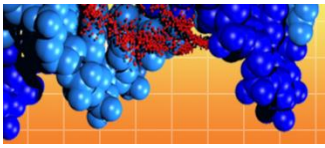

CENTER FOR BIOINFORMATICS & COMPUTATIONAL BIOLOGY

BIOINFORMATICS 2014 FALL SEMINAR SERIES

Hosted by: Center for Bioinformatics and Computational Biology
Department of Computer and Information Sciences, &
Department of Electrical and Computer Engineering
http://bioinformatics.udel.edu/seminars

MONDAY, November 3, 2014
3:30pm
DBI Room 102

Worms in Space:
Epigenetic Response of *C. elegans* in Simulated Microgravity

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ABSTRACT: Biological evolution is directed by the environment, and life on our planet is adapted to, and is optimized for growth and reproduction in Earth's gravitational field. The effects of altered gravity on biology, however, is not well understood, especially microgravity because of the limited access to space. As humans begin a new era of exploration in low Earth orbit and beyond, it will be important to understand how biological processes respond to such drastic change in the gravitational environment, and if any long term (*i.e.,* multi-generational) consequences exist. We present a new tool for studying biophysics in microgravity, "ZOOM" (Zero-gravity On-Orbit Microscope). ZOOM is a free-flying (3U) nanosatellite with a scientific instrument payload that enables diffraction-limited bioimaging in space. A ground-based ZOOM simulator, "ZOOM-Sim", utilizes the same microscope mounted onto a clinorotation apparatus. We demonstrate that ZOOM-Sim is able to mimic microgravity conditions by mapping the trajectories of microspheres suspended in solution, and compare experimental results with theory. For biophysical experiments, we use ZOOM-Sim to monitor the development of *C. elegans* in simulated microgravity, followed by high-throughput epigenetic sequencing to elucidate the genetic responses due to gravity unloading. We compare the epigenetic profiles of five histone marks (H3K27me3, H3K4me3, H3K9me3, H4K20me1, H3K36me1) and RNA polymerase II from animals exposed to simulated microgravity with 1×g controls, and identify putative gravity-responsive genes in *C. elegans* and homologs in humans. These studies will increase our understanding of how gravity (and lack of) influences biological processes, in preparation for future human space exploration.