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Talk 2:

Time-lapse microscopy in single-cell micro-arrays - gene expression, cell fate decisions and cell migration

We report on the design of microstructured cell culture arrays for the study of systems dynamics of eucaryotic cells. Using time-lapse microscopy and image analysis we monitor protein expression time-courses at the single cell level and compare the unbiased (i.e. not ensemble-averaged) dynamics to quantitative models. An intriguing finding of single cell studies is the fact that stochastic fluctuations cause substantial cell-to-cell variability even among genetically identical cells. We present various examples of stochastic outcome in eucaryotic cell response: in particular gene expression after transfection, apoptosis and stem cell decision making. The talk intends to provide a perspective on how single cell platforms can be used for high-throughput acquisition of kinetic time courses. In this context a particular challenge is to accommodate migrating cells. We descibe novel dynamic cell arrays and artifical micro-tracks that are also applicable for accurate assessment of migrational behavior.

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