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Education, science and research

Germany is a land of ideas. Education, science and research play a central role here. In a Europe free of borders and a world of globalized markets, education lays the basis enabling us to exploit the opportunities open borders and world-wide knowledge networks offer. The German education and university system is undergoing a profound process of renewal that is already bearing fruit: Germany is one of the countries most preferred by foreign students, a hub of cutting-edge international research and a constant source of new patents.

Innovative research: Germany is blazing the way in many technologies of the future

The international competition for the best brains

By Martin Spiewak

Famed minds such as Humboldt and Einstein, Hegel and Planck laid the foundations for Germany's reputation as a land of scholars and as the "country of thinkers and poets". As early as medieval times, scholars from all over Europe made the pilgrimage to the newly founded universities in Heidelberg, Cologne and Greifswald. Later, following the university reforms carried out by Wilhelm von Humboldt (1767–1835), the **German universities** actually became considered the ideal example followed by discerning academics elsewhere.

Humboldt conceived of the university as a venue for the independent pursuit of knowledge. It was there that research and teaching were to meld in a single unit, i.e., only those professors were meant to teach students who had themselves through their own research work penetrated to the core of their discipline. Humboldt felt this would guarantee the due depth and breadth of knowledge. At the same time, professors and students were to be free of any state censorship and able to dedicate themselves solely to science and scholarship.

Anyone wanting to make a career for themselves in science had to have spent some time as a student in a German laboratory or lecture hall. In the early 20th century, about one third of all Nobel Prizes were won by German scientists. Their innovations changed the world: the theory of relativity and of nuclear fission, the discovery of the tuberculosis bacillus or of X-rays.

German universities
In Germany there are currently some 1.98 million students enrolled at institutes of higher education, of which 946,000 are women (48 percent). There are 383 such institutes, including 103 universities and 176 universities of the applied sciences. As institutions the state universities are run by the individual federal states. Together with the USA and Great Britain, internationally Germany is one of the most popular countries in which to study.

There are now almost as many female as there are male students

"Heading for the future on the basis of a long-standing tradition": The Ruprecht Karls University in Heidelberg

Important degrees
Bachelor's
Master's
Diploma
Magister
State examination
Doctorate

Bachelor's and Master's
In many cases in practice both old and new courses and degrees are at present on offer at the same time. In winter semester 2007-8 a total of 6,886 Bachelor's and Master's courses were on offer at German universities, meaning that about 61% of all courses have now been switched over to the new structure.

Among other things, the United States has German researchers to thank for the fact that today it is the leading scientific nation on earth. Hundreds of German scholars, many of them, such as Albert Einstein, Jews, found a new home at an American university or research institute when fleeing the Third Reich. By contrast, for the German research community, their emigration was a severe loss that is still felt today.

Reforms to meet the international competition

Globalization is also creating new challenges for the German scientific and university community. The policymakers and universities have taken the initiative, with a series of reforms to adapt the university system to the new international standards. These innovations are in the process of fundamentally shaking up the German academic world. Be it the switch to staggered **degrees** such as **Bachelor's and Master's** degrees or the introduction of tuition fees and selection tests, be it the emergence of private facilities for academic training or the stronger strategic alliances between universities and institutes outside the higher education system – it is safe to say that hardly a section of society is at present undergoing such major changes as is the education system.

The goal of the reforms: to strengthen research and teaching to better face the ever fiercer international competition and to reclaim Germany's leading position. Changed legislation on universities grants each university greater scope, and established professors are being paid more clearly according to their performance. Each big-name university tries to give itself a keener profile, and various **rankings** on university quality and popularity enhance competition.

The so-called "Excellence" initiative for German universities also furthers this goal, too. For five years, the universities selected by an independent group of experts together receive just short of EUR 2 billion. The money is dedicated to promoting post-grad schemes, outstanding centers in specific fields of research (excellence clusters) and the research portfolios of nine top universities. This "elite" includes the LMU and TU in Munich, TU Karlsruhe, RWTH Aachen and the universities of Konstanz, Göttingen, Heidelberg, Freiburg, and the FU Berlin.

