Project: Title

Grantee: Dimitar Valev
Affiliation + contact data: University of Turku, Finland
dimval@utu.fi

Period of STMS: 7.10.2015- 6.11.2015
Host institution (address): University of Southampton, UK
Mentor(s) (name and contact data): Professor Philip Gale
philip.gale@soton.ac.uk

Aims & subject of work :

The green algal carbon concentration mechanism, known from the model alga *Chlamydomonas reinhardtii*, contains an energy-dependent uptake mechanism that carries bicarbonate through the cell wall, plasma membrane and to the chloroplast. In the chloroplast, the mechanism is known to pump bicarbonate down to the lumen. In addition, the chloroplast stroma contains protein capsules called pyrenoids which contain the Rubisco enzyme. The actual mechanism of the *Chlamydomonas* mechanism is not clear. The objective of the STSM was to test the following mechanism: Stromal pH in the light is 8, lumenal is 6; Lumen contains carbonic anhydrase (CA), stroma does not contain; Bicarbonate pumped to lumen is converted to CO_2 which diffuses out to the stroma

Argumentation of necessity of STSM :

In order to test all the hypothesis we needed to construct artificial liposomes which would mimic the thylakoid membranes. Furthermore we needed special transporter molecules so we can pump the bicarbonate inside the artificial liposomes, where it will be converted to CO_2 by the Carbonic Anhydrase. The Chemical department in Southampton University is among the best in the field of inorganic transporter molecules as well as they have huge experience in liposome preparation. STSM provided the financial conditions for visiting their laboratories.

Workplan/timeschedule followed :

- Choise of correct transport molecule (1 week)
- Preparation of stable liposomes with carbonic anhydrase (1 week)
- Bicarbonate measurement assay and Nuclear Magnetic Resonance measurements (2 weeks)

Main results and outcome :

During the course of the visit we have managed to construct stable POPC liposomes with Carbonic Anhydrase. We have found selective transporter molecule to assist the antiport of HCO_3^- in exchange of Cl^- ions. The actual prove of our concept has not been reached due to lack of fast and reliable method for HCO_3^- and CO_2 quantification.