



# Excellence Initiative at a Glance

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

The Second Phase 2012–2017  
Graduate Schools – Clusters of Excellence – Institutional Strategies

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# **Excellence Initiative**

## at a Glance

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All the information on Graduate Schools (GSC), Clusters of Excellence (EXC), and Institutional Strategies (ZUK) funded under the Excellence Initiative is based on the funding proposals submitted by the institutions and on their own profiles published on their respective websites and other sources.

The content of this publication is subject to change without notification. Please contact the respective institution for further information.

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## Words of Welcome



**Professor Dr. Johanna Wanka**  
*Federal Minister of  
Education and Research*  
*Deputy Chairperson of the  
Joint Science Conference (GWK)*

### Outstanding Conditions for Cutting-Edge Research

An internationally competitive science and research landscape is an expression of a country's future viability. This is why the Federal Government and the Länder decided in favour of stepping up investments in education and research in the face of the 2009 financial crisis. They also agreed to continue the "Higher Education Pact", the "Joint Initiative for Research and Innovation" and the "Excellence Initiative".

The Excellence Initiative, which is implemented by the DFG and the German Council of Science and Humanities, has inspired not only those universities that are receiving funding but also the German higher education sector as a whole. Apart from promoting outstanding research, the Excellence Initiative is also helping to generate new structures such as doctoral procedures involving transparent recruitment and supervision agreements or attractive new staffing structures alongside conventional

professorships. Furthermore, the Initiative also supports collaborations, thus providing outstanding conditions for cutting-edge research, coordinated career pathways between the various partner institutions and the efficient use of research infrastructures to the advantage of all those concerned. In addition, strategic research collaborations involving eminent global partners attract attention to our country, as do researchers with a German doctorate in their role as science ambassadors.

The Excellence Initiative has revitalized the German higher education landscape. The Federal Government and the Länder must continue down this path together if Germany wants to maintain its position in the global race for research and innovation leadership and further improve its future viability. The Federal Government is willing to continue this course!

## Internationally Visible and Recognised

In the context of their long-term joint research funding, the Federal and State Governments want to consolidate Germany's sustainable position as a science location, enhance its international competitiveness and present its top-class university research more visibly. All of these are explicit goals of the Excellence Initiative for which the Federal and State Governments are providing 4.6 billion euros in two phases between 2006 and 2017.

The Excellence Initiative has sparked a pioneering spirit at universities, along with new ideas and diverse new forms of cooperation between universities and non-university research institutions. The Initiative has thus made a significant contribution to overcoming the frequently lamented pillarisation of the German science system. Both research performance and the excellence competition itself have received international recognition; our European neighbours have since introduced similar contests.

The Clusters of Excellence and Graduate Schools enable universities to increase their power to attract researchers from abroad and drive their profiling and differentiation strategies. Inter-institutional cooperation is one way of magnifying the visibility of university locations and research regions.

In the first phase of the Excellence Initiative, the projects presented in this brochure developed into remarkable success stories for the respective science and research institutions. I am convinced that they will continue to augment their innovative capacities in the second funding phase and amalgamate with the newly-selected projects to enhance the profile of science and research as important potential for the future.



Doris Ahnen

*State Minister of Rhineland-Palatinate  
for Education, Science,  
Further Education and Culture  
Chairperson of the  
Joint Science Conference (GWK)*



**Professor Dr. Peter Strohschneider**  
*President of the Deutsche Forschungsgemeinschaft (DFG)*



**Professor Dr.-Ing. Wolfgang Marquardt**  
*Chairman of the German Council of Science and Humanities*

### The Excellence Initiative – A Success Story, Part Two

This edition of "The Excellence Initiative at a Glance" is the fifth in less than five years. Stocks of the four previous editions with a print run of more than 35,000 were soon exhausted: public interest in the Excellence Initiative as a tool that sets international benchmarks for funding research and developing universities continues unabated.

This completely revised, new edition of the brochure is also the first to present the projects – approved in June 2012 and funded since November 2012 – which competed successfully in the second phase of the competition to promote top-level university research in Germany. The entire programme was initiated by the Federal and State Governments and is conducted by the Deutsche Forschungsgemeinschaft (DFG) and the German Council of Science and Humanities (WR).

Launched in 2005, the first phase of the Excellence Initiative very soon generated a dynamic

invigoration and modernisation of German universities and the system of Higher Education and research: the 85 institutions selected from more than 600 draft proposals in 2006 and 2007 and funded for the following five years, stand for an impressive wealth of superb research ideas and themes as well as for highly efficient forms of organising research. At the same time, they also mark the replacement of the fiction that all universities are equal by the paradigm of functional differentiation – an explicit research policy objective. All of this engendered a great deal of attention and recognition, both nationally and internationally.

The continuation of the Excellence Initiative – a decision taken by the Federal and State Governments in mid-2009 at the dogged insistence of research and as a clear demonstration of the political priority assigned to Higher Education and research in the aftermath of the global financial crisis – brought

the institutions funded in the first phase into direct competition with new proposals.

This very competition revealed once again what lies at the heart of all structural issues, not just in the Excellence Initiative, but in research in general: the quality and complexity, the originality and novelty of research insights.

On 15 June 2012, at the end of a rigorous academic-driven review and decision-making process, a total of 99 projects at 44 universities were selected for continued or first-time funding: 45 Graduate Schools which train junior researchers, 43 Clusters of Excellence, in which universities, often in cooperation with non-university research institutions, advance knowledge-driven basic research, and, finally, eleven so-called Institutional Strategies through which entire universities seek to

continue positioning themselves in the international domain.

The brochure presents all 99 institutions of excellence which will receive funding until 2017 in the same compact form that has already proved so popular: one page each with information on the core research focus areas and themes, the universities and other institutions involved, as well as the spokespersons and most important contact information. The publishers of this brochure should like, once again, to invite in particular decision makers in the political, business and social arenas, the media, and, last but not least, the general public to witness for themselves the inspiration and performance of university research in Germany. This glance at the current status of the Excellence Initiative is, of course, even now not unrelated to the question of its future. From the

point of view of research, the basic political will to continue financing successful projects is both gratifying and consistent.

How this should and could happen, how it can be integrated into the continued development of the system of Higher Education and research in Germany and into its overall politico-constitutional, financial and social general conditions – to address these issues the DFG and the German Council of Science and Humanities have drawn up strategies which shape political debate. The projects presented in this brochure impressively illustrate why this debate is so extraordinarily important.

# The First Phase 2005–2012

## The Initiative

It was in 2004 that science and policy-makers in Germany started to develop the idea for an Excellence Initiative; the decision to go ahead was made by the Federal and State Governments in June 2005. The aims of the Initiative are to strengthen top-level research in Germany and to enhance its competitiveness in the international domain. Thus a competition was launched to identify and reward outstanding projects in three areas:

- Graduate Schools to promote young scientists and researchers
- Clusters of Excellence to promote top-level research
- Institutional Strategies to develop project-based, top-level university research

The competition was organised by the Deutsche Forschungsgemeinschaft (DFG) and the German Council of Science and Humanities. The Federal and State Governments provided a total of 1.9 billion euros to fund the successful projects until the end of 2012.

## The Competition

The first phase consisted of two rounds held in 2005/2006 and 2006/2007, each involving a preliminary and a final round.

In the preliminary rounds universities submitted draft proposals which were reviewed by internationally appointed panels of experts. The reviews of the Graduate Schools and Clusters were discussed by an “Expert Commission” appointed by the DFG, those referring to the Institutional Strategies by a “Strategic Commission” appointed by the German Council of Science and Humanities. Pre-selection was conducted by a “Joint Commission” in which both commissions were represented.

The universities selected at this stage subsequently presented their full proposals which were evaluated using the same procedure as in the preliminary rounds. The “Grants Committee” composed of the Joint Commission and the Federal and State Ministers of Science and Research then selected the projects for funding.

## The Decisions

The first round of the Excellence Initiative 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. On 13 October 2006, the Grants Committee selected 38 of these projects for funding; they were located at 22 universities: 18 Graduate Schools, 17 Clusters of Excellence and three Institutional Strategies. These projects were 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 of the competition. On 19 October 2007, the Grants Committee selected 47 of these projects for funding at a total of 28 universities: 21 Graduate Schools, 20 Clusters of Excellence and six Institutional Strategies. Altogether, they received a good billion euros by November 2012.

### The Continuation

In June 2009, the Federal and State Governments decided to extend the Excellence Initiative from 2012 until the end of 2017. The core principle in the second phase was to engender competition between new projects and those already receiving funding.

The Federal and State Governments backed their continuation of the programme with a significant increase in funding of 1.9 billion euros, bringing the total to 2.7 billion euros.

In contrast to the first phase, only one round was held, which again was divided into a preliminary and a final round. The modalities remained essentially unchanged, except that more flexible funding amounts were specified: Graduate Schools from one to 2.5 million euros annually, Clusters of Excellence from 3 and to 8 million euros (each including a 20 per cent programme allowance). In the Institutional Strategies, greater emphasis was placed on elements of research-related teaching.

### The Preliminary Round

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

The 205 draft proposals 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 59 successful draft proposals for new projects competed with the projects that had been funded in the first phase. Both groups of applicants had until 1 September 2011 to submit full funding proposals or extension proposals. These were then reviewed by the spring of 2012, again initially under the supervision of the DFG and the German Council of Science and Humanities.

In June 2012, the final decisions were taken by the Commissions of the DFG and German Council of Science and Humanities, followed by the Joint Commission and finally by the Grants Committee. On 15 June 2012, it selected a total of 99 projects at 44 universities for funding: 45 Graduate Schools (33 extensions, 12 new projects), 43 Clusters of Excellence (31 extensions, 12 new projects) and eleven Institutional Strategies (six extensions, five new strategies). They will receive approximately 2.4 billion euros up to November 2017.

## The Three Funding Lines

### The Graduate Schools

Graduate Schools aim to improve the promotion of young scientists and researchers and to raise the profile of research at the same time. They offer an excellent research environment in which to train highly qualified doctoral students.

Each Graduate School is established in a wide area of science, addresses innovative questions, and is headed by leading academics. They are designed to provide the ideal conditions for a doctorate, encourage doctoral students to identify with the location, and generally contribute to the development of internationally competitive science locations.

In the second phase of the Excellence Initiative, 45 Graduate Schools will each receive funding of between 1.2 and 1.8 million euros per year for five years, including a 20 per cent programme allowance.

### The Clusters of Excellence

Clusters of Excellence bundle research potential at university locations in Germany and, hence, increase their international visibility and competitiveness. The core principle is to engage in scientific networking and collaboration in research fields of particular promise for the future. In addition to various university institutions, non-university research institutions and industrial partners are involved in the Clusters across the board.

For the universities a Cluster of Excellence constitutes an important component in their strategic planning and accelerates the process of setting thematic priorities.

In the second phase of the Excellence Initiative, a total of 43 Clusters of Excellence have been granted funding for a period of five years, with each Cluster of Excellence receiving between 4.2 and 10.8 million euros per year, including a 20 per cent programme allowance.

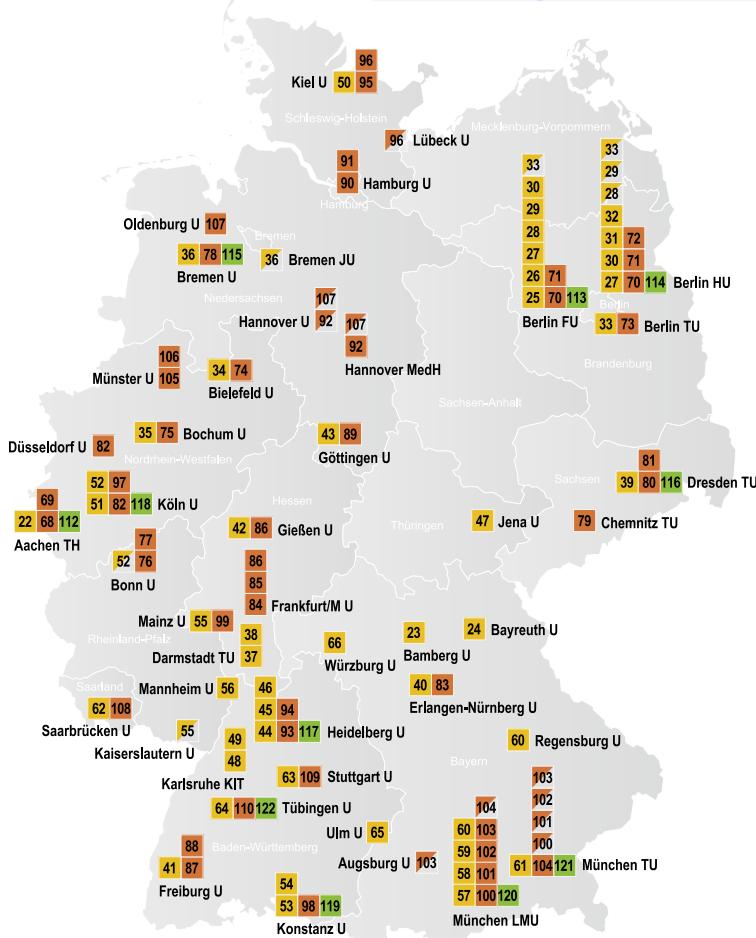
### The Institutional Strategies

Institutional Strategies aim to strengthen a university as a whole, allowing it to compete successfully with the leading players in the international science arena: an Institutional Strategy calls for a university to develop a long-term strategy on how it can consistently expand and enhance its top-level research and improve the promotion of young scientists and researchers. This means identifying existing strengths and setting priorities.

To qualify for the third funding line, universities had to develop an outstanding Institutional Strategy and already have at least one Graduate School and one Cluster of Excellence.

In the second phase, eleven universities will each receive between 9.6. and 13.4. million euros per annum for a period of five years, including a 20 per cent programme allowance, to implement their Institutional Strategies.

# Impact of the Excellence Initiative



## Graduate Schools

- Applicants – speakers
- Co-applicants

## Clusters of Excellence

- Applicants – speakers
- Co-applicants

## Institutional Strategies



Projects funded from 2012 to 2017 –  
the numbers in the boxes refer to the pages  
on which the projects are presented.



## **Current Graduate Schools**



### Coordinator

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# Aachen Institute for Advanced Study in Computational Engineering Science (AICES)

## Interdisciplinary support teams

Computational engineering science plays a key role in developing methods for areas like process and product design. The AICES Graduate School builds on existing activities in this field at RWTH Aachen University, such as the Centre for Computational Engineering Science. The Graduate School focuses on the analysis and synthesis of technical systems. Research is divided into three areas: application and modelling, mathematical and numerical methods, as well as computational tools and infrastructure.

Doctoral students work on the use of innovative computational methods which embrace 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, as well as geosciences.

### Partners:

- RWTH Aachen University (applicant – speaker)
- Forschungszentrum Jülich
- Max-Planck-Institut für Eisenforschung, Düsseldorf

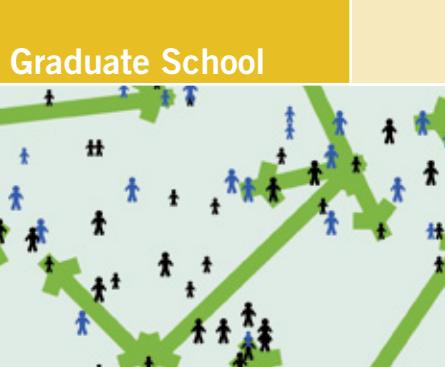
## Bamberg Graduate School of Social Sciences (BAGSS)

### Promoting young talent in the Social Sciences

The Bamberg Graduate School of Social Sciences (BAGSS) is training a new generation of first-rate researchers, preparing PhD candidates for the great challenges of modern knowledge-based societies that are now interconnected and difficult to control. Students explore complex connections based on four pillars: The first pillar encompasses education, personal development and learning from early childhood to adulthood. The second pillar comprises education and social inequality across the entire life course. The third pillar explores the impact of the aforementioned developments as well as demographic trends on labour markets and corporations as they compete globally for market shares,

investments and human resources. The fourth pillar focuses on governance, institutional change and political behaviour in internationalised knowledge-based societies.

In order to guarantee multidisciplinary support, BAGSS gathers together Sociologists, Psychologists, Educationalists, Political Scientists and Economists as well as Demographers and Statisticians. Intensive one-to-one coaching is coordinated with a structured learning programme that is customised in written agreements between supervisors and PhD candidates.