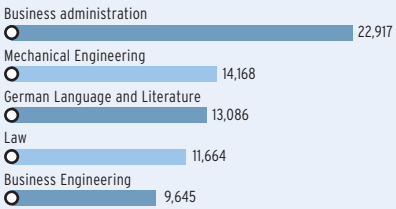
The **German Research Foundation** (DFG) is the main financial backer and primarily responsible for organizing

University ranking
Oldest university: Ruprecht Karls University, Heidelberg, founded in 1386
Biggest university: Cologne University, with 45,600 students
Most attractive university for top international research: University of Bayreuth, according to the Alexander von Humboldt Foundation-based research ranking
Universities with greatest research activities: Technical University of Munich and the University of Heidelberg according to CHE research ranking
Biggest private university: Catholic University of Eichstätt-Ingolstadt with 4,800 students

German Research Foundation (Deutsche Forschungsgemeinschaft)
The DFG is science's central self-governing organization. It supports research projects, whereby funds are channeled primarily into institutes of higher education. It also promotes collaboration between researchers and advises parliaments and authorities.

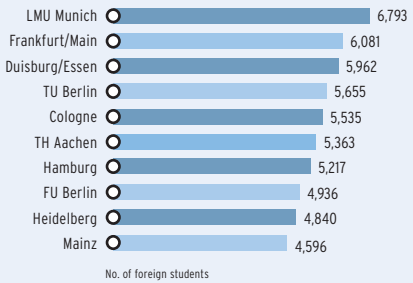
Studying in Germany – the key facts at a glance

The most popular subjects
Of the approx. 300,000 new students enrolled for the winter semester 2006-7, around 146,000 were women

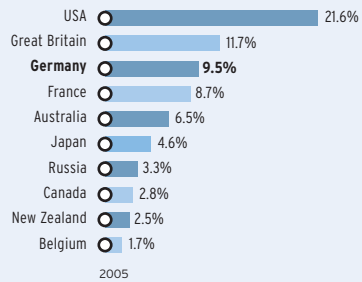


Quelle: Statistisches Bundesamt, OECD

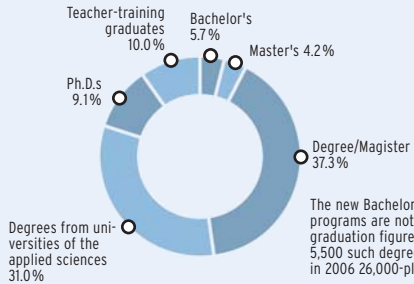
Appealing to the international elites of tomorrow
In the winter semester 2006-7, about 250,000 foreign students were enrolled at German universities, and around 55,000 were studying at one of the ten universities most favored by international students:



Most popular countries to study in
Worldwide a good 2.73 million students attend foreign universities . Germany is one of the most popular places to study



Increasingly international degrees
Most students opt to graduate with a Magister or a Diploma, but Bachelor's and Master's programs are becoming ever more popular



The new Bachelor's and Master's programs are not yet reflected in graduation figures. In 2003 only 5,500 such degrees were awarded, in 2006 26,000-plus.

this Excellence Initiative. One section of the latter in particular promises to have a long-term impact: The idea is to reward reform concepts put forward by a university and outlining how in the years to come it intends to emerge at the pinnacle of international **research**. In other words, gone are the days when the university system was based on largely egalitarian principles and research and teaching were essentially on an equal footing in every German university.

Research at higher education institutes
Based on the principle of "the unity of research and teaching", German universities are not only establishments for teaching students, but are also engaged in top-level research. A pre-requisite for this is close collaboration between scientists and research institutes both inside and outside Germany. The universities are financed by public funds, foundations and research work commissioned by third parties.

The tertiary education system

After the Second World War, an academic community arose that was more broadly diversified than ever before, a fact stimulated by German reunification in 1990. Anyone wanting to study in Germany is able to choose between 383 higher-education institutions that are spread across the entire country. Be it in cities or in the countryside, traditional or highly modern, small with everything in walking distance or large and spread across a pulsating metropolis – today almost every larger German city has its own college or university. The state of North Rhine-Westphalia alone has over 15 universities, 27 universities of the applied sciences and 8 art academies. Many of them were founded in the 1960s and 1970s, the age of major expansion in tertiary education, when within the space of only two decades, the number of students exploded by a factor of five, with the figure for female students rocketing most. Today, they have almost overtaken the number of their male counterparts.

Today, some two million young people study in Germany. More than one third of every age set enters tertiary education, and the ratio is growing. Nevertheless, Germany is still below the international average, firstly owing to the relatively low ratio of pupils who obtain a high-school leaver's certificate and secondly as just one third of the latter group opt for vocational training in the tried-and-true dual system (see p. 129). This provides training for many professions that would require a university degree in other countries – such as for crafts/technical careers or for technical and auxiliary medical jobs.

