Facts and Figures

JÜLICH
FORSCHUNGSZENTRUM

At a Glance

Forschungszentrum Jülich pursues cutting-edge interdisciplinary research and – as a member of the Helmholtz Association – is one of the large interdisciplinary research centres in Europe. With its competence in materials science and simulation, and its expertise in physics, nanotechnology, and information technology as well as in the biosciences and brain research, Jülich is developing the basis for the key technologies of tomorrow. In this way, Forschungszentrum Jülich helps to solve the grand challenges facing society in the fields of energy and the environment as well as information and the brain.

5,768
employees

907
visiting scientists

1,614
publications
in peer-reviewed journals

525.4
revenues
in millions of euros

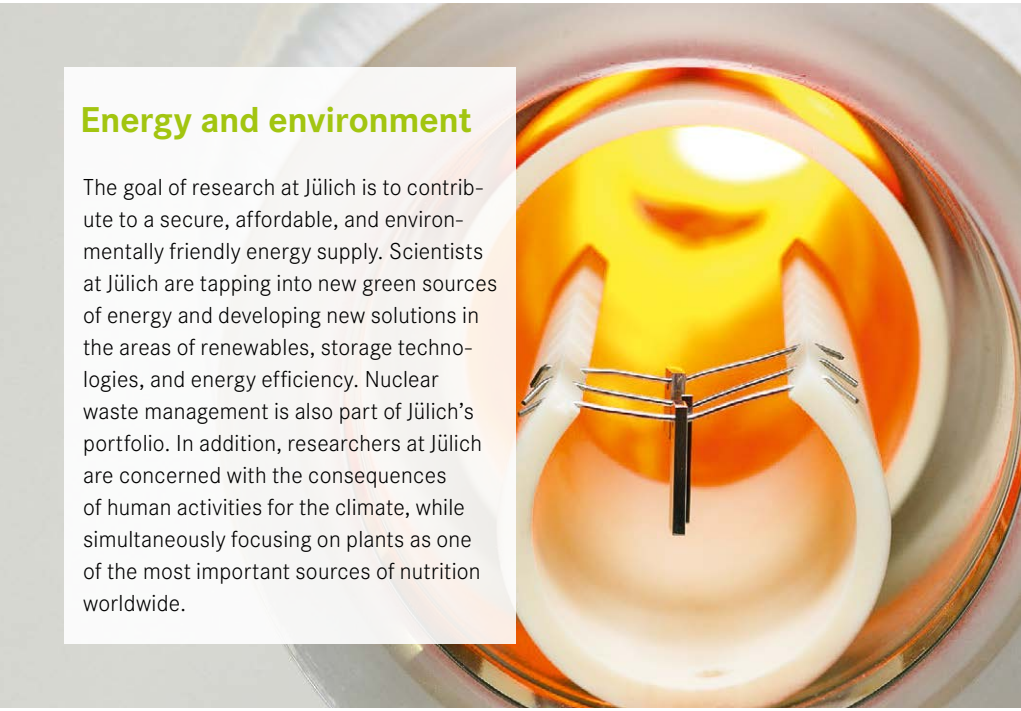
378
involvements
in nationally funded projects

Contents

Research Fields

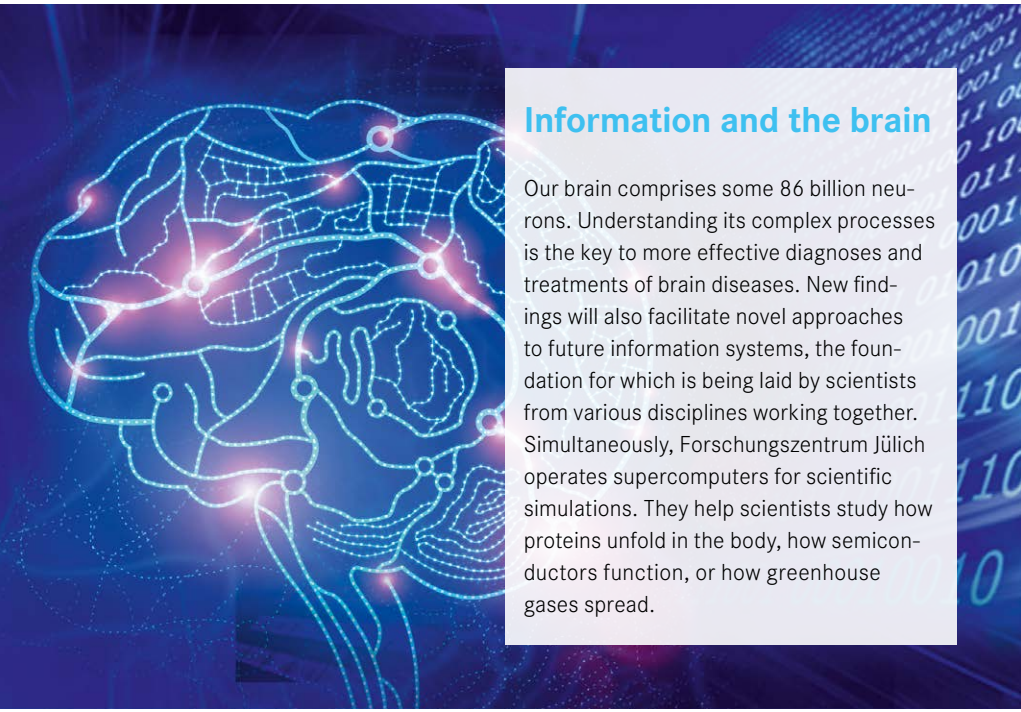
Energy and environment

The goal of research at Jülich is to contribute to a secure, affordable, and environmentally friendly energy supply. Scientists at Jülich are tapping into new green sources of energy and developing new solutions in the areas of renewables, storage technologies, and energy efficiency. Nuclear waste management is also part of Jülich's portfolio. In addition, researchers at Jülich are concerned with the consequences of human activities for the climate, while simultaneously focusing on plants as one of the most important sources of nutrition worldwide.



