Radek Kana`s group

Project name: Role of carotenoids in the thylakoid membrane structure and organization in cyanobacteria *Synechocystis PCC 6803* mutants

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For how many student/s: 1-2

Description of the project:

Synechocystis sp. 6803 is a unicellular non-nitrogen (N2)-fixing fresh water cyanobacterium. It has been one of the most popular organisms for genetic and physiological studies of photosynthesis for two major reasons; it is naturally transformable by exogenous DNA (Grigorieva and Shestakov 1982) and grows heterotrophically at the expense of glucose (Rippka et al. 1979). Therefore *Synechocystis sp. 6803* is proved to be very useful model organism for generation of site-directed single and multiple mutants due to its natural transformability and homologous recombination. The light reactions of oxygenic photosynthesis take place in thylakoid membranes that is specialized membrane system located in the stroma of chloroplast and cytoplasm of cyanobacteria (Los 2010). The structure of the main photosynthetic thylakoid membrane has been already described including their atomic structure for all of them as the Photosystem I (PSI) Photosystem II (PSII), light harvesting antennae, cytochrome b6f, chloroplast ATPase (Fromme 2008). In photosynthetic thylakoid membrane, light is captured by light-harvesting antenna complexes (phycobilisomes - PBS) and transferred into membrane embedded Photosystem I and II for further photochemical reactions. Carotenoids are involved as accessory light harvesting pigments (Croce & van Amerongen 2014, Stamatakis et al 2014) and they can be photoprotective especially when there is an excess of light (Schaeffer et al 2006, Cazzaniga et al 2012).

In the proposed project, we want to study role of carotenoids in the thylakoid membrane structure and organization. Experiments will be carried out with specific mutants affected in carotenoids composition and sub-cellular localization of PSI will be visualized by its fluorescence tagging by Yellow Fluorescence Protein (YFP). The final aim of the project is to characterize the structural and organizational changes in the thylakoid membrane due to different mutations. The student will learn different techniques including confocal microscopy (3D imaging), absorption spectroscopy, and methods for detection of cell physiology (e.g. cell growth curve) and molecular biology methods (e.g. clear native gel, SDS-page).

Requirements:

- Ability to speak and write in English
- Ability to data recording
- Cover letter which contains the motivation of the student