

**Title Mechanism of light-induced water-splitting  
in natural photosynthesis**

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**Date & Time** Friday, August 29, 2014 4:00 p.m.

**Place** I<sup>2</sup>CNER Hall, Ito campus, Kyushu University

**Abstract**

Photosynthetic water-splitting generates electrons, protons, and oxygen, which are the sources for energy and oxygen indispensable for maintaining almost all life forms on the earth. This reaction is catalyzed by photosystem II (PSII), a large membrane-protein complex consisting of 20 subunits with a total molecular mass of 350 kDa for a monomer. The crystal structure of PSII was solved at 1.9 Å resolution, revealing a clear picture of the catalytic center, a  $Mn_4CaO_5$ -cluster, for photosynthetic water-splitting, which was organized into a distorted chair form. This feature of the distorted shape suggested a remarkable flexibility in the structure, which would be needed for structural changes expected to occur during the catalytic water-splitting cycle (S-state cycle). Based on the high-resolution crystal structure as well as results obtained from a number of other techniques, the mechanism of photosynthetic water-splitting is emerging which may have important consequences on the design and synthesis of artificial catalysts for light-induced water-splitting. I will introduce the structure of photosystem II and the water-splitting catalyst and discuss the possible mechanism for photosynthetic water-splitting.

**About the Speaker**

Prof. Jian-Ren Shen received his B.S. degree from Zhejiang Agricultural University (now Zhejiang University) in China and Ph. D degree from The University of Tokyo in Japan (1990). During 1990-2003, he worked in RIKEN as a research scientist and senior research scientist on the structure and function of photosystem II (PSII). He moved to Okayama University as a professor in 2003, continuing his research on the structure and function of PSII. In 2011, he succeeded with his colleagues on the high-resolution crystal structure analysis of PSII, revealing the detailed structure of  $Mn_4CaO_5$ -cluster, the catalytic center for water-splitting. This achievement was selected as one of the 10 breakthroughs of 2011 by the journal Science, and he has received several awards including the Asahi Award and a special award of the Japanese Photosynthesis Society. He is now the director of Photosynthesis Research Center at Okayama University.

**Host: Associate Professor Ki-Seok Yoon**

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