



JACOBS  
UNIVERSITY



Presenting Research Opportunities at Jacobs University

# 1<sup>st</sup> Annual Research Day



## BOOKLET

## Rapid links

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Klaus Boehnke, Franziska Deutsch, Ulrich Kühnen

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Christoph Lattemann

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Keivan Mallahi-Karai

Arnulf Materny

Artem Naumov, Alexander Kochetkov

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Yilmaz Uygun

Hendro Wicaksono

Adalbert Wilhelm

Mathias Winterhalter

Isabel Wünsche

## Head of the Research Group

**Prof. Dr. Giuseppe Abreu**

Wireless Communications and Signal Processing



## Describe your research project in three sentences and one picture

- Physical-layer (PHY) and Multiaccess-layer (MAC) techniques for beyond 5G and 6G Wireless Communications systems aimed at high speed, ultra-low latency, energy and spectrally efficient, robust, and secure multi-point wireless connectivity for applications ranging from internet of things (IoT) to augmented and virtual reality (AR/VR) and more.
- Joint communications and sensing technologies for vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and vehicle-to-human (V2H) – altogether also referred to as V2X –systems aimed at high-precision positioning, trajectory-tracking and environmental awareness to enable connected autonomous driving.
- Post-quantum and lightweight security mechanisms for communications systems exploiting features of the wireless channel and signals.

## Why do you like doing research?

I enjoy solving hard problems, especially when the solution can be presented in elegant and simple ways that hide the sophistication required to achieve them. I also enjoy knowing that many of the problems we engineers solve have a true potential to impact the lives of real people.

## How can, in particular undergraduate, students contribute?

Undergraduate students who apply themselves sufficiently early, and who are ready to truly commit to it, can start training to doing research in my group typically during the second year of study as an ECE major. My research is fundamentally theoretical or algorithmic, such that a strong mathematical background and reasonable programming skills suffice. Some of my PhD students in fact started as junior research assists during their undergraduate studies and afterwards went straight into PhD, skipping the requirement of having a M.Sc. Degree entirely.

## How can students join your research?

Students are always welcome to approach me, and I am always willing to find interesting projects for students. But there are challenges. . . Interested students must, however, have the necessary grasp of mathematics, be dedicated and motivated.

### (Optional) Give two examples of past student projects

**Example 1: Advanced Wireless Localization Scheme and Analytical Tools:** This project started with an undergraduate student, who was given the task of improving on a wireless localization algorithm I developed myself, known as the Super Multidimensional Scaling (SMDS) algorithm, and which was the basis for starting my first start-up <https://zigpos.com>. The objective was to reduce the complexity of the method and, if possible, increase the precision by introducing advanced linear algebra techniques. The work led to several variations of SMDS algorithm, including the Complex SMDS and the Turbo SMDS. Subsequently the student went on a fast-track to do his PhD, which was concluded **Summa cum Laude** in 2018, when the student was only 24 years old. He is now the founder and CEO of <https://www.natix.io>.

**Example 2: Advanced Waveforms and Receivers for Joint Communications and Sensing with Application to V2X Systems:** Yet another project which started with an undergraduate student, who was first inserted in an on-going project sponsored by Continental AG. The student started his activities already from the second semester, studying the message-passing algorithm in order to develop a new decoder for an emerging type of modulation scheme, referred to as quadrature spatial modulation (QSM), suitable to multi-antenna systems at high frequency bands. Thanks to the success of his work, the work resulted in various patents and a full journal paper at the most prestigious journal of the field, propelling the student to pursue his PhD on a fast-track basis (i.e., without the requirement of a Masters Degree), supported by Continental AG under an expanded research project (see <https://www.jacobs-university.de/news/future-6g-technology-jacobs-university-bremen-and-continental-intensify-cooperation>).



## Head of the Research Group

Andreas Birk, Robotics

## Describe your research project in three sentences and one picture

The group of Andreas Birk investigates the Artificial Intelligence (AI) side of robotics, especially with respect to machine perception and world-modeling for intelligent autonomous systems. The related research includes contributions to fundamental methods, e.g., for robust registration in 2D and 3D, as well as to real-world applications in unstructured environments, e.g., in marine systems, search and rescue operations, or logistics.

## Why do you like doing research?

I guess, it is in my genes ... 😊

## How can, in particular undergraduate, students contribute?

There are two options that are ideally even combined. First, contributions can be made through programming, which requires excellent coding skills in C++ and deep knowledge of fundamental principles of algorithms and data-structures. Ideally, there is also experience with the Robot Operating System (ROS). The second option are theoretical contributions that are linked to specific ideas and concepts, which typically require deep mathematical knowledge from areas like signal processing, stochastics, or discrete optimization.

## How can students join your research?

The best way to join is to do a research-oriented BSc thesis. For this purpose, a very limited number of according topics is offered every year. This is only a reasonable option if (a) you have had a deep look at the offered research topics and (b) you found a topic where you are very confident that you have the necessary deep theoretical and practical background. A research-oriented BSc thesis is high risk and it requires a high amount of independent studying. The reward is a high likelihood that the work will lead to a strong publication.

Research-oriented topics are published in a special section on the following webpage:

<http://robotics.jacobs-university.de/TMP/BScTheses/>.



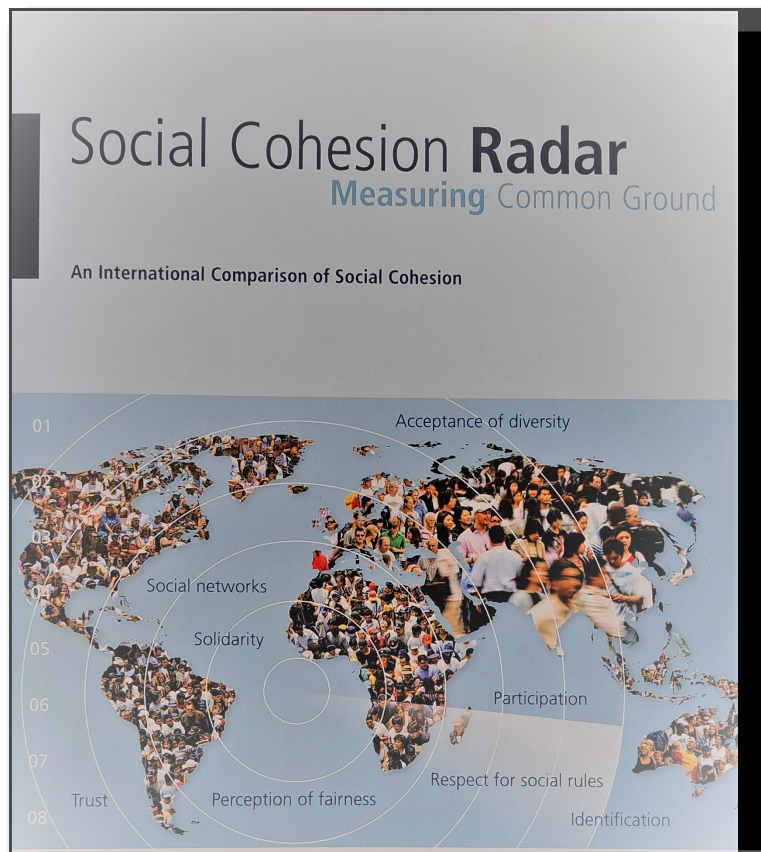
## Head of the Research Group

Prof. Dr. Klaus Boehnke



## Describe your research project in three sentences and one picture

The research that we conduct in my team always has clear political connotations. It has to do with social cohesion, xenophobia, right-wing extremism, value change, value transmission, migration to Germany, and last but not least, peace. We typically work with cross-cultural, large-scale surveys to generate new knowledge.



## Why do you like doing research?

For me research is political activism. My ultimate – lofty sounding – research aim is to make this world a better place.

## How can, in particular undergraduate, students contribute?

As I often work with self-collected data, students can most prominently help collecting data (e.g., in their home country) and in getting the collected survey data (e.g., paper-pencil questionnaires) on the computer. After they have completed their stats courses, they can also assist with data analysis.

## How can students join your research?

Just pass by my office in RIV, Room 112. I have an open-door policy. I am a dedicated office sitter, but if you want to make 100% sure that I am there, write me an advance email or give me a call before you come (3401).

## (Optional) Give two examples of past student projects

**Example 1:** Jacobs students collected data in their home countries on self-developed items to assess paternal warmth (in parenting) and we published the work in a high-impact journal: [Boehnke, K., Arnaut, C., Bremer, T., Chinyemba, R., Kiewitt, Y., Koudadjey, A. K., Mwangase, R., & Neubert, L. (2014). Toward emically informed cross-cultural comparisons: A suggestion. *Journal of Cross-Cultural Psychology*, 45(10), 1655-1670. DOI: 10.1177/0022022114547571dd]

**Example 2:** Students collected data among fellow students using a new version of the so-called "Social Axioms Questionnaire" and the study results made it into a multi-country research report (mentioning Jacobs University): [Leung, K., Lam, B. C. P., Bond, M. H., Conway, L. G. III, Gornick, L. J., Amponsah, B., Boehnke, K., Dragolov, G., Burgess, S. M., Golestaneh, H. Busch, H. Hofer, J., Dominguez Espinosa, A. d. C., Fardis, M. Ismail, R., Kurman, J., Lebedeva, N., Tatarko, A. N., Sam, D. L., Mendes Teixeira, M. L., Yamaguchi, S., Fukuzawa, A., Zhang, J., & Zhou, F. (2012). Developing and evaluating the social axioms survey in eleven countries: Its relationship with the five-factor model of personality. *Journal of Cross-Cultural Psychology*, 43, 833-857. doi: 10.1177/0022022111416361]

## Head of the Research Group

Klaus Boehnke



Franziska Deutsch



Ulrich Kühnen



## Describe your research project in three sentences and one picture

We assessed basic values of representative samples from Germany and the UK at the onset of the Corona Pandemic and one year later. Does the Pandemic yield any value change and in what direction? How are these values associated to political attitudes and opinions such as conspiracy theories?



## Why do you like doing research?

We are social scientists. Mere intuitions or beliefs about the world are insufficient bases for accepting far reaching implications. As scientist we are self-critical enough to instead rely on empirical evidence. As social scientists we want to make contributions to public discourses about social and political questions. In sum, we care about what is true and what is good.

## How can, in particular undergraduate, students contribute?

We are happy to supervise small research projects using the data that we collected. Such projects may for instance develop into a Bachelor's thesis. We are open to creative ideas.

## How can students join your research?

Just drop us a line.



## Head of the Research Group

**Prof. Dr. Klaudia Brix**, Molecular Cell Biology – Biomedicine of Proteolysis

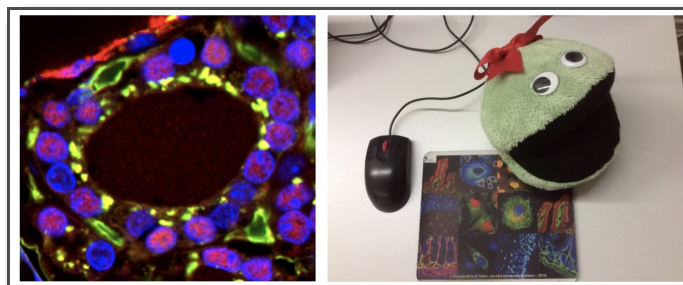
Klaudia Brix took up her current position as Professor of Cell Biology in 2002 and is the SPC (Study Program Chair) of BCCB, the third largest Major at Jacobs University. Her teaching activities in BCCB and MCCB comprise molecular cell biology, biomedicine, and chemical biology, and she chairs the exchange with the NYU-SURP program. She is convinced that early research involvement of our students is more than (just) a USP of Jacobs University.

