Single molecule spectroscopy reveals secret dynamics of phycobilisomes

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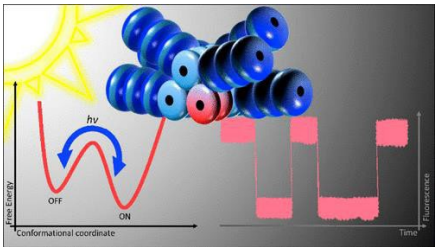

Figure 1. When illuminated, phycobilisomes switch between different states of emission.

Introduction: In many strains of cyanobacteria, pigment-protein complexes called phycobilisomes (PBs) work as the photosynthetic antennae, i.e., absorb light and transfer excitations to the photosystems. The optical properties of pigments are dynamically tuned bythe protein matrix. This tuning is vital for the survival of the photosynthetic organisms under constantly changing environmental conditions.

Methodology: Isolated PBs of *Synechocystis* PCC6803 were characterised using single molecule fluorescence spectroscopy excitation with 594 nm pulsed laser light.

Results and Discussion: Our study revealed the light-induced spectroscopic dynamics of PBs,which do not involve interactions with other proteins [1,2,3]. Switching between thermal energy dissipative and light-harvesting states involves a conformational change [1]. We have also investigated the main cyanobacterial photoprotective mechanism, involving the orange carotenoid protein (OCP) [4]. By controlling the interaction between individual PBs and singleOCPs, we revealed an intermediate state of energy quenching signifying the docking of OCPon a PB. In this intermediate state, some of the rods temporarily disconnect from the core and a hidden red state is exposed [4]. Not all hidden states of PBs are quenched [5]. The isolated rods of PBs can assume two different spectral states, both of which are possibly involved in energy transfer [5].

References:
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