

## Transcriptional regulation and coordination of photosynthetic genes in the model cyanobacterium *Synechocystis*

Hernandez-Prieto M<sup>1</sup>, Semeniuk T<sup>1</sup>, Giner-Lamia J<sup>1</sup>, **Futschik M<sup>1</sup>**

<sup>1</sup>*Systems Biology and Bioinformatics Laboratory (SysBioLab), Center of Marine Sciences (CCMAR), University of AlgarveCCMAR - Center of Marine Sciences, University of Algarve, Faro, Portugal*

Miguel A. Hernandez-Prieto, Trudi Semeniuk, Joaquín Giner-Lamia, and Matthias E. Futschik

Systems Biology and Bioinformatics Laboratory (SysBioLab), Center of Marine Sciences (CCMAR), University of Algarve, Faro, Portugal.

We know in great detail structures and functions of the main structural components of photosynthesis, but our knowledge of the regulation of photosynthesis and its coordination with other cellular processes is still limited hindering an optimal usage in green biotechnology. Therefore, the substantial amount of expression data that has been accumulated for cyanobacterium *Synechocystis* sp. PCC6803 - an important photosynthetic model organism - provides unique opportunities to clarify how its photosynthetic apparatus adapts to environmental stresses, and how photosynthesis is co-regulated with other processes on a systems level. Although there exists differences between oxygen photosynthesis in plants, algae, and cyanobacteria, insights in its regulation in cyanobacteria can help us to gain a better general understanding of this important process.

Using CyanoEXpress (<http://cyanoexpress.sysbiolab.eu>), a database for *Synechocystis* transcriptome data, we examined the regulation of photosynthetic genes across a large variety of environmental conditions and abiotic stresses. Global clustering of expression data revealed strong co-regulation of genes constituting the photosynthetic apparatus. The observed co-expression enabled the prediction of novel genes involved in the photosynthetic capacity through “guilt by association” principle. Finally, network-based analyses indicated tight coordination of photosynthesis with various processes such ATP synthesis and translation.

### Reference:

Miguel Hernández-Prieto, Trudi Semeniuk, Joaquin Giner-Lamia and Matthias Futschik (2016) The Transcriptional Landscape of the Photosynthetic Model Cyanobacterium *Synechocystis* sp. PCC6803, *Scientific Reports* 6:22168