Karlsruhe Institute of Technology

THE RESEARCH UNIVERSITY IN THE HELMHOLTZ ASSOCIATION

Annual Report 2016 of Karlsruhe Institute of Technology

KIT – The Research University in the Helmholtz Association

Mission

We create and impart knowledge for the society and the environment.

From fundamental research to applications, we excel in a broad range of disciplines, i.e. in natural sciences, engineering sciences, economics, and the humanities and social sciences.

We make significant contributions to the global challenges of mankind in the fields of energy, mobility, and information.

Being a big science institution, we take part in international competition and hold a leading position in Europe.

We offer research-based study programs to prepare our students for responsible positions in society, industry, and science.

Our innovation efforts build a bridge between important scientific findings and their application for the benefit of society, economic prosperity, and the preservation of our natural basis of life.

Our working together and our management culture are characterized by respect, cooperation, confidence, and subsidiarity. An inspiring work environment as well as cultural diversity characterize and enrich the life and work at KIT.

Employees 2016

Total	9 239
Teaching and research	5 773
Professors	365
Foreign scientists and researchers	978
Infrastructure and services	3 466
Trainees	464

Students

Winter semester 2016/17	25 892

Budget 2016 in Million Euros (provisional figures)

Total	841.8
Federal funds	263.2
State funds	247.2
Third-party funds	331.4

Karlsruhe Institute of Technology – The Research University in the Helmholtz Association – stands for excellent research and outstanding academic education. It also is a driver of innovation by making best possible use of the synergies resulting from the merger of a state university with a national large-scale research center seven years ago.

In this report, we look back on a very active year 2016 and present to you some highlights of our work. You will read about exciting results and agenda-setting developments in the areas of research, teaching, and innovation. For example, KIT is involved in three of four "Kopernikus Projects for the Energy Turnaround" funded by the Federal Government. To better account for practical application in academic education, the first learning factory for production in global networks worldwide started operation. Moreover, the state approved of the Karlsruhe Priority Region for Mobility Systems and the associated establishment of a test center for connected and automated driving, with KIT being one of the partners. In addition, KIT succeeded in acquiring two new research training groups funded by the German Research Foundation and four Helmholtz young investigator groups. According to the monitoring report of the EU Commission, KIT is the most successful German university in the research and innovation framework programme "Horizon 2020" of the European Union.

Of course, we also inform you about life at KIT. For instance, about the first ball night of KIT that will take place annually from now on as well as about staff changes. On January 01, 2016, the sixth and last member of KIT's Presidential Committee took up work that is shared in accordance with our departmental principle. Moreover, we are pleased to provide some further details on ongoing implementation of our Umbrella Strategy adopted in 2015.

Numerous awards and the entrusting of honorable functions show that, with the help of its outstanding students, professors, and staff in research and administration, KIT is optimally prepared for a successful future.

On behalf of the Presidential Committee of KIT, I express my sincere thanks to our political partners, our partners in research and industry, the KIT Supervisory Board, and the members of KIT for their trusting, intense, and successful cooperation last year.

I cordially invite you to take your time to read and leaf through this annual report and I hope you will enjoy looking back on KIT – The Research University in the Helmholtz Association – in 2016. May 2017 become as thrilling as last year!

Enjoy reading.

Yours,

Professor Dr.-Ing. Holger Hanselka
President of KIT

A RETROSPECTIVE VIEW OF KIT

Concentrating on its three core tasks research, teaching, and innovation, Karlsruhe Institute of Technology as "The Research University in the Helmholtz Association" creates and imparts knowledge for society and the environment.

Research, which is one of the central tasks of KIT, is committed both to gaining knowledge and to rising to the challenges of making major contributions to the sustainability of our society and the preservation of our natural basis of life. Being one of these challenges, the "Energiewende" (or energy transition) is spurred on by the Federal Ministry of Education and Research through, among others, the Kopernikus projects. In a joint effort by science, economy, and society, these projects strive to develop

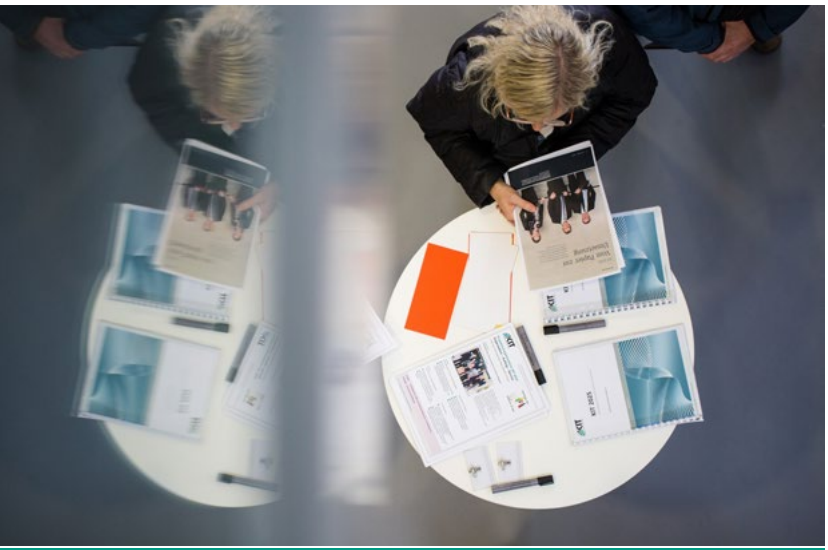
technological and economic solutions for restructuring the energy system. Success in the KIT-managed Kopernikus project "ENSURE – New Power Grid Structures for the Energy Turnaround," and substantial participation in two more of the four supported Kopernikus projects have strength-ened KIT's position as a research institution promoting the "Energiewende".

In 2016, KIT has achieved considerable success not only in energy research but also in its two other profile-sharpening topics mobility and information as well as in many other research areas: The State of Baden-Württemberg supports both the alliance "Karlsruhe Priority Region for Mobility Systems," where KIT together with research partners from Karlsruhe and the region develops efficient, smart, and integrated mobility solutions, and the "Test Center for Connected and Automated Driving." These two projects increase the visibility of the Karlsruhe region as an outstanding mobility research location and enhance the area's innovative strength. A new high-performance computer, ForHLR II, which is funded by the federal government and the State of Baden-Württemberg, was put into operation. Under the direction of KIT, the Helmholtz Association's Helmholtz Data Federation has been established, a data infrastructure to professionalize research data management in the domain of big data.

INSIDE VIEWS

With the KIT 2025 Umbrella Strategy adopted by the Supervisory Board and the KIT Senate in November 2015, KIT set its course for the coming years: Seven major areas of action were defined to outline the objectives through to 2025 and the measures to be taken to achieve them. In 2016, the phase of implementation of the strategy started by transferring the numerous measures into a suitable project structure. These measures are going to be gradually implemented in the coming years. The pursued scheme continues to be under the direct responsibility of the President, is controlled by the Presidential Committee and the Heads of Divisions, and is handled in collaboration with different scientific and administrative project teams. In addition to the committees, a sounding board consisting of KIT executives advises the Presidential Committee on the implementation of the KIT 2025 Umbrella Strategy.

On April 22, 2016, the Joint Science Conference of the Federal Government and the Länder announced the key elements of the new Initiative of the Federal Republic of Germany and the German states for supporting top-level research at German universities (successor program to the Excellence Initiative). Since this announcement in Berlin, the project incorporated by the Presidential Committee into the structure of the KIT 2025 Umbrella Strategy has been able to focus its activities. Until April 2017, the draft pro-posals for clusters of excellence will be submitted to the Deutsche Forschungsgemeinschaft. Until September, a panel of experts will decide which of these drafts can be submitted as full proposals until February 2018.



In 2016, KIT started to implement the KIT 2025 Umbrella Strategy.

On November 19, 2016, the first KIT ball night took place under the theme "Feuer und Flamme" (which literally translates to Fire and Flame).

Just like any university in Baden-Württemberg, KIT is obliged to draw up and regularly update a structure and development plan for a period of five years. In this plan, the envisaged technical and structural development of KIT is outlined. The structure and development plan, in particular, is a planning tool for the approval of new professorships. Based on the strategic objectives of the KIT 2025 Umbrella Strategy, KIT has drawn up and introduced to the committees said structure and development plan for the period of 2017 to 2021. With the approval of the structure and development plan by the State of Baden-Württemberg, the plan is valid and the course is set for the coming decade.

On November 19, 2016, approximately 600 members and guests of KIT joined in the first ball night of Karlsruhe Institute of Technology. Under the theme "Feuer und Flamme"

(which literally translates to Fire and Flame), the festively dressed participants in high spirits danced to the rhythms of a live band and enjoyed a varied show program and pleasant ambience.

Since January 1, 2016, the Presidential Committee of KIT for the first time has been made up of six members and hence is complete now in accordance with the KIT Act. As early as in July 2015, a large majority of the KIT Senate agreed to the appointments of Professor Dr. Oliver Kraft as the new Vice President for Research and of Professor Dr. Thomas Hirth as the new Vice President for Innovation and International Affairs and thus confirmed the respective unanimous decisions of the Supervisory Board. Prior to his appointment, Oliver Kraft was part of the cooperative management of KIT's Institute for Applied Materials. He succeeded Professor Dr.-Ing. Detlef Löhe who retired on December 31, 2015. The vacancy of head of the new Department for Innovation and International Affairs was filled by Thomas Hirth who until 2015 was Head of the Stuttgart Fraunhofer Institute for Interfacial Engineering and Biotechnology, Professor and head of institute at University of Stuttgart, and member of the Presidential Committee of Fraunhofer-Gesellschaft.

In October 2016, the KIT Senate confirmed by an overwhelming majority the decision of the Supervisory Board to elect Christine von Vangerow as new Vice President for Human Resources and Law of Karlsruhe Institute of Technology (KIT). On January 1, 2017, Christine von Vangerow succeeded Dr. Elke Luise Barnstedt, who retired at the end of 2016. Christine von Vangerow headed the Central Ser-vices Department of the Bundesanstalt für Materialforschung und -prüfung (BAM, Federal Institute for Materials Research and Testing), Berlin, since 2009 and was Member of the Board of BAM.

Since January 1, 2017, Christine von Vangerow has been new Vice President for Human Resources and Law of KIT.

Two reappointments were made at the second management level. Professor Dr. Doris Wedlich, Head of Division I – Biology, Chemistry, and Process Engineering, and Dr. Karl-Friedrich Ziegahn, Head of Division IV – Natural and Built Environment, were confirmed in office by the Division Councils in agreement with the Presidential Committee.

Professor Dr. Doris Wedlich, Head of Division I – Biology, Chemistry, and Process Engineering, and Dr. Karl-Friedrich Ziegahn, Head of Division IV – Natural and Built Environment, were confirmed in office.

OUTSIDE VIEWS

As is revealed by its performance in different rankings, KIT stands up extremely well to national and international comparison. With a funding amount of almost EUR 46 million, KIT at present is the most successful German university under Horizon 2020, the EU framework programme for research and innovation. This is the result of the first Monitoring Report on this programme issued by the EU Commission. KIT is ranked no. eight among the fifty best higher and secondary education institutions in Europe. Featuring among the universities in this report, KIT would also have scored well in comparison with the fifty best research organizations. Here, KIT would be no. seven and again be the top German institution.

The 2016 Performance Ranking of Scientific Papers for World Universities issued by the National Taiwan University is based exclusively on the analysis of scientific publications. In engineering sciences and natural science, KIT, as in 2014, again takes the top position among the German universities. In the overall ranking of the 500 best universities worldwide, KIT is ranked no. 198.

Besides, KIT has been very successful in the internationally renowned ranking of QS Quacquarelli Symonds Ltd., London. Whereas, in the overall ranking QS World University Ranking 2016, KIT is among the 100 best universities in the world, it is ranked no. four in Germany and thus consolidates its position as one of the best universities.

In the QS World University Rankings by Subject 2016, KIT is among the 100 best universities in the world in eight subjects. In two subjects, i.e. materials sciences and physics, it has been listed in the world's top 50. The rankings are based on the criteria of academic reputation, reputation among employers, frequency of citations in scientific publications, and Hirsch index, an indicator quantifying the research outputs of researchers. In Germany, KIT is in second position in materials sciences and reaches place

The 2016 Presidential Committee of KIT: Professor Dr. Thomas Hirth, Professor Dr. Oliver Kraft, Professor Dr.-Ing. Holger Hanselka, Dr. Elke Luise Barnstedt, Professor Dr. Alexander Wanner, Dr. Ulrich Breuer (from left to right).

three in informatics and physics. The following subjects of KIT are also ranked in the top ten in Germany: Electrical engineering, chemical engineering, civil engineering, chemistry, architecture, mechanical engineering, mathematics, and Earth sciences. Hence, eleven subjects of KIT reached the German top ten.

The QS Graduate Employability Ranking 2017 issued in November 2016 focused on the preparation of university graduates for the labor market. It measures, among others, the reputation of the university among employers, the number of very successful alumni, the networking of the university with employers, and the attractiveness of graduates for employers from industry and business. In this ranking, KIT is named the best German university and is no. 20 in the world.

KIT has an excellent reputation among employers: The University Ranking of WirtschaftsWoche 2016 puts KIT in top positions in all engineering science subjects. Whereas in informatics, industrial engineering and management, and electrical engineering, KIT reaches the second place, third place is achieved in mechanical engineering. In addition due to position no. eight in natural sciences, KIT ranks among the top ten universities. The WirtschaftsWoche 2016 ranking is based on assessments by personnel managers of large and medium-sized German enterprises.

Besides, KIT subjects are positively rated in the 2016 CHE University Ranking published in the DIE ZEIT Studienführer. In this ranking, students evaluate their studies conditions. Every year, one third of the disciplines is newly evaluated. Education as offered by Karlsruhe Institute of Technology (KIT) in the subject of electrical engineering and information technology was found to be convincing. For the criteria of "overall studies situation," "graduation within an appropriate period of time," and "supervision by teachers," this subject is ranked in the top group. In addition, the subjects of mechanical engineering and chemical engineering / applied chemistry are in the top group as regards the category of "overall studies situation."

KIT has been generously supported by private persons. A donation by entrepreneur Stefan Quandt, member of the Supervisory Board and alumnus of KIT, has enabled setting up of the KIT Accessibility Lab, where innovative concepts for people with a sight impairment are developed and implemented. For students with visual impairments, especially in the subjects of mathematics, computer science, natural sciences, and engineering, the Accessibility Lab develops various aids such as a web application that converts literature to selected accessible formats.

The new buildings on Adenauerring will provide more learning places and ensure enhanced networking of science, society, and industry.

Thanks to a generous donation by the Klaus Tschira Foundation, KIT can continue to develop an outstanding building project. With substantial support by the State of Baden-Württemberg and the city of Karlsruhe, new sustainably certified buildings with innovative communication areas can be constructed on Adenauerring. These buildings will contribute to developing KIT into one of the most attractive locations for research and education in Europe. For the first time, it will be possible to bring the social sciences together with informatics and economics and create additional areas for research uses.

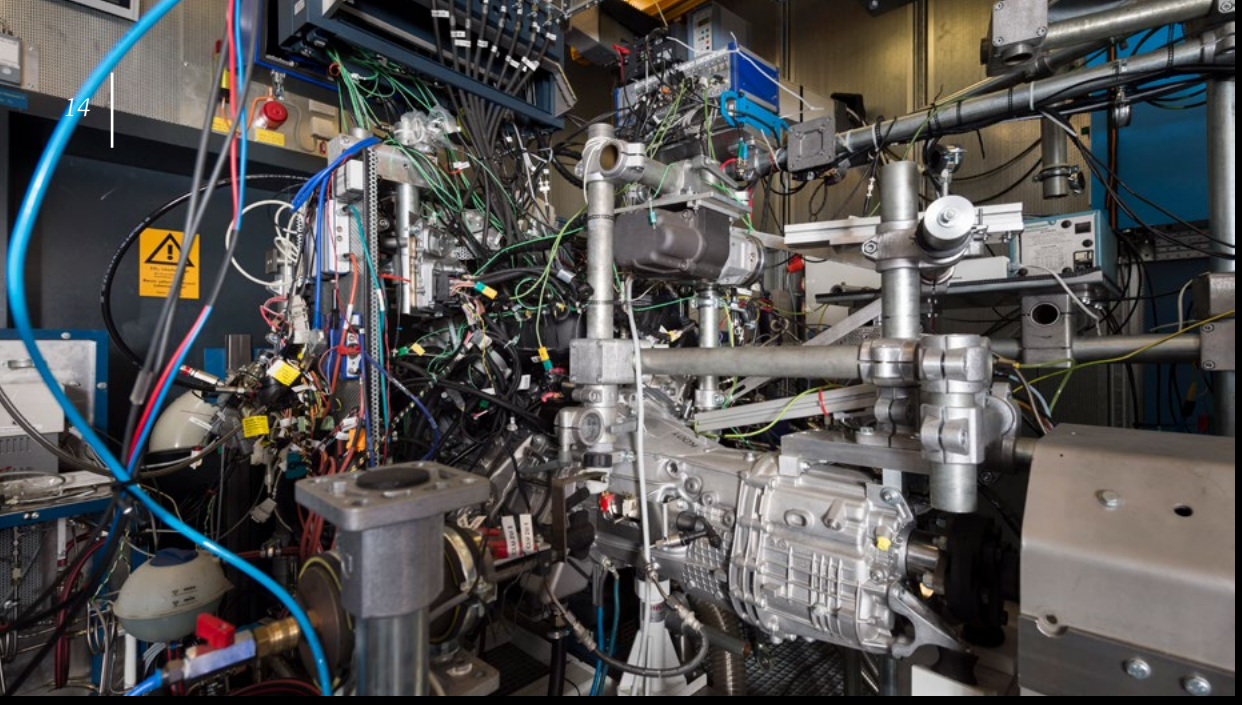
RESEARCH

KIT runs numerous research infrastructures that are also open to external users. One of them is the new high-performance computer for research ForHLR II that started operation in March 2016. It offers a high computing capacity and innovative visualization technology for latest simulation methods. ForHLR II distributes computation work to many processor cores. Altogether, it has 1186 nodes, more than 24,000 processor cores, and 95 terabytes of main memory. Computing capacity of the system is about one petaflop, corresponding to a quadrillion computing operations per second. Scientists can use ForHLR II to calculate highly complex climate models, for instance. On this basis, it is possible to study global warming, its feedback on regional climate fluctuations, the local water cycle from the biosphere up to

the atmosphere, or propagation and specific impacts of air pollutants.

In 2016, the Helmholtz Association approved of the KIT-coordinated establishment of the Helmholtz Data Federation (HDF). Thanks to its secure federation structure and the setup of multi-thematic data centers, HDF will enable data-intensive science communities to find scientific data, to share them while retaining data sovereignty, to use them across disciplines, and to archive them reliably. The federation relies on three key elements: Innovative software for research data management, excellent user support, and latest storage and analysis hardware.

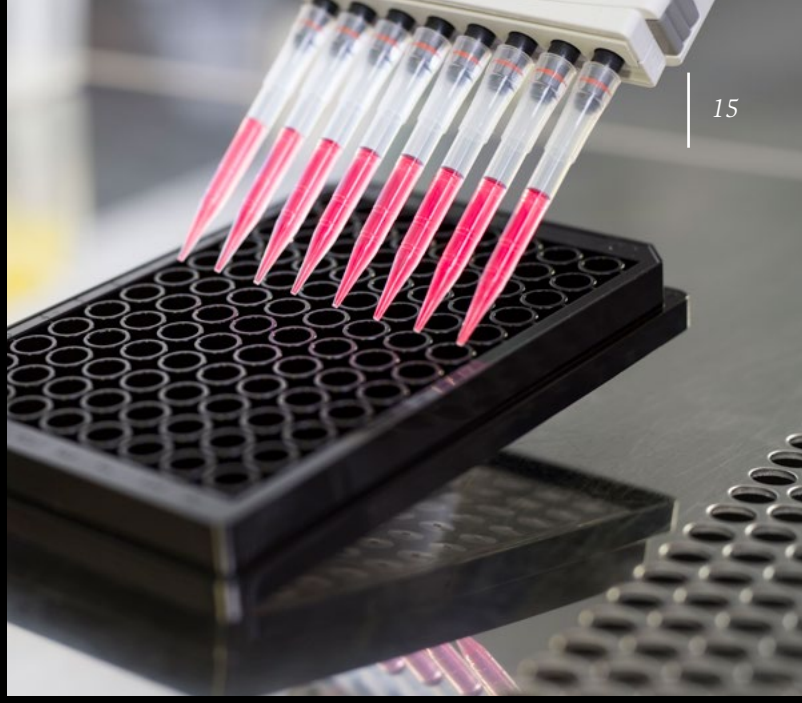
The State of Baden-Württemberg and the Federal Republic of Germany equally shared the costs of construction of the Material Research Center for Energy Systems of KIT in the amount of EUR 27.4 million. In November 2016, this center was officially opened together with the Microtribology Center µTC of Fraunhofer Society in the direct vicinity. The Material Research Center pursues a highly interdisciplinary approach. Research focuses on innovative materials for efficient energy conversion and storage.



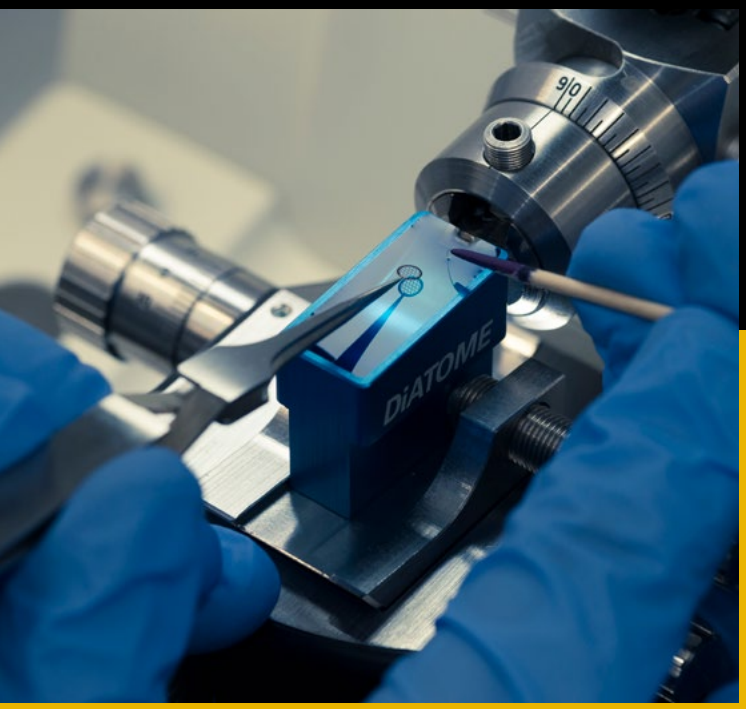

SCANIA
230
JET A-1


IPEK


regional eco mobility
2030
Emissionsfreies Fahren
Leistungsfähigkeit
Nutzerfreundlichkeit
Orgware
Kommunikation
Mobilitätskonzepte und Geschäftsmodelle




AURIGA


DIATOME


KIT

ENSURE, ENAVI, AND P2X
KOPERNIKUS PROJECTS FOR THE ENERGY TURNAROUND

The German "energy turnaround" or "Energiewende" is a challenge facing politics, industry, science, and society. It consists of goals defined by the federal government: By 2050, the share of renewable sources in electricity supply is to increase to 80%. In parallel, primary energy consumption is to be reduced by 50% (compared to 2008). Moreover, compared to 1990, emission of greenhouse gases is to be decreased by 80% at least. Other goals are the phase-out of nuclear energy by 2022 and increased independence of energy imports while maintaining supply security. Hence, the German energy system is facing a profound change. It will only be successful, if adequate prerequisites and solutions are developed from both the technical and social perspectives.

With the "Kopernikus Projects for the Energy Turnaround," the federal government has launched a large and comprehensive research initiative: Within the next ten years, science, industry, and civil society are to jointly develop technological and economically efficient solutions for the transformation of the energy system. In 2016, four of forty project proposals were selected for funding. KIT was very successful: It coordinates the ENSURE project and is involved in another two Kopernikus projects, ENavi and Power-to-X.

"For the German energy system, the energy turnaround is a change of paradigms that is not only associated with challenges, but also with economic opportunities," says Professor Dr.-Ing. Holger Hanselka, President of KIT, Spokesperson of the ENSURE Board, and Research Field Coordinator Energy of the Helmholtz Association. "It is a national joint venture that is implemented and designed by KIT together with its partners in the Helmholtz Association and Kopernikus projects. In the Helmholtz Association, KIT stands for an integrated approach to studying the energy system and transforming it on the technical level as well as on the level of society. Our success in acquiring the Kopernikus projects has moved KIT into the focus of national research for the energy transition."

The Kopernikus project ENSURE is to answer the question of which fractions of centralized and decentralized supply the future power grid structure will comprise.

Fluctuating energy production due to renewable energy sources results in high requirements on novel energy storage systems.

ENSURE – New Power Grid Structures for the Energy Turnaround

The ENSURE consortium intends to answer the question of what a technically, economically, and socially reasonable power grid structure will be like and which fractions of centralized and decentralized supply it will comprise. For this purpose, efficient new system structures, stable system control mechanisms, and the integration of new technologies are studied comprehensively within the project. Particular attention is paid to the technical and societal transformation process to be managed. The ENSURE consortium consists of six core partners represented in the board of directors and another 17 project partners. The core partners are KIT and RWTH Aachen as representatives of research and higher education and the companies of E.ON (utility company and distribution grid operator), TenneT TSO (transmission grid operator), Siemens (integrated technology company), and ABB (power and automation technologies).

ENavi – Navigation System for the Energy Turnaround

Transformation of energy supply will have impacts on numerous interconnected systems: On the entire energy system, on organizational, political, and social structures, as well as on the behavior of companies, consumers, and citizens. An economically efficient, environmentally compatible, reliable, and socially viable energy system, hence, requires a holistic approach on the system level. The ENavi Kopernikus project considers energy transition to be a transformation process of the whole society and combines scientific analysis with socio-political requirements. The project is coordinated by the Institute for Advanced Sustainability Studies, Potsdam; KIT is represented in the proposing board of directors.

Power-to-X – New Process Technologies for Power Use

Increasing use of renewable energy sources will even more frequently cause the amount of electricity generated to exceed electricity consumption at that particular moment. To reasonably use this excessive power, it has to be stored inexpensively and efficiently or converted into other forms of energy. Electric power can be stored in batteries or used for the production of various substances: Gaseous substances, such as hydrogen or methane (power-to-gas), liquid substances, such as fuels (power-to-liquid, power-to-fuel), or basic chemicals for the chemical industry (power-to-chemicals). The Power-to-X project is coordinated by RWTH Aachen, Forschungszentrum Jülich, and DECHEMA. Seven groups of KIT scientists will contribute.

AUTONOMOUS, INTERCONNECTED, SMART, AND SAFE
KIT IN THE CENTER OF MOBILITY RESEARCH

Mobility is one of the crucial prerequisites for economic growth, employment, and participation of the individual in social life. Mobility requires a high-performance mobility scheme that optimally interconnects all transport means. Under the KIT Mobility Systems Center, 37 institutes work on current research projects. Research alliances with industry partners give rise to innovations in the mobility sector.

Pooled Virtually

The Tech Center a-drive research alliance pools the competencies in the area of automated driving of Ulm University, Karlsruhe Institute of Technology, and the FZI Research Center for Information Technology. The industry partner Daimler AG provides for quick implementation in practice. The virtual Tech Center a-drive is to gradually transfer autonomous driving units to series production. It is funded with a total of EUR 7.5 million, with Daimler AG contributing EUR 5 million, while the Baden-Württemberg Ministry of Science, Research, and the Arts and the Baden-Württemberg Ministry of Finance and Economics provide EUR 1.25 million each.

The highly integrated lateral and transverse guidance systems developed by the OmniSteer project significantly increase maneuverability in situations like parking.

Steered Individually

Using a demonstration vehicle, the OmniSteer project is aimed at developing new chassis types with wheels that can be steered individually and electric drives, the goal being to increase efficiency in flowing urban traffic. Particularly in narrow inner-city areas, maneuverability of automobiles is pushed to the limit. Those who need to park their vehicles frequently, such as delivery services and mobile care providers, lose a lot of working time searching for and then getting into parking spaces. The project is funded by Germany's Federal Ministry of Education and Research with a budget of EUR 3.4 million until 2018. Project partners are the Schaeffler Group, PARAVAN, HELLA, and KIT with its Institute of Vehicle System Technology and the FZI Research Center for Information Technology.

Interconnected Regionally

The alliance "Karlsruhe Priority Region for Mobility Systems" pools the competencies of research partners in the region for the development of efficient, smart, and integrated mobility solutions. "Mobility in Germany and Baden-Württemberg needs new impulses from research to create values added," Professor Thomas Hirth, KIT Vice President for Innovation and International Affairs, emphasizes. The focus is on the application and practical suitability of research findings. The research alliance enhances Karlsruhe's visibility as a center of mobility research and the innovative capacity of the region.

To start the project, the partners have initiated seven joint projects. One project analyzes changed mobility and traffic requirements due to aging population or urbanization and develops adapted mobility concepts and technical solutions. Another two projects cover new challenges facing urban infrastructure and urban traffic flows as well as networked mobility. Another project focuses on the design and operation of a self-driving car and pertinent IT services. In addition, electric and hybrid electric drives as well as conventional combustion engines are studied. A last project concentrates on integrated lightweight construction of an electric compressor for combustion engines.

Automated and connected driving will be tested in real settings in and around the city of Karlsruhe.

The budget of the alliance totals about EUR 8 million. EUR 2.1 million each are financed by the State Ministries of Science, Research, and the Arts and of Finance and Economics in the pilot phase of two years. Founding partners of the alliance are KIT, the Fraunhofer Institutes for Chemical Technology, of Optronics, System Technologies, and Image Exploitation, for Systems and Innovation Research, and for Mechanics of Materials, the Fraunhofer Project Group for New Drive Systems, Karlsruhe University of Applied Sciences, and KIT's FZI Research Center for Information Technology. Enterprises are invited to join the alliance for producing synergies and transferring knowledge among the partners via collaborative research projects.

Test Center for the Future

The region of Karlsruhe will become a top address for new types of mobility. With the "Test Center for Connected and Automated Driving," the State of Baden-Württemberg will actively shape the future of self-driving vehicles. The Test Center will be set up in Karlsruhe, with connections to Bruchsal and Heilbronn. Karlsruhe Institute of Technology (KIT) is one of the partners. "The Karlsruhe Technology Region in Southwest Germany is the ideal location for pioneer work in the area of autonomous and connected driving in the next years," Professor Dr.-Ing. Holger Hanselka, President of KIT, says. "In the Test Center, we bring together research and application as well as the automotive and ICT industries."

Together with the Test Center, a real-world lab for concepts, methods, and business models of autonomous and connected driving will be established. Here, research into social and technical challenges in the mobility sector is linked more closely to application.

At the Karlsruhe Test Center, companies and research institutions can test future-oriented technologies and services related to connected and automated driving in real-life traffic, examples being automated driving of cars, buses, or commercial vehicles, such as road cleaning and delivery services vehicles. In addition, regulatory and legal requirements are developed further under the project that pursues a holistic approach.

The Baden-Württemberg Ministry of Transport provides EUR 2.5 million for the setup of the Test Center. The consortium itself and the associated and industry partners additionally contribute own funds of around EUR 4.2 million. Apart from the KIT, the FZI Research Center for Information Technology, the city of Karlsruhe, Karlsruhe University of Applied Sciences, Heilbronn University, the Fraunhofer Institute of Optronics, System Technologies, and Image Exploitation, the cities of Bruchsal and Heilbronn, and other associated research and industry partners are involved.

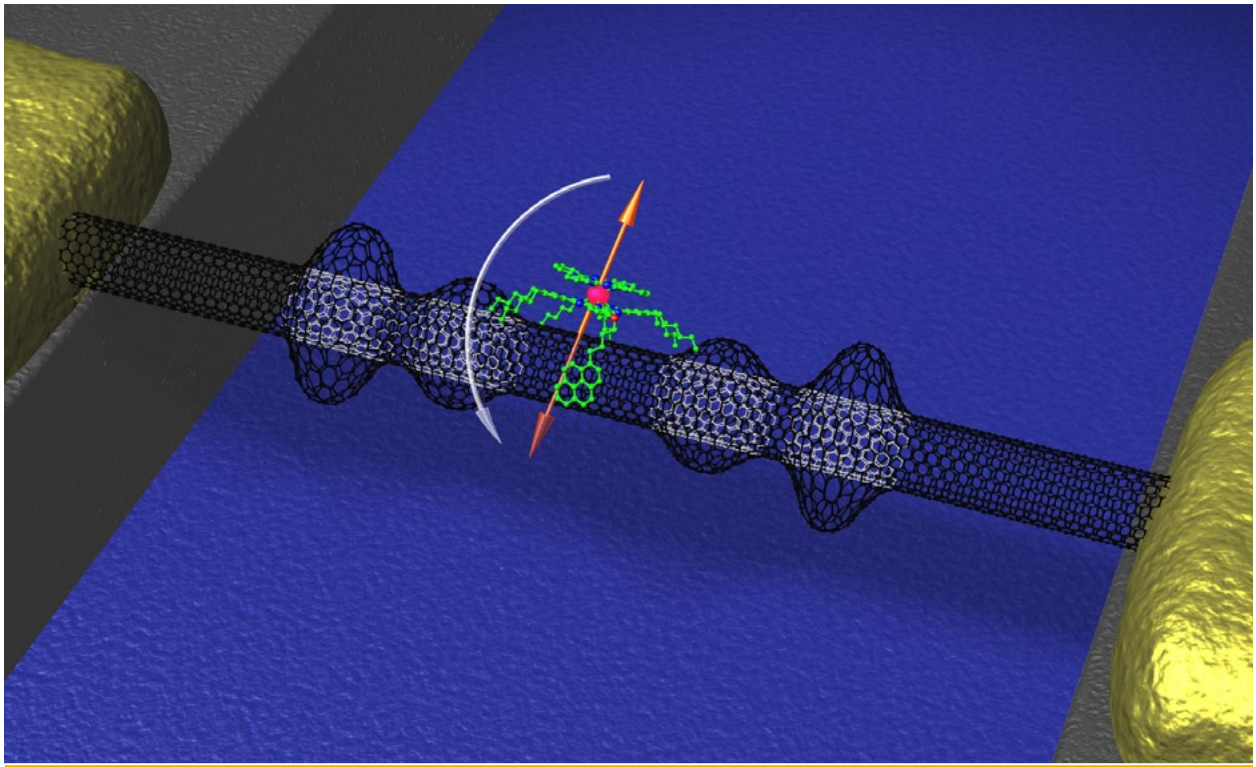
ON THE WAY TOWARDS A QUANTUM COMPUTER
QUANTUM MAGNETS AND QUANTUM PHOTONIC CIRCUITS

Secure data encryption, ultra-rapid computation of huge data volumes, or so-called quantum simulation of highly complex systems: Optical quantum computers are a big hope for tomorrow's computer technology. Scientists of KIT pave the way towards these goals by conducting fundamental experiments. This includes formulation of the "quantum Einstein-de-Haas effect" as well as development of a quantum photonic circuit with an electrically driven light source.

