



German Chemistry Innovation for the Future

International Careers
and Research Opportunities
in Germany



AN INITIATIVE OF THE

Federal Ministry
of Education
and Research

Research in
Germany



Land of Ideas

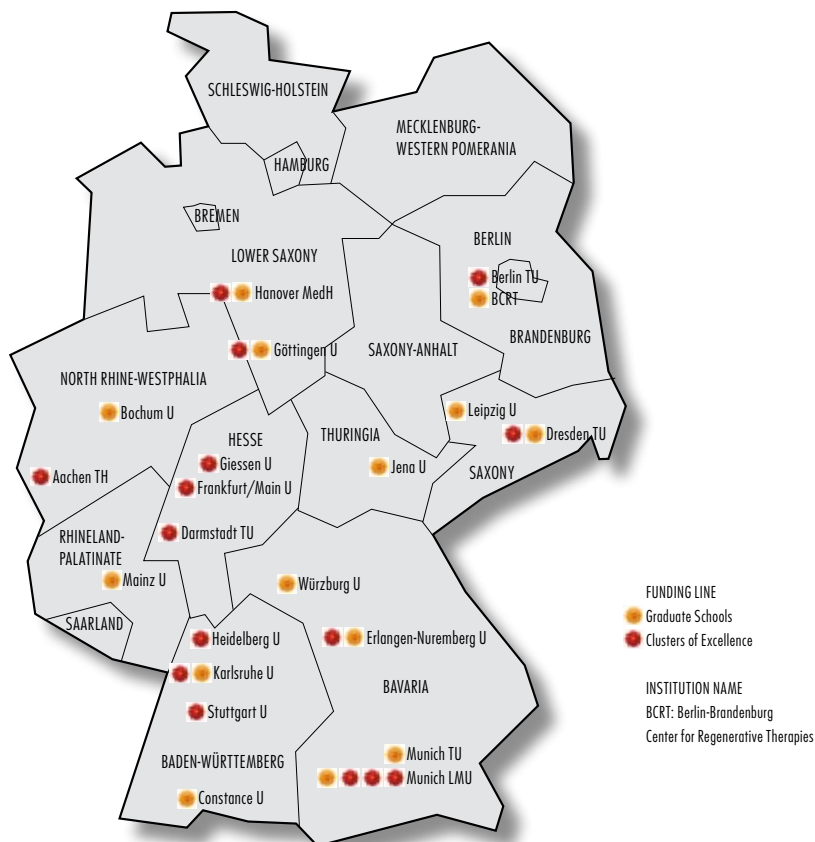
www.research-in-germany.de



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Currently running Graduate Schools and Clusters of Excellence of the German Excellence Initiative





1 - Introduction

Germany has a long history of scientific expertise in chemistry. It is home to excellent research institutions and universities as well as market leaders in the chemical industry.

And Germany continues to invest significantly in chemical research and development (R&D):

From 2005 to 2010, the federal government alone has increased its total R&D expenditures from ¥83 billion to ¥118 billion per year ^[1]. Total industrial investments in R&D increased for the same period from ¥359 billion to approximately ¥437 billion ^[2].

Germany's long-term investment in science and research is creating thousands of exciting new research and employment opportunities in chemistry.

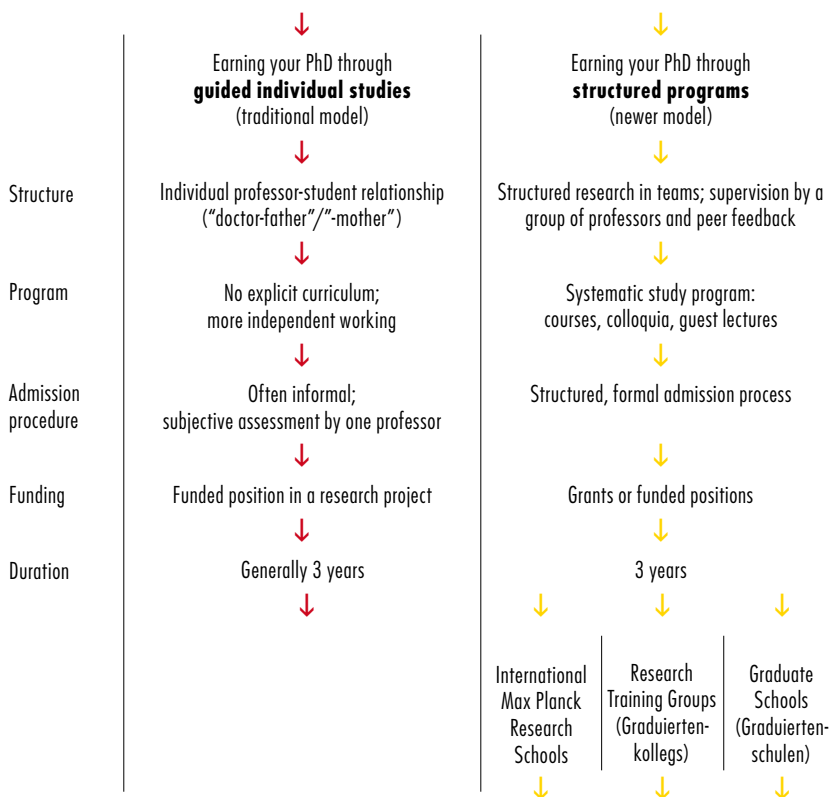
Get in touch with Germany
the land of ideas
and great opportunities
in chemistry!



