THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT
FALL COLLOQUIUM SERIES PRESENTS:

Fine Lecture

Professor Harry Atwater

Chair of the Division of Engineering and Applied Science,
Professor of Applied Physics and Materials Science
CalTech

Three Grand Challenges for Photonics and Energy

Photonics and energy sciences are yielding advances that can open paths for conceptually new energy conversion technologies. I will discuss three such "grand challenge" pathways. A first is tailoring nonreciprocity and harnessing optical coherence from the apparently incoherent emission of thermal radiation and luminescent emitters, for thermal energy management. A second challenge is that of generating chemical fuels from sunlight, suitable for aviation and heavy transport use, from advances in photoelectrochemical water splitting and carbon dioxide reduction. This requires new approaches to solar fuels systems design with tandem reactions to achieve chemical selectivity for complex multicarbon products. The third challenge is space solar power, powered by ultralight, inexpensive photovoltaics. Space solar power technology can potentially enable generation of dispatchable, baseload solar electricity that doesn't exhibit the intermittency of conventional solar photovoltaic systems, enabling solar power generation during both daytime and nighttime. I will describe the materials science challenges which must be met to enable scalable ultralight photovoltaic space power systems.

Harry Atwater is the Otis Booth Leadership Chair of the Division of Engineering and Applied Science, and the Howard Hughes Professor of Applied Physics and Materials Science at the California Institute of Technology. Atwater's scientific effort lies at the junction energy conversion processes and nanoscale light-matter interactions. His current research in energy centers on high efficiency photovoltaics, photoelectrochemical processes for generation of solar fuels, and carbon capture and removal. His research has resulted in world records for solar photovoltaic conversion and photoelectrochemical water splitting. Atwater was an early pioneer in nanophotonics and plasmonics; he gave the name to the field of plasmonics in 2001. His current research also spans fundamental phenomena in nanophotonics, low-dimensional materials and plasmonics. Currently Atwater directs the Liquid Sunlight Alliance (LiSA), a Department of Energy Hub program for solar fuels, and is a PI of the Caltech Space Solar Power Project. Atwater is a Member of US National Academy of Engineering, and a Clarivate Highly Cited Researcher from 2014-2026. He is the recipient of numerous awards, including the von Hippel Award of the Materials Research Society. He is also a Fellow of the APS, MRS, Optica, SPIE, and the National Academy of Inventors. He is also the founding Editor in Chief of the journal ACS Photonics. Atwater is also founder of 6 early-stage companies, including Captura (scalable carbon dioxide removal from oceanwater), and Alta Devices, (world records for photovoltaic cell and module efficiency) and AHP Systems (space solar power).

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Reception to immediately follow in the Willens Wing Atrium

In person only; no Zoom

Questions? Contact allison.macknick@northwestern.edu

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