



Research in Germany

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Research in
Germany



Land of Ideas

MANUFACTURING SCIENCE
AND ENGINEERING





Research in Germany

Imprint

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MANUFACTURING SCIENCE AND
ENGINEERING

PREFACE

This brochure provides a first insight into research in Germany in the fields of manufacturing science and engineering and is especially recommended to early career researchers from abroad.

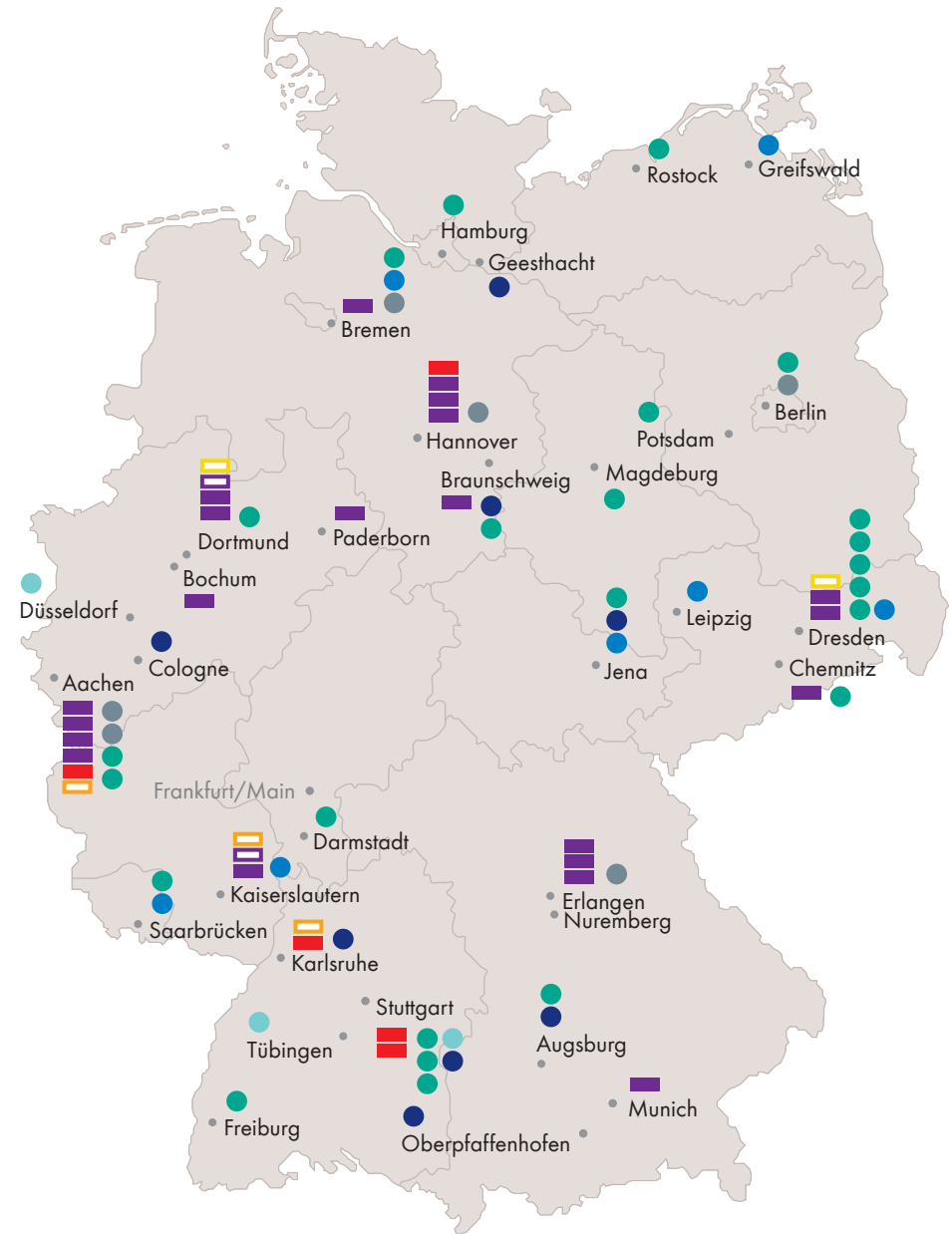
Manufacturing science and engineering in Germany is primarily conducted at universities but also at non-university research institutions. Almost all universities and many universities of applied sciences host a manufacturing science and engineering section. The spectrum ranges from small monothematic working groups to large interdisciplinary departments and covers a variety of topics from traditional areas to new explorative research fields.

