University of Basel
Department Biozentrum

SIB Swiss Institute of Bioinformatics

BIOZENTRUM
The Center for Molecular Life Sciences

Basel Computational Biology Seminar

22830 Current research in Bioinformatics I

Hanno Hennighausen

Active fluid framework for spreading and translating cell clusters

During many biological processes, cell aggregates spread on substrates in a process of active wetting. In this talk I will first show the existence of an active wetting transition, where active forces control a transition from dewetting to a stable partial wetting state, and then to complete wetting. We show that the interplay between active forces, cluster geometry, and dissipative forces leads to a size-dependent wetting transition. In contrast to passive fluids, friction and viscosity can control the wetting state by regulating the transmission of active forces across the tissue. Furthermore, during embryonic development and cancer progression, clusters of cells migrate collectively and usually follow external cues, such as gradients of chemoattractant (chemotaxis), substrate stiffness (durotaxis), or electrostatic potential (electrotaxis). Using the active wetting framework, I will then show that cell groups can also be guided by internal cues, i.e., by gradients of their own properties. We found that, when moving from soft to stiff substrates, clusters of neural crest cells exhibit an opposite gradient in their own tissue stiffness, with soft cells at the front and stiff cells at the back. We predict that this internal stiffness gradient is enough to guide collective cell migration — a phenomenon that we call internal durotaxis. Moreover, these cell clusters are taller at the back than at the front. We explain this asymmetric height profile by modeling the cell cluster as an active liquid droplet driven by the motile cells at its base. We speculate that the emergence of internal guidance cues could provide robustness to the migration of cell clusters in noisy environments.

Speaker Information

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Event Details

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