FACTS, FIGURES, PEOPLE

2023 I 2024

Member of the Helmholtz Association

JÜLICH
Forschungszentrum

WE LOVE RESEARCH

At Forschungszentrum Jülich, almost 7,450 people have been working hand in hand with 1,457 visiting scientists from 72 countries. We are one of the major interdisciplinary research institutions in Europe and, being a member of the Helmholtz Association, we contribute to solving the major social challenges of our time.

CONTENT

FACTS, FIGURES, PEOPLE
2023 I 2024

DEAR READERS,

This brochure is designed to provide you with a compact overview of our successes, achievements and our research focus areas. We will also introduce you to some of our outstanding researchers.

I would like to emphasize a few topics in particular.

Artificial intelligence: it is developing rapidly and promises pioneering applications, for example in the prediction of dramatic weather events or in the early detection of brain tumours. With JUPITER, Forschungszentrum Jülich is welcoming the first European exascale computer and one of the most powerful AI computers in the world. The first module was delivered in spring and immediately took first place in the Green500 list of the most energy-efficient supercomputers. I am very pleased about this, as it shows that we have been factoring in sustainability right from the start, even and especially with our most powerful top-class appliances.

Transfer: with our large-scale equipment and research infrastructures, but also in the laboratory and in the field, a lot of data and findings are obtained that lead to applications which can be of great benefit to us all – as in a project during the European Football Championship in which visitor flows were analyzed and optimized with the help of computer simulations, for example, or with Agri photovoltaic systems that allow land to be used for both photovoltaics agriculture. We work closely with partners in science and industry. In Siegen in March of this year, EPIQ was inaugurated, the development partnership of Forschungszentrum Jülich and the start-up eleQtron for a trapped-ion quantum computer in North Rhine-Westphalia. You will find more examples of how we demonstrate our research and expertise outside the box in the "Science Meets Politics" section. We are also proud of our cooperation with Hermann Josef Hospital in Erkelenz on a hydrogen-based heat and power supply in a region that has set itself the goal of becoming a hydrogen model region.

Internationality: in 2023, Forschungszentrum Jülich had 7,423 employees from 114 countries and 1,457 visiting researchers from 72 countries. There were 1,193 publications with international partners from 73 other countries. We were involved in 186 projects from European framework programmes, coordinating 34 of them. These are just some of the impressive figures from this area. One thing is certain: never before have researchers been networked as well as they are today. We need a combination of different perspectives to solve the major current challenges. That is why we build bridges between disciplines and countries.

Yours sincerely,
Astrid Lambrecht

JÜLICH RESEARCH AT A GLANCE

14
Institutes

18
Branch offices in Germany and abroad

238
football fields
would fit into the 1.7 square kilometres of Forschungszentrum Jülich's campus

