

Public Lecture

Stranger Things: Transport Phenomena at the Molecular Scale

Transport phenomena, like heat conduction or electrical flow are very important for many aspects of everyday life. For much of the 20th century, scientists focused on understanding how systems respond to small changes from equilibrium, leading to laws like Fick's law of diffusion and Ohm's law of electrical conduction. Contemporary research now addresses more complex aspects such as turbulence, slides, and fractures. A fascinating question is how much we can apply our understanding of larger, everyday systems to tiny atomic and molecular scales, where processes happen incredibly quickly, on the order of picoseconds - attoseconds (10^{-12} - 10^{-18} s) and macroscopic transport laws often break down. In this talk, I will discuss several examples from my own work, showcasing general concepts of how molecular systems behave differently from larger ones. I will touch on topics like heat conduction, solvation dynamics, electronics, plasmonics, polaritonics, and quantum effects. I'll also explore how our observations are influenced by the time and length scales of physical processes and the boundaries of the systems involved.

Friday, December 13 2024 4:00 pm

Homi Bhabha Auditorium

TIFR, Colaba Mumbai

About the Speaker

Prof. Nitzan is the Donner Professor of Physical Sciences and Professor of Chemistry at the University of Pennsylvania, USA. He is renowned for his contributions to condensed-phase chemical dynamics, including the theory of surface-enhanced Raman scattering and the modern theory of charge and energy transport. Prof. Nitzan is one of the founders of the field of Molecular Plasmonics and towering figure in the field of Molecular Electronics. Additionally, he is a wonderful educator. His book "Chemical Dynamics in Condensed Phases" (Oxford University Press) is used as a graduate level textbook worldwide.

