
MATERIALS IN MAINZ SCIENCE
The Graduate School of EXCELLENCE
SUMMARY > 2014 > 2015 > 2016 >

TITLE:
Check of a nanofabricated thin film structure. As part of the research area Model Systems and Correlated Matter, magnetic nanostructures are being investigated as on the nanoscale the magnetic properties are not anymore dominated by the bulk material but can be engineered using tailored geometries.

The Graduate School of Excellence Materials Science in Mainz (MAINZ) is an international doctoral program currently composed of roughly 70 doctoral students. The program is conducted by excellent scientists from Johannes Gutenberg University Mainz (JGU), Max Planck Institute for Polymer Research (MPI-P) and University of Kaiserslautern (TUK). As part of the Excellence Initiative, MAINZ has been awarded a federal grant twice (2007-2012 and 2012-2017) as one of the few doctoral programs in the interdisciplinary area of Chemistry, Physics and Biology. Our three-year training program focuses on training through research and training for life that supply the intellectual framework necessary to become an independent scientist or professional. Networking is one of the key aspects of the program reflected in all training offered. The aspect of networking is embodied in our mentoring program mentMAINZ, which provides our doctoral students with early contact with international leaders in science and industry.

JG|U
JOHANNES GUTENBERG UNIVERSITÄT MAINZ

TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

Max-Planck-Institut für Polymerforschung
Max Planck Institute for Polymer Research

TABLE OF CONTENTS

"THE GRADUATE SCHOOL MATERIALS SCIENCE IN MAINZ – **EXCELLENT GRADUATE EDUCATION AND MORE**"

Thanks to its outstanding researchers and their remarkable achievements, JGU has made a name for itself throughout the world as an internationally recognized research university. One of the core research areas at Johannes Gutenberg University is materials sciences. This scientific prowess has been affirmed by the repeated approval for the Graduate School of Excellence Materials Science in Mainz (MAINZ) in 2007 and 2012.

At the same time, JGU considers promoting and supporting young researchers as best as possible to be one of its core responsibilities besides research and teaching. For one decade now, the Graduate School MAINZ has been our best practice example in this respect.

In order to strategically promote measures for young researchers and to advise the president in related matters, the Gutenberg Council for Young Researchers (GYR) was established in 2014 as one of JGU's three strategic expert boards. The election of MAINZ Director Mathias Kläui as its first director illustrates the impact and visibility that the Graduate School has gained throughout the university.

Successful graduate education concepts developed by MAINZ have also been adopted by research training groups like that integrated in Collaborative Research Centre TRR173 Spin+X which was established in January 2016 and which further intensifies collaborations between groups in Mainz and Kaiserslautern.

Among the diverse activities of the Graduate School MAINZ, only a few can be highlighted in this booklet. One of the most successful and visible activities has been the MAINZ Visiting Professorship program. It allows highly renowned international scientists to perform part of their research at MAINZ and to interact with its PhD students. Moreover, it has been successful in strengthening institutional ties with world-leading international universities. Internationalization has also been fostered by DAAD-funded exchange programs SpinNet and MaHoJeRo connecting MAINZ with partners in the US, China and Korea, as well as a series of summer schools organized at Chinese universities.

While DFG funding of the Graduate School MAINZ has been extended until 2019 recently, the partners have already taken major steps to secure sustainability of the Graduate School. We are currently preparing a merger between MAINZ and the Max Planck Graduate Center (MPGC), which is a joint undertaking between JGU and the Max Planck Institutes on our campus. We will use the next year to shape a new institution that combines the best of both worlds, MAINZ and MPGC.

Through all its activities, the Graduate School MAINZ exemplifies the fundamental ambitions of Johannes Gutenberg University Mainz, which are expressed by its mission: *Moving Minds – Crossing Boundaries*. MAINZ offers innovative scientific, technical and complementary PhD training combined with excellent research in materials science. MAINZ bridges previously disjoint fields of research, ranging from simple model systems and correlated materials to functional polymers, hybrid structures and bio-related materials. Ten years after its establishment, the Graduate School MAINZ continues to set standards in graduate education and beyond.

Prof. Dr. Georg Krausch
President of Johannes Gutenberg University Mainz

TIMELINE 2014-2016

2014

January 2014
Winter School "Nanoscience",
Heidelberg, Germany

July 2014
MAINZ Student Seminar,
Prague, Czech Republic

July-August 2014
Summer School
"The New Developments in
Condensed Matter Physics",
Weihei, China

August 2014
Summer School
"Charge and Spin Transport
in Non-Metallic Systems",
Mainz, Germany

August-September 2014
Summer School
"Numerical and Analytical
Methods for Strongly
Correlated Systems",
Benasque, Spain

October 2014
MAINZ Award:
Leonie Mück & Christoph Schüll

October 2014
MAINZ Visiting Professorship:
Andrei Slavin & Stephan Link

October 2014
MAINZ Alumni Meeting,
Schloß Sörgenloch

2015

July 2015
Summer School
"Properties of Soft Matter – Insights
into Solid Mechanics and Rheology",
Mainz, Germany

September 2015
Summer School
"Investigating the
Solid-Liquid Interface",
Mainz, Germany

October 2015
MAINZ Student Seminar,
Lisbon, Portugal

October 2015
MAINZ Award:
Isabel Schick & Markus Bannwarth

October 2015
MAINZ Visiting Professorship:
Thierry Valet & Dieter Jaksch

October 2015
MAINZ Alumni Meeting,
Schloß Sörgenloch

2016

June 2016
MAINZ Student Seminar,
Dublin, Ireland

October 2016
Summer School
"New Directions in Spintronics
Research – Spin, Charge and Light",
Shanghai, China

October 2016
MAINZ Alumni Meeting,
Schloß Sörgenloch

October 2016
MAINZ Award:
Antonia Statt & Sven Bach

October 2016
MAINZ Visiting Professorship:
Gen Tatara & Bert Meijer

Photos: Maximilian Staab, Frank Wiedemeier, Markus Püttmann, Erik Schaefer, Nils Richter

MAINZ EVENTS 2007-2016

SUMMER SCHOOLS

NAME	LOCATION	DATE
Methods in Materials Science	Istanbul, Turkey	July 2007
Theory in Electronic Structure in Materials	Königsfeld, Germany	September 2007
Thin Films	Oberwesel, Germany	November 2007
Polymer Syntheses	Kirchberg, Germany	March 2008
Solar Cells and Other Semiconducting Devices	Lausanne, Switzerland	May 2008
Energy	Patras, Greece	June 2008
Simulation of Macromolecules on Different Scales	Hall, Austria	September 2008
Thermodynamics of Polymer-Containing Mixtures	Cadzand-Bad, Netherlands	September 2008
NMR-EPR-MRI	Cologne, Germany	November 2008
Nanoparticles	Titisee/Neustadt, Germany	July 2009
Novel Superconductors (in cooperation with UCSB, Materials Research Lab)	Santa Barbara, United States	August 2009
Physics of Biopolymers	Istanbul, Turkey	August-September 2009
Atomic Force Microscopy	Eisenach, Germany	October 2009
Polymers under Constraints	Titisee, Germany	January-February 2010
Photoemission	Dijon, France	February 2010
Membrane Transport in Biological Systems	Sasbachwalden, Germany	June 2010
Emerging Materials for Spintronics (in cooperation with Stanford University and IBM Almaden)	Watsonville, United States	August 2010
Microscopy	Garmisch-Partenkirchen, Germany	August-September 2010
Biomimetic Materials	Segovia, Spain	October 2010
Rheology and Mechanical Properties of Polymers	Würzburg, Germany	April 2011
Quantum Properties in Anomalous Metals and Correlated Systems	Venice, Italy	May-June 2011
Electrooptics	Cambridge, United Kingdom	August 2011
Advanced Spintronics Materials and Transport Phenomena (in cooperation with Tohoku University)	Kaiserslautern, Germany	August 2011
Characterization of Polymer Interfaces/Surfaces/Thin Films (in cooperation with SPP 1369)	Wittenberg, Germany	April 2012
Physics and Chemistry of Spintronics Materials (in cooperation with Indian Institute of Science Bangalore)	Karnaka, India	February 2012
Nanoparticles	Bonn, Germany	May 2012
Superconductivity 297K: Synthetic Highways to Room Temperature Superconductivity (in cooperation with IBM Almaden and Stanford University)	Almaden, United States	October 2012
Electrosynthesis	Hirschegg, Austria	February 2013
NewSpin3	Mainz, Germany	April 2013
Nanoscience	Mainz, Germany	January 2014
New Developments in Condensed Matter Physics (in cooperation with Peking University and National Taiwan University)	Weihai, China	July-August 2014
Charge and Spin Transport in Non-Metallic Systems	Mainz, Germany	August 2014
Numerical Analytical Methods for Strongly Correlated Systems	Benasque, Spain	August 2014
Spin Mechanics 3	Munich, Germany	June 2015
Properties of Soft Matter – Insight into Solid Mechanics and Rheology	Mainz, Germany	July 2015
The Role of Structure in Dynamical Arrest	Mainz, Germany	July 2015
Investigating the Solid-Liquid Interface	Mainz, Germany	September 2015
Entanglement in Strongly Correlated Systems	Benasque, Spain	February 2016
Spin Caloritronics 7	Utrecht, Netherlands	July 2016
JEMS Spintronics Tutorial	Glasgow, United Kingdom	August 2016
Antiferromagnetic Spintronics	Mainz, Germany	September 2016
New Directions in Spintronics Research – Spin, Charge and Light	Shanghai, China	October 2016

COMPLEMENTARY SKILLS WORKSHOPS

NAME	DATE
Oral Presentation, Scientific Writing and Poster Preparation	June 2007
Project Management	October 2007
Career Service	October 2007
Presentations	March 2008
Oral Presentation, Scientific Writing and Poster Preparation	December 2008
Writing and Publishing	January 2009
Introduction to Good Scientific Practice	February 2009
Job Application	September 2009
Time and Self-Management	September 2009
Writing and Publishing	October 2009
Intercultural Communication	November 2009
Oral Presentation	December 2009
Scientific Writing and Presentation	December 2009
Presenting in English	February 2010
Project Management: Getting a Grip on Your PhD	April 2010
Optimizing Writing Strategies for Publishing in English	April 2010
Oral Presentation	December 2010
Job Hunting and Interview Skills	January-February 2011
Leadership Skills	November 2011
Scientific Writing	December 2011
Oral Presentation	December 2011
Introduction into Patent Law	December 2011
Time Management in Doctoral Research	February 2012
Intercultural Communication	April 2012
Presence - Performance - Impact	March 2013
Publishing Research Results in English	April 2013
Project Management For Successful Researchers	August 2013
Professional X-Culture	October 2013
Poster Design and Poster Communication	October 2013

NAME	DATE
Application and Assessment	October 2013
MAINZ Application Talk	October 2013
Mit Präsenz überzeugen	March 2013
MAINZ Application Talk	April 2014
Leadership and Management Skills	May 2014
Application and Assessment	May 2014
Mit Kommunikation zum Erfolg	July 2014
Project Management for Successful Researchers	August 2014
Application and Assessment	September 2014
MAINZ Application Talk	September 2014
Professional X-Culture	October 2014
Poster Design and Poster Communication	November 2014
The Art of Self-Presentation	January 2015
Publishing Research Results in English	February 2015
Efficient Reading	April 2015
Making the most of Conference Participation	May 2015
MAINZ Application Talk	June 2015
Application and Assessment	June 2015
Project Management for Successful Researchers	September 2015
Systematic Creativity	October 2015
Mit Kommunikation zum Erfolg	November 2015
The Art of Self-Presentation	December 2015
Leadership and Management Skills	January 2016
Publishing Research Results in English	May 2016
Application and Assessment	June 2016
Project Management for Successful Researchers	September 2016
Application and Assessment	October 2016
Communicate Strategically and Effectively	November 2016
Mit Kommunikation zum Erfolg	November 2016
The Art of Self-Presentation	December 2016

MAINZ LECTURE SERIES

NAME	DATE
"Materials and Energy"	April 2009 until October 2010
"Materials and Industry"	November 2010 until September 2011
"Challenges in Materials Science"	October 2011 until February 2013
"Methods in Materials Science"	March 2013 until May 2014
"Materials and Energy"	May 2014 until May 2015
"Fundamentals in Materials Science"	From May 2015

MAINZ STUDENT SEMINARS

NAME	LOCATION	DATE
1st MAINZ Student Seminar	Ehringerfeld, Germany	August 2010
2nd MAINZ Student Seminar	Windischeschenbach, Germany	August 2011
3rd MAINZ Student Seminar	Cambridge, United Kingdom	August 2012
4th MAINZ Student Seminar	Stockholm, Sweden	August 2013
5th MAINZ Student Seminar	Prague, Czech Republic	July 2014
6th MAINZ Student Seminar	Lisbon, Portugal	October 2015
7th MAINZ Student Seminar	Dublin, Ireland	June 2016

MAINZ RETREATS

NAME	LOCATION	DATE
1st MAINZ Retreat 2010	Schmitten, Germany	April 2010
2nd MAINZ Retreat 2013	Bad Dürkheim, Germany	November 2013

MAINZ ALUMNI MEETINGS

NAME	LOCATION	DATE
1st MAINZ Alumni Meeting	Sörgenloch, Germany	October 2013
2nd MAINZ Alumni Meeting	Sörgenloch, Germany	October 2014
3rd MAINZ Alumni Meeting	Sörgenloch, Germany	October 2015
4th MAINZ Alumni Meeting	Sörgenloch, Germany	October 2016

CAREERS OF OUR ALUMNI

FROM MAINZ VIA UC SANTA BARBARA TO TU DARMSTADT

Christina Birkel

2002-2007	Studies of Chemistry at JGU
2007-2010	MAINZ PhD Student (Prof. Tremel, JGU)
2011-2013	PostDoc at University of California, Santa Barbara, USA
Since 2013	Junior Research Group leader at TU Darmstadt, Germany
Since 2017	Athene Young Investigator Junior Research Group leader at TU Darmstadt, Germany

Christina Birkel is a Junior Research Group leader (Athene Young Investigator) at the Technische Universität Darmstadt. "My group works independently on research projects in the broad field of synthetic solid state chemistry with a strong focus on energy relevant carbides. I am also active in teaching on the bachelor and master level and have acquired a Teaching Certificate of Higher Education." Her next career goal is running a well-funded and self-sustained research group, either in the form of a tenure-track or a tenured professorship position.

Christina´s current research projects are built on her broad experimental expertise acquired during her time as a doctoral student in Prof. Tremel´s group. "I benefitted greatly from the very open research environment in MAINZ as well as the opportunities to travel multiple times during my doctorate. MAINZ funding allowed me to present my research results at different international conferences, visit my mentor in the US and build an international network that I can still rely on." The network built during her time as doctoral student still boosts Christina´s career. "I am continuously meeting many of them at international conferences, some of them invite me to give a research talk at their university or they even write recommendation letters." Being asked why she chose academia as career, Christina replies firmly: "I really enjoy the combination of research and teaching and being a part of an international scientific 'family'. Working with doctoral students is very motivating and it brings me great joy to mentor them and see them succeed. The struggles are real but they are worth it in my opinion and I am thankful for a lot of support by my colleagues, friends and family." If she were to be a PhD student again herself, Christina says, she would make the same decisions again: "Be curious and persistent, have fun, do what you love and travel often!"

FROM MAINZ VIA BOSTON CONSULTING GROUP TO DEUTSCHE BANK

Eberhard Jakobi works for Deutsche Bank in Frankfurt, Germany as a Head of HR Management Information and Analytics in Germany. "We are supporting Deutsche Bank in strategic Human Resource topics, such as workforce planning, restructuring efforts, diversity goals, and various regulatory requirements. Technically spoken, we do big data analytics on people data."

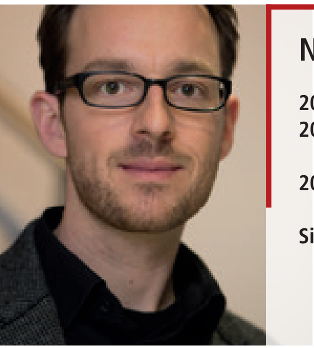
Asked for his career planning, Eberhard says he doesn´t plan much ahead for future career steps but concentrates on performing excellently in his respective current role. In the past, this has always led to highly interesting next steps. "Hence, I currently do not know what my next step will be. But I am confident that it will be interesting and challenging." His strategy seems to pay off, having been selected by the magazine *Capital* as one of Germany´s 'Top 40 under 40' Managers twice. Seeking new challenges and being at the edge of excessive demands were main reasons for Eberhard for choosing his career path. He still benefits strongly from the data handling and analytics skills he trained in his studies and PhD. "This experience is a big vantage when dealing with complex data and analytics – anticipating pitfalls in an early stage or understanding subtleties quickly." Eberhard describes MAINZ as a kind of second home at the university. "I was in contact with other PhD students in the same situation to share experience or sorrow, but I also felt a lot of tailwind by Claudia Felser who was director at that time and by the MAINZ office who both gave me a great push forward and support and helped me through difficult situations. Afterwards, I believe that the MAINZ studentship – the fact that this was an exclusive group – was a relevant piece in my CV to get an offer from The Boston Consulting Group as my first employer." Furthermore, the complementary skills curriculum and mentoring was a good complementation of the PhD studies. Still, his counsel for future doctoral students would be: "Get to learn your maths. This makes a difference."

Eberhard Jakobi

2000-2005	Studies of Physics at TU Darmstadt
2002-2006	Studies of Mechanical Engineering at TU Darmstadt
2006-2010	MAINZ PhD Student (Prof. van Dongen/Prof. Blümer, JGU)
2010-2015	Project Leader, Boston Consulting Group, Frankfurt
2016-2017	Director, People Analytics, Deutsche Bank, Frankfurt
Since 2017	Head of HR Management Information and Analytics Germany, Deutsche Bank, Frankfurt

FROM MAINZ VIA HARVARD TO FAU ERLANGEN-NÜRNBERG

Nicolas Vogel is a professor in the Department of Chemical and Biological Engineering at FAU Erlangen-Nürnberg. "My interest gravitates around self-assembly processes, which we use to create functional materials. The underlying question in my field is how complex and functional structures emerge from simple building blocks – look at nature for a perfect demonstration of this mechanism!"



Nicolas Vogel

2002-2008	Studies of Chemistry at JGU
2008-2011	MAINZ PhD Student (Prof. Landfester, MPI-P)
2012-2014	Postdoctoral Researcher, Harvard University, USA
Since 2014	Associate Professor at Friedrich-Alexander University Erlangen Nürnberg

The foundation for his current position was laid during his PhD where Nicolas made first contact with colloidal particles, their chemistry and physics. "I never stopped working with them." He particularly appreciates the academic freedom he already had as a PhD student. "Katharina Landfester as my PhD supervisor always gave me an incredible amount of freedom to choose scientific projects that interested me – even though some of the scientific questions I pursued were not closely related to her research field. I am also grateful for the support MAINZ gave me to participate in summer schools and scientific conferences, which helped me to extend my knowledge and build a network." Some of the contacts he made during his PhD are still collaborators of his group. "On a more general level, I am currently leading a master's program here at the FAU and when organizing soft skills workshops and summer schools I benefit from my previous experience at MAINZ." During his time as a postdoc at Harvard University, Nicolas was strongly influenced by his advisor Joanna Aizenberg. "From my postdoctoral adviser I learned leadership skills in a top-level research group. In my own group, I try to recreate the friendly and stimulating atmosphere I experienced in the Aizenberg lab." He also stresses the importance of family. "My wife always encouraged me to pursue my career. We went to Boston for a postdoc together and even worked jointly on the foundations of what has become one of my most interesting research projects."

When asked for career advice for future doctoral students, Nicolas smiles and says: "'Life is what happens while you are making other plans' (John Lennon). Keep an open mind and do not narrow your focus too much. Life is full of unpredictable events and best enjoyed when you try to do what interests you most."

FROM MAINZ VIA *NATURE* TO *PLOS ONE*

"My current task is to build a physical sciences division at *PLOS ONE*", says Leonie Mück, a Division Editor in Physical Sciences at the multidisciplinary open-access journal *PLOS ONE*. The journal is part of the Public Library of Science, a non-profit open access publisher and open science advocacy organization. Leonie explains her ambitious plan: "While *PLOS ONE* has been a prominent journal for biomedical papers, it has had little presence in physics, chemistry, earth sciences and engineering. It is my job to change that."
The groundwork for her current position was laid during her time in MAINZ. "I founded the *Journal of Unsolved Questions (JUnQ)* together with MAINZ Alumnus Thomas Jagau who is now heading a DFG-funded Emmy Noether group at LMU Munich. *JUnQ* is a student-led journal for negative and null results. *JUnQ* got a lot of support from MAINZ, which was immensely helpful. I can safely say that the fun I had when working on *JUnQ* has had a huge impact on where I am today." The journal is still successfully published and many MAINZ students followed in Leonie´s steps. Besides founding *JUnQ*, she managed to graduate from the doctoral program with highest honors and received the MAINZ Award 2013 for her outstanding PhD thesis. Leonie also cherishes the time spent abroad during her PhD and she still benefits from the experience and connections made at MAINZ. "The lessons I learned during my PhD about doing science, writing about science and publishing science also reverberate every time I pick up a submission for assessment. I am grateful to my PhD supervisor Juergen Gauss and his mentorship on not losing focus of what's important when doing science." Consequently, Leonie promotes issues like improving reporting, data sharing and source code sharing practices in the physical sciences. Her advice for future doctoral students: "A) Take your time; B) share your code, share your data, publish Open Access."

Leonie Mück

2004-2009	Studies of Chemistry at University of Marburg
2010-2012	MAINZ PhD Student (Prof. Gauss, JGU)
2013-2015	Associate Editor, *Nature Communications/Nature*, Nature Publishing Group London
2015-2017	Senior Editor and Team Leader, *Nature*, Nature Research, London
Since 2017	Division Editor Physical Sciences, *PLOS ONE*, Public Library of Science, Cambridge

FACTS & FIGURES 2014-2016

PUBLICATIONS

271 ALL
146 FIRST AUTHOR (54 %)

CONFERENCES

PARTICIPATIONS (154)

76 WITHIN GERMANY
78 OUTSIDE GERMANY

CONTRIBUTIONS (164)

87 POSTER PRESENTATION
77 ORAL PRESENTATION

GENDER DISTRIBUTION

73 % MALE STUDENTS

27 % FEMALE STUDENTS

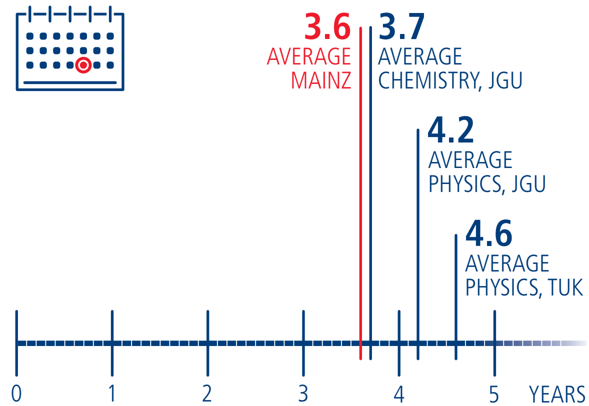
SECONDMENTS

AVERAGE DURATION:
16 WEEKS

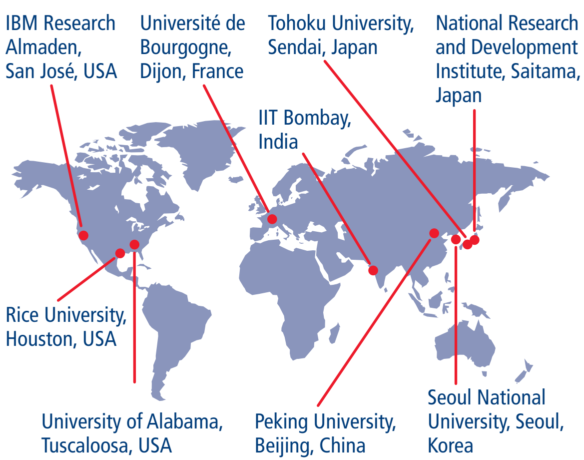
2016
2015
2014

AUSTRALIA **5 %**
OCEANIA **5 %**
ASIA **21 %**
EUROPE **21 %**
NORTH AMERICA **47 %**

DURATION OF PHD (DATA: ENROLLMENT TO DEFENSE)



COOPERATION AGREEMENTS



DOCTORAL DEGREES AWARDED

MAINZ

TOTAL NUMBER: **63**
SUMMA CUM LAUDE: **48 %**

CHEMISTRY, JGU **18 %**

PHYSICS, JGU **12 %**

PHYSICS, TUK **25 %**

Prof. Dr. Mathias Kläui, MAINZ Director

AN INTERVIEW
WITH MAINZ DIRECTOR MATHIAS KLÄUI

Funding from the 5 years' Excellence Initiative for MAINZ expired in 2017 – what is the current status of MAINZ and what are your plans for the future?

We are happy that DFG has extended our funding until 2019. In the meantime, we have worked with the authorities of Johannes Gutenberg University to find ways to realize an institutionalization as promised in the previous funding proposal and make MAINZ a permanent structure within JGU and the participating partners. During the last year, there have been intense discussions between MAINZ and the Max Planck Graduate Center (MPGC) and given a large overlap of people, of topics and of activities, a merger was proposed to form a joint graduate school of excellence. This was put forward to the Max Planck Society and I am happy to report that the proposed concept was evaluated positively. This means that we can expect to receive significant funding after 2019.

At the same time, we have been supporting Collaborative Research Centers that are running with significant scientific overlap with MAINZ. We have been successful in integrating MAINZ graduate education concepts with the research training groups of a number of Collaborative Research Centers showing the significant synergies that MAINZ provides to support research and training activities at the participating partner institutions.

What will each institution contribute to the joint future graduate school of excellence?

We will try to combine the best of all worlds to create an even better institution. MAINZ will contribute key aspects that make us special: our needs-based training, our sophisticated and highly appreciated mentoring program, our strong internationalization and international visibility as well as alumni activities, to only name a few. MPGC will particularly contribute with its strong focus on interdisciplinarity and on inter-institutional cooperation. These are fostered by a set of very successful instruments of which joint PhD regulations for members of MPGC probably are most important and a major benefit for our students.

What are key internationalization measures that MAINZ has implemented?

Apart from our regular open Student Internship and Guest PhD Programs that are in high demand, we have been active to establish cooperation programs with selected partners. MAINZ has recently signed a Memorandum of Understanding on student exchange with the MINT Center at the University of Alabama. During the last years, we have successfully obtained DAAD funding for two consecutive exchange programs: SpinNet connecting JGU, Stanford University, Tohoku University and IBM Research at Almaden, and MaHoJeRo with Tohoku University and Seoul National University. We also receive DAAD funding for a series of summer schools that we organize at leading Chinese universities. And, last but not least, the very successful MAINZ Visiting Professorship program allows us to invite experts from all around the world for extended stays. This program alone has already created an impressive international network that our students and alumni benefit from.

How do you measure success of the graduate school?

Work in graduate education is so multi-facetted that trying to simply quantify our success does not do justice to the complexity of our work. We do not just count papers, outgoing or incoming internships, visits, etc. We believe that we are on the right track if we see that our alumni are successful in their careers. That's why we are exploring career path tracking measures like "5-years-later" interviews as a key to self-assessment. Alumni are one of the most important – and one of the previously most undervalued – resource for any institution in German higher education. This holds in particular for a program such as MAINZ with many successful Alumni that have gone onto exciting career paths. Some of our alumni are successful in business or have launched start-up companies while others have been hired at a professorial level by prestigious academic institutions like Princeton or Columbia University. The wide range of diverse careers is also a motivation to constantly improve our needs-based training concept: no standard trainings but tailor-made measures based on an individual training needs assessment for each student.

Finally and very importantly, we regularly see a large fraction of our alumni at our annual alumni weekends. Hearing the personal stories of how MAINZ has changed and supported their development from launching careers to enhancing professional networking is most gratifying and we are happy that we can maintain such a strong alumni network.