exchange rate used: 1€ = ¥(CNY) 9.2725 (exchange rate April 2011)

Paths to a PhD in Germany

Formal qualification: Master's degree or German Diplom*;
in some cases also Bachelor's degree (fast track)



PhD degree!

*Academic degree in German-speaking countries and necessary qualification for PhD studies. In Germany, the Diplom is in the process of being replaced with a combination of Bachelor and Master's degree, a system used in much of the world. A Master's degree can be seen as equivalent to the Diplom degree.

2 - PhD Studies in Germany

If you are interested in pursuing a PhD in chemistry, Germany offers flexible paths. They are tailored to individual needs, and provide funding opportunities to finance your studies. English is the language of research and doctoral education is truly international. Join the growing number of international students pursuing chemistry PhDs in Germany ^[3].

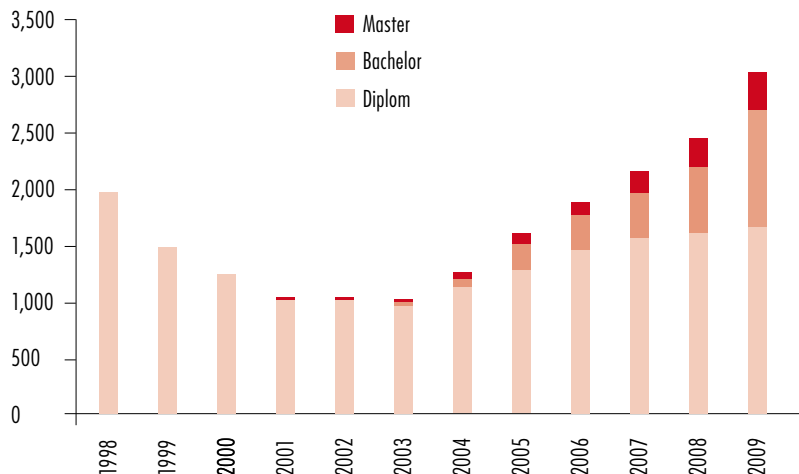
Whether you pursue your PhD through guided individual studies with a professor in your area of research interest, or complete a structured program, your German PhD degree will make you highly competitive in today's market for positions both in academia and industry.

Whichever path you choose, there are no tuition costs at the PhD level, and you'll find various forms of financial aid to help you pursue your PhD studies (see Chapter 4 for more on funding):

- **Structured programs:** PhD students in Research Training Groups or at International Max Planck Research Schools can obtain grants for up to three years to finance their studies. Graduate Schools provide funding directly to PhD students. Internationality is a trademark of Research Training Groups in Germany. There are even dedicated Research Training Groups that have the international structure built-in, with one partner located in Germany and the other abroad.



Number of chemical Diplom, Bachelor and Master degrees achieved in Germany from 1998 to 2009 ^[3]