Klaudia Brix was Chair of the 2012 Gordon Research Conference (GRC) on Proteolytic Enzymes and Their Inhibitors and of the 2018 GRC on Protein Processing, Trafficking, and Secretion. She was Co-Coordinator of the Germany-wide, DFG-funded priority program “Thyroid Trans Act” from 2012 to 2019, and is currently a Member of the Core Group of the EU-COST action ProteoCure.



## Describe your research project in three sentences and one picture

Klaudia Brix is an expert in molecular biomedicine and quantitative cell biology. Her group’s work specializes on the significance of proteolysis in epithelial organs and is well-connected with the research activities of the life scientists and chemists at the School of Science. Research topics comprise protein trafficking in eukaryotic cells, significance of cysteine cathepsin and kallikrein proteases in health and disease, primary cilia, SARS-CoV-2 Spike protein interactions with host cells, neuron interactions with glial cells in the hippocampus and the Choroid plexus, intestine mucosal models, and auto-regulation of thyroid gland functions.



## Why do you like doing research?

Experimental research means to learn about new topics and methods every day, which is demanding but also enriching. The complementarity of experimental approaches is another important aspect. Understanding how cells and tissues are built and interact with each other to enable healthy body function is central in all research endeavors of our group. Only when the underlying principles are known, we can attempt clarifying what goes mechanistically wrong in the onset and progression of diseases. Doing research in the field of proteolysis means to interact with a very supportive network of experts willing to share.



## How can, in particular undergraduate, students contribute?

Undergraduate Students can contribute in on-going research projects during their BSc thesis. Graduate Students would be very welcome in an MSc program in the Molecular Life Sciences.

## How can students join your research?

Students can join our research group meetings to learn more about the ongoing research projects.

## (Optional) Give two examples of past student projects

**Example 1:** 1. Project on the interaction of the Spike protein of SARS-CoV-2 with neuronal cells and the possible impacts on changes of the cytoskeleton, such as occasionally observed clinically for peripheral neurons of COVID-19 patients. Experimental approaches and methods entailed cell culture, immunoblotting and high-end immunofluorescence microscopy to investigate expression and localization of the virus-related proteins and possible receptors, as well as Spike protein-priming proteases, Cell-Profiler based quantitative image analyses of the respective changes in certain cytoskeletal elements, and contribution to presentation of the results to the third-party funding body.

**Example 2:** 2. Project on the significance of cysteine cathepsin protease activity to maintain primary cilia of thyroid epithelial and carcinoma cells. The significance of primary cilia relates to their role in denoting thyroid health or disease when changed in frequency or length on human thyrocytes *in situ*. Experimental approaches and methods entailed cell culture, immunoblotting experiments to demonstrate expression and secretion of proteases, and immunostaining of cells with specific cilia markers to monitor changes in frequencies and lengths of the cellular antennas. To enable semi-automated, highly reproducible data analysis, the student performed confocal laser scanning microscopy at near-super resolution, and analyzed hundreds of micrographs quantitatively by Cell-Profiler-based pipelines to allow identification of the delicate cilia structures

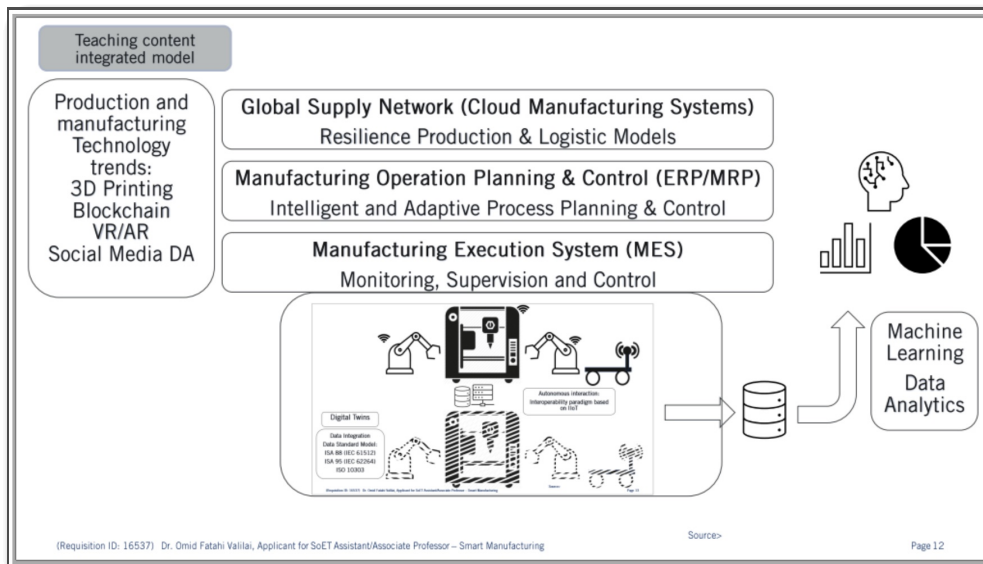
## Head of the Research Group

### Dr. Omid Fatahi Valilai

- \* Computer Integrated manufacturing & Production Network
- \* Industry 4.0 & Smart systems

## Describe your research project in three sentences and one picture

We are trying to elaborate ideas for transforming production systems using the information technology driven mechanisms. We are eager to demonstrate the interactions in smart manufacturing systems in a globalized and network structure with sustainable ambition. We use the operations research and system analysis and design approaches to model, simulate and optimize the production systems for benefiting from the Industry 4.0 paradigm. We also try to focus on smartness in terms of multi agent system and using Blockchain technology as an enabler.



## Why do you like doing research?

We like to play a major role in shaping the future world of Production and manufacturing systems and supply chains. We are trying to help the 3 pillars of Sustainability to be realized in modern future generation of production and supply chains. We are eager to shape the definition of smart manufacturing and production system and use emerging technology for digital transformation of conventional production and logistic systems.

## How can, in particular undergraduate, students contribute?

We have successful experience of engaging and mentoring under graduate students or using their course materials in real cases and help them to accomplish the stages of doing a research. so if you are interested to do a research and you don't know how to strat, we will happy to have you in our teams.

## How can students join your research?

Please feel free to contact me and my work group colleagues:

Email: [o.fatahivalilai@jacobs-university.de](mailto:o.fatahivalilai@jacobs-university.de)

Office: South Hall, Office 209

Tel: 0421 200-3077

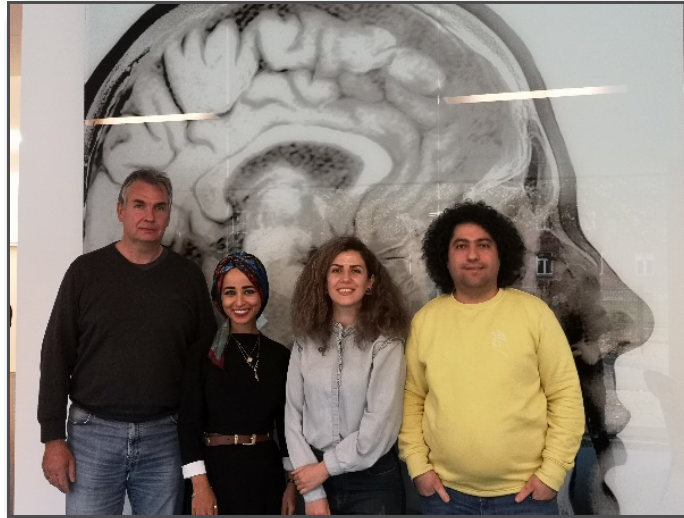
Website: <http://ofatahival.user.jacobs-university.de/>

## **(Optional) Give two examples of past student projects**

**Example 1:** Using machine learning programming to model and create simple artificial intelligence modules for consumer comments analysis and perceptive quality determination. This was done by one of our under graduate students in our team and has resulted in basic models for shaping the omni-channel strategies for product lifecycle management.

## Head of the Research Group

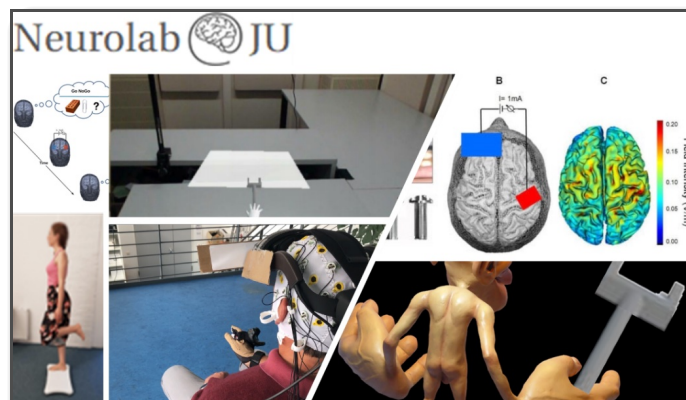
**Professor Ben Godde**, Professor of Neuroscience



*From left to right: Prof. Godde, Radwa Khalil (postdoc), Hadis Imani (PhD student), Amir Jahanian Najafabaadi (PhD student)*

## Describe your research project in three sentences and one picture

Our main interest is in perceptual, motor, and cognitive learning and brain plasticity during the adult lifespan, particularly into old age. We develop and evaluate interventions for maintaining and improving functioning during aging, such as perceptual or motor training or physical and creative activities. Our methods include electroencephalography, neurobiofeedback, non-invasive brain stimulation, and virtual and augmented reality scenarios. Check my homepage for details: <http://bgodde.user.jacobs-university.de/>



## Why do you like doing research?

Neuroscience is an interdisciplinary and very dynamic field where each day I learn something new about our brains you cannot find in any textbook. To be part of this is extremely exciting and the reason why I wanted to become a researcher since childhood.

## How can, in particular undergraduate, students contribute?

UG students can contribute by assisting during experiments, doing literature research, communicating to the (German) participants and public, or just doing some pilot experiments. This partly might require some fundamental knowledge in Neuro-science/psychology/biology. 3rd year students are welcome to discuss ideas for thesis projects early in their 5th semester.

## How can students join your research?

Students can contact me or my work group members any time. A good starting point would be taking my 2nd year courses in Neuroscience. Note: Neuroscience studies and experiments need to be well prepared and specific equipment. Thus, there might be periods without any experiments. Also, a great amount of flexibility is required.

## (Optional) Give two examples of past student projects

**Example 1:** In a recent student project, two guest students from Wellesley, studied brain oscillations related to creative processes in dancers performing either improvised or structured dance. They used our wireless EEG devices with which we are able to measure brain activity in mobile settings. The students brought their own idea and designed, prepared, and performed the study under my supervision.

**Example 2:** In a running project, a student examines how tools like golf clubs are integrated into the own body schema. He uses behavioral tests and electroencephalography with the same mobile device to assess changes in perception and peripersonal space induced by long-term experience with the tool and associated alterations in brain activations.



