UNIVERSITY OF RHODE ISLAND
Department of Chemistry
SEMINAR

3:00 P.M., Monday, September 28, 2026
Room 105 – Beaupre Center

Norman C. Craig Professor of Chemistry Helen E. Blackwell

Department of Chemistry
The University of Wisconsin–Madison

Redirecting Bacterial Conversations with Synthetic Chemical Signals

HOST

Fang Wang
Department of Chemistry
401-874-4243

Redirecting Bacterial Conversations with Synthetic Chemical Signals

Abstract: Bacterial collective behavior is orchestrated by simple chemical signals. Through quorum sensing, these signals regulate population-level decision-making, enabling bacteria to transition from solitary cells to organized multicellular communities. At high cell densities, quorum-sensing circuits trigger transcriptional reprogramming that allows pathogenic bacteria to activate virulence pathways and assemble recalcitrant biofilms responsible for chronic infections and biofouling. Our research leverages synthetic chemistry to interrogate and reprogram these communication networks. We design, synthesize, and evaluate non-native signal mimics and antagonists that target quorum sensing receptors with tunable affinity, specificity, and metabolic stability. Our laboratory has developed numerous libraries of small molecules and peptide-based ligands that function as agonists or antagonists across multiple quorum sensing systems in both Gram-negative and Gram-positive bacteria. These chemical probes provide precise temporal and spatial control over signal transduction, enabling structure–activity relationship analysis in biologically relevant *in vitro* and *in vivo* models. Using these tools, we can investigate quorum sensing as a non-lethal, anti-infective therapeutic target that modulates bacterial behavior rather than viability. Current efforts in the lab focus on defining ligand–receptor binding modes, competitive interactions with native autoinducers, and the role of membrane partitioning in signal modulation. This presentation will highlight our synthetic strategies, mechanistic insights, and recent advances in chemically rewiring bacterial communication networks.