Publications

New scientific insights are only actually of benefit to the world in general if they are made accessible to other scientists. It is therefore no coincidence that publications in journals are considered to be an important benchmark for scientific achievements – above all in the renowned journals *Nature* and *Science*. In 2014, a total of five articles written by Jülich researchers made it into *Nature*, and three into *Science*.

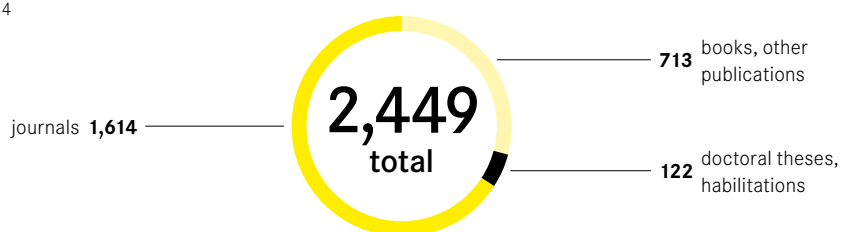


Information and the brain

Our brain comprises some 86 billion neurons. Understanding its complex processes is the key to more effective diagnoses and treatments of brain diseases. New findings will also facilitate novel approaches to future information systems, the foundation for which is being laid by scientists from various disciplines working together. Simultaneously, Forschungszentrum Jülich operates supercomputers for scientific simulations. They help scientists study how proteins unfold in the body, how semiconductors function, or how greenhouse gases spread.

Jülich publications

2014



Institutes and Subinstitutes

1

Institute for Advanced Simulation

- Jülich Supercomputing Centre
- Quantum Theory of Materials
- Theory of Soft Matter and Biophysics
- Theoretical Nanoelectronics
- Theory of the Strong Interactions
- Computational Biomedicine
- Theoretical Neuroscience

2

Institute of Bio- and Geosciences

- Biotechnology
- Plant Sciences
- Agrosphere

3

Institute of Complex Systems

- Neutron Scattering
- Theory of Soft Matter and Biophysics
- Soft Matter
- Cellular Biophysics
- Molecular Biophysics
- Structural Biochemistry
- Biomechanics
- Bioelectronics

4

Institute of Energy and Climate Research

- Materials Synthesis and Processing
- Microstructure and Properties of Materials
- Electrochemical Process Engineering
- Plasma Physics
- Photovoltaics
- Nuclear Waste Management and Reactor Safety
- Stratosphere
- Troposphere
- Fundamental Electrochemistry
- Systems Analysis and Technology Evaluation
- Helmholtz Institute Erlangen-Nürnberg for Renewable Energy Production
- Helmholtz Institute Münster for Ionics in Energy Storage

5 **Nuclear Physics Institute**

- Experimental Hadron Structure
- Experimental Hadron Dynamics
- Theory of the Strong Interactions
- Large-Scale Nuclear Physics Equipment

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6 **Institute of Neuroscience and Medicine**

- Structural and Functional Organization of the Brain
- Molecular Organization of the Brain
- Cognitive Neurology
- Physics of Medical Imaging
- Nuclear Chemistry
- Computational and Systems Neuroscience
- Neuromodulation
- Ethics in the Neurosciences
- Computational Biomedicine

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7 **Jülich Centre for Neutron Science**

- Neutron Scattering
- Scattering Methods

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8 **Peter Grünberg Institute**

- Quantum Theory of Materials
- Theoretical Nanoelectronics
- Functional Nanostructures at Surfaces
- Scattering Methods
- Microstructure Research
- Electronic Properties
- Electronic Materials
- Bioelectronics
- Semiconductor Nanoelectronics

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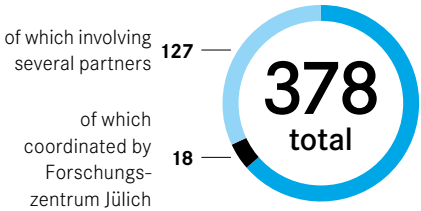
9 **Central Institute of Engineering, Electronics and Analytics**

