My professional goals are: 1) develop high-throughput experimental technologies to explore complex biological systems, 2) use systems biology to study host-pathogen interactions, 3) translate basic science discoveries into antimicrobial and bacterioprotective pharmaceuticals, and 4) promote systems biology. These goals stem from my long-standing commitment to use systems biology to advance human health.

In graduate school I plan to investigate intestinal epithelial cell-*E. coli* interactions using a systems biology approach. The long-term goal of this work is to identify targets for novel antimicrobial and bacterioprotective pharmaceuticals to combat the rising antimicrobial resistance problem.

First, I will identify specific intercellular epithelial-bacterial interactions using the split ubiquitin yeast two-hybrid system. Second, I will construct Bayesian models of the bacterial and epithelial intracellular protein networks using gene expression profiles of *E. coli* knockouts and epithelial siRNA knockdowns. Third, I will develop a high-throughput method for monitoring interacting cells which uses flow cytometry to simultaneously quantitate the expression of fluorescently labeled proteins in conjugated pairs of bacterial and epithelial cells. Pairs of cells will be distinguished computationally by the temporal spacing of flow cytometry events and surface marker expression. Data from this conjugate flow cytometry technique applied to wild type bacterial and epithelial cells, in addition to the intercellular interactions identified by the split ubiquitin yeast two-hybrid screen, will be used to combine the two individual Bayesian models into a single model of bacterial-epithelial interactions. Fourth, I will simulate pharmaceutical perturbations to the combined model to identify potential bacterial targets for antimicrobials and epithelial targets for bacterioprotective drugs. Finally, I will experimentally verify each predicted target using *E. coli* knockouts, epithelial siRNA knockdowns, and two bacterial growth competition assays of 1) knockout versus wild type bacteria on wild type epithelial cells, and 2) wild type bacteria on wild type versus siRNA knockdown epithelial cells.

In graduate school I also hope to promote systems biology in two ways: 1) develop a project-based course where students learn to model biological systems using publicly available data, and 2) organize a network modeling competition similar to CASP to unite the systems biology community.

In the future I hope to translate validated drug targets into novel pharmaceuticals. To prepare for this phase of my career, I am pursuing a Masters degree in Medicine where I am learning about human pathophysiology side-by-side with the same medical students who will be my future clinical collaborators. An NDSEG fellowship will allow me to investigate host-pathogen interactions and continue to prepare for an academic career in biomedical research and translational medicine.