## Head of the Research Group

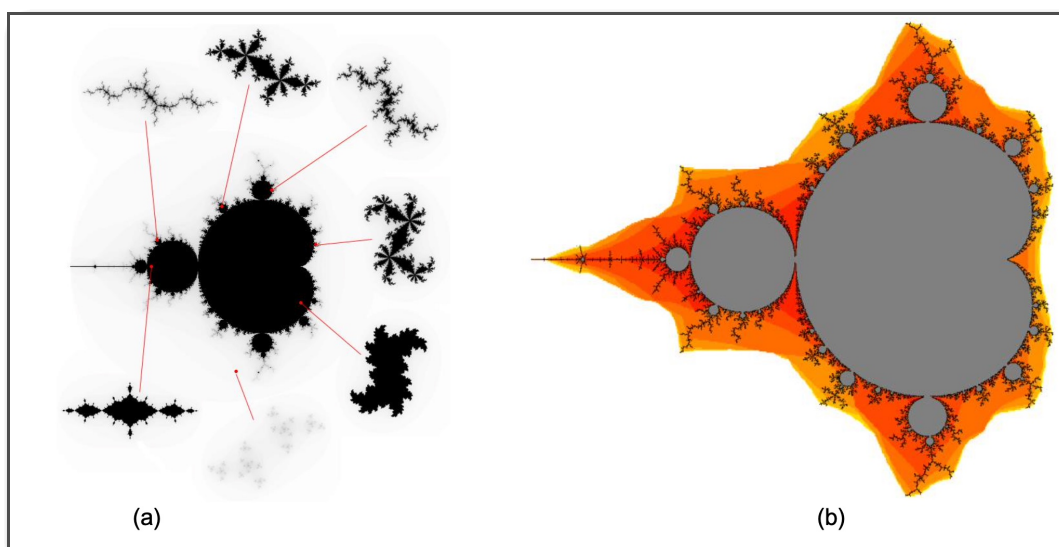
### Igors Gorbovickis

Research area – dynamical systems and their relations with complex analysis, ergodic theory and renormalization. I am also interested in some questions from metric geometry.

## Describe your research project in three sentences and one picture

Dynamical systems are mathematical models of real life evolutionary processes. The aim of the theory of dynamical systems is to understand the mechanisms behind certain fundamental phenomena that can be shared by various seemingly quite different dynamical systems. Examples of such phenomena may include questions of stability (e.g., Is our solar system stable?) or onset of chaos in completely deterministic systems (e.g., Why can't we always give an accurate weather forecast?).

Dynamical systems often give rise to complicated fractal pictures:



(a) The Mandelbrot set in the center and several Julia sets with different parameters; (b) The Mandelbrot set (in gray) and the accumulation set of the critical points of the multipliers (in color).

## Why do you like doing research?

It is thrilling to discover something new and get a better understanding of the world around us!

## How can, in particular undergraduate, students contribute?

There are several projects that could involve programming and collecting empirical data from numerical simulations. There are also several purely mathematical projects.

## How can students join your research?

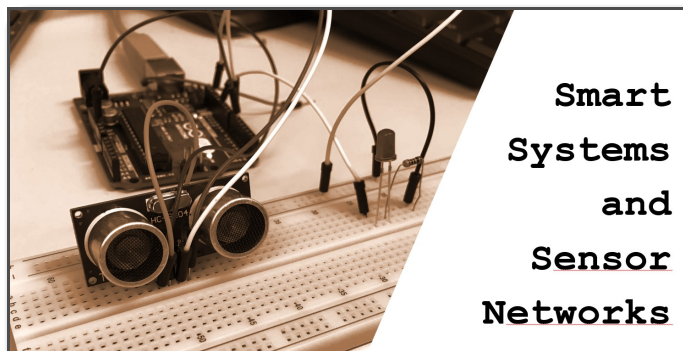
I can be reached for example by email.

## Head of the Research Group

Fangning Hu, Smart Systems and Sensor Networks

### Describe your research project in three sentences and one picture

The idea behind the smart systems is that a microchip could be embedded into various devices like television, light, fan, refrigerator, and air-conditioner, by programming the chips, those devices could make "smart decision" by their own. The Sensor networks technologies enable the above-mentioned non-IP devices connected to the internet thus being reached remotely. Smart systems and Sensor Networks are important building blocks to the Internet of Things (IoT) which can provide an advanced level of services to society and businesses.



### Why do you like doing research?

It is very exciting to contribute to the new technologies which enable people a more comfortable life.

### How can, in particular undergraduate, students contribute?

After learning the necessary technologies in Intro to RIS lab and embedded systems lab, the students could improve the current smart systems prototypes used as new lab materials or propose and design their own smart systems to industries or companies.

### How can students join your research?

Students could do projects in the 5th semester with me and later do the thesis based on the projects.

### (Optional) Give two examples of past student projects

**Example 1:** A smart system which monitors LEDs and temperature remotely with picture (see [LED Control \(jacobs-university.de\)](#)).

**Example 2:** Detect the gesture of a human by embedded gloves.

## Head of the Research Group

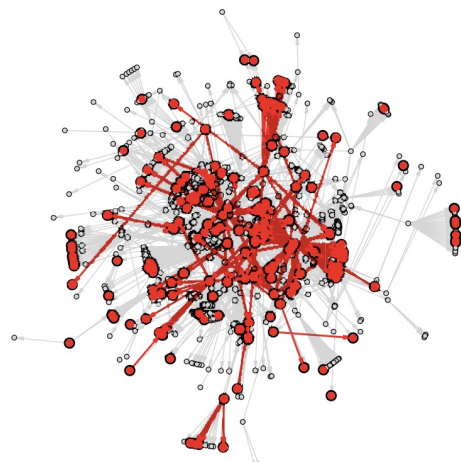
**Marc-Thorsten Hütt**, Professor of Computational Systems Biology



## Describe your research project in three sentences and one picture

We study dynamical processes on graphs, mostly by numerical simulation and by analyzing how architectural features of graphs affect the collective dynamics.

We then apply the results of these investigations, either on the level of theoretical understanding or on the practical level of designing data analysis techniques to a diverse set of disciplines: **biology** (graphs are derived from interacting genes and from biochemical reactions), **medicine** (network-level interpretation of clinical 'omics' data), **neuroscience** (structure-function relationships in the brain), **industrial production** (synchronization of material flow in production networks) and many more.



*Transcriptome data (representing gene activity) mapped onto a gene regulatory network*

## Why do you like doing research?

I have always been passionate about self-organized patterns. The basic idea that interactions among elements under specific rules can lead to collective behaviors (synchronization, spiral waves and other wave phenomena, patches and stripes)

The fact that these patterns emerge from local interactions is the core idea of self-organization. And now applying these concepts to dynamical processes on graphs and re-discovering some of these patterns has a certain beauty for me personally.

## How can, in particular undergraduate, students contribute?

Over the years I have seen a range of people making the transition from students in my courses to members of my research group. To me this is a reminder, how important it is to consider teaching and research as an entity.

An essential component of my day is to discuss research with the people in my group. I enjoy to establish strong ties between the topics of bachelor and master theses I supervise and the research topics in my group.

In the past I had CS students providing efficient implementations of some of the computational methods we are using, or BCCS students helping me identify suitable data sets and analyze them. Over the last three years the majority of students working with me came from the Data Engineering master program.

I have also supervised bachelor theses in IEM. The topics there are mostly related to network representations of production and distribution data, as well as compiling, cleaning and processing company data in several collaborative projects with industry partners.

## How can students join your research?

From my perspective, a perfect research topic is about the match between the supervisor and the student. And the majority of topics of student projects in the past came up during the discussion with the student – with me describing my current research interests and the student highlighting their methodological strengths and topical passions.

## Give two examples of past student projects

**Example 1:** Harshal Deepak Bendale (Data Engineering, class of 2021) programmed the Cohortizer web application as part of his SA job: [sysbio.jacobs-university.de/software/](https://sysbio.jacobs-university.de/software/)

**Example 2:** Jackson Whiteley (CS, class of 2022) has programmed the network coherence calculator cytoscape app as part of his bachelor thesis: [apps.cytoscape.org/apps/networkcoherencecalculator](https://apps.cytoscape.org/apps/networkcoherencecalculator)

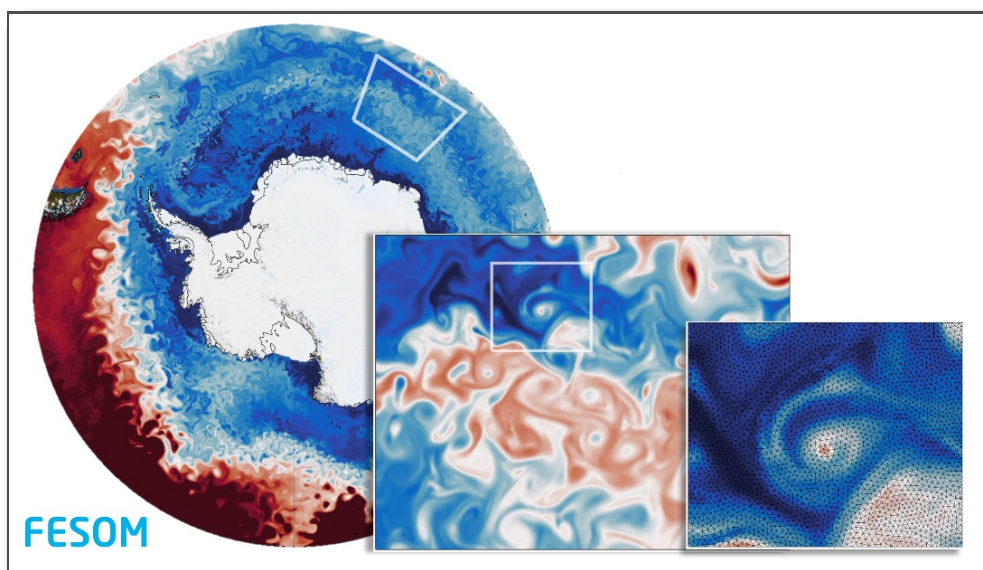
## Head of the Research Group

**Stephan Juricke**

Climate and ocean physics and modelling

## Describe your research project in three sentences and one picture

To be able to understand and predict anthropogenic climate change and its consequences, we need to use sophisticated climate models that describe the evolution of the climate system through time. We develop and improve these climate models in collaboration with the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven with a specific focus on ocean and sea ice components by improving the numerical methods and the representation of physical processes. We then use these ocean and climate models (Fig. 1) to gain insight into the workings of the climate system and the interplay of the various processes involved.



**Figure 1** Southern Ocean temperature at 100m as simulated by the ocean model FESOM with 4.5 km model resolution. From fesom.de

## Why do you like doing research?

Research helps us to better understand the environment that we live in and gives us the tools to protect it, for the sake of the planet, humanity, and all other living beings alike. It is tremendously diverse, fascinating, and necessitates complex thinking as well as creativity.

## How can, in particular undergraduate, students contribute?

We have a large amount of data that is produced by climate models and observations, and basically not enough people to look at all this to discover new process interactions and advance our understanding. We also need help to develop and code new diagnostic tools for our simulations, as well as numerical and physical improvements of our models. Finally, distributing the information that we generate to the public in easily accessible ways is another challenge for which we need support.



## How can students join your research?

Just approach me. Depending on your interests and skills, we can discuss and develop ideas for how to contribute. There is also the opportunity to support one of my PhD students in their work.

## *(Optional)* Give two examples of past student projects

**Example 1:** Development and implementation (in python) of new diagnostic tools that can be used to investigate how kinetic energy (energy due to an objects motion) in the ocean is transferred between different spatial scales and ultimately converted into other forms of energy (e.g. heat).

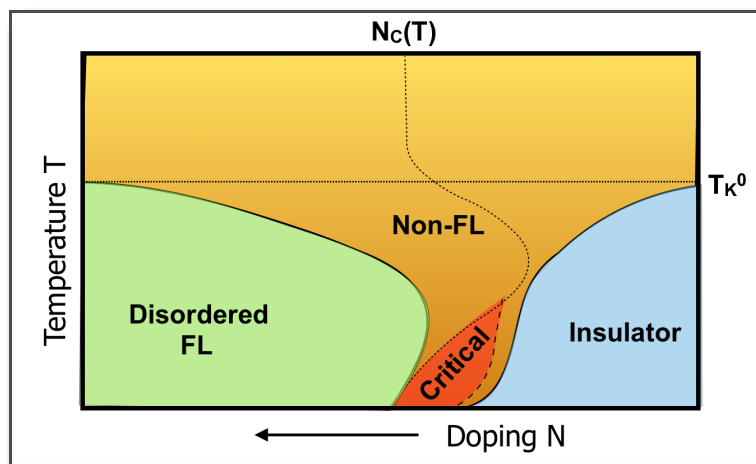
## Head of the Research Group

Prof. Dr. Stefan Kettmann, Complex Systems



## Describe your research project in three sentences and one picture

My current projects are on quantum phase transitions and the quantum dynamics in disordered quantum systems with long range interactions such as doped semiconductors, on new physics at the crossover between BCS-Superconductivity and Bose-Einstein condensates in thin films, and on modeling and forecasting power grid dynamics and energy markets.



