# Meiotic cytoplasmic streaming in C. Elegans embryos

A.Mamane[1,] and J.-F. Joanny[1,2]
[1] *Physico-Chimie Curie UMR 168, Institut Curie, PSL Research University, 26 rue d'Ulm, 75248 Paris Cedex 05, France*
[2] *ESPCI-ParisTech, 10 rue Vauquelin 75005 Paris, France*

Cytoplasmic streaming refers to a collective movement of the entire cytoplasm observed in many cells. The mechanism of meiotic cytoplasmic streaming (MeiCS) in the Caenorhabiditis elegans zygote is mysterious as the flow direction is not predetermined by cell polarity, and the direction occasionally reverses. We show that the network structure of the endoplasmic reticulum (ER) is required for the collective flow. We propose a positive feedback mechanism, in which a local flow generated along a microtubule is transmitted to neighboring regions through the ER and aligns microtubules in a broader area to self-organize the collective flow. Our theoretical model reproduces the experimental results and predicts not only the emergence but also the reversal of the flow with a set of experimentally realistic parameters. We also discuss the contribution of meiotic streaming to cortical granule exocytosis. The proposed model can account for different types of streaming, and thus provides a general model for cytoplasmic streaming.