Again, unlike many other countries, **private universities** play a comparatively subordinate role: 96 percent of students attend public institutions that are subject to state supervision and control and are essentially open to anyone who has a high-school leaver's certificate (or a comparable certificate) that authorizes them to enter university. Since the 1970s, alongside the state universities and theological colleges, countless non-state-funded, non-denominational universities have been founded, financed by tuition fees and donations.

Technical universities and universities of the applied sciences

While the classic university is dedicated to pure science and scholarship and covers the entire spectrum from ancient

A university degree – the launchpad for a successful career

Private universities
In addition to the non-state funded, denominational institutes of higher education, a number of state-recognized, private educational establishments have been founded since the 1970s. There are now 110 – mostly small – non state-funded higher education institutes, including 13 private universities such as the European Business School in Oestrich-Winkel, and the Private University of Witten/Herdecke, as well as 15 theological universities.

School education

Good initial opportunities for everyone are a key prerequisite for education and achievement. German schooling is based on nine years of compulsory education for all children. Attendance of all government schools is free of charge. Once children are aged six, they as a rule attend primary school for four years, before going on to a variety of secondary schools: Hauptschule, Realschule, Gymnasium. The standards and weighting of practical versus theoretical lessons differ. There are also Gesamtschulen, in which all children of compulsory school age are taught in parallel classes, depending on their particular abilities. Children can easily move from one stream to another as they improve. In Hauptschulen, grades 5 to 9 are compulsory, and 10th grade is voluntary.

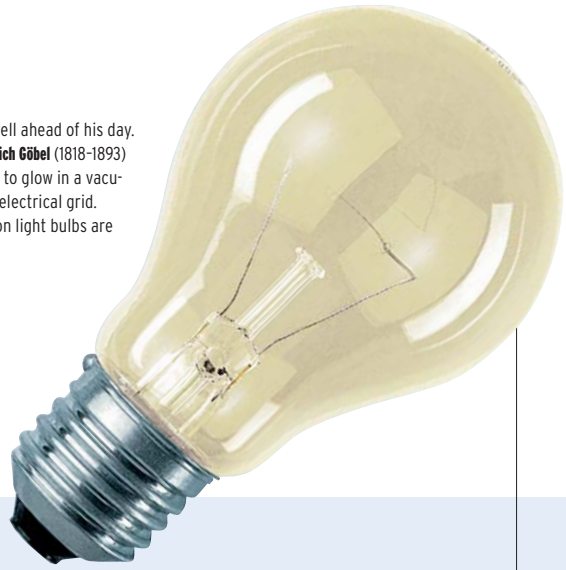
Realschule covers grades 5 to 10 and is halfway between Hauptschule and a Gymnasium. The children leave with a "Mittlere Reife" certificate. Gymnasium provides in-depth education. Pupils graduate from Gymnasium after the 12th or 13th grade with a High-School Certificate.
Lessons in German schools tend to be in the mornings but the Federal Government has provided EUR 4 billion to support the creation of all-day schools. Since 2003, this money has been used to support more than 6,000 schools in effort to upgrade or establish day-long instruction. Forward-looking support at the pre-school level and more language classes are likewise intended to enhance the quality of education. A Standing Conference of the Ministers of Education and Cultural Affairs of the Länder coordinates schooling, as each Federal state has its own school laws.

Inventions and Innovations

The ideas country: From the bicycle to the MP3 format — German inventors and inventions shape today's world. Innovations "made in Germany" at a glance

1796
Homeopathy
Heal a disease with something similar to it: This was the idea **Samuel Hahnemann** (1755-1843) used to create the principle of homeopathic therapy. Today, just under 40 percent of Germans have used this soft form of medicine

1854
Light bulb
The clockmaker was well ahead of his day. For in 1854, when **Heinrich Göbel** (1818-1893) caused bamboo fibers to glow in a vacuum, there was still no electrical grid. Today, some 350 million light bulbs are sold each year



1876
Refrigerator
On March 25, 1876 **Carl von Linde** (1842-1934) was awarded the patent for the first refrigerator, which used ammonia as a cooling agent. In 1993, German company **Foron** introduced the world's first CFC-free "Greenfreeze" refrigerator

1876
Otto engine
Take in, condense, ignite, work, expel: **Nikolaus August Otto** (1832-1891) has gone down in the annals of technology as the inventor of the four-stroke engine, accelerating the pace of motorization