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## Bayreuth International Graduate School of African Studies

### Stemming the brain drain in Africa

The Bayreuth International Graduate School of African Studies (BIGSAS) focuses on cooperation between African and non-African junior researchers. One of the Graduate School's goals is to promote the growing number of alumni networks between African universities and to strengthen cooperation with European institutions. In so doing, BIGSAS seeks to counteract Africa's scientific brain drain and, in the long term, to create the preconditions and structures for top-level doctoral training in Africa itself. Training at BIGSAS is concentrated in three research areas:

- Uncertainty, innovation and competing orders in Africa
- Knowledge, communication and communities in motion
- Negotiating change: discourses, politics and practices of development

Closely interlinked research and teaching, intensive mentoring of doctoral students, as well as continual cross-faculty exchange on the Bayreuth Campus create the foundations for excellent doctoral training in African Studies.

### Partners:

- University of Bayreuth (applicant – speaker)
- 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
- Addis Ababa University/Ethiopia

## Graduate School of North American Studies (GSNAS)

### North America in transformation

The idea of freedom, a quintessential value of American society, has been driving social and cultural change since the nation was founded. In the context of progressing globalisation since the end of the Cold War and the "Triumph of Democracy", however, the vulnerability and limitations of democracy have begun to emerge. The United States find their fate increasingly determined by forces that are beyond the control of one single state.

Social opportunities and economic stresses are spread unequally. The economic ascent of China, India and Brazil heralds a multipolar world in which the United States wields only limited influence. Domestically, radical movements like the "Tea Party" are polarising the population. New media have an increasing impact on cultural production. The arts and the entertainment industry are in transformation, and, in addition, new forms of information and political participation are evolving.

The objective of the Graduate School's research programme is to attain a well-grounded, interdisciplinary understanding of the crisis-laden transformation American society is undergoing in politics, economic development, the media, the arts, culture and religion. Research and curriculum at the Graduate School rest on six Social Studies and Humanities disciplines: Cultural Studies and Literature, History, Political Science, Sociology and Economics. The teaching language is English.



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## Graduate School of East Asian Studies (GEAS)

### A focus on change

East Asia is undergoing a profound political, social, economic and cultural transformation, which is the focus of this Graduate School. Its course programme combines regional studies on China, Japan and Korea with other relevant disciplines in order to expand knowledge on this increasingly influential part of the world. In addition to extensive regional expertise, PhD candidates also acquire substantial methodological skills in History, Political Science, Legal Studies and Economics as well as Ethnology and Cultural Studies. An intensive study period in East Asia is a vital component. The Graduate School builds on already existing networks of FU with the region's key universities and research institutions, as well as major European and US institutions with a focus on East Asia. Dialogue is to be strengthened across continents and disciplines, elucidating the transformation in East Asia.

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- Yonsei University, Seoul/South Korea
- Seoul National University/South Korea
- Tokyo University/Japan
- Sophia University, Tokyo/Japan
- Harvard University (Edwin O. Reischauer Institute/Fairbank Center for East Asian Research), Cambridge, MA/USA
- Institute of East Asian Studies, University of California, Berkeley/USA
- Weatherhead East Asian Institute, Columbia University, New York/USA

## Berlin-Brandenburg School for Regenerative Therapies (BSRT)

### Biologists and engineers collaborating for patients

Experts from biology, engineering, and the clinical sciences are working together on regenerative therapies. They want to heal acute and chronic diseases by activating the body's self-healing powers. For this purpose, they use conventional implants to develop novel combinations of cells, drugs and technical products. The projects conducted by junior researchers are indicative of a new type of scientist: engineers, chemists and physicists need to understand complex biological processes, whilst biologists and biochemists have to comprehend the technical components of therapy approaches. Close cooperation with specialists from the clinical sciences generates the understanding required to meet the practical demands.

#### Partners, amongst others:

- Freie Universität Berlin and Humboldt-Universität zu Berlin as sponsor universities of the Charité - Universitätsmedizin Berlin (applicants – speakers)
- Technische Universität Berlin
- University of Potsdam
- German Rheumatism Research Centre (DRFZ), Berlin
- Fraunhofer Institute for Biomedical Engineering (IBMT)
- Hasso-Plattner-Institut, School of Design Thinking, Potsdam
- Helmholtz-Zentrum Geesthacht, Institute of Biomaterial Science
- Zuse Institute Berlin (ZIB)
- Max Planck Institute of Colloids and Interfaces, Potsdam
- Max Planck Institute for Molecular Genetics, Berlin



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Freie Universität Berlin/Humboldt-Universität zu Berlin

Funding period:  
1 November 2007 – 31 October 2017

## Berlin Graduate School Muslim Cultures and Societies

### Multifaceted Islam

The debate on Islam shapes the political sphere and influences social discourse. To meet the growing need for soundly-based knowledge in this area, the Graduate School trains qualified specialists to work in academia, the media, politics, and international cooperation.

The Graduate School systematically and comparatively investigates the entire spectrum of what is referred to both historically and currently as Islam. Research emphasises in particular the inner diversity, historical changeability and global connectedness of Muslim cultures and societies as well as relations between Muslims and non-Muslims. Interdisciplinary collaboration generates fascinating changes in perspective.

Geographically, the Graduate School also covers a broad spectrum, partly due to the international composition of doctoral candidates, partly to the diversity of regions they study. In addition to the Middle East, research focuses on sub-Saharan Africa, Central, South and Southeast Asia, as well as the Muslim diaspora in Europe and North America. Research projects investigate the role of Islam as a frame of reference for social, cultural and political phenomena in the past and the present.

### Partners:

- Freie Universität Berlin (applicant – speaker)
- Humboldt-Universität zu Berlin (co-applicant)
- Zentrum Moderner Orient, Berlin

## Friedrich Schlegel Graduate School of Literary Studies

### Literature in the cultures of the world

The Friedrich Schlegel Graduate School of Literary Studies supervises dissertations in the field of literary studies that address texts from the European, American, Arabic and Asian cultural areas. Doctoral students combine, amongst other things, comparative text, media and cultural approaches with theoretical questions and identify connections between literary texts and cultural processes. Fields of research include the relationship between literary texts, the interconnections between literary texts and processes of linguistic reasoning, rhetoric and poetics, correlations between literature and other aesthetic media, as well as the mutual interdependence of literature and the discourse of knowledge. Through his work, the cultural philosopher, literary historian and translator Friedrich Schlegel (1772–1829) laid the foundations for the

development of theoretically demanding, methodologically innovative literary studies of the kind that have been successfully conducted at Freie Universität Berlin for many years. Literary studies with an international focus that reflect comparative cultural and media issues are associated with the name of Friedrich Schlegel.

#### Partners:

- Freie Universität Berlin (applicant – speaker)
- Humboldt-Universität zu Berlin (co-applicant)

### Graduate School



Freie Universität



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## Berlin Graduate School of Integrative Oncology (BSIO)

### Strategies to combat cancer

Cancer is one of the major challenges facing Medicine and society: approximately 1.45 million people in Germany currently suffer from cancer; each year, about 450,000 new cases are diagnosed. Fighting this disease is the focus of the Berlin Graduate School of Integrative Oncology (BSIO). Its mission is to understand the individual molecular blueprint of a tumour and develop customised therapy plans for patients. Such “personalised cancer medicine” is one of the Graduate School’s core areas. Researchers from Haematology, Oncology, Genetics, Biochemistry, Surgery, Radiology, Computer Science as well as Social Studies and Humanities collaborate closely to train tomorrow’s Molecular Oncologists and physicians. Intensive dialogue between bio-scientific research and clinical application will expedite the development of therapies. By the

same token, experimental lab research will receive important input, driving it to give the highest priority to urgent problems of clinical cancer therapy.

### Partners:

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- Max Planck Institute of Molecular Plant Physiology, Potsdam
- Max Delbrück Center for Molecular Medicine (MDC), Berlin
- Leibniz-Institut für Molekulare Pharmakologie (FMP), Berlin
- Hertie School of Governance, Berlin

## Berlin School of Mind and Brain

### Connecting mind and grey matter

Consciousness, perception, language and psychiatric diseases are the central research areas involved in understanding the human mind. They can only be explored by linking brain and mind research (mainly Philosophy, Psychology, Linguistics and Neuroscience). Since 2006, the Berlin School of Mind and Brain has been preparing young scientists for this challenging interdisciplinary work. During the second funding period, "Fundamentals of Social Thinking" will be added to the academic programme. By integrating a new interdisciplinary Master's and a post-doctoral programme, the Graduate School makes a special contribution to promoting the scientific development of junior researchers at all career stages.

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- Freie Universität Berlin
- Technische Universität Berlin
- Otto von Guericke University Magdeburg
- University of Potsdam
- Max Planck Institute for Human Development, Berlin
- Max Planck Institute for Human Cognitive and Brain Science, Leipzig
- Max Delbrück Center for Molecular Medicine, Berlin
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## School of Analytical Sciences Adlershof (SALSA)

### Get Moving with SALSA

How much chemical softener is there in plastic toys? Does a food item really contain the ingredients listed on the label? And how much fine dust is there in the air? Analytical Chemistry provides answers to these questions. Beyond solving many scientific and technical problems of everyday life, it is also behind innovations in fields such as Nanotechnology or Material Sciences. SALSA embraces the interdisciplinary nature and complexity of today's analytical problems. Its multidisciplinary research areas can be captured in three central thematic pairs: "Limits and Scales", "Sensitivity and Selectivity", and "Make and Measure". PhD candidates primarily learn by studying concrete problems and cases so they can contribute to modern knowledge acquisition beyond traditional patterns of teaching and learning. SALSA is part of Berlin's "Analytic City Adlershof", which bundles the

non-university, university and business expertise of the Adlershof location in all things related to Analytical Chemistry.

#### Partners:

- Humboldt-Universität zu Berlin (applicant – speaker)
- Technische Universität Berlin
- Swiss Federal Institute of Technology Zürich/ Switzerland
- Federal Institute for Materials Research and Testing (BAM), Berlin
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## Berlin Mathematical School (BMS)

### International Mathematics in Berlin

The Berlin Mathematical School (BMS) is a joint graduate school of the three major Berlin universities. Doctoral candidates at the BMS are fully integrated into Berlin's active mathematical research environment. For instance, they might do their thesis research at the mathematics institutes WIAS or ZIB, at Matheon or the new Einstein Center for Mathematics Berlin (ECMath), at one of three DFG Research Training Groups, or at a Collaborative Research Centre such as the new CRC/TR "Discretization in Geometry and Dynamics".

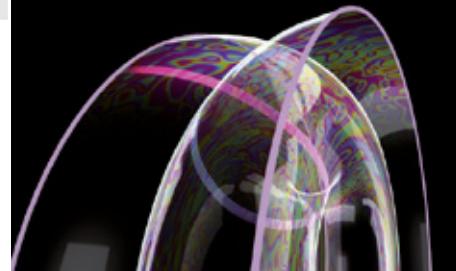
Its student body of almost 200, hailing from more than 40 countries, proves that BMS's structured two-phase graduate programme can compete internationally for the best young mathematicians.

Students with a Bachelor's degree are admitted to Phase I (three to four semesters, emphasizing course work) which prepares them for the qualifying exam.

Phase II involves four to six semesters of dissertation research. More than 80 professors as well as 25 post-docs offer a broad spectrum of basic and advanced graduate courses, held in English. The course programme is complemented by a regular colloquium series, summer schools, soft-skills training, conference travel support, and a strong mentoring programme.

#### Partners:

- Technische Universität Berlin  
(applicant – speaker)
- Freie Universität Berlin (co-applicant)
- Humboldt-Universität zu Berlin (co-applicant)



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Universität Bielefeld

Bielefeld University

Funding period:  
1 November 2007 – 31 October 2017

## Bielefeld Graduate School in History and Sociology (BGHS)

### Two faculties – one doctoral programme

Approximately 200 doctoral candidates study and conduct research together under one roof at the Bielefeld Graduate School in History and Sociology (BGHS). It is an institution run jointly by the Faculty of History, Philosophy and Theology and the Faculty of Sociology, which both have an excellent reputation at home and abroad. The Graduate School's unique hallmark is its interdisciplinary co-operation between Social Studies, History, Political Science and Social Anthropology. BGHS considers itself an international community of learners that enables doctoral researchers to reflect not only on their own topic, but on their academic disciplines,

and engage in dialogue beyond the confines of their subject areas. Inequality, social change and global social developments are some of the main research fields. BGHS offers a bilingual programme of studies as well as individual mentoring and financial assistance to support its young scholars in their research.

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## Ruhr University Research School (RUB-RS)

### Going international with Research School<sup>plus</sup>

At Ruhr-Universität Bochum (RUB), all doctoral candidates and their supervisors are members of the Ruhr University Research School (RUB-RS). Operated jointly by all faculties, the school advances doctorates and offers specialist as well as trans-disciplinary learning opportunities. In future, this strategy will include the project RS<sup>plus</sup>, which allows doctoral candidates to take advantage of the international dimension of research stays, field studies, conference attendance, visits and symposia. The project encourages new ideas and innovative formats, provided that they serve the objective of excellent, internationally-minded research of added value to both the individual doctoral work and RUB. RS<sup>plus</sup> makes doctoral candidates full stakeholders in the competition for research funding as well as in review, decision-making and evaluation

processes. Doctoral candidates are invited to work as expert evaluators for RS<sup>plus</sup> so that they can learn and participate in peer review on interdisciplinary selection committees in tandem with experienced academics. RS<sup>plus</sup> thus enhances professionalism in academia by creating an authentic environment that integrates the international components of individual dissertations and expressly enhances the skills profile of RUB's doctoral candidates.



RUHR  
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## Bremen International Graduate School of Social Sciences

### Changing patterns of social and political integration

BIGSSS conducts dissertation projects in three core areas under the umbrella theme of "Changing Patterns of Social and Political Integration": "Global Governance and Regional Integration", "Welfare State, Inequality and Quality of Life" and "Changing Lives in Changing Socio-Cultural Contexts". The core disciplines are Political Science, Social Studies and Psychology. Neighbouring disciplines such as Law, Behavioural Health Economics, Economics, History and Cultural Studies are also represented. The school's very own Methods Center for Social Studies complements the core content areas.

The school encourages early academic independence and high scientific quality with its structured curriculum in combination with intensive individual mentoring by a doctoral committee and the "in-house faculty". Of the school's more than 70 alumni (documented since 2002 with the GSSS at the University of Bremen), nearly 70 per cent have

embarked on successful academic careers. The remaining graduates are pursuing other attractive occupations in the public or private sector or with NGOs. BIGSSS is also very international: Of the doctoral candidates who have been accepted since 2008, 45 per cent have an international background; in 2012, there were 31 applicants per doctoral scholarship, hailing from a total of 90 countries.

### Partners:

- University of Bremen (applicant – speaker)
- Jacobs University Bremen (co-applicant)

## Graduate School of Computational Engineering

### Computer simulation as a model of the future

To develop new technical solutions scientists are increasingly using computational modelling, analysis, simulation and optimisation. This method effectively complements experimental studies which are a great deal more expensive. When it comes to economically and socially relevant issues like the efficiency of power supply systems, the potential of future mobile communications, or the continuing development of medical equipment, computational engineering is seen as the model of the future.

Training at the Graduate School focuses on an interdisciplinary environment based on the interaction between computer science, mathematics and engineering science. The research programme also includes cross-sectional areas, such as high-performance computing and simulated reality.

#### Partners:

- Technische Universität Darmstadt (applicant – speaker)
- Fraunhofer Institute for Computer Graphics Research, Darmstadt
- Fraunhofer Institute for Structural Durability and System Reliability, Darmstadt



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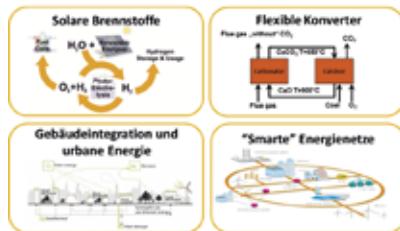
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# Graduate School

## Integrierte Energieforschungs-Plattformen



TECHNISCHE  
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Technische Universität Darmstadt

Funding period:  
1 November 2012 – 31 October 2017

# Darmstadt Graduate School of Excellence Energy Science and Engineering (ESE)

## Tomorrow's energy supply

Sustainable energy supply is one of the top global issues of the future. Top-notch technologies are needed – and thus energy engineers whose interdisciplinary expertise allows them to identify and master scientific, technological, economic and social challenges. PhD candidates at the Darmstadt Graduate School of Excellence Energy Science and Engineering (ESE) work in multi-disciplinary dissertation project teams. They create a scientific foundation for a continuous transition from today's dominantly fossil-based, non-renewable energy sources to the energy supplies of the future, which means renewable and environmentally-friendly energy resources. In addition to improved conventional energy technologies, we also need progressive technologies for renewable energies that are competitive and safe. ESE offers four trans-disciplinary

main research areas: Solar Fuels, Building Integration and Energy-self-sustaining Urban Settlements, Smart Energy Networks as well as Flexible Energy Converters with low CO<sub>2</sub> emissions.