## Why do you like doing research?

When you reach out and pursue your ideas you will always discover new things. It is necessary and fun to learn from others, but it is even better to discover something for the first time yourself.

## How can, in particular undergraduate, students contribute?

I like that most undergraduate students are open for new ideas, so I give them often problems for which I did not yet secure research funding and this results sometimes in unforeseen new projects.

## How can students join your research?

Send me an email [s.kettemann@jacobs-university.de](mailto:s.kettemann@jacobs-university.de)

## (Optional) Give two examples of past student projects

**Example 1:** Superconducting p-n Junctions with bachelor of physics student Avinash Niroula, published as A. Niroula, G. Rai, S. Haas, S. Kettemann, Spatial BCS-BEC Crossover in Superconducting pn-Junctions, Phys. Rev. B 101, 094514 (2020). Lead to collaboration with experimental group at Tsinghua Univ., China. first results are submitted to Nature Communications (2022).

**Example 2:** Solution of the Schrödinger equation on the Cayley tree with bachelor of physics student Deepak Aryal, published as D. Aryal, S. Kettemann, Complete Solution of the Tight Binding Model on a Cayley Tree: strongly localised versus extended states, J. Phys. Commun. 4, 105010 (2020)



## Why do you like doing research?

I like discovering novel compounds with novel structure, composition and properties. Only chemists can prepare novel materials and study them afterwards. We work on fundamental as well as real world industrial projects. To date our research has resulted in 318 publications (36 with undergraduate coauthors) and 15 patents.

## How can, in particular undergraduate, students contribute?

Undergrads can join my research group as early as in their 1st year of study. They can support the research projects of PhD students or postdoctoral researchers and eventually even work independently after initial training. Since 2002 the contribution of undergrads has resulted in 36 publications with undergraduate students as coauthors. <http://ukortz.user.jacobs-university.de/publications/publications-with-jacobs-bsc-student-coauthors/>

## How can students join your research?

Send an email to [u.kortz@jacobs-university.de](mailto:u.kortz@jacobs-university.de) or talk to me after class to make an appointment.

## (Optional) Give two examples of past student projects

<http://ukortz.user.jacobs-university.de/publications/publications-with-jacobs-bsc-student-coauthors/>



## Head of the Research Group

### Research Training Group (RTG) "Social Dynamics of the Self"

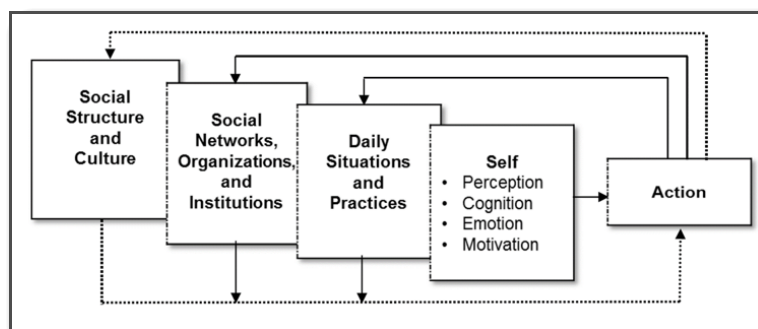
The RTG is funded by the German Research Foundation (DFG). It is part of the Bremen International Graduate School of Social Sciences (BIGSSS) and composed of nine Faculty members and five (plus seven) Doctoral Researchers from Jacobs University and the University of Bremen.

Doctoral Researchers: Pay Laurin Jessen, Carina Hartz, Gamze Ipek, Tanya Keni and Dariya Koleva  
Faculty from Jacobs: **Ulrich Kühnen** (speaker), Klaus Boehnke, Franziska Deutsch, Sonia Lippke and Jan Lorenz.



## Describe your research project in three sentences and one picture

In an ongoing cycle of mutual constitution, culture and the self make each other up and therefore need to be studied in concert. Individuals are socio-culturally shaped shapers of their socio-cultural environment:



There are two fundamental ways of defining the self: Either by unique and **independent** features (such as traits, abilities, attitudes) or by social and **interdependent** ones (e.g. social roles, relationships). In the context of our RTG early-career Doctoral Researchers from various social science disciplines study the self's social embeddedness to better understand human thinking, feeling, and action. Topics range from social morality over life goals and well-being, to honor cultures, resistance and solidarity in online communities, to social cohesion.

## **Why do you like doing research?**

We are convinced that every scientific discipline has its blind spots. To overcome this, our research program is characterized by interdisciplinarity, combining research perspectives particularly from psychology, sociology and political science. That way we come closer to understanding individual as well as societal phenomena.

## **How can, in particular undergraduate, students contribute?**

There are possibilities to get involved in the research projects of our Doctoral Researchers, including developing ideas for a Bachelor's thesis. In addition, we sometimes hire SAs to support us in doing our research.

## **How can students join your research?**

Feel free to approach one of the RTG Doctoral Researchers or Faculty!

## Head of the Research Group

**Prof. Dr. Christoph Lattemann** - Business Administration and Information Management - School of Business, Social and Decision Sciences  
Head of I3 Research Group: Information, Innovation and International Management

Presenter:

Pia Gebbing (M.Sc.)

Research Associate

Department of Business & Economics



Prof. Lattemann



Pia Gebbing

## Describe your research project in three sentences and one picture

The I3 Group is an interdisciplinary team of six researchers -Pia Gebbing, Leon Rabe, Elena Bündenbender (Psychology), Prof. Christoph Lattemann, Raoul Pilcicki (Information Systems) and Laura Schmid (Economics) - and is currently involved in two BMBF funded projects and an industry-funded project in the context of Digital Transformation, Service Industry, Creativity, and AI-based Price Modeling. The major aim of the research group is to design state-of-the-art ICT applications for innovation management, service provision, and education, in particular in the creative sector. To study digital transformation in the service sector, Prof. Lattemann founded a Design and Creativity Thinking lab at Jacobs University, the "D-Forge". Research related to the D-Forge deals with the user-centered adoption of innovative technologies in the service industry to establish new entrepreneurial opportunities, ICT-based business models, and novel, creative ways to collaborate, and innovate.



## Why do you like doing research?

Technologies are significantly changing our world and the way we live and work together, in particular in providing valuable services. Researching on how to design technologies that improve services for our society and businesses is fascinating and rewarding. Much more, there is simply no better thing than teaching our students to innovative and design valuable IT based services to improve our daily lives and to make the world a better place.

## How can, in particular undergraduate, students contribute?

Students can contribute to and be involved in our research by taking part in research projects as paid student assistants and/or by doing internships at one of our corporate partners to transfer practice-oriented knowledge into scientific work, in form of a bachelor or master theses. We have a broad network of partner firms to find the right place for your internship. Students can help to conduct literature reviews or design artefacts (e.g. some kind of prototypes of software applications or by defining design principles). Students can also be involved in projects by conducting research for their own thesis.

## How can students join your research?

Just approach one of the members of the research group by email, by phone or by meeting them directly in their offices or in one of our teaching sessions.

## (Optional) Give two examples of past student projects

**Example 1:** Involvement of students in a third-party funded project on fostering creativity in innovative hybrid work environments, either as a student assistant (paid) to help analyzing qualitative (interview data), or as a graduating student conducting own research on an own chosen topic in the context of the above mentioned context in their bachelor thesis (accepted and presented as a student contribution at the GeNeMe-Conference).

**Example 2:** Organizing internships for students at companies to work on real-world "research" projects, such as AI-based price-predictions of non-commodity products.

## Head of the Research Group

Prof. Dr. Alexander Lerchl

## Describe your research project in three sentences and one picture

We investigate the effects of magnetic and electromagnetic fields on biological systems. Currently, we look at the effects of 5G electromagnetic fields in the mm-range (27 and 40.5 GHz) on gene expression and methylation patterns in human cells. Sophisticated exposure facilities and state-of-the-art methods enable us to research whether these electromagnetic fields are of any health-related relevance or not.



*Experimental setup for 5G electromagnetic field exposure of human cells. The incubators ensure constant temperatures.*

## Why do you like doing research?

I like challenges and surprises 😊

## How can, in particular undergraduate, students contribute?

There are areas where large numbers of biological samples have to be prepared and analyzed, e.g., by RT-qPCR cyclers. Likewise, large data sets have to be categorized and analyzed.

## How can students join your research?

By normal application procedures, or by simply contacting me.



## Head of the Research Group

**Prof. Dr. Sonia Lippke** (on the very left), Health Psychology and Behavioral Medicine



## Describe your research project in three sentences and one picture

Health Psychology and Behavioral Medicine is the science of behavior and mental processes in connection with health and morbidity. It is mainly concerned with risk and health behaviors, psychological processes and psycho-social factors as well as their interrelation with physical diseases and constraints. Communication and interaction relating to health and medicine is very important, and we research and improve this in the health care system, in organizations and companies, in education and life-long learning.



*Sonia Lippke with Constantin Schreiber when visiting Sonia's class to talk to her and her students.*

## Why do you like doing research?

It is just fun to work on important aspects, work with great people (my work group!!) and hand back findings to the public. Working on prevention makes me happy and to do work on an aggregated level instead of only working on single cases/patients seems very valuable to me. Please try it out and get own hands on experience!

## How can, in particular undergraduate, students contribute?

Join in with our research, recruit study participants, work and co-create with individuals, collect data online and offline, analyze data, visualize results, write up/improve reports, do literature searches, communicate findings and collect feedback, built up social media to disseminate findings.

## How can students join your research?

Contact me at [s.lippke@jacobs-university.de](mailto:s.lippke@jacobs-university.de) or via TEAMS And check out my concrete research projects at: <http://slippke.user.jacobs-university.de/english/>

## (Optional) Give two examples of past student projects

**Example 1:** see paper here Lippke, S., Fischer, M. A., & Ratz, T. (2021). Physical activity, loneliness, and meaning of friendship in young individuals-a mixed-methods investigation prior to and during the COVID-19 pandemic with three cross-sectional studies. *Frontiers in Psychology*, 12, 146. <https://doi.org/10.3389/fpsyg.2021.617267> → the qualitative part was a student project (by Marie Fischer, a former Master Student in Psychology at Jacobs University)

**Example 2:** Langener, S., Ratz, T., & Lippke, S. (2018). User-centered Digital Health Application Development To Promote Healthy Ageing. *MEDIENPRODUKTION – Online Zeitschrift für Wissenschaft und Praxis*, 12, 23-32. [https://www.researchgate.net/publication/334363836\\_User-centered\\_digital\\_health\\_application\\_development\\_to\\_promote\\_healthy\\_ageing](https://www.researchgate.net/publication/334363836_User-centered_digital_health_application_development_to_promote_healthy_ageing) → this was the result of a student project (by Simon Langener, who did a research internship with us).