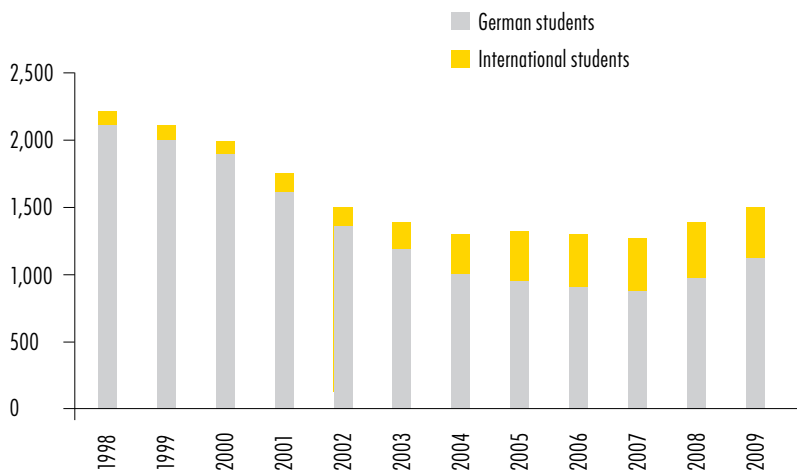


A list of Graduate Schools and Clusters of Excellence currently part of the German Excellence Initiative are shown on the map and table on the front and back inner side of the cover.

- **Guided individual studies:** These PhD studies are usually imbedded in research projects of a professor's work group, and candidates are paid a competitive salary. Although there is a noticeable shift towards the structured doctoral programs, the traditional model of guided PhD studies is still widespread.



Number of PhD degrees in chemistry obtained by German and foreign students from 1998 to 2009 ^[3]



The proportion of foreign students getting a Diplom degree remained on a stagnant level of 5-10% between 1998 and 2009. In contrast, the proportion of international students getting a German PhD degree increased from 5% in 1998 to 25-30% in 2007-2009 ^[3]. This reflects the increased internationality of Germany's scientific education caused by the structured PhD programs.





3 - German Research Institutions

If you've already obtained basic training as a chemist, consider the opportunities in Germany, a country with a long history in chemical research. Whether you're interested in basic or applied research, an academic career or a position at one of Germany's non-university research institutions, Germany has a lot to offer!

Research Opportunities at German Universities

The German university system is rich in opportunity for those interested in a research career in chemistry. From the 118 research universities (both "full" universities and "technical universities") and 182 universities of applied science (Fachhochschulen) in Germany about 60 and 22, respectively, are home to chemical work groups and departments, which cover the full spectrum of subfields in chemistry^[3,4]. The number of scientific full-time staff working in chemical departments at German universities has increased from 7,336 in 2000 to 8,990 in 2009^[5] – a testament to the importance of chemistry in German academia.



Prof. Dr. Frank Neese

Chair of Theoretical Chemistry, University of Bonn,
Gottfried Wilhelm Leibniz Prize 2010

"German universities are well equipped with modern research instruments, and have excellent technical facilities maintained by well-trained technical personnel. [...] The German funding system and funding culture is [...] one of the best in the world."

Germany, April 2010



Opportunities for chemical research can be found at all academic levels at German universities, which offer their academic employees competitive salaries and benefits. If you have commensurate qualifications, consider making Germany your academic home to gather international experience!

- **Professorships:** Almost all full and associate professors in Germany have civil servant status and enjoy freedom in their research and teaching. Even more – Germany is committed to increasing the number of international professors at its universities ^[6]. The “junior professorships”, created in 2002, provide early career researchers the opportunity to carry out independent research before attaining a tenured position. The corresponding evaluation criteria for a tenure track are defined individually by the Federal States and the universities ^[7]. Junior professors have essentially the same rights and obligations of associate professors, but at a younger age. About one in seven junior professors come from abroad ^[7]. Since creation of the junior professorship positions, the “Habilitation” process* is no longer a formal requirement for obtaining a professorship in Germany, but is still practiced to some extent.

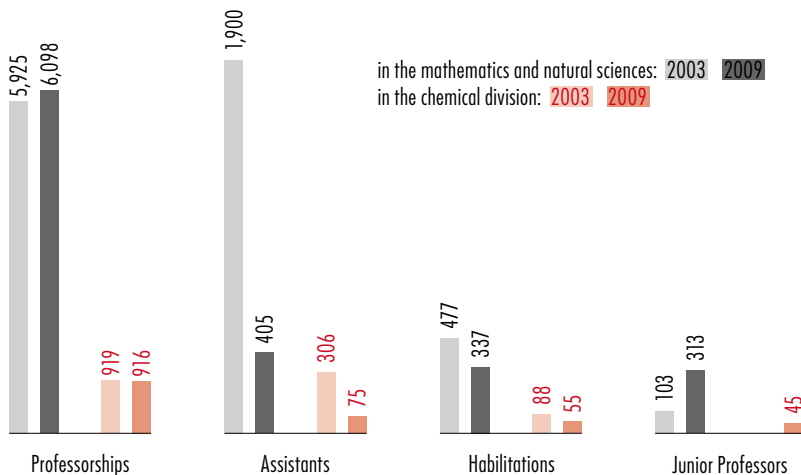
- **Mid-level positions:** German universities offer several options for PhDs in the early to advanced stages of their research careers. Post-doctoral positions can be obtained via individual funding or co-application within larger joint projects (see Chapter 4). A further step towards a professorship is the “assistant” position. An assistant is assigned to the research unit of a professor, and has six years to complete the qualifications for a full professorship – which used to be the “Habilitation” process*. Alternatively, “junior professorships”, individual fellowships or grants provide funding for an advanced academic career development (see Chapter 4).