- Engineering and Technology
- Electronic Systems
- Analytics

National and International Cooperations

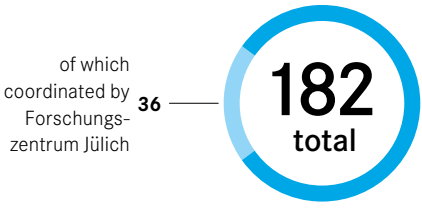
Nationally funded projects

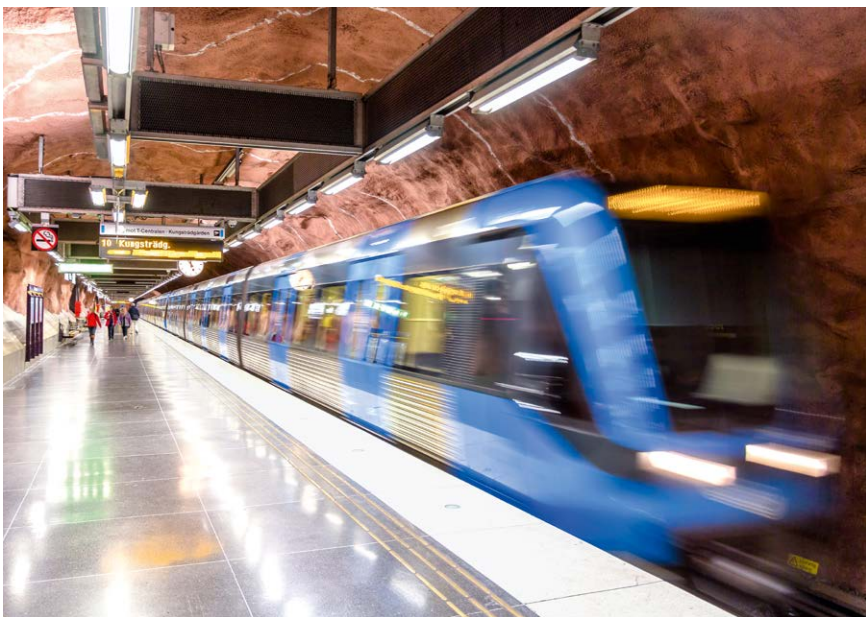
2014



EU-funded projects

2014





As part of the ORPHEUS project, Jülich scientists together with university and industrial partners are studying how to improve safety in underground stations in case of fire. BMBF is funding the project with a total of € 3.2 million (of which € 1.1 million is for Jülich).

1 Efficient membranes

EU project Green-CC
Development of ceramic gas separation membranes with the objective of reducing the energy requirements of industrial processes.
Volume: € 1.2 million · Funding body: EU

2 EUROfusion

European Consortium for the Development of Fusion Energy
Newly structured consortium of 29 national fusion centres from 26 countries aiming to construct the first fusion power plant.
Volume: € 6.8 million · Funding body: EU

3 Parkinson vaccination

EU project SYMPATH
Testing the safety and tolerability of two vaccines for a protein that plays a key role in the development and progression of Parkinson's disease.
Volume: € 6 million · Funding body: EU

4 Soil – plants – atmosphere

Collaborative research centre TR 32
Cooperation between Forschungszentrum Jülich and the region's universities to study the exchange of energy and oxygen.
Volume: € 2.8 million · Funding body: DFG

5 Algae fuel

Project AUFWIND
Comparative testing of three cultivation systems to produce kerosene from algae.
Volume: € 3.1 million · Funding body: BMEL

6 Optogenetics

New optical sensors and photoregulators (OptoSyS)
Project investigating new methods for light-controlled biological processes in living cells
Volume: € 1.4 million · Funding body: BMBF

7 Brain simulations

Human Brain Project (HBP)
The European flagship project aims to create a new infrastructure for brain simulations; Forschungszentrum Jülich coordinates setting up the High-Performance Computing (HPC) Platform.
Volume: € 3.6 million · Funding body: EU

8 Biotech tools

Molecular Interaction Engineering (MIE)
Helmholtz network for novel technologies for biotech production such as printable biological circuits for the food industry and medical diagnostics.
Volume: € 2.6 million · Funding body: BMBF

The volumes given each represent Jülich's share of the contract volume.

Platforms

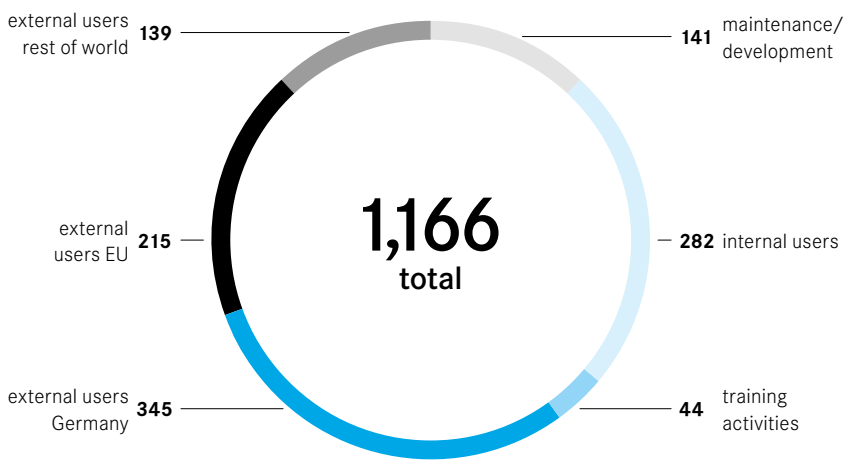
Jülich Centre for Neutron Science (JCNS)

Neutron research provides unique insights into matter. JCNS operates instruments at four leading neutron sources. In addition to the eleven instruments at Heinz Maier-Leibnitz Zentrum (MLZ) in Garching, JCNS operates a branch office at the most powerful neutron source in the world, ILL, in Grenoble, France, and – as the only institution outside of North America – at the most powerful spallation source in the world, SNS in Oak Ridge, USA, as well as at the CARR research reactor near Beijing.

View into the experimental hall at the research neutron source Heinz Maier-Leibnitz in Garching

Beam time allocated

in days, rounded, 2014



Helmholtz Nanoelectronic Facility (HNF)

The Helmholtz Nanoelectronic Facility is the Helmholtz Association's central technology platform for nanoelectronics. HNF's mission is researching, manufacturing, and characterizing nano- and atomic structures for information technology. The nanoelectronics laboratory offers universities, research institutions, and industry free access to know-how and resources for fabricating structures, devices, and circuits – from the atomic scale to complex systems. The focus of work at HNF is resource-conserving "green information technology".

