Can long-range quantum coherence exist in a self-assembled biological light harvesting ordered aggregate? | 12AGS	**Start date: October 2016**
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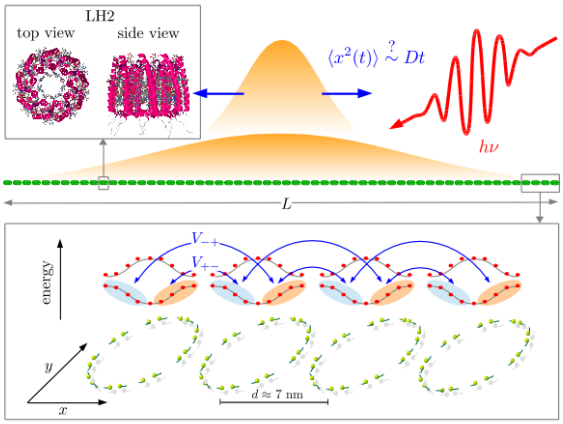

Abstract: Excitation energy transfer in biological light-harvesting systems spans a wide range of time-scales, with a description that makes use of coherent and incoherent frameworks: coherent formulations are of importance in order to account for observables within single complex of tightly-bound chromophores, and results in a characterization useful to obtain classical rates relevant for long-range transfer. However, fluorescence imaging experiments performed on quasi-1D synthetic arrays of bacterial LH2 complexes suggest that long-range inter-complex transfer occurs two orders of magnitude faster than expected from the classical description. This observation challenges our current understanding based upon excitonic relaxation rates measured in natural complexes and underlines that a non-trivial phenomenon is likely occurring in these biomimetic systems. We find that a compromise between unitary dynamics and a slower dephasing than that observed in natural structures is required in order to reproduce the observed diffusion. Starting from a microscopic model for the LH2 complexes, our work has explored numerically several scenarios that could hinder inter-complex dephasing in these synthetic systems, among others, spatial correlations in the environment. The current results highlight the requirement of a delicate balance between dephasing high enough in order to overcome local minima, but low enough to boost the unitary propagation, while it sets lower bounds to the inter-complex coupling imposing a lower limit to the complexes' packing density in these artificial structures.

Recent results:	**Publications:**
Invited conference talks by Plenio at the 19th IUPAB congress and 11th EBSA congress, Edinburgh, UK, 16th – 20th July 2017; at the at the Heraeus Workshop on Non-Markovianity and Strong Coupling Effects in Thermodynamics, Bad Honnef, Germany, 10th – 14th April 2017 and at the QuEBS'17, Jerusalem, Israel, 26th – 29th March 2017. *Poster presentations* by Mattioni at the QuEBS'17, Jerusalem, Israel, 26th – 29th March 2017. *Oral Presentation* by Eisenberg at the QuEBS'17, Jerusalem, Israel, 26th – 29th	I. Eisenberg, F. Caycedo-Soler, D. Harris, S. Yochelis, S.F. Huelga, M.B. Plenio, N. Adir, N. Keren, and Y. Paltiel. *Regulating the Energy Flow in a Cyanobacterial Light-Harvesting Antenna Complex.* J. Phys. Chem. B **121**, 1240 – 1247 (2017)

Further Collaborators:
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