### Partners:

- Technische Universität Darmstadt (applicant – speaker)
- GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt
- Fraunhofer-Institute for Structural Durability and System Reliability LBF, Darmstadt

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

### Interdisciplinary and interactive

The international Graduate School DIGS-BB offers challenging English-language doctoral programmes in three areas, as well as access to the unique research infrastructure at TU Dresden and its non-university partner institutions. Doctoral candidates research the complex molecular and cellular processes behind the development of tissues and organisms in the fields of Cell, Developmental and Systems Biology. In the programme "Regenerative Medicine", research groups study stem cells, analyse cellular processes in tissue regeneration, develop novel therapies in close collaboration with clinical experts, and more. Research groups in the field of Bioengineering and Biophysics apply state-of-the-art biophysical and biochemical methods to analyse individual molecules, explore molecular motors, or describe the physical forces at work in tissue development. Twice a year, the school holds selection rounds to recruit excellent

young international scientists from the Life, Natural and Computer Sciences as well as Engineering and Medicine.

#### Partners:

- Technische Universität Dresden (applicant – speaker)
- Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG), Dresden
- Max Planck Institute for the Physics of Complex Systems, Dresden
- Helmholtz-Zentrum Dresden-Rossendorf
- Leibniz Institute of Polymer Research Dresden



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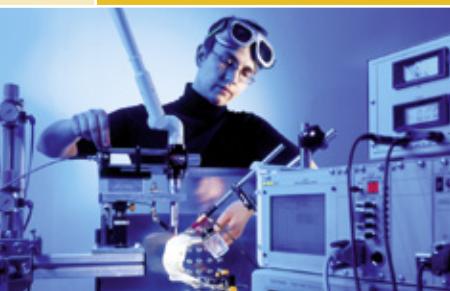
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## Erlangen Graduate School in Advanced Optical Technologies

### Optics shows the way

From global positioning systems and internet via lasers and fibre optics to lithography for applications in chip manufacturing and eye surgery – optical technologies are of great benefit practically everywhere. In this respect, the border areas between physics, engineering and medicine are starting to play an ever more important role. Researchers from the fields of physics, chemistry, biology, and engineering often use similar methods, but they rarely cooperate and thus fail to achieve the desired interdisciplinary technology transfer. An enhanced academic training programme aims to change this. Along with the new Elite Master's programme in Advanced Optical Technologies, the Graduate School is the second step on the path to creating a leading international centre for academic training in optical technologies.

### Partners:

- Friedrich-Alexander-Universität Erlangen-Nürnberg (applicant – speaker)
- Universitätsklinikum Erlangen
- Bayerisches Laserzentrum, Erlangen
- Fraunhofer Institute for Integrated Systems and Device Technology, Erlangen
- Max Planck Institute for the Science of Light (MPL), Erlangen

## Spemann Graduate School of Biology and Medicine

### Incubator for excellent young researchers

Interdisciplinary training at the Speman Graduate School ranges from basic research to clinical application and pharmaceutical product development. Students of Biology, Medicine, Molecular Medicine and Chemistry work in the following core research areas: Protein Structure and Function, Synthetic Biology and Signalling, Developmental Biology, Neurosciences, Immunology and Virology, Molecular Medicine and Plant Sciences. Supplemental interdisciplinary courses connect the programme. The Graduate School was established as close cooperation between the Freiburg research training groups, the International Max Planck Research School, four Collaborative Research Centres of the German Research Foundation, as well as the Bernstein Center Freiburg. These research groups and centres are led by internationally renowned scientists who are members of the Graduate School. In

addition, several of the school's Principal Investigators are also involved in the Clusters of Excellence BIOSS (Centre for Biological Signalling Studies) and BrainLinks-BrainTools. According to the German Research Foundation's 2012 "Funding Atlas", Biology in Freiburg ranks second nationwide.

#### Partners:

- University of Freiburg (applicant – speaker)
- Max Planck Institute of Immunobiology and Epigenetics, Freiburg



#### Coordinator

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## International Graduate Centre for the Study of Culture

### Multifaceted study of culture

The study of culture did not acquire its diverse social and socio-political relevance overnight. However, in the last 25 years, research in the study of culture has made rapid advances. In North America, Europe, and beyond numerous new theories, methods and models have been developed which have made the entire field of everyday culture into an object of study. To a much greater extent than ever before, social structures and human action are also now understood and analysed as an expression of culture.

Against this backdrop, the researchers at the International Graduate Centre for the Study of Culture (GCSC) continue to develop new methods and approaches as well as transfer strategies between

various disciplines and science cultures. The thematic arch spans eight research areas:

- Cultural Memory Studies
- Cultural Narratologies
- Cultural Transformation and Performativity Studies
- Visual and Material Culture Studies
- Media and Multiliteracy Studies
- Cultural Identities
- Global Studies and Politics of Space
- Cultures of Knowledge, Research, and Education

The GCSC builds on the Giessen Graduate Centre for the Humanities (GGK) that was founded in 2001 and has been developed into a graduate school with an international profile over the last few years.

## Göttingen Graduate School for Neurosciences, Biophysics, and Molecular Biosciences (GGNB)

### Ideal conditions for doctoral students

The neurosciences, biophysics, and molecular biosciences can look back on a long tradition of excellent research in Göttingen. In this context, the Graduate School provides doctoral students with ideal conditions for research and study, offering a range of intensive mentoring and seminars to foster a new generation of excellent scientists. GGNB pools the competencies of four life science and natural science faculties at the University of Göttingen as well as four non-university research institutions. Under one roof, they offer 12 international doctoral programmes, some of which have already received multiple prizes, amalgamating a variety of subjects from the neurosciences and biosciences, medicine, biophysics, and other related subject areas in one interdisciplinary doctoral training programme. Besides the supervision of dissertations, this support includes 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 themselves.

#### Partners:

- University of Göttingen (applicant – speaker)
- 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



#### Coordinator

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# Heidelberg Graduate School of Fundamental Physics

## A new generation of physicists

The Graduate School focuses on fundamental questions in astrophysics, cosmology, particle physics, complex quantum physics, complex classical systems, mathematical and environmental physics. Working within and 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 to ensure that he or she is able to complete the doctorate within three years. The modular structure of the programme, which also includes soft skills, can be tailored to the needs of the individual student. Doctoral students are actively involved in the learning process and the organisation of the school itself. Exchange programmes with globally recognised institutions promote international networking.

### Partners:

- Heidelberg University (applicant – speaker)
- Max Planck Institute for Astronomy, Heidelberg
- Max Planck Institute for Nuclear Physics, Heidelberg
- Heidelberg Institute for Theoretical Studies (HITS)
- GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt



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## The Hartmut Hoffmann-Berling International Graduate School of Molecular and Cellular Biology Heidelberg (HBIGS)

### Fit for leadership

Molecular biology and cell biology research provides the foundations for numerous areas of the life and biosciences: from structural biology to bioinformatics and from molecular medicine to immunobiology. The Graduate School is devoted to the investigation of biological processes and the opportunities opened up 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 Bioscience 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 as well as the academic arenas.

#### Partners:

- Heidelberg University (applicant – speaker)
- European Molecular Biology Laboratory, Heidelberg
- German Cancer Research Center, Heidelberg
- Max Planck Institute for Medical Research, Heidelberg



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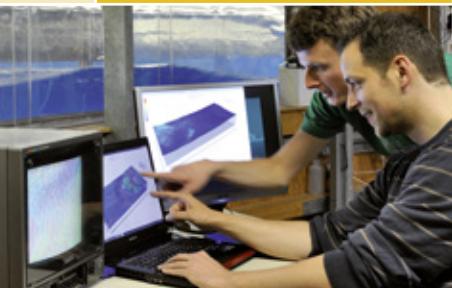
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# Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences

## The third pillar of science

How can we improve our understanding of the dynamics of cancer? What semantic connections are there between illustrations in mediaeval manuscripts? Which new materials are ideal for storing energy? The Graduate School is driving scientific computing as an approach to solving problems like these. With its core areas of mathematical modelling, simulation, optimisation and visualisation, today, scientific computing is seen as the third path to scientific knowledge, complementing experimentation and theory.

Doctoral students learn how to develop even more efficient scientific computing methods and to apply this methodology to new scientific fields. The Graduate School is part of the Interdisciplinary Centre for Scientific Computing at Heidelberg University which has years of experience in interdisciplinary,

structured doctoral programmes. It is globally networked with leading institutions in the field of applied mathematics as well as with industrial research facilities.

### Partners:

- Heidelberg University (applicant – speaker)
- Centre for Modelling and Simulation in the Biosciences, Heidelberg
- German Cancer Research Centre, Heidelberg
- Heidelberg Institute for Theoretical Studies (HITS)



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## Jena School for Microbial Communication (JSMC)

### Elucidating complex interactions

Microorganisms interact with other microorganisms, plants, animals, humans and environmental processes by way of chemical signals. In order to decode this “communication” in all its facets, scientists must collaborate across the boundaries of their disciplines. The Graduate School JSMC offers excellent conditions for research and provides the necessary network. Doctoral candidates and postdocs receive trans-disciplinary training as well as individual coaching, both for careers in academia and in industry. The school’s research fields lend themselves to many biotechnological applications, for instance in medicine and environmental protection. Therefore, twelve industrial partners are actively involved in the Graduate School. JSMC is also the central hub for numerous innovative large-scale projects and an umbrella for research in “Microbial Communication”.

#### Partners:

- Friedrich Schiller University Jena  
(applicant – speaker)
- Leibniz Institute for Natural Product Research and Infection Biology – Hans Knöll Institute (HKI), Jena
- Max Planck Institute for Chemical Ecology, Jena
- Max Planck Institute for Biogeochemistry, Jena
- The Institute of Photonic Technology, Jena
- Fraunhofer Institute for Applied Optics and Precision Engineering, Jena
- Helmholtz Centre for Environmental Research – UFZ, Leipzig



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## Karlsruhe School of Optics & Photonics (KSOP)

### Exploring the visible

Companies generate an annual turnover of more than 100 billion euros with lasers, innovative luminescent and fluorescent materials, optical components and devices, as well as high-resolution microscopes. German companies are world leaders in this market. In addition, Optics and Photonics generate ideas for Physics, Chemistry, Biology, and Electrical and Mechanical Engineering. In university education, however, Optics and Photonics are frequently assigned to other disciplines; as independent subjects they hardly play any role in Germany at present. The Karlsruhe Graduate School wants to change this.

Doctoral students work on photonic materials and components as well as biomedical photonics. Moreover the research areas include advanced spectroscopy, optical systems and solar energy. Doctoral students are also introduced to management methods to help prepare them for careers in science and industry.

### Partners:

- Karlsruhe Institute of Technology (applicant – speaker)
- FZI – Research Centre for Information Technology, Karlsruhe
- ZSW – Centre for Solar Energy and Hydrogen Research, Stuttgart



Karlsruher Institut für Technologie

### Coordinator

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## Karlsruhe School of Elementary Particle and Astroparticle Physics: Science and Technology (KSETA)

### Research in international projects

A unique feature of the Graduate School KSETA is the fact that physicists and engineers cooperate on research and research training in large-scale projects of Elementary Particle and Astroparticle Physics. Using theoretical and experimental research, the School pursues a trans-disciplinary approach, which optimally prepares young scientists for career paths in science and business. They participate in international and interdisciplinary projects, for instance at the CMS detector at CERN's "Large Hadron Collider" in Geneva, at the Pierre Auger Cosmic Ray Observatory in Argentina, and on the Karlsruhe Tritium Neutrino Experiment KATRIN. Physicists and Computer Scientists develop solutions, ranging from data management in the World Wide Grid to computer-algebraic calculations in

Theoretical Physics. The Graduate School also embraces the Collaborative Research Centre CRT/TR9, "Computational Particle Physics", the Helmholtz Alliances "Physics at the Terascale" and "Astroparticle Physics", the International School for Astroparticle Physics (ISAPP), and the Marie-Curie Initial Training Network LHCPhenonet.

#### Partners, amongst others:

- Karlsruhe Institute of Technology  
(applicant – speaker)
- CERN, Geneva/Switzerland
- KEK, High Energy Accelerator Research Organization, Tsukuba/Japan
- Lawrence Berkeley National Laboratory/USA



#### Coordinator

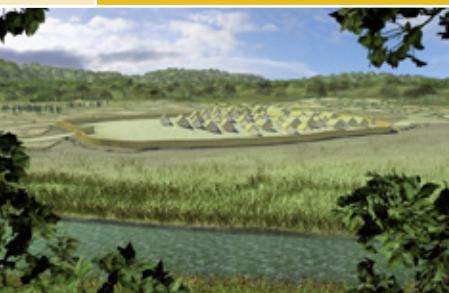
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# Graduate School “Human Development in Landscapes”

## Humans and the environment

The surroundings in which people live shape the way they think, act and live together. Uncovering the impact of interaction between humans and the environment over thousands of years is the goal that the Graduate School has set itself. The concept is situated 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. Professorships in environmental archaeology, archeozoology and isotope research as well as aDNA analysis and modelling past societies – some of which are new research fields in Germany – complement the portfolio of subjects taught at the Graduate School, which is still the foundation of the new Johanna Mestorf Academy.

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 as far as Africa.

## Partners:

- Kiel University (applicant – speaker)
- Archaeological State Museum Schleswig-Hostein – Schloss Gottorf
- Leibniz Institute for Science and Mathematics Education, Kiel
- German Archaeological Institute, Berlin



Kiel University  
Christian-Albrechts-Universität zu Kiel

## Coordinator

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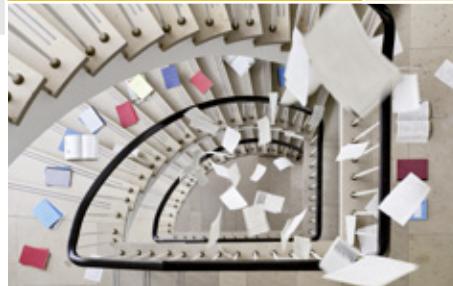
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## a.r.t.e.s. Graduate School for the Humanities Cologne (AGSHC)

### An integrated Graduate School for international graduate training

The a.r.t.e.s. Graduate School for the Humanities Cologne (AGSHC) at the Faculty of Arts and Humanities of the University of Cologne adopts a broader concept of the Humanities that goes beyond the dichotomy between Cultural Studies and traditional Humanities (i.e. Geisteswissenschaften). This model is based on the core research areas and fields of excellence of what is one of Europe's largest Faculties of Arts and Humanities. A special emphasis is placed on hermeneutical and historico-contextual models, including the genesis and invention of knowledge as well as processes of reception and transculturation under prevailing anthropological and ethical conditions. As an integrated Graduate School, AGSHC is in charge of all doctoral dissertations at the Faculty of Arts and Humanities, pooling expert resources, core research areas and fields of excellence with regard to interdisciplinary

questions. Additionally, it offers a Research Master's programme and a Research Lab for scholars in the post-doctoral phase. With AGSHC, the Faculty of Arts and Humanities is positioning itself as a "Graduate Faculty", competing with the most eminent Graduate Schools and attracting doctoral candidates from around the world. This also makes AGSHC a platform for the internationalisation of graduate training with a varied palette of collaborations and support programmes for national and international exchange.



Universität zu Köln

#### Coordinator

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## Bonn-Cologne Graduate School of Physics and Astronomy (BCGS)

### Of lasers and black holes

The Graduate School builds on the strengths of the physics departments at the universities of Bonn and Cologne, which complement each other excellently in terms of content, supported by a Max Planck Institute and a Helmholtz Centre. Accordingly, the range of subjects is very broad, extending from particle and nuclear physics via astrophysics to the physics of condensed matter, statistical physics and photonics. Based upon the Anglo-American system, graduates holding a Bachelor's degree are able to complete a doctorate in five years.

The Graduate School has been conceived as a prototype for the future training of graduates at the two universities. Special features of this approach include coherent coordination of teaching content and timetabling, allowing students to benefit from

the courses and services offered by both universities, and joint mentoring. The outstanding experimental and theoretical facilities directly available in the two departments provide the basis for research-driven training.

