Friedrich-Alexander-Universität
Erlangen-Nürnberg

RTG 2950 SyMoCADS

Synthetic Molecular Communications Across Different Scales: From Theory to Experiments

5th SyMoCADS Seminar - November 6, 2026

08:30 – 09:00	**CHECK IN & COFFEE**
09:00 – 09:15	**Opening** Prof. Robert Schober & Prof. Kathrin Castiglione
09:15 – 10:15	***Faster to Function: Model- and Data-Driven Biocatalysis from Single Enzymes to Cascades*** **Prof. Katrin Rosenthal** Bielefeld University, Germany
10:15 – 11:15	***Long-distance molecular communication in plants*** **Prof. Richard J. Morris** John Innes Centre, United Kingdom
11:15 – 11:45	**COFFEE BREAK**
11:45 – 12:15	**SHORT INTRODUCTION & PROJECT RESULTS - CLUSTER 3** ***P7: Transmitter Systems for Releasing and Sending Airborne MC Signals as "Odor Objects"*** **Sümeyye Carkit-Yilmaz**, FAU Erlangen-Nürnberg
12:15 – 12:40	***P8: Receiver Architectures for Information Recovery from Airborne MC Signals*** **Zhu Kaikai**, FAU Erlangen-Nürnberg
12:40 – 13:50	**LUNCH BREAK**
13:50 – 14:20	**SHORT INTRODUCTION & PROJECT RESULTS - CLUSTER 1** ***P2: Design and Characterization of Protein Modules for MC-Based Sensing and Control in Microliter-scale Bioreactors*** **Silvana Zurmühl**, FAU Erlangen-Nürnberg
14:20 – 14:45	***P1: Nanodevices for MC-Based Sensing and Control in Microliter-scale Bioreactors*** **Lea Erbacher**, BVT, FAU Erlangen-Nürnberg
14:45 – 15:10	***P3: MC-based Modelling, Monitoring, and Control of Microliter-scale Bioreactors*** **Teena tom Dieck**, IDC, FAU Erlangen-Nürnberg
15:10 – 15:40	**COFFEE BREAK**
15:40 – 16:10	**SHORT INTRODUCTION & PROJECT RESULTS - CLUSTER 2** ***P4: Forces, Limitations, and Concepts for SPION Steering*** **Keyu Xiao**, LITES, FAU Erlangen-Nürnberg
16:10 – 16:35	***P5: Lumped-Parameter Models for and Optimization of SPION Steering in Highly Branched Vascular and Tissue Structures*** **Luiz Wille**, LITES, FAU Erlangen-Nürnberg
16:35 – 17:00	***P6: Development of Tumor Models for MC based on Additive Manufacturing Approaches*** **Daniel Fleischhauer**, LKT, FAU Erlangen-Nürnberg
17:00 – 19:00	**GET TOGETHER AND NETWORKING**

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GUEST LECTURES

Faster to Function: Model- and Data-Driven Biocatalysis from Single Enzymes to Cascades



Prof. Katrin Rosenthal

Bielefeld University, Bioprocess Engineering, Bielefeld, Germany

Sustainable bio-based production relies on efficient biocatalytic processes, yet their development remains largely iterative, especially when sensitive enzymes or novel target molecules are involved. This talk presents approaches for the biocatalytic synthesis of pharmaceutically relevant compounds, spanning single-step reactions to complex cascades and wild-type to genetically modified biocatalysts. For enzyme cascades, it is shown how modeling, simulation, and targeted experiments can be combined into model-based and data-driven strategies that overcome destabilizing interactions and enhance overall performance. In addition, cell-free protein synthesis is introduced as a route to complex proteins such as membrane proteins, which are obtained in functional form using hydrophobic environments and integrated activity assays. Finally, the role of FAIR data for reproducibility, modeling, and machine learning is discussed, as well as the transfer of these approaches into scalable, economically and environmentally competitive industrial processes.

Long-distance molecular communication in plants



Prof. Richard J Morris

John Innes Centre

Norwich, United Kingdom

Information processing is key for plant survival. Plants need to adapt to a changing environment and they do so by changing their development in response to various stimuli. To transmit information to distal parts of the plant they use a variety of signals. After an introduction on communication and electrical signal transmission in plants, I will focus on recent results relating to long-distance calcium waves and a form of signal known as variation potentials. I will demonstrate how simple mathematical models have allowed us to evaluate different hypotheses and put forward new ideas for the underlying mechanisms. These models and mechanisms provide new insights into how information is transmitted throughout the plant.

References:

- MJ Evans, WG Choi, S Gilroy, RJ Morris Plant Physiology 171 (3), 2016, 1771-1784
- MJ Evans, RJ Morris The Plant Journal 91 (6), 2017, 1029-1037
- M Blyth, RJ Morris Frontiers in Plant Science 10, 2019, 1393
- Bellandi A, Papp D, Breakspear A, Joyce J, Johnston MG, de Keijzer J, Raven EC, Ohtsu M, Vincent TR, Miller AJ, Sanders D, Hogenhout SA, Morris RJ, Faulkner C. (2022) Science Advances. Oct 21; 8(42)