987
million euros
was the total budget of Forschungszentrum Jülich in 2023

Supercomputer JUWELS, quantum computer JuPSI
Jülich Supercomputing Centre

900 MHz NMR spectrometer
Institute of Biological Information Processing

EBRAINS
Institute of Neurosciences and Medicine

Atmospheric simulation chamber SAPHIR
Institute of Climate and Energy Systems

3
Research focus areas

Information

Energy

Bioeconomy

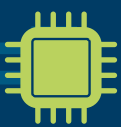
93
New patent applications
in 2023

2,511
Publications
in 2023

SELECTED RESEARCH INFRASTRUCTURES ON THE JÜLICH CAMPUS

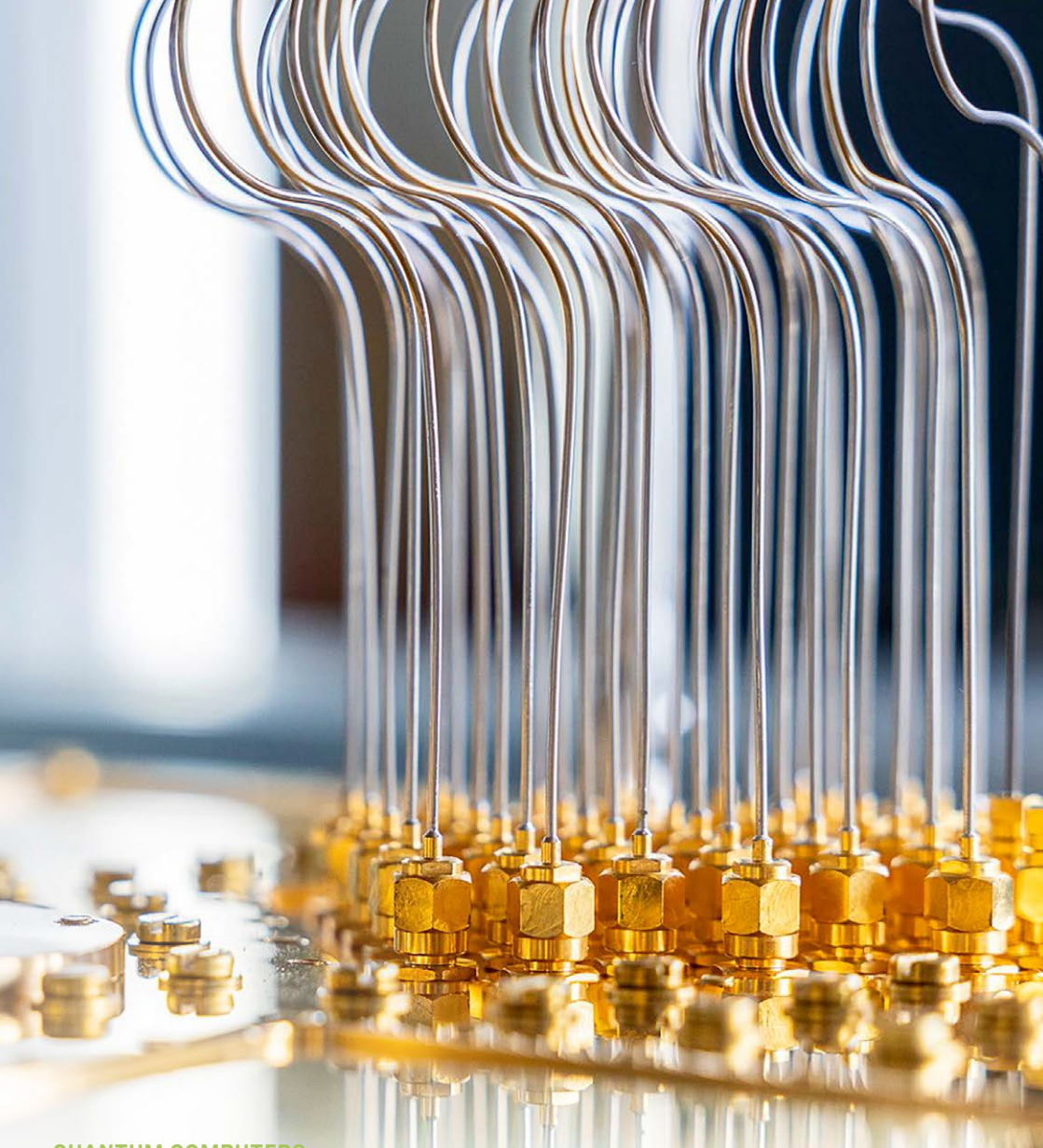
DPPN
Institute of Bio- and Geosciences

Electron microscopes PICO and KRIOS
Ernst Ruska-Centre



Nanotechnology
Helmholtz Nano Facility

Quantum technology
Helmholtz Quantum Center (in the planning stage)



QUANTUM COMPUTERS

Detail of a cryostat used to cool quantum computer chips down to 10 millikelvin – which is significantly colder than it is in outer space. Such cooling devices are part of the equipment of Jülich's quantum computer laboratories, opened at the end of 2023 on Campus Melaten of RWTH Aachen University.

FOCUS INFORMATION

In the field of Information, scientists investigate how information is processed in biological and technical systems. They develop supercomputers that are among the most powerful in the world, focus on artificial intelligence, do pioneering work in the construction of quantum computers – and study the human brain.

