

## CHEMISTRY Departmental Seminar

Fall 2017  
CHEM 285 Schedule  
Tuesdays at 4:30-5:45PM  
Room Duncan Hall 250

September 19, 2017

**Professor Robert Waymouth**  
Stanford University



### ***Glowing mice: Chemistry of mRNA delivery into live animals***

Catalysis is a foundational pillar for chemical synthesis; the discovery of highly active, environmentally benign catalytic processes is a central goal for the development of sustainable chemical processes. The development of new families of catalysts continues to drive innovation in Chemistry and Materials Science. In this lecture, I will discuss how the development of new oxidation catalysts provides access to new monomers which were then enchainned to generate functional materials that proved useful agents for the delivery of messenger RNA into living animals. Functional delivery of messenger RNA (mRNA) to tissues in the body is key to implementing potentially transformative strategies for vaccination, protein replacement therapy and genome editing, collectively impacting approaches for the prevention, detection and treatment of disease. I will describe the step-economical synthesis and evaluation of a new, tunable and effective class of synthetic biodegradable materials: charge-altering releasable transporters (CARTs) for mRNA delivery into cells. CARTs are structurally unique and operate through an unprecedented mechanism, serving initially as oligo( $\alpha$ -amino ester) cations that complex, protect and deliver mRNA, and then change physical properties through a degradative, charge-neutralizing intramolecular rearrangement, leading to intracellular release of functional mRNA and highly efficient protein translation. With demonstrated utility in both cultured cells and animals, this new mRNA delivery technology should be broadly applicable to numerous research and therapeutic applications.

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