**Adventure Photosynthesis**

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In science, Nature serves as a model for amazing technological developments in many fields. These include photosynthesis, which could play a major role in new approaches for energy supply in the near future. However, the fundamental process that produces oxygen and glucose from light, water and carbon dioxide in plants has not yet been deciphered in all details. In particular, the mechanism of light-driven oxidative water-splitting in the key enzyme photosystem II (PSII), which is responsible for the release of atmospheric oxygen essential for life, has not yet been fully elucidated.

The big adventure began about 20 years ago by the first X-ray structural analysis on oxygen-active PSII crystals (Zouni et al, Nature, 2001). In the last decade, further milestones in the elucidation of the water splitting mechanism have been achieved in the framework of an international collaboration. Here, ultra-short X-ray laser pulses were used to take atomic snapshots of PSII during the water splitting reaction. These insights could be the basis for the development of artificial light-driven water splitting catalysts.