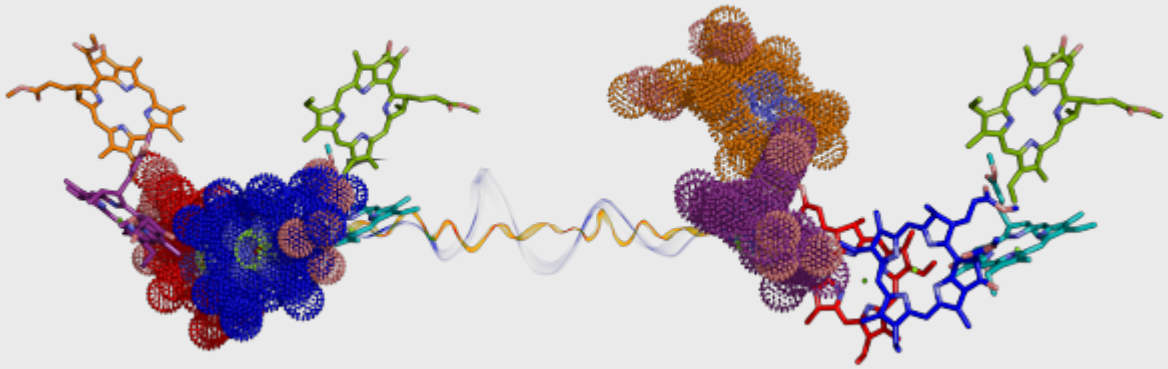
The Quantum Design of Photosynthesis for Bio-Inspired Solar-Energy Conversion



Title: The Quantum Design of Photosynthesis for Bio-Inspired Solar-Energy Conversion.
When: Wednesday, June 13, (2018), 12:00.
Place: Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th Floor).
Speaker: Elisabet Romero, The Institute of Chemical Research of Catalonia (ICIQ), Tarragona, Spain.

Photosynthesis holds the key to the efficient use of solar energy using abundant and renewable materials. At the heart of Photosynthesis, the pigment-protein complex photosystem II reaction center (PSII RC), performs charge separation with near unity quantum efficiency despite its highly disordered energy landscape, and thus converts sunlight to electrochemical energy.

To achieve this amazing feat, the PSII RC exploits The Quantum Design Principles of Photosynthetic Charge Separation1-2, complementary and interrelated solutions to ensure rapid forward and irreversible transfer of energy and electrons within a disordered and fluctuating environment. Thus, these principles provide a guide for the rational design and construction of systems able to transfer energy and electrons with high efficiency and in the right direction. In this talk, I will present these principles with a focus on the role of vibronic coherence and discuss my view on how to implement coherence in bio-inspired systems with the potential to perform efficient energy and electron transfer.

References

Romero, E., Augulis, R., Novoderezhkin, V. I., Ferretti, M., Thieme, J., Zigmantas, D. & van Grondelle, R. Quantum coherence in photosynthesis for efficient solar-energy conversion. Nat. Phys. 10, 676-682 (2014).

Romero, E., Novoderezhkin, V. I. & van Grondelle, R. Quantum design of photosynthesis for bio-inspired solar-energy conversion. Nature 543, 355-365 (2017).