What Makes the Spin Flip Over

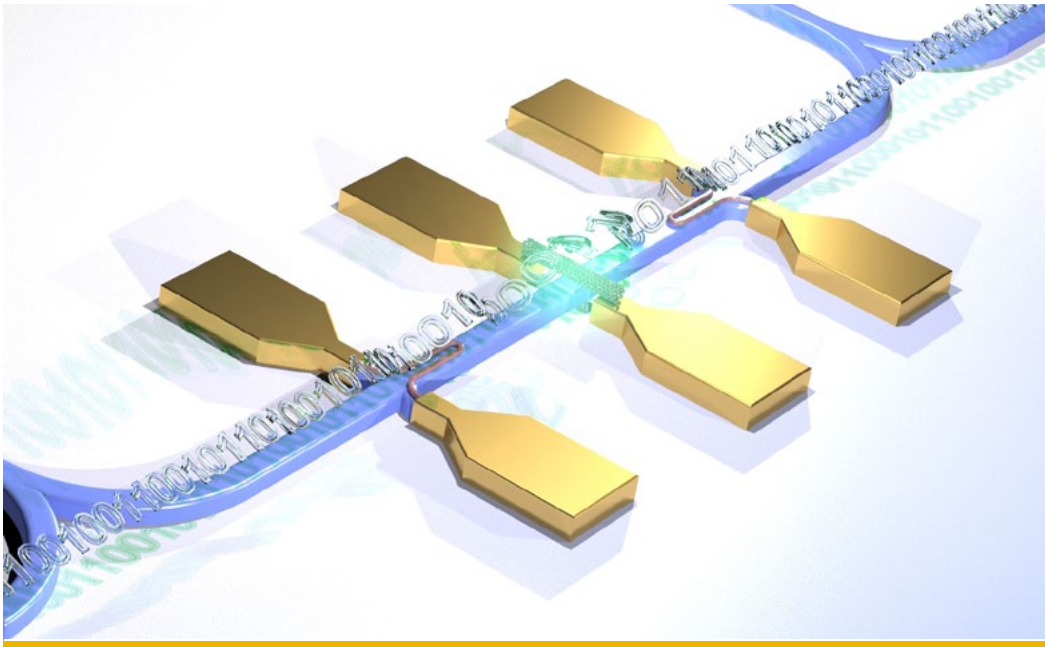
Quantum objects have properties that distinguish them significantly from macroscopic objects. Electrons behave like tiny magnets, one pole of which may have two directions only: Downwards or upwards. Under specific conditions, the spin may flip over and the particle changes its direction of rotation. In 1915, Albert Einstein, together with the Dutch physicist Wander Johannes de Haas, proved that the generated magnetism is due to the intrinsic angular momentum created by the inherent electrons of the bar material.

But what happens, if the magnetic material that consists of a large number of electron spins in the experiment described above is reduced to a single spin – the spin of a quantum magnet? This question was addressed by scientists of KIT and the Institut Néel at the Centre National de la Recherche Scientifique (CNRS) in Grenoble, France: They attached a magnetic molecule to a carbon nanotube and measured the current flowing through this arrangement while changing the external magnetic field. The scientists proved that the reversal of the magnetic moment of the quantum magnet is determined by the mechanical properties of the carbon nanotube. "Only if the spin couples to a phonon carrying a suitable amount of energy, can it flip over," explains Professor Dr. Mario Ruben, Director of the Molecular Materials Group of KIT's Institute of Nanotechnology and Institute for Inorganic Chemistry. This correlation which applies to quantum magnets in the nanoworld has now been reformulated by researchers as the new "quantum Einstein-de-Haas effect." One of the scientists involved, Professor Dr. Wolfgang Wernsdorfer, returned from the Institut Néel to Germany in 2016. Funded by a Humboldt



The mechanical properties of the carbon nanotube (black) cause the spin (orange) of a molecule (green and red) to flip over.

professorship, he is currently setting up a center for molecular quantum spintronics at KIT. This center will facilitate future groundbreaking work in the fields of electronics, spin physics, and quantum computing at KIT. One of the goals is to build first components of quantum computers – ultra-fast and energy-efficient computers that are based on magnetic molecules and nuclear spins.



Carbon nanotube (center) as a photon source and superconducting nanowires as receivers constitute parts of the optical chip.

Quantum Optical Structure on a Chip

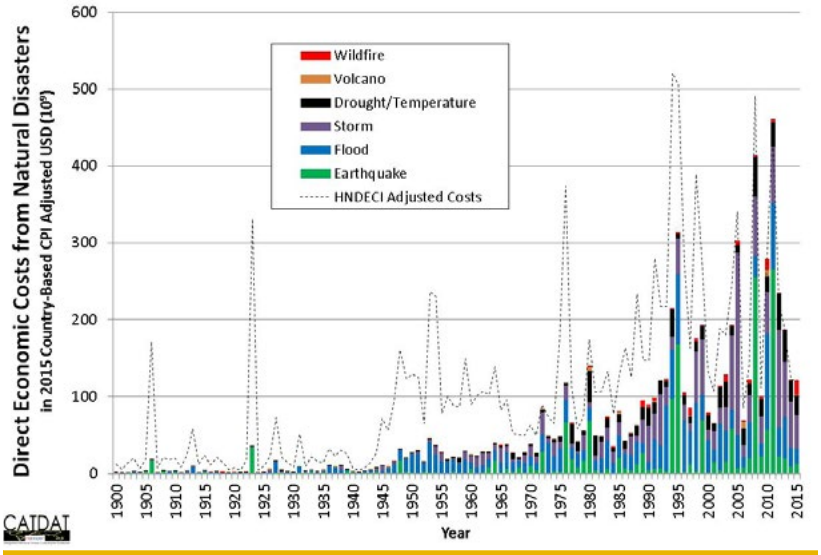
Researchers used special carbon nanotubes for a quantum photonic circuit with a light source integrated into the chip. Carbon nanotubes have a diameter one hundred thousand times smaller than a human hair and they emit single light particles when excited. Light particles (photons) are also referred to as light quanta. Hence, the term "quantum photonics." "Experiments investigating the applicability of optical quantum technology so far have often claimed whole laboratories," Professor Dr. Ralph Krupke of KIT says. "However, reasonable use of this technology requires its accommodation on minimum space."

The carbon nanotubes are attractive ultracompact light sources for optical quantum computers, because they emit single photons. As all elements on the chip now developed are triggered electrically, additional laser systems are no longer required, which is a considerable simplification compared to optical excitation used so far. "Development of a scalable chip on which a single-photon source, detector, and waveguide are combined, is an important step for research," emphasizes Ralph Krupke, who conducts research at the KIT Institute of Nanotechnology and the Institute of Materials Science of Darmstadt Technical University. "As we were able to show that single photons can be emitted also by electric excitation of carbon nanotubes, we have overcome a limiting factor that so far prevented potential applicability."

The study was carried out by researchers of the University of Münster and Karlsruhe Institute of Technology in cooperation with scientists from Poland and Russia. Work was supported by the German Research Foundation, Helmholtz Association, and Volkswagen Foundation.

EVALUATING NATURAL DISASTERS
CATDAT DATABASE SUPPORTS CATASTROPHE MANAGEMENT

More than eight million deaths and seven trillion US dollars of economic damage have been caused by natural disasters since the start of the 20th century. These figures have been calculated and collected by geophysicist Dr. James Daniell from Karlsruhe Institute of Technology. He developed the CATDAT database to evaluate data of natural disasters.



Economic costs 1900 – 2015: Flood, earthquake, and storm have caused the highest losses.

Since 2003, James Daniell, who conducts research at KIT's Geophysical Institute as well as at the Center for Disaster Management and Risk Reduction Technology (CEDIM), has built the CATDAT database from information out of online archives, books, reports from institutions, publications, and other databases around the world.

CATDAT looks at examining socioeconomic indicators and represents a massive base for a post-disaster risk model that helps governments and aid organizations manage catastrophes and assess the scale of a disaster. James Daniell has evaluated over 35,000 natural disaster events globally. For his analyses, he uses socioeconomic indices, such as population development, consumer price indices, gross domestic products, capital stock, and data on food security and building inventory and vulnerability in all countries exposed to disasters.

His analyses revealed that around a third of economic losses between 1900 and 2015 was caused by floods. Earthquakes caused 26 percent of losses, storms around 19 percent, volcanic eruptions around one percent only. In absolute terms, economic losses due to natural disasters have increased over the last 100 years. Over the whole time period, floods have caused the highest amount of economic losses, however, in recent times, since 1960, the highest percentage has switched to storms and storm surge with around 30 percent of losses.

In relation to the current capital value of infrastructure and buildings in each country, the damage caused by natural catastrophes is decreasing. Many countries have enhanced protection of their buildings against natural disasters and, hence, reduced the risk of high damage. Improved flood protection also has reduced losses compared to the 1900 to 1960 time period, during which many huge events occurred. Less developed nations, however, are often more vulnerable towards catastrophes: More deaths and higher economic losses are to be expected than in higher developed countries. One common reason is that building regulations are often not adhered to.

Looking at the largest economic losses, the year 2011 with major earthquakes in Japan and New Zealand is the highest loss to date. With around 335 billion dollars direct damage, the Tohoku earthquake–tsunami–nuclear accident is the highest single-event natural catastrophe loss. Around 18,500 people died and around 450,000 became homeless.

RUNNING ELECTRONS

KATRIN NEUTRINO BALANCE IS CELEBRATING "FIRST LIGHT"

Neutrinos are the most abundant massive particles in the universe: Each cubic centimeter contains 336 neutrinos. Their investigation leads to the fundamental problems of particle physics and cosmology. Neutrinos play an important role in studying the origin of matter and in the design of visible cosmic structures. For some years now, it has been known that neutrinos have a rest mass, a discovery that received the Physics Nobel Prize in 2015.

Professor Dr. Oliver Kraft, Professor Dr. Guido Drexlin, Professor Dr. Johannes Blümer (all KIT), Professor Dr. Ernst-Wilhelm Otten, University of Mainz, and Professor Dr. Hamish Robertson, University of Washington, Seattle, switch on the "first light" of KATRIN.

KATRIN, the Karlsruhe Tritium Neutrino Experiment, is to directly measure for the first time the so far unknown mass of neutrinos. KATRIN is being set up in international cooperation at the Karlsruhe Tritium Laboratory on KIT's Campus North. Experimental measurement is based on the highly precise spectroscopy of highest-energy electrons produced by the beta decay of tritium.

One important step on the way to measurement operation was "first light" in October 2016. For the first time, the detector "saw" electrons run through the whole 70 m length of the facility. For the "first light," a switchable electron source was used instead of tritium. It employed a UV light source knocking out suitable electrons from a gold-plated stainless-steel plate, which impinged upon the detector at the opposite end of the facility after a time of flight of a few millionths of a second. On their way through the whole experiment, the electrons passed superconducting magnets and cold traps, regions filled with gas and vacuum, zones with temperatures below four Kelvin and room temperature, whose operation must be harmonized optimally. Measurement of neutrino mass in the tritium mode is to begin in autumn 2017. The planned measurement time will be five years.

To cope with the problem of the century, "measuring neutrino mass," the scientists working with KATRIN have solved numerous scientific problems over the past couple of years, venturing into new technical territory. One of the challenges is maintaining a high voltage of 18,600 V to a precision of 0.01 V. Or the generation of an ultrahigh vacuum corresponding to the vacuum existing on the surface of the moon, and do so in a world record volume of 1240 cubic meters corresponding to the size of a gym. Some 150 scientists from six countries and 18 renowned institutions are involved in the KATRIN experiment, whose budget amounts to EUR 60 million.

EXCELLENT CELL RESEARCH

CANCER RESEARCH AND MUSCLE REPAIR

3D Model for Prostate Cancer Research

In the western world, prostate cancer is the most common malign tumor in men. Science is facing the challenge of examining the progression of the disease from the trigger to the formation of metastases and particularly of understanding the interaction of cancer cells with their environment.

To achieve this, the group headed by Dr. Friederike J. Gruhl at the Institute of Microstructure Technology is working closely with Professor Andrew C. Cato at KIT's Institute of Toxicology and Genetics to develop a biomimetic system. Using this cell culture model, human prostate cancer can be recreated in vitro. Cryogels are used as the base material. They are made of synthetic polymers which can be put together to form three-dimensional porous structures due to the formation of ice crystals from trapped water. The mechanical properties of these structures are very similar to those of natural cell tissue. In future, it may be possible to cultivate both healthy cells of the prostate tissue and cancer cells in the 3D cryogel model.

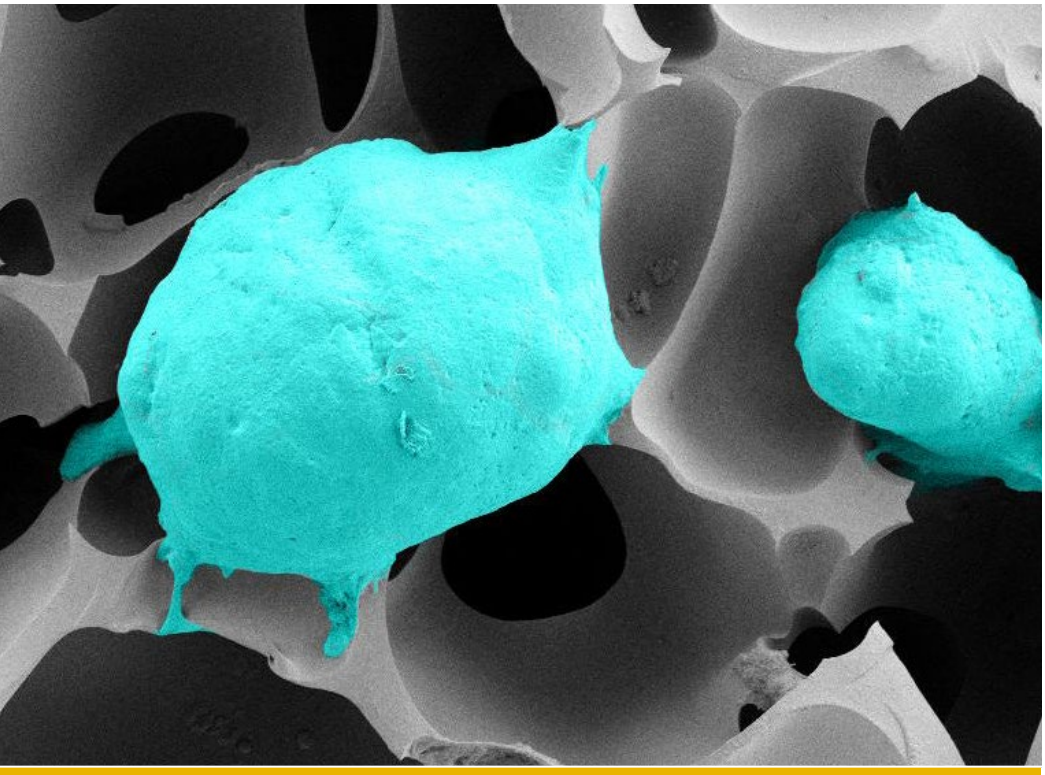
A paper on this project published in the scientific journal Small dealing with micro and nano sciences was crowned top story of the week on "Prostate Cell News," a major international platform and database for prostate cancer research.

Repair Mechanisms of Torn Muscle Fibers

The cells of our skeletal muscles have effective mechanisms for the repair of ruptures in their cell membranes. These ruptures are due to mechanical stress to which we expose our muscles even when doing healthy exercises. These holes in the cell envelopes must be closed as soon as possible, because otherwise muscle cells will die off and atrophy will develop.

In an interdisciplinary cooperation project of the research teams led by Professor Dr. Uwe Strähle and Professor Dr. G. Ulrich Nienhaus, doctoral students Volker Middel and Lu Zhou developed new techniques to observe membrane repair processes with ultra-high resolution in real time in human cells and in muscle cells of zebrafish embryos. It only takes a few seconds until proteins from the inside of the injured cell form a repair patch that finally closes the hole in the membrane.

KIT researchers demonstrated that scavenger cells moving around within the muscle virtually perform nanosurgery to latch to the repair patch and eat it up. Only after the patch has been removed, is the cell membrane fully restored. Thus, the repair of the membrane in muscle fibers requires, in addition to the formation of repair patches in the injured cell, the aid of macrophages roaming around within the muscle.

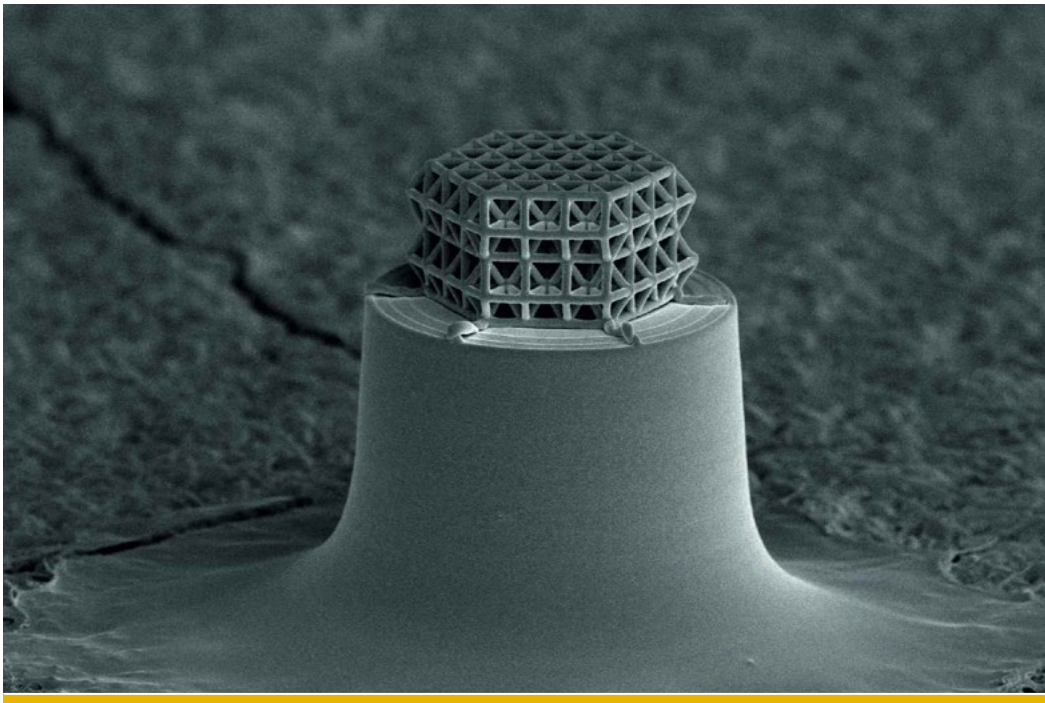


Prostate cancer cells (green) in a superporous cryogel with tissue-like elasticity.

WITH A LASER AND PYROLYSIS

SMALLEST LATTICE STRUCTURE WORLDWIDE

Struts and braces shorter than one micrometer and 200 nanometers in diameter form the smallest lattice structure in the world. They are made of glassy carbon and are smaller than so-called metamaterials by a factor of 5. Metamaterials are materials, whose structures of some micrometers (millionths of a meter) in dimension are planned and manufactured specifically for them to possess mechanical or optical properties that cannot be reached by unstructured solids. Examples are invisibility cloaks that guide light, sound or heat around objects, materials that counterintuitively react to pressure and shear, or lightweight nanomaterials of high specific stability.



The smallest lattice structure in the world is visible under the microscope only. Struts and braces are 0.2 µm in diameter. Total size of the lattice is about 10 µm.

The stable lattice structure presented for the first time in the Nature Materials journal in February 2016 was produced by the established 3D laser lithography process. The desired structure of micrometer size is hardened in a photoresist by laser beams in a computer-controlled manner. However, resolution of this process is limited, such that struts of about 5 to 10 µm length and 1 µm in diameter can be produced only. In a subsequent step, the structure is therefore shrunk and vitrified by pyrolysis. For the first time, pyrolysis was used for manufacturing microstructured lattices. The object is exposed to temperatures of around 900°C in a vacuum furnace. As a result, chemical bonds reorient themselves. Except for carbon, all elements escape from the resist. The unordered carbon remains in the shrunk lattice structure in the form of glassy carbon. The resulting structures are tested for stability under pressure by the researchers.

The small dimension results in so far unreached ratios of strength to density. The results reveal that load-bearing capacity of the lattice is very close to the theoretical limit and far above that of unstructured glassy carbon. Diamond is the only solid having a higher specific stability.

Microstructured materials are often used for insulation or shock absorption. Open-pored materials may be used as filters in the chemical industry. Metamaterials also have extraordinary optical properties that are applied in telecommunications. Glassy carbon is a high-technology material made of pure carbon. It combines glassy, ceramic properties with graphite properties and is of interest for use in electrodes of batteries or electrolysis systems.

HIGH-TEMPERATURE SUPERCONDUCTORS FOR JAPAN
KIT SUPPLIES CURRENT LEADS FOR A FUSION POWER PLANT

For millions of years, the sun's energy has been produced by the fusion of light atomic nuclei, such as hydrogen. Fusion of atomic nuclei takes place inside the sun as a result of the high pressure and the high temperature of several million degrees Celsius prevailing there. Controlled reproduction of this process on Earth might open up a nearly inexhaustible source of energy, as the necessary light elements are available in high numbers or may be supplied by suitable processes.

A big problem in implementing a controlled nuclear fusion process is confinement of the atoms at extremely high temperatures, at which atomic nuclei are separated from the respective electrons and form a so-called plasma. Confining this plasma and keeping it away from the wall of the fusion power plant is achieved by means of very high magnetic fields. These magnetic fields can be produced in an energy-efficient way using superconducting magnetic coils.

Operation of superconducting magnetic coils requires current leads for transferring currents of up to 80,000 amperes from room temperature to the temperature of the superconducting magnetic coils of -270°C. Cooling of these current leads is associated with a high energy consumption. To minimize losses during current transport, copper, the conductor material that is usually applied at these temperatures, is replaced by so-called high-temperature superconductors. Below -210°C, these materials no longer have an electric resistance, current is not lost anymore. The current leads consist of two parts, a high-temperature superconductor module and a conventional copper heat exchanger.

Karlsruhe Institute of Technology is highly experienced in constructing such high-temperature superconductors and produces 26 of these current leads with a maximum current of 25,700 amperes for operation of JT-60SA, the Japanese fusion machine currently under construction. Before they are shipped to Japan, these current leads are subjected to acceptance tests. Meanwhile, 22 of the 26 current leads have been tested and 16 have been sent to Japan and integrated into the machine already. By the end of 2017, the remaining current leads are planned to be built and tested. The project is funded by the Federal Ministry of Education and Research.

Many high-temperature superconductor current leads have already been tested successfully in the CuLTKa test facility. Scientists met at KIT for the 27th Technical Coordination Meeting of the Japanese fusion facility.

AIR SHOWERS IN THE EARTH'S ATMOSPHERE

NEW METHOD TO DETECT COSMIC RAYS

High-energy cosmic rays generate air showers of secondary particles and electromagnetic radiation in the Earth's atmosphere. Their measurement provides information on the properties of primary particles. Measurements by the radio antennas of LOFAR (Low Frequency Array) and at the Pierre Auger Observatory demonstrated that the energy of primary particles and element composition of cosmic rays can be determined with high precision using the KIT-developed CoREAS (CORSIKA-based Radio Emission from Air Showers) simulation code. Thus, conclusions may be drawn with respect to the potential sources of the particles.

Recent results found a surprisingly high number of light particles, protons and helium nuclei, at energies above 10^{17} electron volts. In this relatively high energy range, preferably heavy particles have been found so far, which may arise from supernova remnants. This might suggest that the light particles detected now are of extragalactic origin or – the more exciting option – that a particularly energy-rich source exists in our galaxy. Experts already know that particle flux from galactic sources stops somewhere and cosmic rays of highest energies can be produced in the most energetic extragalactic sources only. Yet, it is still unknown in which energy ranges this transition takes place. Recent analysis of the LOFAR data has now opened up a new perspective on this question. Such research would not be possible without the simulation code CoREAS developed by KIT. With this code, scientists evaluate the measurements of the radio antennas and interpret the signals. Up to 100 simulations may be required to exactly classify a signal. CoREAS is used by astroparticle physicists worldwide to interpret radio emissions from air showers.

This composite photograph illustrates a particle shower hitting the detector field in the center of the LOFAR telescope in Exloo, the Netherlands.

CoREAS is the result of ten years of development work at KIT. The simulation code is implanted in the CORSIKA code (Cosmic Ray Simulation for KASCADE) that was used in particular for KIT's KASCADE-Grande particle detector experiment and the LOPES radio prototype experiment operated until 2013.

Within the framework of the Pierre Auger Observatory, an international astrophysical large-scale experiment in Argentina with major contributions by KIT and other German universities, CORSIKA is being further developed and continuously complemented by new interaction models.

TEACHING

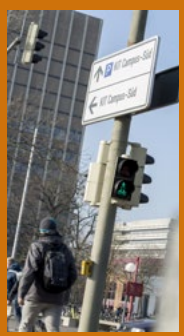
In the 2016/17 winter semester, the number of KIT students reached a historic maximum of 25,901. This is mainly due to the increase in foreign students from 16.1% in the 2012/13 winter semester to presently 22.3%. The reasons are the higher international reputation of KIT and the high international attractiveness of German universities in general. The proportion of female students also rose steadily in the past years to the current historic high of 28.2%. By 2025, the proportion of female students at KIT is planned to increase to 40%.

In the 2016/17 winter semester, KIT established two new bachelor programs, namely, "Technomathema-

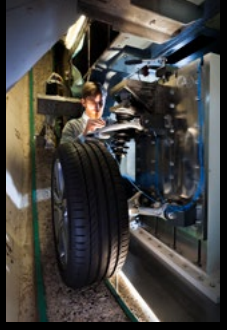
tik" (technomathematics) and "Wirtschaftsmathematik" (economic mathematics). So far, there has only been a bachelor program of mathematics that offered the three lines of mathematics, technomathematics, and economic mathematics which were then continued by separate master's courses. Establishment of three separate bachelor programs now allows for incorporating their specific differences in the corresponding studies and examination regulations.

The master program of "Resources Engineering" was supplemented by several courses relating to the topic of "Water" and renamed "Water Science and Engineering" as of winter semester 2016/17. This program now offers interdisciplinary, research-oriented education at the interface of hydrological engineering and natural sciences.

Since the 2016/17 winter semester, KIT's teaching degree program has been extended by a course on computer science at secondary schools. Computer science teachers trained in Karlsruhe are to help improve and extend computer science education at schools. In 2015, computer science was made a mandatory subject in the curricula of secondary schools in the State of Baden-Württemberg.




6.1 Projective modules



BARRIER-FREE ACCESS TO INFORMATION

ACCESSIBILITY LAB AT STUDY CENTER FOR THE VISUALLY IMPAIRED

The new "Accessibility Lab" of Karlsruhe Institute of Technology develops and realizes innovative concepts for people with visual impairments. The Lab belongs to the Study Center for the Visually Impaired (SZS) and combines research, teaching, and support in the fields of assistive technologies, barrier-free access to information, and adapted working environments for blind and visually impaired people. The Accessibility Lab was financed from a donation by entrepreneur Stefan Quandt.

"The new Accessibility Lab of the Study Center for the Visually Impaired reduces barriers and strengthens research: Students with visual impairments can benefit from an even better working environment. At the same time, they can contribute their skills and experience to research and development for new assistive technologies. All people involved will benefit. I am happy that my donation helps strengthen the SZS in its role as a driver of innovations," Stefan Quandt, an alumnus of KIT, says.

The Accessibility Lab of SZS is equipped among others with a lab for printing, a test lab for research and development, and facilities to set up assistive working and lab environments. The Accessibility Lab develops assistive technologies in cooperation with manufacturers of aids for handicapped persons. Moreover, it is currently establishing a network with other universities and offers training courses on barrier-free teaching materials for education facilities. "Thanks to Stefan Quandt's donation, we can now buy state-of-the-art devices, such as a 3D printer working with various printing technologies," says Professor Rainer Stiefelhagen, Director of SZS, who also holds the Chair for "IT Systems for Visually Impaired Students."

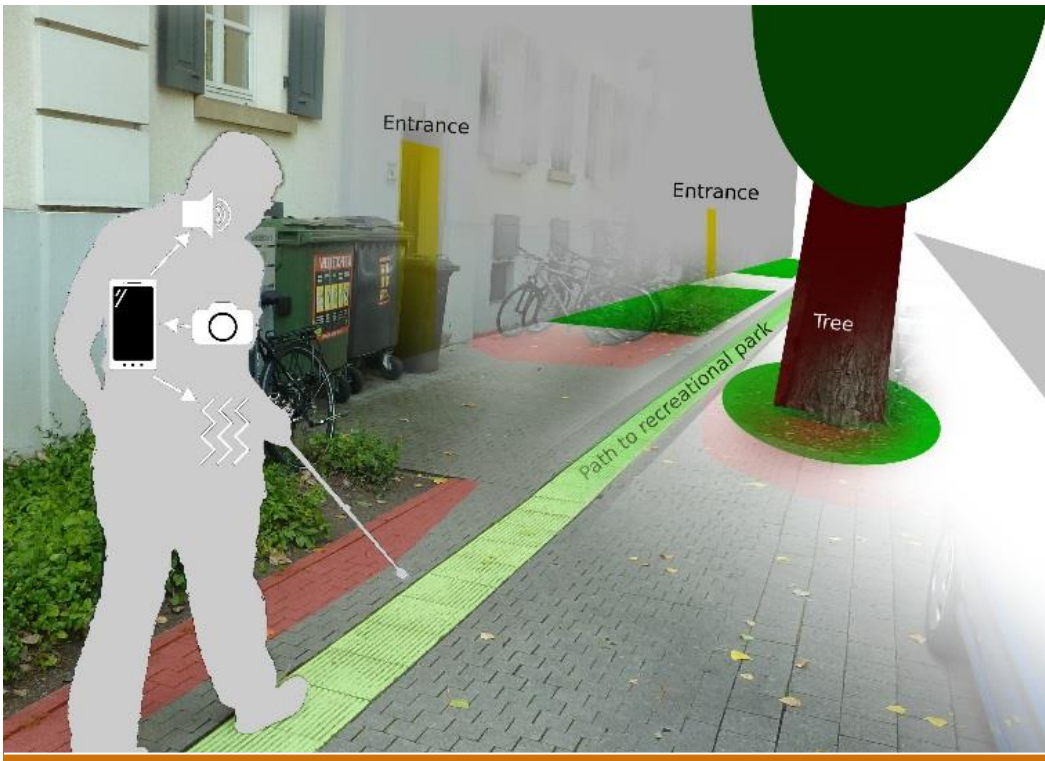
3D printers based on various printing technologies are used to make three-dimensional graphics tactile. (3D campus model (digital and printed))

IT-based assistive technologies can be of great help to visually impaired people. KIT scientists develop navigation systems to help blind and visually impaired persons move around independently in unknown spaces or large-surface Braille displays, i.e. Braille output devices, that recognize images, photos, and graphics.

Inauguration of the KIT Accessibility Lab: Stefan Quandt, entrepreneur, Professor Dr.-Ing. Holger Hanselka, President of KIT, and Professor Dr. Rainer Stiefelhagen, Director of SZS (from left to right).

Navigation System for People with Visual Impairments

For blind and visually impaired people, it is difficult and sometimes even risky to move independently in unknown environments, especially in urban and busy areas. The feeling of insecurity and disorientation and the fear of accidents can significantly limit their mobility and social integration. Within the framework of the TERRAIN collaborative project, scientists want to develop and test a portable electronic assistance system, by means of which the range of movement of the visually impaired is extended considerably. The Federal Ministry of Education and Research funds this project with EUR 1.7 million.



The TERRAIN project is to extend the range of movement of the visually impaired.

The system relies on mobile devices, such as smartphones or smart watches. Their usability by persons with visual impairments is steadily improving. Acceptance rates are rising, as these devices offer important functions, such as GPS or voice input and output.

Besides the mobile device, the system will include another two hardware components. A camera captures the situation directly in front of the navigation system user, such as signs, barriers, persons, and sends it to the mobile phone for evaluation. Here, digital map data and pictures of certain environments with typical landmarks, buildings, entrances, and crossings are stored. In addition, a "mobile Braille line" is to provide detailed information about the environment in Braille.

TERRAIN is a collaborative project coordinated by iXpoint Informationssysteme GmbH. The project partners at Karlsruhe Institute of Technology are the Study Center for the Visually Impaired, the Computer Vision for Human-Computer Interaction Lab, and the Institute for Technology Assessment and Systems Analysis.

German Thesis Award for Smileys to Touch

Many applications on digital devices use graphical elements to facilitate use: Widgets, icons, windows, menus. For the visually impaired, however, graphical elements are a problem, because Braille displays only convert alphanumeric characters into Braille. For her doctoral thesis at the Institute of Microstructure Technology in close cooperation with the SZS, mechanical engineer Elisabeth Wilhelm designed a display on which not only alphanumeric char-acters, but also images and graphics become tactile.

The display is based on a microfluidic chip with phase change valves that can be triggered individually. When some valves are open, a specially designed pump pumps fluid to the corresponding locations that bend up slightly. In this way, not only alphanumeric characters, but also shapes are reproduced as tactile image elements. Elisabeth Wilhelm built the corresponding prototype. For her doctoral thesis, she was granted the German Thesis Award 2016 in the amount of EUR 25,000 by the Körber Foundation in the area of "Natural and engineering sciences."

