

## **A spatial measure-valued model for interactions in heterogeneous (intra-cellular) systems**

Lea Popovic (Concordia University, UK)

To address intracellular heterogeneity, molecular crowding, and other spatial features affecting intracellular reactions requires spatial model of the dynamics within the cell. Inherently stochastic nature of intracellular reactions introduces coupling of reaction and diffusion dynamics.

We introduce a measure valued framework which incorporates reaction dynamics between different molecular types and continuous movement of molecules in space. Reactions rates at a spatial location are proportional to the mass of different types present locally, as well as location specific chemical rates.

We investigate possible limits based on the multi-scale nature of the process, depending on the mass of different molecular types.

A classical scaling would result in a deterministic PDE limit, whose long-term behaviour depended on the mobility of types and localisation of reactions.

In realistic intracellular models the mass of some types remains discrete, and the scaling limit gives a new type of spatial random evolution process which couples Markovian jumps and PDE dynamics.