ΠΑΝΕΠΙΣΤΗΜΙΟ ΙΩΑΝΝΙΝΩΝ
ΣΧΟΛΗ ΘΕΤΙΚΩΝ ΕΠΙΣΤΗΜΩΝ
ΤΜΗΜΑ ΦΥΣΙΚΗΣ

ΟΜΙΛΙΑ
ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

Dr. Stefano Santabarbara

Senior Researcher at Institute of Agricultural Biology and Biotechnology, National Research Council of Italy (CNR), Milan, Italy.

«Excited state energy and electron transfer dynamics in Photosystem I of oxygenic photosynthesis»

Παρασκευή 14 Ιουνίου 2024, ώρα 11:00π.μ.
Αίθουσα Σεμιναρίων Τμήματος Φυσικής
Βιβλιοθήκη - κτίριο Φ2 - 3ος Όροφος

ABSTRACT

Photosystem I (PSI) is a large macromolecular cofactor-protein super-complex, that is an integral and fundamental actor in the electron transport chain of oxygenic photosynthesis. The PSI super-complex is composed of over 15 protein subunits and binds an excess of one hundred cofactors of different chemical nature. The most abounds cofactor is, in most cases, Chlorophyll (Chl) *a*, which has both the function of absorbing the incident photon in an extended light harvesting network and converting them into a charger-separated radical pair state through photochemical reactions that occurs in a specialised compartment of the photosystem known as the reaction centre (RC). Photosystem I has some peculiar characteristics that makes it interesting as a model system beside its fundamental biological role. In the first place, the quantum yield of conversion of absorbed photons is very high, approaching unit. This indicates that, although a very large network of light harvesting chromophores (100-200 molecules per RC) are present in this system, the losses in the excited state delivery to the photochemical centre are minimized. Secondly the light harvesting network contains energy states which have a lower energy than the reaction centre; hence the high photochemical yield is maintained even in place of an energetically unfavorable “uphill” energy transfer which has the benefit of extending the absorption cross section in the far-red/near infrared region. Furthermore, differently from all other known photosynthetic RC, in PSI two parallel electron transfer chain are active in charge separation and charge stabilization reactions, according to the so-called bi-directional electron transfer mechanism. This peculiar photochemical process might be at the basis for the high photochemical efficiency and robustness in the light harvesting network, especially considering the special-yet-intriguing case of recently discovered organisms in which Chl *a* is substituted by the intrinsically low-energy Chlorophylls *d* and *f*. The presentation will discuss some of the functional features of PSI, including excited state transfer dynamics, photochemistry and mechanism of electron transfer, for the canonical Chl a-binding super-complex as well as in the less well understood Chl *d*-binding complex.