Ringberg Castle Symposium 2017

on 4D Molecular Systems Engineering

Co-organizers: Martin Möller, Leibniz-Institute of Interactive Materials

Joachim P. Spatz, Max Planck Institute for Medical Research

Molecular systems engineering is centered on the discovery of basic principles governing the behavior of natural or synthetic molecular systems and the application of such knowledge to the design of advanced devices and technologies. This design paradigm aims to incorporate synthetic building blocks, including electronic, optical, mechanical, chemical, and biological components, into functional systems that will impact a diverse range of fields, from advanced biological and biomedical applications to energy harvesting and beyond. To address the current fabrication and operational limits of molecularly functional systems, new challenges must be addressed, especially with respect to active molecular materials. This includes the integration of internal energy conversion strategies to enable active functions like switchable material properties, hierarchical self-assembly, memory-based effects, and the development of internal and external feedback mechanisms. The ability to incorporate these features and deploy them dynamically over time elevates 3-dimensional materials into 4-dimensional systems.

Thus, we wish to organize a discussion symposium that addresses the scientific challenges facing the advancement of molecular systems engineering by focusing on understanding and predicting material systems properties and leveraging that knowledge through rational material design. This will bring us closer to the ultimate goal of developing material systems that qualify as both complex and adaptive, possessing properties that heretofore are only found in living organisms or human-controlled machines.

We believe it is timely to unite like-minded physicists, chemists, and life scientists striving to solve the unique challenges encountered at the intersectional gap between the molecular assembly of materials and the design of smart systems possessing feedback mechanisms that can be harnessed to perform useful work.

Invited Speakers (not yet confirmed)

Job Boekhoven, TU Munich
Yu Suk Choi, University of Western Australia
Cees Dekker, TU Delft
Peer Fischer, MPI for Intelligent Systems
Erwin Frey, LMU
Martin Fussenegger, ETHZ
Benny Geiger, Weizmann Institute
Wilhelm Huck, Radboud University
T. K. Lu, MIT
Dan Luo, Cornell University
Luis Liz-Marzán, CIC biomaGUNE
Wolfgang Meier, University of Basel
Bert Meijer, TU Eindhoven
Daniel Müller, ETHZ
Virgil Percec, University of Pennsylvania
Randall Platt, ETHZ
Sai Reddy, ETHZ
Hans-Werner Schmidt, University of Bayreuth
Sergei Sheiko, University of North Carolina
Oren Sherman, University of Cambridge
Fritz Simmel, TU Munich
Peter Timmerman, University of Amsterdam,
Oliver Trapp, LMU
Britta Trappmann, MPI for Biomolecular Medicine
Andreas Walther, University of Freiburg
Tanja Weil, MPI for Polymer Research
Itamar Willner, The Hebrew University of Jerusalem

Participants from Leibniz Institute of Interactive Materials
Dimitri Chigrin
Laura De Laporte
Robert Göstl
Tamas Harazsti
Andreas Herrmann
Martin Möller
Ahmed Mourran
Uli Schwaneberg
Sören Schweizerhof

Participants from MPI for Medical Research
Amelie Benk
Heike Böhm
Ada Cavalcanti-Adam
Jacopo Di Russo
Kerstin Goepfrich
Michael Grunze
Andrew Holle
Jan-Willi Janiesch
Ilia Platzman
Friedhelm Servane
Joachim Spatz
Medhavi Vishwakarma
Qiang Wei
Marian Weiss
Jennifer Young