If you are interested in academic research, the opportunities are better than ever, thanks to the serious investment Germany is making to raise the international competitiveness of its research universities.



* The Habilitation process includes the composition of a “Habilitationsschrift”, a kind of professorial thesis, which is usually longer than a PhD thesis and has a broader and higher level of scholarship. In addition, the teaching ability of the candidate is evaluated. A successful Habilitation candidate may then be summoned to the faculty as a professor.

Temporal changes in the number of Germany's academic mid-level, and senior positions ^[5]



Through its **Excellence Initiative** in 2005 Germany started a nationwide competition among higher education institutions to strengthen their research capacity and make them more attractive to highly qualified scientists from all over the world. The initiative offers three funding lines ^[8]:

Graduate Schools – Promotion and education of young scientists.

Clusters of Excellence – Internationally visible and competitive research hubs that promote cooperation with non-university research institutions and industry to tackle cutting-edge scientific problems. They offer research positions from postdoc to the senior level.

Institutional Strategies – Promotion of top-level university research to enhance the institutions' international competitiveness.

In the first phase of the Excellence Initiative €17.6 billion were invested between 2006 and 2011. Therein 39 Graduate Schools and 37 Clusters of Excellence were funded, out of these 14 schools and 15 clusters deal with chemical research topics (see front and back inner

side of the cover). Funding is generally provided for 5 years, with an annual amount of up to ¥9.3 million for Graduate Schools and up to ¥60.3 million for Clusters of Excellence, respectively. In the second Excellence Initiative phase additional ¥25 billion will be provided for the period of 2012-2017. Invitations for full proposal submissions have been extended to 128 applicants, thereof 46 (15 schools, 27 clusters) are in the field of chemistry [8].

All in all, the Excellence Initiative has and will create thousands of new positions for top national and international talents.

Opportunities at Non-University Research Institutions

Germany's non-university research institutions offer young, highly qualified scientists excellent training opportunities for leading positions in science and industry. Four large publicly funded organizations outside of the universities have important institutes for chemistry research.

- The research institutes of the world-renowned **Max Planck Society (MPG)** concentrate on basic research in the natural sciences, life sciences, social sciences and the humanities. Max Planck Institutes have produced seventeen Nobel Prize winners – most recently Gerhard Ertl in chemistry in 2007.



Prof. Dr. Peter H. Seeberger

Director, Max-Planck Institute of Colloids and Interfaces,
Potsdam-Golm

Professor at the Institute of Chemistry and Biochemistry,
Free University Berlin

"The position as a director at a German Max Planck Institute is a scientist's dream: strong basic funding, excellent infrastructure, and fantastic co-workers and colleagues. It is in the same league with the top institutions in the United States and Europe ... indeed, German academic chemistry is currently being rejuvenated and we need the risk-takers to make the most of it."

Germany, March 2010

Some numbers and statistics about the four large German non-university research institutions

	Max Planck Society ^[9]	Helmholtz Association ^[10]	Fraunhofer Society ^[11]	Leibniz Association ^[12]
Annual budget in €	12 billion	27.8 billion	15.3 billion	12 billion
Total number of research centers	80	17	80 60 located in Germany	87
Number of research centers with substantial research in chemistry	13	5 (at 15 centers one or multiple research groups are working on chemical topics)	16 in subfields like polymer research, advanced materials, environmental and energy technologies	at least 15 in fields like polymer and material research, optics and electronics, or terrestrial and marine environment
Employees (reference years 2008/2009)	5,000 scientists, with 29% coming from abroad. Foreign and visiting scientists account for 51%, postdocs for even 88%	30,000, about 30% are scientists. In 2008 alone, more than 4,176 foreign scientists came to the Helmholtz Centers to do research	18,000 mainly scientists and engineers	16,000 with 44% academics
Homepage-Link	www.mpg.de	www.helmholtz.de	www.fraunhofer.de www.fraunhofer.cn	www.leibniz-gemeinschaft.de

- The **Hermann von Helmholtz Association of National Research Centres (HGF)** work on long-term research challenges, performing cutting-edge research across disciplinary, organizational, and national borders in strategic programs in six core fields: energy, earth and environment, health, key technologies, structure of matter, aeronautics, space and transport.

