


Excellence Initiative
at a Glance

The Programme by the German Federal and State Governments
To Promote Top-level Research at Universities

Who – Where – What
Graduate Schools – Clusters of Excellence – Institutional Strategies

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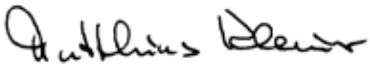


Prof. Dr.- Ing. Matthias Kleiner
President of the
Deutsche Forschungsgemeinschaft (DFG)
German Research Foundation

The Excellence Initiative – A Success Story

This is the third edition of our brochure "Excellence Initiative at a Glance" in just over two and a half years, with the previous two editions of more than 25,000 copies being out of print. In its own way, this also shows what a success story the Excellence Initiative is.

There is surely no other programme in previous decades that has changed the German university and science system so profoundly and so successfully as the Excellence Initiative. To strengthen research at Germany's universities by organising a competition and to raise its visibility internationally – such were the goals set by politics and science when the programme was launched in 2005. These were ambitious goals indeed, all the more so, as it meant a departure from a long-cherished conception that all universities are equal and should be treated equally. Instead, the Excellence Initiative chose a path of inequality and of funding elites.

What happened then admittedly exceeded even the most daring expectations, including those of the Deutsche Forschungsgemeinschaft (German Research Foundation) and of the Wissenschaftsrat (German Council of Science and Humanities), both of which had run the competition. The first phase already shook up the German universities, who in two rounds submitted an impressive range of forward-looking research concepts. And by doing so, it was precisely the universities that had been dismissed as notoriously inflexible which proved particularly innovative.

At the end of the two rounds, in October 2006 and October 2007, science and politics together selected 85 institutions: 39 Graduate Schools for the training of young, top-flight scientists and researchers; 37 Clusters of Excellence, in which universities, non-university research institutions, and often

business and industry work on particularly promising topics of the future; finally, nine so-called Institutional Strategies that universities draw up to advance their development as a whole.

This brochure now presents all 85 institutions of the Excellence Initiative, each with its own page. It then provides information on the main research topics, on the participating universities and other institutions, along with the contact details of the key people involved. Besides the scientists and researchers, the aim of this new edition is, above all, for decision-makers from politics, business and industry, and society, for representatives of the media, and last, but not least, the general public to gain a first impression of the diversity of ideas in and the future viability of university research. For the Excellence Initiative is not only changing the German science and research system – it is actually driving the country forward as a whole. To date it has created well over 4,000 new jobs in research and science, it is promoting our specialists, experts and executives of tomorrow, and it is contributing to innovation in business and industry. And it shows how science supports society.

It was no surprise therefore when in 2009 the federal and state governments decided that the Excellence Initiative should be continued – and with increased financial support. This is just what science had demanded from politicians – and that they answered the call in the midst of the most serious financial and economic crisis of recent decades cannot be too highly praised.

The second phase of the Excellence Initiative which this set in motion has now been in full swing since 2010. The universities applied for the new funding with 227 new projects. In March 2011, shortly before publication of this latest edition, the Joint Commission of the DFG and the German Council of Science and Humanities selected 59 of these new proposals for the final round, which have also been listed at the end of this brochure. The new proposals that were successful in the preliminary round will go into a competition with the institutions already being funded, with the result being decided in June 2012.

So far, this much is clear: this competition will be as exciting as it is hard-fought. And whatever the result, there is sure to be at least one winner: science in Germany. Thanks to the Excellence Initiative, in a short period of time it has already made huge gains in strength and international regard – and will continue to do so in years to come.

The Initiative

The idea was developed by politics and science in Germany from 2004, and the decision was made by the federal and state governments in June 2005. The Initiative's goal is to strengthen cutting-edge research in Germany and to improve its international competitiveness. So, a competition was organised to select outstanding projects in three areas:

- Graduate Schools to promote young scientists and researchers
- Clusters of Excellence to promote cutting-edge research
- Institutional Strategies on projects to promote top-level research.

The competition was run by the DFG and the German Council of Science and Humanities. A total of 1.9 billion euros was made available by the Federal and State Governments to fund the selected projects.

The Graduate Schools

Graduate Schools aim to combine and improve the promotion of young scientists and researchers and to raise the profile of research. Highly qualified doctoral students are trained in these Schools that offer an excellent research environment.

Graduate Schools are grounded in a broad scientific environment, build on innovative questions, and are headed by proven scientists. Hence, they provide the ideal conditions for a doctorate, inspire the doctoral students' to identify with the respective campus, and altogether contribute to forming internationally competitive centres of science.

Under the Excellence Initiative, 39 Graduate Schools were selected to receive five years of funding, with each School receiving an average of one million euros per year.

The Clusters of Excellence

Clusters of Excellence concentrate and focus the research potential at university locations in Germany and, hence, strengthen their international visibility and competitiveness. Their policy is to engage in scientific networking and collaboration in research fields of particular promise for the future. Besides various university institutions, non-university research institutions and industrial partners also play a important role throughout the Clusters.

Clusters of Excellence have been conceived to contribute importantly to the respective university's strategic planning and to accelerate the process of setting thematic priorities at universities.

Under the Excellence Initiative, a total of 37 Clusters of Excellence receive funding over a period of five years, with each Cluster of Excellence receiving an average of 6.5 million euros per year.

The Institutional Strategies

Institutional Strategies aim to strengthen a university as a whole, so that it can compete successfully with the leading players in the international science market. An Institutional Strategy calls for a university to develop a long-term strategy on how it can consistently expand and enhance its cutting-edge research and improve the promotion of young scientists and researchers. This means identifying existing strengths and sharpening profiles in all fields.

To qualify for the third funding line, universities have to develop an exceptional Institutional Strategy and must, additionally, each have at least one Graduate School and one Cluster of Excellence.

Under the Excellence Initiative, a total of nine universities and their Institutional Strategies are funded for of five years, with each receiving up to 13.5 million euros per year.

The Selection Process

The first phase was held in two rounds: 2005/2006 and 2006/2007. Each round had a preliminary and a final round.

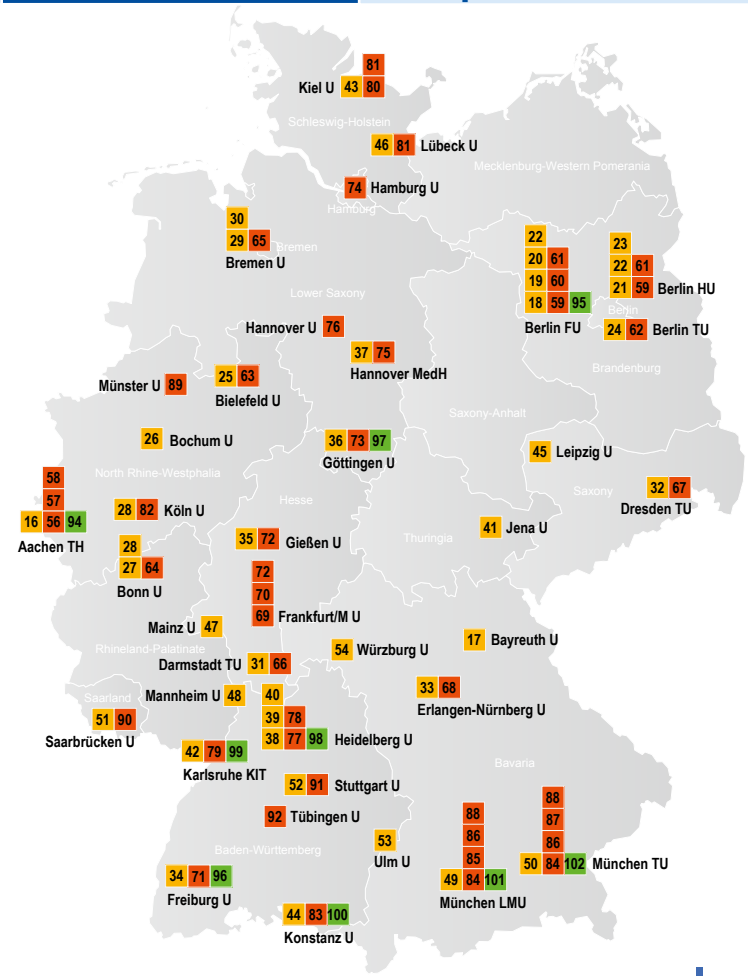
In the preliminary round universities submitted Draft Proposals. These were reviewed by internationally appointed panels of experts. The reviews for the Graduate Schools and the Clusters were discussed in the "Expert Commission" appointed by DFG; those for the Institutional Strategies in the "Strategic Commission" appointed by the German Council of Science and Humanities. Both formed a "Joint Commission" for the preliminary selection.

The universities chosen from this stage subsequently presented their full proposals. These were assessed in an identical procedure. The "Grants Committee" made up of Joint Commission and the Federal and State Ministers of Science and Research then selected the projects for funding.

The Decisions

The first round saw 319 Draft Proposals submitted by 74 universities. 90 drafts (39 Graduate Schools, 41 Clusters of Excellence, ten Institutional Strategies) were nominated for the final round. Of these 38 projects at 22 universities were selected for funding on 13 October 2006: 18 Graduate Schools, 17 Clusters of Excellence and three Institutional Strategies. They will be funded up to November 2011 with a total of 873 million euros.

305 Draft Proposals were received in the second round, of which 92 (44 Graduate Schools, 40 Clusters of Excellence, eight Institutional Strategies) reached the final round. A total of 47 projects at 28 universities were selected for funding on 19 October 2007: 21 Graduate Schools, 20 Clusters of Excellence and six Institutional Strategies. They will have received a good one billion euros in total by November 2012.



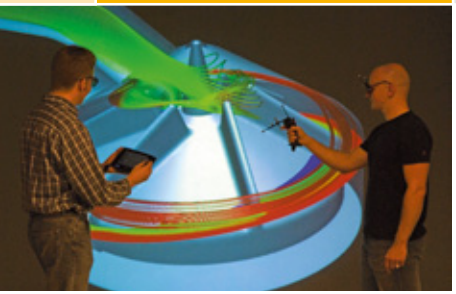
- Graduate Schools to promote young scientists and researchers
- Clusters of Excellence to promote cutting-edge research
- Institutional Strategies to promote top-level research

The numbers in the symbols indicate on which pages the projects can be found in this brochure.

Abbreviations:

FU = Freie Universität Berlin
HU = Humboldt University Berlin
KIT = Karlsruhe Institute of Technology
LMU = University of Munich
MedH = Medical School
TH = University of Technology
TU = Technical University
U = University

Current Graduate Schools



RWTH AACHEN UNIVERSITY

Aachen Institute for Advanced Studies in Computational Engineering Science (AICES)

Interdisciplinary support teams

Computational engineering plays a key role in process and product design, as well as in production planning. The AICES Graduate School builds on the existing activities in this field at the RWTH Aachen, such as the Centre for Computational Engineering Science. The Graduate School focuses on the analysis and synthesis of technical systems. The research is divided into three areas: application and modelling, mathematical and numerical methods, as well as computational tools and infrastructure. The doctoral students work on the use of innovative computational methods that cover model development and identification, model interaction on various scales, as well as the optimal design, regulation and operation of complex technical processes. Fields of application include materials sciences, process engineering, transport systems, electrical engineering, biomedical technology and engineering, and geosciences.

The participating institutions are:

- RWTH Aachen University (host institution)
- Research Centre Jülich
- Max Planck Institute for Iron Research, Düsseldorf

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Bayreuth International Graduate School of African Studies (BIGSAS)

Countering the brain drain in Africa

The Bayreuth International Graduate School of African Studies (BIGSAS) focuses centrally on cooperating with African and non-African young researchers and scientists. One of the Graduate School's goals is to establish a network between African universities and to strengthen cooperation with European institutions. In so doing, BIGSAS acts to counteract the scientific brain drain in Africa and to create the prerequisites for excellent doctoral training on site in Africa.

BIGSAS focuses on the research areas:

- Insecurity, innovation and a striving for order in Africa
- Culture, conceptualisation and communication in the languages, literatures and media of Africa
- Concepts and conflicts of development cooperation
- Dealing with precarious environmental changes and disasters in Africa.

Closely interlinked research and teaching, intensive support and advice services for doctoral students, and continual cross-faculty exchange on the Bayreuth Campus create the foundations for excellent doctoral training in the field of African studies.

The participating institutions are:

- University of Bayreuth (host institution)
- University Mohammed V-Agdal, Rabat/Morocco
- Moi University, Eldoret, Kenya
- Université d'Abomey-Calavi (UAC), Cotonou/Benin
- Eduardo Mondlane University, Maputo/Mozambique
- University of KwaZulu-Natal/South Africa

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Graduate School of North American Studies

A changing North America

Freedom and democracy are core values of American society. Since the founding of the United States, they have repeatedly acted as the driving force of social and cultural change. At the same time, they have marked the starting points for debates on what economic and social requirements are needed for their realisation and how freedom can best be protected: that is the internal perspective. The external view is accompanied, where necessary, by a violent export of democratic ideas and concepts. In the age of globalisation, with the collapse of the Soviet Union, which left the United States as the only superpower, and the events of 11 September 2001, this has intensified the argument between liberal and conservative forces in the United States over what exactly the concept of freedom is.

This development has far-reaching consequences for the USA's identity and also presents the academic study of North America, including Canada's situation, with new challenges. The Graduate School is therefore establishing a research context between domestic and foreign policy, business and industry, society, the media, art, culture and religion. The goal is to achieve a fundamental, historically-grounded understanding of the social change. Six subjects are involved: cultural and literary studies, history, political science, sociology, and economics and business administration.

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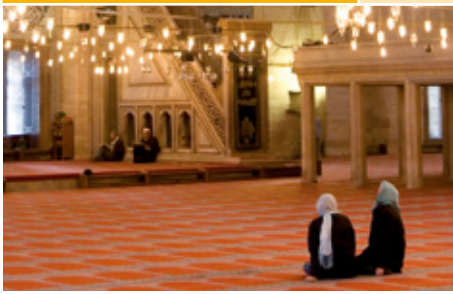

Muslim Cultures and Societies: Unity and Diversity

Multifaceted Islam

The preoccupation with Islam shapes the political sphere as well as public discourse, and not only in Germany. To meet the growing demand for experts, the Graduate School is training professionals from science and academia, the media, politics, as well as from fields of international cultural and economic cooperation.

