Many bacteria communicate using small organic molecules and peptides to monitor their population densities in a process called ”quorum sensing.” At high cell densities, bacteria use this signaling network to switch from an isolated, nomadic existence to that of a multicellular community. This lifestyle switch is significant; only in groups will pathogenic bacteria turn on virulence pathways and grow into drug-impervious communities called biofilms that are the basis of myriad chronic infections. In turn, certain symbiotic bacteria will only colonize their hosts and initiate beneficial behaviors at high population densities. Our research is broadly focused on the design, synthesis, and characterization of non-native ligands that can intercept quorum sensing and provide new insights into its role in host/microbe interactions. These molecules provide a novel approach to study quorum sensing with both spatial and temporal control in a range of settings. We have developed a series of efficient synthetic methods that provide us with straightforward access to these ligands. In addition, we have applied our quorum sensing antagonists and agonists in vitro and in vivo to investigate quorum sensing as an anti-infective target.

In Talk 1, I will introduce quorum sensing and motivate why I believe chemists are poised to make unique contributions to this research field through several literature examples. Thereafter, in Talk 2 I will go on to introduce my lab’s research approach, highlight our recent results, and outline our future goals.