- The **Fraunhofer Society (FhG)** is Europe's largest application-oriented research organization. Main research areas include health,

security, communication, energy and the environment. The organization pursues a direct utility and implementation of research findings in industrial and social applications. The Fraunhofer Society operates two joint Sino-German Laboratories in China (see also Chapter 6).

- The Gottfried Wilhelm Leibniz Association of German Research Institutes, known as the **Leibniz Association**, does research in an interdisciplinary fashion in groundbreaking research fields ranging from natural sciences, engineering and environmental sciences via economics, social science and infrastructure research to the humanities.

4 - Funding Opportunities for Research in Germany

German Funding Opportunities

Germany boasts a wide variety of funding opportunities for researchers from abroad, covering all career levels from students (S), graduates and doctoral students (GD), up to postdocs (PD) and senior scientists (SE). Whether you are interested in scholarships, fellowships, or grants for study or research in Germany, support for collaborative research projects, or international networking in science and research, Germany has something for you!



The **Alexander von Humboldt Foundation** brings scholars and scientists in all disciplines from around the world to Germany to work on independent research projects at a German host institution.

In 2009 a total of 2,027 fellows stayed in Germany, 16% in the field of chemistry ^[13]. The most important criterion for selection is the excellence of the individual researcher. Funding programs of the Humboldt Foundation focus on postdocs and senior scientists, examples are:

- **Research Fellowships** (PD, SE) – For foreign academics who completed their doctorate less than 4 years ago (PD) or less than 12 years ago (SE). Opportunity to carry out an independent research project in cooperation with an academic host at a German research institute for a duration of 6-24 months (PD) or 6-18 months (SE), respectively.

- **Sofja Kovalevskaja Award** (PD) - Provides up to ¥15 million over 5 years for successful top-ranked junior researchers who completed their doctorate less than 6 years ago. Candidates can carry out research of their own choice at a research institution in Germany where they will establish their own working group.

- **Alexander von Humboldt Professorship** (SE) – Award winners are funded with a maximum of ¥46 million for 5 years to carry out long-term and groundbreaking research in Germany. Applicants should be internationally recognised as leaders in their field.

For more information, see
www.humboldt-foundation.de

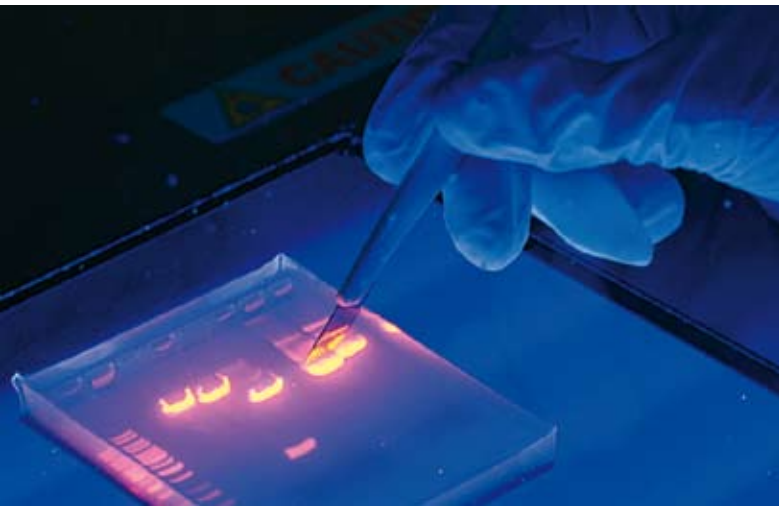


The **German Academic Exchange Service (DAAD)** promotes exchange at all academic career levels through providing individual funding programs, and by running international programs and projects. Between 2005 and 2007, DAAD invested altogether €4.7 billion in its programs. In this period, a total of 163,240 persons, among them 21,145 foreign academics, were provided with funding for study and research visits to Germany ^[14].