The Graduate School does not understand Islam as a homogenous body that could or had to conflict with other civilisations. Rather the emphasis is on the inner diversity, the historical changeability and the global networks of predominantly Islamic cultures. Extending beyond the Middle East, the researchers include Africa, Central Asia, South Asia, and Southeast Asia, as well as the Muslim diaspora in Europe and North America. They examine the diversity of what Islam is understood to be, historically and in the present. This involves a combination of religious and legal aspects of Islam with identity-endowing factors like language, space, ethnicity, social situation, and gender. The Graduate School attaches particular attention to the history of relations between Muslims and non-Muslims.

The participating institutions are:

- Freie Universität Berlin (host institution)
- Institute for Asian and African Studies, Humboldt University Berlin
- Centre of Modern Oriental Studies, Berlin

Freie Universität Berlin

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Friedrich Schlegel Graduate School of Literary Studies

Literature in the cultures of the world

The Friedrich Schlegel Graduate School of Literary Studies supervises dissertations from the field of literary studies that deal with texts from the European, American, Arabic and Asian cultural area. The idea is for the doctoral students, inter alia, to combine comparative text, media and cultural approaches with theoretical questions and to identify connections between literary texts and cultural processes. Fields of research include the relations between literary texts, the interconnections between literary texts and processes of text reflection, rhetoric and poetics, correlations between literature and other aesthetic media, as well as the mutual dependence on literature and discourses of knowledge.

With his work, the cultural philosopher, literary historian and translator Friedrich Schlegel (1772–1829) created the prerequisites for the development of theoretically demanding and sophisticated, methodologically innovative literary studies as have been successfully represented at the Freie Universität Berlin for many years. Literary studies that are internationally focused and that reflect questions of comparative culture and media are associated with the name of Friedrich Schlegel.

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Berlin School of Mind and Brain

Combining mind and brain

The great technological and scientific advances made in the study of the human brain have opened up the possibility of addressing fundamental questions of the mind and brain sciences – for example conscience or free will – in a completely new approach. This is why researchers from the humanities, social sciences and behavioural sciences are collaborating closely with neuroscientists at the Berlin School of Mind and Brain. The doctoral students acquire a knowledge of neuroanatomy and cognitive science as well as of linguistics and ethics, including the various methods of clinical and experimental research. They focus on questions relating to conscious and unconscious perception, decision-making and language, as well as the plasticity of the brain and changes occurring over a lifetime, and the disorders of intellectual performance caused by brain disease.

The participating institutions include:

- Humboldt University Berlin (host institution)
- Freie Universität Berlin (co-applicant)
- Technische Universität Berlin (co-applicant)
- Charité - University Medicine Berlin (co-applicant)
- University of Magdeburg (co-applicant)
- University of Potsdam (co-applicant)
- Fraunhofer Institute for Computer Architecture and Software Technology, Berlin
- Max Delbruck Centre for Molecular Medicine, Berlin
- Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig
- Humanities Research Centres, Berlin

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Berlin-Brandenburg School for Regenerative Therapies

Biologists and engineers collaborating for patients

Experts from biology, engineering, and the clinical sciences are working together on therapies for acute and chronic diseases. Using conventional implants, they want to develop novel combinations of cells, drugs and technical products.

The PhD projects align themselves with a new type of scientist: bioengineers have to understand complex biological processes, while biologists have to understand the technical components of the therapy approaches. The necessary appreciation of the practical requirements creates the close cooperation with the specialists from the clinical sciences.

The participating institutions are:

- Humboldt University Berlin (host institution)
- Freie Universität Berlin (host institution)
- Technische Universität Berlin
- German Heart Institute Berlin
- German Rheumatism Research Centre (DRFZ), Berlin
- Institute of Polymer Research at the GKSS Research Centre, Teltow
- Zuse Institute Berlin
- Max Delbrück Centre for Molecular Medicine, Berlin
- Robert Koch Institute, Berlin
- Max Planck Institute for Molecular Genetics, Berlin
- Max Planck Institute of Colloids and Interfaces, Potsdam-Golm

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Berlin Graduate School of Social Sciences (BGSS)

Understanding social and political institutions

The Berlin Graduate School of Social Sciences at the Humboldt University Berlin aims to become an internationally recognised centre for training young social scientists in and around Berlin. The School follows in the tradition of integrated and interdisciplinary social sciences. Studies focus on the question of how modern societies overcome problems, such as the participation and exclusion of certain population groups, diversity and discrimination, as well as heterogenisation and individualisation.

Two interdisciplinary and mutually-related lines of research determine the research activities and the measures to promote young researchers at the BGSS:

- Laboratory Europe: Democracy and society beyond the national state.
- Protection, precaution and safety. The transformation of modern countries and the changing significance of civil society.

The model involves a one-year preparatory phase plus a three-year doctoral programme, but also offers particularly qualified graduates holding a Master's degree the opportunity to take the fast track into the doctoral programme.

The participating institutions include

- Humboldt University Berlin (host institution)
- Freie Universität Berlin
- Centre Marc Bloch, Berlin
- Social Science Research Center Berlin
- Hertie School of Governance, Berlin

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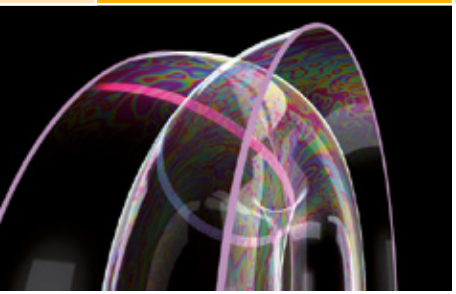

Berlin Mathematical School (BMS)

Internationally competitive maths

All the potential of the maths departments at all three of Berlin's universities is packaged and concentrated into promoting young scientists at the Berlin Mathematical School. With the help of the Graduate School, the Technische Universität Berlin, the Freie Universität Berlin and the Humboldt University Berlin plan to attract the best talents from all around the world to the doctoral programme in Berlin.

The first training phase takes the students from Bachelor's level to admission to the doctoral programme (three to four semesters) and then, in the second phase, to the doctorate (four to six semesters). The participants benefit from the strong mathematical research network in Berlin. Thus, for example, they can contribute to projects at the DFG Research Centre "MATHEON – Mathematics for Key Technologies" or to the "Space-Time-Matter" Collaborative Research Centre.

The participating institutions are:

- Technische Universität Berlin (host institution)
- Freie Universität Berlin (co-applicant)
- Humboldt University Berlin (co-applicant)
- Weierstrass Institute for Applied Analysis and Stochastics, Berlin
- Zuse Institute Berlin
- Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Hannover and Potsdam-Golm
- Potsdam Institute for Climate Impact Research, Potsdam

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Bielefeld Graduate School in History and Sociology

Two faculties – One doctoral training programme

The Bielefeld Graduate School in History and Sociology is run by historians and sociologists from the University of Bielefeld. This close cooperation is not a chance development. Mutual, strongly theoretical research and training relations have existed between the two sides for a while. With the Graduate School, an interdisciplinary structure has now been integrated. The School prepares doctoral students for various postdoctoral career fields. The research focuses on six topic lines:

- Science and technology research
- The political as a communication space in history
- World society
- Historical and comparative semantics
- Social injustice
- Structures between relatives

A highly competitive selection process, intensive support and advice services, visiting professors from home and abroad, and an "Autumn School" – organised by doctoral students – are some of the trademarks of the Graduate School. The recruitment of foreign doctoral students and specific support for German doctoral students on their stays abroad, attendance of international conferences, and publications in international journals all aim, naturally, to create an international setting and focus.

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Ruhr University Research School (RURS)

Doctorate with added value

The Ruhr University Research School at the Ruhr University Bochum (RUB) covers all faculties and introduces doctoral students, in their capacity as holders of responsibility, to international science and research work. The more than 250 doctoral students are supported and advised by members from all the faculties. All doctoral programmes, including three Research Training Groups and ten Collaborative Research Centres of the RUB, contribute actively to the cross-disciplinary Graduate School.

In terms of content, the Research School reflects the core research areas pursued at the RUB. The Natural Sciences and Engineering Section addresses the systems chemistry of boundary layers, plasma sciences, materials sciences, the sustainable planning and execution of urban infrastructure, and questions of security in information and communications technology. The Life Sciences Section deals with macromolecular networks as well as neuronal and cognitive networks. The Humanities and Social Sciences Section concentrates on biomedical ethics and public health research, religion and secularisation, semantic spaces as well as human safety and security in the globalisation process.

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Bonn Graduate School of Economics (BGSE)

From Bachelor's to Doctorate

The Bonn Graduate School of Economics (BGSE) offers an international doctoral programme that combines economic and business administration subjects. The doctoral students are able to specialise in two of the five areas offered at the BGSE: microeconomic theory, management and applied microeconomics, financial economics, macroeconomics and public finance, plus econometrics and statistics. The training programme covers topical questions and problems of economics and its various branches, such as decision and game theory, social contract theory, macroeconomics, and mathematical economic theory.

A special feature of this programme is that it not only accepts students holding a Diplom or Master's degree, but also excellently qualified Bachelor's graduates from home and abroad. The doctoral programme is made up of a research-orientated Master's phase plus a dissertation phase. Particularly successful participants can complete parts of their doctorate while still doing their Master's programme.

The participating institutions are:

- University of Bonn (host institution)
- Max Planck Institute for Research on Collective Goods, Bonn
- Institute for the Study of Labour, Bonn

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Bonn-Cologne Graduate School of Physics and Astronomy

Of lasers and black holes

The Graduate School builds on the strengths of the physics departments at the Universities of Bonn and Cologne that complement each other excellently in terms of content, along with the participation of a Max Planck Institute and a Helmholtz Centre. Accordingly, the range of subjects is very broad, extending from particle and nuclear physics to astrophysics to the physics of condensed matter, statistical physics and photonics. Following the Anglo-American system, graduates holding a Bachelor's degree will be guided to a doctorate in five years.

The Graduate School has been conceived as a prototype for the future training of graduates at the two universities. A coherent coordination of the content and timing of the studies, and thus the opportunity to use the courses and services offered by both universities, including joint mentoring, represent special features of this approach. The basis for the research-orientated training is provided by the outstanding experimental and theoretical facilities at the participating departments, as well as directly in the participating institutes themselves, such as telescopes or the ELSA electron accelerator.

The participating institutions are:

- University of Bonn (host institution)
- University of Cologne (co-applicant)
- Research Centre Jülich
- Max Planck Institute for Radio Astronomy, Bonn

Global Change in the Marine Realm

Universität Bremen

Oceans as a global conveyor belt

Human interventions in the natural environment have a global impact that developing countries, in particular, suffer from: an increase in natural disasters and food crises. The oceans play a key role in the endeavours to understand the Earth's climate system. The Graduate School is examining the interrelationships between ocean and climate, processes in coastal areas, as well as the marine ecology and biogeochemistry of the seas and oceans. However, the research not only covers the natural sciences and the geosciences, but also extends to the humanities. For example, the impact on and consequences for society as a result of rising sea levels or reduced fish stocks also form part of the research programme. Doctoral students from the Graduate School analyse the changes, elaborate forecasts and aim to develop options for mitigating the negative developments.

The participating institutions are:

- University of Bremen (host institution)
- Alfred Wegener Institute for Polar and Marine Research, Bremerhaven
- German Maritime Museum, Bremerhaven
- Max Planck Institute for Marine Microbiology, Bremen
- Centre for Tropical Marine Ecology, Bremen

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Universität Bremen

Bremen International Graduate School of Social Sciences (BIGSSS)

The future of social and political integration

The Future of Social and Political Integration is the core topic of research at the Bremen International Graduate School of Social Sciences (BIGSSS). The whole spectrum covers five core topics from the social sciences, political science, and psychology. These are "Global Integration", "Integration and Diversity in the New Europe", "Social Integration and the Welfare State", "Attitude Formation, Value Change, and Intercultural Communication", and "Life Course and Lifespan Dynamics". The core topic areas are complemented by the BIGSSS Methods Centre. Besides the core subjects of political science, sociology and psychology, the adjacent subjects of law, economics, health sciences, and communication sciences also constitute part of the research programme. Graduates of the BIGSSS are qualified to take on executive and management positions in national and international institutions within and beyond science and academia. The BIGSSS builds on the Graduate School of Social Sciences at the University of Bremen.

The participating institutions are:

- University of Bremen (host institution)
- Jacobs University Bremen

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Graduate School of Computational Engineering

Computer simulation as a model of the future

Scientists develop new technical solutions by means of computational modelling, analysis, simulation and optimisation. This method represents an efficient and effective alternative to experimental studies that cost a great deal more. Computational engineering is seen as the model of the future per se when addressing economically and socially relevant questions like the efficiency of transport systems, radiation pollution emitted by cell phones, or the continuing development of medical equipment.

The training that the Graduate School offers focuses on an interdisciplinary environment and on the interaction between informatics, mathematics and engineering. The programme includes cross-sectional areas, such as visualisation, simulated reality, software engineering and lifecycle research.

The participating institutions are:

- TU Darmstadt (host institution)
- Fraunhofer Institute for Computer Graphics Research, Darmstadt
- Fraunhofer Institute for Structural Durability and System Reliability, Darmstadt

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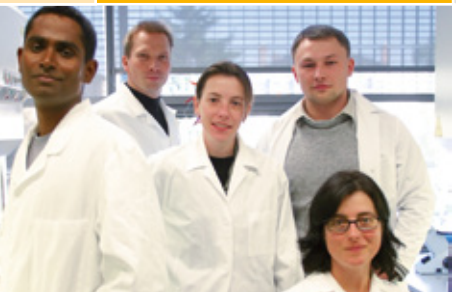

TECHNISCHE UNIVERSITÄT DRESDEN

Dresden International Graduate School for Biomedicine and Bioengineering (DIGS-BB)

Interdisciplinary and interactive

The DIGS-BB Graduate School combines basic biological research with clinical application and bioengineering. It offers graduates of medicine, science and engineering three different doctoral programmes. Molecular cell and development biology, for example, examines the nature and modus operandi of molecular cell assemblies as well as stem cells and their development. Doctoral students in the MD/PhD programme on regenerative medicine, inter alia, develop regenerative therapies for neurodegenerative or vascular diseases. Scientists in the doctoral programme on nanotechnology, biophysics and bioengineering address the dynamic behaviour of single molecules in living cells, with the structure and the effectiveness of biomolecular motors and biomaterials.

