



University
of Basel

Department
Biozentrum



Swiss Institute of
Bioinformatics

BIOZENTRUM

The Center for
Molecular Life Sciences

Basel Computational Biology Seminar

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Self-organized guidance of cells and tissues

From immune responses and cancer invasion to tissue morphogenesis, directed motion is a hallmark of living systems. But how do cells “know” where to go? Traditional models invoke long-range chemical or mechanical cues, yet direct evidence for such global guidance signals is often limited. An alternative picture reframes guidance as an emergent process driven by self-generated gradients, local feedback, and stochastic exploration. In this talk, I will present theoretical work quantifying self-generated versus globally controlled guidance across different biological contexts. First, I will summarize our discovery that immune cells steer migration using self-generated chemotactic cues, and show how this mechanism can be exploited by heterogeneous cell populations to optimally co-migrate over long distances. I will then discuss the influence of self-organized versus external guidance cues in shaping complex branched architectures such as neurons and vascular networks. Finally, I will share ongoing work linking local guidance rules to the collective “optimal” tiling of retinal cells and the emergence of tissue-scale order, highlighting shared principles of self-organized guidance from migrating cells to complex tissues.

Date: **Monday, 15 December 2025**

Time: **16:15 h – 17:15h**

Location: **Biozentrum, 2.073**

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