Programs include:

- **Study seminars and practicals, University summer courses, or IASTE Internships (S, GD)** - Study visits, practical trainings or visiting stays in companies, research institutes or institutes of higher education with a duration from several days to a few months.
- **Study scholarships (S, GD)** to acquire a Master's degree during 10-24 months at a German university or **Research grants (GD, PD)** which provide funding for up to 3 years in Germany as part of a specific doctoral project.
- **Research-stays, Re-invitation, Bilateral exchange of academics and scientists (PD, SE)** – Research or study visits at a German university or non-university research institute from few weeks up to a 3 months stay.

For more information, see www.daad.org



The **German Research Foundation (DFG)** is the self governing organization for science and research in Germany. The DFG supports research projects in all fields of science and the humanities at higher education institutions and publicly financed research institutions. Between 2005 and 2007, the DFG awarded €53.8 billion in funds, including €11 billion for the Excellence Initiative ^[14]. In this period the DFG sponsored almost 40,000 individual research projects each year, 7% in the field of chemistry. The DFG offers funding for foreign scientists from the graduate up to the senior level like:

- **Scholarships for PhD studies and postdoctoral scholars**

(GD, PD) – To pursue research in Germany in the framework of Graduate Schools, Research Training Groups or Collaborative Research Centers.

- **Individual fellowships and grants** (PD, SE) - The *Emmy*

Noether Program provides funding for outstanding postdoctoral (PD) researchers to establish an independent junior research group in Germany for up to five years. The *Individual Grants Program* promotes individual research projects of high scientific quality (PD, SE). The *Mercator Program* (SE) awards visiting professorships to established foreign researchers to enable them to carry out a research project at a German university of 3 to 12 months in duration. The *Heisenberg Program* (SE) provides excellent researchers the opportunity to prepare for a leading position within 5 years.

- **Support for international scientific collaboration/joint**

solicitation of proposals – The DFG supports international scientific projects within its various funding programs, following the principle of mutual responsibility. Researchers in Germany apply to the DFG while their partners abroad apply for funding at their respective partner organizations. In this context the DFG facilitates initiation and intensification of international cooperation by covering travel and short term maintenance expenses or by funding joint workshops and other events (PD, SE).

For more information, see www.dfg.de

For the joint cooperation between scientists from China and Germany mainly in the field of basic research the National Natural Science Foundation of China (NSFC) and the German Research Foundation (DFG) jointly founded the Sino German Center (SGC, see also Chapter 6). The SGC developed several funding instruments with regard to the promotion of initial contacts, the development of joint projects and the support of younger scientists.



Dr. Yu Nie

Associate professor at the National Engineering Center for Biomaterials, Sichuan University, China. She has done her Alexander von Humboldt Postdoc in the Department of Pharmacy of the Ludwig-Maximilian University Munich from 2008-2010

“What I most like is the international communication atmosphere in Germany. One sentence I have learned from Germany is “Stop and Think”, which promotes scientists to be more creative, and is very helpful for my scientific research career in China.”

China, April 2011



Prof. Dr. Gerhard Ertl

Professor Emeritus, Dep. of Physical Chemistry, Fritz-Haber-Institute of the Max Planck Society, Berlin, Nobel Prize in Chemistry 2007

“The German Research Foundation (DFG) and the Alexander von Humboldt Foundation are much more than just funding organizations; they enabled me to always attract the best young researchers from all over the world in order to work successfully on hot topics of basic research in a stimulating atmosphere.”

Germany, March 2010



In addition, **the non-university research institutions** offer funding for graduates and doctoral students by means of international research or graduate schools (Helmholtz, Max Planck, Leibniz). On the postdoc level training grants or head positions for research groups are offered by specific Max Planck, Helmholtz and Fraunhofer programs. Fellowships, visiting grants or awards funded by Fraunhofer, Max Planck or Leibniz institutions support foreign senior scientists.

European Funding Programs

Germany is also a “door opener” to the European research area. The European Union provides extensive funding for research or employment in Germany.

The **European Research Council (ERC)** awards grants for up to 5 years through open competitions for top researchers of any nationality and in any scientific discipline. Funding just requires that the project is carried out in an EU member state or an associated country. Grants support single research leaders in conjunction with a host institution, which provides the infrastructure necessary to carry out the research project. Scientific excellence is the sole evaluation criterion for the two types of ERC grants ^[15]:

- *Starting Grants* support independent careers of excellent researchers with 2 to 12 years of experience after their PhD. Approximately 300 grants are awarded each year. Each grant may total up to €18.5 million.