The participating institutions are:

- Dresden University of Technology (host institution)
- Research Centre Rossendorf of the Leibniz Association, Dresden
- Leibniz Institute for Solid State and Materials Research, Dresden
- Leibniz Institute of Polymer Research, Dresden
- Max Bergmann Centre for Biomaterials, Dresden
- Max Planck Institute for the Physics of Complex Systems, Dresden
- Max Planck Institute of Molecular Cell Biology and Genetics, Dresden

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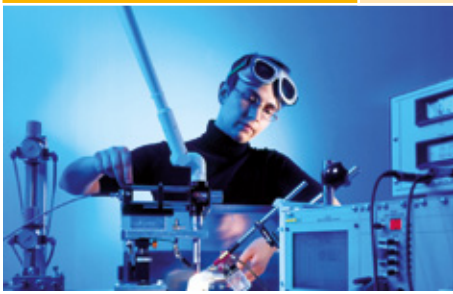
Erlangen Graduate School in Advanced Optical Technologies (SAOT)

Optics helping to find the right path

From global positioning systems and Internet to lasers and fibre optics, all the way to lithography for applications in chip manufacturing and eye surgery – optics are of great benefit practically everywhere. In this respect, the border areas of physics, engineering and medicine are playing an ever more important role. Researchers from the fields of physics, chemistry, biology, and engineering often use similar methods, but only rarely together and without the desired interdisciplinary technology transfer. An enhanced academic training programme aims to change this. Along with the new Master's programme in Advanced Optical Technologies, the Graduate School is the second step towards creating a world-leading centre of academic training in optical technologies.

The participating institutions are:

- University of Erlangen-Nuremberg (host institution)
- Bavarian Laser Centre, Erlangen
- Fraunhofer Institute for Integrated Systems and Device Technology, Erlangen
- International Max Planck Research School on Optics and Imaging, Erlangen
- Independent Junior Research Group of the Max Planck Institute for Quantum Optics, Erlangen/Garching



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Spemann Graduate School of Biology and Medicine

An incubator for excellent young researchers

The Spemann Graduate School provides students of biology, medicine, molecular medicine and chemistry with interdisciplinary training that extends from basic research through to clinical application and pharmaceutical product development. It is based on four existing Graduate Schools, an international Max Planck Research School, four DFG Collaborative Research Centres, and the Bernstein Centre for Computational Neurosciences.

The core research areas are protein structure and function, developmental biology, neurosciences, immunology, molecular medicine, and plant research. Additional interdisciplinary courses link up the programmes. The "MOBILity" exchange programme with 30 international partners at universities and in industrial companies provide for a broad range of experience. To promote the Graduate School's sense of community, the university plans to establish a campus on which teaching and living are united. There are also plans to expand the career opportunities for women; especially doctoral students with children and families will receive more support.

The participating institutions are:

- University of Freiburg (host institution)
- Max Planck Institute of Immunobiology, Freiburg

International Graduate Centre for the Study of Culture

Multifaceted cultural research

Cultural studies have not become diverse and socio-politically relevant just today. Cultural studies research has, however, made rapid advances in the past 20 years. In North America, as well as in Europe, numerous new theories, methods and models have been developed with which the whole range of everyday culture has become an object of study. Social structures and human action are then understood and analysed much more strongly as an expression of culture.

Given this background, the researchers from the International Graduate Centre for the Study of Culture (GCSC) plan to establish new methods and approaches as well as transferring concepts from various disciplines and science cultures.

The thematic arch covers eight fields:

- Memory cultures
- Culture and narrative
- Culture and performativity
- Visual culture
- Culture, language and new media
- Culture and identity
- Political and transnational cultures
- Culture of knowledge, research and education

The GCSC builds on the Giessen Graduate Centre for the Humanities (GGK) that was founded in 2001 and has since become a Graduate School with an international profile.

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GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

Göttingen Graduate School for Neurosciences and Molecular Biosciences (GGNB)

Ideal conditions for doctoral students

The neurosciences and the biosciences can look back on a long tradition of excellent research in Göttingen. With this background, the Graduate School provides ideal research and studying conditions for doctoral students, including its intensive range of support and advice services as well as seminars that serve to promote the development of a new generation of excellent scientists. The GGNB unites the competence of six life sciences and natural sciences faculties at the University of Göttingen as well as four non-university research institutions. Twelve internationally orientated and, in some cases, multiple prizewinning doctoral programmes have joined forces here. They integrate various subjects from the neurosciences and biosciences, from medicine, biophysics and related subject areas into an interdisciplinary doctoral training programme. Besides the supervision of dissertations, this support also includes subject-related lectures and seminars, method courses, modules in which key qualifications can be acquired, as well as other activities, such as conferences organised by the doctoral students.

The participating institutions are:

- University of Göttingen (host institution)
- Max Planck Institute for Biophysical Chemistry, Göttingen
- Max Planck Institute for Dynamics and Self-Organisation, Göttingen
- Max Planck Institute for Experimental Medicine, Göttingen
- German Primate Centre, Göttingen

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Hannover Biomedical Research School

Attacking the body

How does the human body react when harmful bacteria or viruses attack it? Or when toxins and environmental poisons affect it? Gaining a better understanding of the complex interactions between host and pathogen is the core research area of this Graduate School. All in all, it covers the areas of inflammation, infection and immunology as well as transplantation and tissue generation. Cross-disciplinary courses are offered on topics like experimental techniques and bioinformatics, molecular biology, biostatistics, and scientific communication.

All the current postgraduate programmes, Research Training Groups and PhD programmes at the Hannover Medical School have been united within the Graduate School. In addition, it supports the dual careers policy for scientists working in the clinical field by providing rotation positions and tandem research groups.

The participating institutions are:

- Hannover Medical School (host institution)
- University of Veterinary Medicine Hannover Foundation
- Fraunhofer Institute for Toxicology and Experimental Medicine, Hannover
- Helmholtz Centre for Infection Research, Braunschweig
- Federal Agricultural Research Centre, Mariensee
- The Leibniz Institute of Plant Genetics and Crop Plant Research, Gatersleben

MHH Hannover Medical School

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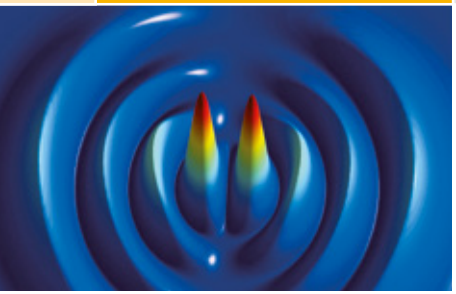

Heidelberg Graduate School on Fundamental Physics

A new generation of physicists

The Graduate School combines astrophysics, cosmology, particle physics and complex quantum physics. Working at the boundaries between these subjects, researchers hope to be able to answer many as yet unresolved questions. The goal is to train a new generation of physicists with an interdisciplinary eye.

Each doctoral student has a team of three mentors who aim to ensure that the student is able to complete the dissertation within three years. The programme's modular structure makes individual learning plans possible that also include the requisite key qualifications. The doctoral students contribute actively to the learning process and to organising the School itself. A combined Master's-Doctoral programme that takes the best doctoral students from Bachelor's stage to doctorate in four instead of five years is planned for the medium term. Exchange programmes with globally recognised institutions promote the international networking.

The participating institutions are:

- University of Heidelberg (host institution)
- Max Planck Institute for Astronomy, Heidelberg
- Max Planck Institute for Nuclear Physics, Heidelberg

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Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences

The third pillar of science

Is it possible to calculate how long it takes pesticides to degrade in the ground? How can we improve our understanding of the dynamics of cancer? How can combined power stations best be regulated? The Graduate School is driving the approach of scientific computing forward to solve problems like these. With its core areas of mathematical modelling, simulation and optimisation, scientific computing is today, seen as the third path to knowledge in science, next to experimentation and theory.

The doctoral students learn how to develop even more efficient scientific computing methods and to introduce this methodology into new scientific fields. The Graduate School builds on the Interdisciplinary Centre for Scientific Computing at the University of Heidelberg, which can point to many years of experience with interdisciplinary, structured doctoral programmes.

The participating institutions are:

- University of Heidelberg (host institution)
- Centre for Modelling and Simulation in the Biosciences, Heidelberg
- German Cancer Research Centre, Heidelberg
- European Media Laboratory Research, Heidelberg
- The European Molecular Biology Laboratory, Heidelberg

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The Hartmut Hoffmann-Berling International Graduate School of Molecular and Cellular Biology

Fit for an executive role

Molecular biology and cell biology research delivers the foundations for numerous fields of the life sciences and biosciences: from structural biology to bioinformatics and molecular medicine to immune biology. The Graduate School focuses its resources on investigating biological processes and the opportunities provided by innovative medical and biotechnological applications. In so doing, it concentrates on four core areas: molecular biology of the cell, cell cycle regulation and development, biology of pathogenic organisms and their interaction with the host, and molecular biotechnology. Besides the Faculties of Biosciences and Medicine, scientists from chemistry and mathematics have also been integrated into the research programme. The Graduate School has set itself the goal of preparing young scientists for leading roles in the industrial and academic sphere.

The participating institutions are:

- University of Heidelberg (host institution)
- European Molecular Biology Laboratory, Heidelberg
- German Cancer Research Centre, Heidelberg
- Max Planck Institute for Medical Research, Heidelberg

RUPRECHT-KARLS-
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Jena School for Microbial Communication

Understanding complex interaction better

The cross-disciplinary doctoral training concentrates on investigating microbial communication. The goal is to gain a better understanding of the complex interaction taking place between microorganisms and organisms of the same kind, with higher organisms, such as people and plants, as well as with the environment. New technologies are being developed to this end.

The topics of the three-year dissertations are not only of interest to basic research, but also to many biotechnical applications at the Jena site. Twelve companies are involved in the Graduate School. An associate professorship will be established for the best graduate of each year.

The participating institutions are:

- University of Jena (host institution)
- Helmholtz Centre for Environmental Research, Leipzig
- Institute of Photonic Technology, Jena
- Leibniz Institute for Natural Product Research and Infection Biology, Hans Knöll Institute, Jena
- Max Planck Institute for Biogeochemistry, Jena
- Max Planck Institute for Chemical Ecology, Jena
- Fraunhofer Institute for Applied Optics and Precision Engineering, Jena

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Karlsruhe School of Optics and Photonics

Exploring the visible

Year in, year out, companies generate more than 100 billion euros of turnover with lasers, innovative luminescent and fluorescent materials, optical components and devices, and high-resolution microscopes. German companies are world leaders in this market. Optics and photonics additionally provide key ideas and stimuli for physics, chemistry, biology, electrical engineering, and mechanical engineering. In academic teaching, however, optics and photonics have frequently been assigned to other disciplines, and so presently hardly play a role at all in Germany as independent academic subjects. The Karlsruhe Graduate School aims to address this.

The doctoral students deal with photonic materials and components as well as biomedical photonics. The research fields additionally include novel spectroscopic methods and optical systems. But the School's doctoral students also familiarise themselves with management methods that prepare them for careers in academia and science, or in business and industry.

The participating institutions are:

- Karlsruhe Institute of Technology (host institution)
- Research Centre for Information Technology, Karlsruhe
- Centre for Solar Energy and Hydrogen Research, Stuttgart

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Graduate School for Integrated Studies of Human Development in Landscapes

Humans and the environment

The surroundings in which people live shape the way they think, act and live together. Uncovering the mutual and reciprocal influences between humans and the environment over thousands of years is the goal that the Graduate School has set itself. The idea is located in between cultural studies and natural sciences, and incorporates molecular biology and archaeology as well as geoinformatics and art history, geophysics and isotope research, archaeology and palaeoenvironmental research. Two new associate professorships in environmental archaeology and environmental history – both of which are new research fields in Germany – complement the range of teaching offered at the Graduate School.

The doctoral students address three core topics: "Social Space and Landscape", "Society and Reflection", and "Mobility, Innovation and Transformation". The focus is on the Baltic region, although some of the topics extend beyond Central Europe and through to Africa.

The participating institutions are:

- University of Kiel (host institution)
- Regional Archaeological Museum – Schloss Gottorf, Schleswig
- Leibniz Institute for Science Education, Kiel
- German Archaeological Institute, Berlin

C | A | U

Christian-Albrechts-Universität zu Kiel

Coordinator

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Konstanz Research School Chemical Biology

The chemistry between proteins and ligands

Scientists from the Departments of Chemistry, Biology, Computer Science and Information Science collaborate in the Graduate School. They have set themselves the goal of investigating the complex, network-like interplay between molecules in living systems. Exploring this interaction is seen as the next great challenge in the life sciences, following the successful sequencing of the human genome.

Proteins play an important role in these investigations. Proteins are macromolecules and are among the basic building blocks of all cells. They not only give the cell its structure, but also serve as the molecular engines responsible for practically all life processes. Research into the interaction between various proteins, or between proteins and other molecules, also represents an important key in the development of new therapeutic concepts for common and serious diseases.

The Graduate School provides the doctoral students with the competence and qualifications needed for understanding complex biological processes at the molecular level and for investigating these experimentally. The programme builds on the interdisciplinary Life Sciences programme run by the Departments of Chemistry and Biology.

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Leipzig School of Natural Sciences – Building with Molecules and Nano-objects

Building intelligent matter

Doctoral students use molecules and nanostructures to build complex materials that are both intelligent and adaptable as well as environmentally friendly and cost-efficient, and additionally resemble living matter. Possible fields of application include biosensors, cell manipulation, artificial tissue, and nanophotonics. In tumour research, for example, cell elasticity can be determined for individual cells by means of new, laser-based methods. This in turn makes it possible to diagnose cancer from the tumour cells found in a blood sample.

Besides their lab work, the doctoral students are systematically taught on the interdisciplinary aspects and research links relevant to physics, chemistry and the biosciences.

The participating institutions are:

- University of Leipzig (host institution)
- Leibniz Institute of Surface Modification, Leipzig
- Max Planck Institute for Mathematics in the Sciences, Leipzig
- Helmholtz Centre for Environmental Research, Leipzig/Halle

UNIVERSITÄT LEIPZIG

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Im Focus das Leben
Universität zu Lübeck

Graduate School for Computing in Medicine and Life Science

Between informatics, medicine and the life sciences

The Graduate School is split into two research programmes that further subdivide into more specific and time-limited research projects. The first programme is located at the interface between informatics and medicine. Here, doctoral students study aspects such as computational methods in neurotechnology, navigation and robotics. The second research programme focuses on the application of informatics in the life sciences, for example, in medical structural and cell biology.

An Advisory Board on which business, industry and public institutions are represented advises the doctoral students on the technology transfer of their research findings. The Graduate School can draw on experience gained with the interdisciplinary degree programmes in informatics, medicine and the life sciences. It will annually hold summer academies at partner universities in the Baltic area in order to recruit highly-qualified graduates from the region.