SUCCESSFUL EDUCATION OF STEM TEACHERS
MINT²KA AND COMPUTER SCIENCE IN TEACHING DEGREE PROGRAM

Karlsruhe Institute of Technology and Karlsruhe University of Education (PH) were successful in the funding line of "Leuchttürme der Lehrerbildung ausbauen" (extending beacons of teacher education) with their joint project proposal "MINT²KA – Lehr-Lern-Labore in den MINT-Fächern als Innovations- und Vernetzungsfeld in der Lehrerbildung am KIT und der PH Karlsruhe" (teaching-learning labs in STEM subjects for innovation and networking in teacher education at KIT and PH Karlsruhe). The funding granted by the Baden-Württemberg Ministry of Science, Research, and the Arts totals up to EUR 2 million.

Under the MINT²KA project, teaching-learning labs are established to link education with research and practice as part of the curriculum. The goal is to improve the education of teachers in STEM subjects at KIT and PH.

"In the education of teachers, KIT with its focus on natural and engineering sciences and PH with its pedagogic profile complement each other optimally. This is also reflected by our long successful cooperation. I am very pleased that we will be able to further intensify this cooperation under MINT²KA," Vice President of KIT for Higher Education and Academic Affairs, Professor Dr. Alexander Wanner, says.

The former President of PH Karlsruhe, Dr. Christine Böckelmann, emphasizes: "For improving young people's skills in STEM subjects in Germany, we need an excellent education of teachers in these subjects. Our cooperation project will help further develop the quality of teacher education in STEM subjects. At the same time, existing cooperation of our universities in Karlsruhe is strengthened."

The proposal made under the direction of Professor Dr. Alexander Woll (KIT) and Professor Dr. Christiane Benz (PH) was selected by an independent expert panel. A total of seven projects will be funded, two of which are cooperation projects. Joint future work will be based on the pupils laboratories existing at KIT and the teaching-

Joint success: Project MINT²KA – Teaching-learning labs in STEM subjects for innovation and networking in teacher education at KIT and PH Karlsruhe.

learning labs of PH. In the subjects of mathematics, chemistry, and physics, these units shall now be further developed and applied to other school levels as well.

Joint development of the teaching-learning labs will foster innovation and networking in teacher education in STEM subjects. Scientific and didactic experts of both universities are to develop and analyze new concepts of teaching-learning settings. School classes and teaching staff are integrated for better cooperation in practice.

Pupils are to be familiarized with the safe use and basics of information technologies at an early stage.

Solid Basic Education

The smartphone is omnipresent in daily life as are social networks and the use of Google as a search tool. Still, the basics of computer science are hardly known to most pupils. For state-wide teaching of computer science, qualified teachers are required.

Moreover, the information and communication technologies sector is presently experiencing growth and has become an important location factor. To cover the high demand for qualified information technology experts, however, even more qualified young staff will be needed in the future. In the 2016/17 winter semester, Karlsruhe Institute of Technology therefore started to offer the subject of computer science in its teacher degree program. Computer science teachers trained in Karlsruhe are to help improve and extend computer science education at schools.

"For the further social and economic development of our state, it is important that our schools have well-trained and qualified computer science teachers," Professor Dr. Alexander Wanner says. "The new course is to convey the expert knowledge required for teaching a subject that will develop very dynamically in the next decades. KIT is one of the leading locations of computer science in Germany and, hence, offers an excellent environment."

Initially, the course program for future teachers corresponds to the university's classical computer science program. At KIT, future teachers can profit from profound basic education in the area of computer science that has been offered successfully for more than 40 years now. In addition, the teacher degree program includes didactics and specially adapted practical work phases.

Students aiming for the teaching degree at KIT have to choose two subjects. The lessons of teachers-to-be do not only cover education in these subjects, but also subject-specific didactics. Whoever chooses computer science, has a lot of combination options at KIT. In spite of the large range of subjects available, it is recommended to choose a related subject, such as mathematics.

STARTING STUDIES
STATE FUNDS "MINOR SUBJECTS" AND "SUCCESSFUL STUDIES"

From pre-prospecting surveys for building projects, such as tunnels or skyscrapers, to research into natural disasters, such as earthquakes and volcanic eruptions. The range of geophysical topics is quite large. The "iBridge" project at KIT is to facilitate access to a maste program for future geophysicists. iBridge in particular addresses students who come to KIT with a bachelor's degree in physics, mathematics, or a subject in the field of geosciences. These students attend the iBridge course prior to their master's lectures. The course comprises five digital modules consisting of tutorials, texts, exercises, and tests. These modules are selected by the students depending on their needs. Apart from the course, iBridge also compiles a digital pool of teaching and learning materials for geophysics programs in Germany.

Implementation of this project is financed by the Baden-Württemberg Ministry of Science, Research, and the Arts (MWK) under the "Little Subjects" structural fund to maintain quality of education in these subjects at universities. Funding is granted to proposals to maintain and strengthen scientific competencies in these subjects in the long term.

In addition, the MWK finances another three projects of KIT to enhance individual success of studies from the "Successful studies in Baden-Württemberg" fund. The project "Studies pilots, mentors, and slow curricula" is aimed at supporting students in starting university studies by offering special advice and support services.

The joint project "Support and further development of the online services of MINT-Kolleg Baden-Württemberg" of KIT and Stuttgart University is designed to further optimize the online preparation course of mathematics developed on behalf of the TU9 universities. In addition, an online course in physics will be established.

The "MoWi-KIT – Motivated for science" project intends to integrate research-based teaching into bachelor programs already. For this purpose, three models are developed, which are characterized by cooperative teaching and learning methods and systematic development of research competencies. These methods are to be adaptable to various subjects and program scopes.

The "iBridge" course is to facilitate access to the geophysics master's program.

FIRST LEARNING FACTORY OF ITS KIND

CLOSE-TO-PRACTICE TRAINING FOR PRODUCTION IN GLOBAL NETWORKS

More and more products are produced no longer at a single place, but at worldwide distributed factories that cooperate closely in a network. Companies have to adapt their processes to this new type of work sharing and to prepare their staff accordingly. Students have to be qualified for coping with these changes during education and training.

The Learning Factory of the Institute of Production Science prepares students and companies for production in worldwide distributed networks.

For this reason, the Institute of Production Science has opened a Learning Factory for Global Production. It is the only learning factory of this kind worldwide. Learning factories reproduce parts of or complete production processes of a company as closely to reality as possible, with assembly stations, workplaces, and control systems. In this way, students can develop professional skills and learn in a close-to-reality environment to solve challenges in production in a self-organized manner.

Existing learning factories mainly focus on general aspects of production, such as lean management or resources efficiency. The Learning Factory of the Institute of Production Science is the only learning factory worldwide that deals with challenges characteristic of production in global networks. Work focuses on how production sites differ from each other in terms of e.g. technical equipment, degree of automation, cost structure, or staff qualification.

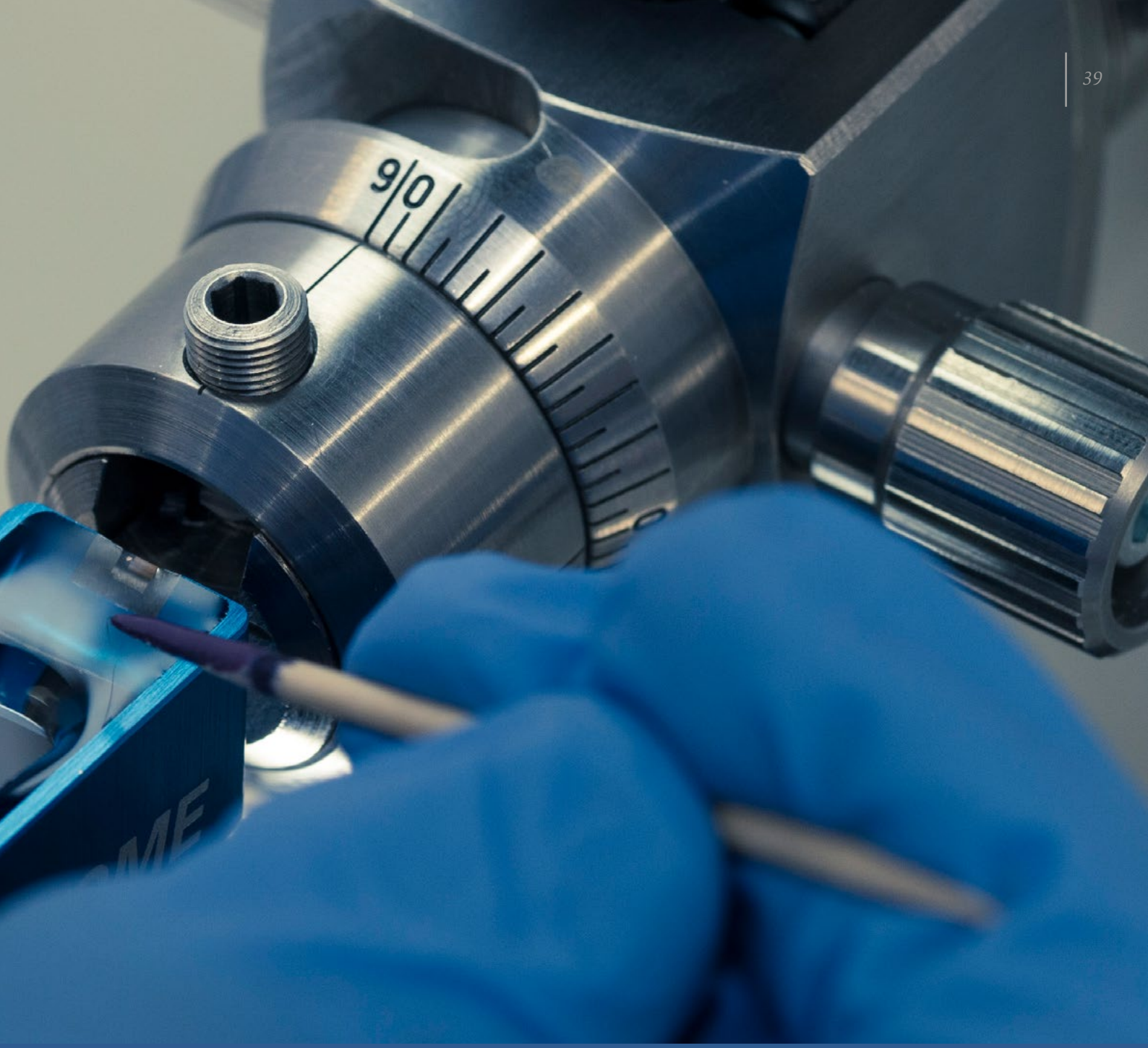
In addition, the Learning Factory illustrates how actors handle existing complexity in a global production network. The Learning Factory consists of several stations for the assembly of an electric motor and gear. From both the product and production perspectives, the electric motor is perfectly suited to teach problem solution in the production sector. It can be assembled and disassembled easily and be produced in several versions with a minimum of expenditure and at low costs. Assembly stations can be designed for manual or automated production. The students can adjust the stations and robots to the production of different motor versions and to various degrees of automation.

The Learning Factory was built and implemented in cooperation with the companies of Bosch, Pilz, Bosch Rexroth, Balluff, and Schunk. Besides the delivery of components, machines, and sensors, the industry partners provided valuable input to design the Learning Factory as closely to reality as possible.

INNOVATION

Innovation is a factor of central importance to the Karlsruhe Institute of Technology. Next to research and teaching it is one of the three strategic core activities defined in the KIT 2025 Umbrella Strategy. The Innovation and International Affairs board function created in early 2016, which is headed by Professor Dr. Thomas Hirth, underlines the importance of innovation to KIT.

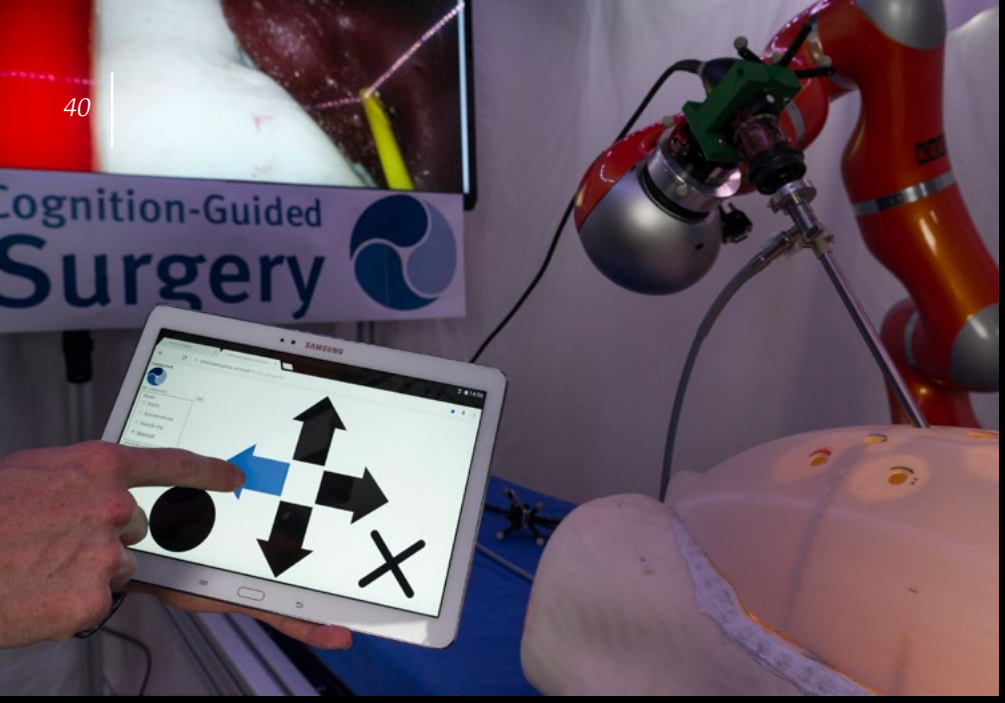
Innovation management serves to identify and protect potential innovations together with science, and to initiate and accompany their economic utilization. KIT's annual innovation competition, NEULAND, promotes product-oriented transfer and motivates KIT's



scientific staff to further pursue innovation activities in their specific research areas. In this way, promising technologies can reveal their market potential at an early stage of development.

It is for this reason that KIT looks for application-oriented research projects suitable for product development and commercialization under the competition categories of "Competition of Ideas" and "NEULAND Special Award." In 2016, first prize in the "Competition of Ideas" category went to Professor Dr. Ute Schepers, Professor Dr. Stefan Bräse, and Bettina Fleck for their anti-MRSA agent. First prize in the "Special Award" category went to Dr. Jürgen J. Brandner and Dr. Berta Spasova, with Cargill as an industrial partner, for their catalytic epimerization and polymerization of functionalized carbohydrates.

The purpose of innovation at KIT is to employ scientific findings for the benefit of society and the economy by means of startups, spinoffs, licensing, or services provided to industry. This is reflected in the innovation data: 127 registrations of inventions and 55 registrations of patents plus approx. EUR 1.7 million of income from licenses were recorded by KIT in 2016.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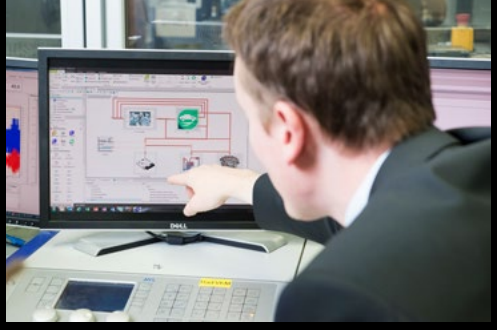

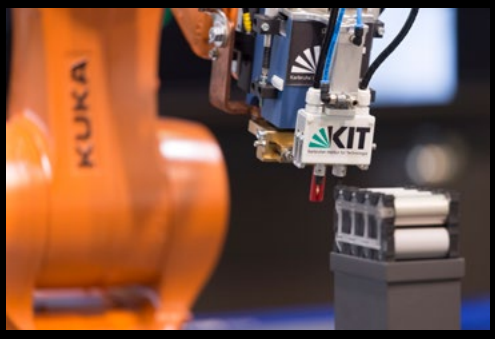
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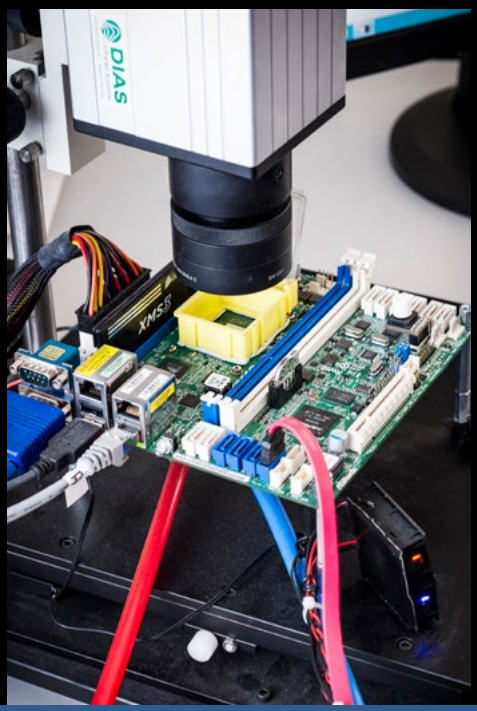
KIT Venture Fest –
Der Innovationstag am KIT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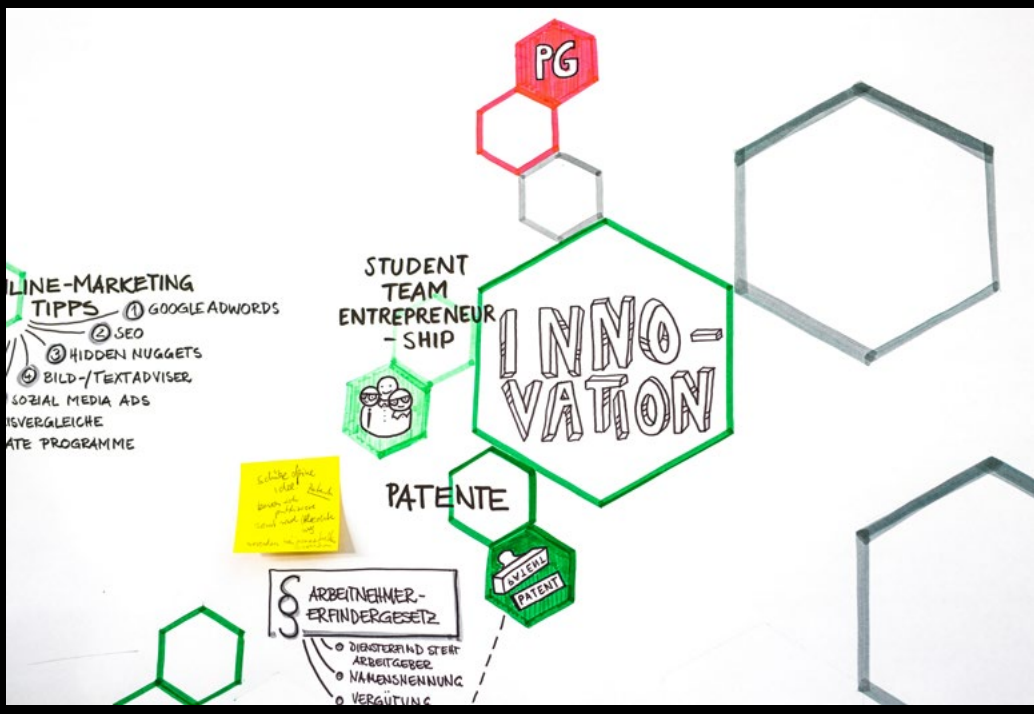
KIT GRÜNDER SCHMIEDE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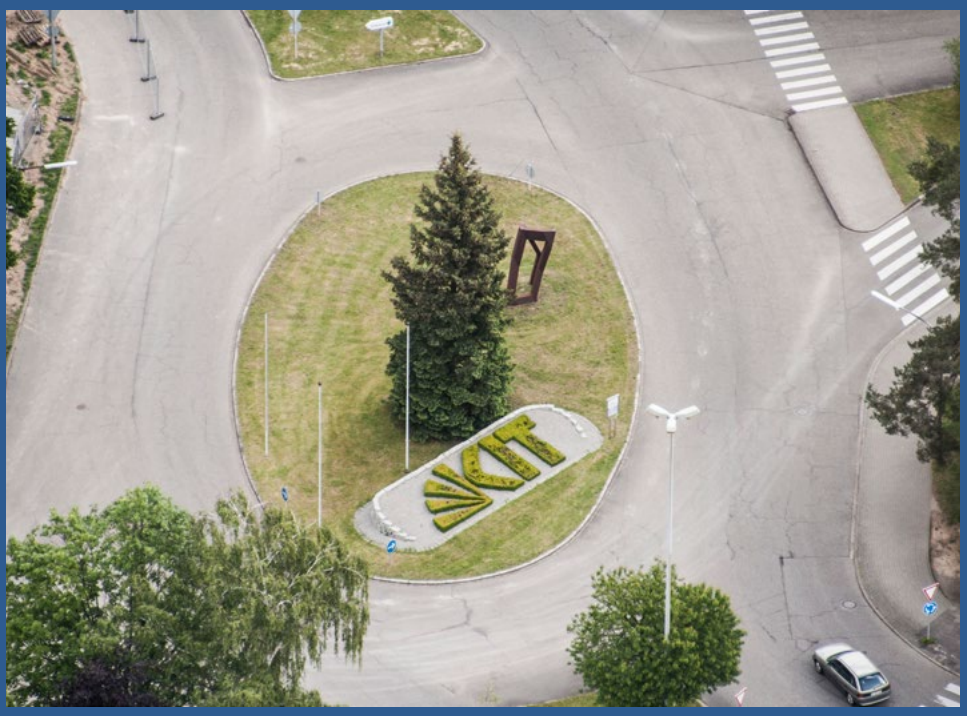
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Technologieangebote
IMA-Services


KIT GRÜNDER SCHMIEDE

KEEP TECHNICAL INFRASTRUCTURE ALIVE
"PREVENTION IN CONSTRUCTION" INNOVATION HUB

Long-term preservation and prospective expansion of technical infrastructure systems, such as water, electricity, gas and district heat pipes, or roads and bridges, is of central importance to Germany as an industrialized country. Preserving these systems is a major challenge to society, especially against the background of climate change, scarcity of resources, and globalization.

The growing frequency of failures of technical infrastructure systems is indicative of the need to take action. Instead of expensive repair, more prevention could be the key to keeping infrastructure fit. However, the enormous innovation pressure in building construction is counteracted by the traditional orientation, density of regulations, and industry-specific obstacles to innovation in this branch of industry dominated by small and medium-sized enterprises.

Bridges and roads are important technical infrastructure systems for Germany as an industrialized country.

To overcome these obstacles for good, KIT and the Helmholtz Association are launching the "Prevention in Construction" innovation hub with a five-year budget of EUR 1.82 million. The hub combines the players in the whole chain of innovation and value – producers of raw materials and products, building planners, contractors and builders, public authorities and standardization agencies. The KIT research infrastructure, which is unique in the world, offers major economic opportunities in this hub to the participating groups.

Despite its high societal relevance, prevention in building construction is a research area not yet very well developed. Prevention means that the combination of selected technical measures and services performed over the lifecycle of a building will dramatically reduce the risk of premature failure of materials and structures. However, the costs of prevention can be justified only on the grounds of lifecycle analysis, which is not yet very common. What is still missing are suitable measures based on science and engineering.

For this reason, structured innovation processes are to be established, and requirements for research and development are to be identified together with actors from all levels. This will lead to the development of innovative products, technologies and services. The expertise elaborated in this way will be made available directly to decisionmakers in politics and society. In addition, these findings are to be used also in training skilled workers, thus finding their way into business and administration.

2016 KIT VENTURE FEST

EXCITING NEW IDEAS ON KIT'S INNOVATION DAY

The Karlsruhe Institute of Technology organized the KIT Venture Fest for the third time. This year's Innovation Day attracted more than 700 guests – a new record high. The KIT Venture Fest represents a platform open to all who are interested in innovation at the Karlsruhe Institute of Technology. Impulse contributions from research, offerings in technology, spinoffs, and an innovation exhibition enable visitors to exchange experience, develop new ideas, and meet supporters.

Students, staff scientists, founders, industrial partners, and investors met under the heading of "Innovative for Business and Society." In this way, the multitude of innovations became tangible to all, and exchanges about projects and new ideas were supported.

While the morning's seminars and workshops were addressed mainly to KIT staff and students, the afternoon offered a variety of short lectures to guests from industry, business, and society. An innovation exhibition displayed successful research and spinoff teams; current technology projects and startups introduced themselves in two pitches.

In the evening, the NEULAND innovation award and the award of the jury to the spinoff teams were given. The highlight of this year's event was the evening lecture by the CEO of Daimler AG, Dr. Dieter Zetsche, about "The Rhino Principle: Big, but far from sluggish – how a worldwide industrial group preserves its pioneering spirit."

The KIT Venture Fest, KIT's Innovation Day, as a showcase and an exchange of technologies and spinoffs.

The KIT Venture Fest, part of the "KIT Founders Forge" project, has developed into the annual Innovation Day. This presents the third core activity of the Karlsruhe Institute of Technology, namely innovation, in an event of its own. It acts as a showcase, a technology, and founders' exchange and as a meeting point of partners, friends, and sponsors from science, industry, and society. The project is funded by the Federal Ministry for Economic Affairs and Energy within the "EXIST Spinoff Culture – the Spinoff University" program.

A highlight of the event was the evening lecture by the CEO of Daimler AG, Dr. Dieter Zetsche, a KIT alumnus, about the "Rhino Principle."

ANTITUMOR AGENT REACHES CLINICAL TRIAL PHASE

THERAPEUTIC AGENT FROM KIT'S AMCURE GMBH SPINOFF

Despite considerable progress in cancer therapy there is still an urgent need for new therapeutic concepts in treating metastasizing tumor species. One of the most aggressive types of tumor is cancer of the pancreatic gland. 95% of the patients die within five years after diagnosis. Since 2012, amcure GmbH, a KIT spinoff company, has investigated and developed new therapeutic agents on a peptide base which, hopefully, can reduce this rate. In 2014, the AMC303 active substance was chosen among the substances available. It has excellent properties for further development.

The AMC303 active substance binds specifically to a certain form of the CD44 surface molecule, thus specifically interfering with central signal pathways of tumor growth without influencing other cell species. The new formation of blood vessels supplying the tumor, and the migration of cancer cells and their invasion into other organs, are inhibited.

The CD44 surface molecule plays an important role in many tumor species and has been studied at KIT since the 1990s. CD44 and its v6 variant have important functions in the spread and origins of metastases. Blocking the molecule with the active substances of amcure opens up application in tumor therapy.

Promising data have so far been obtained from animal experiments; since October 2016, the AMC303 active substance has also been tested in cancer patients in a first clinical trial after approval by regulatory authorities and ethics committees. This trial primarily examines how the substance is tolerated when administered to persons. Should the observations made in animal experiments be confirmed, amcure could establish the basic principle of a much more effective tumor therapy free from side effects.

Advanced development of the AMC303 active substance has been conducted since 2014 by means of funds provided by investors and the spinnovator program of the German Federal Ministry of Education and Research in the amount of EUR 5 million. In December 2016, amcure GmbH received more funds in the amount of EUR 6 million from investors to finance the clinical trial and the next development steps. As in 2014, a consortium participated in the second round which was led by LBBW Venture Capital with the participation of the KfW group of banks, the MBG Mittelständische Beteiligungsgesellschaft Baden-Württemberg, the S-Kap investment group, KIT, and private investors.

amcure GmbH, a KIT spinoff, has studied and developed peptide-based therapeutic agents since 2012.

MOTOR FUEL PRODUCTION FROM RENEWABLE ENERGY SOURCES

THE WORLD'S FIRST CHEMICAL PILOT PLANT COMMISSIONED

Liquid motor fuels produced from renewable energy resources as a function of requirements are an important module of the "Energiewende." Producing synthetic fuels from solar power and airborne carbon dioxide is the purpose of the SOLETAIR project to which INERATEC GmbH, a spinoff of the Karlsruhe Institute of Technology, and Finnish partners contribute.

The world's first chemical pilot plant was commissioned jointly. It is compact enough to fit into a shipping container. The mobile plant produces liquid synthetic motor fuels, such as gasoline, diesel fuel, and kerosene, from renewable hydrogen and carbon dioxide.

The founders of INERATEC GmbH, a KIT spinoff, develop compact microstructured chemical reactors converting gases into high-grade liquid motor fuels.

The plant consists of three components. The "Direct Air Capture" unit developed by the Technical Research Center of Finland filters carbon dioxide out of the air. An electrolysis unit developed at the Lappeenranta University of Technology produces the necessary hydrogen by means of solar electricity. A microstructured chemical reactor, the heart of the setup, then converts the hydrogen obtained from solar power and the carbon dioxide into liquid motor fuels. The reactor was developed at KIT and expanded into a commercial-scale compact facility by INERATEC.

Projects like SOLETAIR make important contributions to the success of the "Energiewende." Commissioning of the pilot plant is a model of successful transfer of KIT research innovation into industrial use. INERATEC GmbH develops, builds, and markets compact chemical plants for various gas-to-liquid and power-to-liquid applications.

The Karlsruhe Institute of Technology, INERATEC, and the Technical Research Center of Finland intend to further expand their cooperation in research and development of innovative systems based on renewable energies, in new storage technologies, and in the conversion of renewable energies into chemical energy resources within the framework of the two prominent joint national research projects, "Energy Lab 2.0" and "Neo-Carbon Energy."

PROMOTING YOUNG TALENT

One of the objectives of the Karlsruhe Institute of Technology is to invite to Karlsruhe "high potentials" from all over the world and offer them attractive working conditions. One key tool in promoting young executive talent at KIT is the Young Investigator Network (YIN) of, at present, 46 members. YIN members independently manage research projects financed by third-party funds. Members and former members of YIN constitute more than 40 professors since 2008.

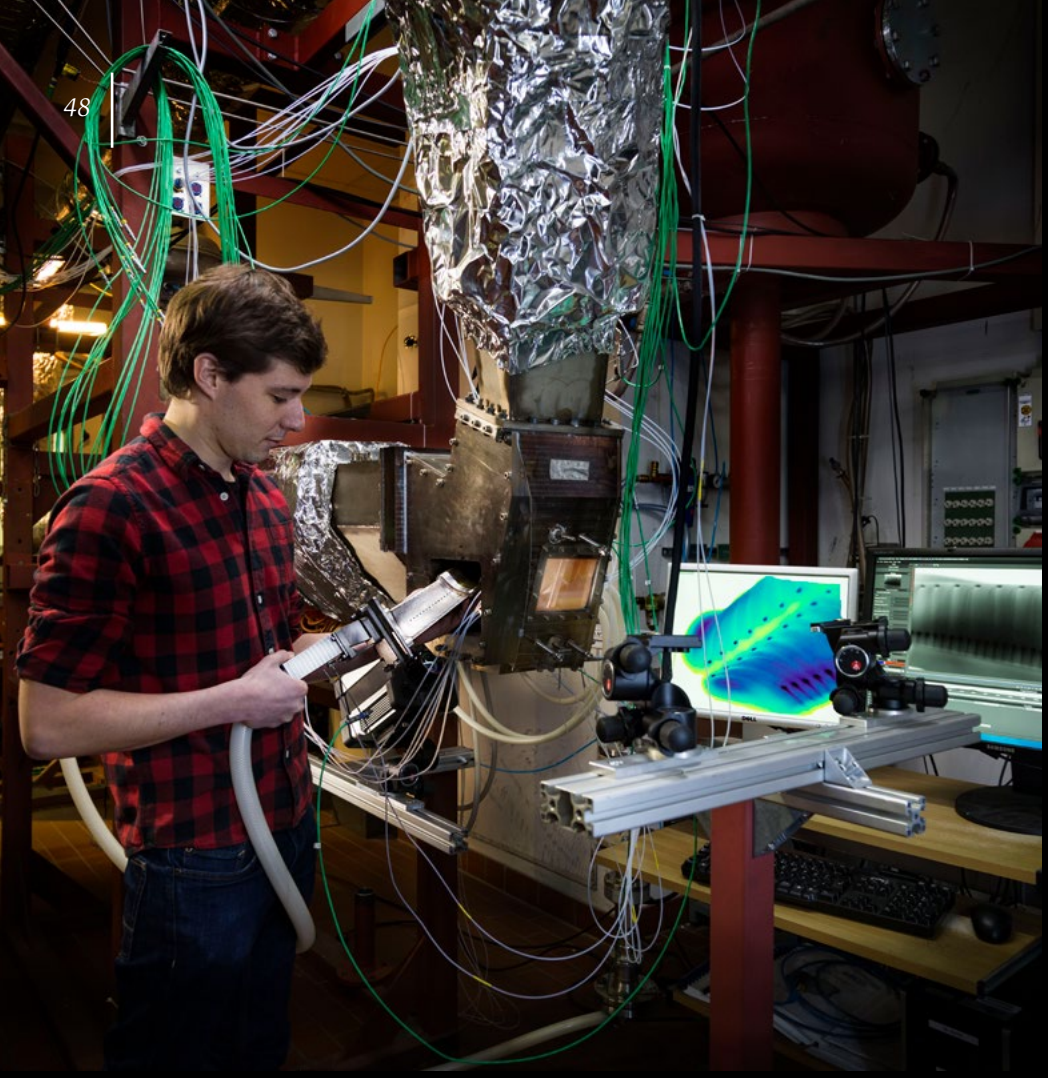
KIT was particularly successful in soliciting funds to support young scientists and engineers in 2016. In

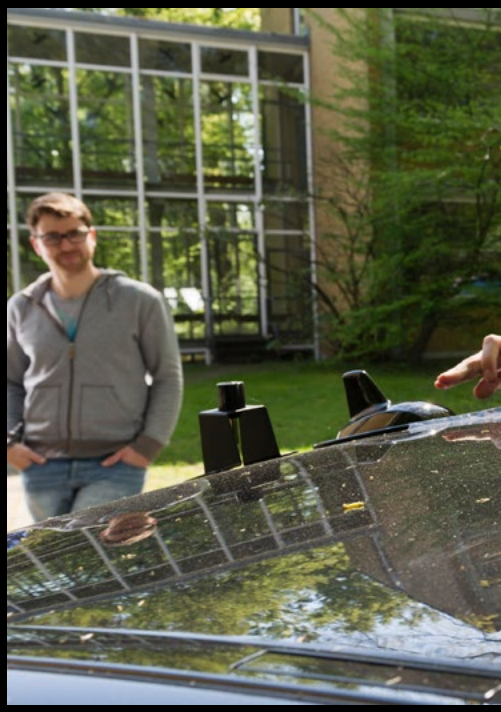
addition to two Research Training Groups and two ERC grants, which will be described in greater detail below, more funds were solicited for other junior scientist groups.

