**Energy cost of protein gradient formation in cells**

Cells make protein gradients for various purposes, such as establishing position information in development [1] or defining cell polarity in the process of cell division []. The two kinds of mechanisms for making gradients that are reported in the literature are through diffusion and active transportation. An example of the first would be bicoid protein gradient in Drosophila embryo formed by diffusion, which provides positional information to the nuclei [2]. Smy1 motor gradient along actin filaments by active transport is an example of the second case, which helps regulate the filament length [3]. 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. I also consider the scaling of the energy expenditure with cell size for the two different models of gradient formation.

**References:**

[1] Ortrud Wartlick, Anna Kicheva, and Marcos Gonza ́lez-Gaita ́, Morphogen Gradient Formation.

[2] Oliver Grimm1, Mathieu Coppey2, and Eric Wieschaus, Modelling the Bicoid gradient.

[3] Lishibanya Mohapatra, Thibaut J. Lagny, David Harbage, Predrag R. Jelenkovic, and Jané Kondev.