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Using single-molecule spectroscopy methods to investigate the environmental dependencies of photoprotection in the main plant light harvesting complex.

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Abstract content
   (Max 300 words)
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The fundamental mechanisms involved in photosynthesis not only provide an opportunity to study physical principles that span over both classical and quantum physics but also take us a step closer to the development of viable alternative energy sources such as cheaper biofuel production and more effective photovoltaics. Some of said mechanisms play a critical role in the photoprotection of oxygenic photosynthetic organisms against high light intensities and are generally referred to as non-photochemical quenching (NPQ). Our interest is in the fast, reversible, energy-dependent component of NPQ that takes place in the major light-harvesting pigment-protein complex (LHCII) of plants. By introducing a low solvent pH the photoprotective state of isolated LHCII proteins is triggered. A study of this emulated photoprotection is made by using Single Molecule Spectroscopy (SMS). The fluorescence lifetime of LHCII are determined by using time-tagged time-resolved (TTTR) measurements, which in turn serves as measurement of NPQ. Time resolved fluorescence intensity also allows for the investigation of fluorescence intermittency. In an attempt to remove unnatural influences on the emulated photoprotection isolated LHCII would rather be followed in free diffusion through single particle tracking (SPT) as opposed to the traditional surface adhesion method. For this purpose we have assembled a unique SMS setup, where isolated LHCII complexes will be followed in real-time with parallel fluorescence measurements being made. The first results of photoprotection on the level of a single biological entity using our novel approach will be shown.

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Tjaart Krüger
Tjaart.Kruger@up.ac.za
University of Pretoria

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Primary author: Mr BOTHA, Joshua (University of Pretoria)

Co-authors: Mr STOLTZ, Herman (University of Pretoria); Mr GRUBER, Michael (Vrije Universiteit of Amsterdam); Dr KRÜGER, Tjaart (University of Pretoria)

Presenter: Mr BOTHA, Joshua (University of Pretoria)

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