This brochure is intended to give an initial overview. The following map and tables highlight research consortia and graduate training programmes at universities and non-university research institutes with a main focus on manufacturing science and engineering.

On top of this, there is a lot more to discover: e.g. the DFG funds a multitude of individual projects in the area of manufacturing science and engineering. These individual grants outweigh the research consortia both in number and in overall funding volume. Towards the end of this brochure, you will find a link to the online database GEPRIS that provides an overview of all DFG funded research projects. You will also find additional important links for further information about programmes in the fields of manufacturing science and engineering and profiles of German universities and research institutions.

We invite you to explore the many opportunities that Germany has to offer and welcome your feedback.

OVERVIEW



- Research Training Groups
- International Research Training Groups
- Integrated Research Training Groups in Collaborative Research Centres/Transregios
- Clusters of Excellence
- Collaborative Research Centres/Transregios
- Fraunhofer Institutes
- Helmholtz Centres
- Leibniz Institutes
- Max Planck Institutes
- Others

DFG funded Priority Programmes and Research Units are not shown on the map since they are not necessarily located at a single location; they are listed on pages 13 and 15.

CENTRES OF RESEARCH

- FUNDED BY DFG -

Clusters of Excellence (EXC) promote cutting-edge research. They serve to strengthen the research profiles of universities or university consortia in internationally competitive fields. They create excellent training and career opportunities for early career researchers. Within the framework of the Excellence Strategy, they can receive between €3 million and €10 million annually and are funded for seven years. A second seven-year period is possible.

Collaborative Research Centres (CRC) are organisational units established at universities which enable researchers to pursue an outstanding research programme crossing the boundaries of disciplines, institutes, departments and faculties. The traditional Collaborative Research Centre is generally applied for by one university and is conducted by researchers of that university. Early career support is a key objective of the Collaborative Research Centre Programme. Early career researchers may get involved in a CRC in numerous ways, for example within the framework of an Integrated Research Training Group. Collaborative Research Centres are funded for a period of up to 12 years.

Transregios (TRR) are Collaborative Research Centres in which up to three universities collaborate with each other and submit a joint application. The contributions of the cooperative partners are essential, complementary and synergetic to the joint research objective. Funding facilitates close, nationwide collaboration among the participating universities and researchers, as well as networking and shared use of resources. There is also the option of international Transregios.

CENTRES OF RESEARCH

Location	Institution	Title	Funded Since	Contact
CLUSTERS OF EXCELLENCE				
 Aachen	Rheinisch-Westfälische Technische Hochschule Aachen	Internet of Production (IoP) (EXC 2023)	2019	www.iop.rwth-aachen.de
 Hannover	Gottfried Wilhelm Leibniz Universität Hannover	PhoenixD: Photonics, Optics, and Engineering – Innovation Across Disciplines (EXC 2122)	2019	www.phoenixd.uni-hannover.de
 Karlsruhe	Karlsruher Institut für Technologie	3D Matter Made to Order (3DMM2O) (EXC 2082)	2019	www.3dmattermadetoorder.kit.edu
 Stuttgart	Universität Stuttgart	Integrative Computational Design and Construction for Architecture (I) (EXC 2120)	2019	www.intcdc.uni-stuttgart.de
 Stuttgart	Universität Stuttgart	Data-Integrated Simulation Science (SimTech) (EXC 2075)	2019	www.simtech.uni-stuttgart.de/exc
COLLABORATIVE RESEARCH CENTRES				
 Aachen	Rheinisch-Westfälische Technische Hochschule Aachen	Precision Manufacturing by Controlling Melt Dynamics and Solidification in Production Processes (CRC 1120)	2014	www.sfb1120.rwth-aachen.de
 Dortmund	Technische Universität Dortmund	Providing Information by Resource-Constrained Data Analysis (CRC 876)	2011	https://sfb876.tu-dortmund.de
 Erlangen-Nuremberg	Friedrich-Alexander-Universität Erlangen-Nürnberg	Additive Manufacturing (CRC 814)	2011	www.sfb814.forschung.uni-erlangen.de
 Hannover	Gottfried Wilhelm Leibniz Universität Hannover	Oxygen-free Production – Processes and Local Mechanisms in Oxygen-free Atmosphere for the Development of Sustainable Production Techniques and Manufacturing Processes (CRC 1368)	2020	www.sfb1368.uni-hannover.de
 Hannover	Gottfried Wilhelm Leibniz Universität Hannover	Process Chain for Manufacturing of Hybrid High Performance Components by Tailored Forming (CRC 1153)	2013	www.sfb1153.uni-hannover.de

