular biology** and **bioengineering**.

This PhD project, starting October 2022, is funded by CBS Graduate School - University Grenoble Alpes.

Motivated candidates with a Master's degree should apply by providing:

- CV
- Cover letter
- Master's degree transcript
- Two letters of recommendation

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Applications (in French or English) must be sent by E-mail only until May 20, 2022. The candidates selected after pre-selection will be interviewed by a jury. The interview will take place in June.