JUPITER, the first European exascale-class computer, will be installed at Forschungszentrum Jülich in the course of 2024. It will enable breakthroughs in the use of AI and take scientific simulations to a new level. Jülich researchers are constantly developing AI and big data methods on which many research results are based. Simulations answer complex questions in areas such as climate research, neuroscience and materials research.

Another focus in Future Computing is quantum technology. Jülich scientists are researching it from the basics to application. In the joint project QSolid, which is coordinated by Forschungszentrum Jülich, a complete quantum computer based on cutting-edge, German technology will be created in the next few years. With its user infrastructure for quantum computing JUNIQ, Jülich also offers science and industry access to various quantum systems and supports users in developing applications for quantum computing.

Technology-based information processing is closely linked to research on biological systems. Learning from the brain – the basis for innovative, energy-efficient computing concepts such as neuromorphic computing. Jülich researchers develop components, architecture and software concepts needed for neuromorphic computers.

Jülich researchers are using innovative imaging methods, digital tools such as brain atlases, and supercomputers to gain a more precise understanding of the brain in order to better diagnose and cure neurological diseases. The complex theoretical models are constantly being refined with the help of data from observations, measurements and computer-aided simulations.

DR. JETTE SCHUMANN

In the CroMa-PRO project, Jette Schumann was one of those responsible for analysing and optimising visitor flows at the UEFA EURO 2024, a football mega event, with the help of computer simulations. The focus was on the last kilometre from the car parks and bus stops to the stadium.

RESEARCH HEADLINES

Quantum computers

GRAPHENE IS CONVINCING

Jülich and Aachen physicists have discovered that two-layer graphene, as a promising material for the quantum computers of the future, has special properties. It could be more suitable for semiconductor qubits than gallium arsenide or silicon, for example.

Quantum computers

COMPLEX BEHAVIOUR

The present model for describing the behaviour of the basic building blocks of superconducting quantum computers was inadequate, as physicists from Jülich and Karlsruhe have discovered. Their findings could help to reduce the susceptibility of qubits to errors.

Nanoelectronics

NANO OBJECT WITH A FUTURE

Jülich researchers and their international partners have created and observed ring-shaped and stable 3D magnetic structures in a solid for the first time. The detection of these “hopfions” could pave the way for new types of data storage and future neuromorphic computers.

Artificial intelligence (AI)

DIAGNOSING BRAIN TUMOURS

A team at Forschungszentrum Jülich has developed a deep learning algorithm that can be used to automatically detect and evaluate brain tumours on PET scans. While the AI achieves similar results to experienced doctors, it does it so much faster.

Supercomputer

HIGH-TECH HOME

Europe's largest supercomputer, JUPITER, is also setting new standards in terms of its accommodation on the Jülich campus. It will receive a data centre consisting of around 50 container modules – a cost-effective construction method that also enables quick installation and flexible adaptation to the requirements of future computer generations.

Alzheimer's research

PHASE II

The Alzheimer's drug candidate PRI-002, developed at Forschungszentrum Jülich and the University of Düsseldorf, has been approved for a Phase II clinical trial. This is the first time it will be tested on a large number of Alzheimer's patients.

Brain research

MOLECULAR PROCESS DECODED

Jülich researchers have discovered how the messenger substance glutamate is effectively accumulated in synaptic vesicles in the brain. These small vesicles enable messenger substances to pass on information. The findings could help to develop new therapeutic approaches for diseases such as stroke.

Bioelectronics

OPTICAL CHIP

An international team led by Jülich researchers developed a biochip that imitates the retina of the eye. Consisting of a malleable organic semiconductor, the chip could help to improve the connection of retinal implants to the body in the future.

STEFAN KESSELHEIM

In the TrustLLM project, Dr. Stefan Kesselheim is working on European language models that are set to be more reliable, transparent and energy-saving than ChatGPT and other existing models. The key to this technology is the JUPITER supercomputer, which will be gradually installed at Jülich in 2024. JUPITER can perform more than one trillion computing operations per second (exaflop/s).

