Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Role of cell division and self-propulsion in self-organization of 2D cell co-cultures MOUMITA DAS, SUPRAVAT DEY, Rochester Institute of Technology, MINGMING WU, MINGLIN MA, Cornell University — Self-organization of cells is a key process in developmental and cancer biology. The differential adhesion hypothesis (DAH), which assumes cells as equilibrium liquid droplets and relates the self-assembly of cells to differences in inter-cellular adhesiveness, has been very successful in explaining cellular organization during morphogenesis where neighboring cells have the same non-equilibrium properties (motility, proliferation rate). However, recently it has been experimentally shown that for a co-culture of two different cell types proliferating at different rates, the resulting spatial morphologies cannot be explained using the DAH alone. Motivated by this, we develop and study a two-dimensional model of a cell co-culture that includes cell division and self-propulsion in addition to cell-cell adhesion, and systemically study how cells with significantly different adhesion, motility, and proliferation rate dynamically organize themselves in a spatiotemporal and context-dependent manner. Our results may help to understand how differential equilibrium and non-equilibrium properties cooperate and compete leading to different morphologies during tumor development, with important consequences for invasion and metastasis

Moumita Das
Rochester Institute of Technology

Date submitted: 09 Nov 2016 Electronic form version 1.4