Departmental Seminar

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Title:

"Fluorescence microscopy tools to illuminate RNA and protein dynamics in live cells"

Cellular life is highly dynamic, and perturbations to levels and localization patterns of biomolecules are hallmarks of disease states. For example, infection of mammalian cells with the intracellular bacterial pathogen *Listeria monocytogenes* triggers dramatic changes in intracellular RNA and protein localization patterns. In this talk, I will present my work developing tools to tag and track RNA molecules and secreted proteins in live mammalian cells to illuminate the dynamics of these species. *Listeria* is predicted to secrete >200 effector proteins in infection, yet our understanding of when they are secreted, where the proteins are located and how these evolve over the course of infection is limited due to the absence of visualization tools. To address this need, we adapted a split-fluorescent protein system for imaging secreted proteins from *Listeria* over the course of infection and demonstrated versatility by varying host model systems and the color of the fluorescent tag. In addition to proteins, localization and dynamics of coding and non-coding RNAs play central roles in biology, including in bacterial infection. Yet, a shortage of versatile fluorescent RNA tags is prohibitive for tracking RNAs, in particular small non-coding species. To fill this need, I developed *Riboglow*, a platform to label and visualize RNAs of interest in live cells over time. *Riboglow* is small, modular and compatible with multi-color fluorescent tagging. I demonstrated that *Riboglow* can be used to track recruitment of mRNA to stress granules, recruitment of the small non-coding U1 snRNA to cytosolic granules, and demonstrated that single mRNAs can be detected and tracked with *Riboglow*. In the future, I will combine my expertise in *Listeria* infection systems and RNA live cell imaging to investigate how changes in RNA dynamics in mammalian cells contribute to infection outcomes. In particular, my model system enables tagging and tracking of mammalian small non-coding RNAs with roles in pre-mRNA splicing, a central process of gene expression.