

# THE DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING SPEAKER SERIES

**PRESENTS**



## **Trip the Light Fantastic**

**Dr. Harry A. Atwater**

California Institute of Technology

**Monday, November 14, 2022, 10:00 AM (Houston Time)**

**ZOOM meeting room (Meeting ID: 976 269 9678 | Passcode: K91Bwy):**

<https://zoom.us/j/9762699678?pwd=RUp5ZmN3cHUyQ1FvUEExVQjVsc1hVUT09>

## **LECTURE ABSTRACT**

Research in nanophotonics, the science of light-matter interactions below the optical wavelength scale, is yielding advances that are opening conceptually new scientific directions and paths toward “grand challenge” photonic technologies. I will discuss three examples. A first grand challenge is generation of chemical fuels from sunlight, for which nanophotonic structures have enabled advances in photoelectrochemical water splitting and carbon dioxide reduction. The second challenge is realization of comprehensively tunable active metasurfaces, which are nanoantenna arrays that enable dynamic, active control of the constitutive properties of light – amplitude, phase, wavevector and polarization – opening new applications such as phased-array optical beam steering, visible light modulation for communication and thermal radiation management. A final grand challenge for nanophotonics is to harness laser light for optical propulsion, yielding optically driven spacecraft capable of reaching beyond our solar system. I will discuss our work in the Breakthrough Starshot initiative, which is aimed at identifying the science advances needed for light-driven spacecraft, with the audacious goal to reach nearby stars within a human lifetime, allowing us to trip the light fantastic.

## **SPEAKER BIOSKETCH**

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. Currently he is the Director for the Liquid Sunlight Alliance (LiSA), a Department of Energy Hub program for solar fuels. Atwater’s scientific effort focuses on nanophotonic light-matter interactions and solar energy conversion. His current research in energy centers on high efficiency photovoltaics, carbon capture and removal, and photoelectrochemical processes for generation of solar fuels. His research has resulted in world records for solar photovoltaic conversion and photoelectrochemical water splitting. His work also spans fundamental nanophotonic phenomena, in plasmonics and 2D materials, and also applications including active metasurfaces and optical propulsion.

From 2014-2020, Atwater served as Director of the Joint Center for Artificial Photosynthesis (JCAP), the DOE Energy Innovation Hub for solar fuels. Atwater was an early pioneer in nanophotonics and plasmonics; he gave the name to the field of plasmonics in 2001. Atwater is a Member of US National Academy of Engineering, and a Web of Science Highly Cited Researcher. He is also founder of 5 early-stage companies, including Captura, which is developing scalable approaches to carbon dioxide removal from oceanwater, and Alta Devices, which set world records for photovoltaic cell and module efficiency. He is also a Fellow of the SPIE as well as APS, MRS, Optica, and the National Academy of Inventors. He is also the founding Editor in Chief of the journal ACS Photonics, and Chair of the LightSail Committee for the Breakthrough Starshot program. He is the recipient of numerous awards, including the 2021 von Hippel Award of the Materials Research Society.

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