Interview: Jonas Siehoff

RESEARCH

In our ever changing world, global challenges have emerged that define our lives and in consequence also our research agenda. Materials science plays a leading role in tackling grand societal challenges in the field of energy, healthcare, mobility, sustainability, and information technology. At the same time, this interdisciplinary research field provides fundamental scientific insight and exciting research opportunities. Our scientific concept is implemented in specific research areas. These multidisciplinary research areas are guided by our scientific objectives and provide ideal technical training opportunities. At the same time, they cover systems and processes where MAINZ excels in research. The four specific research areas of the Graduate School Materials Science in Mainz (MAINZ) are: Model Systems and Correlated Matter, Functional Polymers, Hybrid Structures and Bio-Related Materials.

RESEARCH AREA

MODEL SYSTEMS AND CORRELATED MATTER

This research area addresses model systems that exhibit a reduced complexity. Therefore, model systems provide an ideal basis for understanding fundamental mechanisms that result in correlations in complex materials. Examples of systems established within MAINZ include ultracold quantum gases and magnon gases, which also allow for a precise understanding and tailoring of interaction strengths. Rational design of correlated systems, including molecular magnets, superconductors and charge transfer salts, makes use of this understanding. Future research will focus on tailoring structure and interactions to optimize materials properties by varying the chemical or physical environment. Manipulating properties by ultra-fast excitations constitutes a further strategy for studying the dynamics of processes in highly correlated materials.

Doctoral students of the Graduate School MAINZ conducting an experiment with a liquid nitrogen-cooled superconductor (black platelet). Cooling of the superconductor generates an electromagnetic field that is strong enough to suspend a magnet.

Photo: Private

Working on graphene, I profited a lot from the exchange in the Graduate School MAINZ. Discussing with students and professors in related fields gave me valuable input. Apart from new ideas, this included working together with colleagues from the MPI-P using new techniques to learn more about my sample than just working on my own. Furthermore, I had the possibility to challenge myself beyond the scientific work by becoming student speaker, organizing an international summer school and much more.

Marie-Luise Braatz, doctoral student with Prof. Mathias Kläui since April 2015

Photo: Private

The Graduate School MAINZ provides many tools for a successful PhD and for my future career. Discussing research topics in the MAINZ community made me change my perspective, get different views on the subject and understand the "bigger" picture. MAINZ also gave me the possibility to enlarge my professional network on international research conferences abroad. In particular, I enjoyed being a part of the organization team for the Spintronics Summer School in Beijing, China, recruiting enthusiastic young scientists for a PhD in our field. I am grateful to be part of this community.

Sebastian Emmerich, doctoral student with Prof. Martin Aeschlimann since April 2015

Photo: Private

Since the first months of my research in theoretical solid-state physics MAINZ provided invaluable support. I use analytical and numerical methods for carrier transport in the context of ultrafast demagnetization and was, through MAINZ, able to present results at international conferences and gain deeper insight about the field at two fantastic summer schools in China. Currently, I am on a secondment in Arizona which was funded by MAINZ as well – an invaluable personal and professional experience that I will never forget.

Dennis Nenno, doctoral student with Prof. Hans Christian Schneider since February 2016

A doctoral student of the Graduate School MAINZ measures the volume of a solvent to synthesize a particular polymer on the Dean-Stark apparatus in the background.

Photo: Private

As plastics are highly flammable, the need for flame-retardants is obvious, but many have several drawbacks, e.g. halogenated compounds are environmentally persistent and release toxic substances during degradation. Therefore, we established a reliable and precise synthesis to prepare a family of phosphorus-based FRs with adjustable P-O vs. P-N-ratios, which will allow us to understand the fundamental influence of the binding pattern on the flame retardant mechanism. Thanks to the strong financial and organizational support of the Graduate School MAINZ, I get several chances to present and discuss my work with people outside my scope to get new ideas and perspectives. Additionally, MAINZ not only offers scientific support, but also helps me in my personal development with their "Training for Life" concept.

Jens Markwart, doctoral student with Dr. Frederik Wurm since October 2016

RESEARCH AREA
FUNCTIONAL POLYMERS

Polymers are a remarkably versatile materials class that pervades our life in a variety of applications. JGU and MPI-P are internationally recognized leading centers in polymer research, encompassing polymer theory, synthesis and structure formation. Research at MAINZ comprises the synthesis of polymer materials and the investigation and tailoring of their properties. This research provides a toolbox for designing materials from the molecular level to the micrometer scale with a desired Function-through-Structure. Exciting new research fields are being developed based on new materials, such as nanographene with tailored electronic and magnetic properties linking to the research area of Correlated Matter. The synthesis of functional polymeric particles and polymers for surface functionalization as well as bio-compatible and bio-degradable polymers is a research focus providing links to the research areas Hybrid Structures and Bio-Related Materials.

Photo: Private

The research topic of my PhD focuses on nanomedicines, meaning the application of functional polymers in drug delivery and diagnostics. I do organic synthesis of cationic poly(N-2-hydroxypropyl) methacrylamide-based block copolymers as polymeric vectors for the delivery of therapeutic nucleic acids, such as pDNA or mRNA. Thanks to the interdisciplinary character of the Graduate School MAINZ, I was inspired by various scientific research fields. For me personally, the "Training for Life Program" offered by MAINZ, including talks given by people working in industry, the mentoring program and also several workshops for my personal development, were helpful to make decisions for my future career path.

Simone Beck, doctoral student with Prof. Rudolf Zentel since September 2014

RESEARCH AREA

HYBRID STRUCTURES

Hybrid structures combine organic and inorganic as well as soft and hard materials, and thus provide a natural link between Functional Polymers and hard Correlated Matter. These structures can combine properties and advantages of organic and inorganic components in one structured material. Compared to purely organic materials studied in the research area Functional Polymers, hybrid structures can extend the range of accessible physical phenomena, applications and material properties. Hybrid structures benefit from the complementary properties of their organic and inorganic components. Organic materials provide features such as processibility, flexibility, biological compatibility, stabilization, and specific functions. Inorganic, usually crystalline, components offer properties such as mechanical strength, catalytic activity, or special optical, electronic, or magnetic properties. We define hybrid structures in a broad sense, including hybrid structures formed from natural and artificial materials. This provides strong links to the research area Bio-Related Materials, where we investigate the class of bio-hybrid structures.

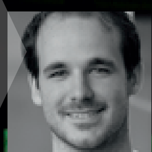
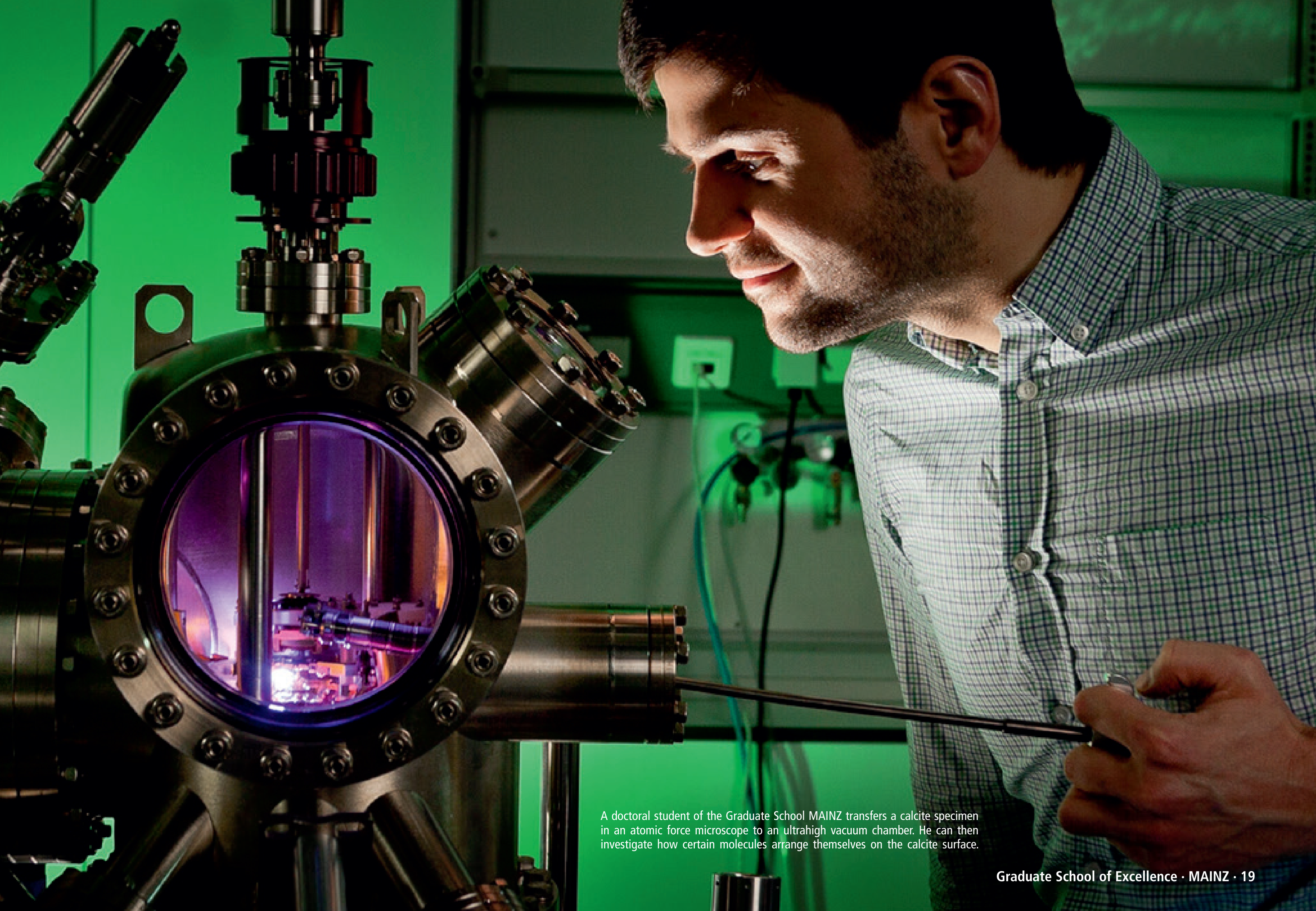


Photo: Private

I study how surface chemistry affects particle plasmons. During my time in MAINZ, my research highly benefits from a stay at Rice University in Houston, TX (USA), where I have learnt from exceptional researchers in nanoscience. I also had the chance to participate at a Gordon Research Conference, where I received excellent feedback on my research. Besides this, I found the MAINZ Student Seminars very helpful, as these seminars introduced me into a great variety of research fields.

Benjamin Förster, doctoral student with Prof. Carsten Sönnichsen since September 2015



A doctoral student of the Graduate School MAINZ transfers a calcite specimen in an atomic force microscope to an ultrahigh vacuum chamber. He can then investigate how certain molecules arrange themselves on the calcite surface.

A doctoral student of the Graduate School MAINZ is checking SDS-Gels which contain Coomassie blue stained proteins which have been produced using genetically modified bacteria.

RESEARCH AREA
BIO-RELATED MATERIALS

Bio-Related Materials represent the most complex type of matter studied at MAINZ. In this area, we address three main materials classes. Bio-mimetic materials represent a class of materials that we design by "learning from nature". Studying these materials helps to understand generic phenomena and processes in real biomaterials. This eventually allows for designing new materials with enhanced properties. Bio-hybrid structures formed by a combination of synthetic and natural constituents are investigated to exploit the exceptional recognition capabilities of biological molecules. Finally, materials for biomedical applications comprise biocompatible and biodegradable polymers, polymer-protein/antibody, polymer-drug conjugates, polymeric nanocapsules, and polyelectrolyte complexes for DNA transfection.

Photo: Private

For my doctoral thesis, I am synthesizing amphiphilic polyphenylene dendrimer-bioconjugates for specific cell targeting. In the field of biomedicine, carrier systems are essential for active agents that are not transported to the desired organ or cell that is responsible for a particular disease. Therefore, dendrimer-bioconjugates are a promising tool for the treatment of many diseases since they might bind therapeutic components and shuttle them to a certain cell applying a targeting biomolecule. The Graduate School MAINZ gives me the opportunity to professionally and personally improve my doctoral training through networking with PhD students from other fields and participation in complementary skills courses, international conferences as well as student seminars.

Jessica Wagner, doctoral student with Prof. Tanja Weil since December 2016

Photo: Private

I am working on the systematic modeling of complex dynamics in colloidal and polymeric suspensions. The Graduate School MAINZ gives me the opportunity to communicate and work with students of very diverse scientific backgrounds. As theoretical physicist this is especially important, since it opens up opportunities for future work and collaborations. Besides this scientific input, I really enjoyed the social aspects of the student seminars in Dublin and Amsterdam.

Gerhard Jung, doctoral student with Prof. Friederike Schmid since October 2015

RESEARCH HIGHLIGHTS

SELECTED FIRST-AUTHOR PUBLICATIONS BY MAINZ PHD STUDENTS

The Graduate School MAINZ stands for both: excellent training and outstanding research. Since it would be beyond the scope of this summary to illustrate the research conducted through MAINZ in its entirety, we have instead selected a few research highlights, a digest of important publications by our own students, which will give you an interesting overview of research conducted at MAINZ.

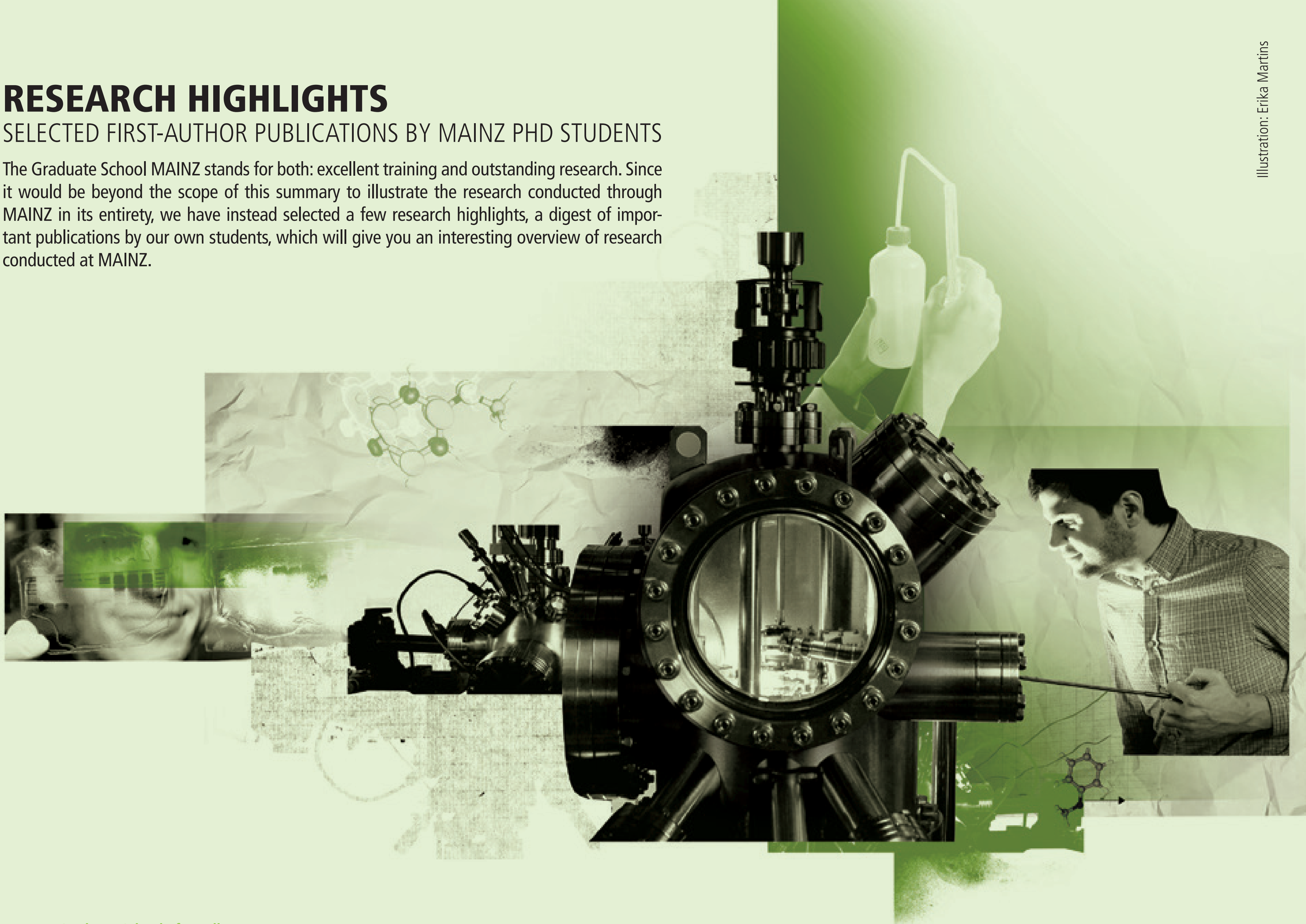
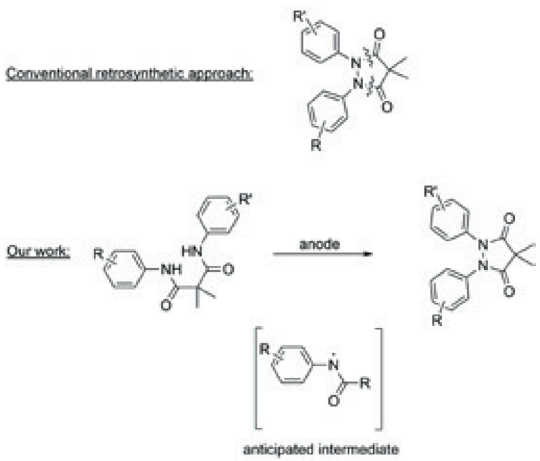


Illustration: Erika Martins

Access to Pyrazolidin-3,5-diones through Anodic N–N Bond Formation

Pyrazolidin-3,5-diones are important motifs in heterocyclic chemistry and are of high interest for pharmaceutical applications. In classic organic synthesis, the hydrazinic moiety is installed by condensation using the corresponding hydrazine building blocks. However, most N,N'-diaryl hydrazines are highly toxic and require upstream preparation owing to their low commercial availability. We present an alternative and sustainable synthetic approach to pyrazolidin-3,5-diones that employs readily accessible dianilides as precursors, which are anodically converted to furnish the N–N bond. The electro-conversion is conducted in a simple undivided cell under constant current conditions.

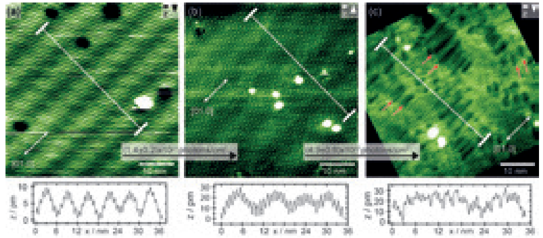


REFERENCE

Gieshoff T, Schollmeyer D, **Waldvogel SR**. Access to Pyrazolidin-3,5-diones through Anodic N–N Bond Formation. *Angew. Chem. Int. Ed.* **2016**, 55, 9437-9440.

Substrate Templating Guides the Photoinduced Reaction of C_{60} on Calcite

A substrate-guided photochemical reaction of C_{60} fullerenes on calcite, a bulk insulator, investigated by non-contact atomic force microscopy is presented. The success of the covalent linkage is evident from a shortening of the intermolecular distances, which is clearly expressed by the disappearance of the moiré pattern. Furthermore, UV/Vis spectroscopy and mass spectrometry measurements carried out on thick films demonstrate the ability of our setup for initiating the photoinduced reaction. The irradiation of C_{60} results in well-oriented covalently linked domains. The orientation of these domains is dictated by the lattice dimensions of the underlying calcite substrate. Using the lattice mismatch to deliberately steer the direction of the chemical reaction is expected to constitute a general design principle for on-surface synthesis. This work thus provides a strategy for controlled fabrication of oriented, covalent networks on bulk insulators.

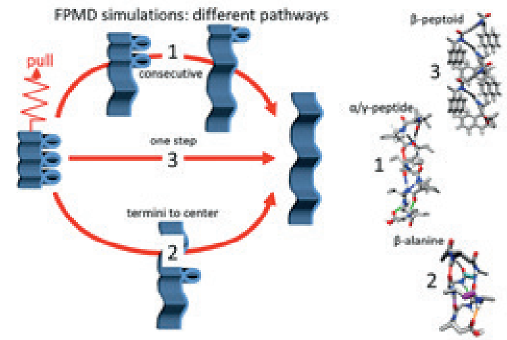


REFERENCE

Lindner R, Rahe P, Kittelmann M, Gourdon A, Bechstein R, **Kühnle A**. Substrate Templating Guides the Photoinduced Reaction of C_{60} on Calcite. *Angew. Chem. Int. Ed.* **2014**, 53, 7952-7955.

Determining Factors for the Unfolding Pathway of Peptides, Peptoids, and Peptidic Foldamers

We present a study of the mechanical unfolding pathway of five different oligomers (α-peptide, β-peptide, δ-aromatic-peptides, α/γ-peptides, and β-peptoids), adopting stable helix conformations. Using force-probe molecular dynamics, we identify the determining structural factors for the unfolding pathways and reveal the interplay between the hydrogen bond strength and the backbone rigidity in the stabilization of their helix conformations. On the basis of their behavior, we classify the oligomers in four groups and deduce a set of rules for the prediction of the unfolding pathways of small foldamers.

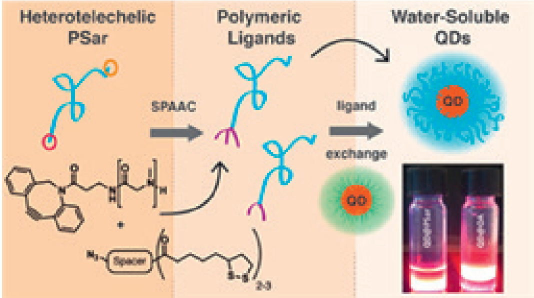


REFERENCE

Uribe L, **Gauss J**, Diezemann G. Determining Factors for the Unfolding Pathway of Peptides, Peptoids, and Peptidic Foldamers. *J. Phys. Chem. B* **2016**, 120, 10433-10441.

Multidentate Polysarcosine-Based Ligands for Water-Soluble Quantum Dots

We describe the synthesis of heterotelechelic polysarcosine polymers and their use as multidentate ligands in the preparation of stable water-soluble quantum dots (QDs). Orthogonally functionalized polysarcosine with amine and dibenzocyclooctyl (DBCO) end groups is obtained by ring-opening polymerization of N-methylglycine N-carboxyanhydride with DBCO amine as initiator. In a first postpolymerization modification step, the future biological activity of the polymeric ligands is adjusted by modification of the amine terminus. Then, in a second postpolymerization modification step, azide functionalized di- and tridentate anchor compounds are introduced to the DBCO terminus of the polysarcosine via strain-promoted azide-alkyne cycloaddition (SPAAC). Through the separate synthesis of the anchor compounds, it is possible to ensure reproducible introduction of a well-defined number of multiple anchor groups to all polymers studied. Finally, the obtained multidentate polymeric ligands are successfully used in the ligand exchange procedures to yield stable, water-soluble QDs. As polysarcosine-based ligands can provide biocompatibility, prevent nonspecific interactions, and simultaneously enable specific targeting, the systems presented here are promising candidates to provide QDs well suitable for ex vivo analytics or bioimaging.

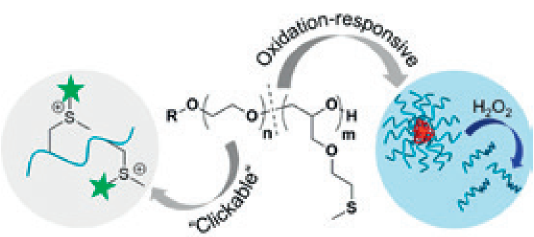


REFERENCE

Fokina A, Klinker K, Braun L, Jeong BG, Bae WK, Barz M, **Zentel R**. Multidentate Polysarcosine-Based Ligands for Water-Soluble Quantum Dots. *Macromolecules* **2016**, 49, 3663-3671.

Oxidation-Responsive and "Clickable" Poly(ethylene glycol) via Copolymerization of 2-(Methylthio)ethyl Glycidyl Ether

Poly(ethylene glycol) (PEG) is a widely used biocompatible polymer. We describe a novel epoxide monomer with methyl-thioether moiety, 2-(methylthio)ethyl glycidyl ether (MTEGE), which enables the synthesis of well-defined thioether-functional PEG. Random and block copolymers were obtained via anionic ring opening polymerization. The random copolymers are thermoresponsive in aqueous solution, with a wide range of tunable transition temperatures of 88 °C to 28 °C. In contrast, block copolymers formed well-defined micelles in water. Intriguingly, the thioether moieties of MTEGE can be selectively oxidized into sulfoxide units, leading to full disassembly of the micelles. Oxidation-responsive release of encapsulated Nile Red demonstrates the potential of these micelles as redox-responsive nanocarriers. MTT assays showed only minor effects of the thioethers and their oxidized derivatives on the cellular metabolism of two cell lines. Furthermore, sulfonium PEG polyelectrolytes are obtained via alkylation or alkoxylation of MTEGE, providing access to a large variety of functional groups at the charged sulfur atom.

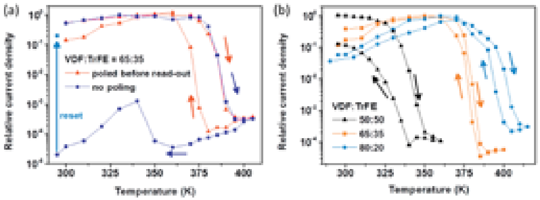


REFERENCE

Herzberger J, Fischer K, Leibig D, Bros M, Thiermann R, **Frey H**. Oxidation-Responsive and "Clickable" Poly(ethylene glycol) via Copolymerization of 2-(Methylthio)ethyl Glycidyl Ether. *J. Am. Chem. Soc.* **2016**, 138, 9212-9223.

Thin Film Thermistor with Positive Temperature Coefficient of Resistance Based on Phase Separated Blends of Ferroelectric and Semiconducting Polymers

We demonstrate that ferroelectric memory diodes can be utilized as switching type positive temperature coefficient (PTC) thermistors. The diode consists of a phase separated blend of a ferroelectric and a semiconducting polymer stacked between two electrodes. The current through the semiconducting polymer depends on the ferroelectric polarization. At the Curie temperature the ferroelectric polymer depolarizes and consequently the current density through the semiconductor decreases by orders of magnitude. The diode therefore acts as switching type PTC thermistor. Unlike their inorganic counterparts, the PTC thermistors presented here are thin film devices. The switching temperature can be tuned by varying the Curie temperature of the ferroelectric polymer.

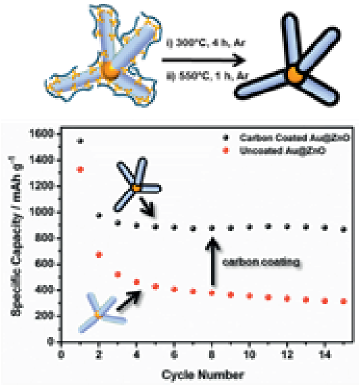


REFERENCE

Lenz T, Dehsari HS, Asadi K, **Blom PWM**, Groen WA, de Leeuw DM. Thin film thermistor with positive temperature coefficient of resistance based on phase separated blends of ferroelectric and semiconducting polymers. *Appl. Phys. Lett.* **2016**, 109, 133302.

Precursor Polymers for the Carbon Coating of Au@ZnO Multipods for Application as Active Material in Lithium-Ion Batteries

The synthesis of statistical and block copolymers based on polyacrylonitrile, as a source for carbonaceous materials, and thiol-containing repeating units as inorganic nanoparticle anchoring groups is reported. These polymers are used to coat Au@ZnO multipod heteroparticles with polymer brushes. IR spectroscopy and transmission electron microscopy prove the successful binding of the polymer onto the inorganic nanostructures. Thermogravimetric analysis is applied to compare the binding ability of the block and statistical copolymers. Subsequently, the polymer coating is transformed into a carbonaceous (partially graphitic) coating by pyrolysis. The obtained carbon coating is characterized by Raman spectroscopy and energy-dispersive X-ray (EDX) spectroscopy. The benefit of the conformal carbon coating of the Au@ZnO multipods regarding its application as lithium-ion anode material is revealed by performing galvanostatic cycling, showing a highly enhanced and stabilized electrochemical performance of the carbon-coated particles (still 831 mAh g^{-1} after 150 cycles) with respect to the uncoated ones (only 353 mAh g^{-1} after 10 cycles).

