PROCESS SYNTHESIS AND PROCESS DYNAMICS

PSD

Prof. Dr.-Ing. Achim Kienle
www.mpi-magdeburg.mpg.de/psd
kienle@mpi-magdeburg.mpg.de

The research activities of the group are concerned with computational methods and tools for the analysis, synthesis and control of complex chemical – and also, more recently, – biological systems. Applications focus on process integration, plantwide control, the dynamics and control of particulate processes and new modeling strategies for cellular systems.

SYSTEMS AND CONTROL THEORY

SCT

Prof. Dr.-Ing. Jörg Raisch
www.mpi-magdeburg.mpg.de/sct
raisch@mpi-magdeburg.mpg.de

The group explores new concepts in systems and control theory and, for example, investigates hierarchical control systems, the abstraction based synthesis of hybrid systems, and control in tropical algebras. New theoretical results are being used to solve a wide range of application problems. Examples include control problems in chemical engineering, medical engineering, high-throughput-screening systems, and electricity grids.

ANALYSIS AND REDESIGN OF BIOLOGICAL NETWORKS

ARB

Dr.-Ing. Steffen Klamt
www.mpi-magdeburg.mpg.de/arb
klamt@mpi-magdeburg.mpg.de

Research lies in the field of Systems Biology where biology, mathematics and the engineering sciences intersect. The group develops theoretical methods for the analysis, inference, and targeted modification of bio-molecular networks and employs these methods in collaboration with partners working experimentally, for example, on identifying cellular signaling networks from experimental data or rationally (re)designing the metabolism of bacteria for the production of certain chemicals. A long-term goal is the routine use of mathematical modeling in biology, biotechnology, and biomedicine.

MOLECULAR SIMULATIONS AND DESIGN

MSD

Dr. rer. nat. Matthias Stein
www.mpi-magdeburg.mpg.de/msd
matthias.stein@mpi-magdeburg.mpg.de

The group simulates intra- and intermolecular interactions at multiple time-scales to provide detailed insight into reaction mechanisms, aggregation and recognition phenomena in biology and chemistry. The rationalization of complex phenomena in chemistry and biology requires a combination of various simulation approaches. The group develops and applies tools from quantum mechanics, molecular and Brownian dynamics to bioinformatics and protein structural modeling.

NUMERICAL LINEAR ALGEBRA FOR DYNAMICAL SYSTEMS

NDS

Dr. Martin Stoll
www.mpi-magdeburg.mpg.de/nds
stollm@mpi-magdeburg.mpg.de

Many processes in the natural and life sciences are modeled using partial differential equations. Solving them efficiently and accurately is important for many scientists. The group works on the development and implementation of fast and robust solvers for a variety of mathematical aspects and models based on differential equations.

By Plane

Nearby airports are Hanover (140 km), Leipzig (150 km) or Berlin (150 km) | There are trains to Magdeburg from these airports

By Train

Deutsche Bahn (DB) to Magdeburg-Hauptbahnhof station (www.bahn.de) | From Magdeburg City Carré/Hauptbahnhof take tram number 1 towards Lerchenwuhne or tram number 8 towards Neustädter See | Get off at Alter Markt station and change into tram number 5 towards Messegelände | Get off at Askanischer Platz station | From there, walk towards Sandtorstrasse. You will find the Max Planck Institute on the right | Current timetables: Magdeburger Verkehrsbetriebe www.mvbnet.de

By Car

Leave the highway (Autobahn) A2 at the Magdeburg Zentrum exit | Turn south onto B 189 (Magdeburger Ring) direction Halle and leave at Zentrum/Universität exit, direction B1 (Burg/Dessau) | Follow the street signs towards the B1, then go straight through the Universitätsplatz tunnel and continue on the B1 | Turn left towards Rothensee/Hafen at the traffic lights before crossing the bridges (Elbbrücken) | The Max Planck Institute is immediately on the right | Parking is available at the institute

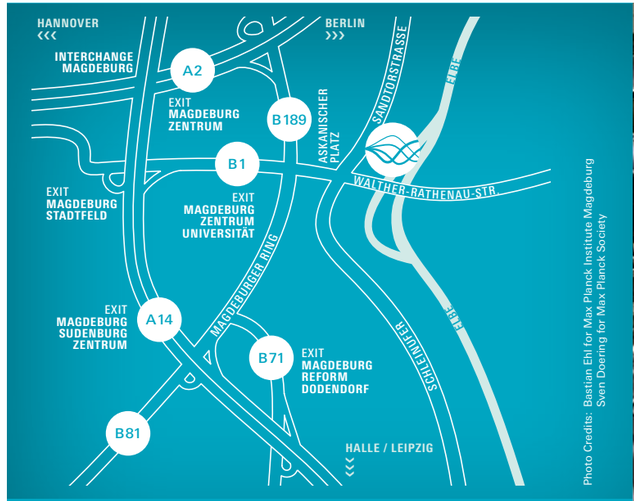


Photo Credits: Bastian Ehl for Max Planck Institute Magdeburg
Sven Doering for Max Planck Society

