2026 Chemistry Department Career and Innovation Seminar

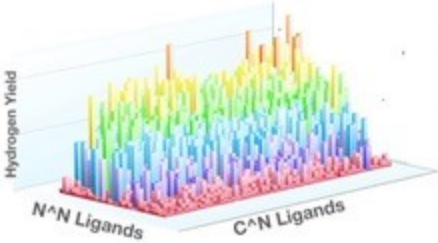
Friday, April 17, from 5:00p – 6:15p
The Science Complex Link Auditorium 151

"Using Chemistry to Accelerate Renewable Energy Solutions"

Stefan Bernhard, Ph.D.

Sponsored by: THE CAMILLE AND HENRY Dreyfus Foundation

Carnegie Mellon University



Modern AI and Machine-Learning Methods

Harnessing light to drive chemical reactions offers a compelling pathway to convert renewable solar energy into stored chemical energy. In nature, photosynthesis demonstrates how sunlight can be absorbed and funneled through a series of chemical steps to form stable, energy-rich molecules. This process has inspired the development of artificial photosynthesis systems that aim to replicate key aspects of natural light-to-chemical energy conversion. Such artificial systems are inherently complex, involving many coupled reactions, competing pathways, and challenges related to efficiency and long-term stability. To understand and optimize these systems, traditional one-experiment-at-a-time approaches are often insufficient. The Bernhard research group addresses this challenge by using automated and high-throughput experimental techniques that allow light-driven reactions to be studied in parallel. Photochemical hydrogen generation is used as a central example, including novel visualization approaches such as hydrogen-sensitive tape that directly reveals from what (photo-)catalysts and when hydrogen is produced. The resulting large, structured datasets are then used with modern AI and machine-learning methods to build predictive, data-driven models that guide future experiments and enable expert-level decision making in complex chemical systems.

Food and Refreshments available starting at 4:45p in SCL 151