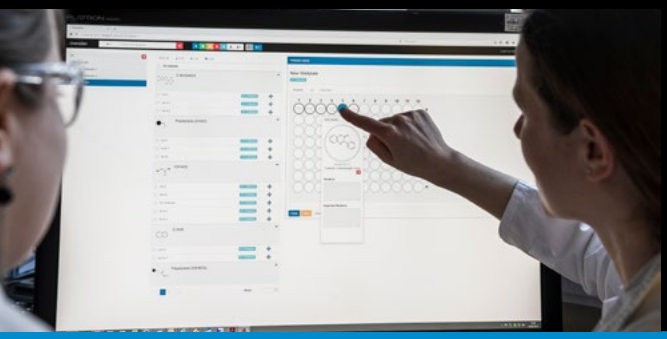
Dr. Katrin Schulz from the Institute for Applied Materials received funds under the Margarete-von-Wrangell habilitation program offered by the State of Baden-Württemberg to support qualified female scientists on their way to a professorship. Katrin Schulz, engineer and materials scientist, works on modeling plastic deformations in metals on a microscale.

The German Federal Ministry of Education and Research supports the "Clouds and Storm Pathways" young investigator group of Dr. Aiko Voigt of the Institute for Meteorology and Climate Research. The group investigates the way in which clouds are coupled to mesoscale atmospheric circulation at medium and high latitudes and their role in today's and future climate.

Moreover, young scientists of the KIT acquired three Helmholtz young investigator groups and four Emmy Noether junior research groups.





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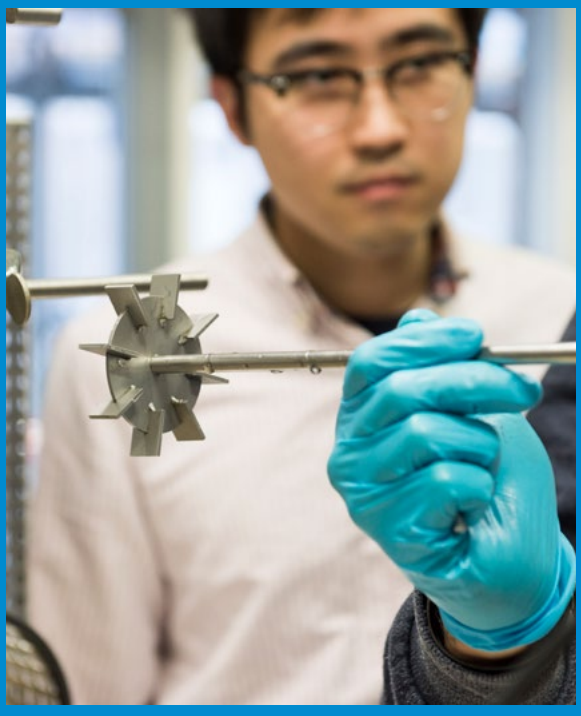


SIMULATION OF LITHIUM-ION BATTERIES

DFG PROMOTES NEW SIMET RESEARCH TRAINING GROUP

Batteries are considered key components of many future technologies, in particular electromobility or electricity generation in fluctuating renewable sources. Many mobile and stationary applications, such as smartphones, electric cars or storage batteries in the power grid, have meanwhile included lithium-ion batteries. This is the point of departure of the newly funded "SiMET - Simulation of Mechanical-electrical-thermal Processes in Lithium-ion Batteries" research training group of the Deutsche Forschungsgemeinschaft (DFG). SiMET stands for the collaboration of young investigators within the framework of interdisciplinary doctoral thesis work in modeling and developing numerical simulation methods for the closely interconnected mechanical-electrical-thermal processes going on in lithium-ion batteries. Such simulation techniques are an important tool in the advanced development of efficient and powerful battery systems.

Work in SiMET meets requirements both in terms of multiscalarity of materials and components in batteries and multidisciplinarity of the processes going on within them. It covers all units of particles in microporous electrodes up to complete cells, on scales ranging between a few nanometers and several centimeters. In this approach, work combines various disciplines, such as process technology, electrical engineering, mechanical engineering, materials sciences, chemistry, physics, and mathematics.

The models are aimed at a wide spectrum mainly of engineering problems. Among other things, they are to simulate electrical behavior in operation over a wide range of temperatures, the impact of various internal structures on performance capability of cells, and understanding mechanically and thermally induced failure effects. As a supplement to model-based simulation, SiMET offers direct access to experimental facilities, ranging from computerized tomography to complex electrochemical and thermal measurement techniques. The experiments serve to determine parameters and validate models.

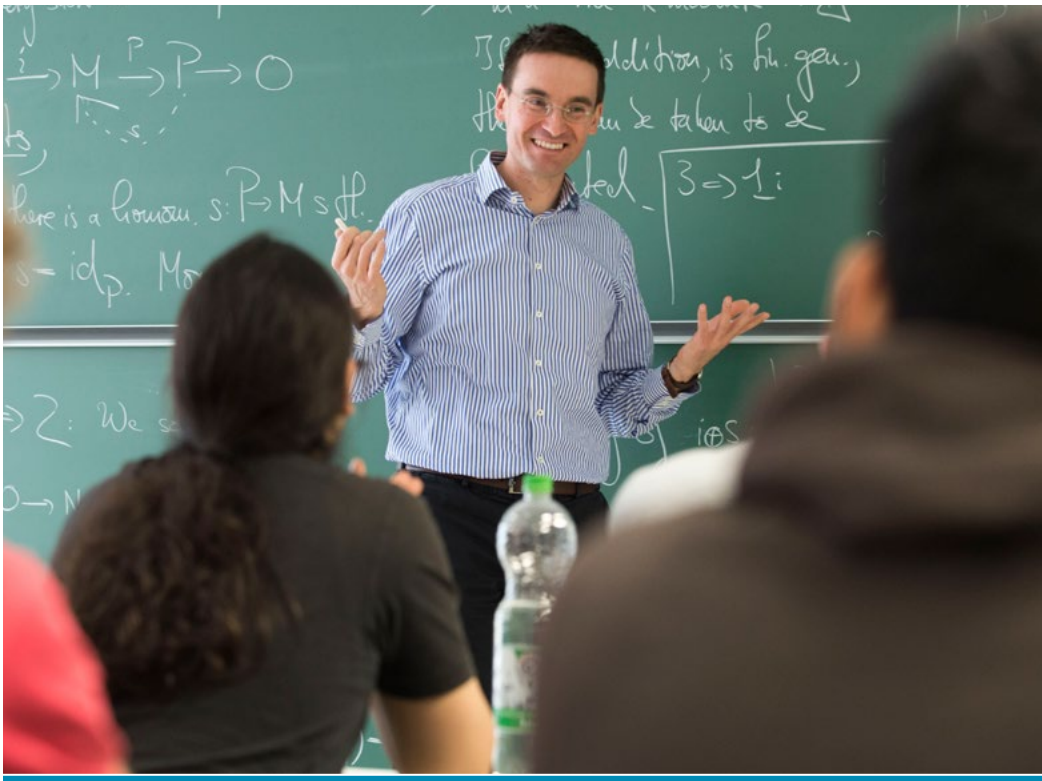
Research training groups offer postgraduate students opportunities to work for their doctorates in a structured research and qualification program at a high technical level. The DFG announced its funding decision for SiMET on November 16, 2016. The SiMET research training group started in April 2017 and will be funded initially for a period of 4 ½ years.

The SiMET research training group offers a structured doctoral program on the subject of modeling and numerical methods of simulating lithium-ion batteries.

RESEARCH IN GEOMETRIC SPACES

RESEARCH TRAINING GROUP OF KIT AND HEIDELBERG UNIVERSITY

Specific research topics in geometry are the subject of work of a new research training group of mathematicians of the Karlsruhe Institute of Technology and the University of Heidelberg. Activities focus on so-called asymptotic geometry. The subjects under investigation are macroscopic properties of geometric spaces.



The new research training group is to help mathematicians from Karlsruhe and Heidelberg in establishing the first systematic, institutionalized postgraduate training in asymptotic geometry.

Observing them seemingly from a long distance makes the difference between a continuous space and its discrete approximation disappear. In this way, asymptotic geometry allows uniform studies of continuous and discrete geometric structures. An important role in this connection is played by the interaction among various methods of mathematics.

Key issues in research often can be solved only by an approach transgressing the boundaries of classical mathematical areas. For this purpose, Karlsruhe expertise in geometric group theory and differential geometry is combined with Heidelberg expert knowledge in so-called Lie groups and higher-level Teichmüller theory.

The research training group is to establish, on a national and international basis, the first systematic, institutionalized postgraduate training in asymptotic geometry. The qualification program of the research training group can provide education and training on a broad basis of methods within geometry. Postgraduate students in this approach work on dynamic, analytical, group-theory, topological and differential geometric aspects.

The new "Asymptotic invariants and limits of groups and spaces" research training group is funded to the tune of approximately EUR 4 million over a period of 4 ½ years by the Deutsche Forschungsgemeinschaft after successful international reviewing. The new institution for promoting young scientists and engineers started work in October 2016 with ten postgraduate and two postdoc students. Ten other postgraduates and five postdocs are attached to the research training group as associate members.

CLOUDS AND CLIMATE

CORINNA HOOSE RECEIVES ERC STARTING GRANT

Professor Dr. Corinna Hoose received an ERC starting grant.

Clouds are most important to the weather and the climate. They can have a cooling effect in shielding from solar radiation or, conversely, contribute to heating. This depends not only on their altitude in the atmosphere but, decisively, on their composition.

Cloud formation begins with aerosols – minute particles acting as nuclei of condensation – on which droplets of water are formed. Professor Dr. Corinna Hoose's research deals especially with mixed-phase clouds. In that case, liquid water and ice occur simultaneously, aerosols acting as nuclei of ice. Such mixed-phase clouds probably trigger most of the precipitation. Whether ice will form within them depends on a variety of microphysics factors and processes. Understanding those better, and making them predictable, is the purpose of the "Closure of the Cloud Phase – C2Phase" project established by Corinna Hoose.

The composition of a cloud of ice particles, liquid droplets of water or both has a major impact on their development and properties. Thus, icing can influence the backscattering capability of a cloud, i.e. terrestrial warming. Clouds with liquid droplets of water reflect insolation more than clouds of ice do. As soon as the first ice has formed, further icing mostly continues very quickly so that clouds are either mainly liquid or mainly consist of ice. This distribution of the cloud phase has not so far been simulated sufficiently well in cloud and climate models.

In "C2Phase," Corinna Hoose combines new high-resolution models and satellite observations. Her work focuses on the distribution of the cloud phase in terms of space, time, and temperature. This is to show that the process of icing meanwhile has been understood and described in numerical models well enough to allow predictions of the distribution of the cloud phase under a variety of conditions which can be observed from space. Corinna Hoose and her team also want to study how improved forecasting can be used for weather and climate models. Geographically, research will focus on Europe because this is where the SEVIRI satellite tool supplies high-grade data, and different mixed-phase clouds occur across all seasons.

This project is funded by the European Research Council (ERC) to the tune of EUR 1.5 million for the next five years in a starting grant, the most important ERC funding tool for young scientists and engineers.

The "Closure of the Cloud Phase – C2Phase" project studies microphysics factors and processes in mixed-phase clouds.

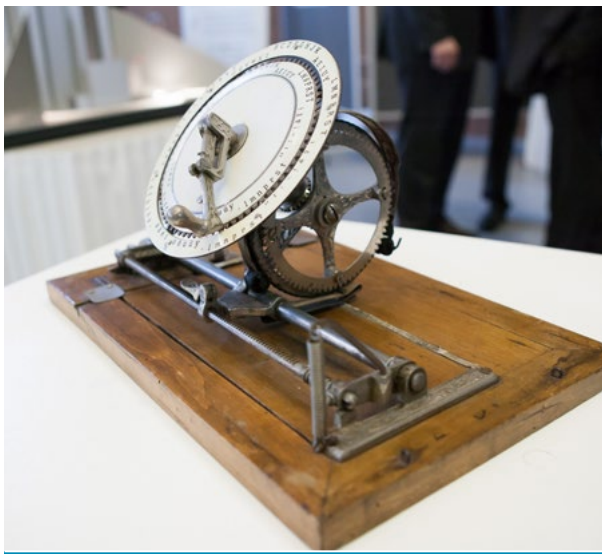
MORE INTEGRITY FOR CLOUD AND BIG DATA

DENNIS HOFHEINZ RECEIVES ERC CONSOLIDATOR GRANT

The digital era means more stringent requirements for cryptography. Cloud computing and big data demand solutions which are not only secure, but also feasible. Within the "PREP-CRYPTO - Preparing Cryptography for Modern Applications" project, cryptologist Professor Dr. Dennis Hofheinz is developing new systems combining proven methods of cryptography with new building blocks.

While it used to be important to send encrypted messages, the challenge now is to grant specific rights of access and possibilities to handle data and, at the same time, guarantee data privacy. Service providers, such as off-site computer centers, could be enabled in this way, on the basis of sensitive encrypted data of enterprises or private persons, to do calculations and processing without first decoding these data and, in this way, ensure data privacy.

A variety of new cryptographic modules have been developed for these complex scenarios over the past few years, such as the so-called Fully Homomorphic Encryption method. It allows data to be processed further without requiring their contents to be decoded at any point in the process. Encrypting and remotely storing data by this method is not yet efficient enough by far to warrant practical applications, as the expense involved would be too high.



This is a Karlsruhe invention, the historic "Rehmann Diskret" encryption machine invented in 1899. In the spirit of this tradition, KIT investigates modern methods of cryptography.

Cryptologist Professor Dr. Dennis Hofheinz in 2016 received an ERC consolidator grant by the European Research Council.

To make full use of the potential of new cryptographic methods, Dennis Hofheinz proposes two technical approaches. On the one hand, he and his team of researchers intend to develop scenarios combining classical algebraic tools and techniques of cryptography with new methods. On the other hand, he plans to generate closely bounded solutions for domain-specific applications.

The European Research Council (ERC) funds this project to the tune of approx. EUR 2 million for the next five years. The ERC consolidator grant awarded to Dennis Hofheinz is one of the most outstanding funding schemes in Europe.

INTERNATIONAL AFFAIRS

KIT is home to many employees and students with foreign background. The International Affairs Service Unit is the central point of contact for all these persons. Whereas the International Students Office is the contact point for current and prospective international students, the International Scholars & Welcome Office supports researchers' international mobility.

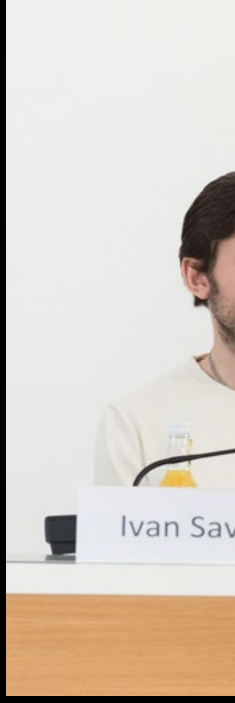
In numerous cooperation projects, the researchers at KIT collaborate with research and educational institutions worldwide. For instance, KIT is active in various university networks, prominent examples being HeKKSaGOn, an association of leading German

and Japanese universities, CLUSTER, the European Consortium Linking Universities of Science and Technology for Education and Research, or the European Campus, a trinational research and education area with international reach.

KIT, moreover, participates in many international research alliances, such as KIC InnoEnergy, which is supported by the European Institute of Innovation and Technology and, by 2050, intends to create a sustainable energy system for Europe, the International Center for Advanced Communication Technologies InterACT, where leading informatics institutions cooperate worldwide, or the Pierre Auger Project for measurement of the ultra-high energy component of cosmic rays.

Abroad as well, KIT is perceived as an attractive research and educational institution. Among its 1,144 foreign employees, KIT counts more than 30 professors and almost 1,000 scientific staff members.

The share of foreign students at KIT amounts to more than 22 percent, which is equivalent to more than 5,000 students.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KIT – Company & Career Service


Jérémy Rimbon


KIT
Institute of Technology
International Students
Office (ISt0)

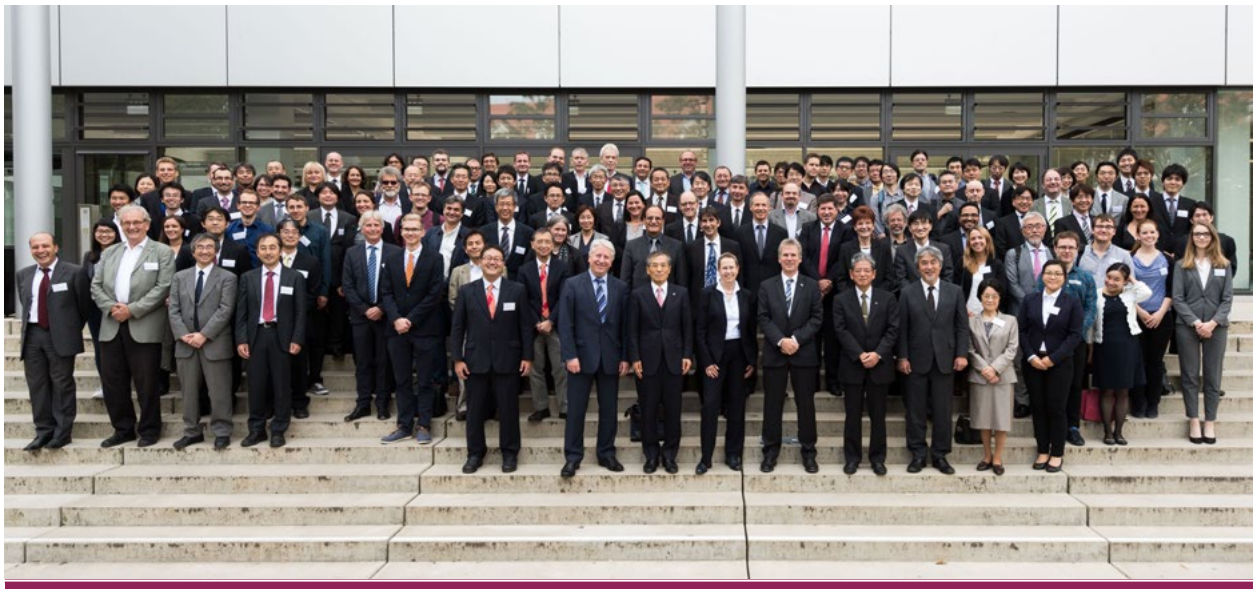
GERMAN-JAPANESE KNOWLEDGE EXCHANGE
KIT HOSTING THE FIFTH HEKKSAGON CONFERENCE

The German-Japanese University Consortium HeKKSaGOn is an association of Karlsruhe Institute of Technology, Heidelberg University, and Göttingen University with three of Japan's leading universities – Kyoto University, Osaka University, and Tohoku University in Sendai. In 2010, the rectors and presidents of these universities signed a cooperation agreement. HeKKSaGOn stands for Heidelberg – Kyoto – Karlsruhe – Sendai – Göttingen – Osaka – network. The goal of the consortium, which is unique in German-Japanese cooperation, is to intensify scientific cooperation as well as ensure the sustainability of transnational initiatives and projects.

In late September 2016, Japanese and German researchers from different disciplines met at the 5th HeKKSaGOn Conference at KIT. Under the theme of "Fostering Student Mobility to Shape Tomorrow's Researchers and Innovators," the partners decided to strengthen the academic exchange of junior research groups by joint promotion and regular exchange programs. The rectors and presidents of the six universities signed a joint mission statement and committed themselves to providing an annual basic amount for research activities in the network. In addition, the researchers of the participating universities founded a ninth working group on "Data Science," which addresses the generation, processing, structuring, and cooperative use of scientific data at universities. The researchers' activities until then had been pooled into eight interdisciplinary groups in the domains of biosciences and natural sciences, chemistry and energy conversion, catalysis and nanotechnology, disaster risks and disaster management, social sciences and humanities, robotics, neuroscience, and mathematics.

In addition to the meeting of the working groups, a Japanese-German HeKKSaGOn Students' Workshop themed "Bridging Cultures through Mobility in Research, Higher Education and Innovation" was organized for the first time by the doctoral students and master students of the HeKKSaGOn universities.

The presidents of the Japanese universities were given a special present: A 3D-printed miniature replication of the Karlsruhe landmark, a pyramid only 2 mm in height. The pyramid with the logos of HeKKSaGOn, KIT, and Nanoscribe sophisticatedly printed on its sides, was created by Nanoscribe, a spinoff company of KIT and specialist for high-resolution 3D printing on the nano- and micrometer scales.



Far more than 100 researchers from Japan and Germany met at the 5th HeKKSaGOn Conference at KIT.

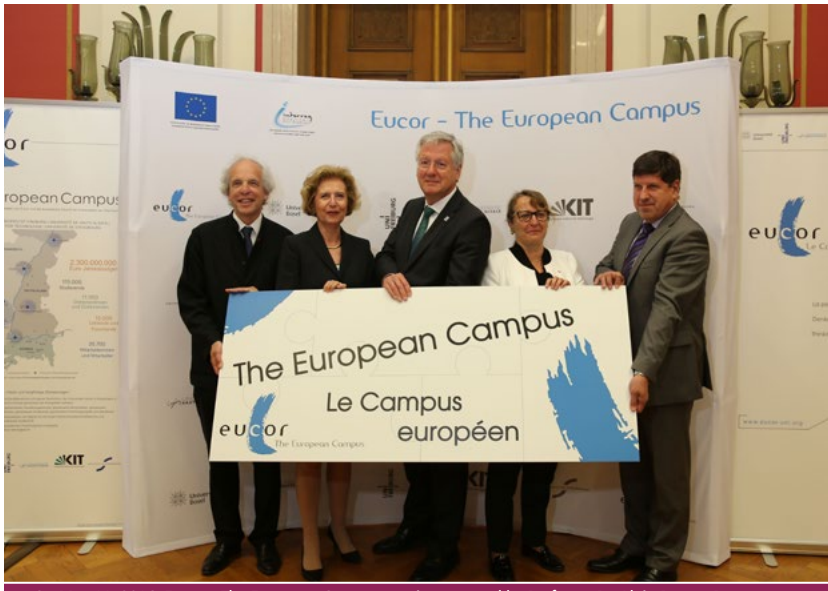
ACROSS THE BORDERS

UNIVERSITY ALLIANCE RECEIVES PRIX BARTHOLDI

Grand Opening of the European Campus

In May 2016, Karlsruhe Institute of Technology and the universities of Basel, Freiburg, Upper Alsace and Strasbourg founded the first European university alliance "Eucor – The European Campus," which enables these five universities to act jointly. The opening of the European Campus is another important step in the cooperation between Germany, France, and Switzerland and the start of a joint Upper Rhine research area.

The European Campus is to provide a new platform for cross-border collaboration in research, teaching, and innovation to jointly strengthen the position in international competition for the best minds and ideas. It is the first "European Alliance for Territorial Cooperation" that is organized and managed by universities alone.



On May 11, 2016, Eucor – The European Campus was inaugurated by Professor Dr. Alain Beretz, Professor Dr. Andrea Schenker-Wicki, Professor Dr. Hans-Joachim Schiewer, Dr. Christine Gangloff-Ziegler, and Professor Dr. Thomas Hirth (from left to right).

European Campus Receives Prix Bartholdi

In December 2016, the university alliance was granted the honorary award of Association Prix Bartholdi. The Association thus recognized the central contribution of the university alliance to cross-border cooperation. The common research and innovation area has its own European legal status. It performs real pioneering work and sets an example with its cross-border cooperation. Whereas joint degree programs are already common practice, the European Campus universities now intend to also appoint joint professors and develop common strategies.

The Prix Bartholdi is awarded annually to outstanding projects in the cross-border educational area of the German-French-Swiss Upper Rhine region.

The Association also awarded student prizes worth between 500 and 4000 Euros to five economics students from the region, who completed an internship abroad. The Prix Bartholdi is funded by "Association Promotion du Prix Bartholdi," whose members are companies, associations, and private individuals.

Tour Eucor 2016

At the end of May, the 19th Tour Eucor passed through the Eucor – The European Campus university cities of Karlsruhe, Strasbourg, Mulhouse, Basel, and Freiburg. The Tour Eucor is organized by the students' association Tour Eucor at KIT. Whether driving over the Swiss Jura Mountains or along the Rhine River, during the Tour Eucor, having fun and fostering intercultural exchange are at least as important as the sporting challenge.

For many years, the Tour Eucor has been standing for cross-border exchange, joint activities, and the achievement of objectives. Approximately 120 students, alumni, and employees of the five partner institutions started for the tour in 2016.

FOCUSING ON INTERNATIONAL SCIENCE EXCHANGE
A HUMBOLDT WEEK HAS BEEN ESTABLISHED AT KIT

At the invitation of the International Scholars & Welcome Office of KIT and the Alexander von Humboldt Foundation, interested young researchers and future academic hosts at KIT met with international researchers from the Humboldt Network as well as with service providers and experts for researchers' mobility for a comprehensive information and network event at the 12th Humboldt-Tag on October 27, 2016. The Humboldt-Tag was extended into a Humboldt Week through the subsequent Annual Meeting of the German Association of Humboldtians.

In 2016, the traditional annual meeting of the German Association of Humboldtians was hosted for the first time by KIT. For the ninth time already, representatives from science and politics met on October 28 and 29 under the title "I^3 – Innovation, Internationalization, and Integration." The program included a panel discussion on the meeting's subject, an interdisciplinary scientific symposium with Humboldt fellows from KIT, and the Association's general meeting.

The German Association of Humboldtians offers to be an international forum for the Humboldt family in Germany, including both all current Humboldt fellows and all fellows selected by the foundation in the past as well as all persons especially attached to these e.g., long-standing hosts or members of the selection committees who have also done research abroad.

The Alexander von Humboldt Foundation promotes academic cooperation between excellent researchers and scholars from abroad and from Germany and grants fellowships to foreign persons wanting to deepen their work in collaboration with a German research group. The foundation, moreover, supports German researchers during their stays abroad. Since it was founded in 1953, 768 Humboldtians have come to stay with KIT and its two predecessor institutions, Universität Karlsruhe and Forschungszentrum Karlsruhe.

Professor Dr. Thomas Hirth, Vice President for Innovation and International Affairs of KIT, talking to Professor Dr. Dirk Wentzel, Jean Monnet Professor at Hochschule Pforzheim and President of the Karlsruhe-Pforzheim Humboldt Regional Group, and Dr. Gerrit Limberg, representative of the Humboldt Foundation (from left to right), at the KIT Humboldt-Tag on October 27, 2016.

INDUSTRY OF THE FUTURE

JOINT INSTITUTE WITH A FRENCH PARTNER UNIVERSITY

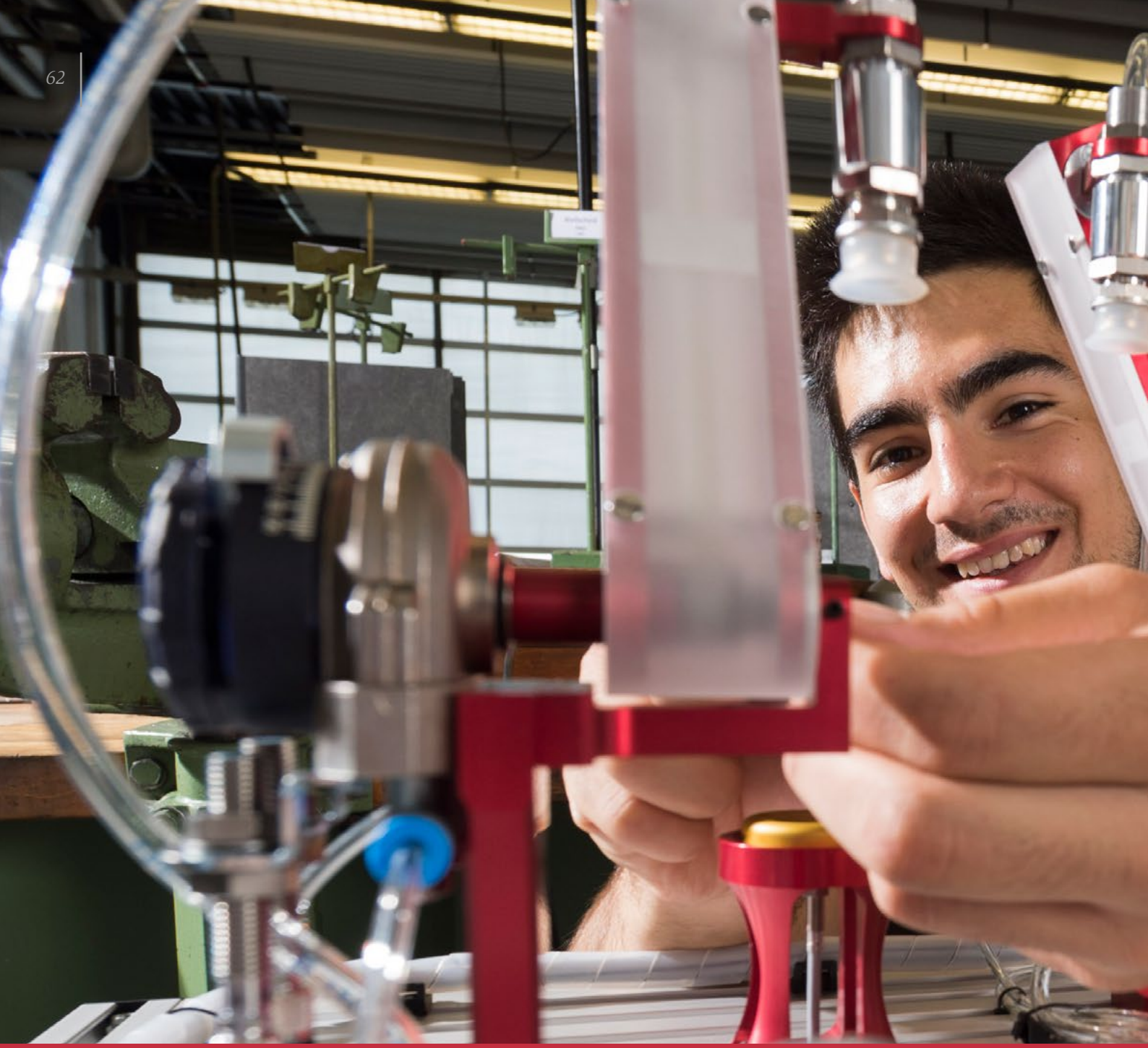
2016 marked the 100th anniversary of the Battle of Verdun and once again clearly showed the paramount importance of the Franco-German friendship for the stability of Europe. To support and fortify this close friendship in times of terror and the refugee crisis, both governments in a joint declaration on the occasion of the meeting of the Franco-German Council of Ministers said that they intend to strengthen the cooperation in education and research as well as the digitization of industry. At KIT, the German-French Initiative (DeFI) coordinates cooperation projects with France in research, teaching, and innovation and initiates projects with partners from science and industry.

Vice President Professor Dr. Thomas Hirth during the event for signing the agreement on setting up the Franco-German Institute "Industrie du Futur."

To support these efforts, Karlsruhe Institute of Technology and its long-standing French partner university Arts et Métiers Metz decided to set up the Franco-German institute "Industrie du Futur." The ceremonial signing of the agreement took place at the beginning of April on the occasion of the visit to Metz of the French Secretary of State for Education and Research Thierry Mandon in the presence of the Vice President for Innovation and International Affairs of KIT, Professor Dr. Thomas Hirth.

KIT's partner university Arts et Métiers is one of the French elite universities. It has several locations throughout the country and is known for its excellent engineering study program. With the Franco-German Institute "Industrie du Futur," KIT and Arts et Métiers create a joint cross-border platform which brings together science, industry, startups, and students.

At the new institute, joint research projects, conferences, seminars, and training programs, among others, will be developed and coordinated to meet the challenges of the digital future.



KIT AS AN EMPLOYER

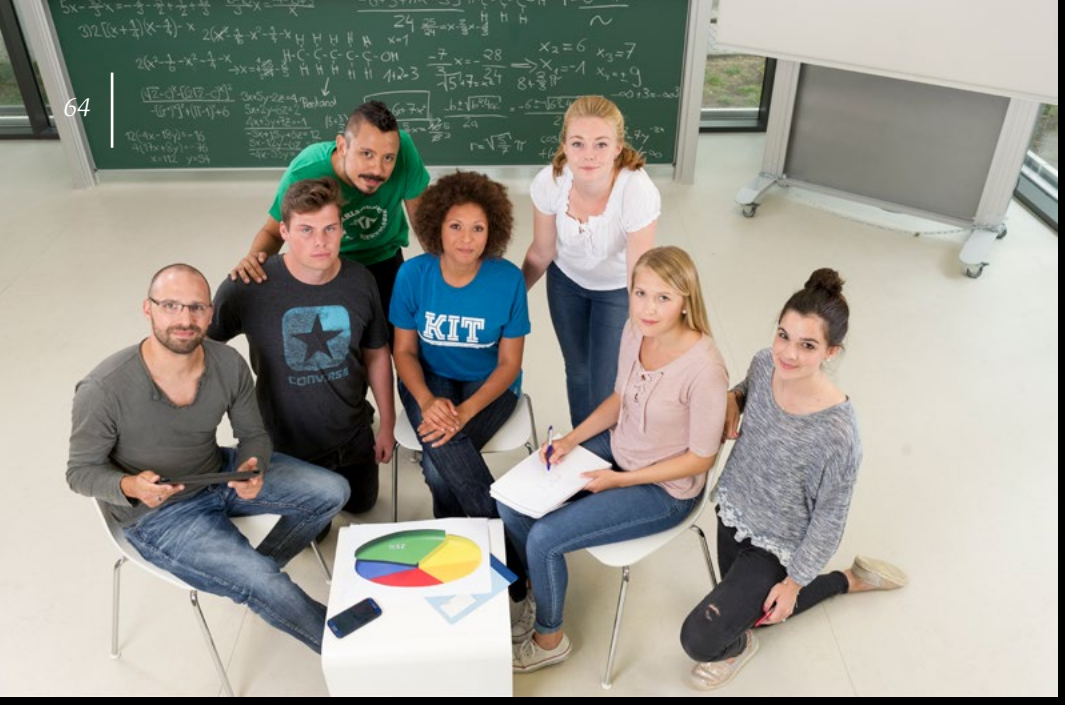
With 9,239 employees, KIT is one of the largest employers in the region. The staff is made up of 5,468 scientific and 3,466 non-scientific members and includes 464 trainees as well as the students of the Baden-Württemberg Cooperative State University. The share of women is 36.5 percent. KIT hosts 1,144 foreign employees, the majority of whom are academic personnel. In addition, there are 365 professors and senior researchers, 21 of whom were appointed in 2016.

