
PhD thesis: Mathematical modelling of cell-cell communication
within the Excellence Cluster "Centre for Integrative Biological Signaling Studies (CIBSS)"
Methods of Systems Biomedicine (MSB), Dr. C. Kreutz

The spatial organization of living cells during the formation of tissues and organs is a complex dynamic process. Within the excellence cluster CIBSS, we develop mathematical models for the investigation and understanding of pattern formation processes during the development of tissues and organs.

We could already develop and implement a comprehensive methodology for mathematical modelling based on the data from our experimental collaborators including methods of parameter estimation, uncertainty analysis and experimental design. However, these approaches were primarily established for the investigation of signaling pathways in individual cells and have to be extended for multi-scale modelling, i.e. for describing signals between cells and different cell types.

The **major goals** of this PhD thesis are:

- **Statistical analysis** and interpretation of data from our collaborators
- Establishing **ODE models** for describing the spatial organization of cells during the development of tissues
- Advancing the **methodology for data-based modelling** on multiple scales

Within CIBSS, we collaborate with two experimental partners which are experts for the considered biological processes. Dr. Peter Walentek investigates cell-cell signaling during the development of epithelia (=Epithelien z.B. Haut, Schleimhäute). Dr. Giorgos Pyrowolakis investigates the development of wings in Drosophila (Flügel von Fruchtfliegen).

Requirements:

- Superior skills
- Motivation
- Some knowledge and interests in programming
- Interest in interdisciplinary research projects

Your benefits: In your PhD thesis you will ...

- learn how to properly analyze biomedical data from the lab,
- learn how to properly design studies in biomedical research,
- learn a comprehensive methodology for establishing novel mathematical models,
- obtain valuable knowledge about interdisciplinary biomedical science.

Combination of abilities from traditional Physics with experiences in biomedical research opens a big job market as well as a huge field of practically relevant science.

It is possible to become part of the CIBSS track of the Spemann Graduate School SGBM and thereby benefit from this professional PhD program (e.g. thesis advisory committee, networking and training of soft skills).

Training as statistical consultant is possible/desirable. German and English language skills are required.

If you are interested or you need more detailed information, please contact:



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