- *Advanced Investigator Grants* support independent research leaders with an excellent track record of significant research achievements over the previous 10 years. The maximum award amount is €32.5 million.

For more information, see <http://erc.europa.eu>

For more detailed information about all the described funding opportunities for research in Germany, see www.research-in-germany.de/funding or the brochure “Funding Opportunities in Germany” described in Chapter 6.



5 - Employment Opportunities in the German Chemical Industry

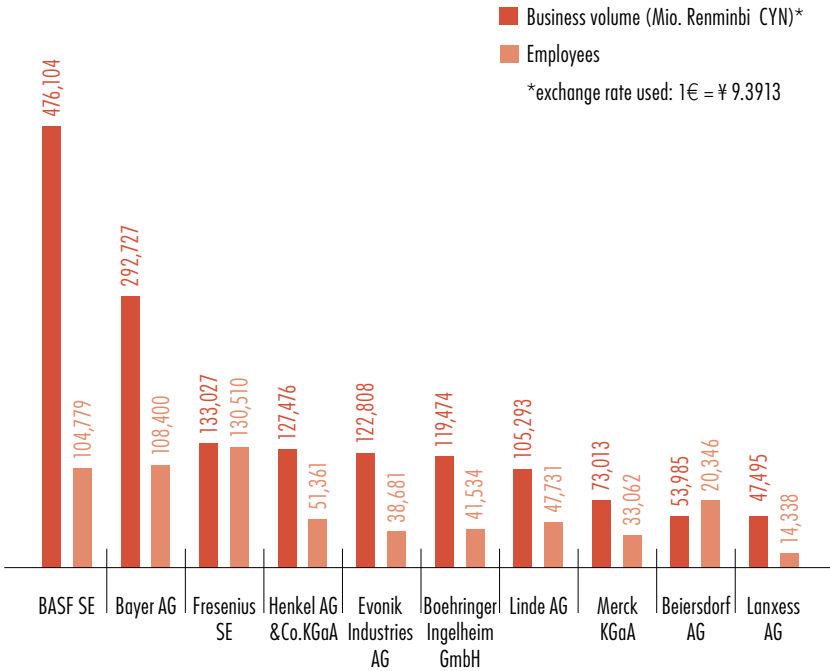
Germany's chemical industry offers excellent opportunities to chemists interested in an international career in the private sector. After the United States (21%), China (20%) and Japan (7%), Germany (6%) has the fourth largest proportion on the chemical global market ^[17]. In Europe, German companies are the largest employers in the EU chemical sector. In 2009, nearly one of every four jobs in the chemical industry within the EU – or some 416,250 positions – was located in Germany ^[16, 17]. Large enterprises, which tend to have substantial international operations, account of 7% to the total 2,000 German chemical enterprises and employ around 65% of the positions in the German chemical industry ^[17].

According to the German Chemical Industry Association (VCI), the areas expected to have particularly high demand for chemists and natural scientists are new and sustainable materials; supply, storage and efficient use of energy; electrical mobility, health research and nanotechnology. The latter field has about 60,000 industrial employees overall, one third of them is located in chemistry thereby underlining the potential of chemical sciences in Germany's nanotechnology development ^[18, 19].



The top ten German companies in business volume ^[20]

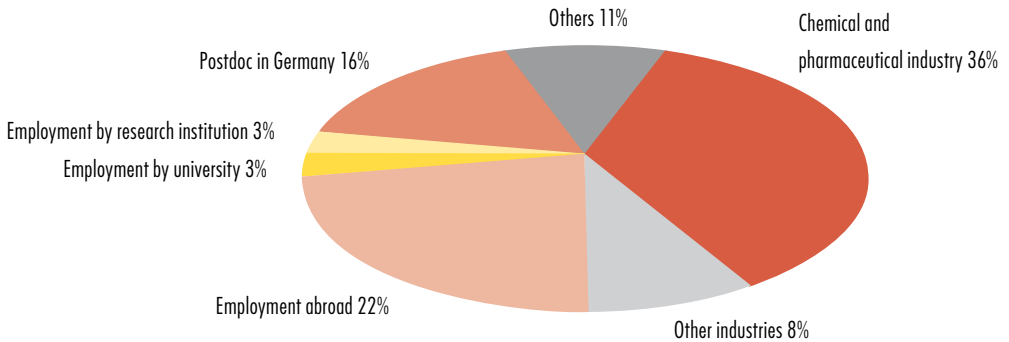
All of them have branches in China



Chemists employed in the German chemical industry are usually very well paid, with above average compensation rates in comparison to all other industries in Europe. Salaried positions carry exceptionally generous social benefits. In addition to an unusually high degree of job security, employees enjoy a minimum of 25 days of paid leave and, in some cases, up to 30 days. All companies are obligated to provide health insurance coverage for their employees.

