**EPFL SB ISIC PCHEM Seminar guest speaker Prof. Gabriela Schlau-Cohen, Thursday, 6th May 2021, 17:15 CEST**

**An exciton in a complex world: Environment-controlled photophysics in light harvesting**

Excitons are the molecular scale currency of electronic energy. Control over excitons and their dynamics enables energy to be directed and harnessed for light harvesting and molecular electronics, yet these dynamics strongly depend on the surrounding environment. Describing – and controlling – this dependence is challenging in condensed phase systems due to the large number of degrees of freedom. We disentangled the effects of the environment in two systems. First, in the primary antenna protein in green plants, LHCII, we performed ultrabroadband 2D electronic spectroscopy and found that two chemically identical carotenoids bound within different protein pockets perform distinct roles. On one carotenoid, we identified a debated dark state that mediates exciton relaxation to collect absorbed energy from the higher lying electronic states, serving as a nexus of light harvesting [*Chem*, 2019]. On the other, we directly measured exciton transfer into its short-lived S1 state, a hypothesized but previously unobserved pathway to safely dissipate excess excitons, regulating absorbed energy [*Nature Commun*, 2020]. Second, in a synthetic system constructed from chromophores held in a DNA scaffold, we varied the efficiency of exciton transfer by changing the scaffold while the chromophores and the distance between them remained the same. In a more rigid environment, subpopulations decreased the efficiency. Conversely, in a more flexible environment, these subpopulations were averaged over, increasing transport efficiency. These results illustrate how rapid fluctuations can, instead of disrupting a process of interest, actually enhance it [*Chem*, 2021]. Collectively, these two systems provide an experimental demonstration of how the environment can control exciton dynamics.