#### Partners:

- University of Cologne (applicant – speaker)
- University of Bonn (co-applicant)
- Forschungszentrum Jülich
- Max Planck Institute for Radio Astronomy, Bonn



Universität zu Köln



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## Konstanz Research School Chemical Biology

### The Chemistry of Life

The Konstanz Research School Chemical Biology (KoRS-CB) prepares the next generation of scientists to face one of the greatest challenges of the future: to explain the process of life in chemical terms. This will only be possible if various disciplines collaborate and overcome the traditional boundaries between the Natural Science disciplines.

Doctoral researchers at KoRS-CB acquire the ability to understand complex biological processes on the molecular level and approach them experimentally. They are supported by a thesis committee consisting of three members. Annual reports, interdisciplinary lectures, and a course programme that offers scientific courses as well as transferable skills flank the doctoral research. A strong network of national

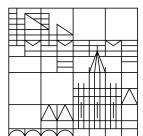
and international collaborative partners from academia and industry facilitates scientific exchange and professional networking.

KoRS-CB is an initiative of the Departments of Biology, Chemistry, and Computer and Information Science.

So far, KoRS-CB has registered more than 130 interdisciplinary research projects. The graduate school itself can award up to ten fellowships annually. Calls are advertised twice per year in June and in December.



Universität  
Konstanz



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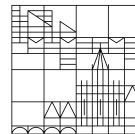
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Universität  
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## Graduate School of Decision Sciences

### Decision-Making – the Cornerstone of the Social Sciences

The Graduate School of Decision Sciences pools the perspectives of the social science disciplines into one elementary issue: How are decisions made, how does decision-making influence human interaction and how does it shape collective processes in our society? The mission is to gain a comprehensive insight into human decision-making behaviour and its economic and political implications.

Economics, political science and psychology are at the heart of the Graduate School and are complemented by computer science, sociology and statistics. Each of these disciplines has its own view on human decision-making behaviour. In the Graduate School of Decision Sciences, these different perspectives are brought together to focus on four central research themes:

- Political Decisions and Institutions
- Information Processing and Statistical Analysis

In an open and communicative scientific environment, the Graduate School offers an ideal teaching and research setting for doctoral candidates who work on decision-making issues and their application to important social science problems.

#### Coordinator

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## Materials Science in Mainz (MAINZ)

### Multifunctional materials

The Graduate School "Materials Science in Mainz" (MAINZ) is dedicated to graduate training in the field of Materials Science. Its innovative programme offers doctoral candidates excellent academic and hands-on training and promotes complementary core competencies as well as Materials Science at the highest level. MAINZ unites research fields that were previously disjunctive, from simple Model Systems and Correlated Matter via Functional Polymers and Hybrid Structures to Biologically-Inspired Systems.

Building on its work during the first funding period, which was geared towards basic research, MAINZ will focus more on applying its know-how to the targeted production of functional materials during the second funding period. This shift towards practical application will be achieved by MAINZ with the support of intensive industrial partnerships, and by running specially designed courses. In the

second funding period, MAINZ is thus building on its successful strategy for connecting research areas that have traditionally been separate, hence creating an inspiring atmosphere that boosts creativity and innovation for ground-breaking insights in the field of Materials Science.

#### Partners:

- Johannes Gutenberg University Mainz (applicant – speaker)
- University of Kaiserslautern (co-applicant)
- Max Planck Institute for Polymer Research, Mainz



#### Coordinator

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# Graduate School of Economic and Social Sciences: Empirical and Quantitative Methods (GESS)

## Three centres under one roof

The Graduate School of Economic and Social Sciences at the University of Mannheim provides structured doctoral programmes in empirical and quantitative methods as well as their interdisciplinary application to Economics and the Social Sciences. It has a strong focus on teaching according to best international practice and on excellence in research. GESS integrates the disciplines involved into a coherent curriculum and comprises three centres: the Center for Doctoral Studies in Business (CDSB), the Center for Doctoral Studies in Economics (CDSE) and the Center for Doctoral Studies in Social and Behavioral Sciences (CDSS). Teaching emphasises the central methodological and quantitative-empirical foundations that are of use to all the disciplines, as well as topic areas

that address multiple branches of modern Economics and Social Sciences. This concept is unique to GESS, making it one of the few graduate schools worldwide that fosters exchange of methods and research approaches across the boundaries of the individual disciplines in Economics and Social Studies.

### Partners:

- University of Mannheim (applicant – speaker)
- Mannheim Centre for European Social Research (MZES)
- GESIS – Leibniz-Institute for the Social Sciences
- Centre for European Economic Research (ZEW), Mannheim
- Central Institute of Mental Health (ZI), Mannheim

## Graduate School of Systemic Neurosciences

### In the depths of the brain

How does the brain work? Neuroscientists at the Graduate School are searching for answers to this fundamental question of modern research. To this end, a broad range of methods is being applied, ranging from Neurobiology to Electrical Engineering and from Neuroinformatics and Theoretical Biophysics to Psychology, the Clinical Neurosciences and Neurophilosophy. Research focuses on the Systemic Neurosciences. Doctoral students address topics such as "From individual cells to complex integrated circuits", "From system analysis to mathematical models", and "From biology to technical applications". The Graduate School has been established as a training platform at the Munich Center for Neuroscience – Brain & Mind at LMU Munich.

#### Partners:

- Ludwig-Maximilians-Universität München  
(applicant – speaker)
- Technische Universität München
- Max Planck Institute of Neurobiology,  
Martinsried
- Max Planck Institute of Psychiatry, Munich
- Max Planck Institute for Ornithology, Seewiesen
- Helmholtz Zentrum München
- German Aerospace Center, Wesseling



#### Coordinator

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## Distant Worlds: Munich Graduate School for Ancient Studies

### Distant worlds of antiquity

The Munich Graduate School for Ancient Studies focuses on the basic principles that governed ancient cultures: How were norms and elites formed at the time, how did people live together, how did they preserve their memories? In order to be able to analyse such questions, the Graduate School pools the core competencies in Ancient Studies at LMU Munich and those of the Bavarian Academy of Sciences and Humanities as well as five Munich-based museums and collections. The School is thus developing a new strategy to promote young Ancient Studies scholars with a focus on research and early academic autonomy. Moreover, it offers a flexible teaching programme organisationally linked with an interdisciplinary junior research group. The teams conduct comparative analyses of basic perspectives of ancient cultures from seven different thematic angles, thus creating a "research

laboratory" that will generate new ideas for research in Ancient Studies concentrated at the Munich Centre for Ancient Worlds.

### Partners:

- Ludwig-Maximilians-Universität München (applicant – speaker)
- Bavarian Academy of Sciences and Humanities, Munich
- Staatliche Antikensammlungen und Glyptothek, Munich
- Staatliches Museum Ägyptischer Kunst, Munich
- Staatliche Münzsammlung, Munich
- State Museum for Ethnology, Munich
- Bavarian State Archaeological Collection Munich
- Deutsches Archäologisches Institut, Munich

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## Graduate School of Quantitative Biosciences Munich (QBM)

### Concepts and methods for the future of bioscience

The molecular biosciences are undergoing a profound transformation: scientists no longer focus on individual components such as genes or proteins, but rather seek to understand biological systems in their entirety. This requires improved techniques for quantitative measurement and data analysis as well as close cooperation between disciplines that have traditionally been separated – from Biochemistry and Medicine to Physics and Mathematics. The Graduate School QBM wants to equip young scientists with the methodological and conceptual skills they need to excel in this new multidisciplinary environment, in particular the ability to bridge the divide between experimental and theoretical fields. Thematically, the Graduate School focuses on the fundamental biological problem of gene regulation in all its facets – a field in which LMU has extensive expertise. QBM offers a structured,

international PhD programme that combines an interdisciplinary research project with a targeted programme of interdisciplinary course work as well as activities to strengthen communication skills.

#### Partners:

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- Max Planck Institute of Biochemistry, Munich
- Helmholtz Zentrum München



#### Coordinator

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## Graduate School for East and Southeast European Studies

### Answers for Europe's future

Eastern and Southeastern Europe are of paramount significance to Germany and the European Union. Since crucial European issues are linked to this region, we need expertise in the Humanities, Cultural Studies and Social Sciences to explore these areas. The joint Graduate School of Ludwig-Maximilians-Universität München and Universität Regensburg offers ideal conditions for excellent doctoral dissertation projects on East and Southeast European topics. The academic programme leads candidates to pursue new enquiries into social, political and cultural developments in Eastern and Southeastern Europe, with an emphasis on analysing the interdependence between these areas and other regions of the world. A hallmark of the Graduate School is its international focus. It also offers exchange programmes with international partners in Eastern and Southeastern Europe as well as in North America.

### Partners:

- Ludwig-Maximilians-Universität München (applicant – speaker)
- Universität Regensburg (applicant – speaker)
- Bavarian State Library, Special Collection on Eastern Europe, Munich
- Collegium Carolinum, Munich
- Institute for German Culture and History in South East Europe, Munich
- Institute for East European Law, Regensburg
- Institute for East and Southeast European Studies (IOS), Regensburg
- Zentralinstitut für Kunstgeschichte mit Sammelschwerpunkt Ost- und Südosteuropa, Munich

## International Graduate School of Science and Engineering (IGSSE)

### Impetus for research and society

At the core of the TUM International Graduate School of Science and Engineering (IGSSE) are its interdisciplinary project teams, which address current research topics at the interface of the Natural Sciences and Engineering. Doctoral candidates learn to forge new paths in science beyond the boundaries of subject areas. At the same time, they benefit from an extraordinary qualification programme that combines TU München's academic excellence with specialised career and soft skills training opportunities. This includes multi-disciplinary exchange and a research stay of several months abroad, as well as acquiring entrepreneurial know-how and building social skills. Funding programmes have been created specifically for post-docs who lead IGSSE junior research groups. IGSSE offers its excellent Master's students the opportunity to gain their first research experience in an interdisciplinary environment. In 2012, the school

established focus areas that connect research groups working on related themes. These networks act as incubators for new, future-oriented research fields at TU München. In 2009, IGSSE served as a model for the establishment of the TUM Graduate School, which introduced international, quality-assurance standards for doctoral programmes across the entire university.



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## Saarbrücken Graduate School of Computer Science

### Home to world-class computer science

The Saarbrücken university campus offers a uniquely rich environment for research in computer science. More than 500 researchers covering almost all areas of computer science work at several co-located research institutes. The academic and research training of young researchers is of great importance to all and is seen as a collective responsibility. The Graduate School provides the common basis for doctoral training.

The structured programme allows for early entry into doctoral studies in keeping with international practice. During the preparatory phase, graduate students attend an extensive range of courses and participate in research projects, allowing them to explore the full breadth of computer science while delving more deeply into special topics according to their own interests. For their dissertation theses,

doctoral candidates pursue their research in internationally recognized research groups on topics as diverse as computer science has to offer.

#### Partners:

- Saarland University (applicant – speaker)
- Max Planck Institute for Informatics, Saarbrücken
- Max Planck Institute for Software Systems, Saarbrücken
- German Research Center for Artificial Intelligence (DFKI), Saarbrücken
- Intel Visual Computing Institute, Saarbrücken
- Center for IT-Security, Privacy and Accountability (CISPA), Saarbrücken
- Center for Bioinformatics, Saarbrücken
- Cluster of Excellence “Multimodal Computing and Interaction” (MMCI), Saarbrücken



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## Graduate School of Excellence advanced Manufacturing Engineering (GSaME)

### The next generation factory

Research and training at GSaME revolve around a comprehensive system of technical, methodical and organisational solutions and tools that will lead to a new paradigm of sustainable industrial production. As one of the foremost international centres for training future leaders in advanced Manufacturing Engineering, the Graduate School has adopted the tried and trusted principle of dual education and developed it to meet the specific needs of doctoral candidates: the school trains junior scientists in Engineering, Computer Science as well as Business Administration by combining challenging science-oriented and industry-relevant research and training, technology and management, as well as practical application and theory.

The Graduate School has defined six research fields:

- Strategies and Factories' Development
- Management of Global Manufacturing Networks
- Information and Communication for Manufacturing
- Equipment and Service Engineering
- Material and Process Engineering
- Intelligent Manufacturing Systems

GSaME's outlook is interdisciplinary and international. The school cooperates closely with partners from science and industry, such as renowned manufacturers, foundations, associations as well as Fraunhofer institutes.



Universität Stuttgart

#### Coordinator

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# LEAD Graduate School: Learning, Educational Achievement, and Life Course Development

## Key questions in educational research

While educational policy reveals an increasing willingness to give greater consideration to evidence-based approaches, there is a lack of secured knowledge and trained experts to implement them. Therefore, the integrated research and training programme at the LEAD Graduate School offers doctoral candidates the opportunity to explore central issues in Educational Science in an interdisciplinary and international environment. About twenty new doctoral students are admitted to the programme annually. They collaborate closely with scientists from six research fields: Educational Research and Educational Psychology, Cognitive and Social Psychology, Neuroscience and Informatics, Clinical Psychology and Psychiatry, Language and Linguistics as well as Sociology and Economics. Five interfaces, called 'LEAD Intersections', have been

defined to facilitate their collaboration. On the basis of its large international network, LEAD fosters connecting and working with outstanding experts of each discipline in person. In addition, visits in labs as well as conference attendance around the world are welcome options for each PhD candidate. The LEADING Research Center supports all LEAD members in employing innovative research methods and meeting the highest quality standards in their research.

### Partners:

- University of Tübingen (applicant – speaker)
- Knowledge Media Research Center, Tübingen

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## International Graduate School in Molecular Medicine Ulm

### Specialists for the interface between biology and medicine

Molecular medicine seeks to decode the causes of human disease on the molecular level. The results have led to pronounced improvements in the diagnosis, prevention and therapy of many diseases. This work at the interface between medicine and biology calls for special training of the kind provided by the International Graduate School in Molecular Medicine. Whether the focus is on cancer, stem cells, infectious diseases or ageing processes – the young scientists are directly integrated in research into the molecular and cellular origins of disease. All the university's faculties are involved, with a total of more than 40 institutes and clinics.

The Graduate School has developed into an important centre for structured doctoral training, providing two structured training programmes: the International PhD Programm in Molecular Medicine for

doctoral candidates in the natural sciences and the "Promotionsprogramm Experimentelle Medizin" for doctoral candidates in medicine. Junior researchers benefit from the Graduate School's international, interdisciplinary focus and intensive mentoring.

#### Visit

- [www.uni-ulm.de/einrichtungen/mm](http://www.uni-ulm.de/einrichtungen/mm)
- [www.uni-ulm.de/einrichtungen/mm/public-relations/video.html](http://www.uni-ulm.de/einrichtungen/mm/public-relations/video.html)

for additional information and a video on the Graduate School.



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**u**ulm

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## Graduate School of Life Sciences (GSLS)

### Excellent personalised mentoring

The Graduate School of Life Sciences (GSLS) encompasses the entire spectrum of the Life Sciences – from protein structures at atomic resolution to complete ecosystems. It is a joint initiative by the Faculties of Biology, Medicine, Chemistry and Pharmacy, Physics and Philosophy (Psychology). It comprises the sections Biomedicine, Infection and Immunity, Integrative Biology, Neurosciences and the newly added section Clinical Sciences.

Each doctoral candidate follows a personalised training and mentoring plan, including academic seminars, workshops on transferable skills, and international conferences. The GSLS also promotes early autonomy for its students by granting scholarships that provide them with independent financial funding and their own scientific budget.

In the second funding period, the GSLS is expanding its programme. A newly created fast-track Master's programme "FOKUS Life Sciences" allows outstanding students to start their doctoral studies as early as one year after obtaining their Bachelor's degree. The GSLS offers medical students a structured and research-oriented Dr. med. programme in order to link basic medical research more closely to patient care. Finally, the PostDoc Plus programme supports post-docs in taking their first steps towards scientific independence.

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## **Current Clusters of Excellence**



## Integrative Production Technology for High-Wage Countries

### Success with integrative production technologies

Competitive production engineering is particularly important for high-wage countries like Germany. RWTH Aachen University contributes 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. The particular focus is on individualising, virtualising, integrating and self-optimising the production process.

The Cluster enables companies from Germany and Europe to recognise where they have to develop expertise 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.

In the second funding period existing models and technologies are being extended and combined

with a cybernetic approach to consider the unpredictable and complex nature of production systems as a whole.

### Partners, amongst others:

- RWTH Aachen University (applicant – speaker)
- ACCESS, Aachen
- Fraunhofer Institute for Laser Technology ILT, Aachen
- Fraunhofer USA – Center for Laser Technology, Plymouth und Center for Manufacturing Innovation, Boston
- Industrial partners: BMW Group, Bosch, Deckel Maho, EADS Deutschland, Festo AG, LANXESS Deutschland GmbH, MAN, Philips Lighting B.V., Phoenix Contact, RKW AG, Siemens AG, SMS Siemag, ThyssenKrupp, Trumpf u. v. m.