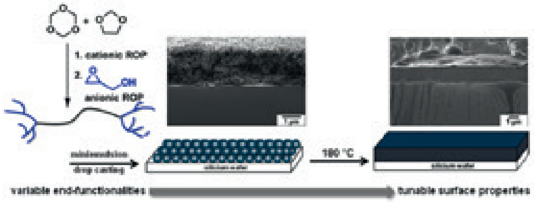


REFERENCE

Oschmann B, Tahir MN, Mueller F, Bresser D, Lieberwirth I, Tremel W, Passerini S, **Zentel R**. Precursor Polymers for the Carbon Coating of Au@ZnO Multipods for Application as Active Material in Lithium-Ion Batteries. *Macromol. Rapid Commun.* **2015**, 36, 1075-1082.

Processing and Adjusting the Hydrophilicity of Poly(oxymethylene) (Co)polymers: Nanoparticle Preparation and Film Formation

Handling the insoluble POM: the preparation of nanoparticles based on hyperbranched-linear-hyperbranched ABA triblock copolymers with variable hydrophilicity and composed of short hyperbranched polyglycerol (hbPG) as the A-blocks and linear poly(oxymethylene) (POM) as a B-block is described. The POM-hbPG-nanoparticles with diameters in the range of 190 to 250 nm were generated in a convenient process, combining the solvent evaporation process with the miniemulsion technique, a water borne handling for POM-copolymers. Furthermore, the film formation properties of the nanoparticles were investigated by deposition on silicon and subsequent sintering, which leads to films with a thickness in the µm-range that were investigated via SEM. The surface properties of these films were investigated via static contact angle measurements at the liquid/vapor interface. The contact angle decreases from 67° for the polymer film based on POM with two hydroxyl end groups to 29° for POM-copolymers with 16 hydroxyl groups, confirming the influence of the polymer structure and size of the hbPG block on the surface properties. In summary, this work presents a possibility for a facile handling and film formation of the insoluble POM, opening new applications, e.g., in coatings.

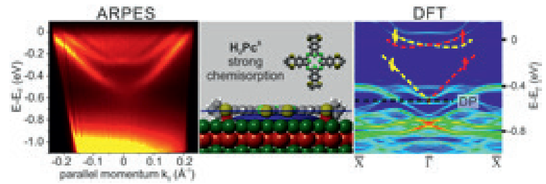


REFERENCE

Bannwarth MB, Klein R, Kurch S, Frey H, **Landfester K**, Wurm FR. Processing and adjusting the hydrophilicity of poly(oxymethylene) (co)polymers: nanoparticle preparation and film formation. *Polym. Chem.* **2016**, 7, 184-190.

Controlling the Spin Texture of Topological Insulators by Rational Design of Organic Molecules

We present a rational design approach to customize the spin texture of surface states of a topological insulator. This approach relies on the extreme multifunctionality of organic molecules that are used to functionalize the surface of the prototypical topological insulator (TI) Bi_2Se_3. For the rational design we use theoretical calculations to guide the choice and chemical synthesis of appropriate molecules that customize the spin texture of Bi_2Se_3. The theoretical predictions are then verified in angular-resolved photoemission experiments. We show that, by tuning the strength of molecule-TI interaction, the surface of the TI can be passivated, the Dirac point can energetically be shifted at will, and Rashba-split quantum-well interface states can be created. These tailored interface properties – passivation, spin-texture tuning, and creation of hybrid interface states – lay a solid foundation for interface-assisted molecular spintronics in spin-textured materials.

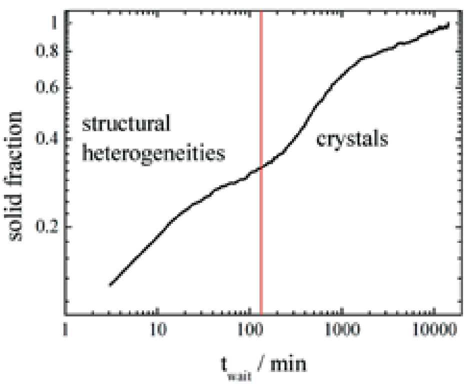


REFERENCE

Jakobs S, Narayan A, Stadtmüller B, Droghetti A, Rungger I, Hor YS, Klyatskaya S, Jungkenn D, Stöckl J, Laux M, Monti OLA, **Aeschlimann M**, Cava RJ, Ruben M, Mathias S, Sanvito S, Cinchetti M. Controlling the Spin Texture of Topological Insulators by Rational Design of Organic Molecules. *Nano Lett.* **2015**, 15, 6022-6029.

Correlation between Dynamical and Structural Heterogeneities in Colloidal Hard-Sphere Suspensions

Dynamical and structural heterogeneities have long been thought to play a key role in a unified picture of solidification in view of the two competitive processes of crystallization and vitrification. Here, we study these heterogeneities by means of a combination of dynamic and static light-scattering techniques applied to the simplest model system exhibiting crystallization and vitrification: the colloidal hard-sphere system. Our method enables us to quantify and correlate the temporal evolution of the amount of ordered clusters (precursors) and the amount of slow particles. Our analysis shows that their temporal evolutions are closely related and that there is an intimate link between structural and dynamic heterogeneities, crystal nucleation and the non-crystallization transition.

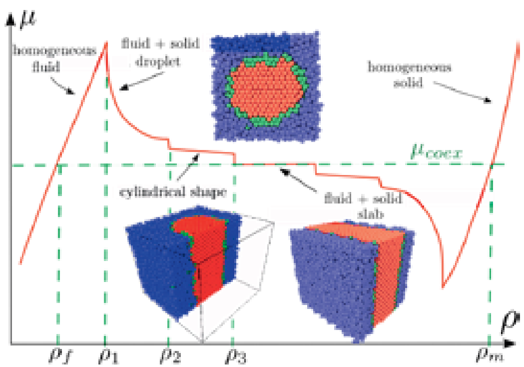


REFERENCE

Golde S, **Palberg T**, Schöpe HJ. Correlation between dynamical and structural heterogeneities in colloidal hard-sphere suspensions. *Nature Physics* **2016**, 12, 712-717.

Finite-Size Effects on Liquid-Solid Phase Coexistence and Estimation of Crystal Nucleation Barriers

A fluid in equilibrium in a finite volume *V* with particle number *N* at a density ρ=*N*/*V* exceeding the onset density ρ_f of freezing may exhibit phase coexistence between a crystalline nucleus and surrounding fluid. Using a method suitable for the estimation of the chemical potential of dense fluids, we obtain the excess free energy due to the surface of the crystalline nucleus. There is neither a need to precisely locate the interface nor to compute the (anisotropic) interfacial tension. As a test case, a soft version of the Asakura-Oosawa model for colloid-polymer mixtures is treated. While our analysis is appropriate for crystal nuclei of arbitrary shape, we find the nucleation barrier to be compatible with a spherical shape and consistent with classical nucleation theory.

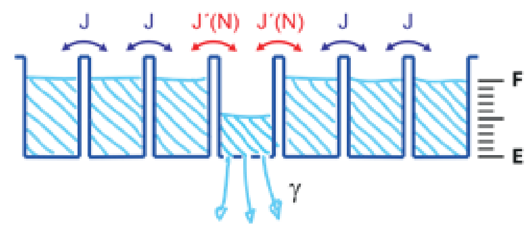


REFERENCE

Statt A, Virnau P, **Binder K**. Finite-Size Effects on Liquid-Solid Phase Coexistence and Estimation of Crystal Nucleation Barriers. *Phys. Rev. Lett.* **2015**, 114, 026101.

Bistability in a Driven-Dissipative Superfluid

We experimentally study a driven-dissipative Josephson junction array, realized with a weakly interacting Bose–Einstein condensate residing in a one-dimensional optical lattice. Engineered losses on one site act as a local dissipative process, while tunneling from the neighboring sites constitutes the driving force. We characterize the emerging steady states of this atomtronic device. With increasing dissipation strength γ the system crosses from a superfluid state, characterized by a coherent Josephson current into the lossy site, to a resistive state, characterized by an incoherent hopping transport. For intermediate values of γ, the system exhibits bistability, where a superfluid and an incoherent branch coexist. We also study the relaxation dynamics towards the steady state, where we find a critical slowing down, indicating the presence of a nonequilibrium phase transition.

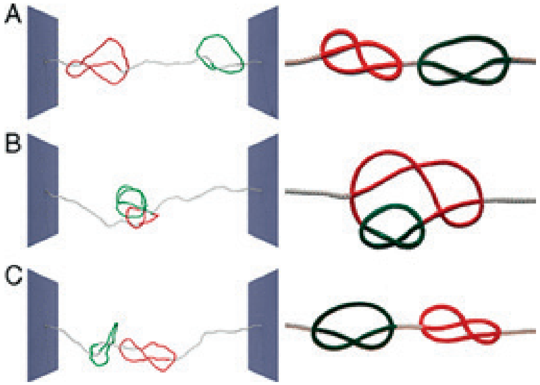


REFERENCE

Labouvie R, Santra B, Heun S, **Ott H**. Bistability in a Driven-Dissipative Superfluid. *Phys. Rev. Lett.* **2016**, 116, 235302.

How Molecular Knots Can Pass through Each Other

We propose a mechanism in which two molecular knots pass through each other and swap positions along a polymer strand. Associated free energy barriers in our simulations only amount to a few k_BT, which may enable the interchange of knots on a single DNA strand.

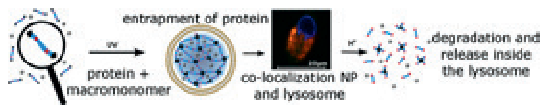


REFERENCE

Trefz B, Siebert J, **Virnau P**. How molecular knots can pass through each other. *Proc. Natl. Acad. Sci. USA* **2014**, 111, 7948-7951.

Biodegradable pH-Sensitive Poly(ethylene glycol) Nanocarriers for Allergen Encapsulation and Controlled Release

In the last decades, the number of allergic patients has increased dramatically. Allergen-specific immunotherapy (SIT) is the only available cause-oriented therapy. SIT reduces the allergic symptoms, but also exhibits some disadvantages. It is a long-lasting procedure, and severe side effects like anaphylactic shock can occur. In this work, we introduce a method to encapsulate allergens into nanocarriers to avoid these side effects during SIT. Degradable nanocarriers provide a physical barrier between the encapsulated cargo and the biological environment and can respond to certain local stimuli (like pH) to release their cargo. The publication introduces a facile strategy for the synthesis of acid-labile poly(ethylene glycol) (PEG)-macromonomers that degrade at pH 5 (physiological pH inside the endolysosome). The macromonomers were used for acid-labile nanocarrier synthesis. Difunctional, water-soluble PEG dimethacrylate (PEG-acetal-DMA) macromonomers with cleavable acetal units were developed. Both the allergen and the macromonomers were entrapped inside liposomes as templates, which were produced by dual centrifugation (DAC). Cellular antigen stimulation tests show that the nanocarriers effectively shield the allergen cargo from detection by immunoglobulins on the surface of basophilic leucocytes and thus offer promise for novel therapies.

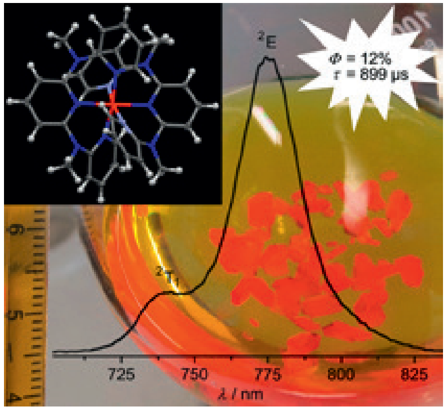


REFERENCE

Pohlit H, Bellinghausen I, Schömer M, Heydenreich B, Saloga J, **Frey H**. Biodegradable pH-Sensitive Poly(ethylene glycol) Nanocarriers for Allergen Encapsulation and Controlled Release. *Biomacromolecules* **2015**, 16, 3103-3111.

$[Cr(ddpd)_2]^{3+}$: A Molecular, Water-Soluble, Highly NIR-Emissive Ruby Analogue

Bright, long-lived emission from first-row transition-metal complexes is very challenging to achieve. Herein, we present a new strategy relying on the rational tuning of energy levels. With the aid of the large N–Cr–N bite angle of the tridentate ligand ddpd (N,N′-dimethyl-N,N′-dipyridine-2-ylpyridine-2,6-diamine) and its strong σ-donating capabilities, a very large ligand-field splitting could be introduced in the chromium(III) complex $[Cr(ddpd)_2]^{3+}$, that shifts the deactivating and photoreactive $^4T_2$ state well above the emitting ^2E state. Prevention of back-intersystem crossing from the ^2E to the $^4T_2$ state enables exceptionally high near-infrared phosphorescence quantum yields and lifetimes for this 3d metal complex. The complex $[Cr(ddpd)_2](BF_4)_3$ is highly water-soluble and very stable towards thermal and photo-induced substitution reactions and can be used for fluorescence intensity- and lifetime-based oxygen sensing in the NIR.

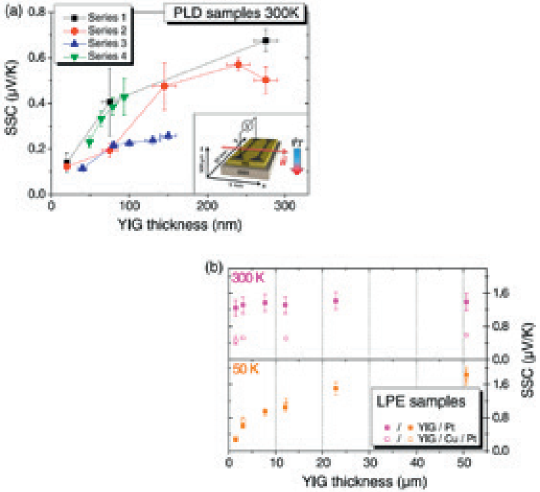


REFERENCE

Otto S, Grabolle M, Förster C, Kreitner C, Resch-Genger U, **Heinze K**. $[Cr(ddpd)_2]^{3+}$: A Molecular, Water-Soluble, Highly NIR-Emissive Ruby Analogue. *Angew. Chem. Int. Ed.* **2015**, 54, 11572-11576.

Length Scale of the Spin Seebeck Effect

We investigate the origin of the spin Seebeck effect in yttrium iron garnet (YIG) samples for film thicknesses from 20 nm to 50 µm at room temperature and 50 K. Our results reveal a characteristic increase of the longitudinal spin Seebeck effect amplitude with the thickness of the insulating ferrimagnetic YIG, which levels off at a critical thickness that increases with decreasing temperature. The observed behavior cannot be explained as an interface effect or by variations of the material parameters. Comparison to numerical simulations of thermal magnonic spin currents yields qualitative agreement for the thickness dependence resulting from the finite magnon propagation length. This allows us to trace the origin of the observed signals to genuine bulk magnonic spin currents due to the spin Seebeck effect ruling out an interface origin and allowing us to gauge the reach of thermally excited magnons in this system for different temperatures. At low temperature, even quantitative agreement with the simulations is found.

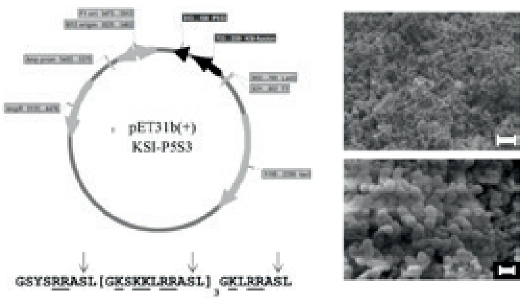


REFERENCE

Kehlberger A, Ritzmann U, Hinzke D, Guo E-J, Cramer J, Jakob G, Onbasli MC, Kim DH, Ross CA, Jungfleisch MB, Hillebrands B, Nowak U, **Kläui M**. Length Scale of the Spin Seebeck Effect. *Phys. Rev. Lett.* **2015**, 115, 096602.

High Yield Recombinant Production of a Self-Assembling Polycationic Peptide for Silica Biomineralization

We report the recombinant bacterial expression and purification at high yields of a polycationic oligopeptide, P5S3. The sequence of P5S3 was inspired by a diatom silaffin, a silica precipitating peptide. Like its native model, P5S3 exhibits silica biomineralizing activity, but furthermore has unusual self-assembling properties. P5S3 is efficiently expressed in *Escherichia coli* as fusion with ketosteroid isomerase (KSI), which causes deposition in inclusion bodies. After breaking the fusion by cyanogen bromide reaction, P5S3 was purified by cation exchange chromatography, taking advantage of the exceptionally high content of basic amino acids. The numerous cationic charges do not prevent, but may even promote counterion-independent self-assembly which in turn leads to silica precipitation. Enzymatic phosphorylation, a common modification in native silica biomineralizing peptides, can be used to modify the precipitation activity.

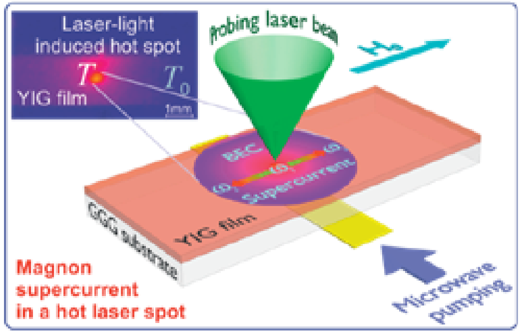


REFERENCE

Zerfaß C, Braukmann S, Nietzsche S, Hobe S, **Paulsen H**. High yield recombinant production of a self-assembling polycationic peptide for silica biomineralization. *Protein Expression and Purification* **2015**, 108, 1-8.

Supercurrent in a Room-Temperature Bose–Einstein Magnon Condensate

A supercurrent is a macroscopic effect of a phase-induced collective motion of a quantum condensate. So far, experimentally observed supercurrent phenomena such as superconductivity and superfluidity have been restricted to cryogenic temperatures. Here, we report on the discovery of a supercurrent in a Bose–Einstein magnon condensate prepared in a room-temperature ferrimagnetic film. The magnon condensate is formed in a parametrically pumped magnon gas and is subject to a thermal gradient created by local laser heating of the film. The appearance of the supercurrent, which is driven by a thermally induced phase shift in the condensate wavefunction, is evidenced by analysis of the temporal evolution of the magnon density measured by means of Brillouin light scattering spectroscopy. Our findings offer opportunities for the investigation of room-temperature macroscopic quantum phenomena and their potential applications at ambient conditions.

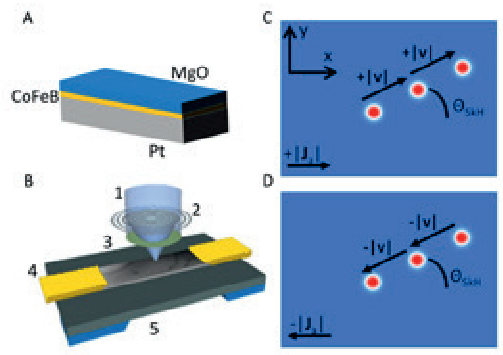


REFERENCE

Bozhko DA, Serga AA, Clausen P, Vasyuchka VI, Heussner F, Melkov GA, Pomyalov A, L'vov VS, **Hillebrands B**. Supercurrent in a room-temperature Bose–Einstein magnon condensate. *Nature Physics* **2016**, 12, 1057-1062.

Skyrmion Hall Effect Revealed by Direct Time-Resolved X-ray Microscopy

Magnetic skyrmions are promising candidates for future spintronic applications such as skyrmion racetrack memories and logic devices. They exhibit exotic and complex dynamics governed by their topology and are less influenced by defects, such as edge roughness, than conventional memories. To demonstrate that skyrmions exhibit the necessary reliability for operation in devices, we show that we can move skyrmions billions of times completely reproducibly. The skyrmion's non-zero topological charge leads to a predicted 'skyrmion Hall effect', in which current-driven skyrmions acquire a transverse velocity component analogous to charged particles in the conventional Hall effect. We find that skyrmions move at a well-defined angle Θ_{SkH} that can exceed 30° with respect to the current flow, but in contrast to conventional theoretical expectations, Θ_{SkH} increases linearly with velocity up to at least 100 ms^{-1}. We can explain this changing skyrmion Hall angle by a new model based on internal mode excitations in combination with a field-like spin-orbit torque, showing that one must go beyond the previously used rigid skyrmion description to understand the dynamics.

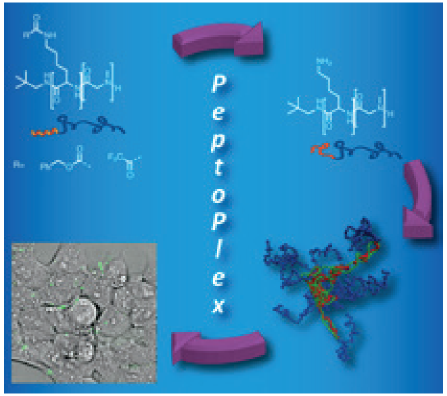


REFERENCE

Litzius K, Lemesh I, Krüger B, Bassirian P, Caretta L, Richter K, Büttner F, Sato K, Tretiakov OA, Förster J, Reeve RM, Weigand M, Bykova I, Stoll H, Schütz G, Beach GSD, **Kläui M**. Skyrmion Hall effect revealed by direct time-resolved X-ray microscopy. *Nature Physics* **2016**, 13, 170-175.

Introducing PeptoPlexes: Polylysine-*block*-Polysarcosine Based Polyplexes for Transfection of HEK 293T Cells

A series of well-defined polypeptide–polypeptoid block copolymers based on the body's own amino acids sarcosine and lysine are prepared by ring opening polymerization of *N*-carboxyanhydrides. Block lengths were varied between 200–300 for the shielding polysarcosine block and 20–70 for the complexing polylysine block. Dispersity indexes ranged from 1.05 to 1.18. Polylysine is polymerized with benzyloxycarbonyl as well as trifluoroacetyl protecting groups at the ϵ-amine group and optimized deprotection protocols for both groups are reported. The obtained block ionomers are used to complex pDNA resulting in the formation of polyplexes (PeptoPlexes). The PeptoPlexes can be successfully applied in the transfection of HEK 293T cells and are able to transfect up to 50 % of cells in vitro (FACS assay), while causing no detectable toxicity in an Annexin V assay. These findings are a first indication that PeptoPlexes may be a suitable alternative to PEG based non-viral transfection systems.

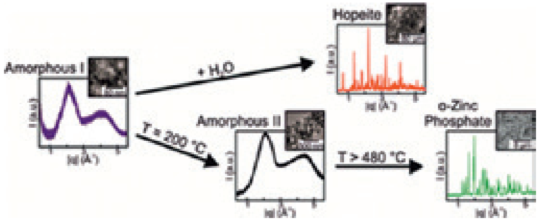


REFERENCE

Heller P, Birke A, Huesmann D, Weber B, Fischer K, Reske-Kunz A, Bros M, **Barz M**. Introducing PeptoPlexes: Polylysine-*block*-Polysarcosine Based Polyplexes for Transfection of HEK 293T Cells. *Macromol. Biosci.* **2014**, 14, 1380-1395.

Thermally Highly Stable Amorphous Zinc Phosphate Intermediates during the Formation of Zinc Phosphate Hydrate

The formation of crystalline solids is still poorly understood. A study of the crystallization of zinc phosphate hydrate revealed the formation of amorphous zinc phosphate (AZP) nanoparticles as intermediate prior to the formation of crystalline hopeite. AZP nanoparticles are stable against crystallization even at 400 °C (resulting in a high temperature AZP). They crystallize rapidly in the presence of water if the reaction is not interrupted. X-ray powder diffraction with high-energy synchrotron radiation, scanning and transmission electron microscopy, selected area electron diffraction, and small-angle X-ray scattering showed the particle size (≈20 nm) and confirmed the noncrystallinity of the AZP intermediate. Energy dispersive X-ray, infrared, and Raman spectroscopy, inductively coupled plasma mass spectrometry, and optical emission spectrometry as well as thermal analysis were used for further compositional characterization of the as synthesized nanomaterial. ^{1}H solid-state NMR allowed the quantification of the water content, an analysis of $^{31}P\{^{1}H\}$ C rotational echo double resonance spectra permitted a dynamic and structural analysis of the crystallization pathway to hopeite.



REFERENCE

Bach S, Celinski VR, Dietzsch M, Panthöfer M, Bienert R, Emmerling F, Schmedt auf der Grüne J, **Tremel W**. Thermally Highly Stable Amorphous Zinc Phosphate Intermediates during the Formation of Zinc Phosphate Hydrate. *J. Am. Chem. Soc.* **2015**, 137, 2285-2294.

TRAINING

The Graduate School MAINZ endeavors to educate its students to become independent scientists. We consider both scientific competence and complementary skills to be of great importance. Therefore, the school offers an individual training program for every student. We designed a training program to optimize our students´ time as PhD candidate and to prepare them for a future career. We provide a most flexible and individually tailored training program, offering our PhD students a training structure that can be adapted to their individual career needs. Our needs based training program provides our PhD students with a solid, broad and interdisciplinary background in the field of materials science, as well as with additional relevant knowledge and skills individually needed. This approach is reflected in our training elements Training through Research and Training for Life.

Photo: Private

Within the MAINZ Lecture Series I regularly gain insights into the latest materials science research topics beyond the scope of my daily work. The format, developed by us students, also provides me with an opportunity to invite speakers I am curious to learn from and to get to know what other MAINZ students are working on. This even led to a cooperation between me and another PhD student. Moreover, networking within and beyond the graduate school takes place at the Lecture Series.

Marius Bauer, doctoral student with Prof. Thomas Basché since May 2016

TRAINING THROUGH RESEARCH

Our program Training through Research goes far beyond the scope of a single research group. It includes interdisciplinary training and an exchange of knowledge in different fields of materials science within the graduate school. During their doctoral thesis MAINZ PhD students perform research in a team environment, acquire a broad and general as well as interdisciplinary knowledge in different fields of materials science. We offer courses and lectures that strengthen the scientific background of our students and help them building a strong network with fellow scientists. The graduate school organizes summer schools and master classes on a regular basis and additionally supports students to visit summer schools and international conferences abroad. Additionally, the graduate school awards the MAINZ Visiting Professorship annually to outstanding international renowned scientists. In close collaboration with members of the graduate school they give lectures and perform research at MAINZ while they serve as ambassadors of MAINZ in the international community.

Photo: Private

The Training through Research concept of MAINZ is far more than a buzzword – instead it is a truly practiced philosophy. MAINZ always actively supports young researchers to broaden their professional expertise as well as to sharpen important complementary abilities, such as the often-quoted "soft skills". I personally experienced such training in many instances during my PhD, where one special example is my time as a member of the student's organization committee of the first MAINZ Summer School "New Directions in Spintronics Research". As the school took place in Shanghai, the project planning required international and intercultural coordination. However, the warm and extremely positive feedback of all participants after the event was a great reward for the efforts of the whole organization team and I am thankful that MAINZ offered me the opportunity to be a part of it.

Nils Richter, doctoral student with Prof. Mathias Kläui 2013 to 2017

Photo: Private

During my PhD studies in organic chemistry, I am focusing on the synthesis and development of peptide-based Au(I)-hybrid materials in the interdisciplinary field of supramolecular polymers. Besides the financial benefits for my research work, I feel lucky to find support in the Graduate School MAINZ when realizing ideas of training concepts to deepen scientific knowledge. Being passionate about 'chemistry beyond the molecule', I became student organizer of a Master Class on 'Supramolecular Functional Materials'. This opportunity contributed to my professional development as a young researcher in a collaborative environment.