In more than 30 professions and 12 degree programs of the Baden-Württemberg Cooperative State Uni-

versity, Karlsruhe Institute of Technology each year systematically prepares approximately 160 trainees and students for their future tasks. Among young people, KIT is a first-choice option for professional training in the Karlsruhe Technology Region and throughout Germany.

This is also reflected by the success of the trainees: For his excellent achievements, biology lab assistant Lukas Geschwender was granted the Helmholtz Apprenticeship Award 2016. Participating in a research project in the Philippines, he detected genetic factors that make rice more resistant to salt stress.

Eight of the winners of the Best of the Year Award of the Karlsruhe Chamber of Commerce and Industry (IHK) have been trained at KIT. In 2016, KIT hence was presented again with an IHK certificate for outstanding results and excellent training.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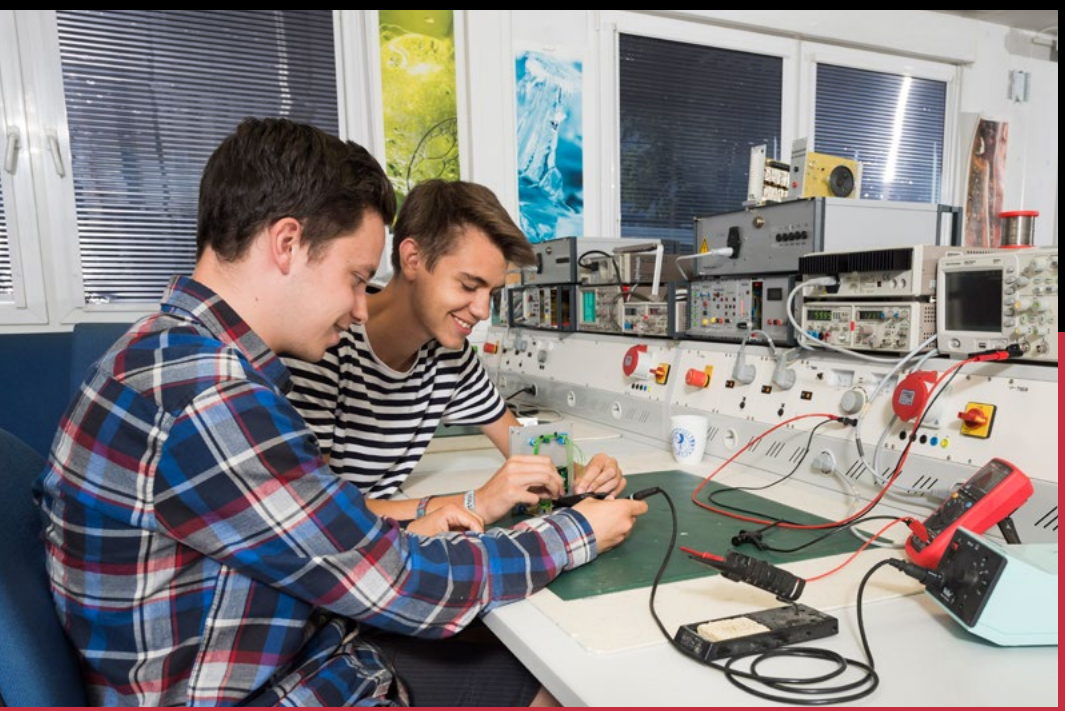


SETUP AND IMPLEMENTATION COMPLETED
COMPLIANCE AT KIT

KIT's compliance system is made up of the Compliance and Corruption Prevention Staff Unit as well as of various central representatives and ombudspersons who, in accordance with the relevant rules, can advise, train, and supervise all employees of KIT in their daily work routines. The setup and implementation of the overall and comprehensive KIT compliance system were completed in 2016.

A comprehensive whistleblower system enables KIT employees or third parties to contact in person or in writing and, if required, anonymously the Compliance and Corruption Prevention Staff Unit. The system allows to sustainably detect irregular behavior, initiate inquiries, and as soon as possible take optimizing preventive measures.

Since July 2015, a trusted lawyer has been appointed with the mandate to act as confidential contact point in cases of suspected corruption or ethically objectionable activities. If real evidence is provided, the lawyer will convey the information given to the Compliance and Corruption Prevention Staff Unit.

In addition, an electronic whistleblower portal in German and English was introduced in 2016. The portal gives KIT employees and third parties a platform for anonymous reporting of incidents of concern.

The number of successful participants in the corruption prevention e-learning courses introduced for all employees at the end of 2015 is usually far above average. If necessary, additional on-site training sessions on particular subjects of compliance and corruption prevention are made available.

A Corruption Prevention Directive and Code of Conduct were developed by the Compliance and Corruption Prevention Staff Unit and published after having been approved by the relevant committees. These guidelines, among others, aim to create and sharpen the awareness of problems and responsibility to protect KIT and its employees from legal consequences and losses of reputation.

The controlling of the numerous internal guidelines enables continuous updating to ensure availability of the latest versions of the current regulations. Different reports to the Presidential Committee and the Supervisory Board complete the transparency of compliance at KIT. The compliance management at KIT provides continuously increasing legal security.

The setup and implementation of the KIT compliance system were completed in 2016.

SELF-COMMITMENT BEARS FIRST FRUITS
"GOOD WORK AT KIT"

The self-commitment to "Good Work at Karlsruhe Institute of Technology" adopted in 2015 by the Presidential Committee, the Senate, and the Staff Council of KIT has increased the sensitivity as regards the drafting and, in particular, the limitation of employment contracts, and bears first fruits.

Whereas, based on self-commitment to "Good Work at KIT," the number of limited employment contracts converted into open-ended contracts increased from 198 in 2014 to 224 in 2015 through to 243 in 2016, the number of new hires with open-ended contracts was doubled to 60 as compared to 2014.

The self-commitment to "Good Work at KIT" controls responsible handling of limited employment contracts.

In the field of human resources management, steps have been taken to establish electronic workflows in several sectors of personnel administration. The implementation and application of the SAP portal-based Employee Self Services and Manager Self Services (ESS/MSS) are considered to be the most important measures and are now being rolled out successively at KIT. The new system step by step reduces the previous hardcopy application forms. Absences and leaves are approved electronically, and employees can maintain their personal data themselves.

Essential preliminary work was done, moreover, to introduce electronic workflows for contracts with student and academic assistants. The handling of employment contracts, continued employments, contract amendments, or reclassifications is being modernized and will be easier and more efficient in the future. Discontinuation of double data acquisition, besides, can minimize the overall administrative expense, improve the quality of administrative proceedings, and optimize the management of personnel measures.

Once this enhancement project has been implemented, the institutes and service units, in the related processes, will be collaborating mainly paperlessly, and the respective procedures will be facilitated and accelerated in this way. The pertinent agreement is still being negotiated and is intended to be signed by the Presidential Committee and Staff Council in 2017.

In the course of 2017, the planned similar electronic workflow for business travel application, approval, processing, and accounting will allow largely paperless and hence much easier and faster administrative procedures.

IMPLEMENTATION OF THE KIT 2025 UMBRELLA STRATEGY

CAREER STAGES AND CAREER PATHS FOR YOUNG RESEARCHERS

With the KIT 2025 Umbrella Strategy adopted by the Supervisory Board and the KIT Senate in November 2015, KIT set its course for the coming years: Seven major areas of action were defined to outline the objectives through to 2025 and the measures to be taken to achieve them. An eighth area of action (international affairs) is currently being drafted. In 2016, the phase of implementation of the strategy started by transferring the numerous measures into a suitable project structure. These measures will be gradually implemented in the coming years. The pursued scheme continues to be under the direct responsibility of the President, is controlled by the Presidential Committee and the Heads of Divisions, and is handled in collaboration with different scientific and administrative project teams. In addition to the committees, a sounding board consisting of representatives of the different groups at KIT advises the Presidential Committee on the implementation of the KIT 2025 Umbrella Strategy.

Recruitment and postdoctoral support of excellent young researchers are of high strategic relevance to KIT. The overall objective is to make young researchers' career paths predictable and transparent and thus provide reliable career prospects for academic high potentials.

In view of this significance, a priority project within the KIT 2025 Umbrella Strategy is dedicated to young researchers. Under the aegis of the Vice President for Research, a project team made up of academic and administrative members works on career path concepts. Based on KIT's well-established and successful doctoral support program, the team, among others, has developed a quality assurance concept for junior professorships (W1 professorships) with tenure track, which follows a 2016 agreement between the federal government and the states and has meanwhile been adopted by the Presidential Committee, the Staff Council, and the KIT Senate: Vacancies, as a rule, shall be advertised internationally. Application shall require a change of university after conferral of the doctorate or at least two years of academic activities outside of KIT. Appointment procedures shall be carried out with internationally renowned experts participating and can be complemented by assessments of the applicants' management and development potentials. If desired, confidential advice may be provided by mentors. Junior professorships with tenure track are limited initially to four years and are extended to six years upon positive interim evaluation. Upon successful assessment in accordance with defined and transparent criteria, junior professors shall be eligible for W3 professorships. Equal opportunities and the work-life balance are integral parts of the developed concept.

Besides implementing the strategic goals of the KIT 2025 Umbrella Strategy, KIT, with the application of the quality assurance concept, creates the conditions for participating in the upcoming program of the federal government and the states on promoting young researchers (Early Career Researchers Pact).

The areas of action for implementation of the KIT 2025 Umbrella Strategy were presented to the employees in a poster exhibition at Campus North and Campus South.

HELP AND ASSISTANCE IN AN ALIEN, UNFAMILIAR WORLD

SUPPORT OF REFUGEES AT KIT

At the end of July 2016, the Karlsruhe Regional Council closed down the two initial refugee reception facilities at Campus East and Campus North. The facility at Campus North was converted into a stand-by option to be re-opened rapidly in case that the number of refugees increases.

In spite of the closedown of these facilities, the commitment of KIT and the KIT employees to refugees has continued, and staff for integration of the refugees was appointed in March 2016.

Integration into professional training and studies is the objective of many individual measures e.g., information meetings, consultation, or open office hours, that are tailored to the situation of the refugees.

Much importance is attached to language courses qualifying refugees for the Deutsche Sprachprüfung für den Hochschulzugang – DSH (test of German language skills for university access). Combined with such language courses, the MINT-Kolleg Baden-Württemberg (course of lectures in mathematics, informatics, natural sciences, and engineering) at KIT also offered subject-related training in preparation for studies.

Five international KIT students from the main countries of origin of refugees were selected and qualified as student ambassadors providing information meetings and advice in different languages i.e., in German, English, French, Arabic, Urdu, Pashto, Amharic, and Tigrinya, and reporting about their own experiences with studying in Germany.

In addition, refugees interested in studying have been enabled to participate in the tandem language program Pelican of the Institute for German Studies, in the course "Programming for Refugees in Karlsruhe" of the Institute of Applied Informatics and Formal Description Methods, in the job market "Welcome2Work" of the Enactus KIT University Group, as well as in other initiatives.

In addition to many other programs, KIT offered a metalworking trial course for refugees.

Nine scholarship holders from the Syria Scholarship Program of the Baden-Württemberg Ministry of Science, Research and the Arts were supervised by KIT, and mentors for refugee freshmen were arranged for. The Federal Ministry of Education and Research has been supporting different measures via programs of the German Academic Exchange Service.

In different trial and one-week work experiences, twelve refugees were enabled to get acquainted with careers and opportunities for training and education at KIT. In September, thanks to cooperation with the employment agency, one refugee started to qualify for the profession of industrial mechanic. Special preparatory courses will provide the basis for the candidate's regular apprenticeship from 2017.

LIFE AT KIT

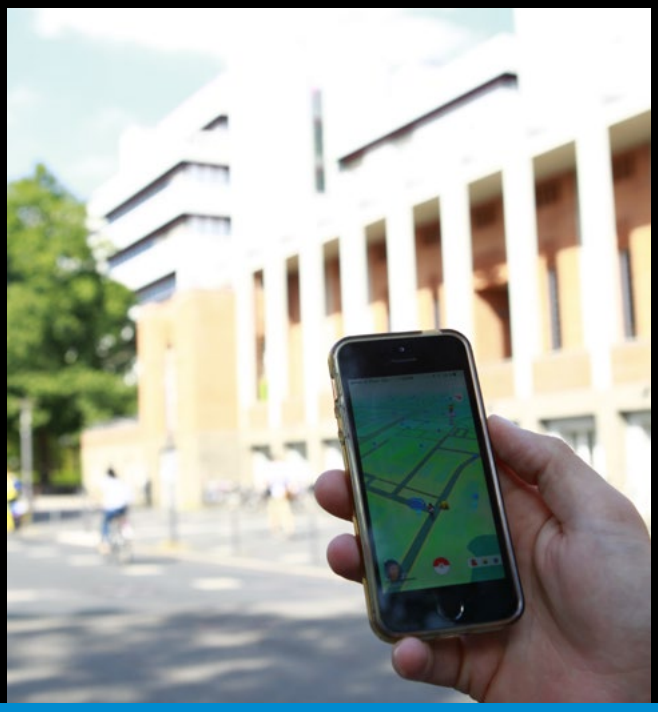
As a large science institution, KIT is in many ways responsible for intensifying sustainability and integrating the protection of resources into its work processes. The Institute's activities at its locations are realigned besides being included in research and teaching.

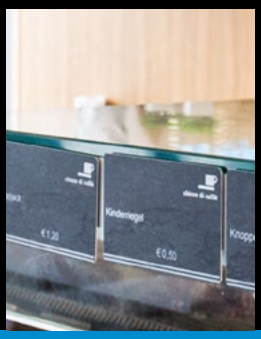
The "Sustainability Management in Non-University Research Organizations" (LeNa) guide addresses the organization of KIT on a broad bases. In the light of these guidelines, some first changes have been made in purchasing. Among other things, paper consumption has been almost completely switched to recycled paper bearing the "Blue Angel" hallmark of quality.

In the year under review, the 2030 Master Plan with the focus on "Property," "Energy and Climate Protection," and "Mobility" was completed for buildings and infrastructure systems as a basis of sustainable campus development. The focus is on development and qualification of public open spaces. Under the heading of "Green Campus," the subjects of biodiversity, urban climate, and air quality will play an important role, among other factors.

Within the "Energy and Climate Protection" area, "Energiewende@KIT" translates the climate policy objectives of the federal and state governments into internal application. In 2016, an energy audit was conducted to examine energy demand in terms of sufficiency and efficiency criteria. Since 2016, ecological electricity has been used at the university; on the campus of the national research center, in-house capacities of an engine-based cogeneration system were commissioned within the framework of a research cooperation project.

"Mobility" also exerts considerable influence on the CO_2 balance of KIT. On the basis of a traffic analysis, recommendations for action were developed in the 2030 Master Plan which will successively be put into effect in the next few years. Promoting the use of e-mobility and of bicycles will be important future functions.

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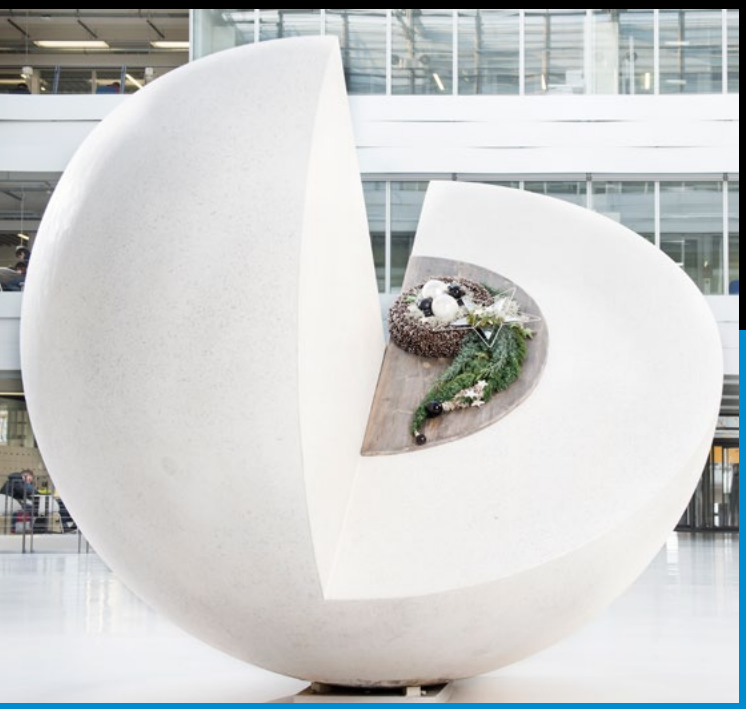



DER BLAUE ENGEL
weil aus 100% Altpapier
schützt die
RESSOURCEN


ZUKUNFTS-
CAMPUS

AGAINST FORGETTING

COMMEMORATIVE PLAQUE RECALLS PERSECUTIONS DURING NS PERIOD

Immediately after the national socialists seized power in Germany on January 30, 1933, the government system was speedily converted into a dictatorship. The regime very soon created the legal basis for persecuting Jewish citizens and imposed sanctions on its political opponents. As time went on, these provisions were tightened up increasingly.

Also staff members of the then Technische Hochschule Karlsruhe became victims of those measures. To commemorate those who were removed from service, excluded from university studies or stripped of their academic degrees and ranks, the Karlsruhe Institute of Technology installed a commemorative plaque in the "Ehrenhof" on the premises of Campus South.

In the course of the persecutions, eleven of then 41 full and extraordinary professors of the former Technische Hochschule Karlsruhe were ousted from service. At least 13 persons were removed from the group of honorary professors, assistant professors, scientific staff members, and auxiliary staff. As a consequence of an insufficient reference base, the exact number of these staff members can no longer be determined with certainty.

Also students of the Technische Hochschule Karlsruhe were affected by the persecutions. After suffering many hardships since 1933, Jews were banned from obtaining doctorates after 1937. Following the pogroms in November 1938, Jewish students were no longer permitted to attend universities. Doctorates obtained before were revoked on the basis of the "Reichsbürgergesetz" from those who had left Germany because they were not able to live in a national socialist state.

The words on the commemoration plaque read as follows: "This plaque commemorates members of the Technische Hochschule Karlsruhe who suffered injustice by national socialism for racist or other ideological or political reasons by removal from office, exclusion from studies, revocation of academic degrees and honors, or in any other way in the years between 1933 and 1945. The persecutions broke the fundamental values of humanity and tolerance. Their memory admonishes us to keep these values alive in the present and in the future. The Karlsruhe Institute of Technology represented by its Presidential Committee and Senate in 2016."

It is part of the culture of KIT to examine its history without prejudice, study it scientifically, and confront it actively. For this reason, the KIT Senate has commissioned an independent expert opinion shedding light on the way in which national socialism worked in the KIT precursor institutions during and after World War II and studying the biographies of potentially incriminated persons in executive positions.

A commemorative plaque in the "Ehrenhof" of KIT commemorates persecutions of staff members of the former TH Karlsruhe during the national socialist period.

THE POLARIZED COMMUNITY OF SOLIDARITY

20TH KARLSRUHE DIALOGUES ABOUT THE EUROPEAN COMMUNITY

Since 1997, the annual Karlsruhe Dialogues have selected a topical societal subject and discussed it in an interdisciplinary fashion and internationally in front of a broad audience. The Karlsruhe Dialogues are organized and designed by the ZAK I Centre for Cultural and General Studies at the Karlsruhe Institute of Technology.

Also in its anniversary year, the symposium concentrated on a critical contemporary issue. Under the heading of "NationEUrope: The Polarized Solidarity Community," the stability of the European Community was discussed against the background of major challenges coming up again and again.

ZAK | Centre for Cultural and General Studies organized the Karlsruhe Dialogues in the anniversary year under the heading of "NationEUrope: The Polarized Solidarity Community."

The crisis of the euro, the Greek crisis, the refugee crisis: How much internal pressure is the European Union able to stand in view of the permanent crises? What has become of the "European Idea" in times of growing globalization? Is Europe a broken puzzle of which some parts have been lost? Is the community of solidarity, EU, able to act in the face of internal conflicts?

However, instead of clarifying such issues, it is populism, right and left-wing extremism, new nationalism, and solitary measures of individual countries which are coming up. Does this mean failure of the structural and legal framework of Europe, or is it precisely in hard times that the strengths of the Community and the willingness to advance reforms are proving their value? These and other questions were discussed with international experts at the 20th Karlsruhe Dialogues who studied the polarization and the developments of the European Community.

For two decades now, proven experts and cultural workers, contemporary witnesses and activists from all over the world have been invited each February to discuss among each other and with the Karlsruhe public. In line with the duty of ZAK to promote public science, discussions with interested members of the public seek to find out how Europe sees itself and examine the perspectives of public participation in the European design process.

NEW TECHNOLOGIES FROM NEW MATERIALS

KIT MATERIAL RESEARCH CENTER INAUGURATED

Powerful materials for future energy supplies, such as batteries and organic solar cells, are in the focus of research at the Material Research Center for Energy Systems (MZE), which was opened on Campus South in November 2016.

MZE pursues a highly interdisciplinary approach by combining approximately 150 scientists from chemistry, physics, materials sciences, electrical engineering, and process engineering under one roof. They study the whole process chain from molecules to components and work on process technology, characterization, modeling and simulation of new materials for energy systems. The focus is on printable organic solar cells and rechargeable battery systems. What is required, for instance, are high energy and power densities for applications in electric mobility or very long lifetimes and low costs per charge-discharge cycle for stationary storage systems. Another activity is the development of new processes allowing these innovative materials to be produced economically on an industrial scale and to be used in energy systems.

The new Material Research Center on KIT Campus South studies materials for future power supplies.

The new MZE building in the immediate vicinity of the Audimax on Campus South of the KIT has a useable area of 4300 m^2. The space concept was tailored specifically to the interdisciplinary approach promoting communication among the working groups and, in this way, intensifying cooperation. The MZE is equipped with modern facilities and equipment for manufacturing and characterizing newly developed materials, among them a high-resolution computerized tomograph and a novel scanning ion/scanning electron microscope (FIB-SEM).

The contractor of MZE is the State of Baden-Württemberg represented by the Karlsruhe Office of Assets and Construction in Baden-Württemberg. Building costs amounted to EUR 27.4 million financed half each by the federal government and the state government. These funds were promised in a competition organized by the State Ministry of Science, Research, and the Arts in an effort seeking to strengthen innovative future technologies in the state. The design of the building comes from the Cologne office of Valentyn Architects.

At the same time, the Microtribology Center, µTC, of the Fraunhofer Society was inaugurated in the immediate vicinity of MZE to study friction and wear processes in technical systems. The scientists working at MZE and µTC will cooperate closely in a variety of research areas, especially in modeling and simulation.

WELCOME2WORK

ENACTUS UNIVERSITY GROUP INITIATES JOB PORTAL FOR REFUGEES

Students of the Karlsruhe Institute of Technology intend to improve sustainably the situation of refugees coming to Germany. For this purpose, they built a Welcome2Work job platform specifically for refugees. It employs an internet-based multilingual job portal supplemented by a sponsorship concept.

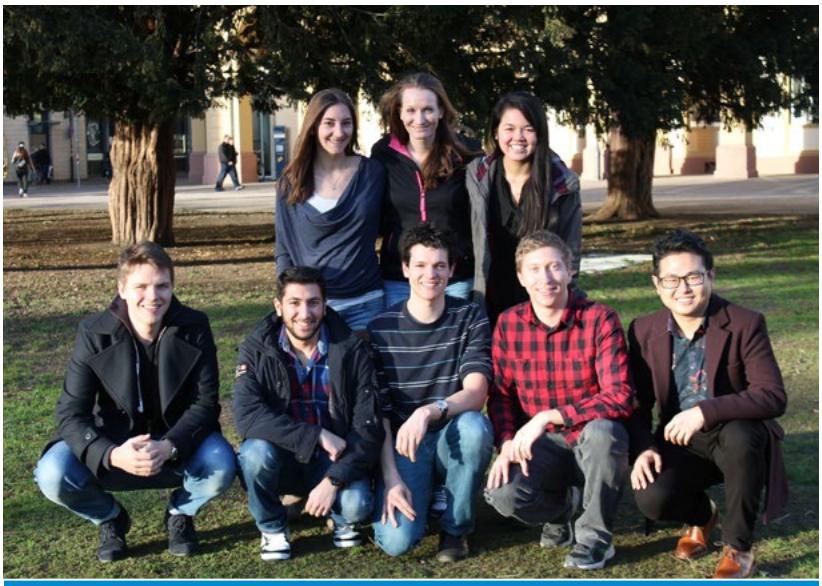
This is to facilitate the search for jobs for refugees in Germany and offer companies access to a pool of applicants not so far considered. The job portal is available throughout Germany; the first contracts were closed in the Karlsruhe region. The search is designed specifically for companies, refugees and persons interested in working within the project as volunteers.

Refugees can register on the online platform free of charge and set up a profile as applicant or apply directly to open positions. Moreover, the profiles are protected and can be seen only by registered companies who can then directly contact applicants. Fundamental legal issues are answered in an information portal. The job portal is available in German, English, French, and Arabic.

Welcome2Work also provides volunteers when requested. They are available to refugees as contact persons to help in cultural, legal, and linguistic problems and provide support in seeking integration into the labor market.

Welcome2Work allows interested refugees and entrepreneurs to meet, while sponsors support refugees in integrating into the labor market.

Partners in cooperation, such as centers of advanced education, language schools, legal consultants, or business consultants for intercultural communication, help applicants, sponsors and employers by providing their expert knowledge. Welcome2Work is a project of the non-profit Enactus KIT student initiative.



The team of "Welcome2Work," a project of the Enactus student initiative.

PRIZES, HONORS, AWARDS, AND APPOINTMENTS

In 2016, KIT had the pleasure to confer several very high honors. President Professor Dr.-Ing. Holger Hanselka, for instance, granted the Honorary Senatorship to the former Board Member of Daimler AG, Professor Dr. Hartmut Weule, for his merits in establishing the International Department of KIT. Dr. Roland Mack, Co-founder and Managing Director of Europa-Park Rust, was appointed new Honorary Citizen of KIT. He received this honor for his merits as a former university council member of a predecessor institution of KIT and for the donation of the Roland Mack Mechanical Engineering Grant at KIT.

KIT medals of merit for outstanding commitment were awarded to Peter Denis, Member of the Board of Commerzbank AG Wealth Management Karlsruhe, Dr. Gert-Henning Flick, Founder of the Dr. Gert Henning and Karin Flick Fund under the roof of the KIT Foundation, Dr. Nikolai Gauss, representative of the Christian Bürkert Foundation, and Dr. Anja Schümann, Chief Executive Officer of the Reinhard Frank Foundation. All of them work in foundations and actively support the granting of scholarships and prizes to students and graduates of KIT.

Professor Dr. Robert Klanner received the 2016 Julius Wess Award for fundamental contributions to the development of silicon trackers needed for the discovery and measurement of new elementary particles. The Julius Wess Award is named after Professor Julius Wess who worked tirelessly in the area of theoretical and experimental elementary particle physics during his twenty years of employment with Karlsruhe University, today's KIT. During this time, he published work of outstanding international importance. The Julius Wess Award of the KIT Elementary Particle and Astroparticle Physics Center is endowed with EUR 10,000.


1000,-€
Dr. Melitta
Büchner-Schöpf-Preis
Preis für hochbegabte Künstler


KIT
Karlsruher Institut für Technologie
HONORARY AWARD


Wissen+Kompetenzen


Schaeffler
FAG Stiftung
HONORARY
AWARD

ALEXANDER VON HUMBOLDT PROFESSORSHIP FOR WOLFGANG WERNSDORFER

KIT BRINGS BRILLIANT EXPERIMENTAL PHYSICIST BACK TO GERMANY

Alexander von Humboldt Professorship ceremony in Berlin: Award winner Professor Dr. Wolfgang Wernsdorfer (second from the left) with the President of KIT, Professor Dr.-Ing. Holger Hanselka (left), State Secretary of the BMBF, Cornelia Quennet-Thielen, and the President of the Alexander von Humboldt Foundation, Professor Dr. Helmut Schwarz (right).

Germany's highest award amounting to EUR 5 million for researchers from abroad went to Professor Dr. Wolfgang Wernsdorfer in May 2016. The pioneer of molecular spin electronics returned from France to Germany in June. Since then, he has continued his research for the development of future quantum computers at the Physikalisches Institut of Karlsruhe Institute of Technology. At KIT, Wolfgang Wernsdorfer is setting up a unique center for molecular quantum spintronics.

Before he came to KIT, Wolfgang Wernsdorfer worked at the Institut Néel of the Centre National de la Recherche Scientifique (CNRS) in Grenoble. He has specialized in molecular quantum spintronics, an area of experimental solid-state physics at the interface to chemistry and materials sciences. Wernsdorfer is among the leading experts worldwide for molecular nanomagnets and their use in quantum computer systems.

With his pioneer experiments, Wernsdorfer has determined and further developed the area of quantum magnetism. He found out how molecular magnets behave under the laws of quantum mechanics. Based on this finding, he was able to build electronic circuits with single molecules, in which electric current can be controlled by the magnetization of the molecule.

Wolfgang Wernsdorfer's goal is to integrate extremely small and quick molecular quantum processors into the highly advanced microelectronic chip technology. The ultimate objective is to use molecular nanomagnets coupled to semiconductor transistors in future quantum computers. This would allow quantum computers based on magnetic molecules and nuclear spins to be developed. When connected in an appropriate way and number, they would be far superior to conventional computers in terms of speed and energy efficiency.

Presently, four spin states can be controlled by quantum mechanics in Wernsdorfer's nanomagnets. With this, one building block of a quantum computer is driven: The qubit. Wernsdorfer will test how many qubits can be connected and how these quantum systems can be applied.

Wernsdorfer has already been granted a number of high-ranking honors and awards, such as the Agilent Europhysics Prize, the Olivier Kahn International Award, an ERC Advanced Grant of the European Research Council, or the Prix Spécial of the Société Française de Physique.

REVOLUTION OF THE PETRI DISH

ERWIN SCHRÖDINGER PRIZE FOR INTERDISCIPLINARY RESEARCHERS

Biologist Professor Dr. Martin Bastmeyer, chemist Professor Dr. Christopher Barner-Kowollik, and physicist Professor Dr. Martin Wegener were granted the 2016 Erwin Schrödinger Prize. This prize of the Helmholtz Association of German Research Centers and the Stifterverband for promoting science and education acknowledges outstanding scientific or technical achievements by scientists from at least two disciplines at the interface of medicine, natural sciences, and engineering.

The scientists of KIT have developed a method to produce flexible, three-dimensional microscaffolds for culturing cells in a customized environment and for conducting related research. For this purpose, they produced specifically designed 3D petri dishes by three-dimensional printing on the microscale.

Every organism consists of cells, whose behavior and development depend on the mechanical and chemical properties of their three-dimensional environment, among others. To adequately study cells, it is therefore important to represent as realistically as possible the processes taking place in this environment. Existing experimental models frequently only cover cell cultivation in two-dimensional petri dishes. By means of laser-based lithography, the scientists produced three-dimensional microscaffolds for cell cultivation. They wrote the scaffolds into a special photoresist with a laser. This resist only hardened at those points that were exposed to the laser focus. The underexposed areas were washed out, while the hardened parts remained and formed the scaffold. To produce petri dishes for cell cultivation from these microscaffolds, special photoresists with a biochemically active surface were developed. Moreover, cells in their natural environment receive information from other cells. This process also is to be simulated in the specially designed petri dishes. For this, the researchers developed a method to attach biological signal molecules to defined points of the three-dimensional structures.

The team successfully used these three-dimensional scaffolds for the cultivation and investigation of myocardial, connective tissue, and stem cells. Cell behavior in this artificial environment is very close to that in the natural environment, but differs considerably from that on two-dimensional surfaces. Easy production of flexible and specifically designed petri dishes opens up a wide range of opportunities for culturing biological tissue that might be used in medicine to replace or regenerate diseased tissue of patients.

Biologist Professor Dr. Martin Bastmeyer, physicist Professor Dr. Martin Wegener, and chemist Professor Dr. Christopher Barner-Kowolik (from left to right) were granted the 2016 Erwin Schrödinger Prize.

HIGH HONORS FOR GISELA LANZA AND THOMAS LÜTZKENDORF
CROSS AND OFFICER'S CROSS OF THE ORDER OF MERIT

Professor Dr. Gisela Lanza was awarded the Cross of the Order of Merit of the Federal Republic of Germany by Federal President Joachim Gauck for her research in the field of production engineering and her commitment to promoting young scientists.

Federal President Joachim Gauck handed over the Cross of the Order of Merit to Professor Dr. Gisela Lanza.

Planning and designing production systems in global production networks is the focus of Gisela Lanza's work. At KIT, the engineer heads the "Production Systems" group of the Institute of Production Science. Here, she develops methods and models for high-quality and yet cost-effective production. KIT's representative for China also founded a branch office of her institute in Suzhou: The Global Advanced Manufacturing Institute (GAMI). As Germany's first shared professor, Lanza was given the opportunity to combine teaching and research at KIT with management tasks in the automotive industry for four years.

Not least, the award also recognizes Gisela Lanza's commitment to young scientists: She addresses students and young researchers from around the world not only with her lectures at KIT's Department of Mechanical Engineering and the HECTOR School of Engineering and Management of KIT's International Department, but also by strongly integrating GAMI into research and teaching at KIT.

