Examples of phenomena in cell physics : cell motility, cell division, epithelial elongation

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Cell phenomena are traditionally explained by molecular activation pathways. Signaling networks are indeed playing key roles in cell fate, for example in motility, division and death. However these switching events at the nanometer scale fail to provide satisfactory explanations for their microscopic read-outs which are at the micrometer scale. Our approach consists of trying to bridge this gap of three orders of magnitude in scales. We take cell biology tools for performing experiments on individual cells and we develop and analyze cell phenomena with condensed matter physics methods and frameworks.
I will present examples illustrating this approach: i/ the cell *ratchet*, ii/ the constriction of a physiological ring made of molecular motors - the *cytokinetic ring*; and iii/ epithelial elongation.