## Head of the Research Group

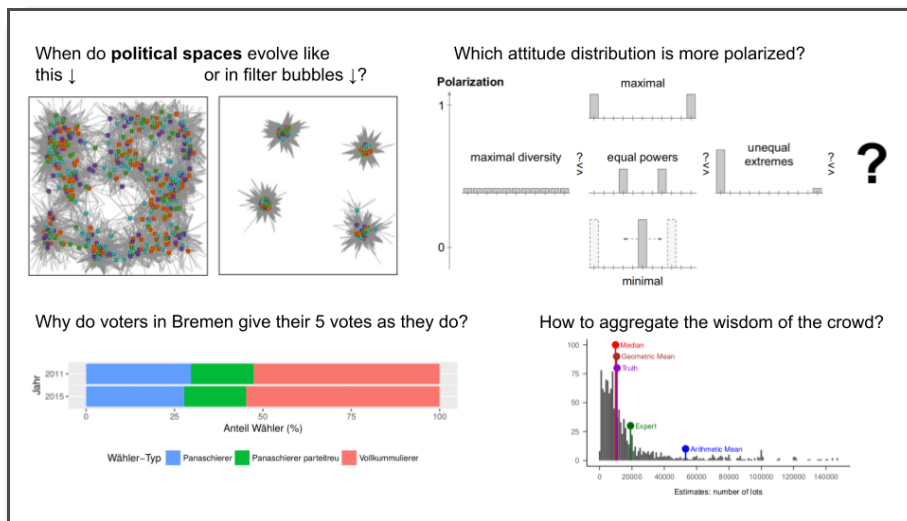
### Jan Lorenz

Assistant Professor in Social Data Science, Research in Computational Social Science with a focus on agent-based models and complex socio-economic systems



## Describe your research project in three sentences and one picture

I want to model and explain **dynamics of opinion formation** and how it leads to phenomena like polarization, consensus, or plurality and consequently influences democratic collective decision making through deliberative interaction. This is interdisciplinary touching, for example, **social psychology**, **game theory**, and the dynamics of **complex systems** because opinion formation is a partly emotional processes with elements of strategic behavior unfolding in societies with interacting individuals which can trigger systemic effects going beyond the scope of individuals. Practically, I am interested in the design of democratic institutions, the aggregation of the wisdom of the crowd, and mapping political spaces.



## Why do you like doing research?

I like to look at social data in an unconventional way. I like to develop measures and visualizations for things like political polarization, information bubbles, spatial segregation, inequality and growth. I like to study social mechanisms with computer simulation and then match them to the real world.

## How can, in particular undergraduate, students contribute?

I am looking forward to guide student project where students aim at finding their own new insights. Besides that I may sometimes have a student job which involves programming R packages, producing data dashboards, or systematically analyzing agent-based models with simulation.

## How can students join your research?

[j.lorenz@jacobs-university.de](mailto:j.lorenz@jacobs-university.de) or contact Jan Lorenz on Teams

## Head of the Research Group

**Keivan Mallahi-Karai**, Mathematics, more specifically in the interface between group theory and probability theory.

## Describe your research project in three sentences and one picture

I currently work mainly in two areas in group theory: one deals with the optimal (in a precise sense) representations of finite  $p$ -groups, where problems of combinatorial nature naturally appear. Another direction involves probability on groups, random walks, and Markov operators on groups, where simulations could be useful.

## Why do you like doing research?

Research is a challenge, but the occasional moments of discovery render it worthwhile.

## How can, in particular undergraduate, students contribute?

There are at least two possible ways that undergraduate students can contribute to research. For problems that numerical experiments provide guidance, students can help by working on the experimental component of the research. Second, in almost all projects students can contribute by doing research alongside me and become research collaborators.

## How can students join your research?

Contact me directly. We can discuss the possibility and then the process.

## (Optional) Give two examples of past student projects

**Example 1:** Jasper Toussaint, Limiting Distribution of Urn Models Governed by Binary Operations,  
**Example 2:** Dzmitry Rumiantsev, Faithful dimension of groups corresponding to certain Lie Algebra classes, 2019-2020. He is the coauthor of a recently finished paper.



## Head of the Research Group

**Prof. Dr. Arnulf Materny**, Professor of Chemical Physics



## Describe your research project in three sentences and one picture

We are using laser spectroscopy in order to investigate material properties on a molecular level. In our “Raman laboratory”, we detect vibrational spectra, which can be considered to be fingerprints of molecules, and use them to e.g. characterize biofilms on microplastics particles. In our femtosecond laboratory, we are using ultrashort laser pulses in order to study elementary dynamics, e.g. occurring in organic semiconductors.



## Why do you like doing research?

Already more than 40 years ago, I was working on a project in school (“termpaper”), which involved lasers. Since that time, I have been fascinated by optics and later, during my studies, by quantum mechanics. The combination of the two fields directly lead me to laser spectroscopy where many fascinating things can be learnt about various molecular systems.

## How can, in particular undergraduate, students contribute?

In general, projects in laser labs always require constant supervision due to laser safety regulations. Therefore, projects will always have to join existing projects. In these projects they can be involved in experiments and the data evolution.

## How can students join your research?

Students should get into contact with me. Depending on running Ph.D. or postdoc projects, the possibility of a participation can be discussed.

## *(Optional)* Give two examples of past student projects

**Example 1:** Investigation of coated plastic foils using Raman spectroscopy in cooperation with a company in Bremen.

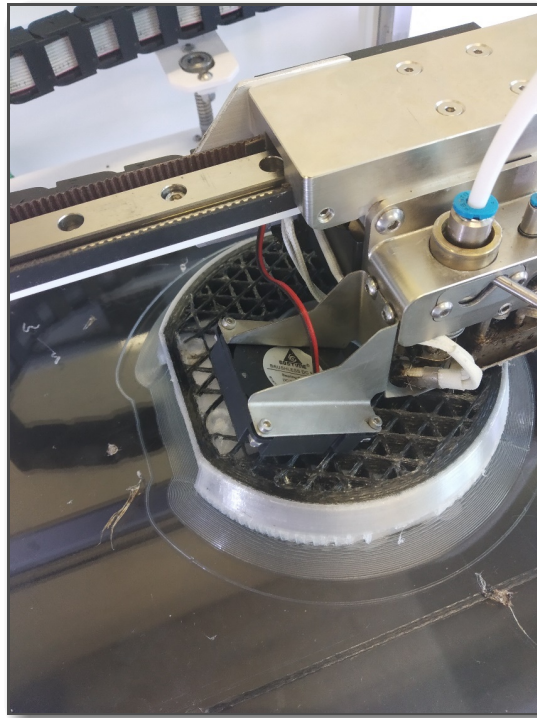
**Example 2:** Participation in experiments using time-resolved nonlinear Raman spectroscopy for the investigation of dynamics in ionic liquid samples.

## Head of the Research Group

Artem Naumov, Alexander Kochetkov

## Describe your research project in three sentences and one picture

We are an international startup company doing research in continuous fiber 3D-printing tech. Areas of research are diverse, including material science, chemical technology and printing algorithms.



## Why do you like doing research?

It is great to like what you do, right?

## How can, in particular undergraduate, students contribute?

We are planning many research projects for the students on campus. Learn the technology, and if you like it, there are hundreds of ways to contribute. YES, we have PRINTERS.

## How can students join your research?

Come and talk to us. We are available for casual talks at the moment, and the office hours are TBD.

## (Optional) Give two examples of past student projects

Check our cases at [anisoprint.com](https://anisoprint.com). Many projects there were made by passionate students!

**Example 1:** Optimization of printing parameters for better quality.

**Example 2:** Investigation of new materials and characterization of printed samples.

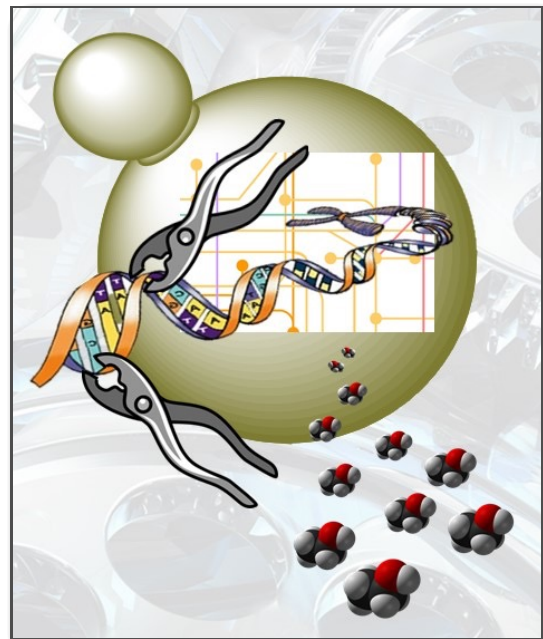
## Head of the Research Group

**Elke Nevoigt**, Molecular Biotechnology



## Describe your research project in three sentences and one picture

We are specialized on genetic engineering of yeast. The well-known baker's yeast has nowadays become a popular microbial cell factory. The applications exceed by far the manufacturing of beer, wine and baking products and include the production of biofuels, chemicals, enzymes as well as ingredients of food and feed from renewable raw materials such as plant biomass and agro-industrial waste streams or by-products.



## Why do you like doing research?

We want to exploit our experience in yeast molecular biology and physiology and contribute to future solutions addressing major challenges of human society such as the climate change, the pollution of the environment and the depletion of fossil resources. We are fascinated by the enormous opportunities and genetic tools that have been emerging to engineer microorganisms to become attractive cellular factories.

## How can, in particular undergraduate, students contribute?

Students can participate in our research intellectually by literature studies and the development of novel research ideas. Provided that sufficient supervision capacity in the laboratory and a budget is available, students might also be involved in experimental work including gene expression, gene deletions and the physiological characterization of newly constructed strains.

## How can students join your research?

Students should make themselves familiar with the research that has been conducted by our group in the past e.g. by reading publications or talking to students currently working in our laboratory. They also need to successfully pass the lecture and the lab course Introduction to Biotechnology (CH-121-A and B). We also strongly encourage interested students to participate in the lecture Industrial Biotechnology (CO-441-A).

## **(Optional) Give two examples of past student projects**

**Example 1:** The deletion of a gene in baker's yeast and the characterization of the impact of the gene deletion on the production of a target product (e.g. ethanol or succinic acid).

**Example 2:** The expression of a heterologous gene (i.e. a gene from a different organism) in baker's yeast and the characterization of the impact of the gene expression on the ability of baker's yeast to consume a non-natural carbon source (e.g. a carbon source that has been derived from a certain agro-industrial waste stream or by-product).

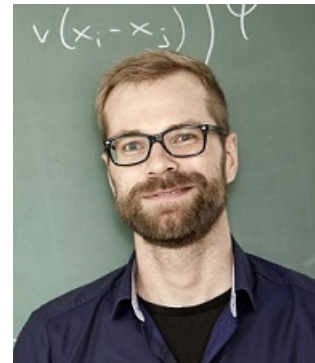


## Head of the Research Group

### Sören Petrat

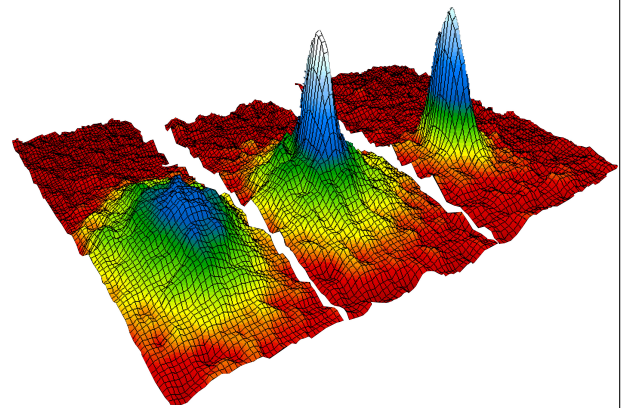
Mathematical Physics, in particular

- many-body quantum mechanics,
- Bose–Einstein condensates,
- Fermi gases.