1891
Glider
He realized one of mankind's oldest dreams: In 1891, **Otto Lilienthal** (1848-1896) managed in gliding in the air for 25 meters. Today, some 7,850 unmotorized gliders sail in Germany's skies

1897
Aspirin
On August 10, 1897 chemist **Felix Hoffmann** (1868-1946) synthesized a white powder that was soon to prove to be a "miracle treatment": acetyl salicylic acid

1930/1931
Television
On Christmas Eve, 1930 **Manfred von Ardenne** (1907-1997) was the first person to succeed with an electrical television broadcast. Today, 95 percent of German households have a TV. Average viewing time per day is about 220 minutes

1760 1780 1800 1820 1840 1860 1880 1900 1920 1940

18th century | 19th century | 20th century

1817
The bicycle
Karl von Drais (1785-1851) was especially taken by the "two-wheeler principle". The bicycle was soon to become a success story world-wide

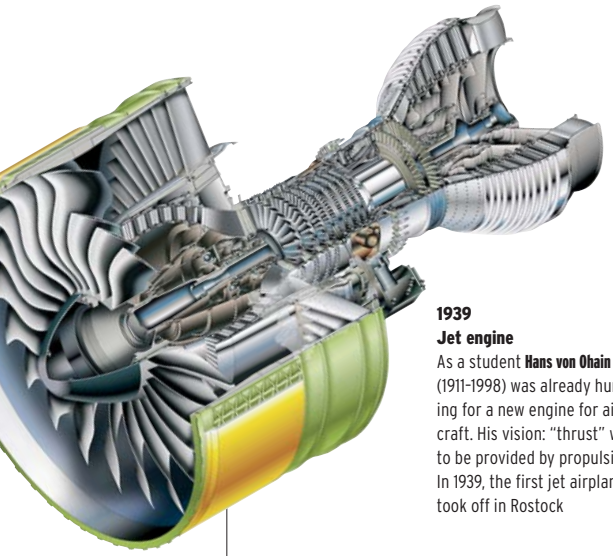
1861
Telephone
The era of revolutionary communications technology commenced with **Philipp Reis** (1834-1874). A mathematics teacher, he was the first person to transform sounds and words into electric current that could be reproduced elsewhere

1885
Automobile
They made society mobile: **Carl Benz** (1844-1929) and **Gottlieb Daimler** (1834-1900). Today, over 46 million automobiles are registered in Germany

$$E = \frac{mc^2}{\sqrt{1 - \frac{v^2}{c^2}}}$$

1905
Theory of relativity
He did not develop a product or invent a process. Instead he created a new idea of time and space. **Albert Einstein** (1879-1955), who emigrated from Germany in 1933, was the first pop star of science. His formula read: $E=mc^2$

Innovations "made in Germany"



1939
Jet engine
As a student **Hans von Ohain** (1911-1998) was already hunting for a new engine for aircraft. His vision: "thrust" was to be provided by propulsion. In 1939, the first jet airplane took off in Rostock

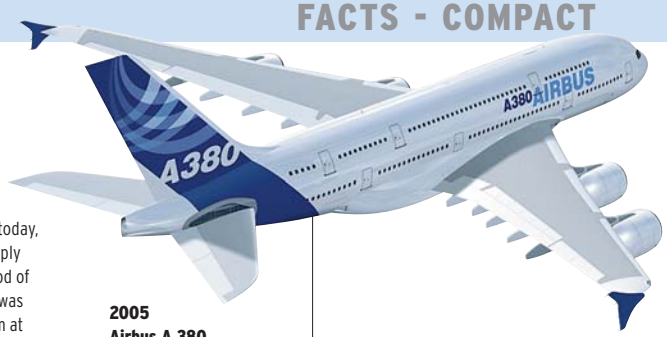
1957
Rawl plugs
Simple but ingenious: This is the only way to describe the invention of the plastic rawl plug. For "patents world champion" **Artur Fischer** the patent for his rawl plug was only one of over 5,000 that he has accumulated during his long life as an entrepreneur

1969
Chipcard
Under Patent DE 19 45777 C3 **Jürgen Dethloff** (1924-2002) and **Helmut Gröttrup** (1916-1981) opened the door wide to the information society. As a check card, phone card or patient card, today, your chipcard is a firm part of everyday life

1976
Liquid crystal display
The future of monitors is large and flat thanks to modern liquid crystals. Darmstadt-based company Merck was the first to offer them for sale, in 1904. The breakthrough came in 1976 with substances with enhanced optical and chemical display properties