The participating institutions are:

- University of Lübeck (host institution)
- Fraunhofer Institute for Biomedical Engineering, Lübeck
- Drägerwerk AG, Lübeck

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Materials Science in Mainz

Multifunctional materials

Modern materials science focuses on the rational design of new multifunctional hybrid materials. This calls for the latest knowledge and insights from various fields of the materials sciences to be combined. This multidisciplinary approach has been implemented by the Graduate School in Mainz.

It is based on three pillars: materials by correlation (MATCOR), polymers in modern materials (POLYMAT) and the International Max Planck Research School for Polymer Materials (IMPRS-P). The doctoral students conduct research on polymers, colloids, supramolecular devices, magnetic materials and ultra-cold quantum gases.

The participating institutions are:

- University of Mainz (host institution)
- TU Kaiserslautern
- Max Planck Institute for Polymer Research, Mainz
- International Max Planck Research School for Polymer Materials, Mainz

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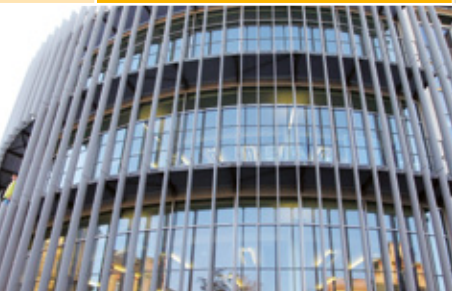

UNIVERSITY OF MANNHEIM

Empirical and Quantitative Methods in the Economic and Social Sciences

Focus on empirical and quantitative methods

The Graduate School is the first in Germany to train doctoral students in business administration, economics and social sciences. The School attaches particular importance to the methodology of modern economics and social sciences, i.e. on quantitative and empirical methods.

Equipped with their quantitative tools, the researchers ground their activities on a broad data basis and work with formal theories that can be tested with the data. Thanks to the empirical tools, they no longer develop and verify their hypotheses solely on the basis of "abstract ideas"; instead, they register and analyse experiential values, for example, by means of broad statistical surveys, interviews or experiments.

After their basic training, the young scientists can address methodological questions such as econometrics or optimisation, data surveying methods or computational methods. It is also possible to work on questions of content that build on the methodology-orientated research areas.

The participating institutions are:

- University of Mannheim (host institution)
- Centre for European Economic Research, Mannheim
- Centre for Survey Research and Methodology, Mannheim
- Central Institute of Mental Health, Mannheim

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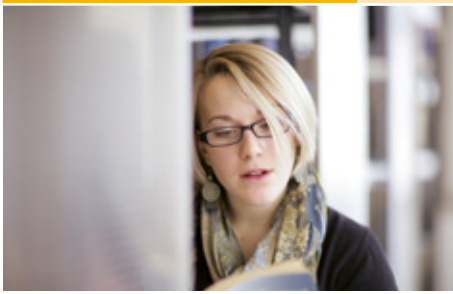

Graduate School of Systemic Neurosciences (GSN-LMU)

Systemic neurosciences

How does the brain work? Neuroscientists at the Graduate School are searching for answers to this fundamental question of modern research. A broad range of methods will be used to this end, extending from neurobiology to electrical engineering; from neuroinformatics and theoretical biophysics to psychology, the clinical neurosciences and neurophilosophy.

The research focuses centrally on the systemic neurosciences. For example, the doctoral students will address the following topic areas: "From individual cells to complex integrated circuits", "From system analysis to mathematical model", and "From biology to technical application". The Graduate School has been set up as a training platform at the Munich Centre for Neurosciences - Brain & Mind, Ludwig-Maximilian University Munich.

The participating institutions are:

- LMU Munich (host institution)
- TU Munich (co-applicant)
- Max Planck Institute of Neurobiology, Martinsried
- Max Planck Institute of Psychiatry, Munich
- Max Planck Institute for Ornithology, Seewiesen
- Helmholtz Centre Munich, Neuherberg
- German Aerospace Centre, Wesseling

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

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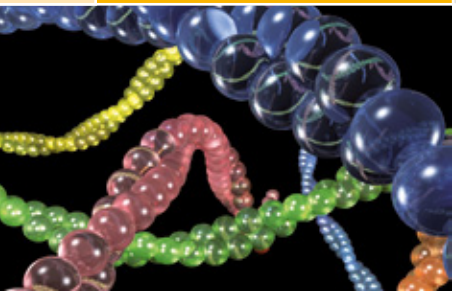

International Graduate School of Science and Engineering (IGSSE)

Benefiting society

Linking up the natural sciences and engineering more closely together is what the IGSSE Graduate School aims to achieve. Research projects and a course programme focus on familiarising engineers with the kinds of questions that natural scientists work on, and vice versa. The course contents also take aspects of the arts and humanities, cultural studies, and social sciences into account that are of relevance to modern technologies. This creates substantial added value for the interdisciplinary experience of young researchers who have an enterprising mind-set and are willing to act accordingly.

The young talents from the natural sciences and engineering are not only encouraged to translate their scientific competence into marketable products. The IGSSE also aims to prepare the next generation of researchers that it produces for tasks in which they can use their scientific ideas to create added value for society, be it in industry, academia, or in other areas of professional life.

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Saarbrücken Graduate School of Computer Science

Wandering through virtual worlds

An intelligent, virtual sales adviser accompanies customers through a department store. Real-time ray-tracing makes it possible to create close-to-reality computer graphics that are used in the production of games and films. The e-learning platform ActiveMath helps pupils and students with their maths problems. These are but a few of the diverse range of different projects with which computer scientists and informaticians occupy themselves in Saarbrücken. The Graduate School has set itself the goal of becoming one of the world's top 10 centres of scientific training in computer science.

To recruit the best and most able young researchers, the Graduate School has concentrated its resources in an integrated Master-Doctoral Programme based on the Anglo-American model. Students with a strong interest in research can take the fast track into the doctoral programme – without first having to gain a Master's degree. Students holding a Bachelor's degree will typically be admitted to the programme.

The participating institutions are:

- Saarland University (host institution)
- German Research Centre for Artificial Intelligence, Saarbrücken
- Max Planck Institute for Software Systems, Saarbrücken
- Max Planck Institute for Informatics, Saarbrücken

UNIVERSITÄT DES SAARLANDES

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Universität Stuttgart
Germany

Graduate School for Advanced Manufacturing Engineering (GSaME)

Next-generation factory

Intelligent production and manufacturing technologies represent the focus of research and training here. In the future, the GSaME Graduate School aims to qualify future top-class professionals for careers in engineering and science, and for management careers, by preparing them for the challenges of highly-efficient, adaptable "next-generation factories". The doctoral students aim to develop comprehensive approaches, methods and tools for engineering production systems.

The Graduate School has six defined research fields:

- Digital and virtual engineering
- ICT (Information and Communications Technologies) for manufacturing
- Networking in manufacturing
- Materials and process engineering
- Intelligent production systems
- Knowledge-based management

The training alternates between theoretical and practical phases. A "learning factory" is also available – an innovative training, research and test environment equipped with digital and physical tools that make it possible to transfer developments into practice.

The participating institutions are:

- University of Stuttgart (host institution)
- Fraunhofer Institute for Production Engineering and Automation, Stuttgart
- Fraunhofer Institute for Industrial Engineering, Stuttgart
- Hans Böckler Foundation
- VDMA Impulse Foundation
- Major companies from the production management sector

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International Graduate School in Molecular Medicine Ulm

Specialists on the interface between biology and medicine

Molecular medicine seeks to understand the causes of human diseases at the molecular level. Molecular and cell biology research have become indispensable in modern medicine. The results have led to pronounced improvements in the diagnosis, prevention and therapy of diseases.

The work at this interface between medicine and biology calls for specially trained scientists. The International Graduate School in Molecular Medicine Ulm wants to ensure a supply of such highly qualified specialists in the future. All the university's faculties are involved, along with a total of more than 30 institutes and clinics. Within the Graduate School, the doctoral students are assigned to individual doctoral student groups that cover the various fields of molecular medicine. This includes the investigation of signalling networks during embryonic development and in degenerative diseases, as well as blood, cancer and hormone diseases.

ulm university universität ulm

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Graduate School for Life Sciences (GSLS)

Individual and excellent support

The Graduate School for Life Sciences (GSLS) is a joint initiative of the Faculties of Biology, Medicine, Chemistry, Physics and Philosophy. It serves to improve the training of doctoral students, including, not least, by providing more intensive support and advice services, plus additional courses. The school was established as part of the "International Graduate School" founded in Würzburg in 2003. It includes five classes: Biomedicine, Infection and Immunity, Integrative Biology, Neurosciences, plus the MD/PhD Programme, where medical scientists who already hold a doctorate are able to gain an additional doctoral degree in the natural sciences, through which they then cover the whole range of life sciences.

Each graduate pursues an individual training and supervision plan over the three years of courses held in English. The programme ranges from research groups and seminars to courses on soft skills, good scientific practice and ethics; from summer schools and attendance of international conferences to publications. An award system motivates the doctoral students on their way to achieving excellent results. An alumni programme plus career development fellowships help students to advance professionally.

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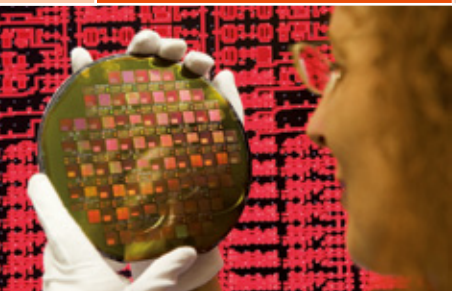
Current Clusters of Excellence



RWTH AACHEN UNIVERSITY

Ultra High-Speed Mobile Information and Communication

Quick and affordable mobile surfing on the Internet

The aim is for the Internet to be wirelessly available with high-speed connections – to the benefit of users. This is what scientists at the Cluster of Excellence on "Ultra High-Speed Mobile Information and Communication," are working on, i.e. mobile information and communications at the highest data rates. The interdisciplinary research group is made up of 21 chairs from the Departments of Computer Science, Electrical Engineering and Information Technology.

The four research fields concentrate on mobile applications and services, end devices and wireless network architectures as well as highly complex analogue and digital integrated circuits. An overarching research field addresses topics like the performance and reliability of complex systems, data protection and security, energy efficiency, and software architecture. The Cluster of Excellence will be provided with a newly built facility that accommodates the labs for producing prototypes and enables the scientists to set up test environments.

The participating institutions are:

- RWTH Aachen University (host institution)
- Fraunhofer Institute for Applied Information Technology, Sankt Augustin and Aachen

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Integrative Production Technology for High-Wage Countries

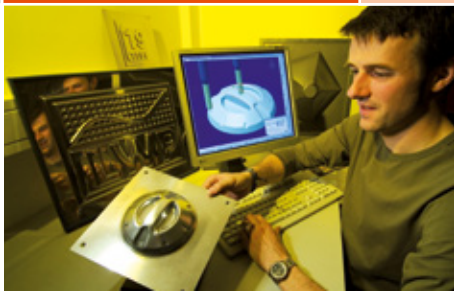
Succeeding with integrative production technologies

Competitive production engineering is particularly important for high-wage countries like Germany. Working within the Cluster, scientists and researchers from Aachen contribute in various ways to ensuring that manufacturing, and thus jobs, remain in these countries. Products that address markets with a large number of customers are particularly relevant in economic terms. In particular, the researchers examine aspects of individualising, virtualising, mixing and self-optimising the production process.

The Cluster enables companies from Germany and Europe to recognise where they have to create competence in order to succeed in a high-wage location. The aim is to enable small and medium-sized enterprises, in particular, to act much more efficiently and to conserve resources.

The participating institutions include:

- RWTH Aachen University (host institution)
- ACCESS, Aachen
- Fraunhofer Institute for Laser Technology
- Fraunhofer Institute for Production Technology, Aachen
- Fraunhofer USA - Centre for Laser Technology, Plymouth
- Fraunhofer USA - Centre for Manufacturing Innovation, Brookline
- Industrial Partners: BMW AG, BorgWarner, Deckel Maho, Gallus, GETRAG, LANXESS Deutschland GmbH, MTU Aero Engines, RKW AG, Rofin Sinar, Schott Glaswerke, Visotek Inc.



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Tailor-Made Fuels from Biomass (TMFB)

Biofuel for the future

Fuels from renewable natural resources are becoming ever more attractive. However, not only are they not yet efficient enough, but the cultivation of rapeseed, soya beans, corn or sugarcane actually competes with the food supply. This might be solved by a new biomass-based production process for synthetic fields.

The Cluster of Excellence aims to develop fuels on the basic of renewable raw materials in which all of the plant can be converted into tailor-made fuel components. In contrast to many present-day biofuels, these new fuels do not compete with the food production process. Since this goal can only be achieved by interlinking various disciplines, such as chemistry, plant engineering and combustion engineering, the participating institutions have already founded a joint centre of excellence: the Fuel Design Centre.

The participating institutions are:

- RWTH University Aachen (host institution)
- Fraunhofer Institute for Molecular Biology and Applied Ecology, Aachen
- Max Planck Institute of Coal Research, Mülheim

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Topoi – The Formation and Transformation of Space and Knowledge in Ancient Civilizations

Space and knowledge

In this Cluster, experts from archaeology, history, philology, theology and philosophy, among other disciplines, are investigating the systematic contexts of space and knowledge in the civilisations of the Near and Middle East, and the Mediterranean and Black Sea region over a time span ranging from 6000 BC to 500 AD.

Topoi is divided into five core research areas that interpret the term "space" very broadly indeed. It extends from internal spaces in people to political-social and imaginary spaces in epics to the consideration of cosmic spaces. Antiquity is of particular interest because this is when the fundamental techniques were developed as an answer to changes of space. Examples include the invention of the wheel and the development of new settlement areas in response to natural disasters.

The participating institutions include:

- Freie Universität Berlin (host institution)
- Humboldt University Berlin (host institution)
- Technische Universität Berlin
- FHTW Berlin - University of Applied Sciences
- Berlin-Brandenburg Academy of Sciences and Humanities
- German Archaeological Institute, Berlin
- Leibniz Institute for Applied Geosciences, Hannover
- Max Planck Institute for the History of Science, Berlin
- The State Museums of Berlin – Prussian Cultural Heritage Foundation
- State Library, Prussian Cultural Heritage, Berlin

Coordinator

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Languages of Emotion

Of language and emotions

What and how we feel is largely determined by language and image. Feelings convey or impede language acquisition; conversely, language skills have an impact on the capacities of emotional communication. The emotion research of the past 20 years largely neglected the role played by language, while language research essentially overlooked the role played by emotions. The Cluster aims to address both sides.