## Describe your research project in three sentences and one picture

One of my recent research projects is about a mathematical description of a Bose gas at very low temperature. Such gases can exhibit a new state of matter called Bose–Einstein condensation, where all particles behave macroscopically in a quantum mechanical way; see the picture on the right. In my research project we managed to systematically describe this matter on all scales for a mean-field model: the condensate scale which describes most of the particles, the Bogoliubov scale which describes free quasi-particles (or sound waves), and systematically all smaller scales which describe the interaction between the quasi-particles.



## Why do you like doing research?

I was always interested into the fundamental physical laws that govern our world. I hope to come closer to their understanding with my research.

## How can, in particular undergraduate, students contribute?

Several of my research projects are accessible to undergraduate students. They involve theoretical understanding, proofs, and computations. I currently have several math and physics students involved in research projects. Outside of my field I am regularly offering research projects on finance (from a math and statistics point of view), and optimization (Operations Research), occasionally also on applications of Machine Learning.

## How can students join your research?

You can just approach me directly after class, in my office, or via email.

## Give two examples of past student projects

**Example 1:** *Perturbation theory on the Canonical Coherent States.* In this math Bachelor thesis project we applied a complicated perturbation theory to a simpler example and computed explicitly corrections to the behavior of a harmonic oscillator.

**Example 2:** *A Study of Correlation: Dow Jones Industrial Average Index and its Individual Stocks.* In this Data Engineering project we were looking for changes in stock market correlations over time, and in particular their relations to ETFs.

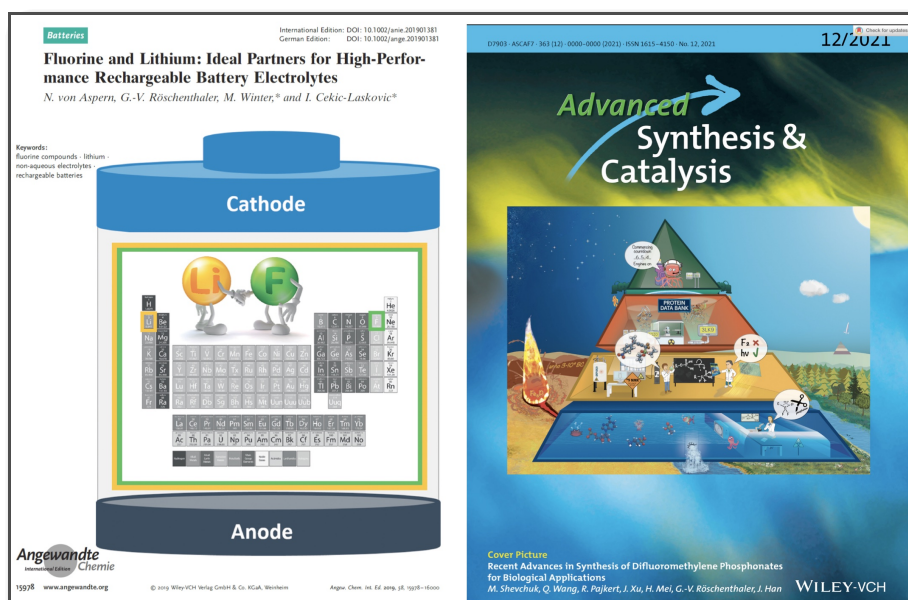
## Head of the Research Group

**Prof. Gerd-Volker Rösenthaller**, Basic and Applied Fluorine and Phosphorus Chemistry



## Describe your research project in three sentences and one picture

Syntheses and Studies of Fluorine- and Phosphorus-containing Compounds for application in Material Science and Medicinal Chemistry



## Why do you like doing research?

Research for me is very exciting because of designing and investigating new compounds, study their properties and looking for possible application different areas. These goals can only be achieved with a dedicated team and in the framework of international cooperation.

## How can, in particular undergraduate, students contribute?

Since our synthetic chemistry procedures need special precautions, undergraduate students will be carefully introduced into this field of fluorine and phosphorus chemistry, With this guidance they can then contribute remarkably and will have scientific success.

## How can students join your research?

Just call me and make an appointment.

### **(Optional) Give two examples of past student projects**

**Example 1:** Synthesis of difluoromethyl phosphonate-containing 1,2,3-triazoles through 'click' chemistry

**Example 2:** [3,3]-Sigmatropic rearrangements of partially fluorinated allylic phosphoesters.

## Head of the Research Group

**Andreas Seebeck**

PostDoc: Hayat Khan

PhD: Lukas Schmidt

SAs: Paula Castillo, Oscar Kirkwood, Maria Ortmann, Stasa Vasilic, 1 vacant position

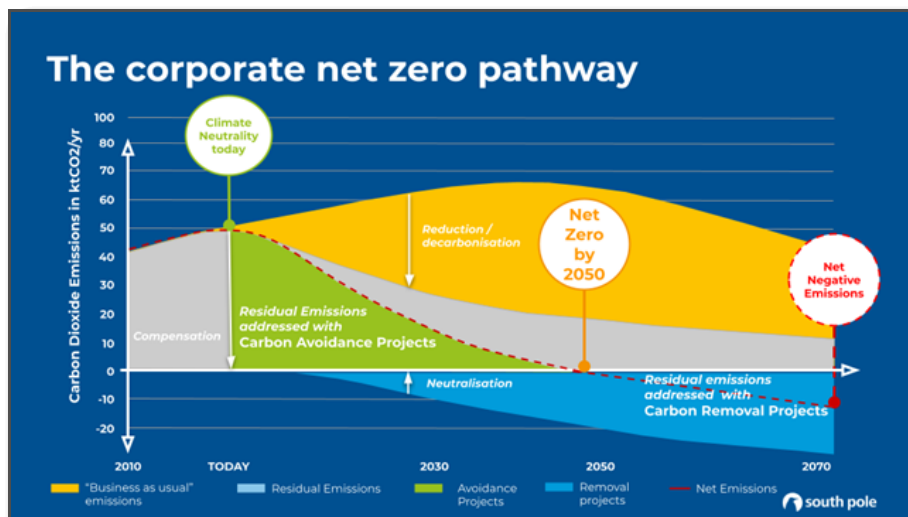


## Describe your research project in three sentences and one picture

Our research focus lies on empirical financial accounting and capital market research. The primary research areas are:

- Sustainability and diversity in finance, accounting, and tax (e.g., integrated reporting, GRI, board gender diversity)
- Disclosure and audit regulation (e.g., extended audit reports, corporate risk disclosure),
- Data and text mining in accounting, finance, and tax (e.g., machine learning, NLP, Artificial Intelligence)

Exciting research cooperations exist with FAU Nuremberg, HSG St. Gallen, RUB Bochum, etc.





## Why do you like doing research?

It allows us to make a difference in the world in the following ways:

- 1) Mentor researchers' thinking who then change the world through consulting, professional service, teaching
- 2) Affect practice, usually high-level decision makers
- 3) Affect standard setters

The accelerating threat of climate change raises the urgency of commitment to climate transition, including the important role of global financial markets to align investment with net zero. Our research findings can contribute to this important transition.

## How can, in particular undergraduate, students contribute?

Being interested in sustainable finance/accounting/tax topics and motivated to learn and contribute to our diverse research group. Our research group and the topics we are working on are diverse and so are the ways YOU can contribute. If you are interested, please reach out to us, tell us about your interests and we will figure out ways in which you can best contribute.

## How can students join your research?

You can join our team by becoming a student assistant (currently 1 vacant position), writing your Bachelor theses at the chair, or by individual agreement.

## (Optional) Give two examples of past student projects

In all of our research projects, students play an important role. They contribute to data gathering and processing, literature reviews, Python coding, discussions, and act as sparring partners.

Two of the most recent published studies are:

Seebeck, A., Kaya, D. (2022) The Power of Words: An Empirical Analysis of the Communicative Value of Extended Auditor Reports, *European Accounting Review*, Forthcoming. (<https://papers.ssrn.com/sol3/papers.cfm>).

Seebeck, A., Vetter, J. (2022) Not Just a Gender Numbers Game - How Board Gender Diversity Affects Corporate Risk Disclosure, *Journal of Business Ethics*, 177(2), S. 395-420. (<https://link.springer.com/article/10.1007/s10551-020-04690-3>).

## Head of the Research Group

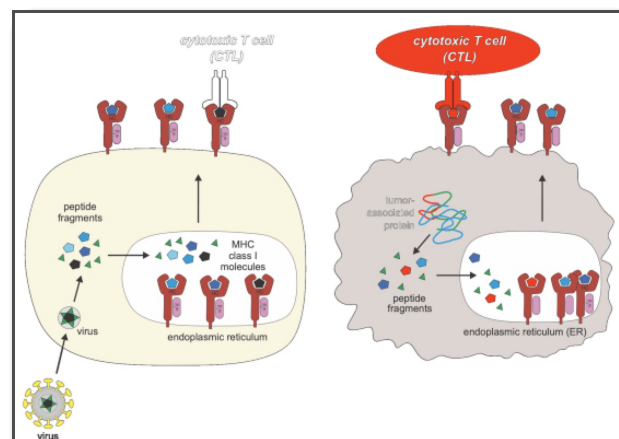
**Sebastian Springer**, Professor of Biochemistry and Cell Biology



## Describe your research project in three sentences and one picture

We're biologists, more precisely molecular immunologists. We work on the molecular mechanisms that underlie the immune response against viruses and tumors. In fact, we've worked for 20 years on the same mechanism, which is central for the immune system. As you can see in the picture, on the left, when a virus infects a cell, some virus particles can be broken up into small particles called peptides. These peptides (the little pentagons) are then loaded onto so-called **MHC class I proteins**, which then travel with them to the surface of the cell. There, specialized cells of the immune system, so-called cytotoxic (or: killer) T cells, can recognize the virus peptides, and then they can kill the infected cell. That sounds cruel but it prevents the spreading of the virus, and it happens many times every second in your body. A similar mechanism is in place to detect tumor cells (or cells that might become tumor cells later). We investigate pretty much everything that has to do with these proteins: their synthesis, folding, peptide binding in cells, trafficking to the surface (and back into the cell at the end of their lives). We do this to learn about the immune system, but also to make ge-

neral conclusions about how cells, and proteins, work. We are **basic scientists**, so the application is in the background, but sometimes our discoveries turn out to be useful, and we have even set up a company once. From time to time, we also have side projects in slightly more crazy areas, depending on what else we would like to explore. The methods we use are from cell biology (mammalian cell culture and analysis), biochemistry (protein purification and analysis), and biophysics (protein analysis and protein-ligand interaction).



## Why do you like doing research?

Well, of course, the first thing is that I've done research since my undergraduate days, and I've stayed in academia because I enjoy doing it. It's also important because at Jacobs, we're proud of offering teaching through research, such that undergraduates get to spend time in the research laboratory. It makes me happy to launch my coworkers on careers in research (this includes my Master students, PhD students, and postdoctoral fellows). Research is really a way of humanity recognizing nature, or nature recognizing itself, and it is a creative, artistic endeavor. If we are lucky, then some of what we do will also help other people.

## How can, in particular undergraduate, students contribute?

We always have undergraduate students in the lab, every day. Most of them during their third year, since they do their BSc thesis, and their preparation. Some come earlier, during their second or sometimes even first year. Real research projects are complex and difficult, and it takes time and tenacity to come to results. This is why we are interested in students who want to stay with us for a long time, spend a lot of time in the lab, carefully learn the methods, and try to be as useful as possible. There is always a lot of training involved, and those people who train undergraduate students in the lab also need to generate results (and perhaps finish their PhD thesis). Therefore, we cannot offer research projects 'for the experience of doing research', but we can only accept students who want to contribute to actual results. For those who do not want to do lab work, but are still interested in doing a project, we always have literature-based projects, where we have to find out some facts from publications that we would like to base our research on. For others who do not want to become actively involved but who just want to be part of a molecular immunology group, they can visit our group seminar and learn about the papers we read and about the scientific progress that happens in our group.

