

Winter 2019 Joint Colloquium Graduate Students for Diversity in Science & the Materials Department

Dean Emily Carter

Dean, School of Engineering and Applied
Science

Gerhard R. Andlinger Professor in Energy
and the Environment
Princeton University

Friday, February 8th, 2019

11:00 am, ESB 1001



Sustainable Energy Materials from First Principles

I believe that we scientists and engineers have a responsibility to use our skills to improve life for all Earth's inhabitants. To this end, for the past dozen years, I have used my skills - in developing and applying quantum mechanics simulation methods aimed at complex phenomena difficult to probe experimentally - to help accelerate discovery, understanding, and optimization of materials for sustainable energy conversion processes. These range from materials for converting sunlight and other renewable energy sources to fuels and electricity, to biodiesel fuels, to clean electricity production from solid oxide fuel cells and nuclear fusion reactors, to lightweight metal alloys for fuel-efficient vehicles. During this talk, I will focus on potential technological advances in materials science, nanoscale optics, and electrochemistry that could someday create a virtuous cycle, exploiting energy from sunlight and molecules in air, water, and carbon dioxide to synthesize the fuels and chemicals needed to sustain future generations.

Bio

Emily A. Carter is the Gerhard R. Andlinger Professor in Energy and the Environment, Professor of Mechanical and Aerospace Engineering and Applied and Computational Mathematics, and Dean of the School of Engineering and Applied Science. In her research, Carter develops and applies quantum mechanics based computer simulation tools to enable discovery and design of molecules and materials for sustainable energy, including converting sunlight to electricity; producing chemicals and fuels from renewable energy, carbon dioxide, and water; and optimizing liquid metal alloys for future fusion reactor walls. The author of nearly 400 publications, Carter has delivered over 500 invited and plenary lectures worldwide and serves on advisory boards spanning a wide range of disciplines. She is the recipient of numerous honors, including election to the U.S. National Academy of Sciences, the American Academy of Arts and Sciences, and the U.S. National Academy of Engineering. She broke the glass ceiling on several major prizes, including the 2017 Irving Langmuir Prize in Chemical Physics from the American Physical Society and the 2018 Award in Theoretical Chemistry from the American Chemical Society. Carter received her B.S. in Chemistry from UC Berkeley in 1982 (graduating Phi Beta Kappa) and her Ph.D. in Chemistry from Caltech in 1987. After a brief stay as a postdoctoral researcher at the University of Colorado, Boulder, she spent the next 16 years on the faculty of UCLA as a professor of chemistry and later also of materials science and engineering. She moved to Princeton University in 2004, where she

was the Founding Director of the Andlinger Center for Energy and the Environment from 2010-2016 before assuming the role of Dean of Engineering and Applied Science in 2016.

<https://carter.princeton.edu/>

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