HNF in figures

as of 31 December 2014

Granting of operating licence	**4 April 2014**
User numbers internal external	**220** **32**
Usage days	**220**
Maintenance days	**33**
Hook-up (set-up and connection of the machines)	**90 days**
Total usage time of all machines	**20,477 hours**
External visitors	**1,680**

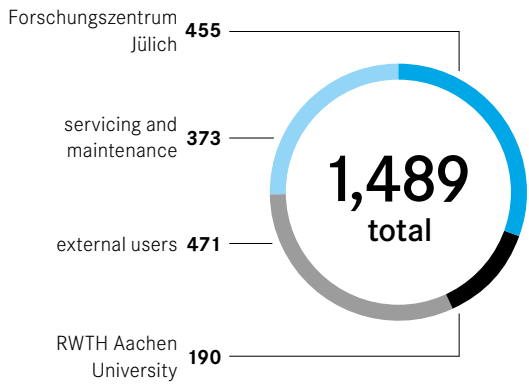
The Helmholtz Nanoelectronic Facility, one of the largest and most modern clean room centres in Europe

Ernst Ruska-Centre (ER-C)

Forschungszentrum Jülich and RWTH Aachen University jointly operate ER-C as a centre for atomic-resolution electron microscopy and spectroscopy at the highest international level. The joint undertaking on the Jülich campus, which is named after the inventor of the electron microscope, offers scientists from all over Germany a unique insight into the world of atoms and develops new methods for materials research.

Measuring time

at electron microscope instruments of ER-C[1] in days, 2014



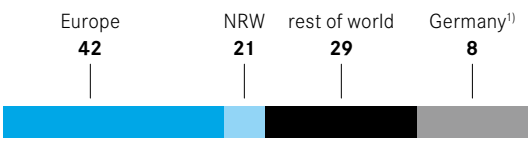
1) Approximately 50% of the measurement time at the five Titan microscopes are allocated by an expert panel, appointed by the German Research Foundation.

The electron microscope PICO, with its record resolution of 50 billionths of a millimetre, can image atomic structures right down to displacements.

Users

according to region, percentage, 2014

1) without NRW



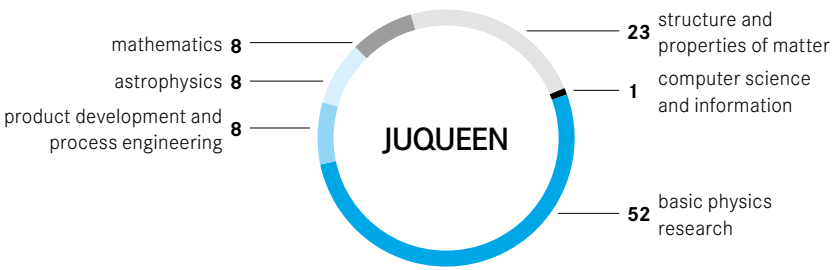
Jülich Supercomputing Centre (JSC)

The Jülich Supercomputing Centre provides scientists and engineers working at Forschungszentrum Jülich, universities, and research institutions in Germany and throughout Europe, as well as in the commercial sector with access to computing capacity on the most powerful class of supercomputers, enabling them to solve highly complex problems using simulations. The John von Neumann Institute for Computing is responsible for the scientific evaluation of projects.

As the fastest computer in Germany, the Jülich supercomputer JUQUEEN ranked eighth in the November 2014 TOP500 list of the fastest computers in the world. Forschungszentrum Jülich operates JUQUEEN as part of the Supercomputing research programme of the Helmholtz Association. Approximately 70 % of the computer is part of the national Gauss Centre for Supercomputing, which means that this part of the computation time is allocated to national and European projects through a well-established peer-review process. The remaining 30 % of computing time is reserved for scientists at Forschungszentrum Jülich and the Jülich Aachen Research Alliance (JARA).

Research fields of ongoing European projects

percentage, PRACE Tier-0, 2014



The numbers are based on the computing time periods September 2013–August 2014 and March 2014–February 2015 of the Partnership for Advanced Computing in Europe (PRACE).

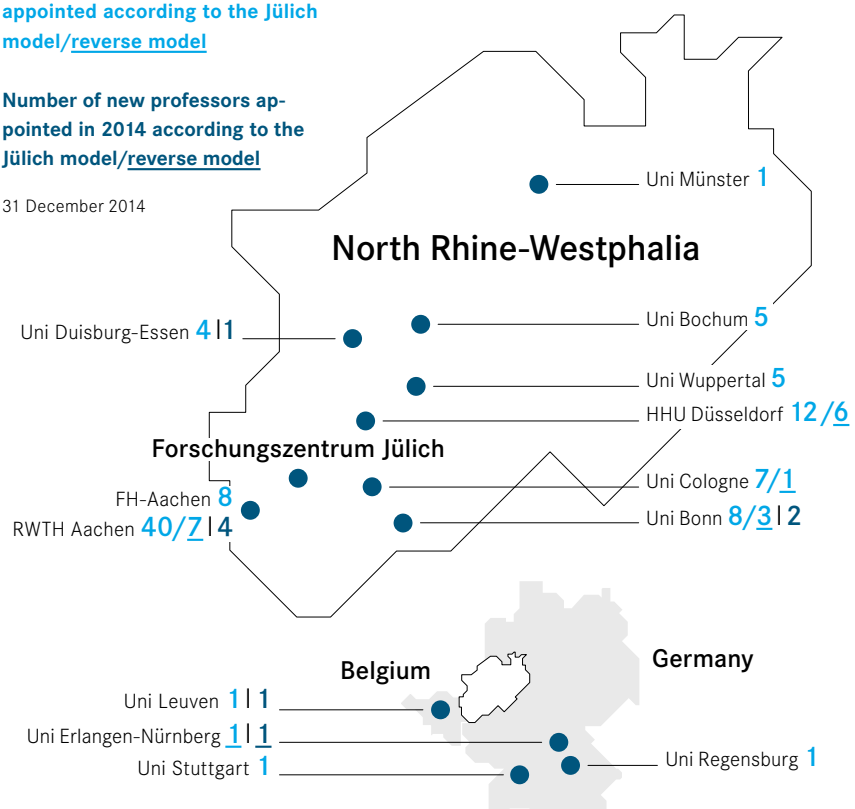
Joint Professorial Appointments

Scientists working at Jülich are appointed professor in a joint procedure with a partner university. In accordance with the Jülich model, those who are appointed professor are simultaneously seconded by the university to work at Forschungszentrum Jülich. In the reverse Jülich model, professors whose primary employment is at their university also work at Jülich (secondary employment). There are 47 joint appointments with JARA alone.

