

**UNIVERSITY OF RHODE ISLAND**  
**Department of Chemistry Seminar**

**3:00 PM, Monday, April 24, 2023**  
**Beaupre Room 105**

**Paul Raston**  
*James Madison University*  
*Department of Chemistry & Biochemistry*

*Laser Spectroscopy of Molecular  
Complexes and Reactions in  
Superfluid Helium Nanodroplets*

**HOST**  
*Daniel Thomas*  
*Department of Chemistry*  
**401-874-5834**

## Laser Spectroscopy of Molecular Complexes and Reactions in Superfluid Helium Nanodroplets

Helium nanodroplets are ultra-low temperature (0.4 K) helium clusters ( $10^2$  -  $10^6$  atoms) that are held together by very weak dispersion forces. The weakness of these forces coupled with the lightness of helium causes the atomic wavefunctions to cover an incredibly large range in position, which renders the nanodroplets superfluid. This makes them an ideal medium to investigate fundamental topics in physical chemistry. In the first part of my talk I will focus on some the complexes that we have assembled in helium nanodroplets, namely structural isomers of the OCS dimer, (possibly) different spin isomers of the NO dimer, and a high energy isomer of the methanol hexamer. In the second part, I will discuss the association reaction between helium solvated OH and O<sub>2</sub>, which results in the formation of HOOO. Our results suggest that this atmospherically relevant association reaction is barrierless, in contrast to the most sophisticated theoretical predications that have been published on this system.