Mathematical Biology Seminar

Monday, September 24, 2018
3 pm – 457 CAB

Jay Newby
University of Alberta

How molecular crowding is changing our understanding of spatial patterning in living cells

Molecular crowding has recognized consequences for biological function. However, there are also circumstances in which un-crowding is important—that is, when molecules must evacuate from a region before a given process can occur. One example is offered by the T cell, where large surface molecules must evacuate from a region to allow for the T cell to interact with its target, thereby facilitating immune function. Evacuation is fundamentally stochastic and spatial, since diffusion is a major driver. Studies of molecular evacuation present mathematical and computational challenges. For example, in some scenarios, it is a "rare event", making straightforward simulation unfeasible. To obtain a complete picture of diffusional evacuation, we use a combination of perturbation theory and numerical simulation. I will also show evidence of persistent un-crowding in living fungal cells. Based on our understanding of diffusional evacuation, we know that diffusion alone cannot explain these observations. I will discuss our current efforts to quantify and resolve how fungal cells control un-crowding.