Total number of professors appointed according to the Jülich model/reverse model

Number of new professors appointed in 2014 according to the Jülich model/reverse model

31 December 2014



JARA: Jülich Aachen Research Alliance

The JARA cooperation between RWTH Aachen University and Forschungszentrum Jülich, established in 2007, saw the founding of the new section JARA-SOFT in 2014. It pools the competences of both institutions in soft matter research. In addition, it was decided to establish specialized JARA institutes. They will be headed collegially by three to five JARA professors and will receive additional funding from the Excellence Initiative. Initially, two institutes each will be established in the sections JARA-BRAIN ("Brain structure-function relationship: Decoding the human brain at systemic levels" and "Molecular neuroscience and neuroimaging") and JARA-FIT ("Green IT" and "Quantum information").

1 **Translational Brain Medicine**
JARA-BRAIN

2 **Sustainable Energy Research**
JARA-ENERGY

3 **Forces and Matter Experiments**
JARA-FAME

4 **Fundamentals of Future Information Technology**
JARA-FIT

5 **High-Performance Computing**
JARA-HPC

6 **Soft Matter Science**
JARA-SOFT

JARA in figures

Budget	in millions of euros
Total	500
Amount invested	60
Funds from the Excellence Initiative[1)]	13.6

Professorial appointments	since 2006
Joint professorial appointments[2)]	47

Publications	2014
Publications by JARA members	1,917[3)]
Joint publications	919

1) for the period 2012–2017
2) as of 31 December 2014
3) peer-reviewed publications

Industrial Partners

Number of industrial collaborations

2014

Important industrial collaborations

2014

Industrial partners	Project
MTU Aero Engines GmbH	Lifetime modelling of aircraft engine blades
Ansaldo Energia	Next generation of thermal barrier coatings
DSM Advanced Surfaces	Effects of MAXRAY coatings on photovoltaic technologies
Dataport	Continuation and further development of nutrient modelling
Omicron Nanotechnology	Cooperation for HNF cluster tool
Kawasaki Heavy Industries	Activity plan of hydrogen recombination for application on hydrogen carrying vessels
Siemens AG	Run-time analysis of parallel applications for industrial software development
Plansee	Oxidation behaviour of chromium-plated materials
Bayer Crop Science AG	Multi-dimensional coupled modelling of root growth, water and nutrient uptake by roots
Sulzer Metco	Investigation of the spitting phenomenon in PS-PVD
MAN Diesel & Turbo	Investigation of alloys in power plant prechambers
Grünenthal GmbH	Development of new analgesics with optimized pharmacological profile
Piramal	Clinical trials to test the new drug Neuraceq

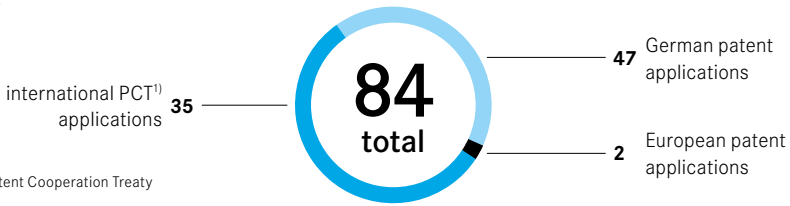
Patents and Licences

Jülich research focuses on basic topics and creates innovations which benefit both industry and society and which lead to protective rights and licensing agreements.

Protective rights include inventions for which patent applications have been filed (patent applications) as well as patents granted.