## How can students join your research?

Write me an email.

## (Optional) Give two examples of past student projects

**Example 1:** Bachelor thesis, class of 2022: Production of MHC class II proteins in mammalian cells, purification, and peptide binding. This involved: tissue culture, transfection and transduction of mammalian cells, protein isolation by affinity chromatography, biophysical characterization of the purified protein by tryptophan fluorescence, peptide binding studies by fluorescence anisotropy and by microscale thermophoresis.

**Example 2:** Bachelor thesis, class of 2021: Literature-based (no laboratory). A literature survey of the ways in which plant-based materials are texturized for use in meat substitute food products.

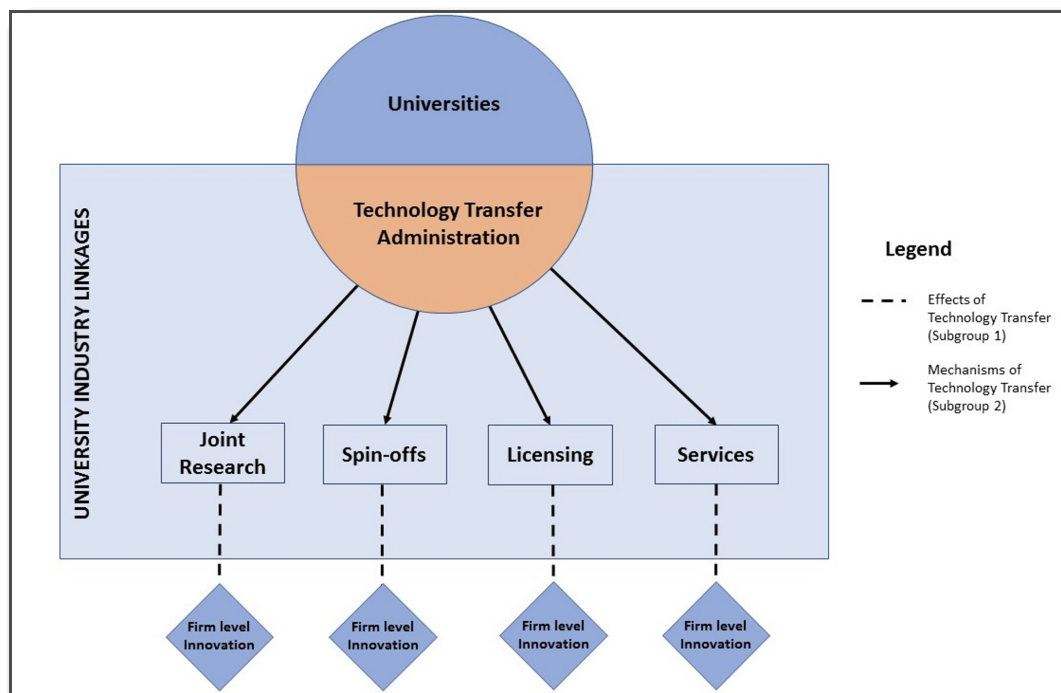
## Head of the Research Group

**Tobias ten Brink**, Professor of Chinese Economy and Society, with a focus on International and Comparative Political Economy



## Describe your research project in three sentences and one picture

How do Chinese party-state actors, researchers, and businesses seek to improve technological innovation capacities to avoid being stuck as a middle-income economy? Going beyond older forms of state-led developmentalism, the project asks for the role of public-private networks to foster innovation, especially among local state actors, research institutes and private and semi-private businesses (DFG Research Grant). In a follow-up project, forms and effects of collaboration between Chinese research institutions and European businesses are identified (BMBF Research Grant).



## **Why do you like doing research?**

To develop a better understanding of the emergence of new innovation hotspots in non-Western authoritarian contexts – a process which already has generated major implications for global affairs.

## **How can, in particular undergraduate, students contribute?**

Students can contribute to data collection & literature search.

## **How can students join your research?**

I regularly publish job announcements at Jacobs, and students may learn about my projects in the classroom.

## Head of the Research Group



History Group  
Headed by: **Julia Timpe, PhD**; University Lecturer in Contemporary History  
(see also: <https://juliatimpe.weebly.com/>)  
Research Fields:  
Modern European History/ Modern German History  
History of Nazi Germany, World War II & the Holocaust/ History of Everyday Life / Digital History

## Describe your research project in three sentences and one picture

There are several ongoing research projects, all exploring aspects related to the history of Nazi Germany, World War II and the Holocaust. Some focus strongly on the everyday experience of individuals living during the Third Reich examining questions such as "how did ideology & political practices effect 'ordinary' peoples' lives, thinking, emotions, practices, etc.?", "how did individuals and groups adapt – or resist – in the realm of the everyday"?, doing so, in particular, by analyzing ego-documents such as letters and diaries. Additionally, work is done in the field of "Digital History," e.g. in collaboration with JUB's Robotics Group (BMBF-funded project on Bunker Valentin, more here: <http://robotics.jacobs-university.de/projects/Valentin3D-DE>), or as part of the PhD project by Frederike Buda, who studies the history and networks of the circle of Nazi-period industrialists known as the "Freundeskreis Reichsführer SS".

## Why do you like doing research?

Historical research allows you to uncover things about the past which might be surprising – or counterintuitive –, and they help you to better understand our present (political, cultural, economic, social) situation. As writer L.P Hartley once put it, "The past is a foreign country; they do things differently there" – I like exploring this 'foreign country' and would say it can be quite exciting!

## How can, in particular undergraduate, students contribute?

In general, undergraduate students could contribute to the research agenda of the History Group through their research work done in their Bachelor Thesis. There are also opportunities to join ongoing student research projects – for more, see below.



## How can students join your research?

Currently, the History Group is recruiting additional members for the ongoing student research project "Home & Away / Fern & Nah: An ordinary man's experience of Nazi Germany & WWII". The project is based on an analysis of letters and diaries as well as photographs and home movies from the 1930s and 1940s. All material comes from the private archive of a man from Northern Germany, who served in the Wehrmacht during World War II. Utilizing Digital History methods, the project aims to explore the experiences of this "ordinary" German soldier during the Nazi period and his time at front as well as his attitude towards the war and the Nazi regime. The first phase of project is devoted to mapping (and visualizing) his movements and activities during World War II and, more generally, to digitizing his letters.

## (Optional) Give two examples of past student projects

**Example 1: Ongoing – since 2021:** Home & Away / Fern & Nah: An ordinary man's experience of Nazi Germany & WW II" (see above) Project website (still under development): <https://homeawaywwii.hypotheses.org/>

**Example 2: In 2016:** Student Research/ Foreign Exchange Project (together with Dr. Ulrike Huhn), titled "Zwangsarbeit und regionale Erinnerung in Bremen und Nikojalew" (in English: Forced Labor and Regional Memory in Bremen and Mykolaiv). This project, which took place in 2016 (at Uni Bremen in collaboration with partners in the Ukraine and at the University of Mykolaiv), included small-scale student research projects into topics related to the history of forced labor done in Bremen during World War II by Ukrainian people, as well as a trip to Kiev, Odessa and Mykolaiv in 2016, where students met with Ukrainian Holocaust survivors and participated, together with Ukrainian students, in the workshop "Captivity and Forced Labor During World War II: Historical Research and Memory." This project and specifically the excursion was chronicled in a blog (in German): <https://bremkraine.hypotheses.org/exkursion>. (See also: U. Huhn and J. Timpe, "Eine europäische Vernetzungsgeschichte: Bremen und Mykolajiw im 2. Weltkrieg: Austausch zwischen Bremer und ukrainischen Geschichtsstudierenden," Resonanz: Magazin für Lehre und Studium an der Universität Bremen (2018); online: [https://blogs.uni-bremen.de/resonanz/2018/04/20/bremen\\_mykolajiw/](https://blogs.uni-bremen.de/resonanz/2018/04/20/bremen_mykolajiw/).)

## Head of the Research Group

**Prof. Dr. Matthias S. Ullrich**, Molecular Microbiology, Marine Microbiology, Plant Microbiology



## Describe your research project in three sentences and one picture

We are working on different research frontiers in molecular life sciences on microbes interacting with their preferentially photosynthetic hosts. This includes plant metabolomics, food microbiology, antibiotics research, and environmental (marine) microbiology. We are using different model organisms to better understand the function of genes and gene products involved in diverse interactions.



## Why do you like doing research?

Research helps me to make sense of my professional life. Research helps me to stay up-to-date with my teaching content. Finally, our research generates revenues, income for the university, and jobs. I love to lead others in research, and I simply enjoy discoveries and the satisfying moment when a hypothesis is proven or clearly disproven.

## How can, in particular undergraduate, students contribute?

Undergraduate students – preferentially from BCCB, MCCB, or CBT – with a particular interest in microbiology can apply to become research team members in their third or fourth semester. Preference will be given to students who actively participate in my courses and have taken the associated microbiology lab course. However, I am generally open to any other students from the natural sciences, who sincerely want to do research work.

## How can students join your research?

The safest way is to approach me directly in person (after class or in my office) and by sending an email and arrange for an appointment in person. What always helps is that the student candidate informs him/herself about what we are doing research on in pubmed, google scholar, and the JUB website paying particular attention to our publications of the past years. Then the candidate should identify a topic of research of particular interest and express this during our first meeting.

## **(Optional) Give two examples of past student projects**

**Example 1:** Identification of novel plant-based antibiotics

**Example 2:** Developing a method to fingerprint plant material based on short sequence repeats

## Head of the Research Group

**Prof. Dr. Dr.-Ing. Yilmaz Uygun**

Logistics Engineering and Technologies Group

Research Fields:

- Intelligent production and logistics planning and scheduling
- Data analytics in logistics
- Additive manufacturing
- Sustainable supply chains
- Workforce in Industry 4.0

## Describe your research project in three sentences and one picture

We developed the world's largest delta-type 3D printer.



## Why do you like doing research?

Doing research is the king's way to create new knowledge that not only advances science but also teaching by sharing such knowledge with students.

## **How can, in particular undergraduate, students contribute?**

We always need helping hands in our lab to work on mechanics, electronics and modeling & simulation.

## **How can students join your research?**

I always offer student assistant positions in research projects to conduct studies.