1995
MP3
For millions of kids today, MP3 players are simply the best. This method of audio compression was developed by a team at the Fraunhofer Institute under **Karlheinz Brandenburg**

1994
Fuel cell automobile
As early as 1838, **Christian Friedrich Schönbein** (1799-1868) developed the principle of the fuel cell. But not until 1994 did Daimler-Benz AG exploit its potential for the world's first fuel-cell powered car



2005
Airbus A 380
A European success story with a lot of German technology: the **Airbus A 380** is the world's largest airliner. Spring 2005 saw the maiden flight of the giant of the air

2007
Hard disk revolution
Nine years after the discovery of the giant magnetoresistance effect, Jülich-based physicist **Peter Grünberg** and Frenchman Albert Fert won the Nobel Prize for Physics.

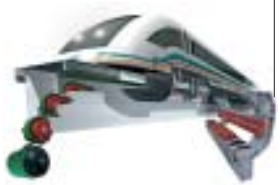
1940 1950 1960 1970 1980 1990 2000 2010

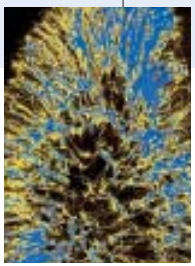
20th century | 21st century

1941
Computer
Because he did not like maths tasks, **Konrad Zuse** (1910-1995) invented the first binary calculator: the Z3. The first computer managed four basic arithmetic functions in three seconds. It was the beginning of the digital age. Today, 240 million PCs are sold each year, alone eight million of them in Germany

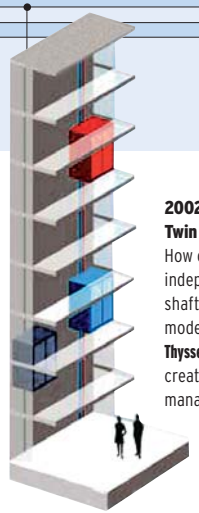
1963
Scanner
The inventor of the precursor to fax machines **Rudolf Hell** (1901-2002) had first thought of dividing texts and images into dots and lines back in the 1920s. His Hell telegraph system was the first to transfer texts and images over long distances. In 1963, he invented the first scanner for inputting color images

1979
Magnetic levitation railway
The world's first maglev ran in Hamburg. Today, the German "Transrapid" travels at 430 kph from Shanghai airport to the CBD. The ingenious idea for magnetic levitation dates back to work in 1933 by engineer **Hermann Kemper** (1892-1977)





1986
Scanning tunnel microscope
It renders even atoms, the smallest pieces of matter, visible. German **Gerd Binnig** and Swiss **Heinrich Rohrer** were awarded the Nobel Prize for Physics for their invention in 1986. It was the decisive breakthrough into the nano-world



2002
Twin elevators
How can two elevator cabins move independently in one and the same shaft? They can thanks to a hypermodern control mechanism by the **Thyssen Krupp** company. Twin elevators create a new dimension in facilities management

Wilhelm von Humboldt: In Germany, he established the university as a home for the independent pursuit of knowledge

studies through to economics, the **technical universities** (TU) focus on engineering and the natural sciences. The TUs have a sterling reputation as the forges of German engineering know-how and are especially popular among foreign students.

Technical universities
Universities with an especially strong technical focus operate as Technical Universities (TU) or Technical Colleges (TH). They attach greater importance to basic research than do universities of applied science. The nine leading TUs have joined ranks to form the TU9 Initiative. They have an especially strong international focus and coordinate their countless study export offerings outside Germany.

Since the late 1960s, another special institution has evolved in the German education system: the university of the applied sciences (FH). More than a quarter of all students in Germany attend a FH, or a so-called vocational academy as it is known in some German states – these collaborate closely with corporations. Students are attracted to the universities of the applied sciences above all by the fact that the track to a job is shorter – an FH degree course lasts three years as a rule – and the curriculum is more practically oriented. Stringently organized courses and regular examinations ensure that the average time spent obtaining a degree is less. This does not mean that there is any shortfall in scholarship – the approx. 176 universities of the applied sciences also conduct research, albeit with a strong focus on potential applications and industry's needs.

International Orientation

Germany appeals to young people from all over the world as a place to study. About 250,000 foreign students are enrolled at German universities, 70 percent more than in 1995. Today, more than every tenth student comes from abroad, the largest numbers coming from eastern Europe and China. Germany is the third most preferred host country for international students, following the United States and Great Britain.

