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Beller Lectureship Talk: Ultrafast Excitation Energy Transfer and the Mechanism of Non-Photochemical Quenching in Plant Photosynthesis
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The success of photosynthesis relies on two ultrafast processes: excitation energy transfer in the light-harvesting antenna followed by charge separation in the reaction center. LHCII, the peripheral light-harvesting complex of Photosystem II, plays a major role. At the same time, the same light-harvesting system can be 'switched' into a quenching state, which effectively protects the reaction center of Photosystem II from over-excitation and photodamage. In this talk I will demonstrate how LHCII collects and transfers excitation energy. Using single molecule spectroscopy we have discovered how LHCII can switch between this light-harvesting state, a quenched state and a red-shifted state. We show that the switching properties between the light-harvesting state and the quenched state depend strongly on the environmental conditions, where the quenched state is favoured under 'NPQ-like' conditions. It is argued that this is the mechanism of non-photochemical quenching in plants.