CENTRES OF RESEARCH

Location	Institution	Title	Funded Since	Contact
Hannover	Gottfried Wilhelm Leibniz Universität Hannover	Regeneration of Complex Capital Goods (CRC 871)	2009	www.sfb871.de
Kaiserslautern	Technische Universität Kaiserslautern	Microscale Morphology of Component Surfaces (MICOS) (CRC 926)	2011	www.sfb926.de
COLLABORATIVE RESEARCH CENTRES/TRANSREGIOS				
Aachen Bremen	Rheinisch-Westfälische Technische Hochschule Aachen Universität Bremen	Function Oriented Manufacturing Based on Characteristic Process Signatures (TRR 136)	2014	www.prozesssignaturen.de
Aachen Chemnitz Dresden	Rheinisch-Westfälische Technische Hochschule Aachen Technische Universität Chemnitz Technische Universität Dresden	Thermo-Energetic Design of Machine Tools – A Systemic Approach to Solve the Conflict between Power Efficiency, Accuracy and Productivity Demonstrated at the Example of Machining Production (TRR 96)	2011	https://transregio96.webspace.tu-dresden.de (DE)
Aachen Dortmund	Rheinisch-Westfälische Technische Hochschule Aachen Technische Universität Dortmund	Damage Controlled Forming Processes (TRR 188)	2017	www.trr188.de
Bochum Erlangen-Nuremberg	Ruhr-Universität Bochum Friedrich-Alexander-Universität Erlangen-Nürnberg	From Atoms to Turbine Blades – a Scientific Basis for a New Generation of Single Crystal Superalloys (TRR 103)	2011	www.sfb-transregio103.de
Braunschweig Munich	Technische Universität Braunschweig Technische Universität München	Additive Manufacturing in Construction (AMC) – The Challenge of Large Scale (TRR 277)	2020	www.tu-braunschweig.de/trr277
Dresden Erlangen-Nuremberg Paderborn	Technische Universität Dresden Friedrich-Alexander-Universität Erlangen-Nürnberg Universität Paderborn	Method Development for Mechanical Joinability in Versatile Process Chains (TRR 285)	2019	https://trr285.uni-paderborn.de



RESEARCH UNITS

-FUNDED BY DFG-

Research Units (FOR) often contribute to establishing new research directions. Research Units are made up of a team of researchers working together on a research project which is often of an interdisciplinary nature. Research Units consist of several researchers and subprojects. The subprojects of a Research Unit are often located at several locations throughout Germany. Research Units are generally funded for up to six years.

Research Units are not shown on the map. Only the titles of the thematic focus and the project websites are listed.

RESEARCH UNITS

Title	Funded Since	Contact
Solidification Cracks during Laser Beam Welding: High Performance Computing for High Performance Processing (FOR 5134)	2021	https://gepris.dfg.de/gepris/projekt/434946896
Process-Orientated Tolerance Management with Virtual Assurance Methods (FOR 2271)	2016	www.for2271.tf.fau.de (DE)
Acting Principles of Nano-Scaled Matrix Additives for Composite Structures (FOR 2021)	2014	www.tu-braunschweig.de/en/iaf/news/article/for-2021-acting-principles-of-nano-scaled-matrix-additives-for-composite-structures



PRIORITY PROGRAMMES

- FUNDED BY DFG -

Priority Programmes (SPP) have a programmatic focus and have the purpose of advancing knowledge in an emerging field of research through collaborative networked support. They are characterised by their enhanced quality of research through the use of new methods and forms of collaboration in emerging fields. One programme can consist of up to 30 individual researchers and subprojects located at several institutions across Germany; it usually has one coordinating person. Priority Programmes normally receive funding for a period of six years.

Priority Programmes are not shown on the map. Only the titles of the overall themes and the project website are listed.



