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Using quantitative fluorescence correlation spectroscopy to study aggregation of the main photosynthetic antenna of plants

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Oxygenic organisms are capable of tuning their photosynthetic capacity on many different timescales to adapt to their environment. As such, they switch on photoprotective mechanisms to harvest solar energy with robust adaptability. Studying these mechanisms at the molecular level gives insight into how solar energy harvesting can sustain life on earth and which design principles can be used to improve man-made solar energy devices.
Photosynthetic antennae are pigment-protein complexes that absorb sunlight and transfer the energy towards reaction centres in photosystems. These complexes exhibit fast heat-dissipative processes that protect them from photo-induced chemical bleaching. In higher plants, aggregation of these complexes amplifies heat dissipation, a process triggered by a lowering of the pH on the inner side of thylakoid membranes.

This presentation will describe a home-built fluorescence correlation spectroscopy setup and its use to study freely diffusing light-harvesting complexes of plants *in-vitro* at varying detergent concentration levels and pH levels. We will focus on the dynamics of the main plant light-harvesting complex, LHCII. Varying sizes of LHCII aggregates were investigated and their fluorescence lifetimes were obtained, allowing a direct comparison of aggregate sizes with quenching rates. In addition, we will show how triplet state lifetimes can be resolved through this technique on freely diffusing and immobilised single complexes.

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