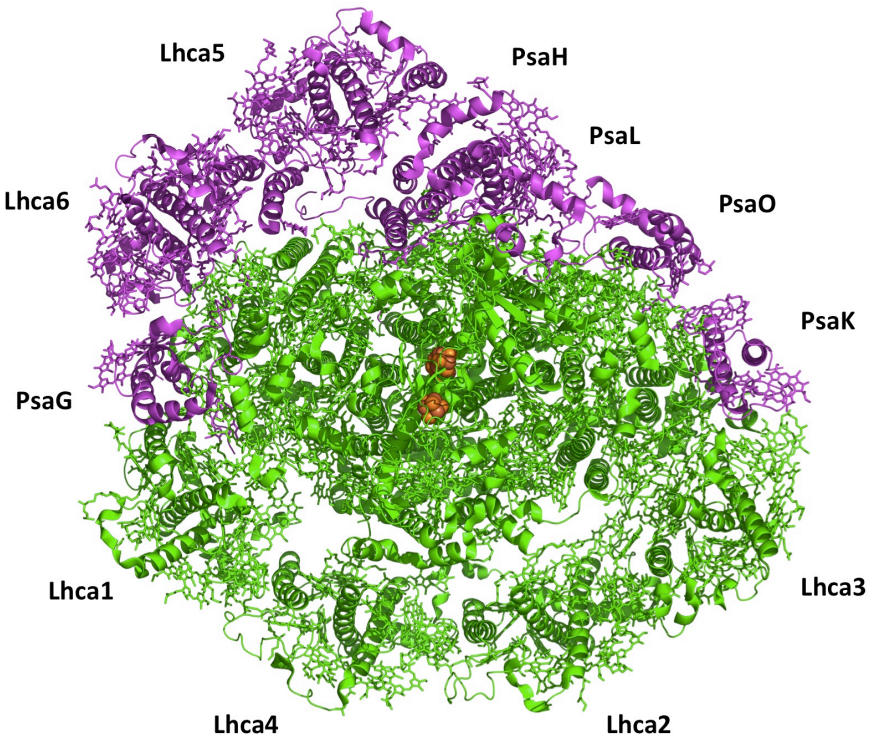
Activity Report –CM01 – 06 to 09 May 2019

We aim at solving the structure of temporal supercomplexes formed around Photosystem I (PSI) during steady state and under stress conditions by the cryo EM technique. The two first visits yielded two high-resolution structures of two distinct forms of Photosystem I (PSI) from the halotolerant green algae *Dunaliella salina*. We solved the crystal structure of this supercomplex at 3.2 Å resolution (manuscript submitted for publication). The second visit yielded structure at 3.5 Å resolution of a much larger form of PSI containing 8 additional subunits and about 40 additional prosthetic groups (manuscript in preparation; see figure).

The 3 days experiment excided all my expectations.



The structure of the large *Dunaliella* PSI supercomplex at 3.5 Å resolution. View from the stroma of the structure of Dunaliella large PSI supercomplex. The subunits that were present in the minimal structure are in green (Results of first visit-Submitted). The additional subunits are in magenta (Results of second visit- In preparation).

In the current experiment we attempted solving larger complex containing PSII together with PSI from the red algae C. *Merolae*. This red algae considered to be ancient organism representing the initial steps in the evolution of eukaryotic PSI. We collected about 3000 good movies at the ESRF cryo-EM facility with good quality resulted in the 2D and 3D classification indicating a novel structure (see the figure bellow). Thus ones again our session of collecting cryo-EM data in ESRF turned to be highly successful. We hope that the data will be sufficient to solve this novel structure to 3.2 Å or better. If not we would like to use the

grids stored in ESRF to collect additional data for getting improved structure. If the resolution will turn to be sufficient we would like to use the next session for solving the structure of very large PSI supercomplex from a temperature-sensitive mutant of *Chlamydomonas reinhardtii*. Accomplishment of this task will set the stage of solving structures of steps in the assembly of PSII recovered from the de novo synthesis of the supercomplex in the TSP4 mutant.