Neutron diffraction sheds light on photosynthesis

September 2 2014

Scientists from ILL and CEA-Grenoble have improved our understanding of the way plants evolved to take advantage of sunlight. Using cold neutron diffraction, they analysed the structure of thylakoid lipids found in plant leaves where photosynthesis takes place. These light-sensitive membranes cover an enormous surface area, with several hectares being present in every square metre of leaf.

The thylakoids present in plants and algae are remarkable in possessing a unique lipid composition which is not replicated by any other cellular membrane. The conservation of this composition across all plants throughout millennia of evolution has led scientists to speculate as to its role in the structure of thylakoids and its significance for the photosynthetic process.

In order to better understand this question, scientists extracted the lipids found in spinach leaves in order to observe the structure that emerged when they were recombined. The cold neutron diffractometer D16 allowed them to obtain good quality images for scales at the angstrom and tens of angstrom scales they required.

In their results, published in the *FASEB Journal* this month, Demé and his colleagues reveal that lipids do indeed play a central role in determining the structure of photosynthetic membranes. Their paper suggests that the dense lamellar stacking of thylakoid bilayers is due to the presence of hydrogen bonds which stick the membranes together across layers of water – a discovery which opens the door to a deeper

understanding of photosynthesis in plants.

More information: Bruno Demé, Céline Cataye, Maryse A. Block, Eric Maréchal, and Juliette Jouhet. "Contribution of galactoglycerolipids to the 3-dimensional architecture of thylakoids." *FASEB J* August 2014 28:3373-3383; published ahead of print April 15, 2014, DOI: 10.1096/fj.13-247395

Provided by Institut Laue-Langevin