Internationalization
There are currently 250,000 foreign students enrolled at German higher education institutes, of whom approximately one in four gained the right to study there in Germany itself. However, there are also some 76,000 Germans studying abroad. The most popular countries are Holland, Great Britain, Austria and the USA.

This success German universities have had in **internationalization** is the product of the joint efforts of each and every university and politicians. Thus, an image campaign for German universities was launched a few years ago together with university organizations. Moreover, with government support several universities have participated in founding partner universities in other countries, including Singapore (TU Munich), Cairo (Ulm and Stuttgart universities) and Seoul (the Weimar Academy of Music). As a rule, the **DAAD**, German Academic Exchange Service, lead manages such foreign initiatives – it is dedicated to international exchange programs for students and scientists alike, and supports offices, lecturers or alumni associations in over 100

DAAD
The German Academic Exchange Service (DAAD) is an organization run jointly by the German institutes of higher education. Its purpose is to promote relations between higher education institutes in Germany and abroad, especially through exchange schemes between students and academics. As a rule its programs cover all disciplines and countries and are open to German and foreign students in equal measure. The DAAD supports a worldwide network of offices, lecturers and alumni associations and provides information and advice on a local basis.

Two-track vocational training

Germany's two-track vocational training system is quite special internationally speaking. On completing school, some 60 percent of young people in Germany move on to learn one of the 350 officially recognized vocations included in the Two-Track System. This entry into professional life differs from vocational training based only in colleges such as customary in many other countries. The practical part of the course takes part on 3 or 4 days of the week in a company; the other 1 or 2 days are spent with specialist theoretical instruction in a vocational school. The courses take 2-3.5 years. In-company training is supported by courses and additional qualification facilities outside the companies. Training is financed by the companies, which pay the trainees/apprentices wages, while the government bears the costs of the vocational schools. At present, 482,000 companies, the public sector and the free professions are busy training young people. Small and medium-sized business provide more than 80 percent of all traineeships. Thanks to the Two-Track System, in Germany the number of young people without a profession or traineeship is comparatively low, and is only 2.3 percent of those in the 15-19 age bracket. This combination of theory and practical work guarantees that the craftsmen and skilled workers have prime qualifications. Vocational training is also a launchpad for a career that can, via advanced training, lead to participants becoming master craftsmen and women. A new qualification track: advanced training alongside the job that can lead even as far as a university Master's degree.

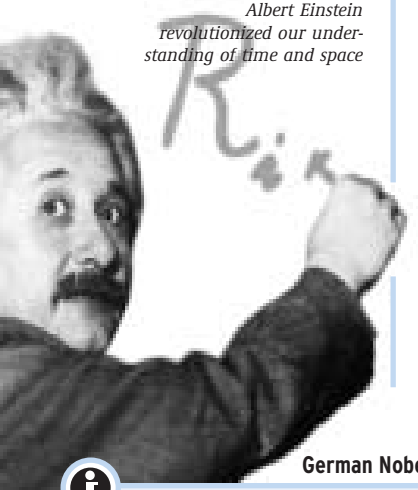
Bologna Declaration
In 1999 in Bologna, Germany, together with its European neighbors, set itself the target of establishing a common European university system by the year 2010. This reform has resulted in the transformation of degree courses into the two-tier Bachelor's and Master's degree courses and the introduction of credits in accordance with a system that is recognized throughout Europe.

countries. It also played a role in setting up hundreds of foreign-language courses (frequently in English) at German universities.

Moreover, an increasing number of departments are switching their courses over to culminate in internationally recognized Bachelor's and Master's degrees. By 2010, all universities should have adopted this new degree policy – as stipulated in the **"Bologna Declaration"**, to which all European states are signatories. The idea is not only to facilitate student exchanges throughout the continent, but also to make Europe a more interesting prospect for overseas academics.

What has long since been the norm at art and music academies is, according to the plan, in future also to be the practice at every university. Until recently, only a small number of departments chose their own students. A central office, the ZVS, handles allocation to universities of students to those subjects with **admission restrictions** – nationwide these are at present Biology, Medicine, Pharmacology, Psychology, Veterinary Medicine and Dental Medicine (and there are also special state-wide restrictions in North Rhine-Westphalia). An increasing number of universities are also issuing their own specific restrictions, and first testing or interviewing applicants before awarding them places.

