# Bose Colloquium

## S. N. Bose National Centre for Basic Sciences

(An Autonomous Research Institute established under DST, GOI)

CENTRE FOR BASIC SCIENCES 1986 S. N. BOSE NATIONAL 1894-1974 বিজ্ঞানেন পরিপশ্যন্তি ধীরাঃ

***Title:*** **Directing Energy and Electron Transfer Processes in Semiconductor-Molecular Hybrids**

## *Abstract:*


Surface interaction of chromophore or redox active molecule which dictate the efficiency of energy/electron transfer, plays an important role in realizing photocatalytic and optoelectronic applications. Metal halide perovskite nanocrystals are interesting in the sense that they can either transfer energy or selectively transfer electrons or holes to the adsorbed molecules.[1,2] The presentation will focus on two specific scenarios of the flow of energy and electron processes in $CsPbX_3$(X= Br, I) nanocrystal-molecular hybrids. The energy transfer is probed through three moleculr acceptors – rhodamine B (RhB), rhodamine isothiocyanate (RhB-NCS), and rose Bengal (RoseB), which contain an increasing degree of heavy atom pendant groups. Electron and/or hole transfer from excited $CsPbX_3$ nanocrystals to a molecular relay present near the interface offers another avenue to directly convert light energy into chemical energy. Such interfacial electron transfer of semiconductor nanocrystals has been widely explored in photocatalytic processes. A basic understanding of the fundamental differences between the two excited deactivation processes (energy and charge transfer) and ways to modulate them should enable design of more efficient light harvesting assemblies with semiconductor and molecular systems.


**References:**


1. DuBose, J. T.; Kamat, P. V. Energy Versus Electron Transfer: Managing Excited-State Interactions in Perovskite Nanocrystal–Molecular Hybrids, *Chem. Rev.*2022, *122*, 12475–12494.
2. DuBose, J. T.; Kamat, P. V. Efficacy of Perovskite Photocatalysis: Challenges to Overcome, *ACS Energy Lett.* 2022, 7, 1994-2011.


**20th December, 2023**

**4.00 PM**

**At Fermion**

**YouTube YouTube Link**

**Webinar Link**

## ***Speaker:*** **Prof. Prashant V. Kamat**


Department of Chemistry and Biochemistry and Radiation Laboratory, University of Notre Dame,
Notre Dame, IN46556, USA


## *Short Biography of the Speaker:*

Prashant V. Kamat is a Rev. John A. Zahm, C.S.C., Professor of Science in the Department of Chemistry and Biochemistry and Radiation Laboratory at the University of Notre Dame. He is also a Concurrent Professor in the Department of Chemical and Biomolecular Engineering. Professor Kamat has for more than three decades worked to build bridges between physical chemistry and material science to develop advanced nanomaterials that promise cleaner and more efficient light energy conversion. He has published more than 500 scientific papers that have been well recognized by the scientific community. Thomson-Reuters has featured him as one of the most cited researchers each year since 2014 (2014 -2023). He is a Fellow of ACS, ECS, MRS and AAAS. He is also Pravasi Fellow of the Indian National Science Academy. He is currently serving as the Editor-in-Chief of *ACS Energy Letters*.