Date/Time : **Mon, 23 February 2015 13:00-14:00**
Venue : **Seminar Room B503, Level B, Centre Bldg.**
Speaker: **William Ryu, Associate Professor, Department of Physics**
Donnelly Centre, University of Toronto

Title: **Quantifying and modeling *C. elegans* exploratory behavior**

Abstract:

Searching is a universal, complex function of biological systems, and from a broad perspective, all organisms that can move have evolved stochastic strategies to explore their environment. Current search theory has struggled with the tension between optimizing for local targets while balancing the ability to search farther areas. However the tradeoff between intensive (local) and extensive (non-local) searching has been solved by a number of statistical strategies in biological systems. One strategy is to have a scale free stochastic program to compromise between intensive and extensive search efficiency (e.g. superdiffusive properties from fractal dimensions of the large scale patterns). An alternative to a scale free strategy is to modify a stochastic strategy over time based on some type of information-based decision-making process.

Animal movement studies are often hindered by difficult observations over large spatiotemporal scales, unknown environmental conditions, and complex behavioral descriptions. To overcome these challenges, we have developed a number of carefully controlled studies to quantify the behavior of *C. elegans* as it explores its environment. In general, when there is no information available to the animal, it will perform a random search which is modified over time to explore a range of different length scales. When presented with environmental information such as a spatial gradient of temperature, it will modify its search and perform taxis. If presented with sensory information that it perceives to be threatening it will respond reflexively with a noxious behavioral response. Modifying all these behaviors is the animal's prior experience encoded by mechanisms of learning and memory. Here I will introduce the benefits of *C. elegans* as a model for experimental biophysics and describe our work in quantifying and modeling worm behavior with respect to search, taxis, and memory.