Albert Einstein revolutionized our understanding of time and space



In 2005, a Federal Constitutional Court ruling overturned the traditional taboo on tuition fees. Hitherto, in Germany it was (almost) only the state that paid for tertiary education. Since 2007, seven federal states have from the first semester onwards charged **tuition fees**, albeit relatively modest ones by international comparison. Other Federal states also levy tuition fees for students who have exceeded ten semesters or have opted after graduation to study another subject.

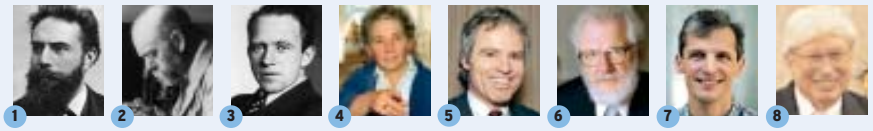
Research in industry

While it is the universities that are solely responsible for courses of study, needless to say in Germany research is also undertaken outside the university. Thus, German industry is strongly engaged in research: Germany easily outpaced the other European countries in the league table, with 24,000 registrations for patents submitted to the European Patent Office. In the form of Siemens, Bosch and BASF, three German corporations are among the world's Top 7 in the international patent registration league table. Germany is also well up in the global patent registration rankings for applied technologies such as automobile, mechanical, environmental, chemical, power and construction technologies. As regards registrations of

Admission restrictions
Given immense demand for some courses, nationwide admission restrictions (numerus clausus) hold. Since 2005, degree courses subject to national admission restrictions are subject to proportional entry ("20-20-60"): 20 percent of places go to students with the best high school leavers' certificates, who can chose a university, and 20 percent are allocated on the basis of how long students have been waiting for a place. Universities can restrict access to 60 percent of places by both average school leaver's certificate grades and criteria of their own.

Tuition fees
Since 2007, the Federal states of Baden-Württemberg, Bavaria, Hamburg, Hessen, Lower Saxony, North Rhine-Westphalia and Saarland levy tuition fees as of enrollment. Most have set the fees at EUR 500 per semester, but offer secured loans to finance them.

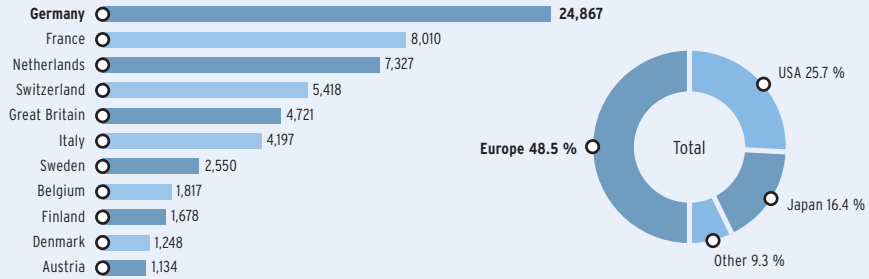
German Nobel Prize winners in the natural sciences and medicine



Of the total 78 German Nobel Prize winners to date, 67 won the prize for services to the natural sciences or medicine. The first Nobel Prize for Physics went in 1901 to Wilhelm Conrad Röntgen for "a new type of ray". Robert Koch, Max Planck, Albert Einstein, Werner Heisenberg and Otto Hahn were also German Nobel Prize winners famed well beyond their field. Christiane Nüsslein-Volhard (Medicine), Horst L. Störmer, Herbert Kroemer, Wolfgang Ketterle and Theodor Hänsch, Peter Grünberg (all Physics) as well as Gerhard Ertl (Chemicals) were recent German winners of this pinnacle of scientific recognition.

1	1901	Conrad Röntgen
2	1905	Robert Koch
3	1932	Werner Heisenberg
4	1995	Chr. Nüsslein-Volhard
5	1998	Horst L. Störmer
6	2000	Herbert Kroemer
7	2001	Wolfgang Ketterle
8	2007	Gerhard Ertl

Leading the Patents table
The total of 135,183 registrations for patents with the European Patents Office in 2006 can be subdivided as follows



Quelle: Eurostat, 2003/Europäisches Patentamt

Max Planck Society
The Max Planck Society was founded on February 26, 1948 – as the successor to the Kaiser Wilhelm Society set up in 1911 for the promotion of science. Max Planck Institutes undertake basic research in the natural sciences, bio-sciences and social sciences as well as the humanities. Together with partner universities, MPG has founded 49 post-graduate and international Max-Planck Research Schools. Half of the doctoral students come from outside Germany.

