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Emergent memory effects in cell polarity and migration

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Living cells actively migrate in their environment to perform key biological functions—from unicellular organisms looking for food to single cells such as fibroblasts, leukocytes or cancer cells that can shape, patrol or invade tissues. Cell migration results from complex intracellular processes that enable cell self-propulsion, and has been shown to also integrate various chemical or physical extracellular signals. While it is established that cells can modify their environment by depositing biochemical signals or mechanically remodelling the extracellular matrix, the impact of such self-induced environmental perturbations on cell trajectories at various scales remains broadly unexplored. I will discuss examples where such interactions with the environment can have deep consequences on the large scale cell dynamics, and show that they can effectively endow cells with a memory of their past trajectory.

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