Construction and analysis of a regulatory network

김유식, Stanislav Y. Shvartsman[1,†]
한국과학기술원; [1]Princeton University

The development and maintenance of living tissues relies on cell communication systems, which, to a first order approximation, can be viewed as large networks of enzymatic reactions. Quantitative analysis of these networks holds the key to the fundamental understanding of embryonic development, elucidating the origins of developmental disorders, and designing man-made tissues. In this talk, I will present our work on the quantitative analysis of the Mitogen Activated Protein Kinase (MAPK) pathway, an enzymatic cascade that regulates cellular processes in all eukaryotes, from yeast to humans. Using a combination of genetic experiments, quantitative imaging, and mathematical modeling approach, we found that the level of MAPK substrates can control the activation status and enzymatic activity of MAPK. Furthermore, we established that MAPK substrate competition is biologically significant and plays a key role in the regulation of gene expression and cell differentiation in the embryo.