CLIMATE RESEARCH

The HALO research aircraft before the start of the two-month PHILEAS measurement campaign, which was led by Forschungszentrum Jülich and Mainz University. It provided valuable data on the influence of the Asian monsoon on the global climate. The monsoon transports polluted air from the atmosphere near the ground over Southeast Asia to the lower stratosphere over the Pacific and the Mediterranean.

FOCUS ENERGY

Sun, wind and water instead of coal and oil: what can a sustainable energy system that relies on renewable energies look like? The global community must drastically reduce its CO2 emissions in order to mitigate the consequences of global warming – rethinking the energy system from the ground up. Jülich scientists model scenarios and make recommendations for a future energy system that is based on renewable energies. They develop technologies for an energy system of this kind, such as cost-effective and environmentally friendly solar cells from the printer or better energy storage systems.

Hydrogen plays a key role: it is intended to replace fossil fuels, store energy, enable mobility and serve as a basic material for the chemical industry, both efficiently and cost-effectively. It is also to be “green”, that is, produced with the help of renewable energies.

Jülich research on this topic is diverse: from material development for electrolysis plants and fuel cells or solar modules to the analysis of electrochemical processes and the transport, storage and use of hydrogen. Batteries are indispensable as energy storage devices. Jülich researchers optimize established systems and develop new battery types. Jülich is also pursuing a value chain in the research into technologies for storing electricity in high-energy chemicals (“Power-to-X”), for example for use as fuel.

The energy system is one of the most important human influences on the climate and the atmosphere, both regionally and globally. Jülich scientists investigate the exact effects of these influences by studying physical and chemical processes in the atmosphere. They use experimental findings and computer simulations to advance existing climate models, act as experts and advise politicians and the public on necessary measures.

MARIE-ALIX PIZZOCCARO-ZILAMY

Dr. Marie-Alix Pizzoccaro-Zilamy develops wafer-thin layers with regular pores that only allow certain components of a gas mixture to pass through. Applied to a carrier material, the layers could be used as filter membranes, for example to separate hydrogen from natural gas after the two gases have been sent through pipelines together.

RESEARCH HEADLINES

Energy system

MILESTONE 2030

Germany can still achieve its goal of becoming greenhouse gas neutral by 2045. This is what detailed analyses by Jülich system researchers have shown. To achieve this, however, extensive measures must be implemented in all sectors by 2030.

Batteries

POWER AT ROOM TEMPERATURE

Jülich researchers have found a new approach for sodium-sulphur solid-state batteries that can be used at room temperature. The decisive factor is a very thin ceramic electrolyte they developed, consisting of three layers.

Batteries

PRINTED MEASURING CELL

Scientists at Jülich's HI-MS branch office have used an innovative method to analyze the interfaces between electrodes and electrolytes in lithium-ion batteries under real conditions. For that purpose, they developed a measuring cell that they produced using 3D printing.

Hydrogen

BUILDING BLOCK OF A HYDROGEN ECONOMY

Dimethyl ether is particularly suitable as a carrier substance for the future transportation of green hydrogen over long distances. This is the conclusion reached by Jülich researchers and their partners in a study.

Hydrogen

TINY ACCELERATORS

Nanoparticles on oxidic electrodes can significantly accelerate reactions such as those that take place in electrolyzers for the production of green hydrogen. Findings by Jülich scientists allow a detailed understanding of a manufacturing process for such nanoparticles, known as metal exsolution, for the first time.

Photovoltaics

WORLD RECORD

Researchers at Jülich's HI-ERN branch office and FAU Erlangen-Nuremberg have built an organic solar module that utilizes solar energy to a particularly efficient degree. Its record efficiency of 14.46 per cent sets new standards.

Photovoltaics

IMPROVED UNDERSTANDING

Using a new measurement technique, Jülich scientists have discovered that charge carrier loss in perovskite solar cells follows different physical laws than in most other semiconductors. Understanding the loss process is important in order to further improve the efficiency of such solar cells.

