

## **Volume-Surface Reaction-Diffusion Systems Modelling Asymmetric Protein Localisation**

Klemens Fellner

For certain types of stem cells, differentiation into specialised tissues occurs via the asymmetric localisation of proteins, so called cell-fate determinants, into just one of the two daughter cells upon mitosis.

Based on a biological model for *Drosophila* SOP cells, we present a model system of reaction-diffusion equations describing the concentration of the key-protein Lgl in the cytoplasm and the cell-cortex. We consider both volume-diffusion in the cytoplasm as well as surface-diffusion on the cell-cortex. The coupling between cortex and cytoplasm is modelled via Robin boundary conditions.

We study the well-posedness of such model systems. Moreover, we shall discuss the existence of an entropy functional both for detailed balance and complex balance system, such as weakly reversible reaction networks. Given suitable entropy functionals, we shall present the derivation of entropy entropy-dissipation estimates, which entails exponential convergence to the equilibrium.