

**Talk title:** Rational Design of Modular Chemical Probes for Biological Drug Delivery

**Abstract:**

The therapeutic landscape is transitioning from small-molecule drugs to biologics-based therapeutics including peptides, proteins, antibodies, and nucleic acids, due to their greater target specificity and lower toxicity. However, the delivery of these biologics remains a significant challenge. They are vulnerable to degradation, must overcome biological barriers, and require targeted delivery to specific cells/tissues. Addressing these challenges, we will focus on creating innovative chemical strategies to bridge the gap between the basic science and translational research in drug delivery. Specifically, we are interested in exploiting the facile synthesis and structural tunability of modular scaffolds to expediate the development of novel chemical probes to address three independent yet interconnected projects: (1) reversible protein modification for protein-based drug delivery, (2) fluorogenic nanoparticles to investigate the cellular uptake mechanism of biologics, and (3) trifunctional activity-based probes for molecular imaging and new target discovery. We will achieve these through a combination of tunable chemical tools and high-throughput techniques, which together, enable a ‘bottom-up’ approach to solving fundamental challenges in biomedicine. Our vision is to provide molecular-level insights into drug delivery and revolutionize the field of medicine by introducing proteins as next-generation therapeutics for currently undruggable diseases.