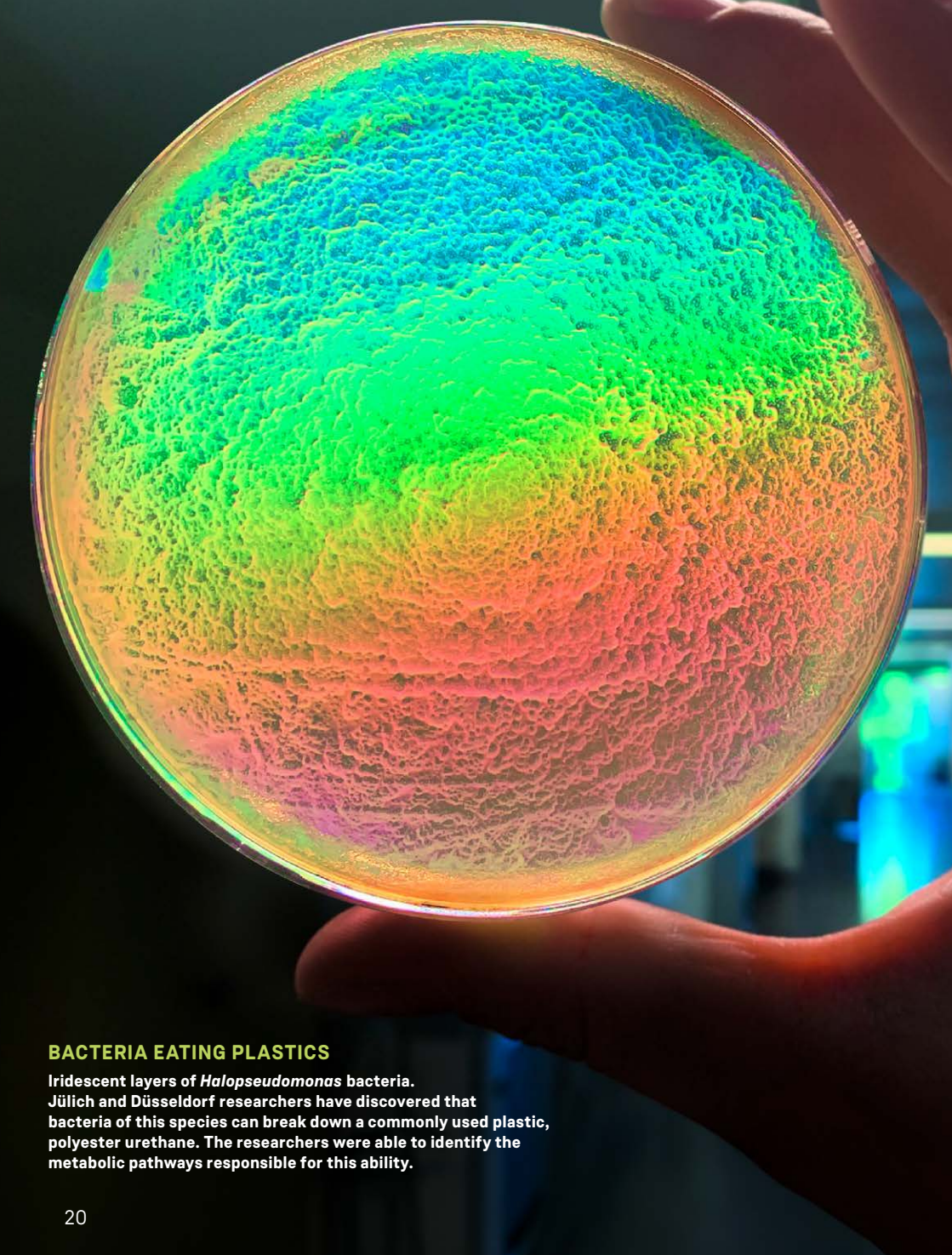
Atmosphere and climate

WATER VAPOUR AND WIND

Jülich researchers and their international partners have simulated the water vapour content in the cold tropopause at an altitude of 10 to 15 kilometres. The results show the clear influence of water vapour in this altitude range on the atmosphere's wind systems near the ground.