Bodo Ramelow, Minister-President of Thuringia, awarded the Officer's Cross of the Order of Merit to Professor Dr. Thomas Lützkendorf in Erfurt. On behalf of the Federal President, Ramelow honored the outstanding merits of the professor in the development of scientific principles for sustainable construction and their dissemination and implementation in practice.

Sustainable construction has many advantages. It contributes to preserving the environment, but also results in a high satisfaction of users and gives rise to economic potentials. The question of how ecological can be combined with economic aspects for the benefit of all parties involved is in the focus of research conducted by Thomas Lützkendorf, who holds the Chair of Sustainable Management of Housing and Real Estate. With his work, he established methodological principles that are indispensable for assessing the viability of buildings.

When handing over the Officer's Cross of the Order of Merit at the Thuringian State Chancellery, Minister-President Bodo Ramelow also mentioned the work of Thomas Lützkendorf for national and international standardization and his participation in various advisory councils and bodies, such as the Round Table on "Sustainable Construction" of the former Ministry of Transport, Construction, and Urban Development. In particular, Lützkendorf's commitment to the environment and society was honored.

On behalf of the Federal President, Professor Dr. Thomas Lützkendorf was honored with the Officer's Cross of the Order of Merit by the Thuringian Minister-President Bodo Ramelow.

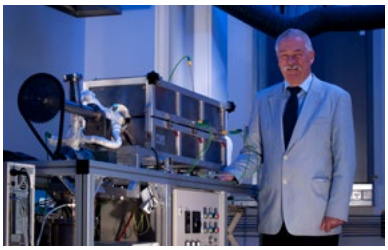
OTHER PRIZES, HONORS, AWARDS, AND APPOINTMENTS

■ For their technical achievements and competencies in research and academic education, **Professor Dr. Dr. Albert Albers** and the Institute of Product Engineering headed by him received the Honorary Award of the Schaeffler FAG Foundation. The award acknowledges excellent technical and scientific achievements in research and academic education that bridge the gap between science and industry.

■ Climate researcher **Dr. Tirtha Banerjee**, postdoc at the Institute for Meteorology and Climate Research, received the Gandhi Medal of the Non Resident Indians (NRI) Welfare Society of India. President of India Pranab Mukherjee handed over the medal at the House of Lords in London. The NRI Welfare Society of India intends to strengthen the link between India and Indians living abroad.

■ **Dr. Larissa Bergmann**, Institute of Organic Chemistry, was granted the first prize in the Competition of Ideas for Baden-Württemberg Young Scientists launched by the Baden-Württemberg Foundation for Energy and Climate Protection for her doctoral thesis "New Emitters for OLEDs: The Coordination- and Photo-Chemistry of Mononuclear Neutral Copper(I) Complexes."

■ **Professor Dr. Henning Bockhorn** was handed over the Jürgen Warnatz Gold Medal by the Combustion Institute for his outstanding scientific achievements in combustion technology, which cover the whole range from fundamental work to technical application. The Combustion Institute is an international, non-profit, educational and scientific society in Pittsburgh, USA. It promotes and disseminates scientific research activities and training in the area of combustion science and technology.



■ **Professor Dr. Martin Dienwiebel**, Institute for Applied Materials of KIT and Fraunhofer Institute for Mechanics of Materials, was conferred the Heisenberg Professorship for Applied Nanotribology for his research into nanotribology by the German Research Foundation.

■ **Professor Dr. Stefan Emeis**, Institute for Meteorology and Climate Research, was granted the Reinhard Süring Plaque by the German Meteorological Society for his long commitment to publishing the "Meteorological Journal" and his active work in various committees.

■ For the development of a superconductor concept with outstanding properties, **Dr. Walter Fietz** and **Dr. Michael Wolf**, Institute for Technical Physics, were awarded the SOFT Innovation Prize by the European Union for Fusion Research. The team has developed a superconductor concept that might be used as a basic element for future high-current leads due to its energy-efficient current transport capability.

■ For a new type of teaching concept, the Baden-Württemberg Foundation granted a Tandem fellowship for innovations in academic education to **Professor Dr. Johannes Gescher**, Institute for Applied Biosciences, and **Katrin Klink**, Personnel Development and Vocational Training. The Tandem fellowship is awarded to teachers cooperating with university didactics experts or other teachers in a project.

■ **Lukas Geschwender**, who passed a vocational training to become a biology lab assistant at KIT, was granted the Helmholtz Apprenticeship Award 2016. At the Botanical Institute, Lukas Geschwender was involved in a research project and experimentally identified genetic factors that make rice more resistant to salt stress.

■ **Professor Dr. Armin Grunwald**, Institute for Technology Assessment and Systems Analysis, was appointed member of the new ethics commission on automated driving by the Federal Ministry of Transport. In late September 2016, the commission of representatives of science, industry, and society started work on ethical guidelines for decisionmaking of computerized vehicles, in particular in risk situations.

■ **Professor Dr. Peter Gumbsch**, Institute for Applied Materials and Head of the Fraunhofer Institute for Mechanics of Materials in Freiburg, is new member of the National Academy of Engineering. His appointment is to honor his innovative research activities in the area of multi-scale material modeling. The National Academy of Engineering of the United States of America appoints persons as academy members, who have performed pioneer work in technical areas or achieved major scientific progress.

■ **Assistant Professor Dr. Lars Heinke**, Institute of Functional Interfaces, was granted the lecturer's prize by the Chemical Industry Fund. Heinke studies thin films of metal-organic framework structures (MOFs). His work focuses on remotely controlled MOF materials with integrated molecules that can be switched by means of light.

■ Cryptologist **Professor Dr. Dennis Hofheinz** was granted an ERC Consolidator Grant by the European Research Council (ERC) in 2016. Under the project "PREP-CRYPTO: Preparing Cryptography for Modern Applications," he develops new systems that combine proved cryptography methods with novel components (see also page 53).

■ **Professor Dr. Corinna Hoose**, Institute for Meteorology and Climate Research, was awarded an ERC Starting Grant by the European Research Council (ERC). She combines simulations of cloud formation with satellite observations to decisively improve process understanding and predictability of cloud formation (see also page 52).

■ Physics student **Thomas Huber**, KIT, reached the second place in the Baden-Württemberg preliminary round of the science communication competition "FameLab" and won the audience prize with his presentation on cosmic rays.

■ **Dr. Michael Kühn**, Institute of Physical Chemistry, was awarded the Helmholtz Doctoral Prize 2015 in the key technologies research field at the 2016 New Year´s Reception of the Helmholtz Association. Kühn has developed a quantum theory method, by means of which suitability of molecules for new organic light-emitting diodes (OLEDs) can be estimated prior to manufacture.

■ For their project "Forschendes Lernen: Entwicklung von fachübergreifenden Lehrmaterialien und ihr Einsatz in Großveranstaltungen" (research-based learning: Development of interdisciplinary teaching materials and their use at large events), **Professor Dr. Ines Langemeyer**, Institute for Vocational Education and General Education, and **Dr. Karin Hartung**, University of Hohenheim, were granted a Tandem fellowship by the Baden-Württemberg Foundation. This fellowship is awarded to teachers cooperating with university didactics experts or other teachers in a project.

■ For his bachelor thesis at SHARE (Schaeffler Hub for Automotive Research in E-mobility) at KIT, **Tino Megner** was granted the DRIVE-E studies award in the category of "Project and bachelor theses." The award is granted annually by the Federal Ministry of Education and Research and the Fraunhofer Society to acknowledge outstanding, innovative theses of students in the area of electric mobility.

■ **Professor Dr. Gary L. Messing**, Distinguished Professor of Ceramic Science and Engineering, Department of Material Science and Engineering, College of Earth and Material Science of Pennsylvania State University, USA, was granted a Helmholtz International Fellow Award 2016 by the Helmholtz Association. Gary L. Messing had been nominated by KIT and Forschungszentrum Jülich.

■ **Dr. Fabian Nies**, Botanical Institute, received the third prize for his doctoral thesis in the Competition of Ideas for Baden-Württemberg Young Scientists launched by the Baden-Württemberg Foundation for Energy and Climate Protection.

■ The Federal Minister for the Environment, Nature Conservation, Building, and Nuclear Safety, Barbara Hendricks, and the Federation of German Industries granted the German Award for Innovations Related to the Climate and Environment in the category of environmentally compatible technologies to the partners of the AmpaCity project, including **Professor Dr. Mathias Noe**, Head of the Institute for Technical Physics of KIT. Within the framework of the AmpaCity project, the longest superconducting cable in the world is operated in the city center of Essen. The AmpaCity project partners are RWE as the network operator, cable manufacturer Nexans, and Karlsruhe Institute of Technology that scientifically accompanies the field test.

■ The German Physical Society and the Société Française de Physique granted the 2017 Gentner-Kastler Prize to climate scientist **Professor Dr. Johannes Orphal**, Institute for Meteorology and Climate Research. The corresponding announcement was made in December 2016. Orphal was granted the prize for his contributions to measuring atmospheric trace gases.

■ For the fourth time, **Professor Dr. Caroline Y. Robertson-von Trotha**, Director of ZAK | Center for Cultural and General Studies, was appointed member of the Culture Committee by the German Commission for UNESCO. The committees advise the bodies of the German Commission for UNESCO in the respective areas.

■ **Dr. Alexander Schug** and his Helmholtz Young Investigator Group at the Steinbuch Centre for Computing were granted the Google Faculty Research Award for their work to predict the 3D structure of biomolecules. The award is granted to excellent scientists at top universities worldwide.

■ **Professor Dr. Gustavo Esteban Romero**, Professor of Relativistic Astrophysics, Faculty of Astronomy and Geophysics of the University of La Plata, Argentina, received the Helmholtz International Fellow Award 2016. KIT had nominated Professor Romero.

■ **Professor Dr. Hartmut Schmeck**, Head of the Institute of Applied Informatics and Formal Description Methods, was awarded the Heinrich Hertz Prize 2016. This prize of KIT and the EnBW Foundation honors Hartmut Schmeck's lifetime achievement and in particular his contributions to the development and use of innovative information and communication technologies in smart energy management systems.

■ **Dr. Benjamin Schmidt**, Institute for Nuclear Physics, was handed over the 2015 Helmholtz Doctoral Prize in the research field matter at the 2016 New Year´s Reception of the Helmholtz Association. Within the framework of an international collaboration, Schmidt conducted research at the EDELWEISS experiment for the search for dark matter.

■ **Professor Dr. Sebastian Schmidtlein**, Institute of Geography and Geoecology, received the Julius von Haast Fellowship Award. His research in New Zealand focuses on the impacts of long-term development of soils on plants. The Royal Society of New Zealand grants this award annually to internationally renowned German researchers in recognition for outstanding achievements and for enhancing cooperation with New Zealand research groups.

■ **Dr. Katrin Schulz**, Institute for Applied Materials, was selected for the Margarete von Wrangell Habilitation Program. Via this program, the State of Baden-Württemberg supports outstanding female researchers on their way to professorship. Engineer and materials scientist Katrin Schulz works on modeling plastic deformations in metals on the microscale.

■ **Dr. Philipp Schuster**, scientist at the Institute for Finance, Banking, and Insurance, was honored for his doctoral thesis on liquidity on bond markets by the Frankfurt Institute for Risk Management and Regulation. Both Schuster and the supervising Chair of Financial Engineering and Derivatives headed by Professor Dr. Marliese Uhrig-Homburg received this research prize.

■ For her doctoral thesis, **Dr. Zäzilia Seibold** received the Logistics Science Award 2016 that is granted annually by the Bundesvereinigung Logistik for outstanding academic theses of high practical relevance. Her thesis was supervised by Professor Dr. Kai Furmans, Head of the Institute for Materials Handling and Logistics. The award is granted to both supervising institutes and doctoral candidates.

■ For her outstanding achievements in the area of theoretical informatics, **Professor Dr. Dorothea Wagner**, Institute of Theoretical Informatics, was appointed member of the National Academy of Science and Engineering, acatech. It advises politics and society in the areas of engineering science and technology policy and represents German engineering science on the national and international levels.

■ **Dr. Elisabeth Wilhelm** Institute of Microstructure Technology, in close cooperation with the Studies Center for the Visually Impaired, has developed a display that makes letters, images, and graphics tactile. For her thesis, she received the German Thesis Award 2016 in the section "Natural and Engineering Sciences." The Annual German Thesis Award established by the Körber Foundation honors the achievements of the best German junior scientists in the humanities, social sciences, and natural and engineering sciences (see also page 33).

■ **Professor Dr. Christof Wöll**, Head of the Institute of Functional Interfaces, received the van't Hoff Prize of the German Bunsen Society for Physical Chemistry. This prize acknowledges Wöll's contributions to understanding thin organic layers, to the chemistry of oxide surfaces, and in particular to characterizing surface-mounted metal-organic frameworks.

■ **Dr. Karl-Friedrich Ziegahn**, Head of the Division for Natural and Built Environment, will advise the European Physical Society (EPS) in the future. The Society has appointed Ziegahn member of the newly established Advisory Board on Science Policies.

■ The **ABIDA** – Assessing Big Data project has won the Germany-wide competition "Excellent Places in the Land of Ideas" 2016. ABIDA is coordinated by the Institute for Technology Assessment and Systems Analysis of KIT, together with the Institute for Information, Telecommunication, and Media Law of the University of Münster.

■ With an edible straw, a team of KIT students (Sabine Schneider, Mareike Schmalz, Yvonne Schwelger, Mara Silber, Nico Leister, and Felix Preis) of the **Institute of Bioengineering in Life Sciences** won the TROPHELIA competition launched by the Research Association of the German Food Industry e.V. The team was additionally granted the special prize for the most innovative product idea.

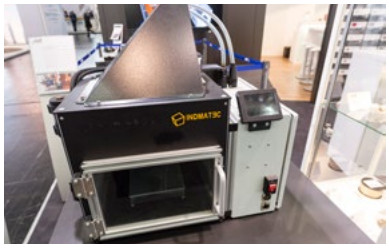
■ Since May 2014, KIT has been pooling its projects with Chinese partners from research and industry at its branch office in the Suzhou Industrial Park (SIP) near Shanghai. The "SIP Work Committee" of the industrial park administration honored the **KIT China Branch** as "2016 SIP Advanced Education Unit" and managing director Guan Xiangzhen as "Excellent Trainer."

■ The "mesana" health sensor of **corvolution GmbH** has the size of a matchbox. When applied to the breast like a plaster, it measures the health data of its wearer for 48 hours. For this, the company, a spinoff of KIT, won the second place at the VC-BW Pitch for startups in Baden-Württemberg. Venture Capital Baden-Württemberg, VC-BW for short, is a network that intends to enhance visibility of the Baden-Württemberg startup scene. Among others, it is supported by the Baden-Württemberg Ministry of Economic Affairs, Labor, and Housing.

■ The university alliance "**Eucor – The European Campus**," a trinational university alliance of the universities of Basel, Freiburg, Haute-Alsace, Strasbourg, and Karlsruhe Institute of Technology, was granted the honorary prize by the Association Prix Bartholdi. The Association recognized the central contribution of the university alliance to cross-border cooperation. Every year, Prix Bartholdi is awarded to outstanding projects in the cross-border educational area of the German-French-Swiss Upper Rhine Region (see also page 59).

■ In the state-wide startup competition "Elevator Pitch BW 2015/2016" of the Baden-Württemberg Ministry of Economic Affairs, Labor, and Housing, **GoSilico GmbH**, a spinoff of KIT, won the first prize. GoSilico has developed a simulation software that accelerates process development for biopharmaceuticals. The first three prizes of the competition were awarded to spinoffs of KIT.

■ The Karlsruhe company **Indmatec GmbH**, a spinoff of KIT, has qualified a high-performance plastic, polyether ether ketone, for fused filament fabrication, a three-dimensional printing technology. For this, it was chosen the best startup in Baden-Württemberg at the VC-BW Pitch. Venture Capital Baden-Württemberg, VC-BW for short, is a network that intends to enhance visibility of the Baden-Württemberg startup scene. Among others, it is supported by the Baden-Württemberg Ministry of Economic Affairs, Labor, and Housing.



■ The **Industry 4.0 Collaboration Lab** of the Institute for Information Management in Engineering was selected one of the "100 Places for Industry 4.0 in Baden-Württemberg." Within the framework of this competition, the federal State of Baden-Württemberg honors institutions that successfully integrate industry 4.0 into their daily business and implement innovative solutions for digitization in the industry and crafts sectors.

■ With their self-designed electric racing car "KIT 15e," the students of the **KA-RaceIng** university group reached the second place in the world ranking of the "Formula Student Electric." In the international design competition "Formula Student," students from all over the world compete with self-designed racing cars.

■ With its electric racing car "KIT 16e," the **KA-RaceIng** students team of KIT won the 2016 Formula Student Germany. The competition on the Hockenheimring covered eight categories. 39 teams of students from all over the world took part.

■ The **KARIS PRO** project carried out by the KIT Institute for Materials Handling and Logistics and partners was selected one of the "100 Places for Industry 4.0 in Baden-Württemberg." Within the framework of this competition, the federal State of Baden-Württemberg honors institutions that successfully integrate industry 4.0 into their daily business and implement innovative solutions for digitization in the industry and crafts sectors.

■ **Karlsruhe Institute of Technology** received the 2016 German University Construction Award of the German University Foundation under the auspices of the Federal Ministry for Building for its refurbished mathematics building on Campus South. The award is supported by the Eberhard Schöck Foundation and acknowledges exemplary university buildings or ensembles of high design quality or exemplary preservation of historic architecture.

■ In the state-wide startup competition "Elevator Pitch BW 2015/2016" of the Baden-Württemberg Ministry of Economic Affairs, Labor, and Housing, **otego**, a spinoff of KIT, won the third prize. otego develops novel thermoelectric generators for autonomous energy supply, which convert energy from smallest heat sources or small devices into electricity. The first three prizes of the competition went to spinoffs of KIT.

■ For very successful communication of a research topic, the idw – Informationsdienst Wissenschaft (idw scientific information service), granted the idw Award for Science Communication to **KIT's Press Office** for the best science press release of 2015 in May 2016.

■ For its long work to successfully combine alumni management, career service, and fundraising, the **Relationship Management** Service Unit of KIT was granted the Alumni Prize "Premium D-A-CH" 2016 by alumniclub.net e.V.

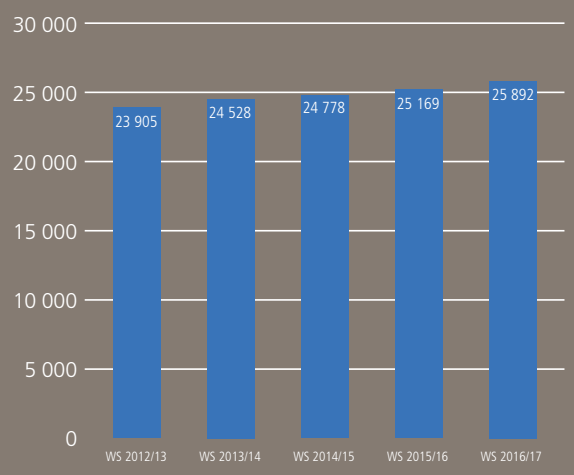
■ KIT's startup **robodev** received a renowned prize: It is among the winners of the WECONOMY 2016 start-up initiative launched by Wissensfabrik (knowledge factory), a platform of more than 120 companies and foundations in Germany, together with Handelsblatt and UnternehmerTUM.

■ In the state-wide startup competition "Elevator Pitch BW 2015/2016" of the Baden-Württemberg Ministry of Economic Affairs, Labor, and Housing, **Rüdenauer 3D Technology**, a spinoff of KIT, won the second prize. Rüdenauer 3D Technology has developed Cross Connected® HoloDeck, a platform that enables producing enterprises to interactively experience their products across locations and teams in any phase of their lifecycles. The first three prizes of the competition went to spinoffs of KIT.

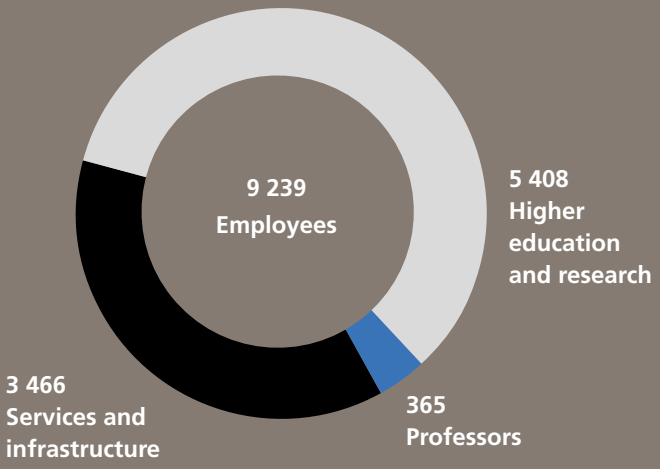
■ For the fourth time, the industrial safety concept of the **Institute for Technical Physics** received a prize. The certificate "Arbeitsschutz mit System" (systematic industrial safety) is awarded by the Verwaltungs-Berufsgenossenschaft, one of the biggest employers' liability insurance associations in Germany, and Unfallkasse Baden-Württemberg, the Baden-Württemberg employers' liability insurance association.

FACTS AND FIGURES

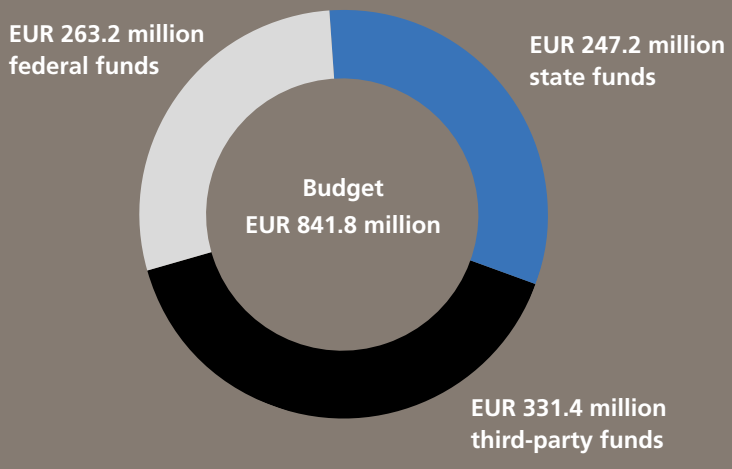
Number of students



Employees 2016



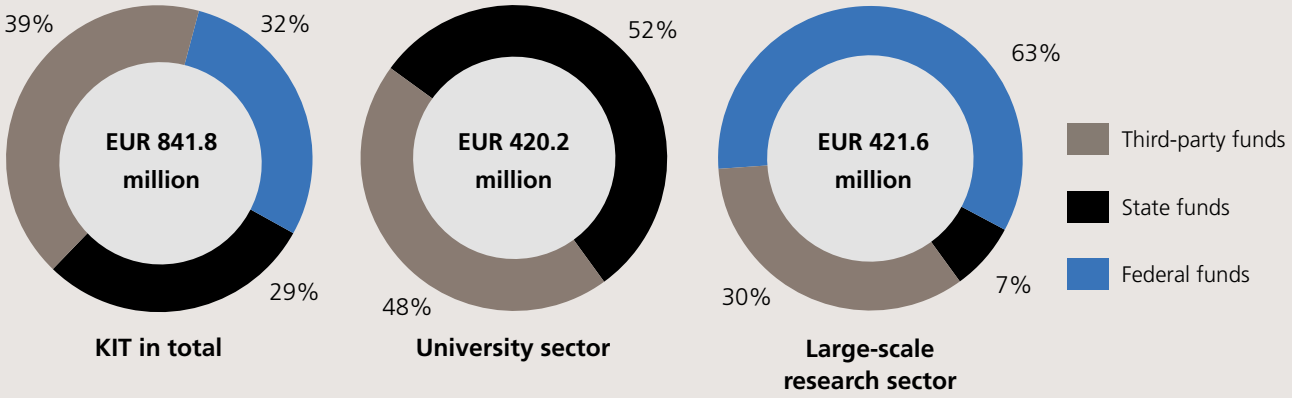
Total budget 2016 (preliminary)



CONTENT

FUNDING (Preliminary; as of July 4, 2017)

Federal, State, and Third-party Funds Acquired in 2016 (Preliminary)



Sources of Funding

KIT in Total

In million euros	2012	2013	2014	2015	2016
Income in total	784.7	844.6	847.4	860.8	841.8
Third-party funds	336.5	357.5	369.2	358.0	331.4
State funds	212.0	216.0	221.3	248.1	247.2
Federal funds	228.8	236.2	271.1	256.9	263.2

University Sector

In million euros	2012	2013	2014	2015	2016
Income in total	406.7	427.3	420.0	428.4	420.2
Third-party funds	223.8	239.3	230.5	208.7	203.1
State funds	182.9	188.0	189.5	219.7	217.1
Federal funds*	0.0	0.0	0.0	0.0	0.0

* In the University Sector, federal funds are included in the third-party funds, as they are granted for special projects rather than for basic funding.

Large-scale Research Sector

In million euros	2012	2013	2014	2015	2016
Income in total	378.0	417.3	427.4	432.4	421.6
Third-party funds	112.7	118.2	138.7	149.3	128.3
State funds	29.1	28.0	31.8	28.4	30.1
Federal funds	236.2	271.1	256.9	254.7	263.2

Sources of Third-party Funding

KIT in Total

In million euros	2012	2013	2014	2015	2016
Third-party funding in total	336.5	357.5	369.2	358.0	331.4
Third-party funding by DFG, incl. CRC	48.2	45.3	47.0	44.1	50.3
Third-party funding by EU	25.4	30.3	31.6	32.3	29.4
Third-party funding by ExIn I	18.3	20.9	3.5	0.0	0.0
Third-party funding by Fed. and State	115.8	123.9	133.8	133.8	124.1
Other income	128.8	137.1	153.3	147.8	127.6

University Sector*

In million euros	2012	2013	2014	2015	2016
Third-party funding in total	223.8	239.3	230.5	208.7	203.1
Third-party funding by DFG, incl. CRC	43.6	39.2	39.4	38.8	41.1
Third-party funding by EU	9.5	14.0	11.9	13.3	11.0
Third-party funding by ExIn I	18.3	20.9	3.5	0.0	0.0
Third-party funding by Fed. and State	84.0	92.0	101.7	92.1	90.7
Other income	68.4	73.2	74.0	64.5	60.3

* Third-party funds shall be all income of and grants awarded to the University Sector under the Solidarity Pact in addition to basic funding.

Large-scale Research Sector

In million euros	2012	2013	2014	2015	2016
Third-party funding in total	112.7	118.2	138.7	149.3	128.3
Third-party funding by DFG, incl. CRC	4.6	6.1	7.6	5.3	9.2
Third-party funding by EU	15.9	16.3	19.7	19.0	18.4
Third-party funding by ExIn I	0.0	0.0	0.0	0.0	0.0
Third-party funding by Fed. and State	31.8	31.9	32.1	41.7	33.4
Other income	60.4	63.9	79.3	83.3	67.3

Use of Funds in 2016 (preliminary)

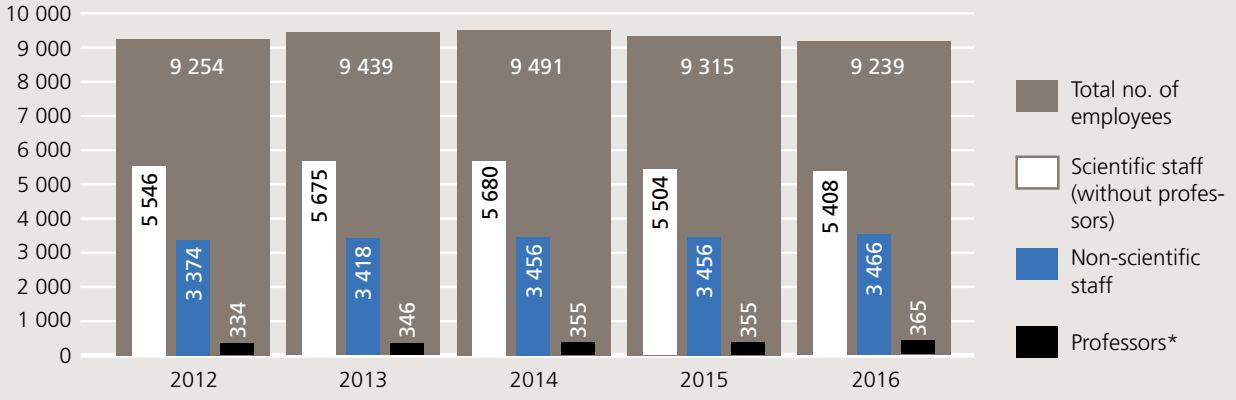
In million euros	KIT in total	University sector*	Large-scale research sector
Expenses in total	841.8	420.2	421.6
Investments in total	77.6	31.4	46.2
of these, major investments	23.6	0.0	23.6
of these, ongoing investments	54.0	32.4	22.6
Personnel expenses	543.4	303.9	239.5
Material expenses	220.8	84.9	135.9

* Figures taken from the financial statement corrected by cost items not relevant to expenses (e.g. provisions).

PERSONNEL INFORMATION

KIT Staff in Total

Staff (headcount)	2012	2013	2014	2015	2016
Total number of employees	9 254	9 439	9 491	9 315	9 239
of these, female employees	3 234	3 334	3 380	3 363	3 373
Professors *	334	346	355	355	365
of these, female professors	40	37	46	47	49
of these, junior professors	10	15	13	8	8
of these, female junior professors	4	6	7	3	3
of these, international professors	28	27	29	32	34
of these endowed professors	8	8	7	8	9
Scientific staff (without professors)	5 546	5 675	5 680	5 504	5 408
of these, female scientists	1 553	1 596	1 607	1 545	1 528
of these, staff financed from third-party funds	2 670	2 747	2 699	2 507	2 458
of these, international employees	938	941	973	967	978
of these, employment contracts of limited duration	4 065	4 187	4 215	3 934	3 778
of these, part-time employees	1 423	1 535	1 635	1 619	1 714
Non-scientific staff	3 374	3 418	3 456	3 456	3 466
of these, female staff	1 644	1 695	1 726	1 769	1 796
of these, staff financed from third-party funds	683	663	649	604	619
of these, international employees	157	159	158	157	166
of these, employment contracts of limited duration	1 008	963	945	901	839
of these, part-time employees	793	831	856	875	927
of these, trainees and students of the Baden-Württemberg Cooperative State University	474	454	474	471	464
of these, female trainees and students	150	146	146	139	162
Trainees' share in the total number of employees [%]	5	5	5	5	5



* Professors, junior professors, and executive scientists receiving W-type salary according to Article 14 of the KIT Act.