PRIORITY PROGRAMMES

Title	Funded Since	Contact
Efficient Cooling, Lubrication and Transportation – Coupled Mechanical and Fluid-Dynamical Simulation Methods for Efficient Production Processes (FLUSIMPRO) (SPP 2231)	2020	www.isf.mb.tu-dortmund.de/en/research/machining-technology/dfg-spp-2231-flusimpro-d-ig/
Property-Controlled Metal Forming Processes (SPP 2183)	2019	https://wpt.mb.tu-dortmund.de/en/research/projects/steels/spp-2183-property-controlled-metal-spinning
Fluidless Lubrication systems with High Mechanical Load (SPP 2074)	2018	www.uni-kl.de/spp2074 (DE)
Surface Conditioning in Machining Processes (SPP 2086)	2018	www.wbk.kit.edu/wbkintern/Forschung/Projekte/SPP2086/
Materials for Additive Manufacturing (SPP 2122)	2018	www.uni-due.de/matframe
Adaptive Modularized Constructions Made in a Flux: Precise and Rapid Building (SPP 2187)	2018	www.ruhr-uni-bochum.de/spp2187
The Utilization of Residual Stresses Induced by Metal Forming (SPP 2013)	2017	www.spp2013.tum.de
Calm, Smooth and Smart – Novel Approaches for Influencing Vibrations by Means of Deliberately Introduced Dissipation (SPP 1897)	2016	https://gepris.dfg.de/gepris/projekt/273845692



Fraunhofer Society is one of the world's leading organisations for applied research with an annual research budget of 2.8 billion euros, 75 institutes and approximately 29,000 employees. Fraunhofer's R&D portfolio covers a wide range of fields, including health, security, communications, transport, energy and the environment. www.fraunhofer.de

The Helmholtz Association contributes to solving major challenges facing society, science and industry with world-level research in six areas: energy, earth and environment, health, key technologies, structure of matter and aeronautics, space and transport. With more than 43,000 employees in 18 research centres and an annual budget of more than 5 billion euros, the Helmholtz Association is Germany's largest scientific organisation. www.helmholtz.de

The Leibniz Association is an umbrella organisation of 96 research institutes. The annual budget amounts to 2 billion euros. Some 11,500 researchers – approximately 25% of them from abroad – work on a widely diverse range of subjects, including the humanities and social sciences, economics, spatial and life sciences, mathematics, natural and engineering sciences and environmental research. www.leibniz-association.eu

The Max Planck Society for the Advancement of Science is one of Germany's largest independent non-profit research organisations. The Max Planck Society has been allocated approximately 1.8 billion euros for 2018. A combined total of 15,300 researchers, postdoctoral/junior researchers and visiting researchers at 86 Max Planck Institutes conduct basic research in the natural sciences, life sciences, social sciences and humanities. One third of the researchers and more than half of the junior and visiting researchers come from abroad. www.mpg.de

Location	Institution	Contact
FRAUNHOFER INSTITUTES		
● Aachen	Fraunhofer Institute for Production Technology (IPT)	www.ipt.fraunhofer.de
● Aachen	Fraunhofer Institute for Laser Technology (ILT)	www.ilt.fraunhofer.de
● Augsburg	Fraunhofer Institute for Casting, Composite and Processing Technology (IGCV)	www.igcv.fraunhofer.de
● Berlin	Fraunhofer Institute for Production Systems and Design Technology (IPK)	www.ipk.fraunhofer.de
● Braunschweig	Fraunhofer Institute for Surface Engineering and Thin Films (IST)	www.ist.fraunhofer.de
● Bremen Dresden	Fraunhofer Institute for Manufacturing Technology and Advanced Materials (IFAM)	www.ifam.fraunhofer.de
● Chemnitz Dresden	Fraunhofer Institute for Machine Tools and Forming Technology (IWU)	www.iwu.fraunhofer.de
● Darmstadt	Fraunhofer Institute for Structural Durability and Systems Reliability (LBF)	www.lbf.fraunhofer.de
● Dortmund	Fraunhofer Institute for Material Flow and Logistics (IML)	www.iml.fraunhofer.de
● Dresden	Fraunhofer Institute for Laser and Surface Technology (IWS)	www.iws.fraunhofer.de
● Dresden	Fraunhofer Institute for Ceramic Technologies and Systems (IKTS)	www.ikts.fraunhofer.de
● Dresden	Fraunhofer Institute for Electron Beam and Plasma Technology (FEP)	www.fep.fraunhofer.de
● Freiburg	Fraunhofer Institute for Mechanics of Materials (IWM)	www.iwm.fraunhofer.de
● Hamburg	Fraunhofer Institute for Additive Manufacturing Technologies (IAPT)	www.iapt.fraunhofer.de
● Jena	Fraunhofer Institute for Applied Optics and Precision Engineering (IOF)	www.iof.fraunhofer.de
● Magdeburg	Fraunhofer Institute for Factory Operation and Automation (IFF)	www.iff.fraunhofer.de
● Potsdam	Fraunhofer Institute for Applied Polymer Research (IAP)	www.iap.fraunhofer.de
● Rostock	Fraunhofer Application Center Large Structures in Production Engineering (AGP)	www.hro.ipa.fraunhofer.de
● Saarbrücken	Fraunhofer Institute for Nondestructive Testing (IZPF)	www.izfp.fraunhofer.de
● Stuttgart	Fraunhofer Institute for Industrial Engineering (IAO)	www.iao.fraunhofer.de
● Stuttgart	Fraunhofer Institute for Manufacturing Engineering and Automation (IPA)	www.ipa.fraunhofer.de
● Stuttgart	Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB)	www.igb.fraunhofer.de

