

University of Louisville  
Department of Chemistry  
**Dr. Vance Jaeger**

Faculty Seminar  
When: September 20, 2024  
Time: 4:00 p.m.  
Location: CBLL-16

## **Simulations of Lipid Membrane Structure and Function with Applications to Human Health**

### **Abstract:**

Dr. Jaeger will discuss how lipid membrane interfaces influence biological processes. The talk will focus on three specific areas. First, the tear film lipid layer is tied to the development of dry eye syndrome. However, the detailed structure and function of the lipid layer are difficult to probe in vivo. Molecular simulations have been used to derive structures based upon fundamental physical interactions. Second, pinholin is a viral protein involved in the breakdown of bacterial cells. The process of cell lysis via pinholin takes place over several minutes. Dr. Jaeger will speak about a specialized technique that allows molecular simulations to investigate the thermodynamics of structural changes in membrane-bound proteins. Third, alpha synuclein is a brain protein that is involved in the formation of synapses and is associated with diseases like Parkinson's. Molecular dynamics simulations reveal how protein-membrane interactions are tied to membrane defects, which are in turn related to membrane composition. Dr. Jaeger's research provides important insights into these three complex systems. His lab's work provides an improved molecular-level understanding of the processes that cause lipid-associated diseases.

Dr. Vance Jaeger has been an Assistant Professor of Chemical Engineering at the University of Louisville since 2017. He earned his B.S. from the University of Nevada in 2010 and his Ph.D. from the University of Washington in 2015. After completing his Ph.D., he was a postdoctoral fellow at the Max Planck Institute for Biophysical Chemistry in Göttingen, Germany, where he was awarded the Alexander von Humboldt Postdoctoral Fellowship.

Dr. Jaeger's research focuses on the biophysics of lipid membranes and their applications to human health. He also develops models for pH-dependent interfacial behavior. He has received recent funding from the NSF for a Research Experience for Undergraduates (REU) site on interfacial materials modeling, and from the NIH for studying the causes of dry eye syndrome. Additionally, he has been supported by NASA Kentucky for a service-learning course in which university students design and 3D print educational aids for blind K-12 students. Dr. Jaeger is dedicated to advancing knowledge in chemical engineering and improving educational practices, particularly for students with visual impairments.