Mathematical Biology Seminar

Monday, September 24, 2018
3 pm – 457 CAB

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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.