NON-UNIVERSITY RESEARCH INSTITUTIONS

Location	Institution	Contact
HELMHOLTZ CENTRES AND INSTITUTES		
● Cologne	German Aerospace Center (DLR)	www.dlr.de
● Augsburg	DLR Center for Lightweight Production Technology (ZLP)	www.dlr.de/zlp
● Braunschweig	DLR Institute of Composite Structures and Adaptive Systems	www.dlr.de/fa
● Jena	DLR Institute of Data Science	www.dlr.de/dw
● Oberpfaffenhofen	DLR Institute of Robotics and Mechatronics	www.dlr.de/rm
● Stuttgart	DLR Institute of Structures and Design	www.dlr.de/bt
● Geesthacht	Helmholtz-Zentrum Geesthacht – Centre for Materials and Coastal Research (HZG)	www.hzg.de
● Karlsruhe	Karlsruhe Institute of Technology (KIT)	www.kit.edu
LEIBNIZ INSTITUTES		
● Bremen	Leibniz Institute for Materials-oriented Technologies (IWT)	www.iwt-bremen.de
● Dresden	Leibniz Institute for Polymer Research Dresden (IPF)	www.ipfdd.de
● Greifswald	Leibniz Institute for Plasma Science and Technology (INP)	www.inp-greifswald.de
● Jena	Leibniz Institute of Photonic Technology (IPHT)	www.leibniz-ipht.de
● Kaiserslautern	Leibniz-Institut für Verbundwerkstoffe (IVW)	www.ivw.uni-kl.de
● Leipzig	Leibniz Institute for Surface Modification (IOM)	www.iom-leipzig.de
● Saarbrücken	Leibniz Institute for New Materials (INM)	www.inm-gmbh.de
MAX-PLANCK-INSTITUTES		
● Düsseldorf	Max-Planck-Institut für Eisenforschung GmbH (MPIE)	www.mpie.de
● Tübingen Stuttgart	Max Planck Institute for Intelligent Systems	www.is.mpg.de
OTHERS		
● Aachen	Institute for Plastics Processing	www.ikv-aachen.de
● Aachen	Access e.V.	www.access-technology.de
● Berlin	Federal Institute for Materials Research and Testing (BAM)	www.bam.de
● Bremen	Institute of Applied Beam Technology (BIAS) GmbH	www.bias.de
● Erlangen	Bayerisches Laserzentrum (BLZ) GmbH	www.blz.org
● Hannover	Laser Zentrum Hannover e.V.	www.lzh.de



GRADUATE TRAINING








- FUNDED BY DFG -

Research Training Groups (RTG) combine an ambitious research programme at universities with comprehensive training, tailored supervision and academic freedom to form an ideal environment for a successful doctorate. Research Training Groups can also have an interdisciplinary approach. They are funded for a period of up to nine years.

International Research Training Groups (IRTG) provide opportunities for joint doctoral training programmes between German universities and universities abroad. The research and study programmes are jointly developed and supervised. Doctoral students in the programme spend six months at the partner institution.

Integrated Research Training Groups (within Clusters of Excellence or Collaborative Research Centres/Transregios) offer ideal research environments for doctoral researchers. The main aim of these structured training programmes is to provide young scientists and academics with opportunities to independently carry out research at an early stage of their career. The programmes further take care to closely integrate early career researchers into an academic network. Working in Clusters of Excellence or Collaborative Research Centres projects, doctoral researchers achieve additional qualifications. As research assistants in these projects, they contribute to the Research Centre's success. They are closely involved with the projects and have access to the entire project infrastructure.