## Tailor-Made Fuels from Biomass

### Biofuels for the future

Innovative biofuels offer a yet unexploited potential for reducing pollutant emissions and greenhouse gases. In doing so, it is important not to take any biomass out of the food value chain. Within these parameters, scientists from several disciplines have joined forces in the Cluster of Excellence to explore the conversion of lignocellulosic biomass into innovative fuel molecules without encroaching upon the food chain. The objective is to develop an interdisciplinary “Fuel Design” that improves the (bio-)catalytic conversion of biomass into fuel and, at the same time, optimises combustion and engines. The close interconnection of chemical, biological and technical fuel production on the one hand, and the mechanical optimisation of combustion on the other, as practised at the newly founded “Fuel Design

Center” in Aachen, is unique in the Cluster of Excellence. As the Aachen-based researchers enter the second funding period, they continue to make important contributions to the future of sustainable mobility.

#### Partners:

- RWTH Aachen University (applicant – speaker)
- Fraunhofer Institute for Molecular Biology and Applied Ecology, Aachen
- Max-Planck-Institut für Kohleforschung, Mühlheim an der Ruhr



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UNIVERSITY**

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## NeuroCure – Towards a Better Outcome of Neurological Disorders

### Improving patients' life situation

Diseases of the nervous system can, in many cases, be treated but not cured. Some of these very different diseases are based in part on the same or very similar neurological mechanisms. By increasing understanding of the underlying mechanisms, the Cluster of Excellence NeuroCure seeks to develop effective therapies and new diagnostic approaches. Building on its initial focus on neurological disorders such as stroke, multiple sclerosis and epilepsy, this interdisciplinary research consortium now also conducts research on psychiatric disorders including Alzheimer's disease, autism, depression and schizophrenia.

By closely linking basic research in neurological diseases with clinical studies, the Cluster aims to improve patients' lives. Through this approach, new research findings and insights can be directly translated into clinical practice.

The structural objective of NeuroCure is to extend and strengthen Berlin as a neuroscience research location both by improving networking amongst ongoing research activities and establishing new professorships and junior research groups.

### Partners:

- Freie Universität Berlin and Humboldt-Universität zu Berlin as sponsor universities of the Charité - Universitätsmedizin Berlin (applicants – speakers)
- German Rheumatism Research Centre Berlin (DRFZ)
- Leibniz Institute for Molecular Pharmacology (FMP), Berlin
- Max Delbrück Center for Molecular Medicine (MDC), Berlin

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

## Space and knowledge

The Topoi Cluster brings together experts from more than 30 disciplines such as Archaeology, Geography, History, Philology, Theology and Philosophy. They work together to investigate the connections between space and knowledge in the civilisations of the Near and Middle East as well as the Mediterranean and Black Sea regions between 7000 BC and 500 AD.

Nowhere else in Germany are the cultures of the Ancient World so strongly represented as in Berlin, and Topoi bundles this strength. A structure to sustain this successful model of transdisciplinary/transinstitutional collaboration was established in May 2011 with the opening of the Berliner Antike Kolleg (BAK). The Berlin Graduate School of Ancient Studies (BerGSAS) at BAK provides interdisciplinary programmes and generates new goals for the future work of the Cluster of Excellence.

### Partners, amongst others:

- Freie Universität Berlin (applicant – speaker)
- Humboldt-Universität zu Berlin (applicant – speaker)
- Berlin-Brandenburg Academy of Sciences and Humanities, Berlin
- German Archaeological Institute, Berlin
- Max Planck Institute for the History of Science, Berlin
- The Prussian Cultural Heritage Foundation, Berlin
- Technische Universität Berlin
- HTW University of Applied Sciences, Berlin



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## Image Knowledge Gestaltung. An Interdisciplinary Laboratory

Complex problems cannot be solved within the boundaries of a single scientific discipline

Complex problems require the knowledge and expertise of researchers from various fields of science.

The Interdisciplinary Laboratory "Image Knowledge Gestaltung" is just such an alliance of Humanities, Natural Sciences, Engineering, Medicine, and – a first in basic research – the creative disciplines of Design and Architecture. More than 25 different disciplines study the fundamental Gestaltung processes of the sciences at the interdisciplinary laboratory. The individual disciplines themselves benefit from the strengthening and enrichment that ensue. The enormous diversity of universities, research institutions as well as excellent collections and museums in Berlin are the foundations on which the project is to be carried out.



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- Freie Universität Berlin
- Technische Universität Berlin
- Berlin University of the Arts
- Berlin Weißensee School of Art
- Federal Institute for Materials Research and Testing, Berlin
- Max Planck Institute of Colloids and Interfaces, Potsdam
- Max Planck Institute for the History of Science, Berlin
- Museum für Naturkunde Berlin
- Bauhaus Dessau Foundation
- The Prussian Cultural Heritage Foundation, Berlin
  - Ibero-American Institute, Berlin
  - Museum of Decorative Arts, Berlin
  - Art Library, Berlin

## Unifying Concepts in Catalysis

### Fit for the change in raw materials: better customised catalysts

Modern Chemistry makes it possible: cars and planes will burn fuels that generate fewer pollutants. Or drugs like antibiotics will be better tuned to their area of application in the human body, achieving a more targeted impact. Catalysts are the key to new developments like this. They facilitate the targeted use of chemical reactions with minimum material and energy expenditure. Tailor-made chemical and biological systems of varying dimensionality and size are required. The scientists also utilise 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 on the knowledge base at the intersection of Chemistry and Biology and to transfer their outcomes to industry more quickly. One result is a joint laboratory that has been set up with BASF, the BasCat.

#### Partners:

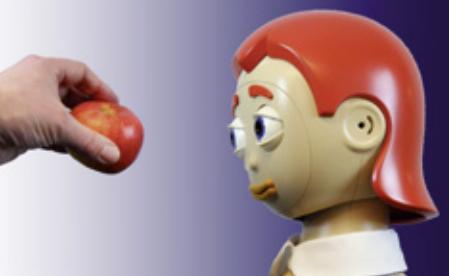
- Technische Universität Berlin (applicant – speaker)
- Humboldt-Universität zu Berlin
- Freie Universität Berlin
- Fritz Haber Institute of the Max Planck Society, Berlin
- Max Planck Institute of Colloids and Interfaces, Potsdam
- University of Potsdam
- Industrial partners: BASF SE, Bayer HealthCare, Evonik, PolyAn, Sanofi-Aventis, Siemens, Uhde
- Main cooperation partners in academia: Northwestern University, Evanston/USA; Argonne National Lab/USA; Rovira i Virgili University & ICIQ, Tarragona/Spain; Swedish Consortium for Artificial Photosynthesis; Leibniz Institute of Catalysis, Rostock; Max Planck Institute for Chemical Energy Conversion, Mülheim an der Ruhr



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## Cognitive Interaction Technology (CITEC)

### Helpful machines with a heart

From regular household appliances to robots: the researchers at the Center of Excellence Cognitive Interaction Technology (CITEC) at Bielefeld University envision intelligent technical helpers that can understand instructions and respond to their users with empathy. Since 2007, CITEC researchers have been working with industrial partners on artificial systems that make our daily lives more convenient. Today, about 40 research groups belong to the globally interconnected Cluster. Some of Bielefeld's creations have achieved international renown, such as robot head Flobi, research on robot hands with manual intelligence, and the virtual robots MAX and Vince.

Computer Scientists, Biologists, Linguists, Mathematicians, Psychologists and Sports Scientists cooperate at CITEC to explore the scientific fundamentals of how to impart cognitive abilities to

machines. The Cluster of Excellence bundles its transdisciplinary basic research in four key research areas: Motion Intelligence, Attentive Systems, Situated Communication as well as Memory and Learning.

#### Partners:

- Bielefeld University (applicant – speaker)
- Bertelsmann SE & Co. KGaA, Gütersloh
- Honda Research Institute Europe, Offenbach
- Miele & Cie. KG, Gütersloh
- v. Bodelschwingh Foundation Bethel, Bielefeld

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## RESOLV: Ruhr Explores Solvation

### Solvents – not just passive spectators

Many chemical reactions, including those that are central to many important industrial and biological processes, take place in a liquid. However, the solvent itself – the best known of them being water – has received little attention so far. In recent years, research has shown that solvation processes in chemical substances are more complex than had hitherto been assumed.

The RESOLV Cluster views solvents as an active part of chemical reactions and explores how they influence the course of these chemical and biological processes. This is important for optimising industrial processes, improving their energy efficiency, reducing environmental stress and avoiding corrosion processes.

To do this, RESOLV combines analytical and engineering procedures with theoretical concepts,

develops them further and generates ideas for applied research and industrial application. The Cluster also has new headquarters: one hundred researchers of various disciplines will collaborate at the ZEMOS Center of Solvation Science in Bochum.

#### Partners:

- Ruhr-Universität Bochum (applicant – speaker)
- TU Dortmund University
- University of Duisburg-Essen
- Fraunhofer Institute for Environmental, Safety, and Energy Technology, Oberhausen
- Max Planck Institute for Chemical Energy Conversion, Mülheim an der Ruhr
- Max-Planck-Institut für Eisenforschung, Düsseldorf
- Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr



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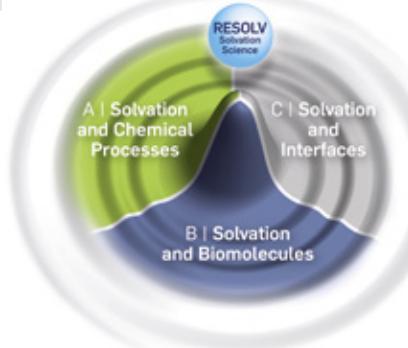
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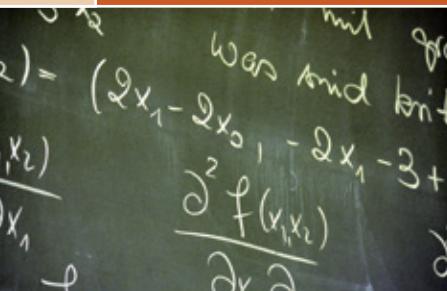
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## Mathematics: Foundations, Models, Applications

### An international spotlight on Mathematics

With the Hausdorff Center for Mathematics, Bonn is consolidating its position as the leading German Mathematics location and establishing itself as a premier international centre.

Mathematics is a vast and changing research field. The Hausdorff Center tackles the entire range of current mathematical problems and issues. Ten research areas cover a wide spectrum of Mathematics and Theoretical Economics, driving forward topics of particular promise, from classical core areas of Mathematics via Mathematical Modelling and Numerical Simulation in the Natural and Social Sciences to the transfer of Mathematics to technical applications.

The Cluster of Excellence gathers together visiting researchers from all over the globe to work on core topics that change every trimester. The centre's local base is being broadened by five new professorships. The appeal of Bonn for young scientists from all over the world continues to grow as a result of the Bonn International Graduate School in Mathematics, the Hausdorff Center's PostDoc Programme, as well as the Bonn Junior Fellow positions for young professors.

### Partners:

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## ImmunoSensation: The Immune Sensory System

### New insight into the immune system as a sensory organ

The immune system keeps the organism safe from harm by defending it from pathogen attacks. Yet the immune system itself can cause disease, such as inflammation, tumours or diabetes. Only in recent years has biomedical research begun to understand the reasons for this. The immune system's 'sensors', which detect damaged self or foreign molecules, are closely linked to other body functions such as metabolism or the nervous system.

The Cluster of Excellence ImmunoSensation studies this broadened perspective on the immune system by bundling the expertise of Immunology, Neurobiology, Molecular Sensor Systems and Mathematics in Bonn. In the Faculty of Medicine and at the University of Bonn's Life and Medical Sciences Institute (LIMES), five departments are exclusively dedicated to Immunology. Among them is the Institute for Innate Immunity, the first of its kind in Germany, which is funded by the state Nordrhein-Westfalen

as a special focus professorship. Other non-university institutions involved are the German Centre for Neurodegenerative Diseases (DZNE) and the Center of Advanced European Studies and Research (caesar). The Cluster of Excellence ImmunoSensation is also a partner in the newly founded International Innate Immunity Consortium and conducts exchange and training programmes with international research partners.

#### Partners:

- University of Bonn (applicant – speaker)
- German Centre for Neurodegenerative Diseases (DZNE), Bonn
- Center of Advanced European Studies and Research (caesar), Bonn



#### Coordinator

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## The Ocean in the Earth System – MARUM, Center for Marine Environmental Sciences

### The ocean in depth!

MARUM uses state-of-the-art methods to elucidate the role of the oceans in the Earth system, in particular in the context of global change. It examines the interactions between the marine geosphere and biosphere and provides information on the sustainable use of the ocean.

One of its important tasks is to provide research infrastructure services: MARUM maintains one of the world's three core repositories for the Integrated Ocean Drilling Program IODP and operates the data information system PANGAEA in cooperation with the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research. It has a comprehensive pool of equipment for exploring the deep sea. This includes the deep sea floor drill rig MARUM-MeBo, as well as remotely-controlled and autonomous underwater vehicles. MARUM comprises the

DFG Research Centre and the Cluster of Excellence "The Ocean in the Earth System" and promotes junior scientists via GLOMAR, the integrated interdisciplinary graduate school for marine sciences.

### Partners:

- University of Bremen (applicant – speaker)
- Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven
- Max Planck Institute for Marine Microbiology, Bremen
- Forschingsinstitut und Naturkundemuseum Senckenberg, Senckenberg by the Sea, Wilhelmshaven
- Leibniz Center for Tropical Marine Ecology, Bremen
- Jacobs University Bremen

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## Merge Technologies for Multifunctional Lightweight Structures (MERGE)

### Components on a diet

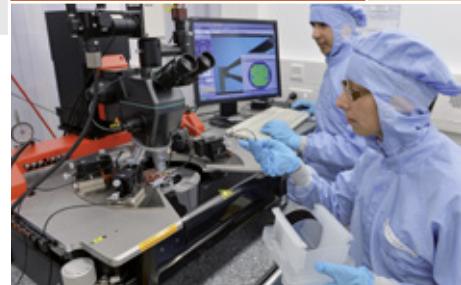
Components must be built lighter to conserve precious raw materials and energy, both in the manufacturing process and in using the finished product. Vehicles with lightweight bodies, for example, use much less fuel. Even though good progress has already been made in the production of lightweight metal, plastic and textile structures, there is still considerable room for improvement, especially when various materials and manufacturing processes are being combined – which is where "MERGE" comes in. The cluster amalgamates existing basic technologies to create new manufacturing processes for the hybrid construction of lightweight structures. In addition, active Microsystems such as sensors, actuators and electronics are integrated in these hybrid structures.

MERGE bundles core competencies in the field of resource-efficient technologies for the construction of lightweight structures and coordinates national

and international corporate collaboration. Moreover, the Free State of Saxony is investing in the construction of a new facility for the institute, which will provide the necessary working environment for scientists, as well as expedite knowledge transfer across disciplines.

#### Partners:

- Chemnitz University of Technology (applicant – speaker)
- Technische Universität Dresden
- Fraunhofer Institute for Electronic Nano Systems, Chemnitz
- Fraunhofer Institute for Machine Tools and Forming Technology, Chemnitz
- Leibniz Institute for Solid State and Materials Research, Dresden
- Three institutes affiliated with TU Chemnitz



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CHEMNITZ

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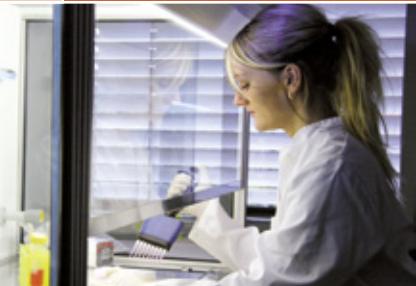
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## Center for Regenerative Therapies Dresden (CRTD)

### Stem cells – a beacon of hope

In modern Biomedicine, the use of stem cells holds great promise for regenerative therapies. Stem-cell-based procedures of tissue engineering could make controlled regeneration possible. However, the mechanisms governing these processes are still largely unknown.

The Cluster of Excellence applies a multidisciplinary approach to cell-based regenerative therapy. Bioscientists identify the decisive cellular processes, and then manipulate them through genetic engineering, or by biochemical or mechanical means, to achieve controlled stem cell reproduction and regeneration. The outcomes should generate completely novel stem cell therapies for blood disorders, diabetes, neurodegeneration and bone atrophy.



