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Modelling the biochemistry of spatiotemporal pattern formation in bacteria

The Min proteins, MinC, MinD and MinE, form an important spatial regulator of cell division in bacteria where they interact on the membrane to generate an oscillatory spatially alternating pole-to-pole localization. Spatial pattern formation has recently been reconstituted in vitro on flat supported membrane and in cell-shaped micro-fabricated chambers. Traveling waves and spiral waves on supported membrane and in vivo-like oscillations in cell-shaped chambers have been observed. In this talk, I will present the results of our recent work on modelling the biochemistry of this system. We have formulated a general model based on interactions that have been recently proposed in the literature and have used the available data to find optimal parameter values. By selectively removing terms and repeating the fitting procedure, we are able to test the importance of various biochemical interactions for fitting the data and gain insight into the geometry of the protein interactions. I will also describe the novel parameter fitting protocol which we developed for the problem at hand.