WPI CHEMISTRY & BIOCHEMISTRY

Wednesday, September 23, 2026
12:00 PM
Gateway Park 1002

Dr. Sean Ryder

Professor and Vice Chair for Outreach
Biochemistry and Molecular Biotechnology
University of Massachusetts Chan Medical School

"Decoding the Maternal RNA Load: From Molecules to Phenotypes"

During fertilization, haploid gametes combine to form a zygote. The sperm and oocyte contribute a similar amount of DNA, but the oocyte provides almost all the cytoplasm. In 1966, Alexander Spirin hypothesized that oocytes contain "masked" messenger RNAs that are stored in an inactive state. These maternally supplied mRNAs are thought to be essential for successful embryo development after fertilization. Maternal transcripts guide cell fate decisions prior to the onset of zygotic transcription, during a period where the genome is undergoing rapid replication. Much remains to be learned about how maternal mRNAs are produced, silenced, and reactivated after fertilization. The wiring diagram, the mechanisms at play, and their functional significance have not been fully described—and remain some of the most fundamental questions in reproductive biology. My lab uses biochemical and biophysical approaches to develop hypotheses concerning mRNA targeting that can be tested in live worms. When I started my lab, the technology did not exist to make site directed mutations at endogenous loci. Thus, we relied on reporter transgenes to assess biological relevance. Advances in CRISPR-Cas9 genome editing have eliminated this roadblock. Over the past few years, we have engineered several mutations in the untranslated regions (UTRs) of essential maternal genes. Our work reveals new roles for several well-characterized maternal RNA-binding proteins and demonstrates the complexity of RNA regulation via the 3′UTR. In this seminar, I present our findings on the functional consequences of dysregulated MEX-3 expression. This RNA-binding protein is highly conserved in animals and is essential for successful embryogenesis. The work provides mechanistic insights into the role of MEX-3 repression in preserving the germline and ensuring successful reproduction.

Host: Dr. Aya Narunsky