סמינר כימיה פיסיקלית ואנליטית

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נושא:

CYANOBACTERIAL PHOTOSYNTHESIS: FROM PHOTOPROTECTION TO SOLAR CELLS

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ההרצאה תתקיים בחדר הסמינרים הפקולטי

CYANOBACTERIAL PHOTOSYNTHESIS: FROM PHOTOPROTECTION TO SOLAR CELLS

Photosynthetic organisms utilize solar energy to sustain themselves in ever-changing natural conditions. The photosynthetic process is initiated by solar energy harvesting, supported by designated antenna complexes. The role of the antenna is to widen the spectrum of absorbed light and transfer and orient this excitation energy towards the photosynthetic reaction centers, where electrons are then excited and eventually used for atmospheric carbon fixation and metabolism. Cyanobacteria are oxygen-evolving photosynthetic prokaryote organisms, which were first to exploit water as the primary source of light-dependent electron transfer. In the case of cyanobacteria, the light harvesting complex is the phycobilisome, which is a gigantic, chromophore (dye)-binding, protein complex. In the work that I will present, both fundamental and applicational endeavors will be discussed, emphasizing the uniqueness and intriguing nature of the phycobilisome complex from complementary perspectives:

1. How do cyanobacteria protect itself against high light irradiation, a process which leads to over-excitation of reaction centers, which can generate deleterious reactive oxygen species1,2,3?

2. Can we use the naturally occurring photosynthetic machinery to construct a bio-based anodic half-cell, that takes advantage of all the desired features nature has evolved4?

To address these non-trivial questions, we have combined multiple approaches, including X-ray crystallography, LC-MS/MS bioinformatic analysis, mutagenesis, small angle X-ray scattering, molecular dynamics, electrochemistry and several spectroscopic techniques.

References

1. Harris, Dvir, et al. "Orange carotenoid protein burrows into the phycobilisome to provide photoprotection." Proceedings of the National Academy of Sciences 113.12 (2016): E1655-E1662.

2. Harris, Dvir, et al. "Structural rearrangements in the C-terminal domain homolog of Orange Carotenoid Protein are crucial for carotenoid transfer." Communications biology 1.1 (2018): 125.

3. Harris, Dvir, et al. "from dimer to dimer – atomistic mechanism for carotenoid encapsulation by orange carotenoid protein natural homologs" in final stages of preparation.

4. Harris, Dvir, et al. "Closing the green gap – improvement of a photosystem 2 based bio-photoanode utilizing inter-species phycobilisome interaction." in final stages of preparation.