Vanessa Lewe, doctoral student with Prof. Pol Besenius since August 2015

TRAINING FOR LIFE

Our Training for Life program is a key component to empower our MAINZ PhD students with personal competencies and professional skills that meet modern society´s challenges. We provide a toolbox covering contemporary methods such as competence profiling, team supervision, individual coaching and complementary skills workshops. Each student discusses her or his tailor-made Career Development and Training Plan with the individual thesis committee on a regular basis to guarantee needs-based education and development during their PhD.

Photo: Private

I took the chance offered by MAINZ to attend all workshops I was interested in. Sometimes I asked myself whether I am spending too much time on courses instead of working in the lab, especially at the end of my PhD studies. Yet, only one year after my PhD defense, I can see how the seminars provide benefits not only for my professional but also for my personal life. The fact that the workshops were attended by students from different natural sciences was of particular benefit. It opened opportunities to discuss my research with experts in different fields who gave valuable input on my project from another point of view.

Hannah Pohlit, doctoral student with Prof. Holger Frey 2012 to 2016

Photo: Private

The high versatility of the Training for Life workshops offered by MAINZ sets the base for an individually optimized career development. Ranging from trainings on academic writing, over self-presentation, up to leadership skills, I could broaden my knowledge in communication, team development and many more soft skills, which represent key competencies of utmost importance for further career steps. During the attended courses, I always experienced highly competent trainers and small group sizes, ideal conditions to benefit most from these workshops. Several taught principles and tools are of impressive utility and already implemented in my daily life.

Christoph Gamer, doctoral student with Prof. Eva Rentschler since July 2015

TEAM SUPERVISION

MAINZ PhD students are supervised by excellent scientists and benefit from intense attention by members of the graduate school throughout their PhD studies. We offer our PhD students conditions that allow them to finish their thesis within three years. A fundamental characteristic of our supervision approach is that it is carried out under the guidance of a thesis committee (two or more experienced scientists) who meet the doctoral student at set intervals to discuss the student's progress. The thesis committee is responsible for monitoring the student's research progress as well as his or her personalized development and training. Students analyze their skills and abilities together with their thesis committee in regular meetings and adjust their needs to the present conditions. Thus, MAINZ students get the most individualized, flexible and effective means of meeting their individual needs in preparing and writing a doctoral thesis.

Photo: Private

For me, team supervision means having discussions with two professors involved in my PhD project on a weekly basis. This also provides twice the amount of ideas and possible contacts for collaborations. Moreover, writing articles and the PhD thesis are noticeably facilitated.

Alexey Sapozhnik, doctoral student with Profs. Hans-Joachim Elmers and Hartmut Zabel since November 2014

Photo: Private

Being in two research groups at the same time and thus having two scientific supervisors is an ambitious and sometimes challenging task. The well planned committee concept helps me to manage the meetings with my supervisors in a most beneficial way for me. Furthermore, the meeting intervals help myself to stay focused and on track to my PhD. The meetings are also a great chance to discuss further career options, e.g. possible secondments or workshops.

Alexander Tries, doctoral student with Profs. Mathias Kläui and Mischa Bonn since January 2017

MENTORING PROGRAM

Our mentMAINZ Mentoring Program promotes the career management of our students for the time after completing their doctoral thesis. The program starts with an analysis of the individual competence profile, personal interests and values as well as of the required work environment. Based on this analysis the Graduate School MAINZ supports each student to find and contact a matching mentor for a one-year-relationship. During this time, the mentor invests time and attention for the professional orientation of the mentee and promotes the student by sharing his or her personal experience, network and feedback. Additionally, mentees benefit from participating in success teams regarding their personal development and professional vita shaping.


Photo: Private

As a member of MAINZ I had the opportunity to broaden my horizon by taking soft skill classes and talking to students with different technical and cultural backgrounds. Especially the mentMAINZ mentoring program provided an opportunity to get insights into industrial R&D and how to approach job hunting. In big part thanks to this program, I was able to find a job at BASF where I can use the skills obtained during my PhD while maintaining the interdisciplinary exchange started in the graduate school.

Stephan Köhler, doctoral student with Prof. Friederike Schmid 2012 to 2014

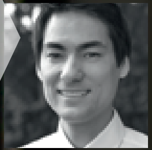


Photo: Private

My participation at the Mentoring Program was a highly valuable experience. The professional training helped me to reflect and identify my strengths, inner drivers and career aspirations. Based on this knowledge, I decided to accompany a crowdfunded technology startup in its exciting initial phase. I am very grateful for the unique insight into the working environment, the gained experience and the resulting network.

Erik Schaefer, doctoral student with Prof. Hans-Joachim Elmers 2013 to 2016

COOPERATION WITH INDUSTRY AND TECHNOLOGY TRANSFER

MAINZ offers its students contact with the world's leading industrial partners in the field of materials science. Personnel from our industrial partners are involved in many graduate school activities, such as lectures, summer schools, as mentors and in joint research projects. In cooperative research projects, students have the opportunity to complete all or part of their thesis at one of our industrial partners. Our broad network of MAINZ alumni, many of whom working in industry by now, further promotes our industrial network and enhances the chances for MAINZ students to build their career in industrial companies throughout the Rhein-Main region and beyond.

Photo: Private

The Graduate School MAINZ allowed me to easily gain insights in diverse fields of science. Besides working on my PhD topic of characterizing the hydration structure of minerals with 3D atomic force microscopy, I was able to attend a large variety of conferences and benefit from career talks by MAINZ alumni. Looking beyond the usual scope of science contributed to my decision of creating a start-up after my PhD, where I work on the visualization of scientific data.

Hagen Söngen, doctoral student with Prof. Angelika Kühnle 2015 to 2017

Photo: Private

I am working on the development and elaboration of an electrochemical method for the synthesis of 3,3′,5,5′-tetramethyl-2,2′-biphenol. This molecule is an important ligand building block for transition metal catalyst for the hydroformylation, one of the largest production branches in the field of homogeneous catalysis in Germany. In collaboration with the industry, namely Evonik Industries AG, Condias GmbH and Eilenburger EUT GmbH, this project has the global goal to establish this synthetic method into technical scale. Through this cooperation, I was able to learn a lot about project management and synergetic effects through scientific and technical exchange. It also gave me a great insight into the structures of industrial companies.

Maximilian Selt, doctoral student with Prof. Siegfried Waldvogel since December 2016

Photo: Private

During my studies in Mainz and in Amherst, USA I did three industrial internships at BASF, Merck and Covestro. Meanwhile, I gained knowledge about technical aspects of synthesis, process development and application based research within big companies. I was able to gain insight about global projects within the field of research and development as well as the importance of intellectual property and innovation management. More importantly I got to know the "real life" of a scientist or engineer working in the leading chemical industry.

Philipp von Tiedemann, doctoral student with Prof. Holger Frey since September 2017

INTERNATIONAL CHARACTER

International PhD students constitute approximately 30 % of all MAINZ students, hailing from over 20 different countries. In addition, we provide our doctoral students with the outstanding opportunity to gain valuable international experience. During their thesis period, MAINZ students can spend up to 12 months at a foreign academic institution or an industrial partner and profit from already existing international contacts. MAINZ has partnered with research institutions, universities and industrial partners from around the globe and we are still extending our network. Additionally, MAINZ students attend international summer schools – MAINZ organizes several schools each year together with international partners – and present their research work at international conferences. Furthermore, excellent foreign students, who have already obtained a Bachelor's degree or started a PhD at a different institution, can apply for a research visit (internship or guest PhD program) of up to 12 months at MAINZ. As English is the working language within the graduate school, international students can get in touch with other MAINZ students easily. Additionally, the graduate school established a buddy program in which local MAINZ students welcome incoming guests, show them around campus and the administrative institutions, and encourage networking with other students at a weekly lunch meeting.

Photo: Private

The international character of the Graduate School MAINZ is something that I value immensely. The opportunity I was given to participate in summer schools, workshops and conferences all over the world is something that has widened my horizons even more and something that is necessary for research. I had the opportunity to meet people and specifically researchers all over the world, exchange ideas and get feedback that was important to my research. MAINZ has always provided me with the best chances and has always encouraged me to continue conducting high impact research.

Angeliki Athanasopoulou, doctoral student with Prof. Eva Rentschler since March 2016

Photo: Private

For me, the possibility to attend international conferences and summer schools without relying on the limited budget of my supervisor helped a lot to meet people from my research area and to build up an international network. My secondment in Oslo was very valuable, since it offered me the opportunity to dig into a new topic. And my work there contributed a large part of my thesis.

Lalita Shaki Uribe Ordonez, doctoral student with Prof. Jürgen Gauss 2013 to 2016

COMMUNICATION OF SCIENCE

MAINZ students are encouraged to actively participate in international scientific conferences to present the results of their research even at a very early stage of their careers. This allows them to get themselves known to the professional community in their respective fields. We encourage our students not only to present posters at conferences but also to deliver oral presentations about their work in sessions or symposia during those conferences. An annual student seminar, where MAINZ students can present their findings to their peers, helps the students to train giving oral presentation on international conferences. The idea of a journal which became the *Journal of Unsolved Questions (JUnQ)* was born during the retreat of the graduate school in 2010. It provides a means to gather 'null'-result research and open problems. *JUnQ* is a platform to communicate projects that just didn´t work, ambiguous data without exaggeration and unfinished investigations that raise more questions than they answer. MAINZ also participates regularly in outreach activities like the annual science market in Mainz to increase communication of scientific topics to the general public.

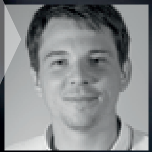


Photo: Private

From my perspective, interdisciplinarity is a key to excellent research and it is also a cornerstone of MAINZ. For instance, the graduate school encouraged me to leave my actual research topic (memories based on ferroelectric and semiconducting polymers) for a few months in order to work on the (non-)ferroelectricity of porcine aortas; the resulting publication was only possible, because physicists, biologists, and medical doctors worked together as a team – a special and very positive experience for me.

Thomas Lenz, doctoral student with Prof. Paul Blom 2014 to 2017

Photo: Private

Joining the editorial board of *JUnQ (Journal of Unsolved Questions)* was a great experience for me. Besides coordinating the publication of scientific articles, I very much enjoyed the creative aspects of communicating science to a broader audience. Later on, I also had the opportunity to take on responsibility as editor-in-chief within the international and interdisciplinary team of PhD students. It was always rewarding to hear from other PhD students or professors at conferences that they had heard about *JUnQ* and appreciated what we were doing.

Kristina Klinker, doctoral student with Dr. Matthias Barz 2015 to 2017


Hai Wang[1,2],
[1] Max Planck Institute for Polymer Research,
[2] Graduate School of Material Science in Mainz,
Electron Transfer (ET) at QD-Oxide Interface
Motivation: Quantum dot sensitized solar cells
Oxide
Electrolyte
QD
Why QDs?
Strong absorbers:
Tunable absorbers:
Chemically stable:
QD-oxide Interfacial ET: a key solar cell aspect:
ET must compete efficiently with recombination within
the QDs. ET can be modelled by Marcus theory:
Quantum dot (Donor)
Oxide (acceptor)
Tuning ET rates as a function
Modifying donor

EARLY STAGE SUPPORT

The Graduate School MAINZ offers a student internship program for excellent Master's students in chemistry, physics or biology that are looking for research experience in materials science. We provide research opportunities abroad (outgoing option) and within our graduate school (incoming option), including internship stipends for up to 12 months and reimbursement of travel costs. Incoming students will have the additional benefit to participate in MAINZ events and trainings during their internship and build a network with MAINZ students and alumni. The Graduate School MAINZ also encourages students with an excellent Bachelor degree to apply for the fast-track option for receiving their doctoral degree without previously obtaining a Master's degree. MAINZ supports students accepted to the fast-track program throughout the program and they are counted as regular MAINZ students with all benefits.

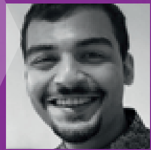


Photo: Private

The exposure in MAINZ is simply amazing, not just for the kind of research facilities available but also for the warm and friendly people throughout the Graduate School MAINZ. I had the pleasure of visiting twice as a guest, and it has been one of the best experiences I have had. The tremendous focus of MAINZ to pursue cutting-edge research coupled with the dedication and sincerity of all the members, students and staff is highly commendable. I wholeheartedly recommend MAINZ as a brilliant place to work, learn and grow as a researcher!

Harsh Jagad, internship student with Prof. Angelika Kühnle in 2016 and 2017

Photo: Private

I was very excited when the Graduate School MAINZ offered me to spend one year abroad at the prestigious private Stanford University. This student internship stipend gave me the chance to work and complete my master thesis in the group of Ian Fisher at the Geballe Laboratory for Advanced Materials, where I achieved knowledge in the field of charge density waves in nearly 2D-materials. The hospitality of the Fisher group was above of all my expectations. All in all this was the most interesting year of my life, from a scientific as well as cultural point of view, and I recommend everyone to use this chance!

Simon Aeschlimann, internship student (outgoing) 2015 to 2016, now doctoral student with Prof. Angelika Kühnle since April 2017

ALUMNI WORK

The Graduate School MAINZ maintains a lively network with their alumni. Our claim is to build bridges between the generations of PhD students and to connect science and professional knowledge in diverse fields of activities. The Graduate School MAINZ has established fruitful cooperation with alumni who work in academic and non-academic organizations. They share their valuable career and work experience with the students in lunch talks, network meetings or as a mentor in our mentMAINZ Mentoring Program. Every year the Graduate School MAINZ invites all former members to join the MAINZ Alumni Meeting to meet long-standing companions and make new contacts during an inspiring weekend.

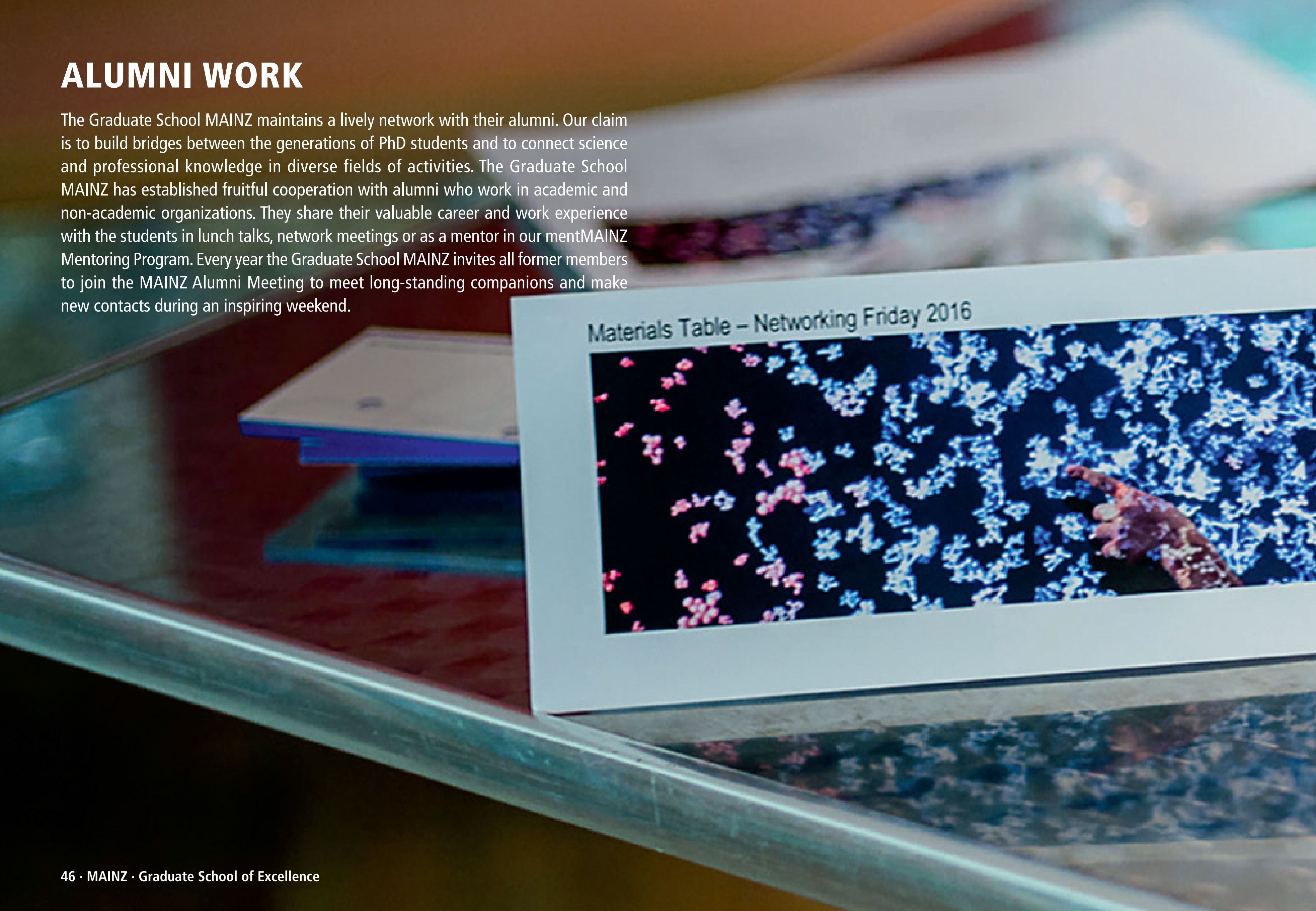


Photo: Private

The MAINZ Alumni work has helped me to transform the highly valuable connections, which I made being a MAINZ student, into professional contacts in academia and industry. The annual alumni meetings aid in fostering these contacts and provide insights into different career paths. Being able to discuss with high-level speakers in an intimate atmosphere, is just the icing on the cake at these events.

Robert Lindner, doctoral student with Prof. Angelika Kühnle 2012 to 2015

Photo: Private

As a MAINZ alumna and former alumni speaker, I very much enjoy to have both the opportunity to further extend my personal network and to learn from industry leaders during our annual MAINZ Alumni Meetings, but to also share my experiences with the current MAINZ students through our Alumni Talks. I think this balance of motivating others and being motivated is the key to a successful future and the strength of MAINZ!

Désirée Weller, doctoral student with Prof. Manfred Schmidt 2010 to 2013

MAINZ Alumni Meeting 2016

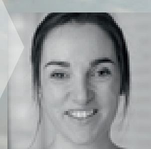


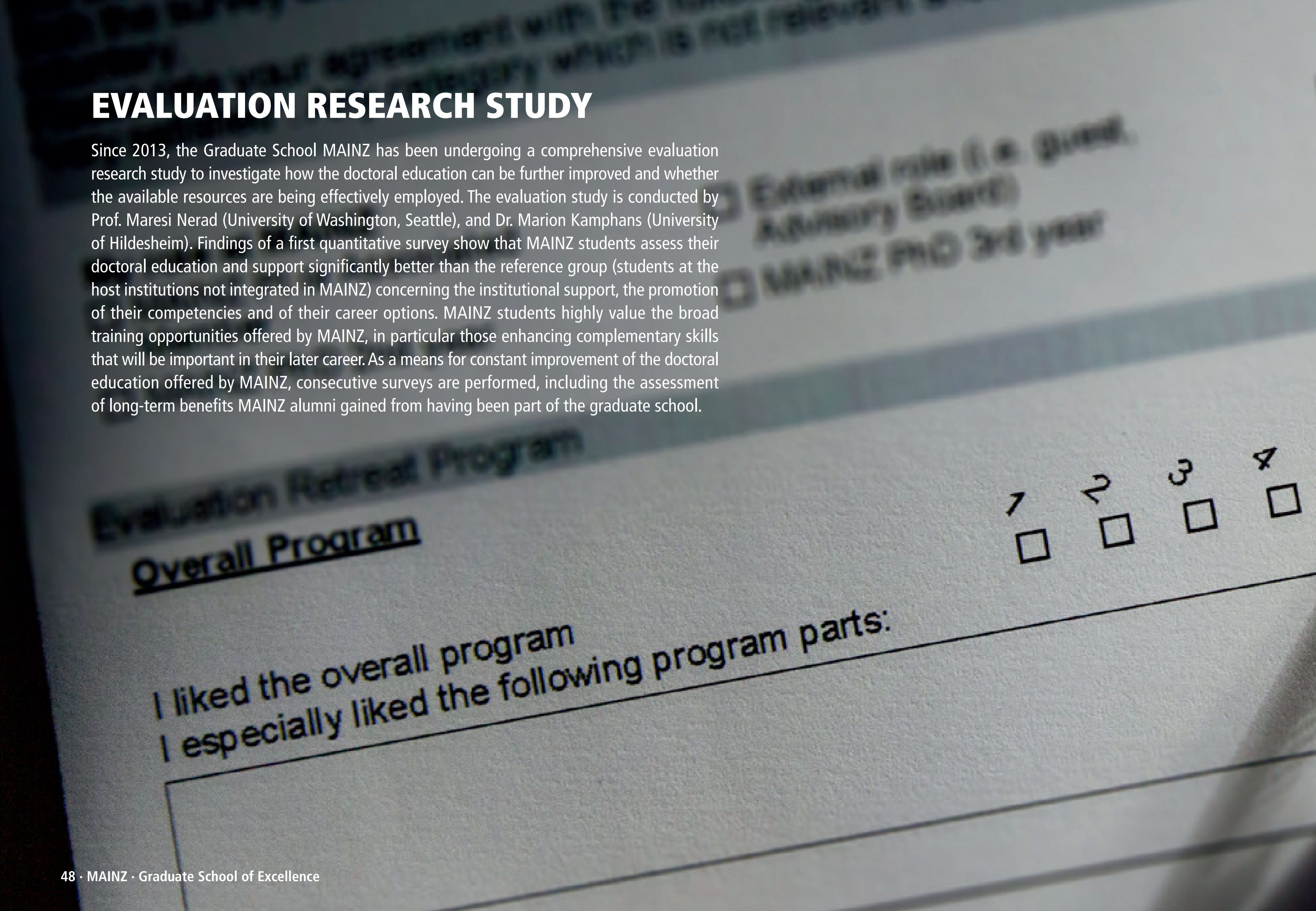
Photo: Private

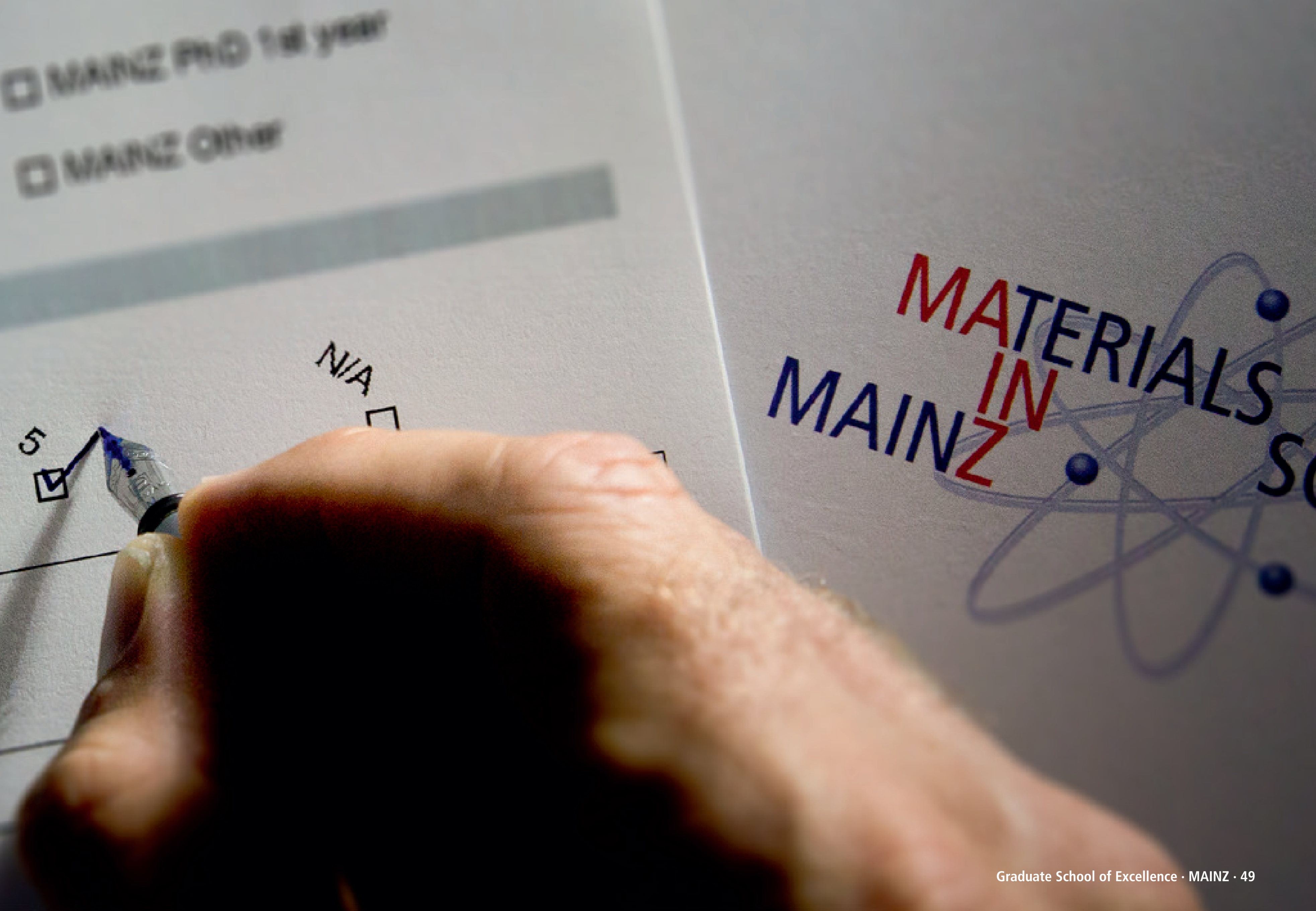
The MAINZ Alumni Meeting has quickly become one of the most enjoyable annual reunions within the last couple of years. The location, accommodation and catering are exceptional making everyone feel at home and welcome. The program is well thought through with similar elements that are implemented every year, such as the wonderful dinner and the photo booth, and a surprise activity (my favorite has been the improtheater). It is the perfect setting to see (old) friends and colleagues in order to catch up and exchange news and ideas, both on a personal as well as a professional level. Additionally, it is a great opportunity to meet new alumni and learn about their fields of research and professional goals, and with that expand the MAINZ alumni network. I really look forward to and enjoy this meeting every year spending time with friends, past (and future?) colleagues, MAINZ staff, "our" photographer and our host at Schloss Sörgenloch.

Christina Birkel, doctoral student with Prof. Claudia Felser 2007 to 2010

EVALUATION RESEARCH STUDY

Since 2013, the Graduate School MAINZ has been undergoing a comprehensive evaluation research study to investigate how the doctoral education can be further improved and whether the available resources are being effectively employed. The evaluation study is conducted by Prof. Maresi Nerad (University of Washington, Seattle), and Dr. Marion Kamphans (University of Hildesheim). Findings of a first quantitative survey show that MAINZ students assess their doctoral education and support significantly better than the reference group (students at the host institutions not integrated in MAINZ) concerning the institutional support, the promotion of their competencies and of their career options. MAINZ students highly value the broad training opportunities offered by MAINZ, in particular those enhancing complementary skills that will be important in their later career. As a means for constant improvement of the doctoral education offered by MAINZ, consecutive surveys are performed, including the assessment of long-term benefits MAINZ alumni gained from having been part of the graduate school.




N/A
5
MATERIALS
IN
MAINZ

MAINZ MEMBERS

The graduate school consists of roughly 150 members, comprised of PhD students (funded by MAINZ and other sources), guest students and faculty. The faculty of MAINZ consists of principal investigators, associated members, external faculty and senior members. The faculty members contribute to MAINZ by supervising PhD students, coordinating training activities and supporting the organization and development of MAINZ. The external faculty represents scientists who work outside the host universities or MPI-P. They can be invited by the Steering Committee to support training and research of the graduate school. Our PhD students are excellent young scientists that finished their studies with highest grades in a short time, are open-minded and ambitious. Each student contributes to the development of MAINZ – by discussing and networking with the other students, as a member of a committee shaping new formats and ideas or as student representative. In addition, MAINZ invites excellent PhD students from foreign universities to participate in the training program of MAINZ for up to 12 months as guest PhD students.

