

Photosystem Segregation in Cyanobacterial Thylakoids

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Cyanobacteria are oxygenic photosynthetic prokaryotes that are the progenitors of the chloroplasts of algae and plants. Light harvesting is realized by a combination of membrane extrinsic and intrinsic pigment-protein complexes to harness light excitation over most of the visible spectral region. The structure and function of the individual constituents of the light-harvesting antenna and two photosystems are well known for some strains however, how these complexes are organized and distributed in to the thylakoid membrane is not known in detail.

Here, we have used a combination of hyperspectral confocal fluorescence microscopy and electron microscopy to investigate the organisms-wide distribution of pigments among several diverse members of cyanobacteria. Our results indicate a reoccurring theme of lateral heterogeneity of the two photosystems observed for most of the organisms studied. Moreover, analysis of a series of *Synechocystis* mutants where the phycobilisome antenna is progressively truncated revealed an adaptive strategy to balance the absorption capabilities of Photosystem I and II under light-limiting conditions. These results demonstrate the noteworthy modulation and plasticity of cyanobacterial thylakoids not observed previously.

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