It concentrates scientific competence acquired from more than 20 humanities, social sciences, and natural sciences subjects – including Japanology and psychiatry, political science and biology, theatre, drama and dance studies, and neuropsychology. The researchers study four areas:

- the relationships between emotions and language as well as between sound and image
- the artistic practices and poetics of emotional expression and turn
- the correlations between emotional and linguistic competence, and their disorders
- emotional modelling at the level of cultural codes

The participating institutions are:

- Freie Universität Berlin (host institution)
- Max Planck Institute for Educational Research, Berlin
- Max Planck Institute for Evolutionary Anthropology, Leipzig
- Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig
- Centre for Literary and Cultural Research, Berlin

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NeuroCure – Towards a Better Outcome of Neurological Disorders

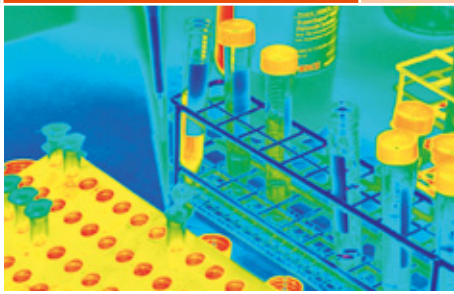
New prospects for neurological diseases

Most neurological diseases are still seen as incurable; only their symptoms can be alleviated. Some of these very different diseases are based partly on the same or very similar neurological mechanisms. Investigations into these processes form a prerequisite for developing effective therapies.

The research focuses on neurological diseases like stroke, multiple sclerosis and disorders of the central nervous system. By closely gearing neurological basic research with clinical studies, the Cluster aims to improve the patient's life situation. New research findings and insights can then flow directly into the treatment.

The participating institutions are:

- Humboldt University Berlin and Freie Universität Berlin as the institutional sponsors of the Charité - University Medicine (host institutions)
- German Rheumatism Research Centre, Berlin
- Leibniz Institute for Molecular Pharmacology, Berlin
- Max Delbrück Centre for Molecular Medicine, Berlin



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Unifying Concepts in Catalysis

Tailor-made catalysts

Modern chemistry makes it possible. Cars and airplanes that burn fuels with fewer pollutant emissions in the future. Or drugs like antibiotics that can be better tuned to their target area in the human body, making them more efficacious. Catalysts are the key to new developments like this. They make the specifically targeted use of chemical reactions possible with the least possible use of energy and materials.

Tailor-made molecules and materials of varying dimensionality and size serve as catalysts. The scientists also use proven methods from nature: microorganisms regulate chemical reactions with the aid of enzymes whose functions have been optimised over the course of evolution. The Cluster aims to develop and investigate new catalysts. In addition, scientists are working on turning their results into industrial applications.

The participating institutions are:

- Technische Universität Berlin (host institution)
- Humboldt University Berlin
- Freie Universität Berlin
- Fritz Haber Institute of the Max Planck Society, Berlin
- Max Planck Institute of Colloids and Interfaces, Potsdam-Golm
- University of Potsdam
- Industrial Partners: BASF AG, Bayer AG, IonGate Biosciences GmbH, PolyAn GmbH, Schering AG, Süd-Chemie AG, Uhde GmbH

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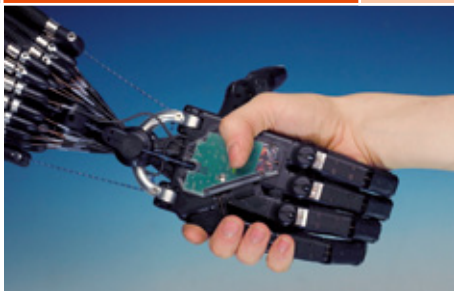
Cognitive Interaction Technology



Empathetic technical systems

Improving human-machine communication has been a research topic at Bielefeld for many years – including cooperation with partners from industry. Scientists in the Cluster of Excellence want to pave the way for technical systems that respond empathetically to humans. This is basic research, while it always bears the application in mind and, eventually, the development of prototypes.

The aim is to design technical cognitive systems in such a way that they can interact with humans at the most natural level possible and can adapt to changing frameworks. Experts in informatics, biology, logistics, physics, psychology and sports science collaborate in the four key fields of the Cluster of Excellence: movement intelligence, attentive systems, situated communication, plus memory and learning.

The participating institutions are:

- University of Bielefeld (host institution)
- Bertelsmann, Gütersloh
- Honda Research Institute Europe, Offenbach
- Miele & Cie., Gütersloh
- Association for Economic Development – WEGE, Bielefeld
- European Centre for Mechatronics, Schloss Crassenstein, Wadersloh

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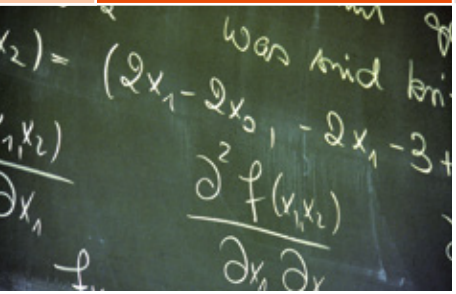

universitätbonn

Mathematics: Foundations, Models, Applications

Maths builds bridges

Mathematics is a very broad and diverse, as well as a currently changing research field. With the Hausdorff Center for Mathematics, Bonn's mathematicians plan to consolidate their position as an international centre. The foundations have long been laid, with numerous mathematicians of worldwide renown already working in Bonn. Twelve research areas cover a broad spectrum of maths topics: from the classical core of mathematics, mathematical modelling and numerical simulation in the natural and social sciences as well as the direct transfer of mathematics into technical applications. Sections of economics and the geosciences, physics, biology and computer science have a strong grounding in mathematical know-how. The creation of new professorships at the interfaces makes it possible to extend bridges to these subjects in order to decisively drive forward promising future maths topics.

The Cluster of Excellence also aims to bring together visiting scientists and researchers from all around the world to work on core topics that will change with each new semester.

The participating institutions are:

- University of Bonn (host institution)
- Max Planck Institute for Mathematics, Bonn

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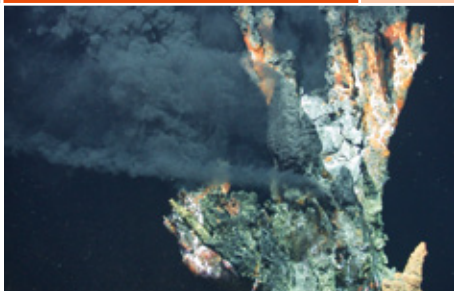
The Ocean in the Earth System



Man and ocean in transformation

Earth is a complex, dynamic system. Ocean, lithosphere, biosphere, atmosphere and cryosphere are closely interlinked though interaction. The Cluster addresses the question of how the flow of energy can act through geological and biological systems on and under the ocean surface. How is the flow fed? How is it distributed, regulated and used? Interest centres on the Black Smokers and other hot springs on the ocean floor. The geoscientific studies aim to help gain a better understanding of the ocean's role in the global earth system.

The Cluster enhances the DFG Research Centre on Ocean Margins that has been investigating selected questions of marine, climate and polar research since 2001. The addition of the Cluster means that further topics like "The Changing Ocean", "Man and Ocean", as well as "Correlations between Geosphere and Biosphere" will also be addressed.

The participating institutions are:

- University of Bremen (host institution)
- Jacobs University Bremen
- Senckenberg Research Institute and Natural History Museum, Department of Marine Science, Wilhelmshaven
- Alfred Wegener Institute for Polar and Marine Research, Bremerhaven
- Max Planck Institute for Marine Microbiology, Bremen
- Centre for Tropical Marine Ecology, Bremen

Universität Bremen

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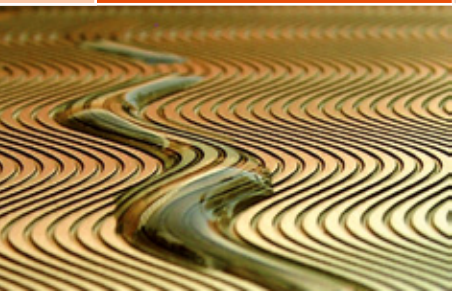

TECHNISCHE UNIVERSITÄT DARMSTADT

Smart Interfaces: Understanding and Designing Fluid Boundaries

Intelligent surfaces

Scientists working in the Cluster are investigating how the microscopic structure of material surfaces influences thermal (energy) and material (fluid or gas) transport. They want to find out how this transport can be improved or made more efficient. For example, they analyse the effects of airflows or the impact of atomised coolant. The results aim to advance energy and transport engineering as well as process and production engineering. This could improve air-conditioning systems and could also cool smaller and higher-performance laptops.

The chemical scientists, physicists, mathematicians, materials scientists and mechanical engineers are conducting research in five areas that promise particularly high innovation potential: static and dynamic wettability, improving thermal transport, near-wall reactive flows, near-wall multiphase flows, and drag and circulation control.

The participating institutions are:

- TU Darmstadt (host institution)
- German Plastics Institute, Darmstadt
- Fraunhofer Institute for Structural Durability and System Reliability, Darmstadt
- Institute of Microtechnology, Mainz
- Max Planck Institute for Polymer Research, Mainz

Coordinator
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Regenerative Therapies: From Cells to Tissues to Therapies: Engineering the Cellular Basis of Regeneration

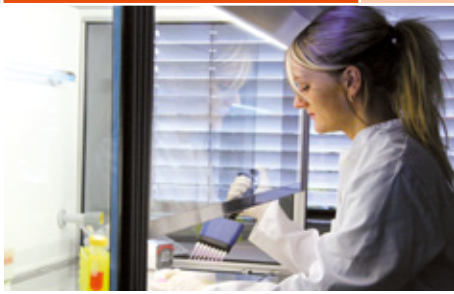
Pinning our hopes on stem cells

Medicine holds great hopes for using stem cells in regenerative therapy. Stem-cell-based methods of tissue engineering promise to make controlled regeneration possible. However, the mechanisms that control these processes are still largely unknown.

The Cluster of Excellence will focus on cell-based regenerative therapy in a multi-disciplinary approach. Bioscientists are currently learning how to control the cellular processes by means of genetics, surface technology and microdevices, for example, in order to be able to regulate the stem cells' reproduction and regeneration. The results aim to make stem cell therapies available for diseases such as leukaemia, diabetes, cardio-vascular diseases, and degenerative diseases of the nervous system.

The participating institutions are:

- Dresden University of Technologie (host institution)
- Max Planck Institute of Molecular Cell Biology and Genetics, Dresden
- Max Planck Institute for the Physics of Complex Systems, Dresden
- Fraunhofer Institute for Ceramic Technologies and Systems, Dresden
- Leibniz Institute of Polymer Research, Dresden
- Research Centre Dresden-Rossendorf, Dresden



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Engineering of Advanced Materials – Hierarchical Structure Formation for Functional Devices

Tailor-made materials

Modern high-performance materials with tailor-made properties promise breakthroughs and advances in information and communications technology, catalysis as well as energy and automotive engineering. New materials and processes not only help to secure industry's competitiveness and economic growth; they also improve the quality of life and contribute to creating an environment worth living in.

Researchers in the Cluster are working on developing hierarchically-organised materials with tailor-made electrical, optical, catalytic and mechanical properties. These aim to facilitate innovative applications in the fields of nanoelectronics, photonics, catalysis and lightweight engineering.

The participating institutions are:

- University of Erlangen-Nuremberg (host institution)
- Max Planck Research Group "Optics, Information and Photonics", Erlangen
- Bavarian Laser Centre, Erlangen
- Centre of Excellence on New Materials, Fürth
- Fraunhofer Institute for Integrated Systems and Device Technology, Erlangen
- Fraunhofer Institute for Integrated Circuits, Erlangen.

Friedrich-Alexander-Universität Erlangen-Nürnberg

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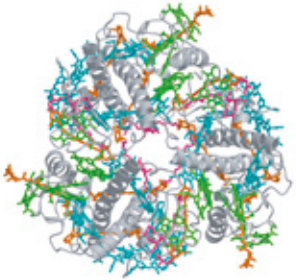
Macromolecular Complexes



Protein complexes: Structure determines function

Macromolecular complexes play a decisive role in all the processes of living cells. They are made up of several proteins that perform jointly-defined functions in a cell. The function depends largely on the cell's three-dimensional structure. Insights into the structure of these complexes are seen as a milestone in understanding the life processes. However, the question of how these complexes act has only been partly researched so far.

The isolation and precise investigation of the major protein complexes are the goals that the Cluster of Excellence pursues. It builds on the previous cooperation between the University of Frankfurt and the Max Planck Institutes in Frankfurt. The scientists want to find out how proteins are organised in these complexes, how this influences their function and what their role in the cell is. These insights will be used in developing novel active agents.

The participating institutions are:

- University of Frankfurt (host institution)
- Max Planck Institute of Biophysics, Frankfurt am Main
- Max Planck Institute for Brain Research, Frankfurt am Main
- Chemotherapeutic Research Institute, Georg Speyer Haus, Frankfurt am Main
- Frankfurt Institute for Advanced Sciences
- Industrial partners: Sanofi-Aventis, Zeiss-NTS

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The development of normative orders

Justifying the rule of power

Normative orders play a decisive role in conflicts over a just and fair economic order and the realisation of peace, human rights and democracy. These orders serve to justify the rule of power and a specific distribution of goods and life chances. The Cluster aims to investigate how such orders are handed down, modified, institutionalised and practised over long periods of time. Researchers from the fields of philosophy, history, politics and law, ethnology, economics, religious studies and sociology are addressing the question of whether and in what respect we are living in a time of new normative orders being formed. The Cluster is divided into four research fields:

- The conception of normativity
- The historicity of normative orders
- Transnational justice, democracy and peace
- The development of legal norms between nations

The participating institutions are:

- University of Frankfurt (host institution)
- TU Darmstadt
- Frobenius Institute, Frankfurt
- Peace Research Institute Frankfurt
- Institute of Social Research, Frankfurt
- Max Planck Institute for European Legal History, Frankfurt
- Point Sud, Centre for Research on Local Knowledge, Bamako/Mali

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Centre for Biological Signalling Studies (bioss) – From Analysis to Synthesis

The language of cells

Biological signalling processes in and between cells control all life processes. They are an organism's existential basis. Hence, a more precise understanding of these processes forms the basis of important biological and medical questions. Many human diseases are caused by faulty or deregulated signalling pathways.

The interdisciplinary Cluster aims to explain the molecular bases and principles of biological signal processing. Biologists and engineers work together to develop and use new machines and methods for analysing the highly complex and dynamic biological signal processing.

