Biographical Information:

Born and raised in sunny Daytona Beach, FL, Jamey moved to Spartanburg in the fall of 2013 to begin undergraduate studies at Wofford College. During the summer of 2016, Jamey participated in the Science Undergraduate Laboratory Internship (SULI) Program at the Pacific Northwest National Laboratory (PNNL) in Richland, WA, where he conducted analytical chemistry research with Dr. Chris Thompson to quantify methane adsorption on organic-rich shales with near-infrared spectroscopy. Jamey graduated Magna Cum Laude and Phi Beta Kappa from Wofford College in 2017 with a BS in Chemistry and BA in Spanish. Jamey was honored in 2017 with an Outstanding Senior Award from the Western Carolinas Section of the American Chemical Society. Following graduation, Jamey returned to PNNL to explore the use of cation-exchanged zeolites for CO₂ separation from post-combustion flue gas with Dr. Radha Kishan Motkuri. In the fall of 2017, Jamey accepted a University Fellowship to attend The Ohio State University as a member of the Chemistry PhD program. Currently a second-year student in the laboratory of Prof. Shiyu Zhang, Jamey’s research interests include the synthesis, characterization, and reactivity of biologically relevant copper nitrosyl coordination compounds.

Presentation Title:

Effect of Labile Cu(II) ion on Reactive Oxygen/Nitrogen Species-induced Oxidative Stress in Alzheimer’s Disease

Presentation Abstract:

Despite its prevalence and lasting socioeconomic impacts, much is still unknown about the underlying chemical aspects of Alzheimer’s Disease (AD) etiology & pathogenesis, thus precluding effective preventative care and treatment. Alzheimer’s patients exhibit large amounts of oxidative stress, for example by tyrosine nitration, fatty acid oxidation and DNA oxidation products, the levels of which can be correlated to the presence of labile copper(II) ions, and is attenuated by the removal of a nitric oxide (NO) source, thus implicating a role of colocalized free copper ions and nitric oxide in the production of reactive oxygen/nitrogen species (ROS/RNS). Under biological conditions, labile copper is mostly likely bound to chlorides, which are the most abundant anions in the extracellular fluid. In order to explore the role of “labile” copper species interacting with nitric oxide as key intermediates in AD etiology, we synthesized and fully characterized a rare copper halonitrosyl complex which demonstrates highly reversible NO binding ($\Delta H_r = -1.95$ kcal/mol, $\Delta S_r = -9.46$ a.u.). X-ray diffraction analysis reveals that [Cl₃CuNO]$^-$ contains a four-coordinated copper center with a strongly bent nitrosyl ligand ($\angle$CuNO = 119°). Monitoring the reaction of this well-defined copper nitrosyl with oxygen (O₂) by UV-Visible spectrophotometry at −80°C results in the observation of a putative copper peroxynitrite species. We will also discuss the reactivity of the putative copper peroxynitrite species with biologically relevant substrates such as 2,4-di-tert-butylphenol (tyrosine mimic). Together, these results suggest the possible intermediacy of copper nitrosyl/peroxynitrite compounds in oxidative stress observed in Alzheimer’s patients.