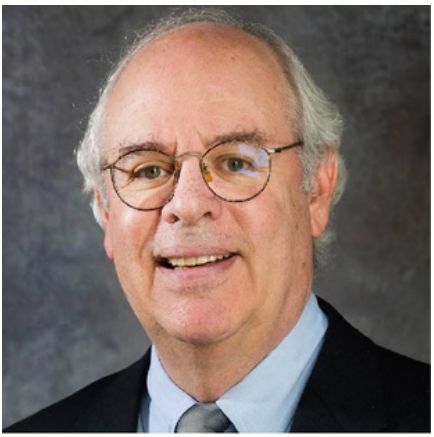
IRA REMSEN MEMORIAL LECTURE

Thursday, April 18, 2024
Remsen 101, 6:30 PM
Pre-Seminar Refreshments 6:00PM, Remsen 140
Reception immediately to follow, Remsen 140



Professor Steven Sibener

Carl William Eisendrath Distinguished Service Professor

A Multiscale View of Dynamical Processes at Surfaces using Molecular Beam Scattering, In Situ Scanning Probe Imaging, and Molecular Dynamics Simulations

This presentation will highlight recent contributions from our group in the areas of surface chemistry and gas-surface interactions. Information derived from molecular beam scattering experiments, in situ scanning probe microscopy, and numerical simulations are yielding a precise multiscale perspective of many important heterogeneous processes such as such as catalysis, reaction dynamics, collisional energy transfer, materials growth and erosion, ice formation, self-organization of polymers, and metallurgy of alloy superconductors. Our newest endeavor involves the concurrent use of neutral particle scattering coupled with in situ atomic-level STM visualization. Here single molecule events involving measurement of the distance and angle between adsorbed nitrogen atoms originating from the same dissociated N2 molecule on ruthenium are precisely determined over a range of impinging N2 kinetic energies and angles, revealing new information about spatio-temporal correlations and energy dissipation in chemisorption. Such measurements provide a window into on-surface chemical processes including non-adiabatic energy dissipation – reaction steps that complement the information available from more traditional scattering experiments. Today's talk will introduce heterogeneous studies from our group encompassing reactive events on semiconductors, metals and moiré graphene, materials growth, annealing, and erosion, and ice formation including molecular capture under non-equilibrium conditions – a topic of importance for astrochemistry and the involvement of terrestrial permafrost chemistry in climate change. Finally, we attribute a new phenomenon involving the observation of notable isotopic enrichment in condensed films to differential isotopic condensation probabilities under specific non-equilibrium collision conditions, findings which may provide a new pathway for creating isotopically pure materials suitable for quantum computation platforms.

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