MAX PLANCK INSTITUTE FOR DYNAMICS OF COMPLEX TECHNICAL SYSTEMS
Sandtorstrasse 1
39106 Magdeburg
P +49 391 6110 0
F +49 391 6110 500
info@mpi-magdeburg.mpg.de
www.mpi-magdeburg.mpg.de

Issue status: July 2014

MAX PLANCK INSTITUTE FOR DYNAMICS OF COMPLEX TECHNICAL SYSTEMS MAGDEBURG

Creating knowledge, broadening horizons

ABOUT THE INSTITUTE

About the institute

The Max Planck Institute for Dynamics of Complex Technical Systems, which was founded in 1996, is the first engineering institute established by the Max Planck Society. It performs an important bridging function between fundamental research and industrial applications.

The institute has nine research groups and various scientific service groups working closely together on different interdisciplinary projects (in engineering, chemistry, information technology, biology and mathematics). Currently, the institute employs about 240 people.

The International Max Planck Research School Magdeburg (IMPRS), a joint initiative by the Max Planck Institute and Otto von Guericke University Magdeburg, provides an excellent training and research program for Ph.D. students.

About the Max Planck Society

The Max Planck Institute for Dynamics of Complex Technical Systems in Magdeburg is one of 83 institutes working under the aegis of the Max Planck Society (MPG) for the Advancement of the Sciences. The MPG is an independent, non-profit organization. It was established on February 26, 1948 as the successor organization of the Kaiser Wilhelm Society, which was founded in 1911. In addition to the institutes, the MPG also supports a range of research units, laboratories and working groups dedicated to the natural and engineering sciences, the humanities and medicine.

About Magdeburg

In recent years, Magdeburg has become an important center for science, research and technology. Apart from the Max Planck Institute and Otto von Guericke University, Magdeburg is also home to other important research and higher education institutions, including the Fraunhofer Institute for Factory Operation and Automation, the Virtual Development and Training Center, the Leibniz Institute for Neurobiology, a branch of the German Center for Neurodegenerative Diseases within the Helmholtz Association, the Magdeburg-Stendal University of Applied Sciences and the Institute for Automation and Communication.

BIOPROCESS ENGINEERING

BPE

Prof. Dr.-Ing. Udo Reichl
www.mpi-magdeburg.mpg.de/bpe
ureichl@mpi-magdeburg.mpg.de

Research focuses on the analysis, design and optimization of bioprocesses for manufacturing vaccines and recombinant proteins. This includes cell culture technology, downstream processing, analytics, and mathematical modeling. Recent topics are: Influenza vaccines and Modified Vaccinia Ankara from cell cultures, virus-host cell interaction, mathematical models for virus replication, purification of virus particles and EPO, plus high-throughput glycan analysis.

COMPUTATIONAL METHODS IN SYSTEMS AND CONTROL THEORY

CSC

Prof. Dr. Peter Benner
www.mpi-magdeburg.mpg.de/csc
benner@mpi-magdeburg.mpg.de

In silico optimization and control of complex technical processes rely on accurate and fast computational methods. For this, the group develops and analyzes mathematical algorithms and methods. Special emphasis is given to computer-aided control system design with a focus on dynamical systems, but other areas in computational science and engineering are also considered. The techniques employed include advanced numerical (multi-)linear algebra, model order reduction/system approximation, and high-performance computing.

PHYSICAL AND CHEMICAL FOUNDATIONS OF PROCESS ENGINEERING

PCF

Prof. Dr.-Ing. Andreas Seidel-Morgenstern
www.mpi-magdeburg.mpg.de/pcf
seidel-morgenstern@mpi-magdeburg.mpg.de

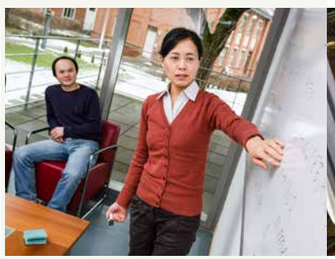
A profound knowledge of a large number of physical and chemical data and parameters is of key importance to understanding, analyzing and optimizing complex reaction and conversion processes. Our research group develops and applies methods to determine thermodynamic and kinetic data such as, for example, phase equilibria or the growth rates of crystals. Based on this, the group investigates complex separation and reaction processes.

PROCESS SYSTEMS ENGINEERING

PSE

Prof. Dr.-Ing. Kai Sundmacher
www.mpi-magdeburg.mpg.de/pse
sundmacher@mpi-magdeburg.mpg.de

The realization of a sustainable transformation system for chemical substances and energies, solely fed with renewable resources, is of paramount importance for the future of our society. For the optimal design of such a system, we need a fundamental understanding of all process levels involved, their hierarchical interaction and the resulting complex system behavior. For this purpose, the group develops new scientific engineering methods, validates their efficacy by use of laboratory-scale plants, and provides the know-how for their industrial application.



MAX PLANCK INSTITUTE
FOR DYNAMICS OF COMPLEX
TECHNICAL SYSTEMS
MAGDEBURG

Creating knowledge,
broadening horizons