New patent applications

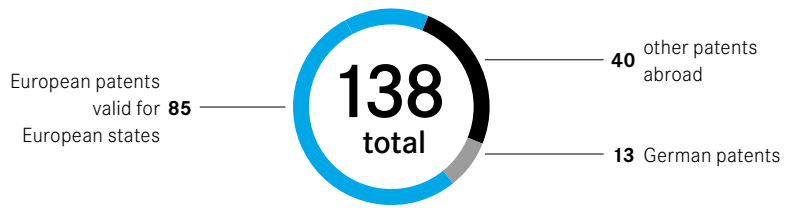
2014



1) Patent Cooperation Treaty

Patents granted

2014



526 patent families 2014 · **17,956** protective rights 2014

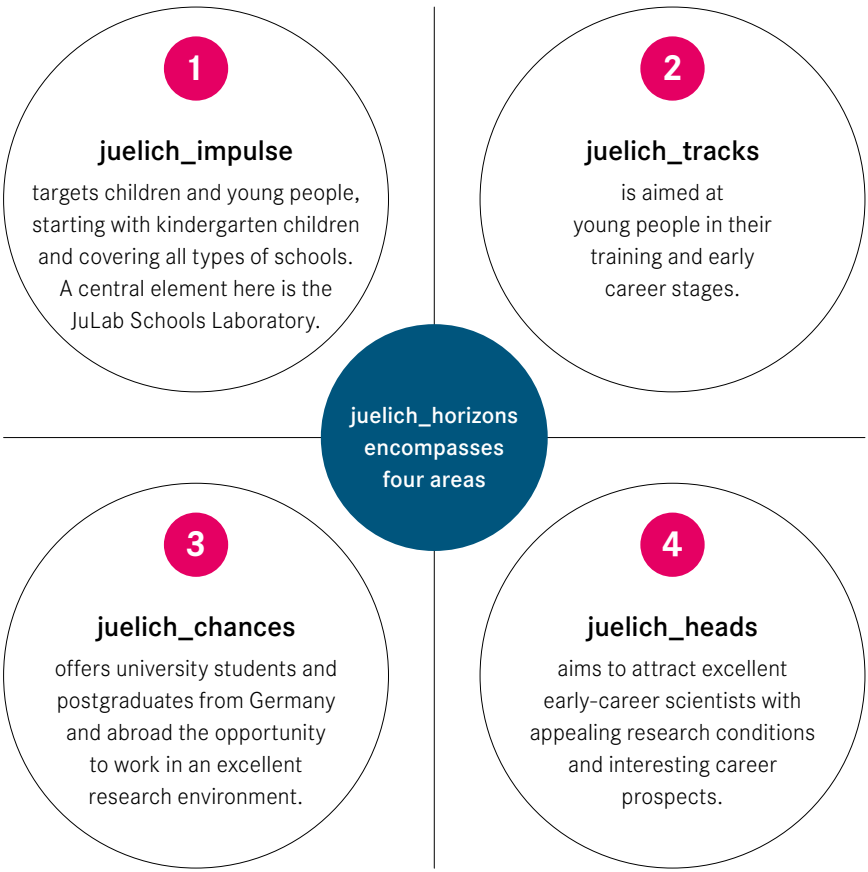
Licences

Total **78**			
of which new **5**	Share SMEs **61**	Total share abroad **21**	Share USA **8**

Revenues from licensing and know-how agreements: **€ 783,000**.

Promoting Young Talent: juelich_horizons

Jülich encourages young people's interest in scientific topics from an early age and supports them during training and studies. Offering them excellent conditions for their first job, their career in science, or taking on their first leadership responsibilities – these are the goals that Jülich's strategic concept for promoting young talent juelich_horizons is committed to.



1 juelich_impulse

JuLab Schools Laboratory

Kindling children's fascination with research – at Jülich, there is an entire laboratory complex with committed and skilled professionals dedicated to this purpose. In 2014, 3,830 school children came to JuLab to conduct experiments. The majority, 2,023 of them, were girls. The topics ranged from creative tinkering for primary school children to insights into brain research and also included

the ambitious project of building a cyclotron for schools and educational purposes.

2 juelich_tracks

With its training opportunities, Forschungszentrum Jülich not only covers its own requirements for qualified employees but also counteracts the region's shortage of skilled personnel. Many trainees are simultaneously enrolled in a university course.

Vocational training places

new trainees 2014

Occupations		those including a dual study programme
Laboratory technicians	**26**	7
Electricians	**11**	–
Metalworkers	**10**	1
Technical product designers[1)]	**–**	–
Administrative occupations	**15**	3
Mathematical-technical software developers	**27**	27
Other	**16**	–
Total	**105**	**38**

1) no new trainees in 2014

3 juelich_chances

Forschungszentrum Jülich is a career stepping stone for undergraduates, postgraduates, and PhD students, who are offered many opportunities through PhD awards and public presentations of their research.

For doctoral training, Forschungszentrum Jülich works together with universities in the framework of 22 graduate schools and research training groups, for six of which Jülich has a leading function.

HITEC
Helmholtz Graduate School in Energy and Climate Research

GRS
German Research School for Simulation Sciences

DFG Graduate School
Quantum many-body methods in condensed matter systems

BioSoft
International Helmholtz Research School of Biophysics and Soft Matter

iGRASP seed
International Graduate School of Protein Science and Technology

Geoverbund ABC/J
Centre for High-Performance Scientific Computing in Terrestrial Systems

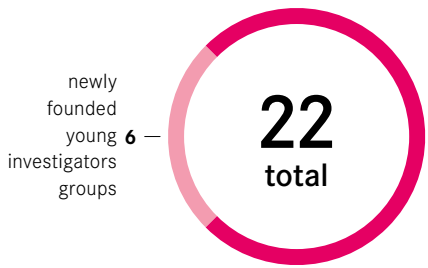
4 juelich_heads

Heading a young investigators group offers scientists early independence and superb career opportunities. Forschungszentrum Jülich also participates in the Helmholtz Postdoc Programme. Funding for up to three years enables young scientists to enhance their own research profile directly after their PhD.

Young investigators group leader Prof. Dietrich Kohlheyer

Young investigators groups at Jülich

2014



Personnel

Overview personnel

as of 31 December 2014

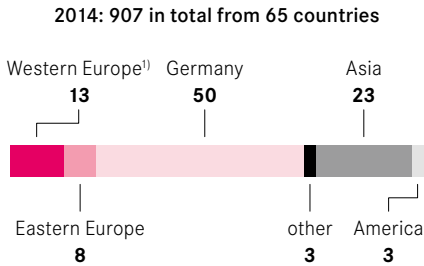
Area	Number[1]
Scientists and technical personnel	3,753
of which scientists incl. scientific training	2,074
• of which PhD students	540
• of which scholarship holders	24
• of which undergraduates/ postgraduates	152
• of which joint appointments with universities[2]	111
• of which W3 professors	51
• of which W2 professors	49
• of which W1 professors	11
of which technical personnel	1,679
Project Management Organizations	937
Administration	717
Trainees and students on placement	361
Total	5,768

1) only employees with a contract paid by Jülich
2) excl. members of the Board of Directors

