# Heterogeneous organization of cyanobacterial thylakoids – from microdomains to nanodomains

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Light photosynthetic reactions in thylakoid membranes (TM) are driven by pigment-protein complexes that require nanoscale interactions of pigments and micro-scale (co)localization of photosystems and light-harvesting antennas. These pigment-protein complexes are heterogeneously distributed between different TM areas in chloroplasts of higher plants (see the variability in PSI/PSII ratio between stromal/granal thylakoids) and also in cyanobacteria (see microdomains areas [1]). In fact, it has been suggested that the microdomains heterogeneity represents a functional and evolutional precursor of "grana-like" and "stroma-like" thylakoids in higher plants.

In the talk, we will explore our current understanding of microdomains importance in photosynthesis of cyanobacteria (*Synechocystis sp.* PCC 6803 – *PSI-YFP*). We will try to put attention to the stability of thylakoid membrane proteins on the microscale level (inside of microdomains; between 0.25 μm – 1 μm) in contrast the visible proteins "trafficking" on nanoscale level (between 100 nm – 250 nm) as it is visible by super-resolution microscopy. Additionally, the current data also indicates that TMs in cyanobacteria are highly structured inside of the single cell and between different cells. This is visible in the variable ratios of Photosystems (defined as microdomains) and in the variability of TM shapes (e.g. regular vs nodular TM structures, inner membrane structures) visible in electron and confocal microscopy pictures.

[1] A. Strašková, G. Steinbach, G. Konert, E. Kotabová, J. Komenda, M. Tichý, R. Kaňa, Pigment-protein complexes are organized into stable microdomains in cyanobacterial thylakoids, Biochimica et Biophysica Acta (BBA) - Bioenergetics, 1860 (2019).