Illustration: Erika Martins

Martin Aeschlimann

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 11/07

AREA OF RESEARCH

Our research program is devoted to the investigation of ultrafast phenomena in solids, thin films, and nanoparticles. This includes the combination of short pulsed laser systems with surface science technology in order to develop novel methods for measuring ultrafast relaxation processes in real time with high temporal and spatial resolutions.

SELECTED PUBLICATIONS

- Spektor G, Kilbane D, Mahro AK, Frank B, Ristok S, Gal L, Kahl P, Podbiel D, Mathias S, Giessen H, Meyer zu Heringdorf F-J, Orenstein M, **Aeschlimann M**. Revealing the subfemtosecond dynamics of orbital angular momentum in nanoplasmonic vortices. *Science* **2017**, 355, 1187-1191.
- **Aeschlimann M**, Brixner T, Cinchetti M, Frisch B, Hecht B, Hensen M, Hubre B, Kramer C, Krauss E, Loeber TH, Pfeiffer W, Piecuch M, Thielen P. Cavity-assisted ultrafast long-range periodic energy transfer between plasmonic nanoantennas. *Light: Science & Applications* **2017**, 6, 17111.
- Eich S, Plötzing M, Rollinger M, Emmerich S, Adam R, Chen C, Kapteyn HC, Murnane MM, Plucinski L, Steil D, Stadtmüller B, Cinchetti M, **Aeschlimann M**, Schneider CM, Mathias S. Band structure evolution during the ultrafast ferromagnetic-paramagnetic phase transition in cobalt. *Science Advances* **2017**, 3, 1602094.

Denis Andrienko

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 05/11

AREA OF RESEARCH

Our current work is focused on three main topics: enhanced sampling of soft matter systems or systematic coarse-graining, charge and energy transport in organic semiconductors, and rational compound design for photovoltaic applications. All developed methods are implemented in an open-source software package (Versatile Object-oriented Toolkit for Coarse-graining and charge transport Applications) to simplify the workflow for charge transport simulations, provide a uniform error control for these methods, a flexible platform for their development, and to eventually allow in silico prescreening of organic semiconductors for specific applications. We target method development for accurate evaluation of the density of states, the role of substituents in charge transport in organic hosts, and development of stochastic models for modelling charge/exciton transport in organic materials.

SELECTED PUBLICATIONS

- Fischer F, Schulz G, Trefz D, Melnyk A, Brinkmann M, **Andrienko D**, Ludwigs S. The PCPDTBT Family: Correlations between Chemical Structure Polymorphism and Device Performance. *Macromolecules* **2017**, 50, 1402-1414.
- Melnyk A, Junk M, McGehee M, Chmelka B, Hansen MR, **Andrienko D**. Macroscopic Structural Compositions of π-Conjugated Polymers: Combined Insights from Solid-State NMR and Molecular Dynamics Simulations. *J. Phys. Chem. Lett.* **2017**, 8, 4155-4160.
- Etzold F, Howard IA, Forler N, Melnyk A, **Andrienko D**, Hansen MR, Laquai F. Sub-ns Triplet State Formation by Non-Geminate Recombination in PSBTBT:PC70BM and PCPDTBT:PC60BM Organic Solar Cells. *Energy and Environmental Science* **2015**, 8, 1511-1522.

Thomas Basché

INSTITUTE OF PHYSICAL CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 11/07

AREA OF RESEARCH

The research interests of the Basché group are centered on the photophysics of organic dye molecules and inorganic nanoparticles as well as their mutual aggregates. Concerning the methodology, we primarily utilize single molecule spectroscopy and correlative microscopies with high spatial and spectral resolution for optical and structural characterization of individual molecules and nanoparticles. More recent applications include electronic and/or plasmonic coupling in molecular aggregates and dye-nanoparticle hybrids, mechanically induced spectral shifts of molecules and nanoparticles and the binding kinetics of protease inhibitors. The single molecule approach taken reveals novel insights into crucial photophysical properties hidden in the ensemble average.

SELECTED PUBLICATIONS

- Stöttinger S, Hinze G, Diezemann G, Oesterling I, Müllen K, **Basché Th**. Impact of local compressive stress on the optical transitions of single organic dye molecules. *Nature Nanotechnology* **2014**, 9, 182-186.
- Diehl F, Roos C, Duymaz A, Lunkenheimer B, Köhn A, **Basché Th**. Emergence of coherence through variation of intermolecular distances in a series of molecular dimers. *J. Phys. Chem. Lett.* **2014**, 5, 262-269.
- Stappert S, Li C, Müllen K, **Basché Th**. Synthesis of an Acceptor-Donor-Acceptor Multichromophore Consisting of Terrylene and Perylene Diimides for Multistep Energy Transfer Studies. *Chem. Mat.* **2016**, 28, 906-914.

Pol Besenius

INSTITUTE OF ORGANIC CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 03/15

AREA OF RESEARCH

The research in the Besenius lab focuses on the synthesis of organic supramolecular systems and biomimetic nanomaterials. Our expertise spans bioorganic, supra- and macromolecular chemistry. We design molecular building blocks that self-assemble into programmable polymers in water and on surfaces. Utilising natural and non-natural supramolecular interactions we investigate electrostatic- and redox-regulated supramolecular polymerisations, for the development of adaptive synthetic materials. These open up exciting avenues in applications as stimuli-responsive biomedical carrier materials and artificial tissue scaffolds, in optoelectronics and in catalysis.

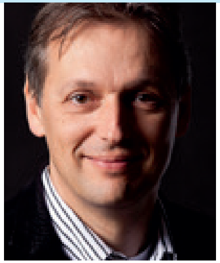
SELECTED PUBLICATIONS

- Frisch H, Fritz E-C, Stricker F, Schmüser L, Spitzer D, Weidner T, Ravoo BJ, **Besenius P**. Kinetically Controlled Sequential Growth of Surface-Grafted Chiral Supramolecular Copolymers. *Angew. Chem. Int. Ed.* **2016**, 55, 7242-7246.
- Ahlers P, Frisch H, **Besenius P**. Tuneable pH-Regulated Supramolecular Copolymerisation by Mixing Mismatched Dendritic Peptide Comonomers. *Polym. Chem.* **2015**, 6, 7245-7250.
- Kemper B, Hristova YR, Tacke S, Stegemann L, van Bezouwen LS, Stuart MCA, Klingauf J, Strassert CA, **Besenius P**. Facile Synthesis of a Peptidic Au(I)-Metalloamphiphile and its Self-Assembly into Luminescent Micelles in Water. *Chem. Commun.* **2015**, 51, 5253-5256.

Paul Blom

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 11/12



AREA OF RESEARCH

Paul Blom focuses on the physics of organic semiconducting devices, especially on the effects of molecular structure, charge carrier density, and impurities. Recently, by incorporating the role of impurities in the recombination the operation of organic light-emitting diodes and organic photovoltaic devices has been consistently described. Next to work on organic transistors also memory devices based on ferroelectric polymers are being developed. By using self-assembly molecular diodes and transistors have been realized. Current research also focuses on energy and charge transfer in organic semiconductors on various time-scales, as well as the use of blend systems to realize novel properties that cannot be obtained in a single material. Here, investigation of phase diagrams and resulting morphology is crucial for the device properties. For bio-electronic applications mixed charge-ion conductors are being investigated.

SELECTED PUBLICATIONS

- Kuik M, Wetzelaer GAH, Nicolai HT, Craciun NI, de Leeuw DM, **Blom PWM**. Charge transport and recombination in polymer light-emitting diodes. *Adv. Mater.* **2014**, 26, 512-531.
- Katsouras I, Asadi K, Li M, van Driel TB, Kjaer KS, Zhao D, Lenz T, Gu Y, **Blom PWM**, Damjanovic D, Nielsen MM, de Leeuw DM. The negative piezoelectric effect of the ferroelectric polymer poly(vinylidene fluoride). *Nature Materials* **2016**, 15, 78-84.
- Abbaszadeh D, Kunz A, Wetzelaer GAH, Michels JJ, Craciun NI, Koynov K, Lieberwirth I, **Blom PWM**. Elimination of charge carrier trapping in diluted semiconductors. *Nature Materials* **2016**, 15, 628-633.

Mischa Bonn

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 11/12

AREA OF RESEARCH

We exploit the intrinsic motion of molecules, in particular their vibrations, to learn about the natural world. We use a combination of cutting edge spectroscopies and microscopies to probe questions regarding physico-chemical coupling in systems relevant in material science. The main topics of research are:

- Surface spectroscopy of interfacial molecular dynamics, using surface-specific vibrational spectroscopies with ultrahigh time resolution.
- Label-free vibrational spectroscopy and microscopy of soft matter. Stimulated Raman spectro-microscopy, we quantify local molecular concentrations in complex samples.
- In a third line of research, we study carrier dynamics in organic semiconducting systems, including graphene (nanostructures), using Terahertz time-domain spectroscopy.

SELECTED PUBLICATIONS

- Thao K, Pan Z, Mora-Seró I, Cánovas E, Wang H, Song Y, Gong X, Wang J, **Bonn M**, Bisquert J, Thong X. Boosting Power Conversion Efficiencies of Quantum-Dot-Sensitized Solar Cells Beyond 8 % by Recombination Control. *J. Am. Chem. Soc.* **2015**, 137, 5602-5609.
- Karakus M, Jensen SA, D'Angelo F, Turchinovich D, **Bonn M**, Canovas E. Phonon-electron scattering limits free charge mobility in methylammonium lead iodide perovskites. *J. Phys. Chem. Lett.* **2016**, 6, 4991-4996.
- Jin Z, Tkach A, Casper F, Spetter V, Grimm H, Thomas A, Kampfrath T, **Bonn M**, Kläui M, Turchinovich D. Accessing the fundamentals of magnetotransport in metals with terahertz probes. *Nature Physics* **2015**, 11, 761-766.

Hans-Jürgen Butt

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 11/07

AREA OF RESEARCH

We study the structure and dynamics of soft matter interfaces. The scientific aim is a simple, comprehensive quantitative description of phenomena based on fundamental physical laws. Major research topics are: dynamics of wetting, super liquid-repellency, surface forces, crystallization in confined space, colloids and granular matter, photoresponsive materials. The methods used include scanning probe techniques, confocal microscopy, fluorescence correlation spectroscopy, light and X-ray scattering. Our goal is to solve fundamental questions, with the perspective of future applications. "Understanding" not only implies quantitative prediction. Full understanding implies being able to make new materials and devices based on this understanding. The department also includes materials science and a synthesis group, although its core is experimental physics.

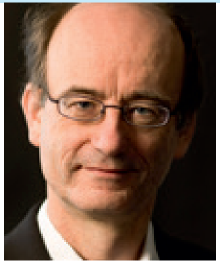
SELECTED PUBLICATIONS

- Schellenberger F, Encinas N, Vollmer D, **Butt H-J**. How water advances on superhydrophobic surfaces. *Phys. Rev. Lett.* **2016**, 116, 096101.
- Wu S, **Butt H-J**. Near-infrared-sensitive materials based on upconverting nanoparticles. *Advanced Materials* **2016**, 281208-1226.
- Ye M, Deng X, Ally J, Papadopoulos P, Schellenberger F, Vollmer D, Kappl M, **Butt H-J**. Superamphiphobic particles – how small can we go? *Phys. Rev. Lett.* **2014**, 112, 016101.

Hans-Joachim Elmers

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

Ferromagnetism and superconductivity have become increasingly important properties of material sciences that have an exceptional impact on quantum information processing, electrical engineering, and automotive applications. The focus of our research is to understand the electronic origin of the correlated behavior of electrons in mostly ferromagnetic and in few cases superconducting materials. Novel physical effects occur when the system dimensions go below a few nanometers or even to molecular sizes. We study these electronic properties using spin-resolving experimental methods, e.g. spin-polarized scanning tunneling microscopy, spin-resolved photoemission microscopy and X-ray magnetic circular dichroism.

SELECTED PUBLICATIONS

- Guterding D, Diehl S, Altmeyer M, Methfessel T, Tutsch U, Schubert H, Lang M, Müller J, Huth M, Jeschke HO, Valentí R, Jourdan M, **Elmers HJ**. Evidence for Eight-Node Mixed-Symmetry Superconductivity in a Correlated Organic Metal. *Phys. Rev. Lett*. **2016**, 116, 237001.
- **Elmers HJ**, Wallauer R, Liebmann M, Kellner J, Morgenstern M, Wang RN, Boschker JE, Calarco R, Sánchez-Barriga J, Rader O, Kutnyakhov D, Chernov SV, Medjanik K, Tusche C, Ellguth M, Volfova H, Braun J, Minár J, Ebert H, Schönhense G. Spin mapping of surface and bulk Rashba states in ferroelectric α-GeTe (111) films. *Phys. Rev. B* **2016**, 94, 201403.
- Klaer P, Razinskas G, Lehr M, Krewer K, Schertz F, Wu XF, Hecht B, Schönhense G, **Elmers HJ**. Robustness of plasmonic angular momentum confinement in cross resonant optical antennas. *Appl. Phys. Lett.* **2015**, 106, 261101.

Michael Fleischhauer

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 11/07

AREA OF RESEARCH

The research focus of the group are quantum many-body phenomena in photonic systems and ultra-cold quantum gases in reduced spatial dimensions as well as photon-based quantum information. In recent years we investigated in particular open many-body quantum systems. We are interested in steady-state properties and non-equilibrium dynamics of these systems. In particular we study phase transitions in the steady state of open systems, and topological properties of finite-temperature and driven, dissipative systems and investigate experimental realizations using ultra-cold quantum gases and photons with local and non-local interactions. We use and develop numerical techniques such as the density-matrix renormalization group and time-dependent versions of it both for closed and open systems.

SELECTED PUBLICATIONS

- O'Brien C, Lauk N, Blum S, Morigi G, **Fleischhauer M**. Interfacing Superconducting Qubits and Telecom Photons via a Rare-Earth Doped Crystal. *Phys. Rev. Lett.* **2014**, 113, 063603.
- Weber TM, Hoening M, Niederpruem T, Manthey T, Thomas O, Guarrera V, **Fleischhauer M**, Barontini M, Ott H. Mesoscopic Rydberg-blockaded ensembles in the superatom regime and beyond. *Nature Physics* **2015**, 11, 157.
- Grusdt F, Yao N, Abanin N, **Fleischhauer M**, Demler E. Interferometric Measurement of Many-Body Topological Invariants using Mobile Impurities. *Nature Communications* **2016**, 7, 11994.

Holger Frey

INSTITUTE OF ORGANIC CHEMISTRY, JGU

MEMBER OF GSC SINCE 11/07

AREA OF RESEARCH

Synthetic Polymer Chemistry; design and synthesis of novel functional polymer materials; branched and dendritic polymers; block copolymers and nanostructures; novel surfactants and biomedical application. Central research areas: polyether chemistry (PEG, PPO), polyesters, polycarbonates from CO_2, Si-based polymer structures (polycarbosilanes, silicones). Central objectives are the design of novel macromolecular architectures, investigation of their structure-property relationships and potential application in areas like nanotechnology, surface modification, medicine and sensor technology. Novel Li-ion conductors and hybrid structures with high ion mobility.

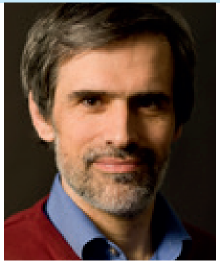
SELECTED PUBLICATIONS

- Herzberger J, Niederer K, Pohlit H, Seiwert J, Worm M, Wurm FR, **Frey H**. Polymerization of Ethylene Oxide, Propylene Oxide, and Other Alkylene Oxides: Synthesis, Novel Polymer Architectures, and Bioconjugation. *Chem. Rev.* **2016**, 116, 2170-2243.
- Herzberger J, Fischer K, Leibig D, Bros M, Thiermann R, **Frey H**. Oxidation-Responsive and "Clickable" Poly(ethylene glycol) via Copolymerization of 2-(Methylthio)ethyl Glycidyl Ether. *J. Am. Chem. Soc.* **2016**, 138, 9212-9223.
- Pohlit H, Bellinghausen I, Schömer M, Heydenreich B, Saloga J, **Frey H**. Biodegradable pH-Sensitive Poly(ethylene glycol) Nanocarriers for Allergen Encapsulation and Controlled Release. *Biomacromolecules* **2015**, 16, 3103-3111.

Jürgen Gauss

INSTITUTE OF PHYSICAL CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

The research comprises the development and application of quantum-chemical methods for the investigation of the electronic structure of atoms and molecules. The emphasis is on high-accuracy calculations with the inclusion of electron-correlation effects (via many-body methods, such as perturbation or coupled-cluster theory) and on the efficient calculation of molecular properties (molecular geometries, NMR parameters, excitation energies, etc.) using analytic-derivative and response-theory techniques. The application of quantum-chemical methods to chemical problems involves issues from all areas of chemistry ranging from the highly accurate prediction of rotational spectra up to the determination of the structure of supramolecular systems via NMR chemical-shift calculations.

SELECTED PUBLICATIONS

- Epifanovsky E, Klein K, Stopkowicz S, **Gauss J**, Krylov AI. Spin-Orbit Couplings within the Equation-of-Motion Coupled-Cluster Framework: Theory, Implementation, and Benchmark Calculation. *J. Chem. Phys.* **2015**, 143, 064102.
- McCarthy MC, **Gauss J**. Exotic SiO_2H_2 Isomers: Theory and Experiment Working in Harmony. *J. Phys. Chem. Lett.* **2016**, 7, 1895-1900.
- Uribe L, **Gauss J**, Diezemann G. Determining Factors of the Unfolding Pathway of Peptides, Peptoids and Peptidic Foldamers. *J. Phys. Chem. B* **2016**, 120, 10433-10441.

Katja Heinze

INSTITUTE OF INORGANIC AND ANALYTICAL CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 05/11

AREA OF RESEARCH

The Heinze group is engaged in designing luminescence transition metal complex chromophores for light-emitting electrochemical cells and sensor applications, in transition metal complexes for dye-sensitized solar cells and upconverting materials, in photosynthesis, in fundamentals of electron transfer reactions, in biomimetic chemistry and in homogeneous catalysis with transition metal complexes.

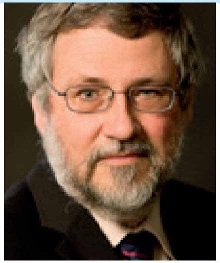
SELECTED PUBLICATIONS

- Breivogel A, Kreitner C, **Heinze K**. Redox and Photochemistry of Bis(terpyridine)ruthenium(II) Amino Acids and their Amide Conjugates – from Understanding to Applications. *Eur. J. Inorg. Chem.* **2014**, 5468-5490.
- Otto S, Grabolle M, Förster C, Kreitner C, Resch-Genger U, **Heinze K**. $[Cr(ddpd)_2]_3^{+}$: a molecular, water-soluble, highly NIR-emissive ruby analogue. *Angew. Chem. Int. Ed.* **2015**, 54, 11572-11576.
- Preiß S, Melomedov J, Wünsche von Leupoldt A, **Heinze K**. Gold(III) tetraarylporphyrin amino acid derivatives: ligand or metal centred redox chemistry? *Chem. Sci.* **2016**, 7, 596-610.

Burkard Hillebrands

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

Burkard Hillebrands' research field is mostly in spintronics, especially in spin dynamics and magnonics, material properties of thin magnetic films, heterostructures and multilayers, as well as in nanostructures. He works with spin waves and their quanta, magnons and their application to future information technologies. He is also interested in magnon gases and condensates such as Bose–Einstein condensates and the creation of magnonic macroscopic quantum states including the generation of magnonic supercurrents as well as dynamic magnetic excitations in confined magnetic structures, linear and nonlinear spin wave propagation phenomena, magnonic crystals and magnetic switching. Besides he investigates spin transport phenomena – particulary conversion processes between magnon, spin and charge currents (spin Hall effects, spin Seebeck effects) – and the development of space-, time- and phase resolved Brillouin light scattering spectroscopy and time resolved Kerr Effect techniques.

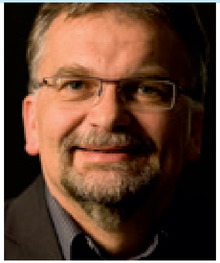
SELECTED PUBLICATIONS

- Bozhko DA, Serga AA, Clausen P, Vasychka VI, Heussner F, Melkov GA, Pomyalov A, L'vov VS, **Hillebrands B**. Supercurrent in a room-temperature Bose–Einstein magnon condensate. *Nature Physics* **2016**, 12, 1057.
- Chumak AV, Vasychka VI, Serga AA, **Hillebrands B**. Magnon spintronics. *Nature Physics* **2015**, 11, 453-461.
- Chumak AV, Serga AA, **Hillebrands B**. Magnon transistor for all-magnon data processing. *Nature Communications* **2014**, 5 (4700).

Gerhard Jakob

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

The group of Gerhard Jakob is interested in thin films and heterostructures of new materials with interesting physical properties. The research topics cover thermoelectrics, spintronics, and multiferroics. For improvement of thermoelectrics we tailor Half-Heusler superlattices to understand and minimize phonon propagation. The ultrathin magnetic thin film heterostructures for spintronics are dominated by the interface interactions enabling new physical phenomena that are often unobservable in volume materials. Using special multiferroic thin films that order both magnetic and ferroelectric we want to achieve a switching of the magnetization by an electric field instead of the usual magnetic field.

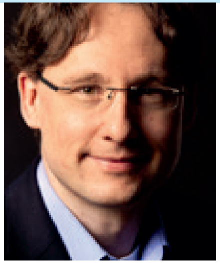
SELECTED PUBLICATIONS

- Komar P, Chávez Ángel E, Euler C, Balke B, Kolb U, Müller M, Kleebe H-J, Fecher G, **Jakob G**. Tailoring of the electrical and thermal properties using ultra-short period non-symmetric superlattices. *APL Mater*. **2016**, 4, 104902.
- Hołuj P, Euler C, Balke B, Kolb U, Fiedler G, Müller M, Jäger T, Chávez Angel E, Kratzer P, **Jakob G**. Reduced thermal conductivity of TiNiSn/HfNiSn superlattices. *Phys. Rev. B* **2015**, 92, 125436.
- Mix C, Finizio S, Kläui M, **Jakob G**. Conductance control at the $LaAlO_3/SrTiO_3$-interface by a multiferroic $BiFeO_3$ ad-layer. *Appl. Phys. Lett.* **2014**, 104, 262903.

Mathias Kläui

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 05/11



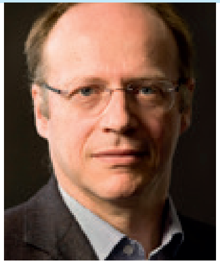
AREA OF RESEARCH

The research of Mathias Kläui focuses on the static and dynamic properties of geometrically confined spin structures, magnetoresistance effects and spin transfer torque as well as spin current-induced magnetization dynamics. In addition to metallic materials, advanced oxidic multiferroics and novel materials, such as graphene are investigated. The physics probed ranges from classical magnetization to spin dynamics in the quantum regime probed by cavity QED experiments. The group has long standing expertise in using advanced dynamic magnetic imaging methods both in the lab and at large scale synchrotron facilities as well as variable temperature magnetotransport. The work focuses on fundamental research but includes also applied projects with leading industrial partners.

SELECTED PUBLICATIONS

- Kehlberger A, Ritzmann U, Hinzke D, Guo E-J, Cramer J, Jakob G, Onbasli MC, Kim DH, Ross CA, Jungfleisch MB, Hillebrands B, Nowak U, **Kläui M**. Length Scale of the Spin Seebeck Effect. *Phys. Rev. Lett.* **2015**, 115, 6602.
- Büttner F, Moutafis C, Schneider M, Krüger B, Günther CM, Geilhufe J, v Korff Schmising C, Mohanty J, Pfau B, Schaffert S, Bisig A, Foerster M, Schulz T, Vaz CAF, Franken JH, Swagten HJM, **Kläui M**, Eisebitt S. Dynamics and Inertia of Skyrmionic Spin Structures. *Nature Physics* **2015**, 11, 225-228.
- Woo S, Litzius K, Krüger B, Im M-Y, Caretta L, Richter K, Mann M, Krone A, Reeve RM, Weigand M, Agrawal P, Lemesh I, Mawass M-A, Fischer P, **Kläui M**, Beach GSD. Observation of Room-Temperature Magnetic Skyrmions and their Current-Driven Dynamics in Ultrathin Metallic Ferromagnets. *Nature Materials* **2016**, 15, 501-506.

Kurt Kremer



MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 11/07

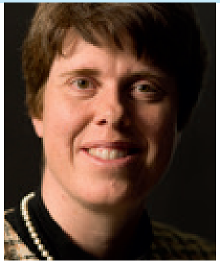
AREA OF RESEARCH

The work of Kurt Kremer focuses on numerical investigations of polymer systems and soft matter in general, based on strong method development efforts. These include multiscale simulation techniques as well as novel adaptive resolution procedures. Systems covered range from highly idealized polymer models, which are used to investigate basic conformational and rheological properties, to highly specialized models for macromolecular organic electronics or biological problems.

SELECTED PUBLICATIONS

- Mukherji D, Marques CM, Stuehn T, **Kremer K**. Depleted Depletion Drives Polymer Swelling in Poor Solvent Mixtures. *Nature Communications* **2017**, 8, 1374.
- Kreis K, **Kremer K**, Potestio R, Tuckerman ME. From classical to quantum and back: Hamiltonian adaptive resolution path integral, ring polymer, and centroid molecular dynamics. *J. Chem. Phys.* **2017**, 147, 244104.
- Halverson JD, Smrek J, **Kremer K**, Grosberg AY. From a melt of rings to chromosome territories: the role of topological constraints in genome folding. *Rep. Prog. Phys.* **2014**, 77, 022601.

Katharina Landfester



MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 05/09

AREA OF RESEARCH

Katharina Landfester and her group develop strategies to build molecularly controlled systems in the fields of drug delivery, cell modules, molecular sensing, and photocatalysis. To achieve this overarching goal, the need arises (1) to develop high precision organic and polymer synthesis; (2) to functionalize polymers and polymer materials; (3) to assemble the polymers to nanocarriers and (4) to create macroscopic systems. They focus on the synthesis of molecularly defined multi-functional nanocarriers with a precisely defined chemical-physical shell and equipped with a wide range of functions. Their vision is to create polymeric systems for sensing materials, functional drug delivery, and synthetic bottom-up synthesized cell-like systems.

SELECTED PUBLICATIONS

- Frick SU, Domogalla MP, Baier G, Wurm FR, Mailänder V, **Landfester K**. Steinbrink, K. IL-2 functionalized nanocapsules for T cell-based immunotherapy. *ACS Nano* **2016**, 10, 9216-9226.
- Schöttler S, Becker G, Winzen S, Steinbach T, Mohr K, **Landfester K**, Mailänder V, Wurm FR. Protein adsorption is required for stealth effect of poly(ethylene glycol)- and poly(phosphoester)-coated nanocarriers. *Nature Nanotechnology* **2016**, 11, 372-377.
- Baluschev S, Katta K, Avlasevich Y, **Landfester K**. Annihilation upconversion in nanoconfinement: solving the oxygen quenching problem. *Mater. Horiz.* **2016**, 3, 478-486.

Herwig Ott

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 11/07

AREA OF RESEARCH

In our research group we study the microscopic dynamics and structure of ultracold quantum gases. We are especially interested in fundamental experiments in quantum atom optics and quantum simulation. To this purpose we have developed a scanning electron microscope which allows for the in situ detection of single atoms in a quantum gas with high spatial resolution and for the implementation of dissipative defects. The latter is used to create and stabilize many-body quantum states. A second research direction is focused on Rydberg physics. Here, we engineer new types of interaction in ultracold quantum gases with help of Rydberg dressed states and study exotic Rydberg molecules.