The participating institutions include:

- University of Freiburg (host institution)
- Swiss Federal Institute of Technology Zurich/ Switzerland
- Ecole Supérieure de Biotechnologie, (ESBS), Strasbourg/France
- Nanyang Technological University, Singapore
- University of California, Los Angeles /USA
- University of California, Berkeley/USA
- University of Cambridge, Great Britain
- University of Toronto, Canada
- Wageningen University, The Netherlands
- École Polytechnique Fédérale de Lausanne, Switzerland
- Fraunhofer Institute for Physical Measurement Techniques, Freiburg
- Max Planck Institute für Immunobiology, Freiburg
- Industrial Partners: BioPro GmbH, Stuttgart, Trinational Biovalley e. V., Freiburg, Basel, Strasbourg, Carl-Zeiss-MicroImaging GmbH, Jena, Hoffmann-La Roche Ltd., Basel

ALBERT-LUDWIGS-
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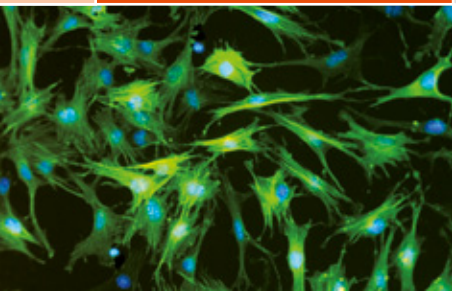

Cardio-Pulmonary System (ECCPS)

Innovative research for cardiac patients

Cardio-pulmonary diseases are one of the most common causes of death. They are also responsible for the highest public health care costs. The Cluster of Excellence investigates cardio-vascular and cardiac tissue diseases, as well as the pulmonary vasculature and tissues. It combines basic research with pre-clinical and clinical studies in order to examine the causes and development of these diseases in an interdisciplinary approach.

In so doing, the researchers address the question of how, for example, vascular remodelling processes can be prevented or reversed. Or how the excessive formation of connective tissue can be stopped. They also study the role played by stem cells in the development and repair processes of cardiac and lung tissues. Their eventual aim is to produce tailor-made therapy concepts.

The participating institutions are:

- University of Giessen (host institution)
- University of Frankfurt (host institution)
- Max Planck Institute for Heart and Lung Research, Bad Nauheim
- Kerckhoff Klinik, Bad Nauheim
- University Hospital Giessen and Marburg

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

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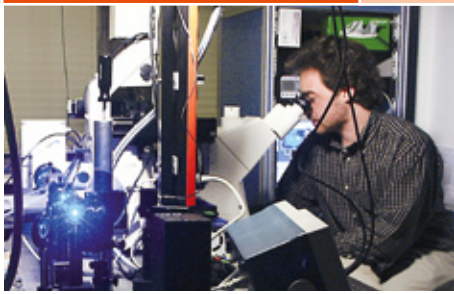
Microscopy at the Nanometer Range



Unravelling the brain's secrets

The human brain is probably the most complex structure that nature has ever brought forth. All functions, like learning, remembering, perceiving and feeling, are ultimately controlled by molecules. The molecular processes in the nerve cells can be studied only with high-resolution microscopes. The newly developed STED microscopy now enables biologists to observe structures in living cells on the nanometer scale. Hence, the Cluster aims to adapt this method of microscopy to meet the requirements of intravital experiments.

The DFG Research Centre on the Molecular Physiology of the Brain (CMPB) at the University of Göttingen, which has been enhanced by the Cluster, will benefit from this. The CMPB studies molecular processes and interactions in neuronal cells to explain how the 3-D networks of highly specialised nerve cells actually function in the human brain. This includes investigating psychiatric and neurological disorders in order to be able to develop new diagnostic and therapeutic methods.

The participating institutions are:

- University of Göttingen (host institution)
- University Medical Centre Göttingen
- European Neuroscience Institute (ENI-G)
- Max Planck Institute for Biophysical Chemistry, Göttingen

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

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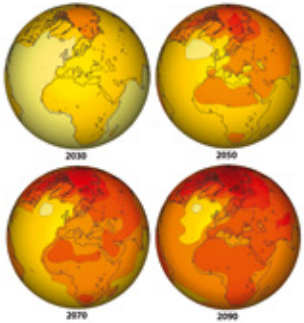

Universität Hamburg

Integrated Climate System Analysis and Prediction (CLiSAP)

Predicting the climate better

Scientists, economists, social scientists and humanists working in Hamburg's Cluster of Excellence want to collaborate and address the current, pressing questions of climate change. In so doing, they will examine the regional impact of climate changes, above all in Europe, with one core area focusing on the north.

How do natural disturbances and anthropogenic interventions change the climate? The Climate Cluster has set itself the goal of analysing and predicting present and future climates and environmental changes as well as their respective impact. Using improved environmental databases and climate models, predictions on aspects like the rising sea levels and storm risks can be made more precise. The aim is also to provide the public with more information, while drawing more attention to the climate problem.

The participating institutions are:

- University of Hamburg (host institution)
- German Climate Computing Centre, Hamburg
- GKSS Research Centre, Geesthacht
- Max Planck Institute for Meteorology, Hamburg

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From Regenerative Biology to Reconstructive Therapy (REBIRTH)

Studying treatment of diseases at cellular and molecular levels

What exactly stimulates the healing processes in living organisms? To what extent are the processes that take place in cells and organs controlled by genes? What kind of role does the environment play? The cluster addresses these questions, for example, by examining cardiac, respiratory system, and liver diseases as well as the pancreatic beta cells. The scientists have defined three research fields: regenerative biology and related sciences; reconstructive therapy in preclinical models; and translation.

The cluster combines excellent education and training with innovative science, plus experimental and clinical medicine. It focuses on innovative approaches to regenerative therapies based on novel cell sources. The medical expertise is complemented by engineering and technology, chemistry, biophotonics and nanotechnology.

The participating institutions are:

- Hannover School of Medicine (host institution)
- University of Hannover
- Foundation of the University of Veterinary Medicine Hannover
- Fraunhofer Institute of Toxicology and Experimental Medicine, Hannover
- Helmholtz Centre for Infection Research, Braunschweig
- Max Planck Institute of Molecular Biomedicine, Münster
- Federal Agricultural Research Centre, Institute of Animal Breeding, Mariensee, Neustadt

MHH Hannover Medical School

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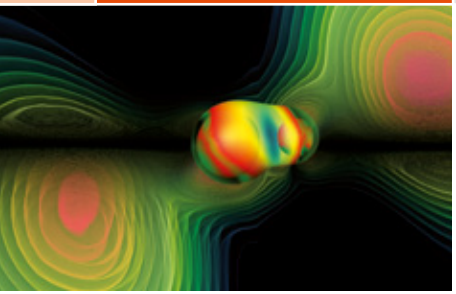

QUEST – Centre for Quantum Engineering and Space-Time Research

Precision measurements of space and time

Thanks to the enormous advances made in theoretical and experimental research, for example on the manipulation of light and matter fields, quantum engineering has become one of the key methods of modern quantum physics. This rapid progress opens up new horizons, such as the testing of the fundamental laws of physics, the unparalleled precision measurement of space and time, or groundbreaking quantum technology-based applications.

QUEST will focus primarily on advancing the research on quantum engineering and on space-time in order, first, to explore the underlying physics and, second, to develop innovative methods for new applications, both in fundamental physics and in applied fields, like Earth observation, navigation and geodesy. The QUEST activities extend across four fields. Quantum engineering, quantum sensors, the physics of space-time, and technology of the future.

The participating institutions are:

- University of Hannover (host institution)
- University of Bremen
- Laser Centre, Hannover
- Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Hannover and Potsdam-Golm
- Federal Institute of Physics and Technology, Braunschweig

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Cellular Networks: From Analysis of Molecular Mechanisms to a Quantitative Understanding of Complex Functions

How biological systems organise themselves

Our knowledge of molecules, genomes and proteomes has progressed at great pace. However, the question of how complex biological networks are regulated still often remains unclear. Within the cells, within a whole organism or in the interaction between organisms, these ensure that the biological systems are able to do their work and are able to adapt to their environment. The Cluster aims to explain how such networks function and how they change.

A comprehensive insight into the regulation of biological systems will eventually make their mathematical modelling and simulation possible. To achieve this, the Cluster is working on four mutually constructive research areas:

- Macromolecular complexes – Biogenesis, interaction and regulation
- The dynamics of cell architecture and interactions with the extracellular environment
- Signal transmission between cells in complex networks
- Influencing and exploiting cellular networks with infectious agents.

The participating institutions are:

- University of Heidelberg (host institution)
- German Cancer Research Centre, Heidelberg
- The European Molecular Biology Laboratory, Heidelberg
- Max Planck Institute for Medical Research, Heidelberg
- Central Institute of Mental Health, Mannheim
- C.H.S. Foundation, Heidelberg

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Asia and Europe in a Global Context: Shifting Asymmetries in Cultural Flows

Cultural relations are asymmetric

Europe and Asia have long been communicating with each other, in an intensive and high-tension relationship – as always when two cultures encounter one another. The Cluster's researchers do not see difficulties that may arise as a shortcoming, but rather take them as a starting point for their studies. Intensive cooperation with partners from Asia makes it possible to analyse the existing asymmetries from both directions and to overcome a Eurocentric perspective.

In the four research fields: governance and administration, public and media, health and environment, and history and cultural heritage, scientists with an historical and contemporary orientation from Asia and Europe-related disciplines study phenomena that arise between individual cultures, language areas, countries and corresponding subjects. In the course of this, theoretical concepts combine with field research and the study of sources – including previously, hardly considered audio-visual media.

The participating institutions include

- University of Heidelberg (host institution)
- SARAI at the Centre for the Study of Developing Societies, New Delhi/India
- Indira Gandhi National Centre for the Arts, Delhi/India
- Centre National de la Recherche Scientifique, Paris/France
- UNESCO
- Harvard University, Cambridge/USA
- Beijing University, China
- Kyoto University, Japan
- Arizona Stateuniversität, Tempe/USA

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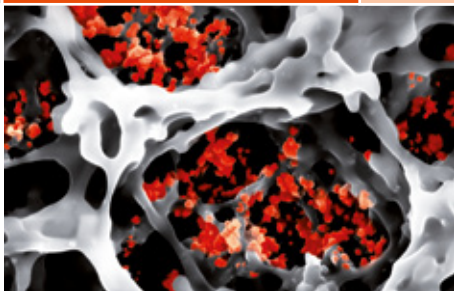
Functional Nanostructures



On the way to "Nano Valley"

Nanotechnologies form the basis for the key technologies of the 21st century. As they do this, basic research findings have to be converted into applications and products. The Cluster of Excellence aims to contribute to developing such nanostructures with a specific function. The Cluster's partners look forward to economic and social effects of the kind that were achieved in Silicon Valley, USA. The Rhine Valley is to become "Nano Valley".

The Cluster was founded as a DFG Research Centre in 2001 and has now been enhanced to a Cluster of Excellence. It previously concentrated on optical and electronic functions. However, much less research has been dedicated so far to exploring the use of biological principles for producing functional nanomaterials or structures. Now, the researchers have set their sights on the life sciences. They try to implement new analytical methods and to manipulate whole cells by infiltrating the cells with functional nanostructures. They also control the growth patterns of living cells through nanotechnologically structured surfaces, and they aim to build transporters for miniscule chemical reactions from biological cell compartments.

Universität Karlsruhe (TH)
Research University · founded 1825

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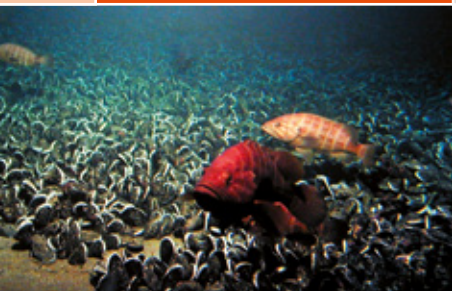

The Future Ocean

Opportunities and dangers of the ocean

The future of humanity depends on the development of the world's oceans. Indeed, oceans strongly influence the climate. They bear indispensable food and natural resources. However, tsunamis, storm floods or the rising ocean levels at the same time present a threat of danger. The researchers working within the Cluster reconstruct past changes and investigate the present changes to the oceans. Building on this, they reassess the risks and opportunities that oceans will have for us in the future and develop concepts for sustainably using the oceans.

Even today one thing is clear. Fishing and the burning of fossil fuels cause a whole range of changes that will lead to unexpected consequences in the near and distant future. The research done by the Cluster concentrates on the topic of "oceans in a greenhouse climate" and "marine resources and natural dangers". It brings together experts from the marine and geosciences, medicine, mathematics, law, economics and social sciences.

The participating institutions are:

- University of Kiel (host institution)
- IFM-GEOMAR Leibniz Institute for Marine Sciences, Kiel
- Kiel Institute for the World Economy (Leibniz Association), Kiel
- Muthesius Academy of Fine Arts and Design, Kiel

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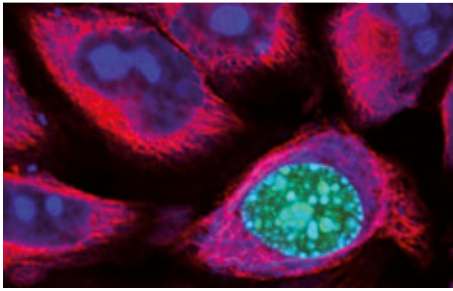
Inflammation at Interfaces



Better skin protection

Skin and mucous membranes form the interface between the body and the outside world. They protect humans and animals alike. Inflammations of the skin, lung, or bowel are a central medical problem in many diseases caused by civilisation and modern society, such as asthma or chronic inflammatory bowel diseases. The Cluster of Excellence has set itself the goal of understanding the protective mechanisms of the skin and mucous membranes and, at the same time, of identifying why disorders occur. In particular, this involves investigating the individual differences between one person and the next. The research project focuses on the causes, treatment and prevention of inflammatory diseases.

Some 130 experts are working within the Cluster on investigating barrier diseases with neurological and immunological question complexes, with questions of cancer research, as well as with the genetic changes of pathogens.

