**Abstract**

Cells make protein gradients for various purposes, such as establishing position information in development [] or defining cell polarity in the process of cell division [].

two ways of making gradients and cite examples for both. The two kinds of mechanisms for making gradients that are reported in the

An example of the first would be bicoid protein gradient in Drosophila embryo formed by diffusion, which provides positional information to the nuclei []. Smy1 motor gradient along actin filaments by active transport is an example of the second case, which helps regulate the filament length []. Establishing and maintaining these gradients require cells to spend energy. In this talk I examine different mechanisms of active gradient formation in cells and estimate the energy costs associated with them. In particular I consider a simple two-lane lattice gas model of gradient formation along the filament which incorporates directed transport and diffusion of proteins []. From this model, I calculate the steady state flux of motors along the filament and thereby the rate of energy required to maintain the gradient.

I also consider the scaling of the energy expenditure with cell size for the two different models of gradient formation.

Finally, I show that the dependence of power required on cell size is different than that of a diffusion model of forming protein gradient in cytoplasm.