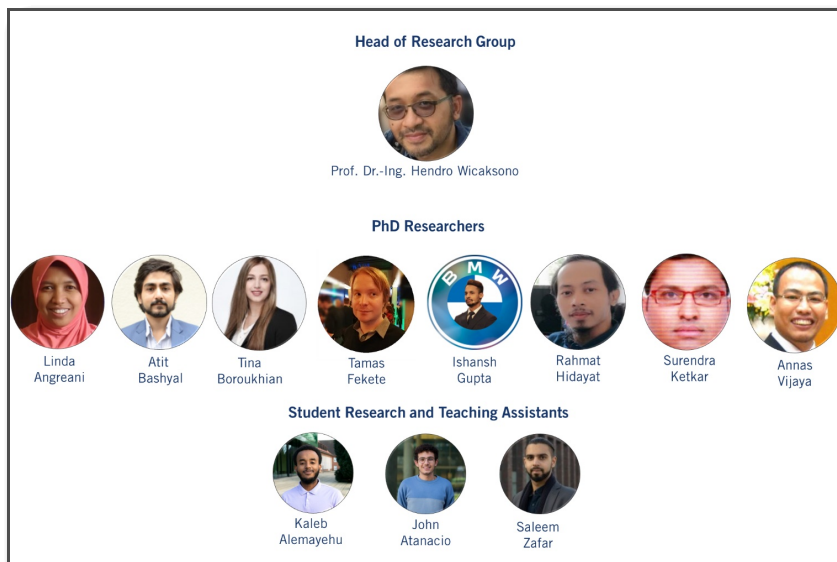
## Head of the Research Group

**Prof. Dr.-Ing. Hendro Wicaksono**

<http://hendro-wicaksono.de/>

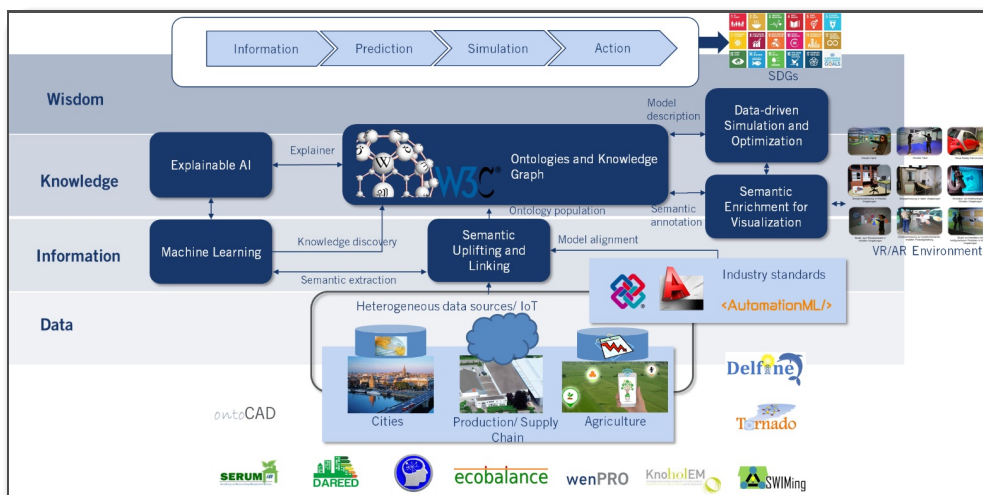
**Methods:** semantic data integration, explainable artificial intelligence, linked data and knowledge graph, causal inference, machine learning, data-driven simulation and optimization

**Applications:** supply chain management, smart cities, smart energy systems, agriculture 4.0, sustainability assessment



## Describe your research project in three sentences and one picture

Our research focuses on data-driven industrial solutions addressing the whole Data, Information, Knowledge, Wisdom (DIKW) pyramid. The solutions allow holistic support for decision-making from information, prediction, and simulation to action. They have been developed through research projects in smart energy systems, manufacturing and supply chain management, smart cities, and agriculture, funded by multiple funding agencies and companies.





## Why do you like doing research?

By doing research, we can try to solve society problems systematically and with a strong basis. Even if we cannot achieve positive outcomes, we can still gain knowledge of how to solve the problems. Research is challenging but fun because it will always lead to critical and creative thinking.

## How can, in particular undergraduate, students contribute?

We encourage, especially early years students, to contribute to our research in different ways, for example, actively contributing to the project works in the courses, individual study courses, theses, and (voluntary) research assistantships. Students can choose their fields of interest in the methods and application fields. Currently, the following research focuses are available for students:

- Methods: Semantic data management (modeling and integration), data analytics/ machine learning, explainable AI, causal machine learning and inference, linear and combinatorial optimization
- Application fields: Green and sustainable supply chain, sustainable manufacturing, sustainability assessment, circular economy, digital transformation assessment, smart city assessment, agri-food supply chain.

Besides gaining knowledge in methods, the students working on methods can experience the possible applications. The students focusing on application fields will be able to have insights into data-driven methods that can be applied to solve problems in the respective fields.

## How can students join your research?

Until now, Bachelor and Master students from different study programs (IEM, CS, IMS, IBA, DE, SCM, Math) have been working in our research group. They have joined our research through the following:

- 1) Bachelor theses, especially IEM, CS, and IMS students.
- 2) Master theses, especially SCM, DE, and DSSB students.
- 3) Advanced projects for DE students.
- 4) Voluntary student research assistantships, especially for the 1st and 2nd year students, who want to gain pre-knowledge for internships or theses.
- 5) Student research assistantships, as long as project funding is available.
- 6) Teaching assistantships.
- 7) Independent Study Course (ISC)

## (Optional) Give two examples of past student projects

**Example 1:** Power Consumption Prediction of Customised Energy Intensive Metal Products using Hierarchical Bayesian Models and Artificial Neural Networks

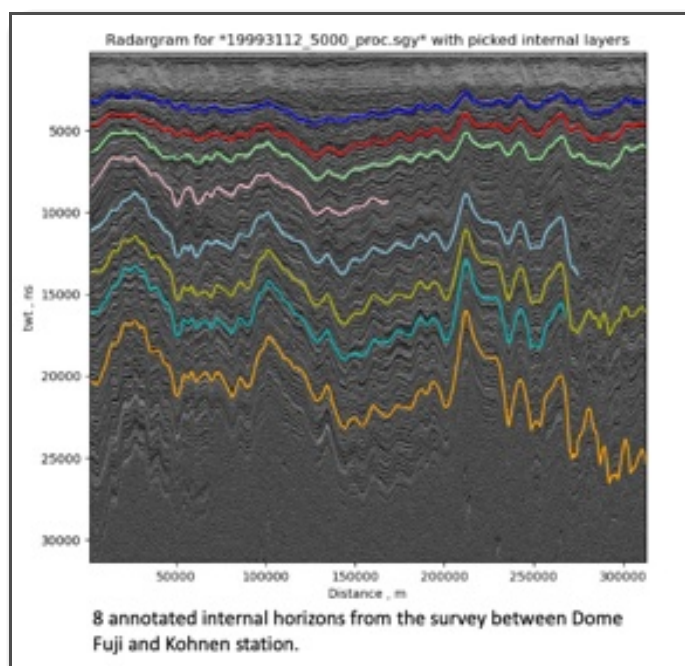
**Example 2:** COVID-19 Impact on the Supply Chain Effects of the Semiconductor Shortage on the Automotive Industry: A Data Analytics Approach

## Head of the Research Group

**Adalbert Wilhelm**, Statistics/Data Science, here particularly: Marine Data Science

## Describe your research project in three sentences and one picture

Marine sciences are challenged by the drastic increase in data streams from satellites, connected observatories, autonomous instruments, high-resolution models, video streams from the water column and seafloor and the range of Omics. The traditional domains of physical oceanography, marine biology and chemistry, geophysics and geology need to gather and develop information and data science tools to effectively utilize this amount of data, and to form improved insights to the processes of marine systems and their changes in a warming climate. This project aims at detecting ice-sheet layers in the internal ice architecture of Antarctica by searching for internal reflection horizons of radio-echo-sounding (RES) data using statistical and machine learning techniques.



## Why do you like doing research?

I like searching for (and finding) solutions to relevant practical problems. I am very curious and aim at understanding the reasons and mechanism behind the visible phenomena.

## How can, in particular undergraduate, students contribute?

Students can work on defined subprojects, in particular, with respect to data exploration, data analysis and code development.

## How can students join your research?

Currently predominantly doing project/thesis work that can be used for their studies as remuneration is limited due to funding restrictions.

**(Optional) Give two examples of past student projects**

**Example 1:** Project work (MSc): Feature extraction of time-series data.

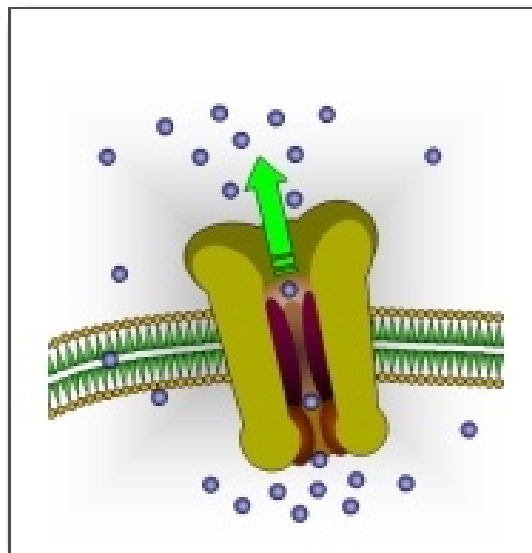
**Example 2:** Project work (MSc): Impact of weather forecasts on cocoa financial prices.

## Head of the Research Group

**Prof. Dr. Mathias Winterhalter**, Professor of Biophysics

## Describe your research project in three sentences and one picture

We are interested in transport phenomena across membranes. For example, we quantify the permeation of antibiotic molecules across single isolated bacterial channels. Comparing translocation rates of different molecules or mutated channels we conclude on the rate limiting interaction and how to optimize the permeation (uptake) of antibiotic molecules.



## Why do you like doing research?

Selective permeation across membranes is an important biological process, knowledge on how to overcome the membrane barrier helps to improve the activity of drugs. It contains also exiting physics: transport in confined systems (tagged Nanopores). We use a multidisciplinary approach with many national and international collaborations and teams with different background.

## How can, in particular undergraduate, students contribute?

We use model system, for example liposomes for which permeation of specific molecules change measurable physical parameters like fluorescence or Zeta-potential. Another model systems are planar lipid membrane in which we may reconstitute single channel and characterize the permeation analyzing the ion current fluctuations (Noise analysis).

## How can students join your research?

In a typical research project the young fellow performs a well-defined question under the guidance of a PhD or Postdoc.

## (Optional) Give two examples of past student projects

**Example 1:** Elucidating membrane permeability using calcein-based fluorescence assay (Ye Seul Lee, 2022)

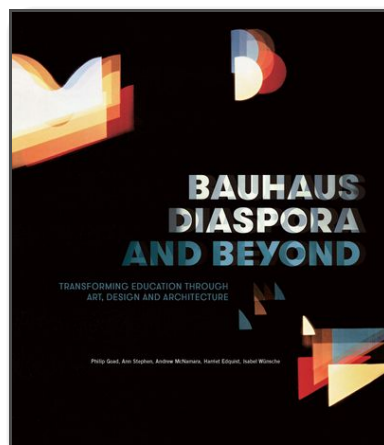
**Example 2:** Antibiotic Permeation through Bacterial Membrane Porins. (Roshan Raj Shah, 2022)

## Head of the Research Group

**Prof. Dr. Isabel Wünsche**

Art & Art History

Russian Art & Culture Group <<https://russian-art.net>>



## Describe your research project in three sentences and one picture

My research focuses on modern and contemporary art of the 20th and 21st centuries. I am specifically looking at the ways in which artists work, the ideas behind the creative process, how the art works are perceived by the public, and what impact they have in shaping our cultural identity. I also study the role of art institutions, including museums and galleries, exhibitions, art publications, artists' networks, etc. My specific interests are the avant-garde movements, abstract art, and the global spread of modernism.

## Why do you like doing research?

I do research in order to gain new insights into how we see and understand the world and explore the foundations of human culture and creative activity.

## How can, in particular undergraduate, students contribute?

I usually offer student assistant jobs for conference and workshop assistance, literature search and data collection, publication assistance, website management, etc.

## How can students join your research?

Take one of my courses, show interest in the subject matter and my research field, and inquire with me.

### **(Optional) Give two examples of past student projects**

- Research assistance for the research and publication project "100 Years On: The First Russian Art Exhibition of 1922"
- Research assistance for the ARC research project "Bauhaus Australia: Emigres, Refuges and the Modernist Transformation of Education in Art, Architecture, and Design, 1930 to 1970"
- BA student project as part of my DAAD research project on German-Portuguese Artistic Relations in the 20th Century
- BA student project as part of my DAAD research project on German-Croatian Artists' Networks