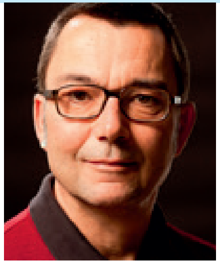
SELECTED PUBLICATIONS

- Labouvie R, Santra B, Heun S, **Ott H**. Bistability in a Driven-Dissipative Superfluid. *Phys. Rev. Lett.* **2016**, 116, 235302.
- Labouvie R, Santra B, Heun S, Wimberger S, **Ott H**. Negative Differential Conductivity in an Interacting Quantum Gas. *Phys. Rev. Lett.* **2015**, 115, 050601.
- Niederprüm T, Thomas O, Eichert T, Lippe C, Pérez-Ríos J, Greene CH, **Ott H**. Observation of pendular butterfly Rydberg molecules. *Nature Communications* **2016**, 7, 12820.

Thomas Palberg

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

Research in Experimental Soft Matter Physics, using advanced light scattering methods (speckle correlation, super-heterodyning cross correlation spectroscopy) advanced microscopy (Bragg, Phase-Doppler and Differential Dynamic Microscopy) on strongly correlated colloidal systems, active matter and micro-swimmers. Equilibrium and non- equilibrium properties (glass transition, crystallization kinetics, complex interactions, electro-kinetics, extreme mechanical load, confinement).

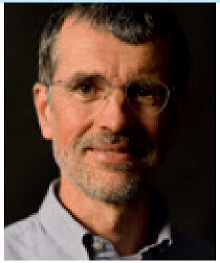
SELECTED PUBLICATIONS

- **Palberg T**, Wette P, Herlach DM. Equilibrium interfacial energies and Turnbull coefficient for bcc crystallizing colloidal charged sphere suspensions. *Phys. Rev. E* **2016**, 93, 022601.
- **Palberg T**, Bartsch E, Beyer R, Hofmann M, Lorenz N, Marquis J, Niu R, Okubo T. To make a glass – avoid the crystal. *Journal of Statistical Mechanics: Theory and Experiment* **2016**, 26, 074007.
- **Palberg T**. Crystallization kinetics of colloidal model suspensions: recent achievements and new perspectives. *J. Phys.: Condens. Matter* **2014**, 26, 333101.

Harald Paulsen

INSTITUTE FOR MOLECULAR PHYSIOLOGY, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

The group of Harald Paulsen takes a biochemical and molecular-biological approach to proteins from plants and algae. One focus is on the interaction of recombinant proteins with organic or inorganic materials to gain new functions or material properties. Calcium carbonate-precipitating peptides were designed by phage display, imitating evolutionary processes (Schüler et al., 2014). A synthetic silica-precipitating protein, modelled after biomineralization in diatoms, was bacterially expressed at (Zerfaß et al. 2015), allowing to analyze its function by systematic structural variations. The major light-harvesting complex of the plant photosynthetic apparatus was stabilized by encapsulating it in silica shells, with or without the help of silica-precipitating proteins (Roeder et al., 2014).

SELECTED PUBLICATIONS

- Schüler T, Renkel J, Hobe S, Susewind M, Jacob DE, Panthöfer M, Hoffmann-Röder A, **Paulsen H**, Tremel W. Designed peptides for biomineral polymorph recognition: a case study for calcium carbonate. *J. Mater. Chem. B* **2014**, 2, 3511-3518.
- Roeder S, Hobe S, P**aulsen H**. Silica encapsulation for significantly stabilized energy-conducting light-harvesting complex (LHCII). *Langmuir* **2014**, 30, 14234-14240.
- Zerfaß C, Braukmann S, Nietzsche S, Hobe S, **Paulsen H**. High yield recombiant production of a self-assembling polycationic peptide for silica biomineralization. *Prot. Expr. Purif.* **2015**, 108, 1-8.

Eva Rentschler

INSTITUTE OF INORGANIC AND ANALYTICAL CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 11/07

AREA OF RESEARCH

Molecular magnetism is one of the most challenging research areas in the development of new technologies in electronics. In the focus of our research activities are molecular magnetic clusters and extended low dimensional systems of exchange-coupled transition metal ions. The characteristic arrangement of spin carriers in metallacrowns provides a rational approach towards new SMMs with a high spin ground state and a large effective anisotropy barrier to the magnetization reversal. Aiming at molecular spintronics we perform high level magnetic investigations complemented by XMCD measurements with the group of Prof. Elmers. Another focus of our ongoing research is on spin crossover molecules (SCO) that show magnetic bistability implying applications in data storage or molecular electronics.

SELECTED PUBLICATIONS

- Happ P, Plenk C, **Rentschler E**. MC-4 metallacrowns as versatile tools for SMM Research. *Coord. Chem. Rev.* **2015**, 289-290, 238-260.
- Plenk C, Beck M, Krause J, **Rentschler E**. Rational Linkage of Magnetic Molecules using Click Chemistry. *Chem. Commun.* **2015**, 51, 6524-6527.
- Happ P, Sapozhnik A, Klanke J, Czaja P, Chernenkaya A, Medjanik K, Schuppler S, Nagel P, Merz M, **Rentschler E**, Elmers HJ. Analyzing the Enforcement of a high-Spin Ground State for a Metallacrown Single-Molecule Magnet. *Phys. Rev. B* **2016**, 93, 174404.

Friederike Schmid

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 02/10

AREA OF RESEARCH

Our research is devoted to the statistical thermodynamics of solids and liquids, with special focus on soft matter, complex fluids at equilibrium and nonequilibrium, and biologically motivated problems. Since our research heavily relies on extensive computer simulations, much effort is also spent on the development of new efficient simulation techniques and multiscale simulation methods.

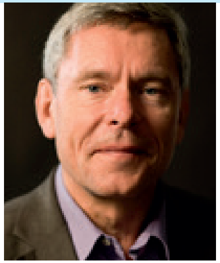
SELECTED PUBLICATIONS

- Toppozini L, Meinhardt S, Armstrong CL, Yamani Z, Kuvcerka N, **Schmid F**, Rheinstädter M. The structure of cholesterol in lipid rafts. *Phys. Rev. Lett.* **2014**, 113, 228101.
- Köhler S, **Schmid F**, Settanni G. The internal dynamics of fibrinogen and its implications for coagulation and adsorption. *PLOS Comput. Biol.* **2015**, 11, e1004346.
- Jung G, **Schmid F**. Computing bulk and shear viscosities from simulations of fluids with dissipative and stochastic interactions. *J. Chem. Phys.* **2016**, 144, 201401.

Gerhard Schönhense

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

In the period 2014-2016 our research within the MAINZ graduate school concentrated on the electronic structure of thiophene derivatives, TTF-TCNQ, several Fabre salts and other organic charge-transfer salts. The methods of choice were near-edge X-ray absorption fine structure (NEXAFS) spectroscopy and hard X-ray photoemission electron spectroscopy (HAXPES). Special emphasis was put on the detection of spectroscopic signatures of phase transitions. This work was carried out in the framework of the PhD Theses of Katerina Medjanik and Alisa Chernenkaya. In cooperation with the theoreticians we could prove that observed changes versus temperature are a fingerprint of charge transfer, shape of the lower empty TCNQ molecular orbitals and the deformation of TCNQ during CDW fluctuations.

SELECTED PUBLICATIONS

- Chernenkaya A, Morherr A, Medjanik K, Witt S, Kozina X, Nepijko SA, Öhrwall G, Bolte M, Krellner C, Jeschke HO, Valenti R, Baumgarten M, Elmers H-J, **Schönhense G**. Orbital-selective NEXAFS: two mechanisms of the charge transfer in single crystals based on thiophene derivatives. *J. Chem. Phys.* **2016**, 145, 034702.
- Chernenkaya A, Medjanik K, Nagel P, Merz M, Schuppler S, Canadell E, Pouget J-P, **Schönhense G**. Nature of the empty states and signature of the charge density wave instability and upper Peierls transition of TTF-TCNQ by temperature-dependent NEXAFS spectroscopy. *Eur. Phys. J. B* **2015**, 13, 88.
- Medjanik K, de Souza M, Kutnyakhov D, Gloskovskii A, Müller J, Lang M, Pouget J-P, Elmers H-J, **Schönhense G**. Hard X-ray Photoemission Study of the Fabre Salts $(TMTTF)_2X$ ($X=SbF_6$ and PF_6) Study. *Eur. Phys. J. B* **2014**, 87, 256.

Sebastian Seiffert

INSTITUTE OF PHYSICAL CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 05/16

AREA OF RESEARCH

Polymer microgels are soft materials with small size. They serve in various everyday-life applications, and they are also promising candidates for more sophisticated new applications in the future. This is particularly promising for microgels that are subject to a delicate interplay with their surroundings, either by assembly and disassembly of their polymeric building blocks through the action of supramolecular binding, or by selective solvation and desolvation of these polymers by the solvent. To make this all truly useful, it is necessary to understand the mutual interplay between (nano)structure, dynamics, and properties of these fascinating materials. This is what our research is focusing upon.

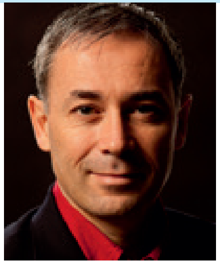
SELECTED PUBLICATIONS

- Seuß M, Schmolke W, Drechsler A, Fery A, **Seiffert S**. Core-Shell Microgels with Switchable Elasticity at Constant Interfacial Interaction. *ACS Appl. Mater. Interfaces* **2016**, 8, 16317-16327.
- Hackelbusch S, Rossow T, Steinhilber D, Weitz DS, **Seiffert S**. Hybrid Microgels with Thermo-Tunable Elasticity for Controllable Cell Confinement. *Adv. Healthcare Mater.* **2015**, 4, 1841-1848.
- Rossow T, Habicht A, **Seiffert S**. Relaxation and Dynamics in Transient Polymer Model Networks. *Macromolecules* **2014**, 47, 6473-6482.

Jairo Sinova

INSITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 01/14



AREA OF RESEARCH

As a condensed matter theory group we are interested on physical phenomena of many body systems in which the behavior of the collective system is quite different and unique from the behavior of its individual components. Condensed matter physics is a vast field of physics which provides endless opportunities. Our group has focused over the past few years on the subfield of spintronics and mesoscopic electronic transport. These fields study the effects that the coupling of the spin and charge degrees of freedom of the electron has on bulk properties of materials as well as transport and optical phenomena. Some of our main contributions to this field are related to spin Hall effects, diluted magnetic semiconductor physics, and current-induced magnetization dynamics. New avenues are always opening ahead, with novel and unforeseen connections to other points of views and topics.

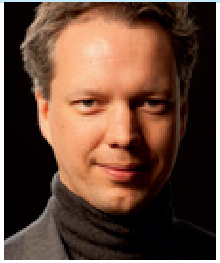
SELECTED PUBLICATIONS

- **Sinova J**, Valenzuela SO, Wunderlich J, Back CH, Jungwirth T. Spin Hall effects. *Rev. Mod. Phys.* **2015**, 87, 1213.
- Kurebayashi H, **Sinova J**, Fang D, Irvine AC, Skinner TD, Wunderlich J, Novák V, Campion RP, Gallagher BL, Vehstedt EK, Zârbo LP, Výborný K, Ferguson AJ, Jungwirth T. An antidamping spin–orbit torque originating from the Berry curvature. *Nature Nanotechnology* **2014**, 9, 211-217.
- Zelezny J, Gao H, Výborný K, Zemen J, Masek J, Manchon A, Wunderlich J, **Sinova J**, Jungwirth T. Relativistic Néel-Order Fields Induced by Electrical Current in Antiferromagnets. *Phys. Rev. Lett.* **2014**, 113, 157201.

Carsten Sönnichsen

INSTITUTE OF PHYSICAL CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

The Nanobiotechnology Group studies the physical chemistry of nanoparticles and their application in nanosciences, biochemistry, and medicine. The focus is on the utilization of metal nanoparticles for the sensing of single biomolecules, dynamic processes, medical relevant molecular targets, and photocatalytic applications. Besides such applications, physical and chemical mechanisms of wet-chemical nanoparticle formation itself and the basic physical and chemical properties of the resulting particles are studied. The main analytical technique comprises of several home-build dark-field single particle spectroscopic microscopes, complemented with a complete array of methods and expertise to develop nanoparticles for biomedical applications.

SELECTED PUBLICATIONS

- Ahijado-Guzmán R, Prasad J, Rosman C, Henkel A, Tome L, Schneider D, Rivas G, **Sönnichsen C**. Plasmonic Nanosensors for Simultaneous Quantification of Multiple Protein-Protein Binding Affinities. *Nano Lett.* **2014**, 14, 5528-5532.
- Prasad J, Zins I, Branscheid R, Becker J, Koch A, Fytas G, Kolb U, **Sönnichsen C**. Plasmonic Core-Satellite Assemblies as Highly Sensitive Refractive Index Sensors. *J. Phys. Chem. C* **2015**, 119, 5577-5582.
- Lambertz C, Martos A, Henkel A, Neiser A, Kliesch T, Janshoff A, Schwille P, **Sönnichsen C**. Single Particle Plasmon Sensors as Label-Free Technique to Monitor MinDE Protein Wave Propagation on Membranes. *Nano Lett.* **2016**, 16, 3540-3544.

Thomas Speck

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 07/15

AREA OF RESEARCH

The guiding theme of the research in the group of Thomas Speck is to advance our understanding of driven non-equilibrium systems with the vision to develop a comprehensive theoretical framework. Major analytical tools to which we contribute are stochastic thermodynamics and the statistical mechanics of trajectories. Our research combines analytical and numerical investigations of minimal model systems from the realm of soft matter. The goal is to lay the theoretical foundations for the understanding and assembly of the next generation of functional soft materials that perform useful tasks beyond the molecular scale.

SELECTED PUBLICATIONS

- Bialké J, Siebert JT, Löwen H, **Speck T**. Negative Interfacial Tension in Phase-Separated Active Brownian Particles. *Phys. Rev. Lett.* **2015**, 115, 098301.
- **Speck T**, Jack RL. Ideal bulk pressure of active Brownian particles. *Phys. Rev. E* **2016**, 93, 062605.
- Williams I, Oğuz EC , **Speck T**, Bartlett P, Löwen H, Royall CP. Transmission of torque at the nanoscale. *Nature Physics* **2016**, 12, 98.

Wolfgang Tremel

INSTITUTE OF INORGANIC AND ANALYTICAL CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 11/07

AREA OF RESEARCH

We develop new methods for the synthesis of nanomaterials ranging from intermetallics and metals to metal oxides and metal chalcogenides. These materials are highly attractive, because a fundamental quantitative understanding of many synthetic and surface processes is still lacking and many nanomaterials have great practical relevance. This gap between a fundamental understanding (e.g. nucleation and crystallization, large scale synthesis of nanomaterials) and high technological relevance (biofouling and batteries) characterizes many topics we are dealing with. Our applications range from biomedicine and biocatalysis over the aggregation of nanocrystals to form liquid crystals or strong and soft hybrid materials to tribology, phononics, thermoelectrics or photovoltaics.

SELECTED PUBLICATIONS

- Bach S, Panthöfer M, Dietzsch M, Meffert R, Emmerling F, Ribeiro Celinski V, Schmedt auf der Günne J, **Tremel W**. Thermally Stable Amorphous Zinc Phosphate Nanoparticles as Intermediates During the Formation of Hopeite. *J. Am. Chem. Soc.* **2015**, 137, 2285-2294.
- Weldert KS, Zeier WG, Day TW, Panthöfer M, Snyder GJ, **Tremel W**. Thermoelectric transport in the fast copper ionic conducting Argyrodite Cu_7PSe_6. *J. Am. Chem. Soc.* **2014**, 136, 12035-12040.
- Schick I, Lorenz S, Gehrig D, Schilmann AM, Bauer H, Panthöfer M, Fischer K, Schmidt M, Strand D, Laquai F, **Tremel W**. Multifunctional Silica-Coated Au@MnO Janus Particles for Selective Dual Functionalization and Imaging. *J. Am. Chem. Soc.* **2014**, 136, 2473-2483.

Siegfried Waldvogel

INSTITUTE OF ORGANIC CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 11/12

AREA OF RESEARCH

Main areas of research are the development of novel electro-organic transformations (both: anodic and cathodic), establishing electrosynthetic screening and process development the development of new methodologies on the field of $MoCl_5$-mediated oxidative coupling reactions and the supramolecular recognition of neutral molecules and their detection by color formation, exploiting these binding events for tracing of explosives including the device and prototype development based on HFF-QMB technology.

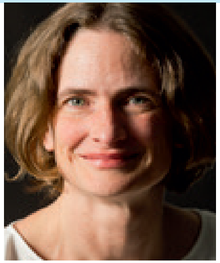
SELECTED PUBLICATIONS

- Lips S, Wiebe A, Elsler B, Schollmeyer D, Dyballa KM, Franke R, **Waldvogel S**. Synthesis of meta-Terphenyl-2,2"-diols by Anodic C–C Cross-Coupling Reactions. *Angew. Chem. Int. Ed.* **2016**, 55, 10872-10876.
- Elsler B, Wiebe A, Schollmeyer D, Dyballa K, Franke R, **Waldvogel S**. Source of Selectivity in Oxidative Cross-Coupling of Aryls by Solvent Effect of 1,1,1,3,3,3-Hexafluoropropan-2-ol. *Chem. Eur. J.* **2015**, 21, 12321-12325.
- Elsler B, Schollmeyer D, Dyballa KM, Franke R, **Waldvogel S**. Metal- and Reagent-Free Highly Selective Anodic Cross-Coupling Reaction of Phenols. *Angew. Chem. Int. Ed.* **2014**, 53, 4979.

Tanja Weil

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 09/16



AREA OF RESEARCH

Our group focuses on the synthesis and assembly of precise macromolecular architectures to achieve function by molecular design principles. We address grand challenges in polymer and materials chemistry such as the synthesis of three dimensional quantum materials such as nanodiamonds as well as the preparation of distinct and adaptive nano-sized objects. We particularly focus our synthesis efforts on the understanding and controlling of cellular functions by tailored macromolecular or supramolecular systems as well as on solving various materials applications such as the design biomimetic materials and membranes.

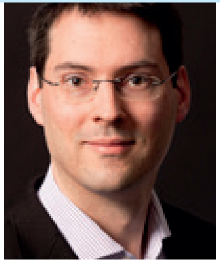
SELECTED PUBLICATIONS

- Chakrabortty S, Agrawalla BK, Stumper A, Vegi NM, Fischer S, Reichardt C, Kögler M, Dietzek B, Feuring-Buske M, Buske C, Rau S, **Weil T**. Mitochondria Targeted Protein-Ruthenium Photosensitizer for Efficient Photodynamic Applications. *J. Am. Chem. Soc.* **2017**, 139, 2512-2519.
- Ng DYW, Vill R, Wu Y, Koynov K, Tokura Y, Liu W, Sihler S, Kreyes A, Ritz S, Barth H, Ziener U, **Weil T**. Directing Intracellular Supramolecular Assembly with N-heteroaromatic Quaterthiophene Analogues. *Nature Communications* **2017**, 8, 1850.
- Tokura Y, Harvey S, Berger R, Wu Y, Ng DYW, **Weil T**. DNAzyme-assisted fabrication of defined polydopamine nanostructures on DNA Origami. *Angew. Chem. Int. Ed.* **2018**, 57, 1587-1591.

Artur Widera

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 11/10



AREA OF RESEARCH

The research focuses on control of individual quantum systems in various physical implementations. Thereby we establish model systems for quantum many-body phenomena, non-equilibrium dynamics or complex transport. In particular, we consider (1) single or few neutral atoms as well-controlled impurities in a Bose-Einstein condensate; (2) ultracold fermionic superfluids in controlled disorder; and (3) nanodiamonds with color centers in microstructured optical waveguide networks. Thereby we experimentally address problems such as solid state simulations of quasi-particles relevant for unconventional electron pairing in solids; dynamics of quantum information carriers coupled to a bath; or investigations of fundamental properties of correlated quantum many-body systems.

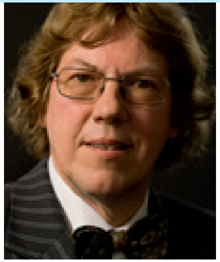
SELECTED PUBLICATIONS

- Kindermann F, Dechant A, Hohmann M, Lausch T, Mayer D, Schmidt F, Lutz E, **Widera A**. Nonergodic diffusion of single atoms in a periodic potential. *Nature Physics* **2017**, 13, 137.
- Hohmann M, Kindermann F, Lausch T, Mayer D, Schmidt F, Lutz E, **Widera A**. Individual tracer atoms in an ultracold dilute gas. *Phys. Rev. Lett.* **2017**, 118, 263401.
- Hohmann M, Kindermann F, Lausch T, Mayer D, Schmidt F, Lutz E, **Widera A**. Single-atom thermometer for ultracold gases. *Phys. Rev. A* **2016**, 93, 043607.

Rudolf Zentel

INSTITUTE OF ORGANIC CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

The expertise of the group is synthetic polymer chemistry aiming at the design of new polymeric materials, which behave as actuators (LC-elastomers, which are semiconducting organic/inorganic hybrid systems (application e.g. in OLEDs) or nanocarriers for biomedical applications). The molecular structure is thereby choosen as basis for the materials properties. The research interests are located around 3 themes: 1. Liquid crystalline materials and mesophases in general; 2. Synthesis of self-organizing semiconducting polymeric materials; 3. Functionalized blockcopolymer structures, which self assemble into micellar structures.

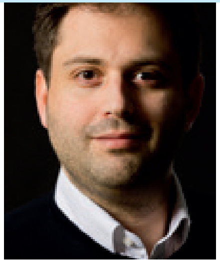
SELECTED PUBLICATIONS

- Schuhladen S, Preller F, Rix R, Petsch S, **Zentel R**, Zappe H. Iris-Like Tunable Aperture Employing Liquid-Crystal Elastomers. *Adv. Mater.* **2014**, 26, 7247-7251.
- Bresser D, Oschmann B, Tahier MN, Mueller F, Lieberwirth I, Tremel W, **Zentel R**, Passerini S. Carbon-Coated Anatase TiO_2 Nanotubes for Li- and Na-Ion Anodes. *J. Electrochem. Soc.* **2015**, 162, A3013-A3020.
- Tahir MN, Oschmann B, Buchholz D, Dou X, Lieberwirth I, Panthöfer, Tremel W, **Zentel R**, Passerini S. Extraordinary Performance of Carbon-Coated Anatase TiO_2 as Sodium-Ion Anode. *J. Electrochem. Soc.* **2016**, 6, 1501489.

Matthias Barz

INSTITUTE OF ORGANIC CHEMISTRY, JGU

MEMBER OF MAINZ SINCE 08/14



AREA OF RESEARCH

The Barz Lab focuses on the development of polypept(o)ides – a hybrid material based on polypeptides and polypeptoids. Our aim is to meet the complex requirements of therapeutic materials with robust, clean and scalable chemistry to develop not only potent therapies, but to enable clinical translation. The reduction of synthetic efforts while maintaining complex functionality requires rethinking of existing concepts in organic chemistry and polymer science and the development of new ones. This toolbox enables the design of nano- or macroscopic materials based on polypept(o)ides either by chemical synthesis or controlled self-assembly and permits their use in diagnosis and therapy of cancer, bacterial (tuberculosis) and viral infections or autoimmune diseases.

SELECTED PUBLICATIONS

- Klinker K, **Barz M**. Polypept(o)ides – Hybrid Systems based on Polypeptides and Polypeptoids. *Macromol. Rapid Commun.* **2015**, 36, 1943-1957
- Schäfer O, Huesmann D, Muhl C, **Barz M**. Rethinking Cysteine Protective Groups: S-Alkylsulfonyl-L-Cysteines for Chemoselective Disulfide Formation. *Chem. Eur. J.* **2016**, 22, 18085-18091.
- Klinker K, Schäfer O, Huesmann D, Bauer T, Capelôa L, Braun L, Stergiou N, Schinnerer M, Dirisala A, Miyata K, Osada K, Cabral H, Kataoka K, **Barz M**. Secondary Structure-Driven Self-Assembly of Reactive Polypept(o)ides: Controlling Size, Shape and Function of Core Cross-Linked Nanostructures. *Angew. Chem. Int. Ed.* **2017**, 56, 9608-9613.

Andrii Chumak

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 02/16

AREA OF RESEARCH

A spin wave is a collective excitation of the electron spin system in a magnetic solid. Spin-wave characteristics can be varied by a wide range of parameters which, in combination with a rich choice of linear and non-linear spin-wave properties, renders spin waves excellent objects for the studies of general wave physics. Nowadays, spin waves and their quanta, magnons, are attracting much attention also due to another very ambitious perspective. They are being considered as data carriers in novel computing devices instead of electrons in electronics. The field of science that refers to information transport and processing by spin waves is known as magnonics.

SELECTED PUBLICATIONS

- **Chumak AV**, Serga AA, Hillebrands B. Magnonic Crystals for Data Processing. *J. Phys. D: Appl. Phys.* **2017**, 50, 244001-20.
- **Chumak AV**, Vasyuchka VI, Serga AA, Hillebrands B. Magnon Spintronics. *Nature Physics* **2015**, 11, 453-461.
- **Chumak AV**, Serga AA, Hillebrands B. Magnon Transistor for All-Magnon Data Processing. *Nature Communications* **2014**, 5, 4700-8.

Jure Demsar

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 03/15

AREA OF RESEARCH

In many of the advanced solids with broken-symmetry ground states (e.g. high-T_c superconductors, antiferromagnets, density waves), it is the interplay between different degrees of freedom (charge, spin, crystal structure) that controls their functional properties. To determine the coupling strengths between these subsystems and/or to manipulate their properties, e.g. ultrafast switching between different (meta)stable states, we develop and employ various femtosecond real-time techniques. In a typical approach, a femtosecond optical pulse drives the system out of equilibrium while the suitably delayed optical (from THz to X-ray range) or electron pulses record movies showing the time-evolution of the system on the elementary time- and atomic length-scales.

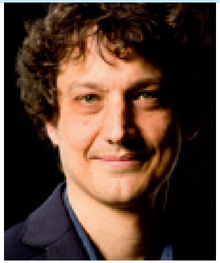
SELECTED PUBLICATIONS

- Dominko D, Vdovic S, Skenderovic H, Staresinic D, Biljakovic K, Ristic D, Ivanda D, Lorenzo JE, **Demsar J**. Static and dynamic properties of low-temperature order in the one-dimensional semiconductor $(NbSe_4)_3I$. *Phys. Rev. B* **2016**, 94, 104113.
- Schubert M, Schaefer H, Mayer J, Laptev A, Hettich M, Merklein M, He C, Rummel C, Ristow O, Großmann M, Luo Y, Gusev V, Samwer K, Fonin M, Dekorsy T, **Demsar J**. Collective modes and structural modulation in Ni-Mn-Ga(Co) martensite thin films probed by femtosecond spectroscopy and scanning tunneling microscopy. *Phys. Rev. Lett.* **2015**, 115, 076402.
- Porer M, Leierseder U, Ménard J-M, Dachraoui H, Mouchliadis L, Perakis IE, Heinzmann U, **Demsar J**, Rossnagel K, Huber R. Non-thermal separation of electronic and structural orders in a persisting charge density wave. *Nature Materials* **2014**, 13, 857-861.

Bertrand Dupé

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 05/17



AREA OF RESEARCH

In the Material by Design sub-group of the INSPIRE group, we aim at exploring the properties of new materials that can host topologically stabilized textures in functional materials such as multiferroics or metallic thin-films. Among these structures, we especially focus in skyrmions. Our approach is based on Density Functional Theory (DFT) with which we can model crystals based on their band structure. We use DFT to parametrize effective Hamiltonians with which we explore the dynamics via the Landau-Lifschitz Gilbert equation and the full magnetic/electric field-Temperature-strain phase diagram of such materials.