The participating institutions include:

- University of Kiel (host institution)
- University of Lübeck (host institution)
- Research Centre Borstel (co-applicant)
- Bernhard Nocht Institute for Tropical Medicine, Hamburg
- Federal Research Institute of Nutrition and Food, Kiel
- DESY, Hamburg
- Kiel Institute for the World Economy, Kiel
- The Leibniz Institute of Marine Sciences, Kiel
- Max Planck Institute for Evolutionary Biology, Plön

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Im Focus das Leben
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Universität zu Köln

Cellular Stress Responses in Aging-Associated Diseases

Growing old healthily

Human life expectancy is increasing. A serious consequence of this is that there are ever more cases of age-related diseases, such as Alzheimer's, obesity or late onset diabetes. New investigations show that changes to individual genes in model organisms, such as mice, cannot only lead to greater life expectancy, but can also reduce the age-related diseases. This would indicate that the individual genes also influence the occurrence of aging-associated diseases. This could fundamentally change our understanding of the causes and so revolutionise the prevention and treatment of age-dependent diseases.

The Cluster of Excellence explores the molecular principles of the aging process and of the associated diseases. The objects of research are often the so-called knockout mice in which individual genes have been specifically switched off. Investigations here concentrate on the following topic areas: cellular stress responses and dysfunction during aging; aging membranes and age-related impairment of the immune system's defence against pathogens and inflammations; and metabolic pathways in aging-associated diseases.

The participating institutions are:

- University of Cologne (host institution)
- Max Planck Institute for the Biology of Aging, Cologne

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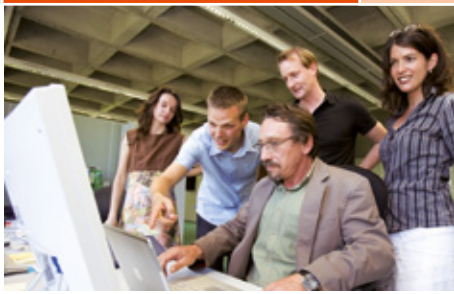
Cultural foundations of integration



Rethinking integration

Integration is a topic that sits right at the top of the political agenda. Key words like European integration, global society, migrant flows, failed states, and the significance of religions for processes of social integration and disintegration demonstrate both the topicality and the explosive potential of this issue. The researchers from Constance examine integration and disintegration at all social levels – from antiquity to the present. They are interested in developing a new theory of culture that understands culture in all its various facets as a constitutive element of integration. In so doing, integration is comprehensively interpreted as the formation of social patterns of order. The scientists start out from a hypothesis that integration is by no means the default from which disintegration deviates. Both processes share the same origin and are of equal status as far as their understanding of social problems is concerned. The Cluster concentrates on four research fields: identity cultures, narrative theory as cultural theory, transcultural hierarchies, and the cultural dynamics of religion.

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Nanosystems Initiative Munich (NIM)

Creating, understanding, and controlling nanosystems

Nanostructures are playing an ever greater role in information technology and in the life sciences. Although many individual components on the nanometre scale have been developed in recent years, only little experience has been gained on how these components can be integrated into complex systems. NIM's prime goal is to create a broad range of artificial, multifunctional nanosystems, to understand how they work, and to control them. The aim is that applications in information technology and the life sciences become possible.

NIM brings together scientists and researchers from various fields like physics, biophysics, physical chemistry, biochemistry, pharmacy, biology, electrical engineering, and medicine. Ten sub-sections will, inter alia, study quantum phenomena in nanosystems as well as artificial and natural nanomachines.

The participating institutions are:

- LMU Munich (host institution)
- TU Munich (co-applicant)
- University of Augsburg (co-applicant)
- University of Applied Sciences Munich
- Max Planck Institute of Biochemistry, Martinsried
- Max Planck Institute of Quantum Optics, Garching
- Walther Meißner Institute of the Bavarian Academy of Sciences and Humanities, Munich
- Deutsches Museum, Munich

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Munich Center for Integrated Protein Science (CiPSM)

Proteins at the centre of the life sciences

In their capacity as central biological macromolecules, proteins determine the structure and function of all organisms. Thus, protein research forms a important foundation for advances in biomedicine. To comprehensively understand the role played by these molecules, protein research needs to be carried out at the level of biological systems. CiPSM combines the study of proteins at the nuclear and molecular levels with the investigation of proteins in protein complexes, cellular networks and model organisms.

One of CiPSM's core areas focuses on studying protein dynamics. Modern techniques help the scientists observe proteins in living cells and various types of tissues. Several branches deal with the biophysical examination of proteins, with protein folding and transport, with the structure of protein complexes, with how proteins interact with nucleic acids, and with the manipulation of protein functions in the nervous system.

The participating institutions are:

- LMU Munich (host institution)
- TU Munich
- Max Planck Institute of Biochemistry, Martinsried
- Max Planck Institute of Neurobiology, Martinsried
- Helmholtz Centre Munich – German Research Centre for Environmental Health

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Munich-Centre for Advanced Photonics (MAP)

Making the most of light's technical options

Whether it's about miniaturising electronic devices, improving microscopy, or better cancer diagnosis and therapy, photonics play a decisive role everywhere. The goal is to generate tailor-made light in previously unattained field strengths and frequencies. Besides the theoretical and experimental principles, MAP is also developing a number of applications, such as the structural elucidation of biological molecules, the course that electronic processes and chemical reactions take at nuclear level or new imaging methods for clinical diagnostics.

MAP takes an interdisciplinary approach, involving physics, chemistry, biology, and medicine, and so creating a unique research infrastructure and an extensive cross-disciplinary network for the development and application of lasers. This includes, inter alia, prototypes for future quantum computers, next generation imaging methods, as well as modern particle accelerators for tumour therapy.

The participating institutions are:

- LMU Munich (host institution)
- TU Munich (co-applicant)
- University of the Federal Armed Forces, Munich
- Max Planck Institute of Quantum Optics, Garching
- Max Planck Institute of Biochemistry, Martinsried
- Max Planck Institute for Extraterrestrial Physics, Garching
- Semiconductor Laboratory of the Max Planck Society, Munich
- Max Planck Institute for Plasma Physics, Garching
- GSI Institute for Heavy Ion Research, Darmstadt
- University of Mainz
- Uppsala University, Sweden

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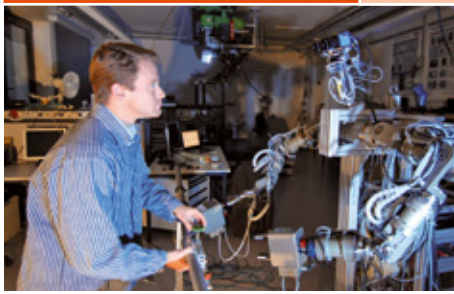
Cognition for Technical Systems (COTESYS)



Robots – Tomorrow's mobile talents

Although modern industrial robots are faster, more precise and stronger than humans, they are not more skilful, dexterous or agile. This forms the base from which COTESYS starts out. The Cluster investigates questions of cognition for technical systems. This is all about perception, knowledge processing and learning, planning and regulating, as well as about how systems interact with humans and their surroundings. The human brain is the starting point. Over the course of evolution, this organ has specialised in learning and regulating complex sequences of movements. It can also adapt its movement control mechanisms to take account of the relevant surroundings and tasks.

In the future, such abilities could also enable technical systems to respond more reliably, more flexibly and better to challenges. Hence, the scientists are researching and developing cognitive mechanisms for regulating movements that they then analyse in demonstration scenarios with humanoid robots, autonomous vehicles, and self-regulating factories.

The participating institutions are:

- TU Munich (host institution)
- LMU Munich
- University of the Federal Armed Forces, Munich
- German Aerospace Centre, Wesseling
- Max Planck Institute of Neurobiology, Martinsried

Technische Universität München

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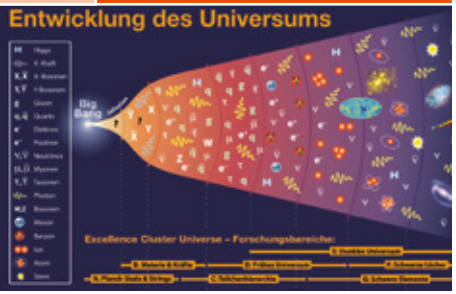

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Origin and Structure of the Universe

Tracking down the secrets of the universe

The key questions of modern physics are to be found where extremely high energies arise in extremely small distances. The ability to understand the nature of the forces and matter under these conditions promises to provide insights into the baffling imbalance between matter and antimatter, the formation of black holes, and the nature of dark matter and energy. Thus the participating astrophysicists and their nuclear and particle physics colleagues are venturing into the innermost structures of space, matter and time, where they gain insight into the origins of nature. Experiments and astronomical observations are complemented by complex simulations and theoretical models. The Cluster is based at the Research Campus Garching, one of the world's largest and most active centres in the field of fundamental physics and astrophysics.

The participating institutions are:

- TU Munich (host institution)
- LMU Munich (co-applicant)
- Max Planck Institute for Astrophysics, Garching
- Max Planck Institute for Extraterrestrial Physics, Garching
- Max Planck Institute of Physics, Munich
- Max Planck Institute for Plasma Physics, Garching
- Semiconductor Laboratory of the Max Planck Society, Munich
- European Southern Observatory, Garching

Religion and Politics in Pre-Modern and Modern Cultures

The return of the religious

Religion has returned to the political agenda. Phenomena that extend from esoteric private religions to fundamentalist violence cause irritations in our seemingly secularised world. The prevailing conviction in Europe, namely that the historical process of the modern age achieves its goal in the sovereign, secular state, turning religion into a legally guaranteed private matter, is beginning to topple. Experts in history, theology, law, ethnology, the social sciences and literary studies explore the relationship between religion and politics from pre-Christian antiquity to the present day. By gaining an understanding of pre-modern structures, they would like to ground the assessment of the current situation on a broader basis. Their research concentrates on the four fields of normativity, staging, integrative processes, and violence.

The participating institutions include

- University of Münster (host institution)
- Hebrew University, Jerusalem/Israel
- Stanford University, USA
- University of Bergen, Copenhagen, Denmark
- Ecole des Hautes Études en Sciences Sociales, Paris/France
- Pontificia Universidad Católica Argentina, Buenos Aires/Argentina
- Princeton University, USA
- University of Groningen, The Netherlands

Westfälische Wilhelms-Universität Münster

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UNIVERSITÄT DES SAARLANDES

Multimodal Computing and Interaction

Robust, Efficient and Intelligent Processing of Text, Speech, Visual Data and High Dimensional Representations

Perfecting access to digital content

Information systems are expected to interact with humans naturally, to consider the environmental context, to respond to language, text and gestures, and to answer appropriately. This is the goal that the Cluster of Excellence is pursuing. The scientists are also working on improving their capabilities, enabling computer systems to learn how to analyse and interpret even incomplete or noisy data, to process the acquired knowledge and to present it in real time.

Today, digital content comes in different forms, such as language, images, films, 3D models and databases. The Cluster of Excellence aims to make these contents as readily available as possible. The goal is not only to transmit information, but also to intelligently and reliably mine, understand and organise these data. That requires new systems to be created in which all this occurs as naturally and as intuitively as possible.

The participating institutions are:

- Saarland University (host institution)
- German Research Centre for Artificial Intelligence, Saarbrücken
- Max Planck Institute for Informatics, Saarbrücken
- Max Planck Institute for Software Systems, Saarbrücken

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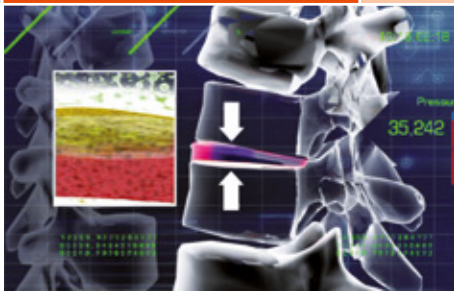

Simulation Technology

Solutions from virtual worlds

Simulation technology is absolutely essential to modern research. This technology is used to model and solve complex problems. Simulation in the form of interaction with real and virtual worlds presents new challenges when developing appropriate technologies. The Cluster aims to blend previous strategies into a new integrative simulation environment that supports all aspects, from model to interactive system.

This means that the researchers not only have to enhance the degree of visualisation, but must, at the same time, also make the simulation systems more efficient and reliable. In the end, this will lead to new predictive and solution methods, such as the fully-virtualised development of prototypes and factories, climate models or, as a long-term goal, a model of the human body.

The participating institutions are:

- University of Stuttgart (host institution)
- German Aerospace Centre, Stuttgart and Cologne
- Fraunhofer Institute for Industrial Engineering, Stuttgart
- Fraunhofer Institute for Manufacturing Engineering and Automation, Stuttgart
- Fraunhofer Institute for Building Physics, Holzkirchen and Stuttgart
- Max Planck Institute for Metals Research, Stuttgart

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Interdisciplinary Centre for Integrative Neuroscience (CIN)

How the brain switches

The field of integrative neurosciences researches both the structure and the modus operandi of individual neurons as well as their complicated interplay, which is actually what makes many different functions of the brain possible at all. How this interplay works in detail and how diseases of the brain impede its functions are the core topics addressed by the CIN Cluster of Excellence. The scientists want to use their insights and findings to develop new technical solutions for applications in medical engineering and information technology.

The primary goal is to unravel and understand the information-theoretical and neuronal foundations of the brain's functions. Experts from five mutually complementary research areas are working on this. Among other aspects, they also aim to improve modern imaging technologies and to develop neuroprosthetics that will replace functions lost as a result of illness or disease.

The participating institutions are:

- University of Tübingen (host institution)
- Fraunhofer Institute for Industrial Engineering, Stuttgart
- Max Planck Institute for Biological Cybernetics, Tübingen

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Current Institutional Strategies

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RWTH Aachen 2020: Meeting Global Challenges

The integrated interdisciplinary university of technology

The RWTH Aachen addresses pressing global problems like energy, mobility, health and demographic change by defining integrated research strategies. Engineering and the natural sciences – the renowned core areas – are being further strengthened to make the most of their innovative potential. The mission is to create an integrated interdisciplinary and international university. The RWTH Aachen aims to master this far-reaching reorientation process with four mutually coordinated and constructive measures:

- A sharper profile

  Strengthening natural sciences basic research and interdisciplinary research and improving scientific cooperation between all the faculties and the fields of engineering and the natural sciences.

- Jülich-Aachen Research Alliance (JARA)

  JARA is a novel organisational and strategic basis for the RWTH's cooperation with the Jülich Research Centre; it aims to serve as a model for future collaboration with external partners.

- Empowering people

  Specifically targeted measures to promote and support people at all career levels by introducing a coherent human resources and organisation development concept that makes it possible to recruit and retain the best minds.

- Strengthening the management structures

  Establishing innovative executive management structures at university board and faculty level in order to distribute resources more efficiently and streamline the decision-making processes.