ANDREAS PESCHEL

Prof. Andreas Peschel is working on the development of a reactor that enables the production of ammonia and reacts flexibly to the fluctuating availability of green hydrogen. Ammonia has the ability to store green energy, requiring much less space than hydrogen and making it ideal for storage and transport.



BACTERIA EATING PLASTICS

Iridescent layers of *Halopseudomonas* bacteria. Jülich and Düsseldorf researchers have discovered that bacteria of this species can break down a commonly used plastic, polyester urethane. The researchers were able to identify the metabolic pathways responsible for this ability.

FOCUS BIOECONOMY

Sustainable bioeconomy is a bio-based circular economy that manages without fossil raw materials, instead relying on the efficient use of biological resources such as plants, animals or microorganisms. Scientists at Forschungszentrum Jülich have been developing new value creation processes, for example.

They use customized microorganisms and biological catalysts to produce, from renewable raw materials or waste such as plant residues, valuable substances for medicines, bioplastics or even fuels. In biotechnology, automation, miniaturization and digitization play an important role in shortening development times and making them more predictable.

Agriculture and plant research are also part of the bioeconomy. Researchers use experimental data from trial fields and simulations of soil-plant interactions to help optimize yields, reduce fertilizer use and address changes caused by climate change.

Digital monitoring supports tailored irrigation and can show stress in plants at an early stage. It is to be demonstrated in the Rhineland region, which serves as a model region in this respect, how the switch to a fossil-free economy can succeed after coal-fired power generation has been phased out. One building block for this is the BioökonomieREVIER initiative. It is coordinated by Forschungszentrum Jülich and networks the local actors. For more than ten years now, scientific expertise and modern infrastructures in important fields of the bioeconomy have been pooled in the Bioeconomy Science Center, which is the competence centre of Forschungszentrum Jülich as well as the universities of Bonn and Düsseldorf and of RWTH Aachen University.

ALEXANDER GRAF

Dr. Alexander Graf and an international team have investigated which forms of land use are good for the climate. Their model calculations show: maximum afforestation has a positive effect in the long term because forests absorb CO_2. In the first 20 years, however, it would even contribute to global warming as dark forests absorb more sunlight than light-coloured meadows, for example.

Agriculture

WATER RESERVOIR TOPPED UP

During the winter of 2023/24, groundwater reservoirs in Germany recovered from previous periods of drought. Jülich experts regularly provide updates on the situation of groundwater and near-surface water resources accessible to plants in their eWRB bulletin.

Biotechnology

ENZYME DEGRADES PET

A team involving Jülich researchers has shown for the first time that deep-sea organisms can progressively degrade the plastic PET using an enzyme. At 70 °C, the enzyme worked more efficiently than other PET-degrading enzymes at their optimum temperatures.

Biotechnology

REMOVING CO_2

Researchers from Düsseldorf, Jülich and Aachen are pooling their expertise in the Active Carbon Capture Sustainable Synthesis (ACCeSS) research project: their aim is to bind CO_2 from the air with the help of microorganisms and convert it into high-quality substances.

FUTURE FIELD STRUCTURAL CHANGE

The Rhineland region is a region in transition – away from the climate-damaging use of lignite and towards sustainable value chains. Structural change is one of the central social challenges not only for the Rhineland lignite region but for the whole of North Rhine-Westphalia.

Forschungszentrum Jülich is actively helping to shape this process. With scientific excellence, it contributes to developing innovations and products, attracting new cooperation partners to the region, maintaining high-quality jobs and creating new ones. The region is to become a model for new economic activity in this way.

Funded by the federal and state governments, and together with regional partners from industry, science and civil society, the focus is on projects from Forschungszentrum Jülich's three strategic areas of research – Bioeconomy, Energy and Information.