Fraunhofer-Gesellschaft
The society is engaged in applied research. Its projects are commissioned by industry and service providers as well as state-run institutions. Some 12,500 members of staff are employed in around 56 research facilities throughout the whole of Germany. The amount spent on research annually totals EUR 1.2 billion. Fraunhofer supports offices in Europe, the USA, Asia, and the Middle East.

patents for environmental protection, Germany leads the way world-wide, followed by the USA and Japan.

Research outside the universities

Cutting-edge research is also being done at hundreds of scientific institutes that are grouped together in organizations such as the Helmholtz Association, the Fraunhofer-Gesellschaft and the Leibniz Association. Precisely these research institutes outside the universities offer leading research minds optimal working conditions that are as good as unparalleled the world over. Here, some of the most fruitful German minds are busy undertaking research and publishing highly original articles. This is especially true of the 78 Max Planck Institutes (MPI). Be it searching for water on Mars, the human genome project, or exploring human behavior, the MPIs are at the forefront of things when it comes to exploring virgin scientific terrain. Since the Max Plank Society was founded in 1948 its scientists have won 17 Nobel Prizes and many other international awards. In 2007, the Nobel Prize for Chemistry was won by MPI Director Gerhard Ertl. The **Max Planck Society** is so appealing to them because of how it sees research: Each institute defines its own topics, is equipped with superb working conditions, and has a free hand when selecting staff. For many a scholar, being appointed Director of an MPI is the pinnacle of his or her career.

The topic on the Internet

www.das-ranking.de
DAAD, the CHE Centrum für Hochschulentwicklung and "DIE ZEIT" offer a database with a detailed ranking of German universities (English, German)

www.bildungsserver.de
The information portal on the German education system (German, English)

www.hochschulkompass.de
This Web site offers information on university study, Ph.D. courses and international collaboration in Germany (English, German)

www.forschungsportal.net
Search engine run by the Federal Ministry of Research on research findings, Ph.D. theses (English, German)

www.dfg.de
Information on the German Research Foundation (English, German)

www.daad.de, www.studieren-in.de
The German Academic Exchange Service Web site provides information for foreign students in Germany and on scholarships (in 24 languages)

What is rare at an MPI is by contrast the very source of life for the **Fraunhofer-Gesellschaft** institutes, namely close collaboration with industry. There are about 80 such research facilities, and they conduct applied research primarily into engineering-related fields. Fraunhofer experts have one foot in the lab and the other in the factory, as their projects are as a rule commissioned by companies, specifically mid-sized corporations.

The 83 member institutes of the **Leibniz-Gemeinschaft** are not only strong in the life and natural sciences, but also trend-setters in the humanities, the social sciences and economics. They include ifo-Institut für Wirtschaftsforschung, which regularly publishes a business climate index, Deutsches Museum in Munich, one of the world's leading science and technology museums, the Bernhard Nocht Institute for Tropical Medicine in Hamburg, and Mannheim's Institute of German Language, that provides scholarly support for advances to the German language.

A total of 15 high-tech German research facilities are joined under the aegis of the **Helmholtz Association**; they are large and often extremely expensive institutions that are well known internationally, such as the Gesellschaft für Schwerionenforschung (GSI), the German Cancer Research Center (DKFZ), the Deutsche Elektronen-Synchrotron in Hamburg (DESY) or the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven. Every year, the Helmholtz institutes attract thousands of foreign researchers, who wish to conduct physical or medical experiments in what are often facilities that are unique worldwide.

The Federal Government has a policy of targeted support with which it wishes to get Germany moving forward faster. Through 2010 three percent of GDP will be committed to R&D (2005: 2.51 percent). Moreover, the funding for research institutes will by raised by three percent annually through 2010 and EUR 6 billion will be invested in nano-, bio- and information technology. ●

Leibniz-Gemeinschaft
Gottfried Wilhelm Leibniz (1646–1716) was one of the last all-round scholars. The scientific range covered by the 83 member institutes is correspondingly broad, extending from the humanities and economics through to mathematics. The focus is on applied basic research. The Leibniz institutes employ more than 13,000 staff and have a total budget of about EUR 1.1 billion.

Helmholtz Association
With 15 research centers, an annual budget of around EUR 2.3 billion and 26,500 members of staff the Helmholtz Association is Germany's largest scientific organization. It conducts research into energy, the earth and the environment, health, key technologies, the structure of material as well as traffic and outer space.

Martin Spiewak
The journalist is the scientific editor of "Die Zeit", a German weekly.