
COLLOQUIUM

Decoding the Cellular Circuitry of Cardiac Repair

Speaker:

Prof. Dr Dominic Grün, holds the Chair of Computational Biology of Spatial Biomedical Systems at the University of Würzburg. He is also the Director of the Würzburg Institute of Systems Immunology. He combines biology with Artificial Intelligence (AI) and machine learning methods to study complex cellular networks.

Time:

Thursday, October 08, 2026 – 1 pm

Venue:

ISAS Campus, Lecture Hall
Otto-Hahn-Straße 6b
44227 Dortmund

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WebEx: <https://t1p.de/uct2i>

Meeting-ID: 2731 088 7746

Password: 3W9x2FbuMfM

Abstract

Mathematical modeling of gene networks in systems biology has uncovered key design principles underlying network motifs that regulate transcriptional responses. Comparable engineering principles are thought to control the interactions of molecular response programs among neighboring cells within local tissue environments. These cellular circuits play a critical role in governing tissue development, maintaining homeostasis, and mediating responses to disease. Recent advances in spatial transcriptomics now enable precise measurement of cellular states within tissues; however, existing computational methods are largely descriptive and lack the capacity to predict these circuits or their downstream effects on cellular behavior. We introduce latent variable modeling approaches to integrate single-cell RNA-sequencing and high-resolution imaging-based spatial transcriptomics data for the inference of cellular circuitry. Focusing on cardiac lesion repair in mouse models of myocardial infarction, we demonstrate that our integrative spatial analysis strategy reveals cellular networks regulating dynamics of scar formation and unveils local niche signals that induce a progenitor-like cardiomyocyte state. These discoveries could be leveraged in the future to improve cardiac repair and regeneration of the heart muscle.