#### Coordinator

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#### Partners, amongst others:

- Technische Universität Dresden (applicant – speaker)
- Biotechnology Center TU Dresden (BIOTEC)
- German Center for Neurodegenerative Diseases (DZNE), Dresden
- Paul Langerhans Institute Dresden (PLID)
- ZIK B CUBE – Center for Molecular Bioengineering, Dresden
- Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG), Dresden
- Dresden International Graduate School for Biomedicine and Bioengineering (DIGS BB)
- University Hospital Carl Gustav Carus Dresden
- Max Bergmann Center of Biomaterials Dresden (Leibniz Institute of Polymer Research Dresden)
- Helmholtz-Zentrum Dresden-Rossendorf

## Center for Advancing Electronics Dresden (cfaed)

### Electronics – smaller, faster, cheaper, different

Internet, smartphones and mobile communications owe their rapid development to the incredible dynamics of CMOS semiconductor technology, the base technology behind modern electronics. Now, however, it is rapidly approaching its physical limitations. The Center for Advancing Electronics Dresden (cfaed) therefore gathers scientists from Electrical Engineering, Computer Sciences, Physics, Chemistry, Mathematics, and Biology to explore alternative materials, technologies, and systems for tomorrow's electronics: silicon nanowires, carbon nanotubes, organic materials, chemical information processing, self-assembling structures, and their integration into heterogeneous information processing systems.

Dresden is just the right place for this task, because the region is Europe's largest microelectronics location. The Cluster unites the research and application know-how of Micro- and Nanoelectronics, Materials and Natural Sciences, as well as Information Technology. This expertise is to be reinforced by

five new strategic professorships, three new open-themed professorships as well as ten research group leadership positions. This expansion will be flanked and supported by a career programme unparalleled in science.

#### Partners, amongst others:

- Technische Universität Dresden (applicant – speaker)
- Chemnitz University of Technology
- Fraunhofer Institute for Electronic Nanosystems, Chemnitz
- Fraunhofer Institute for Nondestructive Testing IZFP, Dresden
- Helmholtz-Zentrum Dresden-Rossendorf
- Leibniz Institute for Solid State and Materials Research Dresden
- Leibniz Institute of Polymer Research Dresden
- Max Planck Institute for the Physics of Complex Systems, Dresden
- Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG), Dresden



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## Cluster of Excellence on Plant Sciences (CEPLAS)

### Understanding the adaptability of plants

Arable land, water and nutrients are becoming scarce; at the same time the climate is warming and the world population is on the rise. This calls for new, sustainable strategies for plant production. The Cluster explores how plants adapt to changing environments, how they are able to populate almost any habitat on earth, and how this insight can be used for agriculture.

The key to understanding this adaptability lies in the plants' genetic make-up: genes control annual or perennial life history of plants, the transformation of light energy into chemical energy by way of photosynthesis, as well as their genetic and metabolic interplay with microorganisms. CEPLAS strives to decode these mechanisms and lay the foundation for future, more productive food crops.



CEPLAS

#### Coordinator

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The Cluster bundles the internationally renowned expertise of experimental and theoretical Biologists and establishes novel training programmes for students, doctoral and postdoctoral researchers at the Cologne-Düsseldorf plant science centre.

#### Partners:

- Heinrich Heine University Düsseldorf (applicant – speaker)
- University of Cologne (applicant – speaker)
- Max Planck Institute for Plant Breeding Research, Cologne
- Forschungszentrum Jülich

## Engineering of Advanced Materials – Hierarchical Structure Formation for Functional Devices (EAM)

### From molecules to 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 developing hierarchically-organised materials with tailor-made electrical, optical, catalytic and mechanical properties with the aim of facilitating innovative applications in the fields of nanoelectronics, photonics, catalysis and lightweight construction.

#### Partners:

- Friedrich-Alexander-Universität Erlangen-Nürnberg (applicant – speaker)
- Max Planck Institute for the Science of Light, Erlangen
- Bayerisches Laserzentrum, Erlangen
- Neue Materialien Fürth GmbH
- Fraunhofer Institute for Integrated Systems and Device Technology IISB, Erlangen
- Fraunhofer Institute for Integrated Circuits IIS, Erlangen
- ZAE Bayern, Erlangen



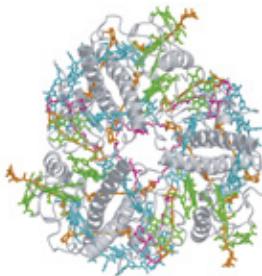
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## Macromolecular Complexes in Action

### Protein complexes: structure determines function

Macromolecular complexes play a decisive role in all the processes of living cells. They are made up of a number of proteins or RNA molecules that perform jointly-defined functions in a cell. The function depends largely on their three-dimensional structures. Insights into the structure of these complexes are seen as a milestone in understanding life processes. However, many questions remain about how these complexes act. The isolation and precise investigation of the major protein and RNA complexes are the goals that the Cluster of Excellence has set itself. It continues to build on previous close collaborations between Goethe University and the Max Planck Institutes in Frankfurt. The scientists want to find out how macromolecular complexes are organised, what impact this has on their function and what role they play in the cell. These insights will help to understand diseases and develop new treatments.

### Partners:

- Goethe University Frankfurt (applicant – speaker)
- Max Planck Institute of Biophysics, Frankfurt am Main
- Max Planck Institute for Brain Research, Frankfurt am Main

## The Formation of Normative Orders

### Justifying Political Rule

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 a system of political rule and a specific distribution of goods and life chances. The Cluster investigates how such orders are handed down, modified, institutionalised and practised over long periods of time. In the second funding phase, researchers from the fields of philosophy, history, political science, legal studies, anthropology, economics, theology and sociology will focus greater attention on the question of how justifications assert themselves in the reality of social power relationships. The Cluster is divided into three research areas:

- The Normativity of Normative Orders
- The Dynamics of Normative Orders
- The Plurality of Normative Orders

### Partners:

- Goethe University Frankfurt  
(applicant – speaker)
- Technische Universität Darmstadt
- Peace Research Institute, Frankfurt am Main
- Max Planck Institute for European Legal History, Frankfurt am Main
- Max Planck Institute for Comparative Public Law and International Law, Heidelberg
- Institute for Social Research, Frankfurt am Main
- Frobenius Institute, Frankfurt am Main
- Point Sud, Centre for Research on Local Knowledge, Bamako/Mali



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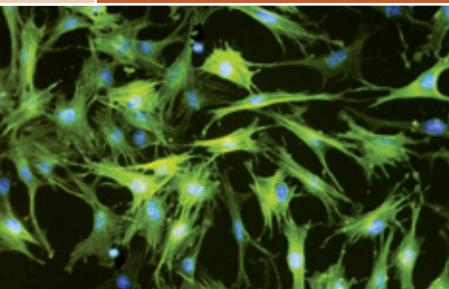
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## Cardio-Pulmonary System (ECCPS)

### Innovative research for cardiac patients

Cardio-pulmonary disease is one of the most common causes of death. It is also responsible for the highest costs in public health care. The Cluster of Excellence investigates vascular and parenchymal heart and lung diseases. It combines basic research with pre-clinical and clinical studies in order to examine the causes and development of these diseases using an interdisciplinary approach. In so doing, the researchers address the question of how vascular remodelling processes, for example, can be prevented or reversed, or how to stop the excessive formation of connective tissue. They also study the role played by stem cells in the development and repair processes of cardiac and lung tissues. Their aim is to produce tailor-made novel therapies.



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#### Partners:

- Goethe University Frankfurt (applicant – speaker)
- Justus Liebig University Giessen (applicant – speaker)
- Max Planck Institute for Heart and Lung Research, Bad Nauheim
- Kerckhoff Klinik, Bad Nauheim
- Universitätsklinikum Gießen und Marburg GmbH (UKGM)

## BIOSS Centre for Biological Signalling Studies – From Analysis to Synthesis

### The language of cells

Signalling processes within and between cells control all biological processes. They are the driving force of the organism. Hence, a more precise understanding of these processes is underlying 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 to use new machines and methods in order to analyse the highly complex and dynamic biological signal processing.

In the second funding phase, research will focus on “Deregulated signalling processes in tumour development” and “The organisation of biological membranes at the nanoscale level”.

#### Partners, amongst others:

- University of Freiburg (applicant – speaker)
- Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg
- Max Planck Institute of Immunobiology and Epigenetics, Freiburg
- Biozentrum of the University of Basel/ Switzerland
- Swiss Federal Institute of Technology Zurich/ Switzerland
- Ecole Supérieure de Biotechnologie, Université Louis Pasteur, Illkirch-Strasbourg/France
- University of Toronto/Canada
- Nanyang Technological University/Singapore
- Industrial partners: BioPro GmbH, Carl-Zeiss-Microimaging GmbH, BioFluidix GmbH, ibidi GmbH



#### Coordinator

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## BrainLinks-BrainTools

### Interfacing with the brain

No other organ of our body is as complex, as fascinating and at the same time as delicate as the brain. Diseases of and injuries to the nervous system can have serious, life-long consequences. Drugs and conventional rehabilitation measures cannot always alleviate symptoms. In such cases, there is great potential in new therapies based on Neurotechnology and Robotics.

In the Cluster of Excellence BrainLinks-BrainTools, scientists from Biology, Microsystems Engineering, Computer Science and Medicine work on connecting technical elements to the nervous system. Freiburg is unique in amalgamating the necessary knowledge and skills for this: basic research on the nervous system is combined with developing microsystems and autonomous robots. The vision is to achieve two developments:

- Systems that can read a patient's intentions and commands from his or her brain activity and thus control external devices. These could be prosthetics or communication aids for paralysed patients, or systems that facilitate the rehabilitation of stroke patients.
- Intelligent, autonomous implants that harvest their own energy, and which interface with the brain to detect and counteract brain dysfunction.

BrainLinks-BrainTools is designed as a long-term project that will grow into one of Germany's largest neurotechnological research centres.

### Coordinator

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## Nanoscale Microscopy and Molecular Physiology of the Brain (CNMPB)

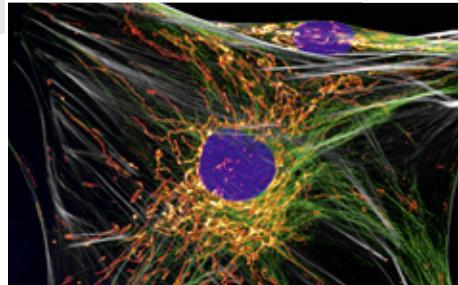
### Unravelling the brain's secrets

Fluorescence microscopy with diffraction-unlimited resolution (nanoscopy) is currently revolutionising the neurosciences. In the process, new frontiers have become apparent that challenge the full exploitation of the nanoscale resolving power. These barriers lie, among others, in the size, specificity, and distinguishability of fluorescent labels and in the limits imposed by biological samples. The Cluster of Excellence Nanoscale Microscopy and Molecular Physiology of the Brain (CNMPB, formerly: Microscopy at the Nanometer Range) explores novel optical concepts and techniques to further open up the nanometer scale imaging of biological samples and to apply novel imaging tools to basic and clinical neuroscience. The basis for this translational effort is the DFG Research Center Molecular Physiology of the Brain (CMPB), which aims at a better understanding of the molecular processes that underlie some prototypes of neurological and

psychiatric diseases. The overall vision is that the revolutionary development in advanced microscopy techniques and labelling will allow new diagnostic tools and therapeutic strategies for the prevention and treatment of such disorders to be developed.

#### Partners:

- University of Göttingen (applicant – speaker)
- German Primate Center, Göttingen
- Laser-Laboratorium Göttingen
- Max Planck Institute for Biophysical Chemistry, Göttingen
- Max Planck Institute for Experimental Medicine, Göttingen
- XLAB – Göttinger Experimentallabor für Junge Leute
- Abteilung Neuropädiatrie, Klinikum Kassel



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CNMPB

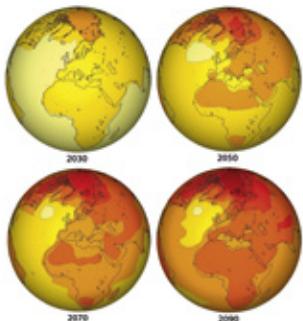
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## Integrated Climate System Analysis and Prediction (CliSAP)

### Tracking down climate change

Is the Arctic sea ice melting? Will the Gulf Stream still bring enough warmth to Europe in the future? How will economies and societies react to climate change – and what conflicts over land, water and other resources will we have to face? Scientists in the Hamburg Climate Cluster study natural as well as man-made climate change and generate important scientific foundations for political and social decision-making.

Global change raises many questions that transcend the scope of individual disciplines. CliSAP has successfully built vital bridges between Meteorologists, Oceanographers, Geophysicists and Ecologists who collaborate closely with Social Scientists, Economists, Media Experts and Peace Researchers.

At the core of its interdisciplinary basic research are climate variability and predictability, regional variations in climate change, economic and social developments and possible “climate conflicts”.

### Partners:

- Universität Hamburg (applicant – speaker)
- Max Planck Institute for Meteorology, Hamburg
- Helmholtz-Zentrum Geesthacht – Centre for Materials and Coastal Research
- German Climate Computing Center, Hamburg

## The Hamburg Centre for Ultrafast Imaging (CUI)

### Live transmission from the atomic circus

Atoms, molecules and electrons move, form bonds between each other and break apart unimaginably fast. Scientists at the Hamburg Centre for Ultrafast Imaging (CUI) want to observe and understand these ultrafast processes directly on the atomic level, so that maybe, one day, they will even be able to control them systematically. The world is not static but dynamic. Things are constantly changing.

Being able to watch atoms move in real time during such changes would be a great leap forward for Physics and Chemistry, but also for Biology and Medicine. The CUI scientists hope, for instance, to gain a more precise understanding of high temperature superconductivity, magnetism, and the development of ordered molecular structures. This type of insight could result in new high-tech materials.

The novel X-ray and electron sources on the Bahrenfeld Campus are an important tool for scientists. Since this undertaking will require the expertise of

many disciplines, scientists from Physics, Chemistry, Biology and Medicine have joined forces under the umbrella of the Cluster of Excellence, to study the fundamental chemical, biological and physical processes in the field of Photon and Nano Science. An additional important feature is the promotion of junior researchers with a clear focus on gender and families.

#### Partners:

- Universität Hamburg (applicant – speaker)
- Deutsches Elektronen-Synchrotron, Hamburg
- European Molecular Biology Laboratory, Hamburg
- European XFEL GmbH, Hamburg
- Max Planck Research Department for Structural Dynamics at Universität Hamburg



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## From Regenerative Biology to Reconstructive Therapy (REBIRTH)

### Studying healing at the level of cells and molecules

What exactly stimulates the healing process in living organisms? To what extent are the processes that take place in cells and organs controlled by genes? And how can we grow human tissue? Scientists in the REBIRTH Cluster collaborate across the various different disciplines involved to develop innovative therapeutic strategies for the organ systems of the heart, lung, liver and blood. Building on the outcomes REBIRTH has achieved in basic research and translation to experimental medicine, new approaches and technologies are being developed that will later be applied to clinical practice for the benefit of patients.

The cluster combines excellent education and training with innovative science, plus experimental and clinical medicine. It prioritises innovative approaches to regenerative therapies based on novel cell sources. Medical expertise is complemented by Engineering and Technology, Chemistry,

Biophotonics, Nanotechnology, Imaging as well as ethical aspects.

#### Partners:

- Hannover Medical School (applicant – speaker)
- Gottfried Wilhelm Leibniz Universität Hannover (co-applicant)
- Laser Zentrum Hannover
- University of Veterinary Medicine Hannover, Foundation
- Fraunhofer Institute for Toxicology and Experimental Medicine, Hannover
- Helmholtz Centre for Infection Research, Braunschweig
- Max Planck Institute for Molecular Biomedicine, Münster
- FLI Federal Research Institute for Animal Health, Mariensee



Medizinische Hochschule  
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## Cellular Networks

### 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, they ensure that the biological systems are able to do their work and adapt to their environment. The Cluster wants to use quantitative analysis to explain how such networks function and how they change.

Comprehensive insights into the regulation of biological systems will facilitate their mathematical modelling and simulation. To achieve this, the Cluster is working on four mutually constructive research areas:

- Protein Machines – Biogenesis, Interaction and Regulations
- Dynamics of Cell Architecture
- Information Processing in Complex Multi-cellular Networks
- Alteration of Networks by Infectious Pathogens

#### Partners:

- Heidelberg University (applicant – speaker)
- German Cancer Research Center, 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
- Heidelberg Institute for Theoretical Studies – HITS
- Karlsruhe Institute of Technology



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## Asia and Europe in a Global Context: The Dynamics of Transculturality

### Cultural relations as interconnected processes

Europeans and Asians have a long history of intensive cultural, political and economic relationships. The Cluster explores these relationships, balancing their historic depth with their present-day significance for processes of global transformation. It connects the rich expertise in Asian Studies at Heidelberg University with the broad range of Humanities and Social Studies disciplines, which tend to be focussed on Europe. This collaboration across subject lines makes it possible to explore cultural interactions beyond the limitations of national, Eurocentric and subject-bound categories. It also allows scholars to capture the contradictory relationship between culture as a factor that shapes identity, and culture as a product of interweaving (global) processes.