GRADUATE TRAINING

Location	Institution	Title	Funded Since	Contact
RESEARCH TRAINING GROUPS				
 Dortmund	Technische Universität Dortmund	Adaption Intelligence of Factories in a Dynamic and Complex Environment (RTG 2193)	2016	www.grk2193.tu-dortmund.de
 Dresden	Technische Universität Dresden	Interactive Fiber-Rubber-Composites (RTG 2430)	2018	https://ing/forschung/graduierntenkollegs/grk2430
INTERNATIONAL RESEARCH TRAINING GROUPS				
 Aachen Austin (USA)	Rheinisch-Westfälische Technische Hochschule Aachen University of Texas at Austin	Modern Inverse Problems: From Geometry and Data to Models and Applications (IRTG 2379)	2018	https://blog.rwth-aachen.de/irtg-mip
 Kaiserslautern Davis (USA)	Technische Universität Kaiserslautern University of California	Physical Modeling for Virtual Manufacturing Systems and Processes (IRTG 2057)	2014	www.irtg2057.de
 Karlsruhe Montreal (Kanada)	Karlsruher Institut für Technologie (KIT) McGill University	Integrated Engineering of Continuous-Discontinuous Long Fiber Reinforced Polymer Structures (IRTG 2078)	2015	www.grk2078.kit.edu
INTEGRATED RESEARCH TRAINING GROUPS IN COLLABORATIVE RESEARCH CENTRES				
 Dortmund	Technische Universität Dortmund	Integrated Research Training Group within: Providing Information by Resource-Constrained Data Analysis (CRC 876)	2011	https://sfb876.tu-dortmund.de/SPP/sfb876-gk.html
 Kaiserslautern	Technische Universität Kaiserslautern	Integrated Research Training Group within: Microscale Morphology of Component Surfaces (MICOS) (CRC 926)	2011	www.sfb926.de

SOCIETIES AND ASSOCIATIONS

IN GERMANY

Association of German Engineers (VDI): www.vdi.eu

National Academy of Science and Engineering (acatech): www.acatech.de

German Academic Society for Production Engineering (WGPP): www.wgpp.de

German Federation of Industrial Research Associations (AIF): www.aif.de

Verband Deutscher Maschinen- und Anlagenbau e.V. (VDMA): www.vdma.org

Wissenschaftliche Gesellschaft für Produktentwicklung (WiGeP): www.wigep.de (DE)

Wissenschaftliche Gesellschaft Lasertechnik e.V. (WLT): www.wlt.de (DE)

Wissenschaftliche Gesellschaft für Montage, Handhabung und Industrierobotik – MHI e.V.: <https://wgmhi.com> (DE)

OPEN POSITIONS

Research in Germany: www.research-in-germany.org/jobs

Helmholtz Association: www.helmholtz.de/en/jobs-talent

Max Planck Society: www.mpg.de/jobboard

Leibniz Society: www.leibniz-gemeinschaft.de/en/careers/jobs.html

Fraunhofer Society: www.fraunhofer.de/en/jobs-career

FURTHER INFORMATION

RESEARCH INSTITUTIONS, PROJECTS, FUNDING, CONTACTS



The “Research in Germany” Portal: Information on research and funding opportunities, academic and research-related job portals, as well as advice on preparing a research stay or initiating a collaboration with German research organisations. www.research-in-germany.org



German Project Information System (GEPRIIS): Online database providing information about all current DFG-funded research projects and contact information for the Principal Investigators. <http://gepris.dfg.de>



German Research Institutions (GERIT): Information on more than 25,000 institutes at German universities and non-university research institutions, searchable by geographic location, subject and other structural criteria. www.gerit.org



Website of the DFG: Further background information about DFG funding programmes, funding guidelines, and lists of currently DFG-funded activities. www.dfg.de



The German Rectors’ Conference (HRK) Research Map: The interactive HRK *Research Map* database provides information on the research priorities that are of strategic institutional importance for each university. www.hrk.de/home (go to → *Research Map*)



The Higher Education Compass: Information on Germany’s higher education institutions, the range of courses and programmes that they offer, their worldwide cooperation, and who to contact locally. www.hochschulkompass.de/en/study-in-germany.html





Contact

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DFG Deutsche
Forschungsgemeinschaft