# SMS Spring 2025 O'Keeffe Lecture Seminar


**Gary Brudvig, PhD**

Professor
Department of Chemistry
and Energy Sciences
Institute
*Yale University*


***"Learning from Nature How to Make Solar Fuels"***

**Friday, February 28, 2025**
**3:00 PM**
**Biodesign Auditorium**


***Photosystem II (PSII) uses light energy to split water into protons, electrons and oxygen. In this reaction, Nature has solved the difficult chemical problem of efficient four-electron oxidation of water to yield O2 without significant side reactions. In order to use Nature's solution for the design of materials that split water for solar fuel production, it is important to understand the mechanism of the reaction. The X-ray crystal and cryo-electron microscopy structures of cyanobacterial PSII provide information on the structure of the Mn and Ca ions, the redox-active tyrosine called tyrosine-Z, chloride and the surrounding amino acids that comprise the oxygen-evolving complex (OEC). The structure of the OEC in the intermediate oxidation states of the catalytic cycle, the binding of substrate water molecules to the OEC and the water oxidation chemistry of PSII will be discussed in the light of biophysical, spectroscopic and computational studies, inorganic chemistry, and structural information from X-ray crystallography and cryogenic electron microscopy. These insights on the natural photosynthetic system are being applied to develop bioinspired materials for photochemical water oxidation and solar fuel production. Our progress on the development of synthetic water and ammonia oxidation catalysts and their use in materials for artificial photosynthesis will be discussed.***


**Gary Brudvig, a graduate of the University of Minnesota, earned his Ph.D. at the California Institute of Technology and joined the Yale faculty in 1982. He is a professor in the Department of Chemistry, Molecular Biophysics and Biochemistry, and serves as the Director of the Energy Sciences Institute. He is also affiliated with the Yale Center for Green Chemistry.**

**Professor Brudvig leads a research team focused on improving solar energy efficiency, specifically by developing a system to produce renewable fuel using manganese complexes and titanium dioxide nanoparticles. He has received several honors, including being a Searle Scholar (1983-1986), a Camille and Henry Dreyfus Teacher Scholar (1985-1990), and an Alfred P. Sloan Research Fellow (1986-1988). In 1995, he was elected to the American Academy of Arts and Sciences.**

**ZOOM Available:** https://asu.zoom.us/j/82848108365

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