International Network University

Excellently networked

The Freie Universität Berlin has set itself the goal of becoming one of the top-flight international universities. Hence, it is fundamentally reorganising itself: from a classical university structure into a strategy-based modern management structure. Building on its networking concept, the Freie Universität Berlin is creating three strategic centres to consolidate its international level of excellence in research and in the training of young scientists.

The FU implemented its Cluster Concept by establishing the Centre for Cluster Development. It supports and stimulates the formation of research networks within the university and identifies new research fields.

The Centre for Graduate Studies coordinates the structured doctoral training and establishes new graduate programmes together with the Cluster networks and their partners.

The Centre for International Exchange acts as a hub for the FU's international network of branches located worldwide. These help the Centre recruit top-flight young academics.

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Windows for Research

Windows and the new universitas

Freiburg's Institutional Strategy pursues three goals: to expand the research windows for the scientists, to promote exchange between subjects, and to enhance the university's internationalisation.

The university is implementing the following measures to drive these goals forward:

- The Freiburg Institute for Advanced Studies (FRIAS) is creating university-operated research centres in four outstanding areas: Historical Studies, Language and Literature, Life Sciences und Soft Matter Science. Internal and external fellows conduct research together in these centres under ideal conditions.
- The Research Group Programme will create new Junior Research Groups to strengthen other subject areas.
- The International Graduate Academy (IGA) Freiburg is promoting young doctoral students by setting structural targets, quality standards and qualification measures.
- A central Science Support Centre assists the scientists in the application for and management of externally funded projects.

Tradition – Innovation – Autonomy

New paths to the top

The University of Göttingen's Institutional Strategy aims to inspire outstanding scientists to top-flight achievements in a climate of cooperation and exchange, and to recruit the best young scientists and so create lasting bonds between them and the university. Göttingen does this by concentrating on its strengths as a research university with a great diversity of subjects along with its autonomous status as an endowed university. In its capacity as an integrated research and teaching community, Göttingen has a key role to play as a leading centre of science and research. The network of non-university research institutions in and around Göttingen opens up specific opportunities for attracting, recruiting and retaining excellent researchers from home and abroad, as well as for establishing and expanding internationally competitive pioneering research.

Göttingen's Institutional Strategy covers four projects:

- "Brain Gain" offers excellent young researchers reliable career prospects, while the Göttingen Courant Research Centres and the Free Floating Junior Research Groups establish new core research areas.
- "Brain Sustain" creates lasting bonds between established top-flight researchers and the university.
- The "LichtenbergKolleg" promotes innovative and networked research in the humanities and social sciences.
- "Göttingen International" supports the recruitment of highly qualified foreign students and young scientists.

GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

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Realising the Potential of a Comprehensive University

Building bridges between academic cultures

The University of Heidelberg is evolving from a classical "universitas" into a full university of the future. It aims to continue to cultivate and nurture its renowned breadth of subjects and so stands out internationally as an even stronger partner. Building further interdisciplinary bridges is one of its core objectives. In addition, the university aims to achieve a new level of interdisciplinarity by interlinking the various academic cultures. Working together with partners (German Cancer Research Centre, European Molecular Biology Laboratory, the Max Planck Institutes, and others) it aims to consolidate and strengthen the outstanding research fields located at the University of Heidelberg: transcultural studies, molecular life sciences, physics and astronomy, chemistry, mathematics and scientific computing. The field of political economy is being developed to this end.

The key measures are:

- The new alliance between the university's Centre for Molecular Biology and the German Cancer Research Centre as a new form of cooperation between university and non-university research
- The Marsilius-Kolleg is responsible for developing a new quality of collaboration between subjects from different academic cultures
- Early independence and better career prospects for young researchers. Junior Research Groups with a tenure track-option will also be established in the humanities.
- The innovation fund "FRONTIER" offers a novel funding instrument for small to medium-sized projects of high scientific quality and great innovative potential.

Founding of the Karlsruhe Institute of Technology

Merging together for strong research

The institutional strategy has set itself a revolutionary goal in Germany's research landscape: the founding of the Karlsruhe University of Technology (KIT), a merger between the University of Karlsruhe and the Research Centre Karlsruhe. The creation of a distinct KIT profile with a strong image and the merger between the two partners in the field of research will take place at two levels. On the one hand, by means of the competencies that the scientists from both institutions introduce into the KIT. The resulting **Competence Portfolio** will make the scientific and technological competencies of the KIT transparent and easily accessible, both internally and externally. And, on the other, by distinctly communicating the profile of research topics that are pursued at the KIT at institutional level, namely through the **KIT Centres** and the **KIT Focuses** that bring together thematically associated programmes and projects of varying size and strategically support these. These KIT Centres stand out through USPs, in their scientific approach, in their strategic objectives, and in their mission. The national research tasks will be fulfilled more comprehensively and more successfully in these centres by mutually and reciprocally complementing and strengthening the programmatic research performed by the Helmholtz Association and through the independent research conducted by university groups.

The whole strategy focuses on the Knowledge Triangle: "Research – Teaching – Innovation".

Addendum:
The new institution (KIT) was formally founded on October 1, 2009.

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The Constance Model – For a Culture of Creativity

A Culture of Creativity

By consistently enhancing its strengths, the University of Constance aims to become a leading international centre for young, top-flight researchers:

- Creativity in research and teaching along with elements of strengthening cutting-edge research; specifically promoting young researchers, in particular through the Zukunftskolleg; and intensifying international contacts.
- Institutional creativity, i.e. expanding the range of services offered, such as coaching and career planning.
- Equal opportunities for men and women at all academic levels.
- Knowledge transfer between science and research, business and industry, politics, and the general public through the Konstanz Science Forum.

The university supports committed scientists with financial and human resources as well as by largely releasing them from their academic duties when implementing innovative research projects. This leads to new interdisciplinary research centres developing, while stimulating scientific exchange within the university as well as with external partners.

The Zukunftskolleg is the key element in promoting young researchers. It has an interdisciplinary and cross-generational design and provides the required scientific and institutional infrastructure. Grants are available for postdoctoral students who have already achieved outstanding scientific results and whose projects possess exceptional potential.

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LMUexcellent: Working Brains – Networking Minds – Living Knowledge

A partner for key questions of the future

In its capacity as a true "universitas" with a broad and differentiated range of fields of knowledge, the LMU has a particularly responsible role to play in solving the ever more complex questions of the future relating to humankind, society, culture, the environment and technology. Hence, the LMU's Institutional Strategy – LMUexcellent – aims to improve the frameworks for pioneering research and to further consolidate the LMU's international position as a leading European university.

To achieve this, the LMU is investing almost two thirds of its Excellence Funding in creating competitive research conditions, such as research and visiting professorships, and is making the professorial appointments process more efficient, where suitable, taking on a proactive role. Another core area lies in the individual and specifically targeted promotion of young scientists, for example with the GraduateCentre-LMU, the university's central coordination and service centre for graduate training. In addition, ResearchServices-LMU offers a comprehensive package of advisory and consultancy services centred on questions of research funding and technology transfer. A further strategic objective aims to extend and consolidate key collaboration with leading international research institutions and universities. A consistent and university-wide quality management system underlies all the university's measures.

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TUM. The Entrepreneurial University

Science with an entrepreneurial mind

The TU Munich is "The Entrepreneurial University". In the context of top-flight research, this means combining as much individual freedom as possible with a science-friendly administration. The university is becoming an entrepreneurial university equipped with the appropriate ideas and actions that can compete with the highest international standards.

The following key measures are being pursued:

- All activities revolve around the TUM Institute for Advanced Study. This scientific centre sharpens the university's distinct profile in the natural sciences and engineering, medicine and the life sciences. An atmosphere of creativity and innovation, of freedom and unbureaucratic support for excellent scientists and junior researchers serves to facilitate substantial advances. At the same time, high risk equals high reward. Truly pioneering interdisciplinary projects cannot be launched without doing the requisite entrepreneurial groundwork and having the courage to invest in risky projects.
- A whole package of administrative measures have been taken to a research-conducive setting for the top-flight scientists: examples include measures to promote women and families, fundraising and alumni network, qualifications-based student selection, a reformed professorial appointments system, international alliances and spin-offs, as well as summer schools.

The Next Phase

The decision to institute the second phase of the Excellence Initiative was taken by the federal and state governments in June 2009. It continues the programme from 2012 until the end of 2017. Its policy is to create competition between new projects and those already being funded.

The decision to continue the programme was backed with a significant increase in financial support to the amount of 1.9 billion euros, bringing the total to 2.7 billion euros.
In contrast to the first phase, the second phase only includes one round, which is again divided into a preliminary and a final round. The modalities are essentially unchanged, except that more flexible amounts of funding have been specified. Graduate Schools can obtain between 1 and 2.5 million euros annually, Clusters of Excellence between 3 and 8 million euros. In the Institutional Strategies, greater emphasis is to be placed on elements of research-related teaching.

The Preliminary Round

By 1 September 2010 a total of 227 draft proposals for the second competition phase had been received for new projects from 64 universities: 98 for Graduate Schools, 107 for Clusters of Excellence and 22 for Institutional Strategies.

The 205 drafts for new Graduate Schools and Clusters of Excellence were reviewed under the supervision of the DFG, firstly in 20 international peer review panels and then in the DFG's "Expert Commission". The 22 drafts for new Institutional Strategies were reviewed individually and comparatively by the "Strategic Commission" appointed by the German Council of Science and Humanities.

Following this procedure, on 2 March 2011 the Expert and Strategic Commissions met as the "Joint Commission" and selected 59 draft proposals at 32 universities for the final round, of which 25 drafts were for new Graduate Schools, 27 for new Clusters of Excellence and 7 for new Institutional Strategies.

The Final Round

In the final round, the successful draft proposals for new projects compete with the projects already being funded from the first phase. Both types of applicant have until 1 September 2011 to submit full funding proposals or renewal proposals. These are then reviewed by the spring of 2012, again firstly under the supervision of the DFG and the German Council of Science and Humanities.

The final decisions are taken in mid-June 2012 in the Commissions of the DFG and German Council of Science and Humanities, as well as in the Joint Commission and finally in the "Grants Committee" made up of the Joint Commission and the Federal and State Ministers of Science and Research. On 15 June 2012 it will meet to decide which Graduate Schools, Clusters of Excellence and Institutional Strategies will be funded for a period of five years from November 2012.

Draft Proposals Selected for the Final Round

Graduate Schools

RWTH Aachen University
JARA-FIT Graduate School: Fundamentals of Future Information Technology

RWTH Aachen University
Mobile Multimedia Gaduate School

University of Bamberg
Bamberg Graduate School of Social Sciences (BAGSS)

Freie Universität Berlin
Graduate School of East Asian Studies

Freie Universität Berlin / Humboldt University Berlin
Berlin School of Integrative Oncology

Humboldt University Berlin
FutureLand Graduate School – The Transformation of Land Use to Sustainability

Humboldt University Berlin
Robert Koch Graduate School Berlin

Humboldt University Berlin
School of Analytical Sciences Adlershof (SALSA)

TU Darmstadt
Darmstadt Graduate School of Energy Science and Engineering

Heinrich Heine University Düsseldorf
iBrain – Interdisciplinary Graduate School for Brain Research and Translational Neuroscience

University of Göttingen
Göttingen Academy for Young Researchers in the Humanities (GEWINA)

Martin Luther University Halle-Wittenberg
F3 – Function Follows Form – Structure and Design on the Atomic and Molecular Scale

Karlsruhe Institute of Technology (KIT)
Elementary Particle and Astroparticle Physics: Science and Technology

Karlsruhe Institute of Technology (KIT)
Karlsruhe School of Informatics Engineering (KSIE)

University of Cologne
a.r.t.e.s. Graduate School for the Humanities Cologne (AGSHC)

University of Constance
Graduate School of Decision Sciences

LMU Munich
Distant Worlds: Munich Graduate School for Ancient Studies

LMU Munich
Graduate School of Quantitative Biosciences Munich (QBM)

LMU Munich / University of Regensburg
Graduate School for East and Southeast European Studies

TU Munich
Risk and Security

University of Münster
Münster Graduate School of Evolution

Niedersachsen Institutes of Technology (NTH)
NTH School of Engineering Sciences

University of Stuttgart
Graduate School Advanced Condensed Matter Science

University of Tübingen
Learning, Educational Achievement, and Life Course Development: An Integrated Research and Training Program

University of Tübingen
Tübingen International Graduate School Molecular and Developmental Cell Systems (TIGS MoDeCS)

Clusters of Excellence

RWTH Aachen University
Sustainable Buildings of the Future – Meeting Energy and Demographic Challenges

Freie Universität Berlin / Humboldt University Berlin
GenoRare: Medical Genomics of Rare Disease

Humboldt University Berlin
Image Knowledge Gestaltung. An Interdisciplinary Laboratory

University of Bielefeld
Communicating comparisons. From the onset of modernity to world society

Ruhr University Bochum
RESOLV (Ruhr Explores Solvation) Understanding and Design of Solvent Controlled Processes

University of Bonn
ImmunoSensation: the Immune Sensory System

University of Bonn
Supramolecular architectures in spatio-temporal resolution (SupraTec)

University of Bonn
The Nature of Forces and Matter

Chemnitz University of Technology
Merge Technologies for Multifunctional Lightweight Structures "MERGE"

TU Darmstadt
TAIFUN – Tailored Functionality in Ceramic Materials

Dresden University of Technology
Center for Advancing Electronics Dresden (AED)

Heinrich Heine University Düsseldorf / University of Cologne
CEPLAS – Cluster of Excellence on Plant Sciences

European University Viadrina Frankfurt (Oder)
BORDERS IN MOTION

University of Freiburg
BrainLinks – BrainTools

University of Hamburg
The Hamburg Centre for Ultrafast Imaging: Structure, Dynamics and Control of Matter at the Atomic Scale

University of Kaiserslautern
Kaiserslautern Center for Advanced Spin Engineering (CASE)

Karlsruhe Institute of Technology (KIT)
Dependable Software for Critical Infrastructures

University of Kiel
Materials for Life

University of Mainz
Earth and the Anthropocene

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Molecularly Controlled Non-Equilibrium (MCNE)

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Precision Physics, Fundamental Interactions and Structure of Matter

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Electromobility Beyond 2020

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Cells in Motion – CiM Imaging to Understand Cellular Behaviour in Organisms

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Hearing4all: Models, technology and solutions for diagnostics, restoration and support of hearing

University of Paderborn
Engineering Self-Coordinating Software Intensive Systems

University of Tübingen
Tübingen Center for the Study of Language

Institutional Strategies

Humboldt University Berlin

Ruhr University Bochum

University of Bremen

Dresden University of Technology

University of Cologne

University of Mainz

University of Tübingen

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