Projects are allocated to the areas of "Governance and Administration", "Public Spheres", "Knowledge Systems", or "Historicities and Heritage". The Heidelberg Research Architecture is a special research environment that facilitates new digital developments as well as the study of previously neglected sources by integrating a great variety of materials and media.

#### Partners, amongst others:

- Heidelberg University (applicant – speaker)
- Harvard University, Asia Center, Cambridge/USA
- Hong Kong University, Institute for the Humanities and Social Sciences/China
- Jawaharlal Nehru University, School of Arts and Aesthetics, New Delhi/India
- Kyoto University, OPIR and GCOE "Intimate and Public Spheres"/Japan
- Peking University, Department of History/China



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## The Future Ocean

### The ocean's potential and risks

To a significant extent, our future depends on developments in our oceans. They have a huge impact on global climate and provide us with food and natural resources, yet also harbour risks that are caused, for instance, by rising sea levels, overfishing or acidification. What are the right approaches to achieving the sustainable use of the habitat ocean?

Researchers at the Cluster of Excellence study changes in the oceans using a multi-disciplinary approach that is unique in its scope, pooling the expertise of Marine Scientists and Geoscientists, Economists, Life Scientists, Mathematicians, Computer Scientists as well as Scholars from Politics, Philosophy and International Law. A fundamental understanding of the oceans will allow them to develop substantiated predictions and scenarios, which, in close dialogue with decision-makers, could contribute to sustainable management of the oceans.

In addition to research, the Cluster of Excellence supports knowledge transfer to the general public, industry and politics. It also promotes international collaboration and supports junior scientists in its Graduate School, Integrated School of Ocean Sciences (ISOS), and in its Integrated Marine Post-doc Network (IMAP).

#### Partners:

- Kiel University (applicant – speaker)
- GEOMAR Helmholtz Centre for Ocean Research Kiel
- Kiel Institute for the World Economy – IfW (Leibniz Association)
- Muthesius Academy of Fine Arts and Design, Kiel



C | A | U

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## Inflammation at Interfaces

### Understanding and controlling inflammation

Inflammation is a central medical problem and considered the cause of many chronic conditions such as Crohn's disease, ulcerative colitis, asthma and neurodermatitis. Chronic inflammation can be triggered by congenital malfunctions at the interfaces of body organs, skin and mucous membranes, or by environmental influences on the body. Scientists at the Cluster of Excellence pursue a holistic approach in their research: they want to discover molecular signatures beyond the focus on single organs and explore them in genetically modified models in order to derive individualised anti-inflammatory therapy.

In its quest for early detection and control of inflammatory processes, the Cluster pools the expertise of approximately 300 scientists from fields such as Medicine, Genetics, Biochemistry, Biology, Physics and Nutritional Science.

#### Partners:

- Kiel University (applicant – speaker)
- Universität zu Lübeck (co-applicant)
- University Medical Center Schleswig-Holstein
- Research Center Borstel – Leibniz-Center for Medicine and Biosciences
- Max Planck Institute for Evolutionary Biology, Plön
- Muthesius Academy of Fine Arts and Design, Kiel

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## Cellular Stress Responses in Aging-Associated Diseases (CECAD)

### Exploring the ageing process

In November 2012, the CECAD Cluster of Excellence embarked on its second funding period with promising results. More than 400 international scientists from the University of Cologne, the University Hospital Cologne, the Max Planck Institute for Biology of Ageing and the Max Planck Institute for Neurological Research, as well as the German Center for Neurodegenerative Diseases (DZNE) work together in close interdisciplinary cooperation. CECAD does research at the molecular level to detect the causes of the ageing process and of ageing-related diseases such as neurodegenerative diseases, diabetes, stroke, kidney failure or cancer. It is CECAD's vision to work together to find new therapeutic approaches towards treating such diseases.

Successful modern cutting-edge research relies on close cooperation and communication. The new CECAD Research Center, due to open in 2013, is

designed to set up close interaction between basic researchers and clinicians, with access to state-of-the-art molecular research methods and in the immediate vicinity of the Max Planck Institutes. CECAD is thus creating a worldwide unique centre of aging research in Cologne.

#### Partners:

- University of Cologne (applicant – speaker)
- University Hospital Cologne
- Max Planck Institute for Biology of Ageing, Cologne
- Max Planck Institute for Neurological Research, Cologne
- German Center for Neurodegenerative Diseases (DZNE), Bonn



#### Coordinator

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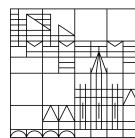
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Universität  
Konstanz



University of Konstanz

Funding period:  
1 November 2006 – 31 October 2017

## Cultural Foundations of Social Integration

### Rethinking integration

Integration is a topic at the forefront of the political agenda. Key concepts like European integration, migrant flows, failed states, and the significance of religion for processes of social integration and exclusion demonstrate both the relevance and the explosive potential of this issue.

How do patterns of social order evolve between the poles of integration and disintegration? This is what researchers at Konstanz are investigating on all social levels, from antiquity to the present. In this context, their premise is not that integration is a norm from which disintegration deviates. Rather, they see both processes as sharing the same origins and being of equal value for understanding social problems. In the face of advancing globalization, it is becoming ever more important to describe and understand de-centered social processes as well.

Scholars working in the humanities and social sciences who are active in the Center share their knowledge for the sake of developing a theory of culture: a theory that understands culture in all its facets as a constitutive element of integration.

Launched in 2006, the Center concentrates on four research fields: Identification and the Politics of Identity; Practices of Knowledge and Non-Knowledge; the Cultural Modeling of Hierarchy and Violence; and the Cultural Dynamics of Religion.

### Coordinator

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## Physics, Fundamental Interactions and Structure of Matter (PRISMA)

### Decoding the mysteries of Particle Physics

What is the glue that holds the universe together? Even after the discovery of the Higgs boson, there is still no final answer to this question. PRISMA means to get to the bottom of some of these mysteries and to shed light on the dark matter in the universe or find out what is the origin of mass.

The physicists involved need excellent infrastructure for their research. Therefore, the energy-recovering, superconducting accelerator (MESA) is being developed and constructed specifically for the cluster. An international user facility is to be added to the existing TRIGA reactor. Moreover, PRISMA is a partner in large-scale international projects such as the ATLAS experiment at CERN and the XENON project in search of dark matter. One of the cluster's key initiatives that has already been implemented is the establishment of an international centre, the Mainz Institute for Theoretical Physics (MITP),

where leading international visiting researchers host scientific programmes and workshops.

The cluster gives young scientists the opportunity to contribute new ideas. Six tenure-track positions and three W3 professorships are being instituted. The cluster awards performance-based grants from the PRISMA research fund, which also includes a budget to finance child care and measures to encourage dual careers.

#### Partners:

- Johannes Gutenberg University Mainz (applicant – speaker)
- Helmholtz Institute Mainz
- GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt
- Helmholtz-Zentrum Berlin für Materialien und Energie (HZB)



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## Munich-Centre for Advanced Photonics (MAP)

### Exploiting the technical potential of light

Whether the issue is miniaturising electronic devices, or improving microscopy or cancer diagnosis and therapy, photonics play a crucial role in everything. The goal is to generate tailor-made light in previously unattained field strengths and frequencies.

MAP uses an interdisciplinary approach involving Physics, Chemistry, Biology and Medicine, creating a unique research infrastructure and an extensive cross-disciplinary network for the development and application of lasers.

Besides the theoretical and experimental principles, MAP is also developing a number of applications, such as the structural elucidation of biological molecules, the course taken by electronic processes and chemical reactions at nuclear level, and new imaging methods for clinical diagnostics based on high brilliance x-ray sources from laser-accelerated electrons. Laser-driven ion beams

are the basis for future procedures in tumour therapy. The researchers' accumulated expertise will be sustained and extended at the Centre for Advanced Laser Applications (CALA).

#### Partners:

- Ludwig-Maximilians-Universität München (applicant – speaker)
- Technische Universität München (co-applicant)
- Universität der Bundeswehr, Munich
- Max Planck Institute of Quantum Optics, Garching



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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 is an important basis for advances in biomedicine. In order to gain a comprehensive understanding of 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. The study of protein dynamics is one of CiPSM's research focuses. Modern techniques help scientists to observe proteins in living cells and in various types of tissue. The different sections address the biophysical examination of proteins, protein folding and transport, the structure of protein complexes, how proteins

interact with nucleic acids, as well as the manipulation of protein functions and dysfunctions in the nervous system.

#### Partners:

- Ludwig-Maximilians-Universität München (applicant – speaker)
- Technische Universität München (co-applicant)
- Max Planck Institute of Biochemistry, Munich
- Max Planck Institute of Neurobiology, Munich
- Helmholtz Zentrum München

## Cluster of Excellence



LUDWIG-  
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MÜNCHEN



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## SyNergy – Munich Cluster for Systems Neurology

### A holistic look at Neurology

“Systems Neurology” is a promising new research field, analysing which mechanisms interact to produce neurological diseases. Systems Neurology goes beyond the boundaries of traditional subject areas – previously, neurodegenerative, vascular and inflammatory conditions were researched separately from one another. SyNergy focuses on the junctures where disciplines overlap. An example is the question as to how inflammation adversely affects the nervous system.

The Cluster supports cooperative tandem projects of two or more scientists. These tandem projects connect various disease mechanisms, as well as bridging basic research and applied clinical research. To strengthen the interfaces between the disciplines, SyNergy is creating several new professorships. In addition, the Cluster plans to introduce training and support programmes for young physicians who aspire to work in science.

### Partners:

- Ludwig-Maximilians-Universität München (applicant – speaker)
- Technische Universität München (co-applicant)
- German Center for Neurodegenerative Diseases (DZNE), Munich
- Helmholtz Zentrum München
- Max Planck Institute of Biochemistry (MPIB), Planegg
- The Max Planck Institute of Neurobiology (MPIN), Planegg
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## Nanosystems Initiative Munich (NIM)

### Nanosystems in authentic environments

Artificial nanosystems have broadly-based potential for application in areas like Information Technology and Biotechnology, but also in the efficient use of solar energy.

Since it was founded in 2006, the Nanosystems Initiative Munich has established itself as an internationally leading nano center. The scientific programme at the Cluster of Excellence rests on two basic pillars, the design and the control of artificial and multi-functional nanosystems. During the second funding period, the Cluster will focus on applying these systems in complex and authentic environments. Research is organised in five thematic areas: Quantum Nanophysics, Hybrid Nanosystems, Nanosystems for Energy Conversion, Biomolecular Nanosystems and Biomedical Nanotechnologies.

#### Partners:

- Ludwig-Maximilians-Universität München (applicant – speaker)
- Technische Universität München (co-applicant)
- University of Augsburg (co-applicant)
- Max Planck Institute of Biochemistry, Martinsried
- Max Planck Institute of Quantum Optics, Garching
- Walther-Meißner-Institute for Low Temperature Research, Munich
- Helmholtz Zentrum München
- Deutsches Museum, Munich



#### Coordinator

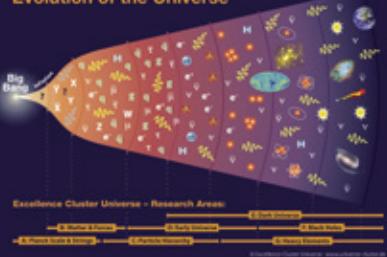
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## Origin and Structure of the Universe

### Tracking down the secrets of the universe

The Cluster of Excellence Universe scientists investigate the key questions of modern Physics and Astrophysics: Where does our Universe come from and how does it evolve? The ability to understand the nature of forces and matter promises to provide insights into the baffling imbalance between matter and antimatter, the formation of stars, galaxies and black holes, and the nature of dark matter and dark energy. Thus the Astrophysicists as well as the Nuclear and Particle Physicists involved in the Cluster penetrate the innermost structures of space, matter and time, gaining insights 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.

#### Partners:

- Technische Universität München (applicant – speaker)
- Ludwig-Maximilians-Universität München (co-applicant)
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- Max Planck Institute for Extraterrestrial Physics, Garching
- Max Planck Institute for Physics, Munich
- Max Planck Institute for Plasma Physics, Garching
- European Southern Observatory (ESO), Garching
- Leibniz Supercomputing Centre, Garching



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## Religion and Politics in Pre-Modern and Modern Cultures

### Return of religion?

Religion has returned to the political agenda. Phenomena that range from esoteric private religions to fundamentalist violence are a cause of concern 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, seems to be under threat.

The Cluster of Excellence "Religion and Politics" consists of some 200 scholars from more than 20 disciplines in the Humanities and Social Sciences from 14 different countries. They explore the complex relationship between religion and politics across the epochs and cultures: from the world of ancient gods to Judaism, Christianity and Islam in

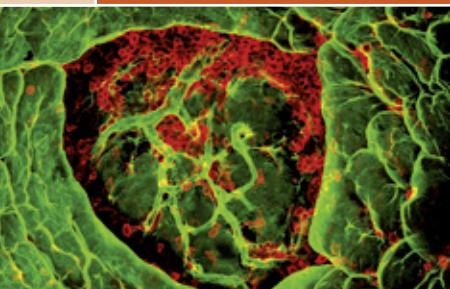
the Middle Ages and the Early Modern Period to the current situation in Europe, America, Asia and Africa. Research focuses on four areas: Normativity, Mediality, Integration and Violence. It is the largest research association of its kind nationwide and the only one of the 43 Clusters of Excellence in Germany to examine the topic of religion.



 ReligionundPolitik  
EXZELLENZCLUSTER | WWU MÜNSTER

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## Cells in Motion (CiM): Imaging to Understand Cellular Behaviour in Organisms

### How do we view cells?

Cells are the elementary building blocks of all organisms. Analysing their plasticity and dynamic behaviour is crucial to our understanding of development, homeostasis and regeneration. Novel optical imaging strategies that can depict 'cells in motion', i.e. dynamic cell behaviour *in vivo*, have revolutionised our insight and impressively demonstrated the need to study cellular behaviour in living organisms. Yet the technology has also showed us deficits in our current imaging strategies. The same is true for medical imaging which, although it was advanced by the development of innovative imaging technologies that allow physicians to see what they are treating, still has limitations in terms of specificity and resolution. Based on our interdisciplinary expertise in Münster, we are in a unique position to overcome these limitations and gain a better understanding of cellular behaviour in organisms by developing and employing novel imaging strategies.

CiM offers an interfaculty environment that sustainably promotes basic biomedical research, clinical translation as well as the interaction between them. Imaging is our common strategy for characterising cell behaviour, regardless of whether this is in cells or tissue, in animal models or in patients.

### Partners:

- The University of Münster (applicant – speaker)
- Max Planck Institute for Molecular Biomedicine, Münster

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## Hearing4all

### Research for better hearing

Nearly one in five Germans and half of all German seniors over the age of 65 suffer from impaired hearing. There is an increasing need for more precise diagnostic methods and individually adjusted hearing aids. The Cluster of Excellence Hearing4all combines basic and applied research striving towards a breakthrough in auditory research and rehabilitation. It focuses on three research areas:

- Individual diagnostics
- Optimising hearing devices by applying theory-driven functional principles
- Developing new technologies to adapt hearing support to patients' needs

Approximately 80 per cent of the world production of hearing aids contains expertise from Oldenburg. Hannover Medical School operates the world's largest cochlear implant centre. The two locations have established a joint centre for auditory research to

bundle the work of Physicists, Engineers, Psychologists, Biologists, medical researchers and Physicians. The Cluster offers support for doctoral candidates as well as career advancement for post-docs and junior research group leaders.

#### Partners:

- University of Oldenburg (applicant – speaker)
- Hannover Medical School (co-applicant)
- Leibniz Universität Hannover (co-applicant)
- Jade University of Applied Sciences, Wilhelmshaven/Oldenburg/Elsfleth
- Fraunhofer Institute for Digital Media Technology IDMT, Oldenburg
- Hörtech gGmbH, Oldenburg
- Hörzentrum Oldenburg GmbH
- Laser Zentrum Hannover
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## Multimodal Computing and Interaction

### Perfecting access to digital content

Today, digital content comes in different forms, such as language, images, films, 3D models and databases. The Cluster of Excellence wants to make this content as readily available as possible and is working to enhance capabilities: computer systems should learn to analyse and interpret even incomplete or noisy data, to process the knowledge acquired and present it in real time. Information should not only be communicated but intelligently mined, understood and organised. This is the goal the Cluster of Excellence has set itself.