Habilitations

	2012	2013	2014	2015	2016
Total	14	11	8	22	19
Men	11	8	7	17	16
Women	3	3	1	5	3

Appointments to W-3 University Professor at KIT in 2016

Name, division	W salary grade - professorship	Previous employer institution
Professor Dr. Johannes Brumm, Division II	W 3-Professur für VWL, insbesondere Makroökonomik	Universität Zürich
Professor Dr. Jan Cermak, Division IV	W 3-Professur für Geophysikalische Fernerkundung	Ruhr-Universität Bochum
Professor Dr. Martin Dienwiebel, Division III	W 3-Professur für Nanotribologie	Fraunhofer Institute for Mechanics of Materials
Professor Dr. Michael Heizmann, Division III	W 3-Professur für Mechatronische Messsysteme	Fraunhofer Institute of Optronics, System Technologies and Image Exploitation and Hochschule Karlsruhe – Technik und Wirtschaft
Professor Dr. Christoph Hilgers, Division IV	W 3-Professur für Strukturgeologie und Tektonik	RWTH Aachen
Professor Dr. Thomas Hirth, Presidential Committee	Vice President for Innovation and International Affairs	Fraunhofer Institute for Chemical Technology
Professor Dr. David Hunger, Division V	W 3-Professur für Experimentalphysik	Ludwig-Maximilians-Universität München
Professor Dr. Oliver Jehle, Division IV	W 3-Professur für Kunstgeschichte	Universität Regensburg
Professor Dr. Jochen Kolb, Division IV	W 3-Professur für Geochemie und Lagerstättenkunde	Geological Survey of Denmark and Greenland, Copenhagen
Professor Dr. Matthieu Le Tacon, Division V	W 3-Professur für Experimentalphysik	Max Planck Institute for Solid State Research, Stuttgart
Professor Dr. Werner Nahm, Division III	W 3-Professur für Optoelektronische Systeme in Medizin und Lebenswissenschaften	Carl Zeiss AG
Professor Dr. Joaquim José Ginete Werner Pinto, Division IV	W 3-Professur für Meteorologie	University of Reading, UK, Universität Köln
Professor Dr. Marcus Popplow, Division II	W 3-Professur für Geschichte der wissenschaftlich-technischen Zivilisation	Technische Universität Berlin
Professor Dr. Sebastian Randel, Division III	W 3-Professur für Photonische Kommunikationstechnik und Teratronik	Bell Laboratories, Alcatel-Lucent, Holmdel, NJ, USA

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PERSONNEL INFORMATION

➔ **Appointments to W-3 University Professor at KIT in 2016**

Name, division	W salary grade – professorship	Previous employer institution
Professor Dr. Mark Rounsevell, Division IV	W 3-Professur für Land use change and climate interactions	University of Edinburgh
Professor Dr. Harald Sack, Division II	W 3-Professur für Information Service Engineering	Hasso Plattner Institute Potsdam
Professor Dr. Felix Studt, Division I	W 3-Professur für Applied Computational Catalysis	SUNCAT Center for Interface Science and Catalysis, SLAC, Menlo Park, USA
Professor Dr. Wolfgang Wernsdorfer, Division V	W 3-Professur für Experimentalphysik	Institut Néel, CNRS, Grenoble
Professor Dr. Florian Wittmann, Division IV	W 3-Professur für Fluss- und Auenökologie	Max Planck Institute for Chemistry, Mainz
Professor Dr. J. Marius Zöllner, Division II	W 3-Professur für Angewandte technisch-kognitive Systeme	KIT

Appointment to W-2 University Professor at KIT in 2016

Name, division	W salary grade – professorship	Previous employer institution
Professor Dr. Thomas Setzer, Division II	W 2-Professur für Corporate Services and Systems	Technische Universtität München

Appointments to Apl. Professor and Honorarprofessor in 2016

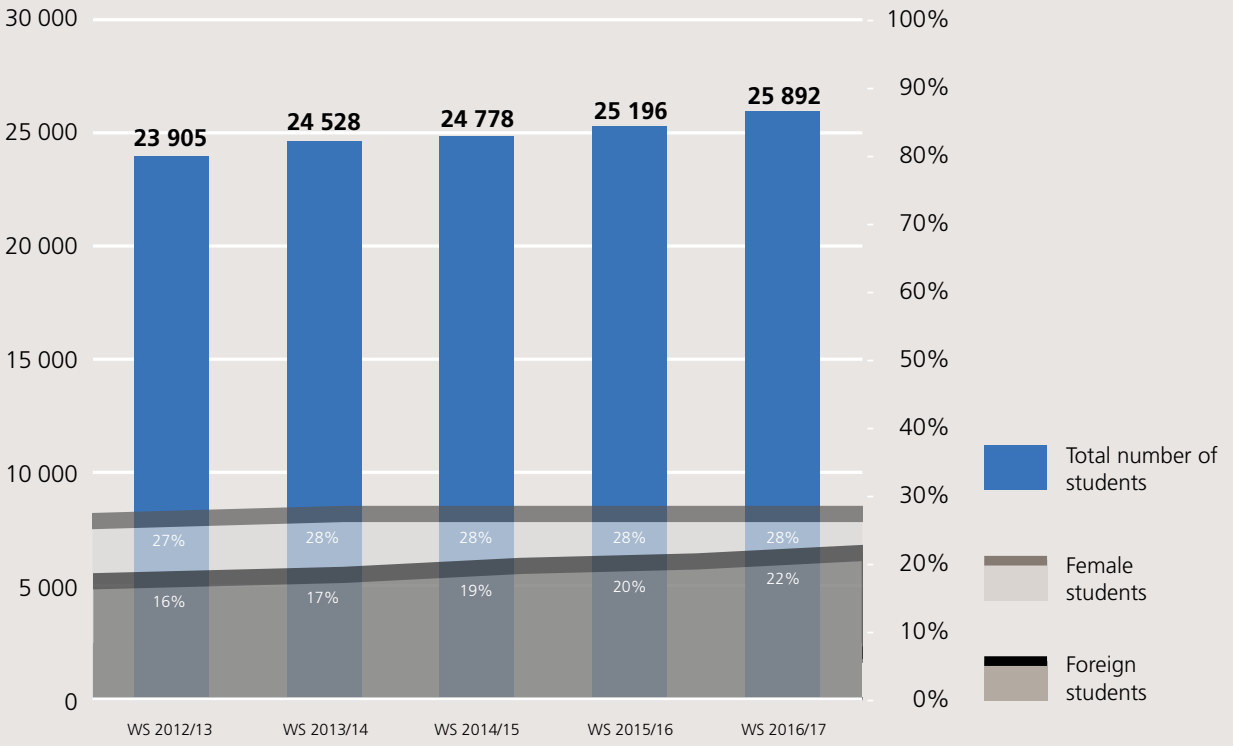
Name	Type	Institute, division
Professor Dr. Jarir Aktaa	Apl. Professor	Institute for Applied Materials, Division III
Professor Dr. Jürgen Brandner	Honorarprofessor	Institute for Micro Process Engineering, Division I
Professor Dr. Günter Frank	Apl. Professor	Institute of Philosophy, Division II
Professor Dr. Gisela Guthausen	Apl. Professor	Institute for Mechanical Process Engineering and Mechanics and Engler-Bunte Institute, Division I
Professor Dr. Michaela Knoll	Apl. Professor	Institute of Sports and Sports Science, Division II
Professor Dipl.-Ing. Philip Kurz	Honorarprofessor	Institute for Building Design and Technology, Division IV
Professor Dipl.-Ing. Matthias Zöller	Honorarprofessor	Institute for Building Design and Technology, Division IV
Professor Dr. Ilka Seidel	Apl. Professor	Institute of Sports and Sports Science, Division II
Professor Dr. Alexander Nesterov-Müller	Apl. Professor	Institute of Microstructure Technology, Division III

Emeriti/Retirements in 2016

Name	Institute	Division
Professor Dr. Klaus Dostert	Institute of Industrial Information Technology	Division III
Professor Dr. Jan Kowalski	Institute for Economic Policy Research	Division II
Professor Dr. Jürgen Rekus	Institute for Vocational Education and General Education	Division II
Professor Dr. Gerd Schön	Institut für Theoretische Festkörperphysik	Division V
Professor Dr. Heinz-Günter Stosch	Institute of Applied Geosciences	Division IV
Professor Dr. Karl-Heinz Waldmann	Institute of Operations Research	Division II
Professor Dr. Friedemann Wenzel	Geophysical Institute	Division V
Professor Dr.-Ing. Heinz Wörn	Institute for Anthropomatics and Robotics	Division II

STUDENTS

Students in Total



Students and Desired Degrees

Desired degree	WS 2012/13	WS 2013/14	WS 2014/15	WS 2015/16	WS 2016/17
Bachelor	13 609	14 077	14 086	14 136	14 245
Master	3 492	5 256	6 819	8 181	9 193
Teacher at German second. schools	792	782	750	780	823
Doctorate	748	880	809	664	555
State examination	113	95	70	50	23
Diploma	4 554	2 801	1 579	796	462
Studienkolleg	218	217	227	224	230
No degree*	379	420	438	365	361
Total	**23 905**	**24 528**	**24 778**	**25 196**	**25 892**

* No degree: In particular exchange students, who do not aim at a degree at KIT.

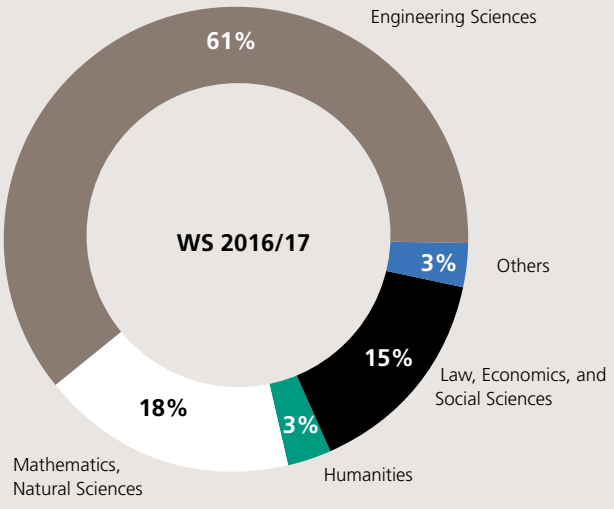
Allocation of Students to Subject Groups

Subject group	WS 2012/13	WS 2013/14	WS 2014/15	WS 2015/16	WS 2016/17
Engineering Sciences	13 724	14 086	14 481	15 204	15 785
Mathematics, Natural Sciences	4 778	4 911	4 716	4 536	4 504
Law, Economics, and Social Sciences	3 784	3 908	4 014	3 831	3 889
Humanities	825	809	767	832	840
Others	794	814	800	793	874
Total	**23 905**	**24 528**	**24 778**	**25 196**	**25 892**

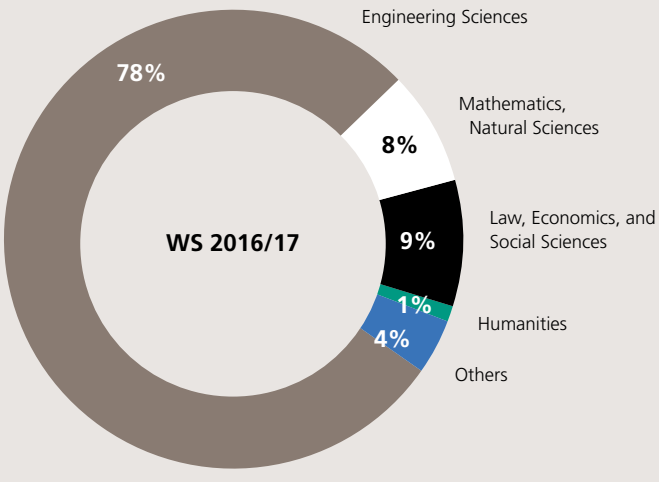
Allocation of Foreign Students to Subject Groups

Subject group	WS 2012/13	WS 2013/14	WS 2014/15	WS 2015/16	WS 2016/17
Engineering Sciences	2 788	3 055	3 429	3 951	4 483
Mathematics, Natural Sciences	360	393	397	391	457
Law, Economics, and Social Sciences	405	440	459	473	508
Humanities	81	75	67	70	83
Others	225	229	235	234	250
Total	**3 859**	**4 192**	**4 587**	**5 119**	**5 781**

Allocation of Students to Subject Groups

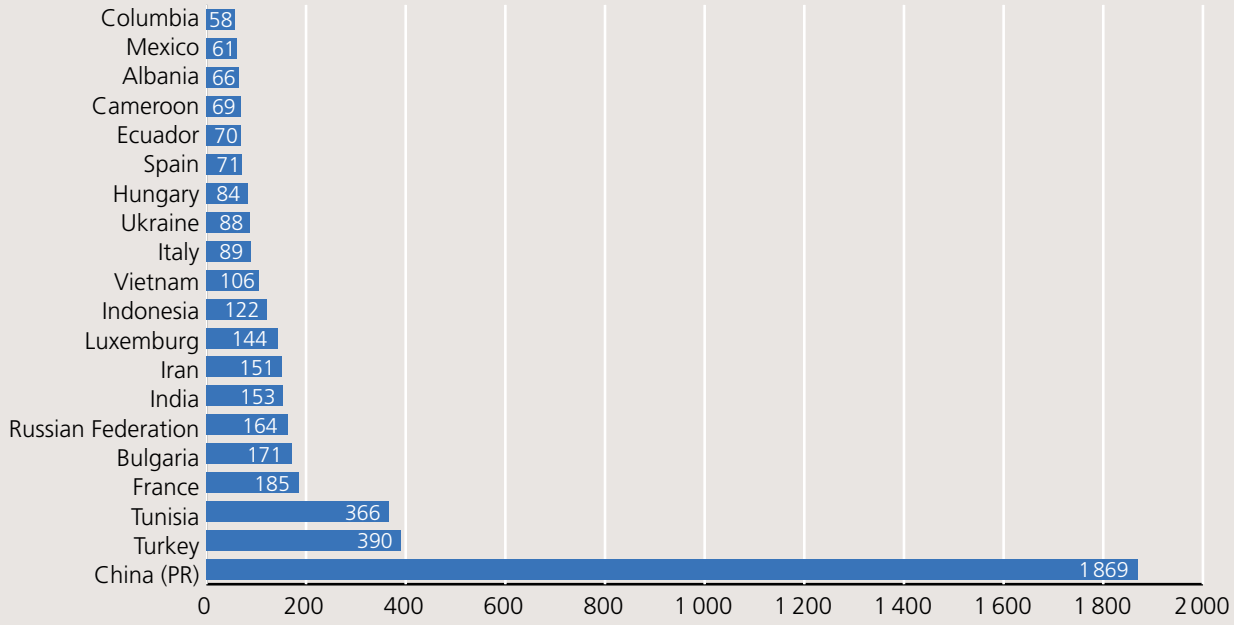


Allocation of Foreign Students to Subject Groups



STUDENTS

Home Countries of Foreign Students (Top 20 of 117)

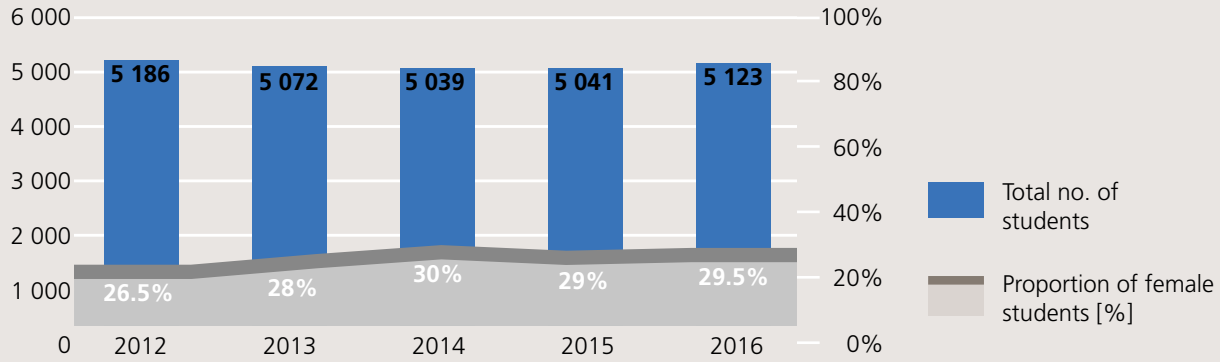


Student Beginners and Degrees Targeted in the 1st Semester *

Desired degree	2012	2013	2014	2015	2016
Bachelor	4 600	4 472	4 350	4 214	4 439
Master	1 241	1 925	2 607	3 196	3 433
Teacher at German sec. schools	225	155	171	136	168
Bachelor's degree in teaching at vocational schools	17	16	28	32	39
Master's degree in teaching at vocational schools	8	10	6	19	17
Doctorate	206	159	201	115	112
Studienkolleg	219	233	251	285	285
Total	**6 516**	**6 970**	**7 614**	**7 997**	**8 493**

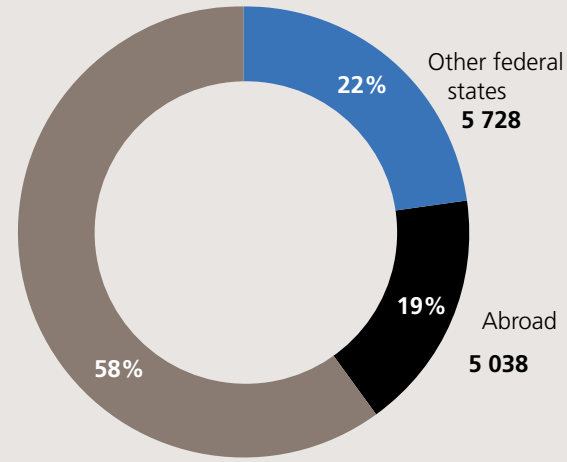
*Without exchange students, who do not aim at a degree at KIT.

Number of First Student Registrations *



* First student registrations: Students registered for the first time at a German university.

Origin of Students in the 2016/17 Winter Semester *

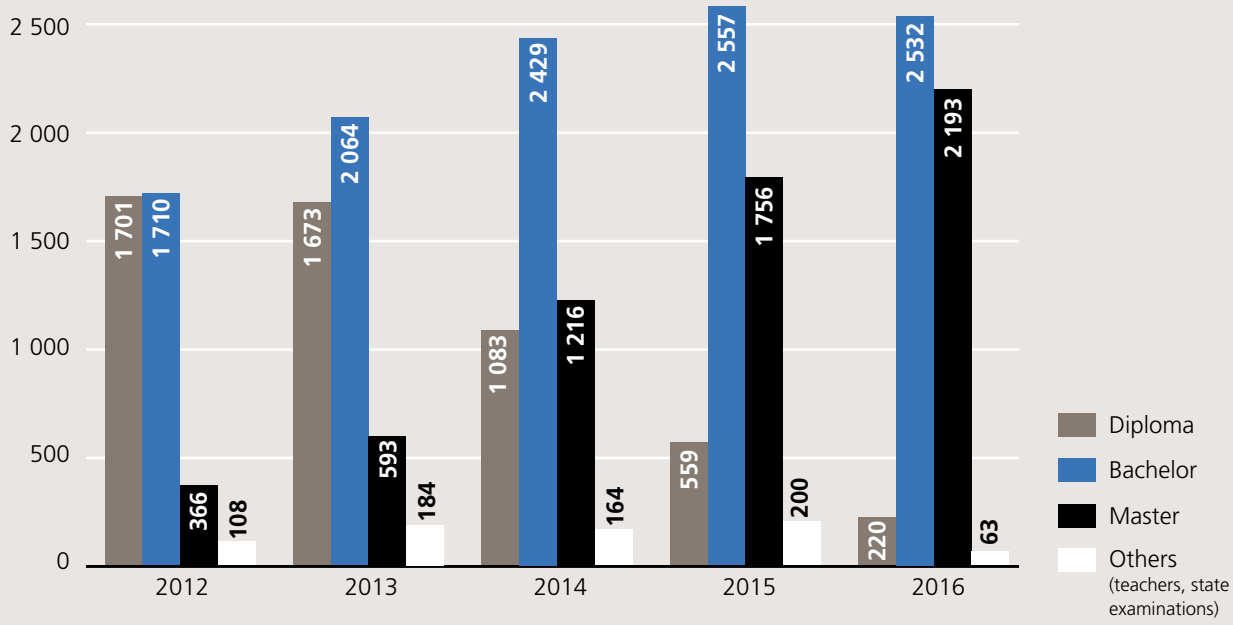


*Place of acquisition of university entrance qualification.

Region	Students
Karlsruhe city and district	4 354
Karlsruhe Regional Council district	4 064
Rest of Baden-Württemberg	6 708
Baden-Württemberg in total	15 126
Rhineland-Palatinate	1 642
Bavaria	1 007
North Rhine-Westphalia	940
Hesse	860
Lower Saxony	400
Other federal states	879
Germany without Baden-Württemberg	5 728
Asia	2 745
Europe	1 340
Africa	582
America	361
Australia	10
Abroad	5 038
KIT in total	**25 892**

STUDENTS

Number of Graduates



Doctorates Completed in the Different Subject Groups

Subject groups	2012	2013	2014	2015	2016
Engineering Sciences	216	248	296	297	315
Mathematics, Natural Sciences	157	167	178	169	210
Law, Economics, and Social Sciences	57	41	54	51	56
Humanities	1	3	11	9	9
Sports	2	3	0	3	7
Arts	0	2	1	0	0
Total	**433**	**464**	**540**	**529**	**597**

Study Programs in the Area of Engineering Sciences

Subject (program)	Bachelor	Master (consecutive)	Teacher	Master (cont. education)	Double degree
Altbauinstandsetzung				●	
Architektur	●	●			German-French Double Master *(École Nationale Supérieure d'Architecture de Strasbourg, France)*
Bauingenieurwesen	●	●			
Bioingenieurwesen	●	●			
Chemieingenieurwesen/Verfahrens-technik	●	●			
Electronic Systems Engineering and Management				● (HECTOR School)	
Elektrotechnik und Informations-technik	●	●			German-French Double Degrees B.Sc. and M.Sc. *(Institut National Polytechnique Grenoble, France)*
Energietechnik		●			
Energy Engineering and Management				● (HECTOR School)	
Energy Technologies (ENTECH)		●			Master program ENTECH *(IST Lisboa, Portugal; Uppsala Universitet, Sweden; INP Grenoble, France)*
Financial Engineering				● (HECTOR School)	
Funktionaler und Konstruktiver Ingenieurbau – Engineering Structures		●			
Geodäsie und Geoinformatik	●	●			German-French Double Degrees B.Sc. and M.Sc. *(Institut National des Sciences Appliquées Strasbourg, France)* Double Master *(Università degli Studi di Trento, Italy)*
Green Mobility Engineering				● (HECTOR School)	
Informatik	●	●	●		Double Master Informatics *(Institut National Polytechnique Grenoble, France)* Double Master Cryptography *(Université de Rennes, France)*
Informationswirtschaft	●	●			
Management of Product Development				● (HECTOR School)	

STUDENTS

Subject (program)	Bachelor	Master (consecutive)	Teacher	Master (cont. education)	Double degree
Maschinenbau	●	●			German-French Bachelor and Master Program *(Art et Métiers ParisTech, France)* German-French Bachelor and Master Program *(Institut National des Sciences Appliquées Lyon, France)* German-French Bachelor and Master Program *(École Polytechnique Paris, Palaiseau, France)* German-French Double Master *(Institut National Polytechnique Grenoble, France)* German-Bulgarian Double Degree *(TU Sofia, Bulgaria)* Dual Master Program *(Korea Advanced Institute of Science and Technology, Korea)* Double Master Vehicle / Production Technology *(CDHK, Tongji University, China)* Dual Master Program *(Instituto Tecnológico de Buenos Aires, Argentina)*
Materialwissenschaft und Werkstofftechnik	●	●			
Mechatronik und Informationstechnik	●	●			
Mobilität und Infrastruktur		●			
Naturwissenschaft und Technik			●		
Optics and Photonics		●			Double Master Program *(Université Paul Cezanne, Aix-Marseille, France; Barcelona Universities, Spain)*
Production and Operations Management				● (HECTOR School)	
Regionalwissenschaft		●			German-Chilean Dual Master Program (Universidad de Concepción, Chile)
Service Management and Engineering				● (HECTOR School)	
Water Science and Engineering		●			

Study Programs in the Area of Arts, Art Science

Subject (program)	Bachelor	Master (consecutive)	Teacher	Master (cont. education)	Double degree
Kunstgeschichte	●	●			

Study Programs in the Area of Mathematics, Natural Sciences

Subject (program)	Bachelor	Master (consecutive)	Teacher	Master (cont. education)	Double degree
Angewandte Geowissenschaften	●	●			
Biologie	●	●	●		
Chemie	●	●	●		
Chemische Biologie	●	●			
Geographie			●		
Geoökologie	●	●			
Geophysik	●	●			
Lebensmittelchemie	●	●			
Mathematik	●	●	●		German-French Bachelor and Master Program *(École Polytechnique Paris, France)*
Meteorologie	●	●			
Physik	●	●	●		German-French Double Master *(UFR de Physique of the Université Joseph Fourier Grenoble, France)* German-French Double Master *(École Polytechnique Paris, France)*
Technomathematik	●	●			
Wirtschaftsmathematik	●	●			

STUDENTS

Study Programs in the Areas of Law, Economics, and Social Sciences

Subject (program)	Bachelor	Master (consecutive)	Teacher	Master (cont. education)	Double degree
Ingenieurpädagogik			●		
Pädagogik	●	●			
Personalentwicklung – Berufs- und Betriebspädagogik				●	
Technische Volkswirtschaftslehre	●	●			
Wirtschaftsingenieurwesen	●	●			German-French Double Degree M. Sc. *(Institut National Polytechnique Grenoble, France)* Double Master *(Linköpings Universitet, Sweden)*

Study Programs in the Area of Sports

Subject (program)	Bachelor	Master (consecutive)	Teacher	Master (cont. education)	Double degree
Sport			●		
Sportwissenschaften	●	●			

Study Programs in the Area of the Humanities

Subject (program)	Bachelor	Master (consecutive)	Teacher	Master (cont. education)	Double degree
Europäische Kultur und Ideen-geschichte (European Studies)	●	●			
Germanistik / Deutsch	●	●	●		
Wissenschaft, Medien und Kommunikation	●	●			

RESEARCH

Coordinated Research Programs

DFG Collaborative Research Centers / Transregio Projects, and DFG Research Units with KIT Being the Coordinating University

Year	Number	
	Collaborative Research Centers/ Transregio Projects	Research Units
2013	0	12
2014	0	10
2015	2	9
2016	2	8

DFG Collaborative Research Centers / Transregio Projects and DFG Research Units with KIT Participation

Year	Number	
	Collaborative Research Centers/ Transregio Projects	Research Units
2013	6	13
2014	6	13
2015	5	17
2016	5	14

Coordinated Research Programs

Collaborative Research Centers at KIT with KIT Being the Coordinating University

Number	Title	Spokespersons	Duration
SFB 1173/1	Wave Phenomena: Analysis and Numerics	Professor Dr. Marlis Hochbruck, Institute for Applied and Numerical Mathematics	2015 – 2019
SFB 1176/1	Molekulare Strukturierung weicher Materie	Professor Dr. Michael Meyer, Institute of Organic Chemistry, spokesperson changed 08/16, previously: Professor Dr. Christopher Barner-Kowollik, Institute for Chemical Technology and Polymer Chemistry	2016 – 2019

The typical budget approved for a Collaborative Research Center / Transregio Project is about EUR 1 to 3 million per year of duration. The duration refers to the complete project. Partial projects at KIT may deviate.

RESEARCH

DFG-funded Research Units of KIT with KIT Being the Coordinating University

Number	Title	Spokespersons	Duration
FOR 1136	Modellierung von geotechnischen Herstellungsvorgängen mit ganzheitlicher Erfassung des Spannungs-Verformungs-Verhaltens im Boden (GeoTech)	Professor Dr. Theodoros Triantafyllidis, Institute of Soil Mechanics and Rock Mechanics	2009 – 2016
FOR 1334	Determinants of Polarized Growth and Development in Filamentous Fungi	Professor Dr. Reinhard Fischer, Institute for Applied Biosciences, KIT (Spokesperson) Dr. Meritxell Riquelme, (Ensenada, Mexico) (Spokesperson)	2010 – 2016
FOR 1447	Physicochemical-based Models for the Prediction of Safety-relevant Ignition Processes	Professor Dr. Ulrich Maas, Institute of Technical Thermodynamics	2010 – 2016
FOR 1546	Rechnergestützte kooperative Trassenplanung in mehrskaligen 3-D-Stadt- und Bauwerksmodellen	Professor Dr. Martin Breunig, Geodetic Institute	2011 – 2017
FOR 1548	Geometry and Physics of Spatial Random Systems	Professor Dr. Günter Last, Institute of Stochastics	2011 – 2017
FOR 1598	From Catchments as Organised Systems to Models Based on Dynamic Functional Units – CAOS	Professor Dr. Erwin Zehe, Institute for Water and River Basin Management	2011 – 2017
FOR 1650	Dislocation-based Plasticity	Professor Dr. Peter Gumbsch, Institute for Applied Materials	2011 – 2017
FOR 2383	Erfassung und Steuerung dynamischer lokaler Prozesszustände in Mikroreaktoren mittels neuer in-situ-Sensorik	Professor Dr. Roland Dittmeyer, Institute for Micro Process Engineering	2016 – 2019

The typical budget approved for a DFG-funded research unit is about EUR 0.4 to 1.5 million per year of duration. The duration refers to the complete project. Partial projects at KIT may deviate.

Collaborative Research Centers with KIT Participation

Number	Title	Spokespersons / KIT participation	Duration
SFB TRR 88/2	Kooperative Effekte in homo- und heterometallischen Komplexen (3MET)	Professor Dr. Gereon Niedner-Schatteburg, TU Kaiserslautern (Spokesperson) Professor Dr. Manfred Kappes, Institute of Physical Chemistry and Institute of Nanotechnology, KIT	2011 – 2018
SFB TRR 89/2	Invasives Rechnen (InvasIC)	Professor Dr. Jürgen Teich, Friedrich-Alexander-Universität Erlangen-Nürnberg (Spokesperson) Professor Dr. Jörg Henkel, Institute of Computer Engineering, KIT	2010 – 2018
SFB TRR 125/1	Cognition-guided Surgery Wissens- und modellbasierte Chirurgie	Professor Dr. Markus W. Büchler, Medizinische Fakultät Heidelberg (Spokesperson) Professor Dr. Rüdiger Dillmann, Institute for Anthropomatics and Robotics, KIT	2012 – 2016
SFB TRR 150/1	Turbulent chemisch reagierende Mehrphasenströmungen in Wandnähe	Professor Dr. Johannes Janicka, Fachgebiet Energie- und Kraftwerkstechnik, TU Darmstadt (Spokesperson) Professor Dr. Olaf Deutschmann, Institute for Chemical Technology and Polymer Chemistry, KIT	2015 – 2018
SFB TRR 165/1	Waves to Weather: Wellen, Wolken, Wetter	Professor Dr. George C. Craig, Meteorologisches Institut, LMU München (Spokesperson) Professor Dr. Peter Knippertz, Institute for Meteorology and Climate Research, KIT	2015 – 2019

The typical budget approved for a Collaborative Research Center / Transregio Project amounts to EUR 1 to 2.6 million per year of duration. The duration refers to the complete project. Partial projects of KIT may deviate.

RESEARCH

DFG-funded Research Units with KIT Participation

Number	Title	Spokespersons / KIT participation	Duration
FOR 1095	Stratospheric Change and Its Role for Climate Prediction (SHARP)	Professor Dr. Ulrike Langematz, Freie Universität Berlin (Spokesperson) Dr. Björn-Martin Sinnhuber, Dr. Gabriele Stiller, Institute for Meteorology and Climate Research, KIT	2009 – 2017
FOR 1246	Kilimanjaro ecosystems under global change	Professor Dr. Ingolf Steffan-Dewenter, Universität Würzburg (Spokesperson) Dr. Ralf Kiese, Institute for Meteorology and Climate Research, KIT	2010 – 2016
FOR 1279	„Protein-based Photoswitches" as optogenetic tools	Professor Dr. Peter Hegemann, Humboldt-Universität zu Berlin (Spokesperson) Professor Dr. Marcus Elstner, Institute of Physical Chemistry, KIT	2010 – 2016
FOR 1451	Exploring mechanisms underlying the relationship between biodiversity and ecosystem functioning	Professor Dr. Nico Eisenhauer, Universität Leipzig, Deutsches Zentrum für Integrative Biodiversitätsforschung (Spokesperson) Professor Dr. Wolfgang Wilcke, Institute of Geography and Geoecology, KIT	2010 – 2016
FOR 1498	Alkali-Kieselsäure-Reaktionen in Betonbauteilen bei gleichzeitiger zyklischer Beanspruchung und externer Alkalizufuhr	Professor Dr. Rolf Breitenbücher, Ruhr-Universität Bochum (Spokesperson) Professor Dr. Harald S. Müller, Institute of Concrete Structures and Building Materials, KIT	2011 – 2018
FOR 1525	INUIT – Ice Nuclei research UnIT	Professor Dr. Joachim Curtius, Universität Frankfurt am Main (Spokesperson) Dr. Ottmar Möhler, Professor Dr. Corinna Hoose, Institute for Meteorology and Climate Research, KIT	2011 – 2017
FOR 1701	Introducing Non-Flooded Crops in Rice-Dominated Landscapes: Impact on Carbon, Nitrogen and Water Cycles (ICON)	Professor Dr. Volkmar Wolters, Universität Gießen (Spokesperson) Dr. Ralf Kiese, Professor Dr. Klaus Butterbach-Bahl, Institute for Meteorology and Climate Research, KIT	2011 – 2017
FOR 1756	Functional dynamics of cell contacts in cellular assemblies and migratory cells	Professor Dr. Jörg Großhans, Zentrum Biochemie und Molekulare Zellbiologie, Universitätsmedizin Göttingen (Spokesperson) Dr. Jubin Kashef, Dr. Clemens Franz, Zoological Institute, KIT	2011 – 2017

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➔ DFG-funded Research Units with KIT Participation

Number	Title	Spokespersons / KIT participation	Duration
FOR 1993	Multifunktionale Stoff- und Energie-wandlung	Professor Dr. Burak Atakan, Universität Duisburg-Essen (Spokesperson) Professor Dr. Olaf Deutschmann, Institute for Chemical Technology and Polymer Chemistry, KIT Professor Dr. Ulrich Maas, Dr. Robert Schießl, Institute of Technical Thermodynamics, KIT	2013 – 2016
FOR 2063	The Epistemology of the Large Hadron Collider	Professor Dr. Gregor Schiemann, Interdisziplinäres Zentrum für Wissenschafts- und Technikforschung, Bergische Universität Wuppertal (Spokesperson) Professor Dr. Rafaela Hillerbrand, Institute of Philosophy, KIT	2016 – 2019
FOR 2083	Integrierte Planung im öffentlichen Verkehr	Professor Dr. Anita Schöbel, Institut für Numerische und Angewandte Mathematik, Georg-August-Universität Göttingen (Spokesperson) Professor Dr. Dorothea Wagner, Institute of Theoretical Informatics, KIT	2015 – 2018
FOR 2290	Understanding Intramembrane Proteolysis	Professor Dr. Dieter Langosch, Wissenschaftszentrum Weihenstephan, Lehrstuhl für Chemie der Biopolymere, Technische Universität München (Spokesperson) Professor Dr. Burkhard Luy, Institute of Organic Chemistry, KIT	2015 – 2018
FOR 2325	Interactions at the Neurovascular Interface	Professor Dr. Ralf H. Adams, Max-Planck-Institut für molekulare Biomedizin, Münster (Spokesperson) Professor Dr. Ferdinand le Noble, Zoological Institute, KIT	2016 – 2019
FOR 2337	Denitrification in Agricultural Soils: Integrated Control and Modelling at Various Scales (DASIM)	Professor Dr. Christoph Müller, Institut für Pflanzenökologie, Justus-Liebig-Universität Gießen (Spokesperson) Professor Dr. Klaus Butterbach-Bahl, Institute for Meteorology and Climate Research, KIT	2015 – 2018

The typical budget granted for a DFG-funded research unit is about EUR 0.4 to 1.5 million per year of duration. The duration refers to the complete project. Partial projects of KIT may deviate.