Areas of first employment (in percentage) of chemists after their PhD [21]

(Data from 2007, data base: 1.104 persons, PhD students in the fields of biochemistry and food chemistry were not considered)



Most of the larger chemical companies in Germany employ people from a wide variety of countries, most of whom have a PhD in chemistry (see graph above). The language of communication is often English and even candidates with no knowledge of German are welcome.

If you're interested in working for a major German chemical company, keep in mind that many firms often have a steady demand for junior-level staff or trainees and fill many jobs with candidates who have applied on their own initiative, rather than responding to a job announcement. Application procedures most often can be found on company websites.



6 - Learn More: Where to Get Started

For more information about:

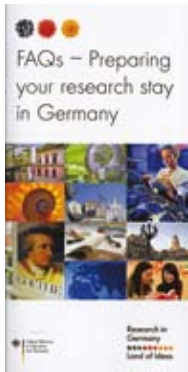
- How to obtain a PhD in Germany
- How to secure fellowships for a doctorate or postdoc position from German foundations or research institutions
- Studying or doing research at German higher education institutions
- Funding opportunities
- Job search engines for academics and information on research being carried out at German universities and non-university research institutions and research-related events
- Topics relating to researcher mobility (visa, social security, tax issues)

download the following free publications at
<http://www.research-in-germany.de/publications>





- **FAQs – Doing a doctorate in Germany**
(2010, 59 pages)
 - available doctorate programs, requirements, information on the application and examination process, funding options, practical advices for living in Germany



- **FAQs – Preparing your research stay in Germany**
(2010, 31 pages)
 - details about life and living in Germany, language, visa, health insurance, social security, tax and financial issues, work permit, etc.



- **German Funding Programmes for Scientists and Researchers**
(2010, 60 pages)
 - funding opportunities for international students, graduates, postdocs and scientists offered by a selection of German funding organizations as well as European funding programs



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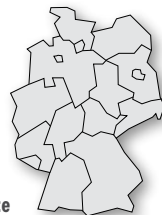
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This brochure is available online at www.research-in-germany.de



Currently running Graduate Schools and Clusters of Excellence of the German Excellence Initiative



Institution	Graduate School	Cluster of Excellence
Aachen TH BCRT*	Berlin-Brandenburg School for Regenerative Therapies	Tailor-Made Fuels from Biomass
Berlin TU Bochum U Constance U	Ruhr University Research School Constance Research School Chemical Biology	Unifying Concepts in Catalysis
Darmstadt TU		Smart Interfaces: Understanding and Designing Fluid Boundaries
Dresden TU	Dresden International Graduate School for Biomedicine and Bioengineering **	From Cells to Tissues to Therapies: Engineering the Cellular Basis of Regeneration
Erlangen-Nuremberg U	Erlangen Graduate School in Advanced Optical Technologies	Engineering of Advanced Materials – Hierarchical Structure Formation for Functional Devices
Frankfurt/Main U Giessen U		Macromolecular Complexes Cardio-Pulmonary Systems
Göttingen U	Göttingen Graduate School for Neurosciences and Molecular Biosciences	Microscopy at the Nanometer Range
Hanover MedH	Hanover Biomedical Research School	From Regenerative Biology to Reconstructive Therapy
Heidelberg U		Cellular Networks: From Analysis of Molecular Mechanisms to a Quantitative Understanding of Complex Functions
Jena U	Jena School for Microbial Communication	
Karlsruhe	Karlsruhe School of Optics and Photonics	Center for Functional Nanostructures
Leipzig U	Leipzig School of Natural Sciences—Build- ing with Molecules and Nano-Objects	
Mainz U	Material Sciences in Mainz	
Munich TU	International Graduate School of Science and Engineering	
Munich LMU	Graduate School of Systemic Neurosciences	-Munich Center for Integrated Protein Science -Munich-Center for Advanced Photonics -Nanosystems Initiative Munich
Stuttgart U		Simulation Technology
Würzburg U	Graduate School for Life Sciences	

U: University; TU: Technical University; TH: Technical Institute; MedH: Medical Institute; LMU: Ludwig Maximilians University

* Berlin-Brandenburg Center for Regenerative Therapies

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