Information systems are also expected to interact with humans naturally, to consider the environmental context, to respond to language, text and gestures, and to answer appropriately. This requires new systems to be created in which all this occurs as naturally and as intuitively as possible.

### Partners:

- Saarland University (applicant – speaker)
- Max Planck Institute for Informatics, Saarbrücken
- German Research Center for Artificial Intelligence, Saarbrücken
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## Simulation Technology (Sim Tech): From Isolated Numerical Approaches to an Integrative Systems Science

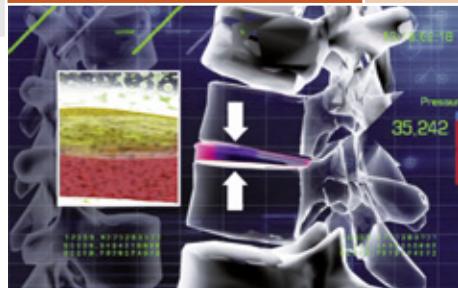
### Solutions from virtual worlds

Virtually re-enacting and solving real problems is what simulation technology in modern research is all about. The Cluster of Excellence bundles the various simulation models and methods that have been developed in isolation into a holistic systems science. More than 60 projects bring together researchers in Engineering, Natural Science, the Life and Social Sciences who cooperate on basic research for their vision of five long-term applications: simulation-based design of new materials, virtualised development of prototypes, environmental engineering, an integrative description of the human body and cyber infrastructure.

Since 2007, the Cluster has been breaking new paths in order to make visualisations from models to interactive systems more exact, predictions more reliable and simulations more efficient. The goal is to utilise this interdisciplinary exchange to address pressing issues in science and society.

#### Partners:

- University of Stuttgart (applicant – speaker)
- German Aerospace Centre, Stuttgart
- Fraunhofer Institute for Manufacturing Engineering and Automation, Stuttgart
- Max Planck Institute for Intelligent Systems, Stuttgart and Tübingen



Universität Stuttgart

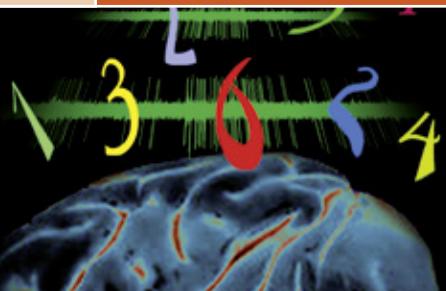
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## Werner Reichardt Centre for Integrative Neuroscience (CIN)

### How the brain switches

Integrative Neuroscience examines how individual neurons function as well as their complex interaction in circuits and networks without which many different brain functions would not be possible. To discover how this interplay works in detail and how diseases of the brain impede its functions are core objectives of the CIN Cluster of Excellence which seeks to unravel the basis of brain function in terms of information theory and biology. These efforts are guided by the conviction that progress will only be made if a consistently interdisciplinary approach is fostered. Scientists at the CIN work in five complementary research areas to improve, for example, modern imaging technologies and develop neuroprosthetics to replace functions that have been lost as a result of illness or disease. Their common goal is to develop new approaches in medical engineering and information technology. In order to secure

the availability of junior researchers, the CIN maintains a Graduate Training Centre with three Graduate Schools.

#### Partners:

- University of Tübingen (applicant – speaker)
- Fraunhofer Institute for Manufacturing Engineering and Automation, Stuttgart
- Max Planck Institute for Biological Cybernetics, Tübingen
- Max Planck Institute for Intelligent Systems, Tübingen

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## **Current Institutional Strategies**



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## RWTH 2020: Meeting Global Challenges

### The Integrated Interdisciplinary University of Technology

Energy, mobility, health and demographic change – RWTH Aachen University meets these global challenges with a holistic research strategy. It will continue to strengthen its renowned focus areas of Engineering and the Natural Sciences to exploit innovative potential to the full.

RWTH Aachen University is implementing the following measures:

#### Internationally Recognised Scientific Profile

RWTH Aachen University will use the strength of its core competencies in Engineering and the Natural Sciences to sharpen its profile yet more. In doing so, it will drive forward the integration of the Faculties of Arts and Humanities, Medicine and School of Business and Economics in order to be able to address issues of high scientific, technological and social relevance.

#### JARA: Focusing Competences – Shaping the Future

The Jülich Aachen Research Alliance (JARA) between RWTH Aachen University and the Forschungszentrum Jülich is expanding its strategic cooperation in research, teaching and infrastructure.

#### Place to Be

In order to recruit and retain the best scientists and students, RWTH Aachen University is introducing a coherent strategy for human resources and organisational development.

#### Corporate Governance and Structures

New inter-faculty profile areas and Integrated Interdisciplinary Institutes (<sup>I<sup>3</sup></sup>) will greatly strengthen interdisciplinary research on important topics of the future.

## Veritas – Iustitia – Libertas. International Network University

### Strong networks in research and teaching

Since it was founded in 1948, the academic ethos of Freie Universität Berlin has been marked by three core values: truth, justice, and freedom. They have become the categories that inform the university's future institutional strategy as it consistently continues to develop the idea of networking that is anchored in its founding tradition.

Freie Universität continues to build its networks for training young researchers as well as its research and internationalisation networks. In cooperation with non-university research institutions, Freie Universität uses its career path model to promote junior researchers during all phases of work and training. Three strategic centers underpin regional and international networking processes:

#### Support for Junior Researchers

The Dahlem Research School develops strategies to promote structured doctoral studies and

establishes quality standards that apply to the entire university. The benefits of the training and support measures it generates reach well beyond the 23 programmes of its own.

#### Promoting Research

The Center for Research Strategy flanks the systematic expansion of interdisciplinary focus areas. Outstanding young researchers are supported in the context of Junior Research Groups as well as temporary W2 professorships.

#### Internationalisation

The Center for International Cooperation has a network consisting of seven liaison offices around the world. It supports international research collaborations and promotes close networking with leading academic institutions in particular through its Primary Partnerships.



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## Bildung durch Wissenschaft – Educating Enquiring Minds

### Guiding principles: Individuality, Openness, Guidance

Individuality, openness and guidance – these are the guiding principles on which Humboldt-Universität zu Berlin (HU) means to build its future. Its institutional strategy comprises three central concepts: to continue developing excellent conditions for top-level research, to promote young scientists, as well as to reform the university's governance and administrative structures. The entire university will benefit from a central reform plan to generate ideal conditions where all individuals can develop their full potential. It includes a Strategic Innovation Fund with its central project of Integrative Research Institutes, the Caroline von Humboldt Programme for gender equality, as well as the support programme for Internationalisation of Research.

The concept of 'openness' goes hand in hand with the individuality-based approach. HU is building on a phase model that offers support to the members of the university at all stages in their academic careers. Openness between excellent research and outstanding teaching plays a key role here, and enhances opportunities to integrate young talents into research early on. Under the slogan 'orientation', HU is carrying out a reform of its governance to strengthen steering and decision-making processes as well as strategic development at departmental level. Flanking this process, the administration is also being transformed into service networks suited to academia.

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## Ambitious and Agile

### A young university takes a leap forward

With its broad range of subjects, 20,000 students, 270 professors and a high percentage of third-party funds, the University of Bremen has established a firm place for itself in the German university landscape, and that just four decades after it was founded. The ambitious and agile university has developed a strategy for the future that will help it take a leap forward and establish itself as an internationally visible research university. The strategy has three objectives:

- The university will hone its profile in national and international cutting-edge research with the help of cooperative junior research groups as well as professorships that build bridges between university and non-university research as well as various disciplines.

- Exploration projects and creative units will give creative researchers and small groups freedom to pursue new, high-risk research topics. The ‘future fund’ promotes up-and-coming researcher areas by financing fixed-term professorships.
- The university will support excellent young researchers: the PhD centre provides assistance for candidates even outside of structured programmes and attractive entry-level positions give post-docs the autonomy to conduct independent research. Women researchers are offered additional incentives in the form of preferential appointments with very good provisions and part-time options.



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## The Synergetic University

### Restructuring to gain more common ground

TU Dresden (TUD) is Germany's largest university of technology, offering the full range of academic disciplines. Having successfully mastered the challenges of German reunification, TUD subsequently improved significantly according to all performance indicators, achieving excellence in the four major academic disciplines of Engineering, Natural Sciences, Medicine, as well as Humanities and Social/Cultural Sciences. With its institutional strategy, TUD intends to catch up with the leading universities worldwide. To do this, it plans to adopt the following measures:

- Novel recruiting methods, as well as support programmes that fully exploit TUD's existing human resources potential, will enhance the university's innovative strength.

- Streamlining its 14 departments into five schools will create more effective structures.
- De-centralising and optimising its administrative processes will prepare TUD to meet the demands on an internationally competitive university.
- The further development of DRESDEN-concept, a close research alliance between TUD, non-university research and cultural institutions in Dresden, is creating synergies in research, teaching and infrastructure.

The promotion of gender equality, interdisciplinarity, internationality, knowledge transfer, and research-oriented teaching will complement these measures.



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## Heidelberg: Realising the Potential of a Comprehensive University

### Building bridges between academic cultures

The concept of the comprehensive university is a central component of Heidelberg University's strategy. With its extraordinary breadth of outstanding subjects and disciplines, the university aims to make a significant contribution to our understanding of the complex material, biological, cultural and societal issues of our times. This requires not only strong research disciplines, but also the basic conditions that foster academic work across disciplinary boundaries.

During the first funding phase, four main areas of research, the Fields of Focus, have emerged which are to be further developed as the core of Heidelberg's research strategy.

- FoF 1: Molecular and Cellular Basis of Life
- FoF 2: Structure and Pattern Formation in the Material World

- FoF 3: Cultural Dynamics in Globalised Worlds
- FoF 4: Self-regulation and Regulation: Individuals and Organisations

Further measures also aim at intensifying academic cooperation on different levels:

- Promotion of collaboration between the Fields of Focus and integration into the university
- Development of networks with external and international partners
- Optimisation of the general conditions for research and teaching

By consistently strengthening its collaborations, Heidelberg University uses extensive synergy effects to shape itself into a leading institution of research and research-based teaching.



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## Meeting the Challenge of Change and Complexity

### Enhancing research in four core profile areas

The University of Cologne has designed a strategy to shape its long-term development and drive it towards achieving its vision of being a leading institute with excellent research and teaching. In particular, the strategy will exploit the university's great potential, and hone and develop its research profile in four core areas.

The profile areas are:

- Ageing-associated diseases
- Behavioural economic engineering and social cognition
- Quantum matter and materials
- Socio-economic, cultural and political change in the Southern Hemisphere.

The strategy is also designed to foster integrative development for the university as a whole. For this purpose, each core profile area will be embedded in a larger context of broad thematic expertise. These areas of expertise will drive interdisciplinary research and prevent the core profile areas from being isolated within the university. New leadership structures and processes will improve the university's flexibility and ability to act as well as creating an internal support system that will offer extensive assistance on all academic levels – from outstanding individuals to excellent, large-scale concerted research projects.



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## Modell Konstanz – Towards a Culture of Creativity

### Space for Ideas

Freedom to do research, learning under excellent conditions, breathing academia: with its institutional strategy "Modell Konstanz", the University of Konstanz strengthens its culture of creativity that is second nature to all its members. This means providing the best possible working and living conditions for all members of the university in a communicative and international environment, creating the space for them to pursue innovative ideas.

The "Zukunftskolleg", the only one of its kind in Germany, embodies the Konstanz concept of promoting the university's young researchers: it unites talented young researchers and experienced scientists of all disciplines in an international community, enabling young academic talents to conduct their own independent research at an early stage in their careers.

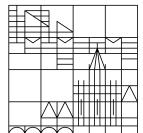
The core measures of the Konstanz institutional strategy are:

- Encouraging creative processes in an international community of top researchers
- Customised career planning support for young researchers
- Internationalisation, gender equality and support for families on all academic levels
- Optimising general conditions for top-level research by creating research-friendly support services
- Science communication and knowledge transfer in order to convey research outcomes to the economic, political and public arenas.

The institutional strategy has been successful in both phases of the Excellence Initiative.



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## LMUexcellent

### Excellence in Research

LMU Munich is one of Germany's leading research-intensive universities. As a genuine "universitas", it offers a broad spectrum of subjects covering all areas of knowledge. The overall aim of the Institutional Strategy LMUexcellent is to render LMU even more attractive for the very best talents and to further strengthen the quality of its research. Key measures were already implemented in the first programme phase of the Excellence Initiative. LMU has since continued to consistently pursue this aim in the second programme phase.

LMU Munich will further sharpen its research profile by investing substantially in the continuous development of an internationally competitive research infrastructure and by expanding its measures for the recruitment of outstanding researchers. Additionally, offering reliable career-development

perspectives from the doctorate to professorship plays a central role. This is reflected in various programmes for the postdoctoral phase and the extension of LMU's established and successful tenure-track model. LMU is also employing a range of instruments to strengthen its network of international contacts by e.g. intensifying existing key cooperations with leading universities worldwide and further developing its fellowship programmes.

Besides internationality, equality and diversity constitute guiding principles which underlie all measures implemented in the context of LMUexcellent.

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## TUM. The Entrepreneurial University

### Science shaped by entrepreneurial thinking

The Entrepreneurial University opens up new horizons for itself and others. It tackles international competition at the level of excellence head on. In order to do so, it develops and implements strategies that promise sustainable, systemic added value and fertilise the German university system.

TUM's institutional strategy 2012 defines three essential structural features:

- With its new appointment and career system TUM FACULTY TENURE TRACK, TUM enacts best international practices, at the same time pioneering a paradigm shift in the German university system. Rigorous yet transparent quality criteria prepare the path to professorial status. By 2020, TUM will have created 100 new professorships.
- Thematically focused, transdisciplinary "Integrative Research Centers" will serve to develop the traditional faculty structure into a matrix structure:
  - MUNICH SCHOOL OF ENGINEERING (Energy, Green Technologies)
  - MUNICH CENTER FOR TECHNOLOGY IN SOCIETY (Technology in relation to the Humanities and Social Sciences).
  - ANNA BOYKSEN DIVERSITY RESEARCH CENTER (Diversity Research)
- Globalization through localization: affiliated campuses abroad extend TUM's international reach. At the same time, they serve as centres for recruiting young scientists at all levels, including post-docs, as well as visiting researchers.



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## Research, Relevance, Responsibility

### Research that matters to society

“Research – Relevance – Responsibility” is the University of Tübingen’s strategy to further strengthen its excellent basic research position and to complement it with an emphasis on practical applications and support for young scientists. To do this, the University of Tübingen will increasingly embrace themes of socio-political relevance and equip students with the broadest possible set of skills.

Five measures are planned:

- To promote young scientists by rapidly expanding the Graduate Academy, founding and promoting independent junior research groups, as well as appointing outstanding young scientists, particularly women, to junior professorships.

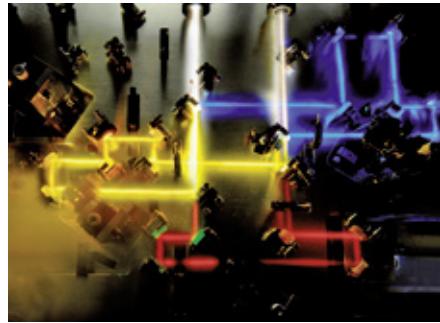
- An initiative to internationalise the university by building strategic partnerships as well as launching coordinated exchange and collaborative projects.
- A gender equality drive instituting new professorships for top end (junior) female researchers.
- To build ‘core facilities’ to coordinate the use and development of infrastructures within and outside of the university.
- Installation of scientific platforms for increased networking with application-oriented basic research.

All these measures are sustainable and will continue beyond the maximum duration of funding under the Excellence Initiative.

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## The Excellence Initiative – A Success Story

In launching the Excellence Initiative, policy-makers and science joined forces to promote outstanding research projects and institutions at Germany's universities. Their aim was to drive top-level research and enhance Germany's international visibility as a research location. This unique competition has already had a sustained impact on the academic landscape and is now in its second phase – the success story continues.

"Excellence Initiative at a Glance" presents all 99 Graduate Schools, Clusters of Excellence, and Institutional Strategies, each with its own page.

### Information on each institution:

- the core research areas and themes
- the universities and their collaborative partners from science and business
- the spokespersons and key contact information

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