Understanding the vocabulary of the individual cell allows for perturbations

Spatial (re)programming

Wound healing, organ development

Local rules leads to global emergent phenomena - sometimes changes \_\_ the system unintuitively.

Understanding how different patterning organizes morphogenesis,

Small off-equilibrium leads to large-scale structure.

We want to harness, or at least start to understand.

Examples: Snowflakes, organoids(?)

BC

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**Investigating spatial algorithms for morphogenetic patterning**

You are spatial <3

All phenomena can be thought of as list of rules and corresponding boundary conditions:

If we know *how* gravity pulls on a ball and *where* it started, we can calculate its trajectory. Local rules lead to global emergent phenomena - but as we know from chaos theory, sometimes a system reacts unintuitively to change.

Our work will be looking at the inherently interesting subject of *morphogenesis*, that is, the origin of physical shape. In nature, mind-bogglingly complex shapes, stem from relatively simple parts – no single cell knows the grand plan, but in collaboration, they can form almost anything.

A lot of work has been put into understanding how different patterning organize morphogenesis. Small-scale symmetry breaks in (chemical nonequilibria) leads to large-scale, emergent structure. Some of this interaction is understood, but as everything happens through self-organization, tracing the path of information has been elusive.

For scientists dreaming big, growing artificial organs as "replacement parts" will revolutionize the health-care industry. A reoccurring problem is that, without us truly understanding why, cells behave wildly different in-vitro (in a lab) compared to in-vivo (in the body). Their environment matter, but figuring out how these boundary conditions affect the cells (i.e. solving the inverse problem) is highly non-trivial.

Our hypothesis is, that if we understand the vocabulary of the individual cell (its rules) we can take that out of the equation, and change biological outcomes by smartly perturbing the initial conditions.

This is what we call spatial (re)programming.

What am i to do?

In this project we will...

somatic

but as there is no conductor

Applications and implications