

## THEME 5: QUANTITATIVE IMAGING & CELL SIMULATION OF SMALL REGULATORY RNA

Students will participate in the following 2 modules:

### **MODULE 1: FISH/STORM IMAGING OF sRNA**

Laboratory: [Jingyi Fei](#) (University of Chicago Biochemistry and Molecular Biology)

In this module, we will demonstrate quantitative imaging of RNAs by single-molecule detection based super-resolution microscopy. Students will use bacterial small regulatory RNA (sRNA) as a training system. The following experimental approaches will be used:

- **Fluorescence in situ hybridization (FISH)**, for labeling sRNA in fixed cells
- **Super-resolution microscopy (STORM)**, to resolve the high copy number of sRNAs in the small volume of a bacterial cell
- **Clustering analysis**, to quantify sRNA copy number from super-resolution images

### **MODULE 2: LATTICE MICROBES CELL SIMULATIONS OF RNA METABOLISM**

Laboratory: [Zaida Luthey-Schulten](#) (UIUC Chemistry & Physics)

Students will be introduced to Lattice Microbe Cell Simulations developed in the Luthey-Schulten lab and how they can be used to describe stochastic gene expression and other processes in the heterogeneous environment of the cell. Students will learn how to use a variety of analytical and simulation techniques to fit the experimental sRNA distributions they obtained via super-resolution imaging to a kinetic model of transcription and degradation. They will examine the effect of gene copy number and DNA replication on the resulting fitting parameters. The model will then be used to predict how the distribution of RNA changes with cell growth rate.