2

Jülich experts (Prof. Regina Palkovits, Prof. Ulrich Schurr) appointed to North-Rhine Westphalia's Bioeconomy Advisory Board

PROJECTS INCLUDE:

- The Helmholtz Cluster for a Sustainable and Infrastructure-Compatible Hydrogen Economy (HC-H2) with various plans for demonstration in the hydrogen demonstration region
- The BioökonomieREVIER initiative, which aims to develop a bio-based economy
- The iNEW innovation platform, which is intended to help establish a circular economy based on carbon dioxide (CO_2)

REGINA PALKOVITS

Prof. Regina Palkovits researches catalyzers which, among other things, act as matchmakers between hydrogen molecules and other molecules. This creates compounds that facilitate the storage and transport of green hydrogen. With her research, Palkovits wants to help develop the Rhineland region into a model hydrogen region.

HARVESTING SUN AND PLANTS

Plants below, solar power above: in January 2024, an RWE Agri-PV demonstration plant near Bedburg in the Rhineland region fed green electricity into the grid for the first time. Jülich researchers help to optimize the interaction between agriculture and solar power generation in practice.

Hydrogen showcase project

CLIMATE-FRIENDLY HOSPITAL

In March 2024, at the Hermann Josef Hospital in Erkelenz, a solid oxide fuel cell system went into operation. It will be combined with LOHC technology (Liquid Organic Hydrogen Carrier) in 2025. The project aims to showcase a climate-friendly energy supply of large buildings using hydrogen technologies.

Materials research

NEW BUILDING IS A MILESTONE

With the Ernst Ruska-Centre 2.0 as a national centre of excellence for high-resolution electron microscopy, an infrastructure is created that offers companies wishing to locate in the Rhineland region outstanding opportunities for the development of innovative materials. The topping-out ceremony for a new research building on the Jülich Campus took place in May 2023.

Centre of competence

SPRINGBOARD INTO INDUSTRY

In the competence centre for industrial electrochemistry, ELECTRA, with the participation of industry, concepts from the laboratory are to be further developed into industrially usable prototypes. During the construction of ELECTRA in September 2023, researchers discussed the climate-friendly transformation of the chemical industry in the presence of NRW Minister Mona Neubaur.

Bioeconomy

MODEL FOR OTHERS

Since the beginning of 2024, the BioökonomieREVIER Rheinland coordination centre at Forschungszentrum Jülich has been supporting a consortium of eight countries in establishing regionally adapted bioeconomies in the European Union.

INSTITUTES AND SECTIONS

1 Ernst Ruska-Center for Microscopy and Spectroscopy with Electrons

- Physics of Nanoscale Systems
- Materials Science and Technology
- Structural Biology

2 Institute for Advanced Simulation

- Jülich Supercomputing Centre
- Theoretical Physics of Living Matter
- Theory of Strong Interactions
- Computational and Systems Neuroscience
- Civil Safety Research
- Data Analytics and Machine Learning
- Materials Data Science and Informatics

3 Institute of Bio- and Geosciences

- Biotechnology
- Plant Sciences
- Agrosphere
- Bioinformatics
- Computational Metagenomics

4 Institute of Biological Information Processing

- Molecular and Cellular Physiology
- Mechanobiology
- Bioelectronics
- Biomacromolecular Systems and Processes
- Structural Biochemistry
- Technical and Administrative Infrastructure

5 Institute of Energy Materials and Devices

- Microstructure and Properties of Materials
- Materials Synthesis and Processing
- Photovoltaics
- Helmholtz Institute Münster: Ionics in Energy Storage

6 Institute of Fusion Energy and Nuclear Waste Management

- Plasma Physics
- Nuclear Waste Management

7 Institute of Climate and Energy Systems

- Energy Systems Engineering
- Jülich Systems Analysis
- Troposphere
- Stratosphere

8 Institute of Energy Technologies

- Fundamental Electrochemistry
- Helmholtz Institute Erlangen-Nürnberg for Renewable Energy
- Theory and Computation of Energy Materials
- Electrochemical Process Engineering

9 Nuclear Physics Institute

- Experimental Hadron Structure
- Experimental Hadron Dynamics
- Large Scale Nuclear Physics Equipment

