## Photosynthesis in 3D

**Photosynthesis in 3D**<br />So far, researchers who wanted to observe tiny structures inside of cells had to use traditional electron microscopy. However, this method requires several preparation steps that damage cellular structures and limit the resolution and accuracy of the images. By using cryo-electron tomography, Wolfgang Baumeister and his team are able to avoid these steps by rapidly freezing the cells. Moreover, this allows them to visualize the internal architecture of cells in a close-to-living state. Using this technique, the scientists investigated the three dimensional structures of chloroplasts in the alga Chlamydomonas, shedding new light on their assembly and function.<br />Two spatially separated reactions take place during photosynthesis: while energy is harvested from sunlight in compartments called the thylakoids, carbon dioxide is fixed to form sugar molecules in a compartment called the pyrenoid. It was not understood how these processes could be coordinated. The new 3D images revealed the detailed structures of tubules that connect the pyrenoid with the thylakoids, providing conduits for the diffusion of energy molecules and sugars between these two separated parts of the chloroplast (see figure).<br />Besides the fact that there are connections between the two reaction compartments, the scientists were also able to show how the thylakoids receive new proteins and how the photosynthesis enzymes are organized: "In the pyrenoid, there are many units of the photosynthesis enzyme RuBisCO", explains Benjamin Engel, scientist at the MPI of Biochemistry. "Our results show for the first time that these units are packed in a hexagonal arrangement." In the future, the authors aim to elucidate how this RuBisCO organization is formed and whether more proteins are involved. [HS]<br />Original publication:<br />Engel B, Schaffer M, Kuhn Cuellar L, Villa E, Plitzko JM and Baumeister W: Native Architecture of the Chlamydomonas Chloroplast Revealed by In Situ Cryo-Electron Tomography. eLife, January 13, 2015.<br />DOI: 10.7554/eLife.04889<br /><br />Contact:<br />Prof. Dr. Wolfgang Baumeister<br />Molecular Structural Biology<br />Max Planck Institute of Biochemistry<br />Am Klopferspitz 18<br />82152 Martinsried<br />Germany<br />E-Mail: baumeist@biochem.mpg.de<br /> www.biochem.mpg.de/baumeister <br />Anja Konschak<br />Public Relations<br />Max Planck Institute of Biochemistry<br />Am Klopferspitz 18<br />82152 Martinsried<br />Germany<br />Phone: +49 89 8578-2824<br />E-Mail: konschak@biochem.mpg.de <br /> www.biochem.mpg.de <br /><img src="http://www.pressrelations.de/new/pmcounter.cfm?n_pinr_=585902" width="1" height="1">

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Proteine sind die molekularen Bausteine und Motoren der Zelle und an fast allen Lebensprozessen beteiligt. Die Wissenschaftler am Max-Planck-Institut für Biochemie (MPIB) untersuchen die Struktur und Funktion von Proteinen ? von einzelnen Molekülen bis hin zu komplexen Organismen. Mit ungefähr 850 Mitarbeitern aus 45 verschiedenen Nationen ist das MPIB eines der größten Institute innerhalb der Max-Planck-Gesellschaft. In derzeit acht Abteilungen und rund 25 Forschungsgruppen tragen die Wissenschaftler zu den neuesten Erkenntnissen in den Bereichen Biochemie, Zellbiologie, Strukturbiologie, Biophysik und Molekularwissenschaft bei. Bei ihrer Arbeit werden sie von verschiedenen wissenschaftlichen, administrativen und technischen Serviceeinrichtungen unterstützt.