Visiting Scientists

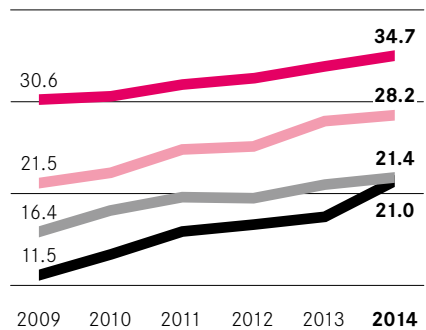
percentage, 2014

1) without Germany



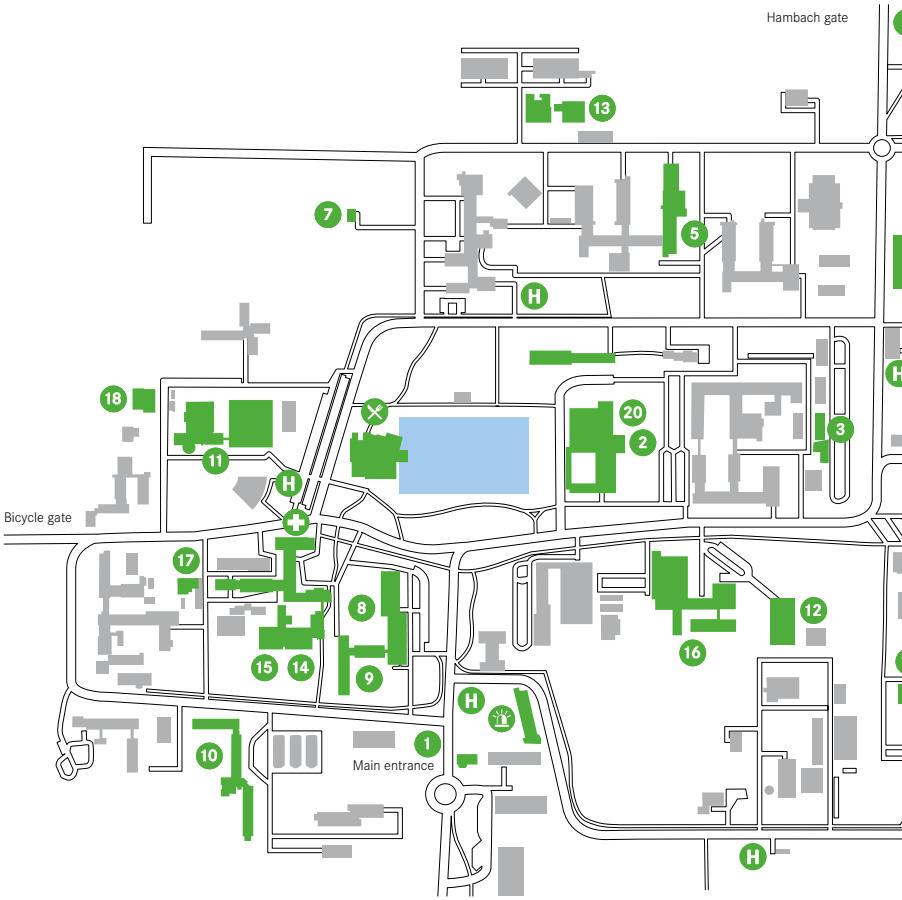
Proportion of women

percentage, 2009–2014

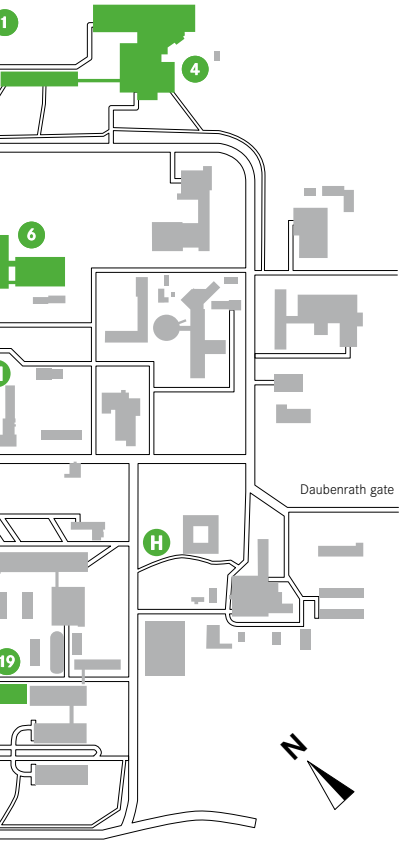


- women as a percentage of total employees
- percentage of women in the salary grades E12 to E15Ü as well as those paid according to groups AT, B, C, and W (specialist staff)
- women as a percentage of scientific personnel
- women as a percentage of total senior personnel

Campus Map



1 Visitor Service
2 Central Library
3 JuLab Schools Laboratory
4 COSY accelerator
5 Ernst Ruska-Centre
6 Hot cells
7 Meteorological tower
8 Board of Directors and Administration
9 Corporate Communications
10 Project Management Jülich
11 Jülich Supercomputing Centre
12 Helmholtz Nanoelectronic Facility



Sustainable Campus

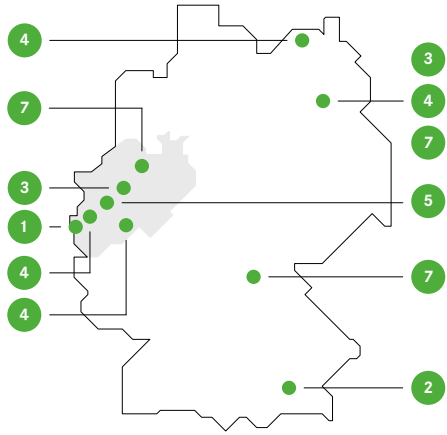
Researching and developing solutions which enable future generations to lead a good life – Jülich attaches the utmost importance to this. But Jülich scientists are also concerned with conducting their research in a sustainable and resource-conserving manner.

