Microdomain observation, detection, and quantification.

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Photosynthetic light reactions proceed in thylakoid membranes due to the activity of pigment–protein complexes. In plants, these complexes are heterogeneously distributed between membrane disc stacks called thylakoid grana and non-stacked membranes called stroma lamellae. In cyanobacteria, the thylakoid membrane is organized in a more uniform architecture. Nevertheless, also in cyanobacteria the photosynthetic complexes show a high degree of heterogeneity; these relatively newly described heterogeneous regions are called microdomains. Microdomains are characterized by specific ratios of Photosystem I, Photosystem II, and Phycobilisomes and they are visible as sub-micrometre sized areas with different fluorescence ratios under confocal microscope. Explaining relationships between complexes requires understanding of spatial co-localisation and temporal dynamics within the membrane. Recently we have been working on several methods that could allow us better understand the behaviour of the *Synechocystis* photosynthetic complexes. Methods include previously described PA-factor that represents the most abundant fluorescence ratio of PSI/PSII/PBS in each cell. More recently, we looked into the membrane structure and were able to find distinct shapes that are present in the relatively heterogeneous population of cells. By implementing a cell profile method, we were able to measure the distance of protein of interest relative to the thylakoid membrane. In addition, we segregated individual cells into inner and outer regions, cell centre and thylakoid, to track the dynamics of fluorescence in these separate regions. All of the aforementioned methods allow us to observe membrane dynamics in various environmental conditions, and thus better understand and explain mechanisms behind acclimating to them.