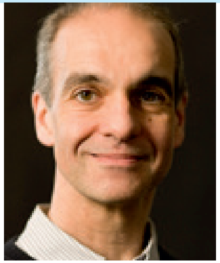
SELECTED PUBLICATIONS

- **Dupé B**, Bihlmayer G, Böttcher M, Blügel S, Heinze S. Engineering skyrmions in transition-metal multilayers for spintronics. *Nature Communications* **2016**, 7, 11779.
- Hanneken C, Otte F, Kubetzka A, **Dupé B**, Romming N, von Bergmann K, Heinze S. Electrical detection of magnetic skyrmions by tunnelling non-collinear magnetoresistance. *Nature Nanotechnology* **2015**, 10, 1039-1042.
- **Dupé B**, Hoffmann M, Paillard C, Heinze S. Tailoring magnetic skyrmions in ultra-thin transition metal films. *Nature Communications* **2014**, 5, 4030.

Sebastian Eggert

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

We consider many-body quantum phenomena in low-dimensions, where correlations dominate the collective behavior. Interesting quantum lattice systems with spin and charge degrees of freedom are found in materials as well as in ultra-cold quantum gases, where frustration, fractional excitations, supersolids, and anyons lead to exciting physical phenomena and novel quantum phases. The calculation of transmission in magnetic nano-wires is important for future spintronics applications. By using quenches and time-periodic driving interesting dynamic effects can be analyzed. We use a combination of numerical many-body simulations with analytic field theories.

SELECTED PUBLICATIONS

- Zhang X-F, Hu S, Pelster A, **Eggert S**. Quantum domain walls induce incommensurate supersolid phase on the anisotropic triangular lattice. *Phys. Rev. Lett.* **2016**, 117, 193201.
- Vogler A, Labouvie R, Barontini G, **Eggert S**, Guarrera V, Ott, H. Dimensional phase transition from an array of 1D Luttinger liquids to a 3D Bose-Einstein condensate. *Phys. Rev. Lett.* **2014**, 113, 215301.
- Tocchio LF, Gros C, Zhang X-F, **Eggert S**. Phase diagram of the triangular extended Hubbard model. *Phys. Rev. Lett.* **2014**, 113, 246405.

Karin Everschor-Sitte

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 09/16

AREA OF RESEARCH

Within the TWIST group we investigate the complex fundamental physics of topologically protected magnetic structures – skyrmions. In particular, we study the interplay between skyrmions, different magnetic structures, and spin and charge currents. This interplay is governed by microscopic mechanisms within complex materials that must also be understood and engineered. Gaining a deeper understanding of these mechanisms to optimally utilize the properties of skyrmions towards potential spintronics applications is a key focus of our work.

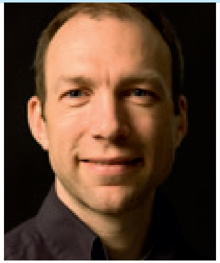
SELECTED PUBLICATIONS

- Sitte M, **Everschor-Sitte K**, Valet T, Rodrigues DR, Sinova J, Abanov A. Current-driven periodic domain wall creation in ferromagnetic nanowires. *Phys. Rev. B* **2016**, 94, 064422.
- **Everschor-Sitte K**, Sitte M, MacDonald AH. Interaction Correction to the Magneto-Electric Polarizability of Z2 Topological Insulators. *Phys. Rev. B* **2015**, 92, 245118.
- **Everschor-Sitte K**, Sitte M. Real-space Berry phases: Skyrmion soccer. *J. Appl. Phys.* **2014**, 115, 172602.

Martin Jourdan

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

My research is mainly focused on the preparation, characterization and functional investigation of novel materials for spintronics. We aim for high spin polarization, topologically protected surface states, large spin-orbit torques etc. Those materials, typically with very specific electronic properties as predicted by our collaboration partners based on band structure calculation methods, are prepared by sputtering and MBE as epitaxial thin films. We use characterization methods such as X-ray and electron diffraction and scanning probe and X-ray microscopy. The electronic properties of the samples are investigated by photoemission spectroscopy or electronic transport measurements, including the preparation and investigation of multilayers and micro-patterned structures.

SELECTED PUBLICATIONS

- **Jourdan M**, Minár J, Braun J, Kronenberg A, Chadov S, Balke B, Gloskovskii A, Kolbe M, Elmers H-J, Schönhense G, Ebert H, Felser C, Kläui M. Direct observation of half-metallicity in the Heusler compound Co_2MnSi. *Nature Communications* **2014**, 5, 3974.
- **Jourdan M**, Bräuning H, Sapozhnik A, Elmers H-J, Zabel H, Kläui M. Epitaxial Mn_2Au thin films for antiferromagnetic spintronics. *J. Phys. D: Appl. Phys.* **2015**, 48, 385001.
- Seifert T, Jaiswal S, Martens U, Hannegan J, Braun J, Maldonado P, Freimuth F, Kronenberg A, Henrizi J, Radu I, Beaurepaire E, Mokrousov Y, Oppeneer PM, **Jourdan M**, Jakob G, Turchinovich D, Hayden LM, Wolf M, Münzenberg M, Kläui M, Kampfrath T. Efficient metallic spintronic emitters of ultrabroadband terahertz radiation. *Nature Photonics* **2016**, 10, 483.

Markus Mezger

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 03/15

AREA OF RESEARCH

Near surfaces and in confinement, the structure of soft matter can exhibit a remarkably different structure compared to bulk. These structures strongly affect the interfacial dynamics of water, complex electrolytes, liquid crystals, and polymers. Structural information on the molecular length scale is obtained by X-ray and neutron scattering techniques. Time resolved experiments at synchrotron sources and quasielastic neutron scattering allows to study their dynamics. Current research projects include studies on confined ionic liquids under shear and the quasiliquid interfacial premelting layer of ice.

SELECTED PUBLICATIONS

- **Mezger M**, Roth R, Schröder H, Reichert P, Pontoni D, Reichert H. Solid-liquid interfaces of ionic liquid solutions – Interfacial layering and bulk correlations. *J. Chem. Phys.* **2015**, 142, 164707.
- Okuno M, **Mezger M**, Stangenberg R, Baumgarten M, Müllen K, Bonn M, Backus EHG. Interaction of a patterned amphiphilic polyphenylene dendrimer with a lipid-monolayer: electrostatic interactions dominate. *Langmuir* **2015**, 31, 1980.
- Wu X-L, Liu S, Wen T, Wang X, Xu A-W, **Mezger M**. Self-templated synthesis of novel carbon nanoarchitectures for efficient electrocatalysis. *Scientific Reports* **2016**, 6, 28049.

Arash Nikoubashman

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 02/17

AREA OF RESEARCH

Our current research activities focus on the controlled transport and assembly of soft matter, using a range of computational techniques such as Molecular Dynamics and Monte Carlo simulations. For example, we are studying the transport of complex liquids in microfluidic devices, which are highly sought after for biotechnological applications, e.g. protein purification and early diagnosis of pathogens. Another ongoing research effort is the fabrication of structured thin films and nanoparticles through the directed self-assembly of block copolymers or through rapid solvent displacement. Our simulations provide invaluable links between the microscopic properties of the constituents and the macroscopic system properties, thus allowing for the design of efficient devices and novel materials.

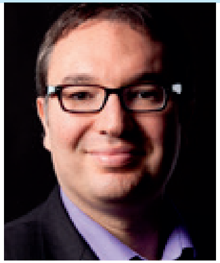
SELECTED PUBLICATIONS

- **Nikoubashman A**, Davis RL, Michal BT, Chaikin PM, Register RA, Panagiotopoulos AZ. Thin films of homopolymers and cylinder-forming diblock copolymers under shear. *ACS Nano* **2014**, 8, 8015-8026.
- Bianchi E, Panagiotopoulos AZ, **Nikoubashman A**. Self-assembly of Janus particles under shear. *Soft Matter* **2015**, 11, 3767-3771.
- **Nikoubashman A**, Lee VE, Sosa C, Prud'homme RK, Priestley RD, Panagiotopoulos AZ. Directed assembly of soft colloids through rapid solvent exchange. *ACS Nano* **2016**, 10, 1425-1433.

Román Orús

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 05/13



AREA OF RESEARCH

I study complex quantum systems, i.e., the emergent properties of systems made of many individual quantum constituents. This embraces the properties of quantum matter, quantum field theory, and even quantum gravity. My main focus now is the development of simulation techniques for quantum lattice systems using tensor networks, and the mathematical investigation of quantum many-body entanglement. My plan is to apply these methods to study a number of important phenomena in condensed matter physics and beyond. Examples are topological quantum order, frustrated quantum antiferromagnets, quantum dissipation, quantum transport, many-body localization, lattice gauge theories, holographic entanglement, new numerical simulation methods, the connection to artificial intelligence, and possible connections of all these topics to experiments.

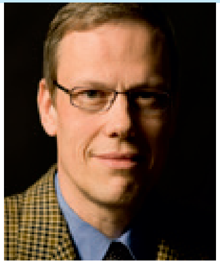
SELECTED PUBLICATIONS

- Mambrini M, **Orús R**, Poilblanc D. Systematic construction of spin liquids on the square lattice from tensor networks with SU(2) symmetry. *Phys. Rev. B* **2016**, 94, 205124.
- **Orús R**, Wie T-C, Buerschaper O, Garcia-Saez, A. Topological transitions from multipartite entanglement with tensor networks: a procedure for sharper and faster characterization. *Phys. Rev. Lett.* **2014**, 113, 257202.
- **Orús R**. A Practical Introduction to Tensor Networks: Matrix Product States and Projected Entangled Pair States. *Annals of Physics* **2014**, 349, 117-158.

Hans Christian Schneider

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 11/07



AREA OF RESEARCH

Hans Christian Schneider is interested in spin-dependent electron dynamics and electronic transport far away from the Fermi energy. Theoretical models range from non-equilibrium Green functions, over kinetic equations and ab-initio methods, and are applied mainly to metallic and ferromagnetic systems. The group has contributed to the current understanding of electronic dynamics due to electron-phonon and electron-electron interactions in ultrafast magnetic dynamics, and has elucidated the role played by the spin-orbit coupling in this process.

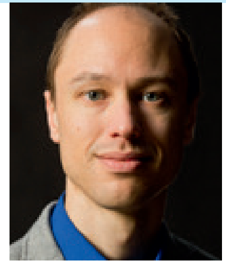
SELECTED PUBLICATIONS

- Kaltenborn S, **Schneider HC**. Spin-orbit coupling effects on spin-dependent inelastic electronic lifetimes in ferromagnets. *Phys. Rev. B* **2014**, 90, 20104.
- Baral A, **Schneider HC**. Magnetic switching dynamics due to ultrafast exchange scattering: A model study. *Phys. Rev. B* **2015**, 91, 100402.
- Nenno DM, Kaltenborn S, **Schneider HC**. Boltzmann transport calculation of collinear spin transport on short timescales. *Phys. Rev. B* **2016**, 94, 115102.

Benjamin Stadtmüller

DEPARTMENT OF PHYSICS, TUK

MEMBER OF MAINZ SINCE 02/16



AREA OF RESEARCH

My research focuses on the light-matter interaction in spin-textured and magnetic materials and at their interfaces with inorganic and organic adsorbates. We are particularly interested in the hot charge/spin carrier dynamics and the corresponding energy and momentum relaxation mechanisms in these materials. The main goal is to obtain a comprehensive understanding of the correlation between the fundamental scattering mechanisms of hot carriers and the dominant interactions in hybrid materials. To this end, we use state-of-the-art time-resolved photoemission techniques and all-optical methods based on the magneto-optical Kerr effect. Ultimately, we aim to reveal novel concepts to control the fundamental properties of spin textured and ferromagnetic hybrid materials on ultrafast timescales.

SELECTED PUBLICATIONS

- **Stadtmüller B**, Seidel J, Haag N, Grad L, Tusche C, van Straaten G, Franke M, Kirschner J, Kumpf C, Cinchetti M, Aeschlimann M. Modifying the surface of a Rashba-split Pb-Ag alloy using tailored metal-organic bonds. *Phys. Rev. Lett.* **2016**, 117, 96805.
- Droghetti A, Thielen P, Rungger I, Haag N, Großmann N, Stöckl J, **Stadtmüller B**, Aeschlimann M, Sanvito S, Cinchetti M. Dynamic spin-filtering at the Co/Alq_3 interface mediated by weakly coupled second layer molecules. *Nature Communications* **2016**, 7, 12668.
- Jakobs S, Narayan A, **Stadtmüller B**, Droghetti A, Rungger I, Hor YS, Klyatskaya S, Jungkenn D, Stöckl J, Laux M, Monti OLA, Aeschlimann M, Cava RJ, Ruben M, Mathias S, Sanvito S, Cinchetti M. Functionalization of topological insulators by rational design of organic molecules. *Nano Lett.* **2015**, 15, 6022-6029.

Matteo Rizzi

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 05/13

AREA OF RESEARCH

My group deals primarily (but not only) with the quantum optical platform of ultracold gases and studies the interplay of synthetic gauge fields with geometrical constraints and particle interactions, in order to achieve and manipulate (fractional) topological states of matter, within the general framework of "Synthetic Quantum Matter". Another direction is to better understand the role of many-body effects on the transport properties of low-dimensional structures, by exploiting progresses in atomic ring-shaped traps. In order to enlarge our fundamental understanding of such quantum many-body systems, a central pillar sustaining our research are numerical methods managing quantum entanglement in an efficient way, namely Tensor Networks (e.g., Density Matrix Renormalization Group).

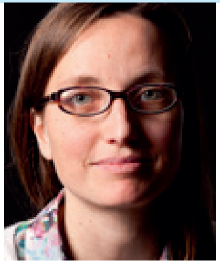
SELECTED PUBLICATIONS

- Cominotti M, Rossini D, **Rizzi M**, Hekking F, Minguzzi A. Optimal Persistent Currents for Interacting Bosons on a Ring with a Gauge Field. *Phys. Rev. Lett.* **2014**, 113, 025301.
- Aghamalyan D, Cominotti M, **Rizzi M**, Rossini D, Hekking F, Minguzzi A, Kwek LC, Amico L. Coherent superposition of current flows in an atomtronic quantum interference device. *New J. Phy.* **2015**, 17, 045023. – HIGHLIGHT OF THE YEAR
- Decamp J, Juenemann J, Albert M, **Rizzi M**, Minguzzi A, and Vignolo P. High-momentum tails as magnetic-structure probes for strongly correlated $SU(\kappa)$ fermionic mixtures in one-dimensional traps. *Phys. Rev. A* **2016**, 94, 053614.

Marialore Sulpizi

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 11/10



AREA OF RESEARCH

My research interests focus on the understanding of structure, reactivity, spectroscopy and dynamics of interfaces using a multiscale approach which comprises *ab initio* molecular dynamics and force field based molecular dynamics simulations. My research activity on interfaces at the nanoscale bridges between traditional soft matter (including liquids and biomolecules) and material science [1]. Some of my recent work has been directed, e.g. to understand the role of interfacial interactions, between electrolyte/surfactants/biomolecules and material surfaces in shaping the crystal growth [3]. My group has also a strong interest in interface vibrational spectroscopy, where our contribution has been both in the direction of fundamental method developments [2] and applications.

SELECTED PUBLICATIONS

- Geada IL, Ramezani-Dakhel H, Jamil T, **Sulpizi M**, Heinz H. Insight into induced charges at metal surfaces and biointerfaces using a polarizable Lennard-Jones potential. *Nature Communications* **2018**, 9, 716.
- Khatib R, **Sulpizi M**. Sum Frequency Generation Spectra from Velocity–Velocity Correlation Functions. *J. Phys. Chem. Lett.* **2017**, 8, 1310-1314.
- Meena SK, **Sulpizi M**. From Gold Nanoseeds to Nanorods: The Microscopic Origin of the Anisotropic Growth. *Angew. Chem. Int. Ed.* **2016**, 55, 11960-11964.

Dmitry Turchinovich

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 03/15

AREA OF RESEARCH

The research interests of Dmitry Turchinovich belong to the investigation of ultrafast and terahertz (THz) dynamics in condensed matter, and to general ultrafast science. Using ultrafast THz spectroscopy employed in several advanced modalities, the Turchinovich group investigates ultrafast dynamics of charge, lattice, and spin subsystems in solids such as semiconductors, metals, graphene, various spintronic systems etc. Further, the group is active in the field of ultrafast fiber lasers and nonlinear wave conversion, mostly aimed at the applications in bioimaging and biospectroscopy.

SELECTED PUBLICATIONS

- Seifert T, Jaiswal S, Martens J, Hannegan J, Braun L, Maldonado P, Freimuth F, Kronenberg A, Henrizi J, Radu I, Beaurepaire E, Mokrousov Y, Oppeneer PM, Jourdan M, Jakob G, **Turchinovich D**, Hayden LM, Wolf M, Münzenberg M, Kläui M, Kampfrath T. Efficient metallic spintronic emitters of ultrabroadband terahertz radiation. *Nature Photonics* **2016**, 10, 483.
- Jin Z, Tkach A, Casper F, Spetter V, Grimm H, Thomas A, Kampfrath T, Bonn M, Kläui M, **Turchinovich D**. Accessing the fundamentals of magnetotransport in metals with terahertz probes. *Nature Physics* **2015**, 11, 761.
- Mics Z, Tielrooij K-J, Parvez K, Jensen SA, Ivanov I, Feng X, Müllen K, Bonn M, **Turchinovich D**. Thermodynamic picture of ultrafast charge transport in graphene. *Nature Communications* **2015**, 6, 7655.

Peter Virnau

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 11/12

AREA OF RESEARCH

Although globular homopolymers are typically highly knotted, less than one in a hundred protein structures contain a knot. Nevertheless, intriguing counter-examples exist, like the most complicated protein knot, which was discovered in Mainz. Apart from analyzing biological data, we perform Monte Carlo simulations of simplified protein, DNA and polymer models to learn more about entanglements in viral DNA, proteins and chromatin. A second topic involves collective properties of colloidal Janus particles that are propelled by diffusiophoresis or similar means. Depending on the interplay of volume exclusion, hydrodynamic alignment of orientations, and attractive forces, several phenomena like living crystals and phase separation are observed and investigated with numerical simulations.

SELECTED PUBLICATIONS

- Trefz B, Siebert J, **Virnau P**. How molecular knots can pass through each other. *Proc. Natl. Acad. Sci. USA* **2014**, 111, 7948-7951.
- Das SK, Egorov SA, Trefz B, **Virnau P**, Binder K. Phase behavior of active swimmers in depletants: Molecular dynamics and Integral equation theory. *Phys. Rev. Lett.* **2014**, 112, 198301.
- Wüst T, Reith D, **Virnau P**. Sequence determines degree of knottedness in a coarse-grained protein model. *Phys. Rev. Lett.* **2015**, 114, 028102.

Patrick Windpassinger

INSTITUTE OF PHYSICS, JGU

MEMBER OF MAINZ SINCE 02/14

AREA OF RESEARCH

Our research group focusses on using cold, neutral atoms for quantum optical and quantum information science in three different directions of application: We use cold atoms trapped and transported by light into hollow core fibers and bring them to highly excited Rydberg states to study strong light-matter interactions in quasi one-dimensional systems. The Dysprosium experiment aims quantum simulation of solid state systems. Novel quantum phases will be studied emerging for ultracold Dysprosium due to dipolar interactions. In the area of applied quantum technologies, we are working towards spaceborne precision tests of Einstein's equivalence principle. In this context our group is developing ultra-stable laser system technologies.

SELECTED PUBLICATIONS

- **Windpassinger P**. Quantensimulation mit ultrakalten Quantengasen. *Physik in unserer Zeit* **2014**, 45, 26-33.
- Langbecker M, Noaman M, Kjærgaard N, Benabid F, **Windpassinger P**. Rydberg excitation of cold atoms inside a hollow core fiber. *Phys. Rev. A* **2017**, 96, 041402(R).
- Lezius M, Wilken T, Deutsch Ch, Giunta M, Mandel O, Thaller A, Schkolnik V, Schiemangk M, Dinkelaker A, Krutzik M, Kohfeldt A, Wicht A, Peters A, Hellmig O, Duncker H, Sengstock K, **Windpassinger P**, Lampmann K, Hülsing Th, Hänsch Th, Holzwarth R. Space-born Frequency Comb Metrology. *Optica* **2016**, 3, 1381.

Eva Wolf

INSTITUTE FOR MOLECULAR PHYSIOLOGY, JGU

MEMBER OF MAINZ SINCE 06/14

AREA OF RESEARCH

Many physiological and behavioral processes are regulated in a day-time dependent (circadian) manner. Our aim is to acquire an atomic resolution picture and quantitative understanding of the molecular processes governing circadian rhythms and their synchronization with the environmental light-dark cycle. We perform structural (X-ray crystallography), biochemical, biophysical and spectroscopic studies of clock proteins, their molecular interactions and activities. Based on our previous research on the mammalian and *Drosophila* Cryptochrome (CRY) clock proteins (Czarna et al, 2013; Schmalen et al, 2014) we now – within MAINZ – study CRYs of marine and migratory animals to understand how variations in protein 3D structure affect light-reception mechanisms and protein interactions.

SELECTED PUBLICATIONS

- Czarna A, Berndt A, Singh HR, Grudziecki A, Ladurner A, Timinszky G, Kramer A, **Wolf E**. Structures of *Drosophila* Cryptochrome and mouse Cryptochrome1 provide insight into circadian function. *Cell* **2013**, 153, 1394-405.
- Schmalen I, Reischl S, Wallach T, Klemz R, Grudziecki A, Prabu JR, Benda C, Kramer A, **Wolf E**. Interaction of circadian clock proteins CRY1 and PER2 is modulated by zinc binding and disulfide bond formation. *Cell* **2014**, 157, 1203-1215. Featured as Research Highlight in *Nature Chemical Biology* **2014**, 10, 484.
- Witosch J, **Wolf E**, Mizuno N. Architecture and ssDNA interaction of the Timeless-Tipin-RPA complex. *Nucleic Acids Research* **2014**, 42, 12912-12927.

Frederik Wurm

MPI FOR POLYMER RESEARCH

MEMBER OF MAINZ SINCE 11/12

AREA OF RESEARCH

The "Functional Polymers" group at the MPI-P works between disciplines: from (in)organic and polymer chemistry over state-of-the art polymer characterization to polymerization kinetics. The development of novel degradable polymers is our focus. The combination of precision polymer synthesis and colloidal formulations produces materials for drug delivery, agriculture, adhesives, and flame-retardants. With living polymerization methods and tailored monomer design materials properties can be precisely controlled to control the blood interactions of nanocarriers ("stealth effect") or the degradation profile of non-toxic flame-retardants. The design of novel stimuli-responsive materials, surfactants, or the precise degradation of (phospho)esters are the basis for our materials portfolio.

SELECTED PUBLICATIONS

- Becker G, Ackermann L-M, Schechtel E, Klapper M, Tremel W, **Wurm FR**. Joining Two Natural Motifs: Catechol-Containing Poly(phosphoester)s. *Biomacromolecules* **2017**, 18, 767-777.
- Wolf T, Rheinberger T, Simon J, **Wurm FR**. Reversible Self-Assembly of Degradable Polymersomes with Upper Critical Solution Temperature in Water. *J. Am. Chem. Soc.* **2017** 139, 11064-11072.
- Schöttler S, Becker G, Winzen S, Steinbach T, Mohr K, Landfester K, Mailänder V, **Wurm FR**. Protein adsorption is required for stealth effect of poly(ethylene glycol)- and poly(phosphoester)-coated nanocarriers. *Nature Nanotechnology* **2016**, 11, 372-377.

SENIOR PRINCIPAL INVESTIGATORS

No.	Last Name, First Name	Current Institution	Member of MAINZ since
1.	Binder, Kurt	Institute of Physics, JGU	11/07
2.	Müllen, Klaus	Max Planck Institute for Polymer Research	11/07
3.	Spiess, Hans Wolfgang	Max Planck Institute for Polymer Research	11/07
4.	Wegner, Gerhard	Max Planck Institute for Polymer Research	11/07

EXTERNAL MEMBERS

No.	Last Name, First Name	Current Institution	Member of MAINZ since
1.	Letz, Martin	Schott AG, Mainz	02/14
2.	Mannstadt, Wolfgang	Schott AG, Mainz	08/11
3.	Parkin, Stuart	MPI für Mikrostrukturphysik, Halle	01/11

MAINZ VISITING PROFESSORS

No.	Last Name, First Name	Current Institution	Member of MAINZ since
1.	Foster, Adam	Aalto University, Finland	2017
2.	Jaksch, Dieter	University of Oxford, United Kingdom	2015
3.	Landau, David	University of Georgia, USA	2013
4.	Link, Stephan	Rice University, USA	2014
5.	Meijer, Bert	University of Eindhoven, Netherlands	2015
6.	Saitoh, Eiji	Tohoku University, Japan	2017
7.	Sessoli, Roberta	Universitá di Firenze, Italy	2017
8.	Slavin, Andrei	Oakland University, USA	2014
9.	Tatara, Gen	RIKEN Center for Emergent Matter Science, Japan	2016
10.	Valet, Thierry	In Silicio SAS, Aix en Provence, France	2015
11.	Zabel, Hartmut	Ruhr-University Bochum, Germany	2013

FORMER PRINCIPAL INVESTIGATORS

No.	Last Name, First Name	Current Institution	Member of MAINZ until
1.	Bach, Volker	Institute for Analysis and Algebra, TU Braunschweig	09/10
2.	Banhart, Florian	Institut de Physique et Chimie des Matériaux de Strasbourg, University of Strasbourg	12/07
3.	Bloch, Immanuel	Max Planck Institute of Quantum Optics	03/09
4.	Felser, Claudia	Max-Planck-Institut für Chemische Physik fester Stoffe	04/14
5.	Janshoff, Andreas	Institute for Physical Chemistry, Georg August University Göttingen	12/08
6.	Knoll, Wolfgang	Austrian Institute of Technology GmbH	07/08
7.	Kühne, Thomas	Institut für Leichtbau mit Hybridsystemen, Universität Paderborn	11/14
8.	Kühnle, Angelika	Fakultät für Chemie / Physikalische Chemie I, Universität Bielefeld	10/17
9.	Schmidt, Manfred	Institute of Physical Chemistry, JGU	12/15
10.	Sirker, Jesko	Department of Physics and Astronomy, University of Manitoba	02/14

FORMER ASSOCIATED AND EXTERNAL MEMBERS

No.	Last Name, First Name	Current Institution	Member of MAINZ until
1.	Anglin, James R.	Department of Physics, TU Kaiserslautern	12/15
2.	Balke, Benjamin	Institut für Materialwissenschaft - Chemische Materialsynthese, Universität Stuttgart	06/17
3.	Baumgarten, Martin	Max Planck Institute for Polymer Research	12/12
4.	Blaum, Klaus	Max Planck Institute for Nuclear Physics	07/08
5.	Blümer, Nils	Rechenzentrum, Katholische Universität Eichstätt-Ingolstadt	10/12
6.	Decker, Heinz	Institute of Molecular Biophysics, JGU	06/14

FORMER ASSOCIATED AND EXTERNAL MEMBERS

No.	Last Name, First Name	Current Institution	Member of MAINZ until
7.	del Campo, Aránzazu	INM Leibniz Institute for New Materials, Saarbrücken	08/15
8.	Deserno, Markus	Department of Physics, Carnegie Mellon University	12/07
9.	Drese, Klaus	Institut für Sensor- und Aktortechnik, Hochschule Coburg	09/16
10.	Fecher, Gerhard	Max-Planck-Institut für Chemische Physik fester Stoffe	10/12
11.	Hoffmann-Röder, Anja	Faculty for Chemistry and Pharmacy, LMU München	05/09
12.	Hübner, Wolfgang	Department of Physics, TU Kaiserslautern	10/12
13.	Köhn, Andreas	Institute for Theoretical Chemistry, University of Stuttgart	03/14
14.	Kuhr, Stefan	Department of Physics, University of Strathclyde	08/09
15.	Markl, Jürgen	Institute of Molecular Physiology, JGU	10/12
16.	Maskos, Michael	Fraunhofer Institute for Microengineering and Microsystems IMM, Mainz	05/09
17.	Mathias, Stefan	Physikalisches Institut, Georg August University Göttingen	03/15
18.	Oettel, Martin	Institut für Angewandte Physik, Eberhard Karls Universität Tübingen	10/12
19.	Paul, Wolfgang	Institute of Physics, Martin-Luther-Universität Halle-Wittenberg	06/09
20.	Rauschenbeutel, Arno	Vienna Center for Quantum Science and Technology	06/10
21.	Renz, Franz	Institute of Inorganic Chemistry, Gottfried Wilhelm Leibniz Universität Hannover	12/07
22.	Schärtl, Wolfgang	Institute of Physical Chemistry, JGU	10/12
23.	Schilling, Rolf	Institute of Physics, JGU	10/12
24.	Schilling, Tanja	Institute of Physics, Universität Freiburg	12/09
25.	van Dongen, Peter G.J.	Institute of Physics, JGU	10/12
26.	Weigel, Martin	Applied Mathematics Research Centre, Coventry University	11/10

