

# From Photons to Chemical Bonds

## Prashant K. Jain

**G. L. Clark Professor of Physical Chemistry**

*Department of Chemistry and Materials Research*

*Laboratory, University of Illinois Urbana-*

*Champaign, Urbana, IL 61801, USA. Email:*

*[jain@illinois.edu](mailto:jain@illinois.edu),*

*Web site: <http://www.nanogold.org>*



**Chemistry  
Seminar on  
Interaction of  
light with  
molecules**

**Monday  
March 11 at  
4 pm in 303  
Schrenk**

**Please contact  
Dr. Amitava  
Choudhury at  
[choudhurya@mst.edu](mailto:choudhurya@mst.edu)  
for further  
information.**

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**Abstract:** The interaction of light with molecules can be used to access new modes of chemical reactivity; however, this interaction is often difficult to exploit in a universal manner. I will describe how plasmonics is proving to be a general strategy for interfacing photons with molecules and activating chemical transformations. This strategy involves heterogeneous catalysts comprised of plasmonic nanoparticles. Plasmonic excitation of the catalyst generates electronically and vibrationally excited states, which modify chemical activity at the interface and even induce emergent activity. I will describe how catalysts based on plasmonic nanoparticles are allowing light to be used as a redox equivalent in chemical reactions, for driving non-equilibrium chemical processes, for modifying product selectivity, for photosynthesizing fuels, and for boosting electrochemical conversions. The ultimate vision is a future where plasmonic excitations can be used to power chemical transformations or direct them with bond-level precision.

**About the speaker:** Prashant K. Jain earned his PhD in physical chemistry working with M. A. El-Sayed at Georgia Tech, following which he was a postdoctoral fellow at Harvard University. After a Miller Fellowship at UC Berkeley, he joined the faculty of the University of Illinois Urbana-Champaign, where he is the G. L. Clark Professor of Physical Chemistry, a Professor in the Department of Chemistry, and a Professor in the Materials Research Laboratory. He is also a University Scholar and an Affiliate Faculty Member of Physics and the Illinois Quantum Information Science and Technology (QUIST).

Prof Jain's lab studies nanoscale light-matter interactions and energy conversion. His noteworthy contributions are discoveries of plasmon resonances in quantum dots and plasmonic redox catalysis. His collective work has been published in over 115 papers and cited over 32,000 times. He has been listed among Highly Cited Researchers by Clarivate Analytics and Elsevier Scopus.

Prashant is a Fellow of the American Physical Society, a Fellow of the Royal Society of Chemistry, a Fellow of the American Association for the Advancement of Science (AAAS), and a Kavli Fellow of the National Academy of Sciences. He serves on the editorial advisory boards of the Journal of the American Chemical Society and the Journal of Chemical Physics and has previously been an advisory board member of the Journal of Physical Chemistry and a member of Defense Science Study group (DSSG). His work has been recognized, among other awards, by a Presidential Early Career Award in Science and Engineering, a Guggenheim Fellowship, the Leo Hendrik Baekeland award, the ACS Kavli Emerging Leader in Chemistry award, the ACS Akron Award, the ACS Unilever Award the Beilby medal, a Sloan Fellowship, an NSF CAREER award, and selection as MIT TR35 inventor and a Beckman Young Investigator.