In 2014, Forschungszentrum Jülich was the first member of the Helmholtz Association to present a sustainability report.

www.fz-juelich.de/sustainable-campus

13 PhyTec experimental facility for plants
14 Medical imaging
15 PET Centre for Brain Research
16 Fuel Cell Laboratory
17 Lysimeter facility
18 Biomolecular NMR Center
19 Technical facility for photovoltaics research
20 Lecture theatre
H Bus stop
Seecasino
Company physician, emergency physician
Fire Brigade

Work at Other Locations



Forschungszentrum Jülich is represented at other locations as follows:

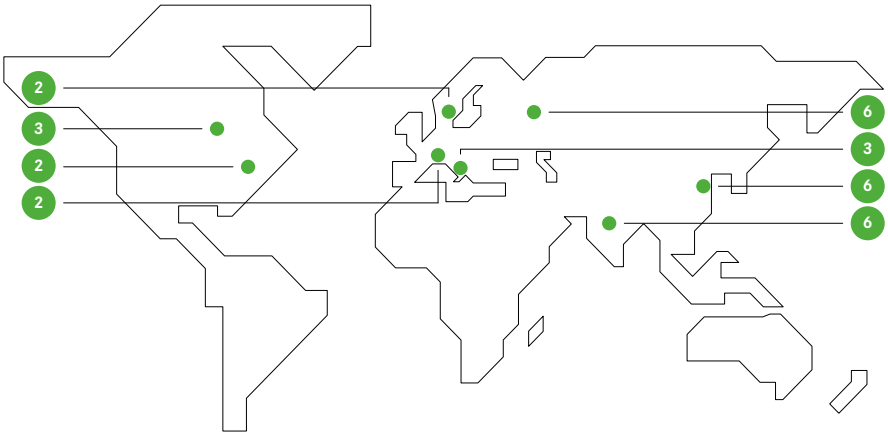
1 **Excellent cooperation with Aachen**
Forschungszentrum Jülich works very closely with RWTH Aachen University in the Jülich Aachen Research Alliance JARA (see p. 15). In addition, they jointly run the German Research School for Simulation Sciences, an independent school for master's and PhD students.

2 **Global experiments with neutrons**
The Jülich Centre for Neutron Science (JCNS) operates instruments at some of the world's leading neutron sources:

- Most of these are located at Heinz Maier-Leibnitz Zentrum in Garching near Munich, run jointly with Technische Universität München and Helmholtz-Zentrum Geesthacht.
- At the SNS spallation neutron source in Oak Ridge, USA, in which JCNS is involved as the only non-American institution.
- At the high-flux reactor at Institut Laue-Langevin (ILL) in Grenoble, France; Jülich is a joint shareholder, together with the French organizations CEA and CNRS. This guarantees the participation of the entire German neutron research community in the operation of the most powerful neutron source in the world.
- In Lund, Sweden, Jülich coordinates the German contribution to the planned European Spallation Source ESS. The aim is to establish a German branch office.

3 **Synchrotron experiments in Germany and abroad**
- The Peter Grünberg Institute, through the Jülich Synchrotron Radiation Laboratory (JSRL), coordinates materials science experiments with synchrotron radiation in Dortmund, Berlin, Trieste (Italy), and Argonne (USA).

4 **Project Management Jülich**
Project Management Jülich, as a largely independent organization with branch



offices in Jülich, Berlin, Rostock, and Bonn, is the project management organization with the highest turnover in Germany.

5 Biotechnology Cluster BIO.NRW

Jülich's Düsseldorf branch office of BIO.NRW, a cluster funded by the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia, focuses on initiating cooperations between research, enterprises, investors, and politics.

6 Internationally represented

- The activities of Forschungszentrum Jülich in India are coordinated by an office in New Delhi.
- As a member of the Helmholtz Association (HGF), Forschungszentrum Jülich is also represented internationally by Helmholtz offices in Brussels, Moscow, and Beijing.

7 Helmholtz institutes

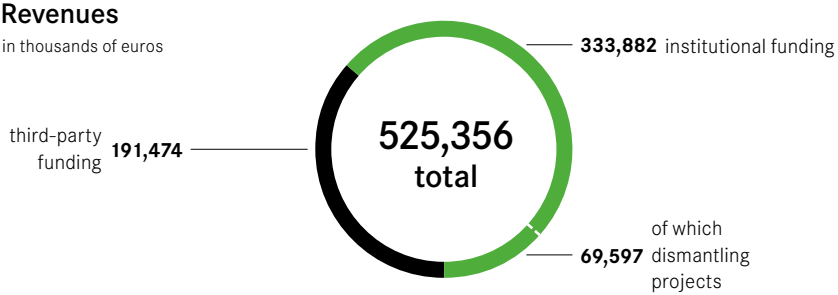
- The Helmholtz Institute Erlangen-Nürnberg (HI ERN) is set up as a branch office of Forschungszentrum Jülich for renewable energy research and is operated jointly with Friedrich-Alexander-Universität Erlangen-Nürnberg and Helmholtz-Zentrum Berlin.
- The Helmholtz institute for Ionics in Energy Storage was established in Münster in June 2014 as a branch office of Forschungszentrum Jülich and pools Jülich's competences in battery research with those of RWTH Aachen University, which is also involved.

Finances

In 2014, Forschungszentrum Jülich obtained third-party funds to the amount of € 191.5 million. Most of this income resulted from research and development activities for industry, the acquisition of funding, and project management on behalf of the federal government and the federal state of North Rhine-Westphalia.

Revenues

in thousands of euros



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