RESEARCH

Young Investigators Groups

ERC Grants

Name, institute, division	Title of project	Duration [YYYY-MM]
Professor Dr. Christian Koos, Institute of Photonics and Quantum Electronics, Division III	ERC Starting Grant EnTeraPIC – Energy-Efficient Multi-Terabit/s Photonic Interconnects	2012-01 – 2016-12
Dr. Erin Koos, Institute for Mechanical Process Engineering and Mechanics, Division I	ERC Starting Grant Capillary suspensions: a novel route for versatile, cost efficient and environmentally friendly material design (CapS)	2013-08 – 2018-07
Professor Dr. Jan Korvink, Institute of Microstructure Technology, Division III	ERC Advanced Grant NMCEL – A modular micro nuclear magnetic resonance in vivo platform for the nematode Caenorhabditis elegans	2015-04 – 2017-06
Dr. Pavel Levkin, Institute of Toxicology and Genetics, Division I	ERC Starting Grant DropCellArray – DropletMicroarrays: Ultra High-Throughput Screening of Cells in 3-D Micro-environments	2014-02 – 2019-01
Professor Dr. Alexander Nesterov-Müller, Institute of Microstructure Technology, Division III	ERC Starting Grant CombiPatterning – Combinatorial Patterning of Particles for High Density Peptide Arrays	2011-11 – 2016-10
Professor Dr. Holger Puchta, Botanical Institute, Division I	ERC Advanced Grant COMREC – Designed plant breeding by control of meiotic recombination	2011-09 – 2016-08
Dr. Matthias Schneider, Institute for Meteorology and Climate Research, Division IV	ERC Starting Grant MUSICA – Multi-platform remote sensing of isotopologues for investigating the cycle of atmospheric water	2011-02 – 2016-01
Dr. Martin Weides, Physikalisches Institut, Division V	ERC Consolidator Grant QuantumMagnonics – Interfacing spin waves with superconducting quantum circuits for single magnon creation and detection	2015-06 – 2020-05

Emmy Noether Junior Research Groups

Name, institute, division	Title of project	Duration [YYYY-MM]
Dr. Frank Biedermann, Institute of Nanotechnology, Division V	In vitro und in vivo Sensing von (Bio)organischen Analyten mit neuartigen Hoch-Affinitätsrezeptoren	2016-10 – 2021-09
Dr. André Butz, Institute for Meteorology and Climate Research, Division IV	Remote Sensing of Greenhouse Gases for Carbon Cycle Modelling (RemoteC)	2011-05 – 2016-04
Dr. Benjamin Flavel, Institute of Nanotechnology, Division V	Kohlenstoffnanoröhren, Solarzellen und Sensoren	2013-06 – 2017-04
Dr. Christian Greiner, Institute for Applied Materials, Division III	Size effects and microstructure evolution in textured metal surfaces during reciprocating sliding	2012-10 – 2017-09
Dr. Manuel Hinterstein, Institute for Applied Materials, Division III	BNT-BT als zukünftige bleifreie Funktionswerkstoffe für PTCR-, Aktor- und Sensoranwendungen	2016-04 – 2021-03
Dr. Lars Pastewka, Institute for Applied Materials, Division III	Korrelation von Reibung und Verschleiß amorpher Materialien	2015-01 – 2019-12
Dr. Nadine Rühr, Institute for Meteorology and Climate Research, Division IV	Die Auswirkungen von Extremereignissen auf den Kohlenstoff- und Wasserkreislauf	2016-10 – 2019-09

Average annual budget of an Emmy Noether Group: EUR 200 000 - 300 000.

Helmholtz Young Investigators Groups

Name, institute, division	Title of group	Duration [YYYY-MM]
Dr. Damian Cupid, Institute for Applied Materials, Division III	Integrated Computational Materials Engineering (ICME) of Electrochemical Storage Systems	2014-04 – 2019-03
Dr. Matthias Mauder, Institute for Meteorology and Climate Research, Division IV	Capturing All Relevant Scales of Biosphere-Atmosphere Exchange – The Enigmatic Energy Balance Closure Problem	2012-02 – 2018-01
Dr. Ulrich Paetzold, Institute of Microstructure Technology, Division III	Nanophotonics for Perovskite / Silicon Multijunction Solar Cells	2016-05 – 2021-04
Dr. Alexander Schug, Steinbuch Centre for Computing, Division II	Multi-scale Simulations of Regulatory RNAs and Two-component Signal Transduction	2011-04 – 2018-08

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RESEARCH

➔ Helmholtz Young Investigators Groups

Name, institute, division	Title of group	Duration [YYYY-MM]
Dr. Miriam Sinnhuber, Institute for Meteorology and Climate Research, Division IV	Solar variability, climate, and the role of the mesosphere / lower thermosphere	2010-09 – 2017-08
Dr. Svetoslav Stankov, Institute of Photon Science and Synchrotron Radiation, Division V	Interplay between structure and lattice dynamics in epitaxial rare earth nanostructures	2010-05 – 2018-12
Dr. Manuel Tsotsalas, Institute of Functional Interfaces, Division I	Hierarchically Structured Biomaterials	2016-01 – 2020-12
Dr. Ralf Matthias Ulrich, Institute for Nuclear Physics, Division V	Interpretation of Ultra-High Energy Cosmic Ray Data Using LHC Measurements	2011-04 – 2017-12
Dr. Kathrin Valerius, Institute for Nuclear Physics, Division V	Analysis of KATRIN data to measure the neutrino mass and search for new physics	2014-07 – 2019-06
Dr. Tonya Vitova, Institute for Nuclear Waste Disposal, Division III	Advanced synchrotron-based systematic investigations of actinide (An) and lanthanide (Ln) systems to understand and predict their reactivity	2011-07 – 2019-10
Dr. Frank Weber, Institute of Solid State Physics, Division V	Competing Phases in Superconducting Materials	2012-01 – 2018-12
Dr. Roswitha Zeis, Helmholtz Institute Ulm, Division I	Investigation of Overpotentials in High Temperature Proton Exchange Membrane Fuel Cells	2010-05 – 2019-02

The annual budget typically is EUR 250 000 – 300 000.

Young Investigators Groups

Name, institute, division	Title of group	Duration [YYYY-MM]
Dr. Luise Kärger, Institute of Vehicle System Technology, Division III	Gewichtsoptimierte Fahrzeugstrukturen durch maßgeschneiderte Hochleistungsfaserverbunde (supported by the Vector Foundation)	2014-07 – 2018-06
Dr. Monika Stelling, Institute of Applied Geosciences, Division IV	Anthropogene Einflüsse auf Stoffumsatzprozesse in der kritischen Zone – Selen als essentieller Nährstoff und toxischer Schadstoff	2012-03 – 2016-02

The annual budget typically amounts to EUR 80 000, another scientific staff position, plus a non-recurrent investment allowance of up to EUR 50 000.

BMBF Junior Research Groups

Name, institute, division	Title of group	Duration [YYYY-MM]
Dr. Alexander Colsmann, Light Technology Institute, Division III	Tandem-Architekturen für effiziente organische Solarzellen	2012-06 – 2016-11
Dr. Guillaume Delaittre, Institute of Toxicology and Genetics, Division I	Biohybrid Nanoarrays for Biotechnological and Biomedical Applications	2013-03 – 2017-12
Dr. Gerardo Hernandez-Sosa, Light Technology Institute, InnovationLab, Division III	BIOLicht – Gedruckte biologisch abbaubare organische lichtemittierende Bauteile	2014-11 – 2018-10
Dr. Samiro Khodayar, Institute for Meteorology and Climate Research, Division IV	Vorhersagemodelle für Extremwetterereignisse unter einem geänderten Klima – Abschätzung des mehrskaligen Einflusses aufgrund der Rückkopplung zwischen Boden und Atmosphäre	2014-08 – 2018-07
Dr. Bastian E. Rapp, Institute of Microstructure Technology, Division III	Fluoropor – chemisch inertes, mikro- bis nanoporöses "Teflon" mit einstellbarem Benetzungsverhalten	2014-10 – 2018-09
Dr. Cornelia Lee-Thedieck, Institute of Functional Interfaces, Division I	BioInterfaces Stammzellen-Material-Wechselwirkung	2012-03 – 2017-09
Dr. Aiko Voigt, Institute for Meteorology and Climate Research, Division IV	Wolken-Strahlungs-Wechselwirkungen mit der nordatlantischen Sturmzugbahn (CONSTRAin)	2016-09 – 2021-08

The total budget ranges between EUR 1 000 000 and 1 500 000.

Other Junior Research Groups and Funding Measures

Name, institute, division	Title of group	Duration [YYYY-MM]	Funding
Dr. Stefanie Betz, Institute of Applied Informatics and Formal Description Methods, Division II	Habilitation grant	2015-02 – 2020-01	Margarete von Wrangell habilitation grant of MWK and others
Dr. Christian Brandl, Institute for Applied Materials, Division III	Computergestützte Nanomechanik von Materialien	2015-05 – 2018-04	DFG and others
Dr. Azad M. Emin, Institute of Process Engineering in Life Sciences, Division I	Extrusion of Biopolymeric Systems	2016-08 – 2019-07	DFG and others

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RESEARCH

➔ Other Junior Research Groups and Funding Measures

Name, institute, division	Title of group	Duration [YYYY-MM]	Funding
Dr. Andreas Haupt, Institute for Sociology, Media, and Cultural Sciences, Division II	Economic Inequality and Labor Markets	2015-01 – 2017-02	Elite program for postdocs of the Baden-Württemberg Foundation; DFG
Dr. Michael Hirtz, Institute of Nanotechnology, Division V	Dip-Pen Nanolithography and Related Techniques	2011-03 – 2020-12	Basic budget by institute, DFG, and others
Dr. rer. pol. Daniel Hoang, Institute for Finance, Banking, and Insurance, Division II	Unternehmensfinanzierung	2016-10 – 2019-09	DFG, Funk Foundation
Dr. Patrick Jochem, Institute for Industrial Production, Division II	Transport und Energie	2009-10 – 2020-07	BMWi and others
Dr. Philipp Niemann, Institute for German Studies: Literature, Language, Media, Division II	Science in Presentations	2015-12 – 2018-11	Klaus Tschira Foundation
Dr. Zbigniew Pianowski, Institute of Organic Chemistry, Division I	Chemical Biology, Supramolecular Systems and Prebiotic Chemistry	2016-10 – 2019-09	DFG, own post
Dr. Ioan M. Pop, Physikalisches Institut, Division V	Sofja Kovalevskaja Award	2015-10 – 2020-09	Alexander von Humboldt Foundation
Dr. Achim Rettinger, Institute of Applied Informatics and Formal Description Methods, Division II	Adaptive Data Analytics	2014-06 – 2017-01	BMBF and 7th EU Framework Programme
Dr.-Ing. Katrin Schulz, Institute for Applied Materials, Division III	Habilitation grant	2016-01 – 2020-12	Margarete von Wrangell habilitation grant of MWK and others
Dr. Stefanie Speidel, Institute for Anthropomatics and Robotics, Division II	Habilitation grant	2011-03 – 2016-12	Margarete von Wrangell habilitation grant of MWK and others

Junior Professorships

Name, institute, division	Area	Duration [YYYY-MM]
Junior Professor Dr. Andreas Chr. Braun, Institute of Regional Science, Division IV	Juniorprofessur für Risikoorientierte Regionalentwicklung	2015-05 – 2019-05
Junior Professor Dr. Anne Koziolek, Institute for Program Structures and Data Organization, Division II	Juniorprofessur für Softwaretechnik	2013-02 – 2017-12
Junior Professor Dr. Henning Meyerhenke, Institute of Theoretical Informatics, Division II	Juniorprofessur Forschungsgruppe Paralleles Rechnen	2011-10 – 2017-09
Junior Professor Dr. Boris Neubert, Institute for Visualization and Data Analysis, Division II	Juniorprofessur für Visual Computing	2015-04 – 2019-03
Junior Professor Dr. Jens Rottmann-Matthes, Institute for Analysis, Division V	Juniorprofessur für Zeitabhängige partielle Differentialgleichungen	2013-09 – 2017-09
Junior Professor Dr. Katharina Schratz, Institute for Applied and Numerical Mathematics, Division V	Juniorprofessur für Wissenschaftliches Rechnen	2013-09 – 2017-08
Junior Professor Dr. Petra Schwer, Institute for Algebra and Geometry, Division V	Juniorprofessur für Metrische Geometrie	2014-10 – 2018-09
Junior Professor Dr. Thorsten Stein, Institute of Sports and Sports Science, Division II	Juniorprofessur für Sportwissenschaft mit Schwerpunkt Bewegungswissenschaft und Biomechanik	2013-04 – 2017-04
Junior Professor Dr. Gabriela Weitze-Schmithüsen, Institute for Algebra and Geometry, Division V	Juniorprofessur (Carl Zeiss Foundation) für Geometrische Gruppentheorie	2010-05 – 2016-05

Graduate Schools Funded by the DFG or Helmholtz Association

Graduate school	Funded by	Spokesperson / participant	Duration [YYYY-YYYY]
Karlsruhe School of Optics & Photonics (KSOP)	DFG	Professor Dr. Ulrich Lemmer, Light Technology Institute (LTI)	2006 - 2018
Karlsruher Schule für Elementarteilchen- und Astro-teilchenphysik: Wissenschaft und Technologie (KSETA)	DFG	Professor Dr. Ulrich Nierste, Institute for Theoretical Particle Physics (TTP)	2012 - 2018
Graduiertenschule für Klima und Umwelt (GRACE)	HGF	Professor Dr. Stefan Hinz, Institute of Photogrammetry and Remote Sensing (IPF)	2011 - 2022

Research Training Groups Funded by the DFG or Helmholtz Association

Graduate school	Funded by	Spokesperson / participant	Duration [YYYY-YYYY]
Prozessketten in der Fertigung: Wechselwirkung, Modellbildung und Bewertung von Prozesszonen	DFG	Professor Dr. Volker Schulze, Institute of Production Science (WBK)	2008 - 2017
Elementarteilchenphysik bei höchster Energie und höchster Präzision	DFG	Professor Dr. Dieter Zeppenfeld, Institute for Theoretical Physics (ITP)	2011 - 2020
Molekulare Architekturen für die fluoreszente Bildgebung von Zellen	DFG	Professor Dr. Hans-Achim Wagenknecht, Institute of Organic Chemistry (IOC)	2015 - 2019
Integrierte Entwicklung kontinuierlich-diskontinuierlich langfaserverstärkter Polymerstrukturen	DFG	Professor Dr. Thomas Böhlke, Institute of Engineering Mechanics (ITM) Together with: University of Waterloo, University of Western Ontario, University of Windsor (all Canada)	2015 - 2019
Energiezustandsdaten – Informatikmethoden zur Erfassung, Analyse und Nutzung	DFG	Professor Dr. Klemens Böhm, Institute for Program Structures and Data Organization (IPD)	2016 - 2020
Asymptotische Invarianten und Limiten von Gruppen und Räumen	DFG	Professor Dr. Roman Sauer, Institute for Algebra and Geometry, KIT (Spokesperson) Together with: Professor Dr. Anna Wienhard, Mathematisches Institut, Ruprecht-Karls-Universität Heidelberg	2016 - 2021
Energy Related Catalysis	HGF	Professor Dr. Olaf Deutschmann, Institute for Chemical Technology and Polymer Chemistry (ITCP)	2010 - 2017
Helmholtz International Research School for Teratronics – HIRST	HGF	Professor Dr. Christian Koos, Institute of Microstructure Technology (IMT)	2012 - 2019
Mechanisms and Interactions of Climate Change in Mountain Regions MICMoR	HGF	Professor Dr. Hans Peter Schmid, Institute for Meteorology and Climate Research – Atmospheric Environmental Research (IMK-IFU)	2012 - 2019
Energy Scenarios – Construction, Assessment and Impact	HGF	Professor Dr. Armin Grunwald, Institute for Technology Assessment and Systems Analysis (ITAS)	2011 - 2019
IMD – Helmholtz Research School on "Integrated Materials Development for Novel High-temperature Alloys"	HGF	Professor Dr. Martin Heilmaier, Institute for Applied Materials (IAM)	2013 - 2018

INNOVATION

Innovation Characteristics

Year	Invention disclosure	Priority-establishing patent applications	Property rights (existing)	Royalties [million euros]	New companies (spinoffs)	Participation in spinoffs
2012	131	72	1 853	2.29	18 (4)	7
2013	129	52	1 874	2.18	25 (7)	6
2014	133	77	1 884	2.16	33 (7)	6
2015	119	59	1 902	2.04	18 (8)	6
2016	127	55	2 000	1.70	21(10)	7

Establishment of New Companies in 2016

Spinoffs
EDI GmbH (CS)
GoSilico GmbH (CS)
Kinemic GmbH (CS)
Robodev GmbH (CS)
NovelSense UG (CS)
Vanguard Photonics GmbH (CN)
Etit Systems GbR (CN)
SimSpark Gbr (CS)
Lavrio.solutions (CS)
Otego GmbH (CN)

Startups
pubki GbR (CS)
MANOPUS UG (CS)
GERMAN IT JOBS GbR (CS)
Vertriebsheld.de (CS)
Selfbits GmbH (CS)
MOBILITIOUS UG (CS)
Waldisoft GbR (CS)
Just Viral GmbH & Co. KG (CS)
Fluffy Fairy Games UG (CS)
Understand.ai GbR (CS)
E&R Solutions GbR (CS)

AWARDS

External Awards
(see separate chapter of this Annual Report from page 78)

KIT Department Teaching Awards

KIT Department	Proposed award winners
Architecture	Professor Renzo Vallebuona, Professor Ludwig Wappner, Thomas Haug
Civil Engineering, Geo- and Environmental Sciences	Dr. Michael Haist
Chemistry and Biosciences	Dr. Frank Breher
Chemical and Process Engineering	Dr. Johannes Schneider
Electrical Engineering and Information Technology	Gustavo Lenis
Humanities and Social Sciences	Marie Hélène Adam, Szilvia Gellai, Dr. Claudia Pinkas-Thompson, Annegret Scheibe, Dominik Schrey
Informatics	Professor Dr. Dennis Hofheinz
Mechanical Engineering	Professor Dr. Bettina Frohnapfel
Mathematics	Professor Dr. Wolfgang Reichel
Physics	Dr. Ellen Gottschämmer, Dr. Joachim Ritter
Economics and Management	Professor Dr. Stefan Nickel

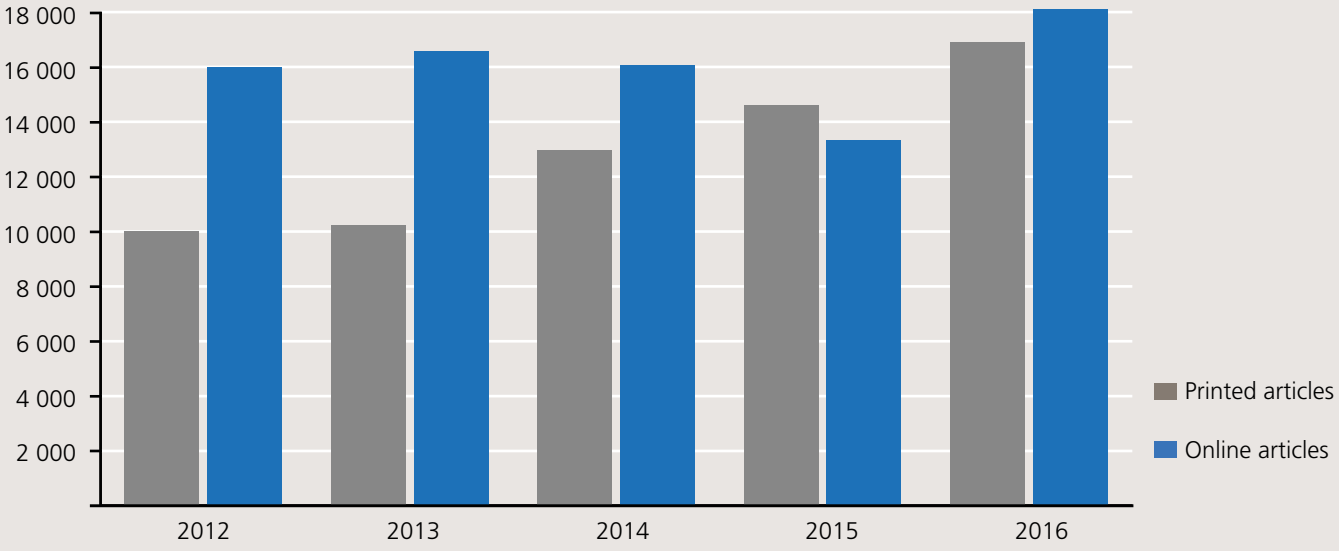
Awards for Doctoral Researchers

Name	Institute
Dr. Stefan Höfle	Light Technology Institute
Dr. Christoph Krämmer	Institute of Applied Physics
Dr. Anja Randecker	Institute for Algebra and Geometry

MEDIA/PUBLICATIONS

Development of Visibility in the Media

	2012	2013	2014	2015	2016
Printed articles	10 024	10 207	12 968	14 609	16 913
Online articles	15 990	16 562	16 046	13 309	18 098



Publications

	2014	2015	2016
Publications in total, irrespective of the year of publication	11 052	11 156	12 395
Publications in the Year of Publication			
Publications of researchers of KIT	7 986	6 597	7 655
of these, books and proceedings	843	893	821
of these, articles in proceedings	1 831	829	953
of these, articles in journals	2 996	2 386	3 713

RANKINGS

National Rankings

		2012	2013	2014	2015	2016
Wirtschaftswoche	Electrical Engineering	2	2	2	4	2
	Informatics	1	1	1	5	2
	Mechanical Engineering	2	3	1	4	3
	Natural Sciences	3	5	8	–	7
	Business Engineering	2	2	1	3	2

International Rankings

		2012	2013	2014	2015	2016
National Taiwan University Ranking	International – Overall	217	185	190	192	198
	International – Natural Sciences	55	51	52	49	53
	International – Engineering Sciences	57	61	79	58	80
	National – Overall	18	14	18	18	18
	National – Natural Sciences	1	1	1	1	1
	National – Engineering Sciences	1	1	1	1	1
QS World University Rankings	International – Overall	141	116	127	93	98
	International – Natural Sciences	–	34	34	34	–
	International – Engineering Sciences & IT	–	33	47	62	–
	National – Overall	8	6	5	4	4
	National – Natural Sciences	–	3	3	3	–
	National – Engineering Sciences	–	3	4	4	–
Times Higher Education	International – Overall	151	154	165	138	144
	International – Natural Sciences	–	–	–	46	68
	International – Engineering Sciences	–	52	56	48	60
	National – Overall	8	9	11	14	14
	National – Natural Sciences	–	–	–	4	9
	National – Engineering Sciences	–	3	3	3	4
Academic Ranking of World Universities	International – Overall	201-302	201-300	201-301	201-300	201-300
	International – Natural Sciences	101-150	101-150	76-100	76-100	51-75
	International – Engineering Sciences	101-150	76-100	101-150	101-150	151-200
	National – Overall	15-24	15-23	14-22	14-21	15-21

MISCELLANEOUS

Sustainability

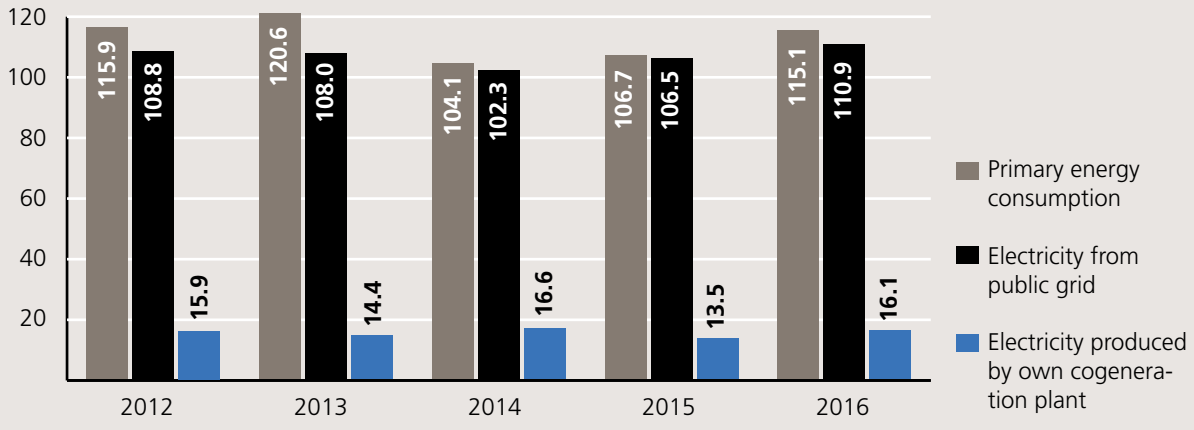
CO_2 Emissions 2012 – 2016

	2012	2013	2014	2015	2016
Heating plant CO_2 [t/a]	13 393	14 939	11 091	12 540	16 361
Cogeneration plant CO_2 [t/a]	5 292	6 714	7 604	6 293	4 205
Total CO_2 [t/a]	18 685	21 650	18 695	18 833	20 566
Allocated CO_2 certificates [t/a]	24 359	13 968	12 501*	11 073*	9 688*

* Due to excessive, not needed CO_2 certificates, no further CO_2 certificates had to be purchased.

Primary Energy Consumption 2012 – 2016

Type of energy	2012	2013	2014	2015	2016
Primary energy consumption [GWh]	115.9	120.6	104.1	106.7	115.1
Electricity from the public grid [GWh]	108.8	108	102.3	106.5	110.9
Electricity produced by own cogeneration plant [GWh]	15.9	14.4	16.6	13.5	16.1
Electricity produced by own photovoltaics facilities [GWh]	–	–	–	1.0	1.0
Heat produced (district heating power plant + cogeneration plant) [GWh]	84.7	84.1	65.9	71.4	77.0
Heat, weather-adjusted [GWh]	84.7	79.3	80.3	74.4	77.0



MISCELLANEOUS

Supply and Waste Management Services 2014 – 2016

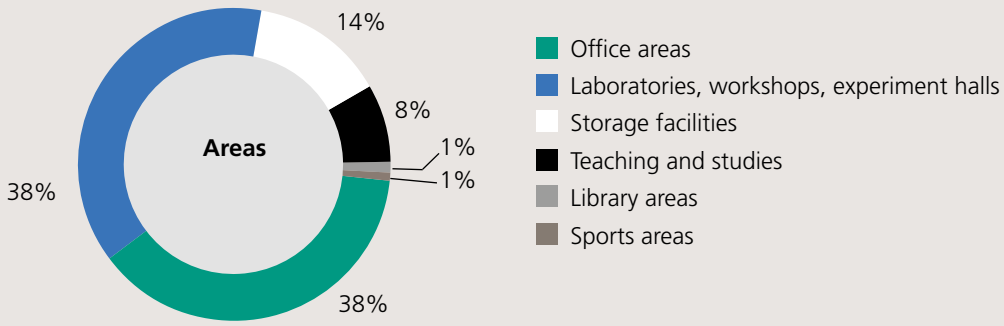
	2014		2015		2016	
Type of service	**CN**	**CS***	**CN**	**CS***	**CN**	**CS***
Electricity supply [GWh]	77	52	78	53	84	54
Heat supply [GWh]	43	39	45	43	51	44
Weather-adjusted [GWh]	52	48	47	45	51	44
Water supply [m³]	100 738	232 473	130 319	236 948	116 505	224 257
Compressed air generation [million m³]	6.3	–	8	–	7.9	–
Sewage disposal [m³]	87 827**	–	110 849**	–	96 085**	–
Waste disposal [t]	6 111**	2 137	15 022**	890	9 549**	1 021

* The data for Campus East and Campus West are included in Campus South.
**The data refer to Campus North in total, including external institutions.

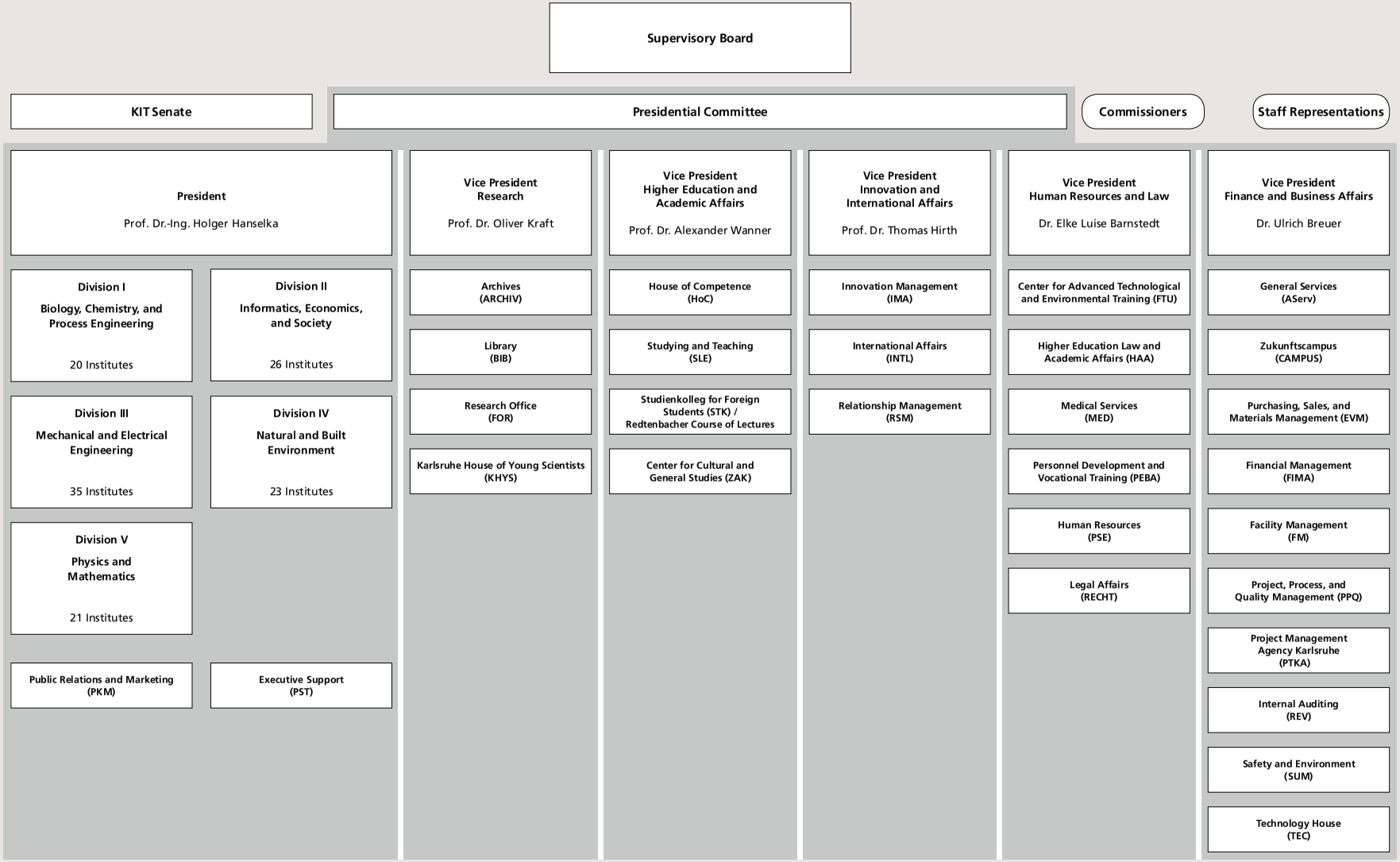
Areas

Type of area [m²]	**KIT in total**	**Campus South***	**Campus North****
Office areas (including conference rooms, rooms for copiers and servers)	164 584	106 002	58 582
Laboratories, workshops, experiment halls	164 891	85 744	79 147
Storage and similar facilities	57 677	33 656	24 021
Teaching and studies (lecture halls, seminar rooms, practice rooms)	32 343	27 250	5 093
Library areas (central + decentralized libraries)	5 216	3 441	1 775
Sports areas	4 428	4 211	217
Total usable area	429 139	260 304	168 835
of this, rented areas		17 918	2 277

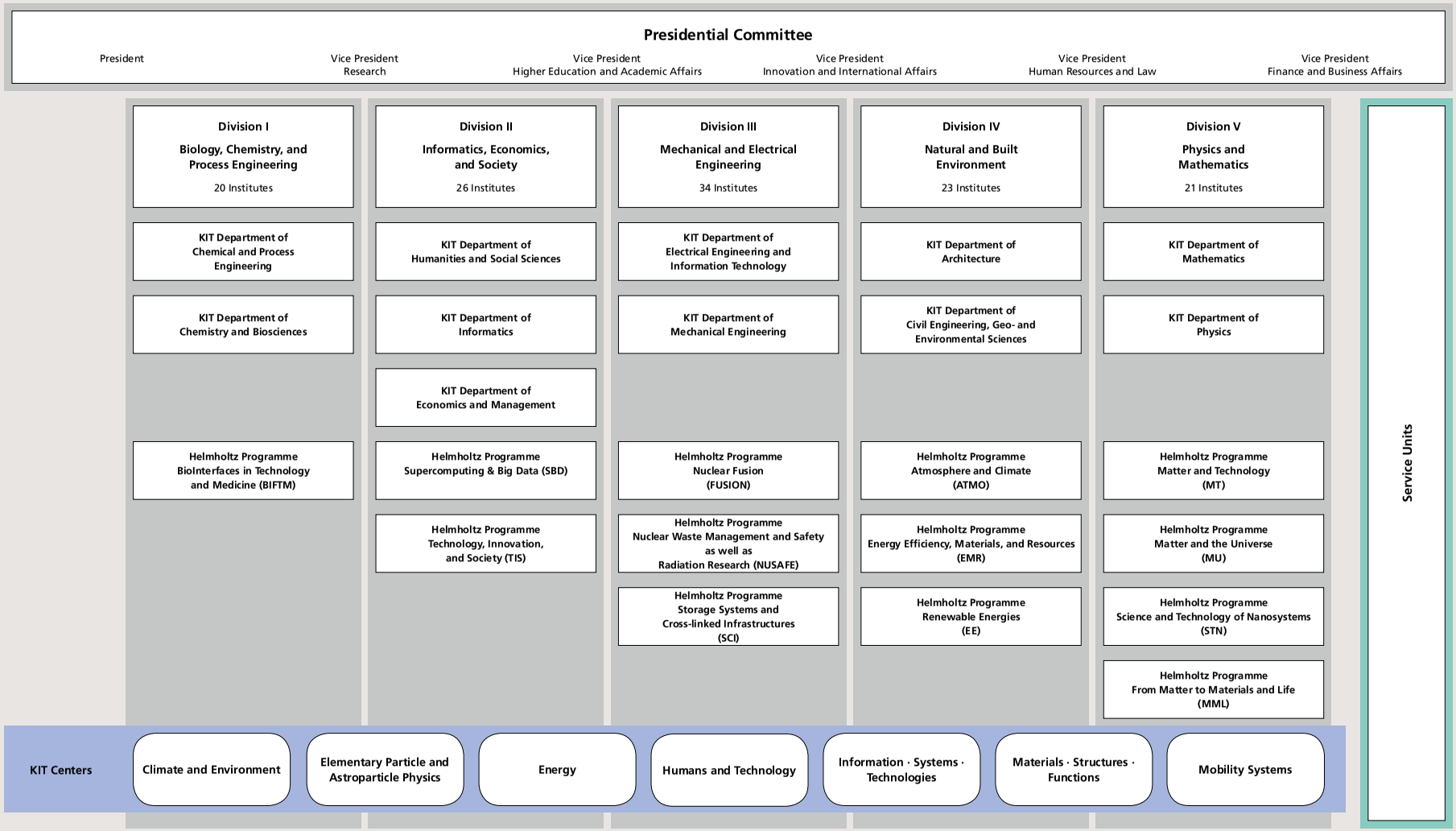
* including Campus East and Campus West ** incl. Campus Alpine



Organizational Structure



Science Organization



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