Molecular Collisions at the Gas-Liquid Interface: From Energy Transfer to Stereodynamics

David J. Nesbitt
JILA, National Institute of Standards and Technology
University of Colorado, and Department of Chemistry and Biochemistry
University of Colorado at Boulder, Colorado 80309

Liquids are by far the least well understood phase of matter, with a detailed understanding of the very outermost "skin" of such liquids representing an ongoing and outstanding challenge to the chemical physics community. This talk will emphasize recent results from our group using a novel combination of i) supersonically cooled molecular beams and ii) high resolution IR/UV lasers to permit detailed study of hypersonic collision dynamics at the gas-liquid interface by probing the final quantum state distributions. Time permitting, the topics covered will sample i) jet cooled CO_2 molecular beams colliding at gas-liquid surfaces, with both the alignment and orientation of the resulting scattered species probed by shot noise limited, polarization modulated IR laser absorption spectroscopy, and ii) hyperthermal scattering of cold NO and HCl molecular beams from gas-room temperature ionic liquid (RTIL), gas-molten metal (Ga), and self assembled monolayer (SAM) interfaces, which exploit laser induced fluorescence (LIF), resonance enhanced multiphoton ionization (REMPI) with velocity-map imaging (VMI) to yield *quantum-state* and *vector momentum* resolved distributions in the scattered molecular flux.