ASHBi SEMINAR

Modeling and tracking random motion in micrometer-scale living systems

Lecturer: Jay Newby, Ph.D.

Associate Professor
Depatment of Mathematical and Statistical Sciences, University of Alberta

Date	Wednesday, 23 April 2025
Time	16:00 – 17:00 [JST]
Venue	**Seminar Room** Onsite only
	1F, Faculty of Medicine Bldg. B

Register here

Abstract

We study stochastic motion of objects in micrometer-scale living systems: tracer particles in living cells, pathogens in mucus, and single cells foraging for food. We use stochastic models and state space models to track objects through time and infer properties of objects and their surroundings. For example, we can calculate the distribution of first passage times for a pathogen to cross a mucus barrier, or we can spatially resolve the fluid properties of the cytoplasm in a living cell. Recently developed computational tools, particularly in the area of Markov Chain Monte Carlo, are creating new opportunities to improve multiple object tracking. The primary remaining challenge, called the data association problem, involves mapping measurement data (e.g., positions of objects in a video) to objects through time. I will discuss new developments in the field and ongoing efforts in my lab to implement them. I will motivate these techniques with specific examples that include tracking salmonella in GI mucus, genetically expressed proteins in the cell cytoplasm, active transport of nuclei in multinucleate fungal cells, and raphid diatoms in seawater surface interfaces.

Organizer : Graduate School of Medicine
Institute for the Advanced Study of Human Biology (WPI-ASHBi), Kyoto University

Host: Sungrim Seirin-Lee
[E-mail] ashbi-event@mail2.adm.kyoto-u.ac.jp