DOCTORAL STUDENTS CURRENT DOCTORAL STUDENTS (INCLUDING GUEST PHD STUDENTS)

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
1	Aeschlimann, Simon	Kühnle	05/17 - now
2	Athanasopoulou, Angeliki	Rentschler	03/16 - now
3	Baals, Christian	Ott	05/16 - now
4	Bauer, Marius	Basché	07/16 - now
5	Bauer, Tobias	Barz	11/17 - now
6	Bause, Marius	Kremer	04/17 - now
7	Beck, Simone	Zentel	06/15 - now
8	Beil, Sebastian	Waldvogel	02/16 - now
9	Blankenburg, Jan	Frey	05/16 - now
10	Böttcher, Marie	Sinova	03/17 - now
11	Braatz, Marie-Luise	Kläui	07/15 - now
12	Campo, Matteo	Speck	01/16 - now
13	Chopra, Uday	Sinova	05/17 - now
14	Cramer, Joel	Kläui	07/15 - now
15	da Rosa Rodrigues, Davi	Everschor-Sitte	09/17 - now
16	Danner, Ann-Kathrin	Frey	01/16 - now
17	De Kruijff, Goswinus	Waldvogel	02/16 - now
18	Ding, Shilei	Kläui	10/17 - now
19	Dreier, Lisa	Bonn	07/15 - now
20	Emmerich, Sebastian	Aeschlimann	03/16 - now

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
21	Filianina, Mariia	Kläui	11/16 - now
22	Fischer, Andreas	Speck	03/17 - now
23	Fischer, Tobias	Hillebrands	04/16 - now
24	Förster, Benjamin	Sönnichsen	09/15 - now
25	Gamer, Christoph	Rentschler	07/15 - now
26	Grigorev, Vladimir	Demsar	04/17 - now
27	Grune, Eduard	Frey	05/16 - now
28	Haag, Florian	Stadtmüller	03/17 - now
29	Haller, Andreas	Rizzi	02/18 - now
30	Heidt, Sabrina	Palberg	11/15 - now
31	Heinz, Björn	Chumak	02/18 - now
32	Heinz, Sven	Jakob	11/16 - now
33	Hofherr, Moritz	Aeschlimann	01/15 - now
34	Jangizehi, Amir	Seiffert	02/17 - now
35	Jia, Xiaoyu	Bonn	04/17 - now
36	Jung, Fabian	Paulsen	09/15 - now
37	Jung, Gerhard	Schmid	05/16 - now
38	Kerber, Nico	Kläui	11/17 - now
39	Koß, Peter	Binder	09/15 - now
40	Krewer, Keno	Turchinovich	05/16 - now

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
41	Krishnan, Rao Shruthi	Wolf	10/16 - now
42	Landowski, Alexander	Widera	12/14 - now
43	Letscher, Fabian	Fleischhauer	10/14 - now
44	Leukel, Sebastian	Tremel	03/16 - now
45	Lewe, Vanessa	Besenius	03/16 - now
46	Linker, Olga	Frey	11/16 - now
47	Litzius, Kai	Kläui	12/13 - now
48	Markwart, Jens	Wurm	04/17 - now
49	Mars, Julian	Mezger	01/16 - now
50	McKeever, Benjamin	Everschor-Sitte	12/16 - now
51	Nagler, Benjamin	Widera	06/17 - now
52	Nenno, Dennis	Schneider	07/16 - now
53	Otto, Sven	Heinze	11/15 - now
54	Petersen, Niels	Windpassinger	12/14 - now
55	Pfeiffer, Alexander	Kläui	09/15 - now
56	Prychynenko, Diana	Sinova	03/15 - now
57	Rastogi, Alankar	Bonn	11/17 - now
58	Ross, Andrew	Kläui	03/17 - now
59	Sadadi, Hoofar	Seiffert	09/17 - now
60	Sapozhnik, Alexey	Elmers	11/14 - now
61	Schäfer, Timo	Schmid	07/16 - now
62	Schmoll, Philipp	Orús	10/16 - now
63	Selt, Maximilian	Waldvogel	12/16 - now
64	Sonnenschein, Christoph	Müllen	01/15 - now
65	Thomas, Oliver	Ott	11/14 - now
66	Tries, Alexander	Kläui	09/17 - now
67	Tüting, Laura	Sönnichsen	07/14 - now
68	Velkov, Hristo	Sinova	07/14 - now
69	von Tiedemann, Philipp	Frey	09/17 - now
70	Wagner, Jessica	Weil	04/17 - now
71	Wei, Li	Windpassinger	10/17 - now
72	Wu, Libin	Besenius	09/17 - now
73	Ye, Weixiang	Sönnichsen	09/15 - now
74	Zaporozhchenko, Anna	Schönhense	01/15 - now
75	Zhou, Zhou	Kläui	09/17 - now

MAINZ AWARDS

MAINZ Award 2009	Frederik Wurm
MAINZ Award 2009	Daniel Kessler
MAINZ Award 2010	Matthias Junk
MAINZ Award 2010	Daniel Wilms
MAINZ Award 2011	Christina Birkel
MAINZ Award 2011	Christian Ohm
MAINZ Award 2012	Anna Maria Hofmann
MAINZ Award 2012	Christine Elisabeth Tonhauser
MAINZ Award 2013	Leonie Mück
MAINZ Award 2013	Christoph Schüll
MAINZ Award 2014	Markus Bannwarth
MAINZ Award 2014	Isabel Schick
MAINZ Award 2015	Sven Bach
MAINZ Award 2015	Antonia Statt
MAINZ Award 2016	Jana Herzberger
MAINZ Award 2016	Lalita Shaki Uribe Ordonez

DOCTORAL STUDENTS ALUMNI (INCLUDING GUEST PHD STUDENTS)

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
1	Afshar, Yaser	Schmid	04/11 - 03/12
2	Agrawal, Milan	Hillebrands	11/10 - 05/14
3	Al Bahri, Mohammed	Kläui	01/17 - 09/17
4	Andraschko, Felix	Sirker	12/12 - 10/14
5	Andres, Markus	Eggert	05/07 - 04/08
6	Anyfantakis, Manos	Butt	02/09 - 01/10
7	Ayed, Cyrine	Landfester	06/17 - 12/17
8	Bach, Sven	Tremel	05/13 - 12/15
9	Baldrati, Lorenzo	Kläui	11/16 - 04/17
10	Bannwarth, Markus	Landfester	02/11 - 02/14
11	Bantz, Christoph	Schmidt	01/08 - 12/09
12	Barz, Matthias	Zentel	04/07 - 12/08
13	Battagliarin, Glaucho	Müllen	02/09 - 01/10
14	Becker, Greta	Wurm	07/14 - 09/17
15	Beckmann, Dirk	Müllen	01/08 - 07/09
16	Beyer, Patrick	Zentel	01/07 - 07/07
17	Birkel, Alexander	Tremel	06/08 - 10/10
18	Birkel, Christina	Tremel	08/08 - 11/10
19	Bittner, Denis	Rentschler	11/15 - 03/18
20	Bohle, Anne	Spiess	02/08 - 01/10
21	Böhm, Paul	Frey	11/09 - 07/12
22	Bozhko, Dmytro	Hillebrands	03/14 - 01/17
23	Brächer, Thomas	Hillebrands	11/11 - 02/14
24	Braun, Hubertus	Elmers	04/12 - 02/15
25	Bühler, Jasmin	Schmidt	08/11 - 06/13
26	Burkhardt, Björn	Kläui	07/12 - 10/12
27	Büttner, Felix	Kläui	11/11 - 08/13
28	Calcavecchia, Francesco	Kühne	11/10 - 07/14
29	Chernenkaya, Alisa	Schönhense	09/13 - 04/16
30	Cho, Mark Don	Müllen	08/08 - 06/10
31	Choi, Hyeok-Cheol	Kläui	12/12 - 05/13
32	Coustet, Marcos	del Campo	08/10 - 11/10
33	Cui, Jizhai	Jourdan	06/14 - 09/14
34	Dallos, Timea	Müllen	04/08 - 03/09
35	De Lucia, Andrea	Jakob	10/13 - 03/17
36	Diehl, Anna-Maria	Rentschler	09/07 - 09/10
37	Diehl, Marcel	Rentschler	06/12 - 06/15
38	Diehl, Sandra	Elmers	04/11 - 07/14
39	Dietzsch, Michael	Tremel	01/11 - 03/14
40	Dockter, Christoph	Paulsen	12/07 - 08/09
41	Dong, Bowen	Kläui	07/15 - 12/16
42	Duro Castano, Aroa	Zentel	04/11 - 07/11
43	Eben, Kerstin	Landfester	07/11 - 07/14
44	Ebert, Marlon	Binder	11/09 - 12/12

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
45	Eichhorn, Tobias	Jakob	10/08 - 09/11
46	Fantini, Andrea	Parkin	01/12 - 07/15
47	Fassbender, Birgit	Spiess	01/08 - 12/09
48	Feist, Florian	Basché	06/06 - 05/09
49	Ferrante, Yari	Aeschlimann	05/13 - 04/16
50	Filevich, Oscar	del Campo	09/09 - 02/10
51	Fine, Tamir	Janshoff	01/08 - 01/09
52	Finizio, Simone	Kläui	01/12 - 07/15
53	Fischer, Anna	Frey	09/10 - 12/11
54	Fischer, Janina	Kreiter	06/09 - 05/10
55	Fischer, Tobias	Basché	07/13 - 02/16
56	Fleischhaker, Friederike	Zentel	08/06 - 05/07
57	Fokina, Ana	Zentel	05/13 - 02/16
58	Fritz, Dominik	Kremer	11/06 - 10/09
59	Gan, Weiliang	Kläui	11/17 - 02/18
60	Gan, Yanjie	Schmidt	05/08 - 10/08
61	Geidel, Christian	Müllen	01/09 - 07/10
62	Gieshoff, Tile	Waldvogel	05/15 - 09/17
63	Gilz, Lukas	Anglin	04/10 - 11/12
64	Gojzewski, Hubert	Butt	10/08 - 07/09
65	Golde, Sebastian	Palberg	09/12 - 09/15
66	Golling, Florian	Müllen	08/11 - 08/14
67	Graf, Tanja	Felser	11/08 - 05/11
68	Grusdt, Fabian	Fleischhauer	09/12 - 04/15
69	Gundlach, Kristina	Paulsen	03/08 - 06/10

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
70	Gupta, Jyotsana	Bubeck	05/09 - 08/10
71	Haberkorn, Niko	Zentel	06/08 - 05/10
72	Hadji, Rashid	Butt	01/08 - 02/08
73	Happ, Peter	Rentschler	02/11 - 04/14
74	Haschick, Robert	Müllen	02/08 - 07/09
75	Hauke, Christopher	Kühnle	03/11 - 03/13
76	Heinrich, Christophe	Tremel	04/11 - 07/14
77	Heller, Philipp	Zentel	06/14 - 02/17
78	Herbort, Christian	Adrian	10/07 - 07/10
79	Herold, Sebastian	Waldvogel	01/14 - 04/17
80	Herrera Sanchez, Isaac	Zentel	09/08 - 02/09
81	Herzberger, Jana	Frey	12/13 - 12/16
82	Heuser, Johannes	Schmid	02/13 - 05/15
83	Hild, Kerstin	Elmers	01/09 - 01/11
84	Hilf, Jeanette	Frey	10/11 - 03/14
85	Hilf, Stefan	Frey	07/07 - 05/09
86	Hofmann, Anna Maria	Frey	11/08 - 11/11
87	Hoshyargar, Faegheh	Tremel	05/09 - 05/10
88	Imada, Yasushi	Waldvogel	09/17 - 02/18
89	Jagau, Thomas-Christian	Gauss	02/11 - 06/13
90	Jakap, Arpad	Schmidt	03/09 - 12/09
91	Jakobi, Eberhard	Blümer	11/07 - 05/10
92	Jakobs, Sebastian	Aeschlimann	12/10 - 02/15
93	Jaskiewicz, Karmena	Butt	05/09 - 12/09
94	Jenkins, Catherine	Felser	05/09 - 04/12

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
95	Jimenez-Garcia, Lucia	Müllen	01/08 - 04/11
96	Jünemann, Johannes	Rizzi	03/14 - 05/17
97	Jung, Martin	Rentschler	06/07 - 01/09
98	Jung, Verena	Felser	03/07 - 02/09
99	Junk, Matthias	Spiess	10/07 - 05/10
100	Kamimoto, Natsuyo	Waldvogel	04/14 - 10/14
101	Kamm, Valentin	Laquai	08/09 - 07/10
102	Kehlberger, Andreas	Kläui	01/12 - 05/15
103	Kessler, Daniel	Zentel	03/09 - 08/09
104	Khalavka, Yuriy	Sönnichsen	09/07 - 08/10
105	Kieslich, Gregor	Tremel	10/10 - 06/13
106	Kins, Christoph	Spiess	12/10 - 05/12
107	Klanke, Julia	Rentschler	09/11 - 05/13
108	Klein, Rebecca	Frey	12/12 - 09/15
109	Klinker, Kristina	Zentel	05/15 - 07/17
110	Klos, Johannes	Zentel	11/08 - 10/10
111	Kocun, Marta	Janshoff	01/08 - 01/09
112	Köhler, Stephan	Schmid	01/12 - 12/14
113	Koll, Dominik	Tremel	11/08 - 10/11
114	Koll, Kerstin	Tremel	01/09 - 06/11
115	Köller, Tetyana	Palberg	05/07 - 05/10
116	Komar, Paulina	Jakob	01/14 - 11/16
117	Kömmelt, Sabine	Schmidt	04/08 - 07/08
118	König, Markus	Kläui	07/12 - 10/12
119	Kozina, Xeniya	Felser	11/08 - 01/12

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
120	Krautscheid, Pascal	Kläui	09/13 - 09/15
121	Kreis, Karsten	Kremer	02/13 - 08/16
122	Kreitner, Christoph	Heinze	05/13 - 06/16
123	Krez, Julia	Felser	08/11 - 06/14
124	Krohne, Korinna	Maskos	03/08 - 12/10
125	Kühn, Frauke	Schmidt	01/08 - 10/10
126	Kulaga, Emilia	Butt	05/09 - 11/09
127	Kutnyakhov, Dmytro	Elmers	09/07 - 08/10
128	Labouvie, Ralf	Ott	12/10 - 11/13
129	Lange, Birger	Zentel	01/07 - 06/07
130	Langhammer, Eva-Maria	Frey	09/13 - 04/16
131	Lazarra, Thomas	Knoll	01/08 - 12/08
132	Lechmann, Maria	Butt	08/07 - 07/09
133	Leibig, Daniel	Frey	06/14 - 10/16
134	Lenz, Thomas	Blom	07/14 - 01/17
135	Li, Ai-Min	Rentschler	10/14 - 03/18
136	Li, Yi	Schmidt	08/07 - 02/10
137	Liaqat, Faroha	Tremel	06/10 - 06/11
138	Lindner, Robert	Kühnle	12/12 - 04/15
139	Lo Conte, Roberto	Kläui	08/12 - 10/15
140	Loges, Niklas	Tremel	05/07 - 02/09
141	Lotz, Alex	Förch	10/09 - 09/10
142	Ludwig, Christian	Gruhn	07/08 - 06/11
143	Luis, Duque	Förch	10/09 - 09/10
144	Luty-Blocho, Magdalena	Maskos	01/09 - 03/10

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
145	Luz, Gisela	del Campo	09/10 - 12/10
146	Makowski, Marcin	Butt	10/09 - 10/10
147	Marsico, Filippo	Wurm	02/12 - 07/14
148	Mauer, Ralf	Laquai	01/09 - 07/10
149	Mawas, Mohammed-Assaad	Kläui	07/12 - 10/12
150	Mayer, Daniel	Widera	12/14 - 07/17
151	Medina Hernando, Stefan	Schmid	07/10 - 06/13
152	Medina, Angel	Schmidt	10/08 - 09/11
153	Medyanyk, Kateryna	Schönhense	10/08 - 01/11
154	Meister, Michael	Laquai	03/09 - 07/10
155	Melnyk, Anton	Kremer	07/13 - 06/16
156	Meshcheriakova, Olga	Felser	11/10 - 02/14
157	Meuer, Stefan	Zentel	05/06 - 11/08
158	Minoia, Andrea	Kremer	12/07 - 11/08
159	Mix, Christian	Jakob	02/11 - 10/13
160	Moderegger, Dorothea	Zentel	01/10 - 06/12
161	Moers, Christian	Frey	11/10 - 02/14
162	Mück, Leonie	Gauss	01/10 - 12/12
163	Müller, Sophie	Frey	08/11 - 10/14
164	Müller, Waltraut	Maskos	01/07 - 11/09
165	Muth, Dominik	Fleischhauer	09/09 - 04/12
166	Naghavi, Seyed	Felser	11/07 - 12/10
167	Nardi Tironi, Catarina	Müllen	02/13 - 12/15
168	Natalello, Adrian	Frey	01/12 - 06/14
169	Neumann, Timo	Hillebrands	04/06 - 12/09
170	Nguyen, Thi Huong	Butt	10/09 - 09/10
171	Nicolescu, Alina	Spiess	02/11 - 04/11
172	Niun Tun, Thet	Köper	08/08 - 11/09
173	Noskov, Sergey	Maskos	02/07 - 01/10
174	Obermeier, Boris	Frey	12/07 - 11/10
175	Ohm, Christian	Zentel	05/08 - 12/10
176	Opper, Kathleen	Müllen	11/08 - 03/09
177	Oschmann, Bernd	Zentel	02/13 - 08/15
178	Pang, Shuping	Müllen	01/08 - 12/08
179	Paroor, Hasha Mohan	Butt	11/08 - 11/09
180	Passarello, Donata	Hillebrands	09/12 - 12/15
181	Plenk, Christian	Rentschler	06/11 - 06/14
182	Pohlit, Hannah	Frey	02/13 - 03/16
183	Poma, Adolfo	Delle Site	12/07 - 11/08
184	Prasad, Janak	Sönnichsen	10/10 - 10/13
185	Preis, Jasmin	Frey	05/09 - 07/12
186	Raccis, Riccardo	Butt	10/08 - 12/09
187	Rahe, Philipp	Kühnle	08/10 - 10/10
188	Reichert, Peter	Butt	01/11 - 01/14
189	Reuter, Frank	Rentschler	08/08 - 10/10
190	Richter, Nils	Kläui	01/15 - 04/17
191	Rieger, Florian	Schmid	09/12 - 08/15
192	Rix, Stephan	Felser	10/08 - 06/11
193	Rost, Daniel	van Dongen	01/13 - 06/15
194	Roth, Marcel	Butt	05/08 - 12/11

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
195	Roth, Meike	Spiess	08/08 - 07/10
196	Roth, Peter	Zentel	11/08 - 08/09
197	Rühle, Victor	Kremer	10/08 - 09/10
198	Ruthard, Christian	Gröhn	01/08 - 01/11
199	Saha, Sanjib	Schmidt	09/08 - 08/09
200	Sahl, Mike	Schmidt	04/08 - 01/11
201	Schaefer, Erik	Elmers	12/13 - 11/16
202	Schattling, Philipp	Zentel	05/11 - 05/13
203	Schechtel, Eugen	Tremel	12/14 - 08/16
204	Scheibe, Patrick	Zentel	08/08 - 12/09
205	Scherer, Christian	Maskos	12/06 - 09/09
206	Scherer, Christoph	Letz	09/11 - 10/14
207	Schick, Isabel	Tremel	01/12 - 10/14
208	Schladt, Thomas	Tremel	07/08 - 11/10
209	Schmidt, Felix	Widera	06/14 - 02/17
210	Schneider, Imke	Eggert	04/06 - 08/10
211	Schömer, Martina	Frey	10/09 - 09/12
212	Schoop, Leslie	Felser	04/11 - 03/14
213	Schüll, Christoph	Frey	07/10 - 05/13
214	Schultheiß, Helmut	Hillebrands	07/07 - 06/10
215	Schultheiß, Katrin	Hillebrands	06/10 - 01/14
216	Schwab, Matthias	Müllen	01/09 - 01/12
217	Schwall, Michael	Felser	08/11 - 11/12
218	Schwartz, Veronique	Förch	10/09 - 09/10
219	Sebastian, Thomas	Hillebrands	03/10 - 01/13
220	Sengupta, Esha	Berger/Butt	10/09 - 09/10
221	Serrano, Cristina	del Campo	01/11 - 04/11
222	Seyler, Helga	Frey	03/07 - 12/09
223	Shen, Yi	Frey	01/08 - 12/09
224	Simon, Sascha	Müllen	11/08 - 11/10
225	Slaughter, Liane	Sönnichsen	08/11 - 03/12
226	Smith, Kyle	Sönnichsen	08/15 - 12/15
227	Söffing, Stefan	Eggert	06/09 - 02/12
228	Söngen, Hagen	Kühnle	06/15 - 12/17
229	Spirin, Leonid	Binder	09/07 - 10/10
230	Staab, Maximilian	Schönhense	06/12 - 10/16
231	Statt, Antonia	Binder	12/13 - 09/15
232	Steidl, Lorenz	Zentel	11/08 - 12/11
233	Steinbach, Tobias	Wurm	01/12 - 01/15
234	Strauch, Thomas	Paul	02/06 - 07/09
235	Su, Qi	Müllen	01/08 - 12/08
236	Tarantola, Marco	Janshoff	09/07 - 01/10
237	Thielen, Jörg	Landfester	12/08 - 12/10
238	Thielen, Philip	Aeschlimann	01/12 - 11/14
239	Tonhauser, Christine	Frey	12/09 - 06/12
240	Tonhauser, Christoph	Frey	09/09 - 07/12
241	Trefz, Benjamin	Virnau	07/13 - 05/16
242	Trotzky, Stefan	Bloch	05/07 - 05/10
243	Türp, David	Müllen	10/08 - 10/11
244	Uribe Ordonez, Lalita	Gauss	10/13 - 09/16

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
245	Utech, Stefanie	Maskos	03/08 - 12/10
246	Vehoff, Thorsten	Kremer	06/08 - 05/10
247	Vianna, Sulivan	Butt	02/09 - 04/10
248	Vice, Bradley	Förch	09/08 - 04/09
249	Vogel, Nicolas	Landfester	09/08 - 06/11
250	Vollmar, Svenja	Schneider	05/13 - 04/15
251	Wang, Hai	Bonn	06/12 - 06/15
252	Wang, Long	Landfester	05/09 - 04/10
253	Wang, Zi	Landfester	11/14 - 01/16
254	Weber, Stefan	Butt	11/08 - 10/10
255	Weldert, Kai	Tremel	05/13 - 10/15
256	Weller, Désirée	Schmidt	04/11 - 11/13
257	Wenzlik, Daniel	Zentel	04/10 - 04/13
258	Werre, Mathias	Frey	08/10 - 06/13
259	Wie, Yuing	Spiess	08/08 - 10/08
260	Will, Sebastian	Bloch	10/06 - 07/09
261	Willerich, Immanuel	Schmidt	07/08 - 07/11
262	Wilms, Daniel	Frey	04/07 - 03/10
263	Wilms, Dorothea	Binder	10/10 - 01/13
264	Wilms, Valerie	Frey	10/09 - 09/12
265	Wiss, Kerstin	Zentel	07/07 - 06/10
266	Wolf, Cornel	Landfester	04/09 - 12/10
267	Wolf, Florian	Frey	03/07 - 12/09
268	Wolf, Stephan	Tremel	04/07 - 06/09
269	Wu, Si	Bubeck	11/09 - 03/10

No.	Last Name, First Name	First Supervisor	Member of MAINZ from - to
270	Wurm, Frederik	Frey	04/07 - 05/09
271	Yang, Can	Landfester	03/17 - 05/17
272	Yella, Aswani	Tremel	04/06 - 03/09
273	Yordanov, Stoyan	Butt	10/08 - 12/09
274	Yu, Yaming	Frey	03/09 - 08/09
275	Zakerin, Marjan	Gutmann	10/09 - 10/10
276	Zeier, Wolfgang	Tremel	10/10 - 06/13
277	Zerfaß, Christian	Paulsen	12/11 - 04/15
278	Zhang, Shuangshuang	Schmid	09/15 - 08/16
279	Zhou, Zhengliu	Jakob	06/14 - 09/14
280	Zhu, Yao-Hui	Schneider	04/06 - 07/09
281	Zins, Inga	Sönnichsen	10/07 - 09/10
282	Zorn, Matthias	Zentel	07/08 - 03/10
283	zur Borg, Lisa	Zentel	06/11 - 01/13

MAINZ COORDINATION OFFICE

Michael Fuchs

GENERAL MANAGER

MEMBER OF MAINZ SINCE 01/15

Christine Haunhorst

TRAINING THROUGH RESEARCH, RECRUITING, PUBLIC RELATIONS

MEMBER OF MAINZ SINCE 06/17

Katrin Klauer

TRAINING FOR LIFE, MENTORING, ALUMNI

MEMBER OF MAINZ SINCE 01/17

Snjezana Teljega

WELCOME CENTER

MEMBER OF MAINZ SINCE 04/11

Petra Graffert

ADMINISTRATIVE ASSISTANT

MEMBER OF MAINZ SINCE 06/12

Nicole Plenz

ADMINISTRATIVE ASSISTANT

MEMBER OF MAINZ SINCE 06/14

Alice Alexander

ADMINISTRATIVE ASSISTANT

MEMBER OF MAINZ SINCE 06/16

Anna-Maria Helmer

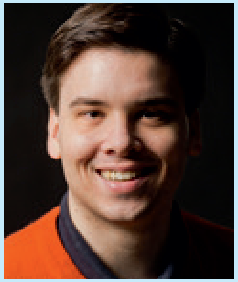
STUDENT ASSISTANT

MEMBER OF MAINZ SINCE 08/13

Christin Spira

STUDENT ASSISTANT

MEMBER OF MAINZ SINCE 03/14



Felix Janßen

STUDENT ASSISTANT

MEMBER OF MAINZ SINCE 06/16

CONTACT

Graduate School Materials Science in Mainz (MAINZ)
Johannes Gutenberg University Mainz
Staudingerweg 9
55128 Mainz
Germany

Tel. +49 (0)6131 39 26 984
Fax. +49 (0)6131 39 26 983
mainz@uni-mainz.de
www.mainz.uni-mainz.de

IMPRINT

PUBLISHER
Graduate School Materials Science in Mainz (MAINZ)

RESPONSIBLE FOR CONTENTS
Prof. Dr. Mathias Kläui (MAINZ Director), Dr. Michael Fuchs (MAINZ General Manager)

CONCEPT
Dr. Mark Bajohrs, Dr. Michael Fuchs, Dr. Christine Haunhorst (Graduate School MAINZ)
Petra Giegerich (Press and Public Relations, JGU)

EDITOR
Dr. Christine Haunhorst (Graduate School MAINZ)

IMPLEMENTATION AND PREPRESS
cala media GbR, Mainz

PHOTOS
Eric Lichtenscheidt (all except 10-11 and 46-47)
Private (10-11)
Markus Püttmann (46-47)

FUNDING

DFG

Rheinland-Pfalz
MINISTERIUM
FÜR BILDUNG, WISSENSCHAFT,
WEITERBILDUNG UND KULTUR