10 Institute for Sustainable Hydrogen Economy

- Catalytic Interfaces*
- Catalytic Materials*
- Reaction Engineering*
- Process and Plant Engineering*

(* for chemical hydrogen storage)

11 Institute of Neurosciences and Medicine

- Structural and Functional Organisation of the Brain
- Molecular Organization of the Brain
- Cognitive Neuroscience
- Medical Imaging Physics
- Nuclear Chemistry
- Brain and Behaviour
- Computational Biomedicine
- JARA Institute Brain structure-function relationships
- JARA Institute Molecular neuroscience and neuroimaging

12 Jülich Centre for Neutron Science

- Neutron Scattering and Soft Matter
- Quantum Materials and Collective Phenomena
- Neutron Analytics for Energy Research
- Neutron Methods

13 Peter Grünberg Institute

- Quantum Theory of Materials
- Theoretical Nanoelectronics
- Quantum Nanoscience
- Electronic Properties
- Electronic Materials
- Quantum Control
- Semiconductor Nanoelectronics
- JARA Institute Energy-efficient information technology
- JARA Institute Quantum Information
- Quantum Computing Analytics
- Functional Quantum Systems
- Neuromorphic Compute Nodes
- Neuromorphic Software Ecosystems
- Technical Services and Administration

14 Central Institute of Engineering, Electronics and Analytics

- Engineering and Technology
- Analytics

As of July 2024

RESEARCH INFRASTRUCTURES

Forschungszentrum Jülich's scientists can use extensive, highly specialized research infrastructures. Facilities such as the Helmholtz Nano Facility (HNF), the Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C) or the Jülich Centre for Neutron Science (JCNS) complement each other and, as world-class infrastructures, are also available to external researchers.

On the roadmap of the ESFRI (European Strategy Forum on Research Infrastructures) are research infrastructures that are of importance for Europe, strategically and as regards research policy, such as IAGOS for research into the Earth's atmosphere and EBRAINS for the neurosciences. The German hubs of these are coordinated by Jülich. The Ernst Ruska Centre 2.0 has been on the German roadmap for research infrastructures since 2019.

RESEARCH INSTRUMENTS AND FACILITIES

HELMHOLTZ NANO FACILITY (HNF)

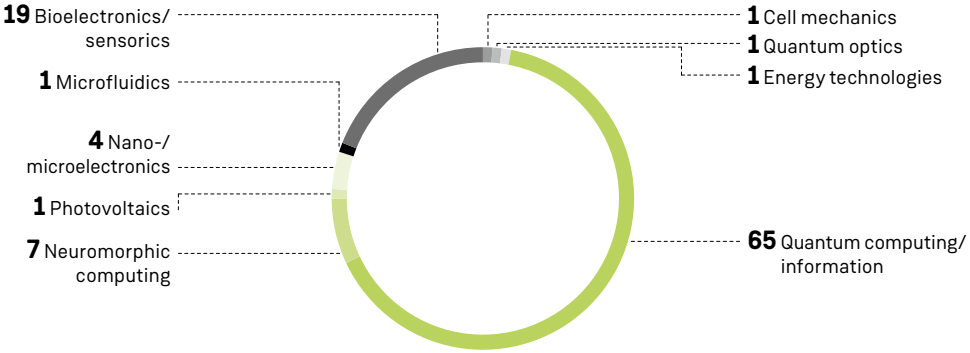
The HNF provides universities, research institutions and industry broad access to its technologies.

The Helmholtz Nano Facility (HNF) provides scientists with instruments and knowledge for the production and research of nanostructures. Unique throughout Europe, the HNF is a research infrastructure for researching, producing and characterizing nanostructures and atomic structures for information technology. Work at the HNF focuses on quantum computing, the components of which are based on the laws of quantum mechanics and use qubits for computing.

As a state-of-the-art clean room facility with 1,000 m^2 of clean room of ISO classes 1-3, the HNF offers resources in production, synthesis, characterization and the integration of structures, devices and circuits.

Usage according to research area[1)]

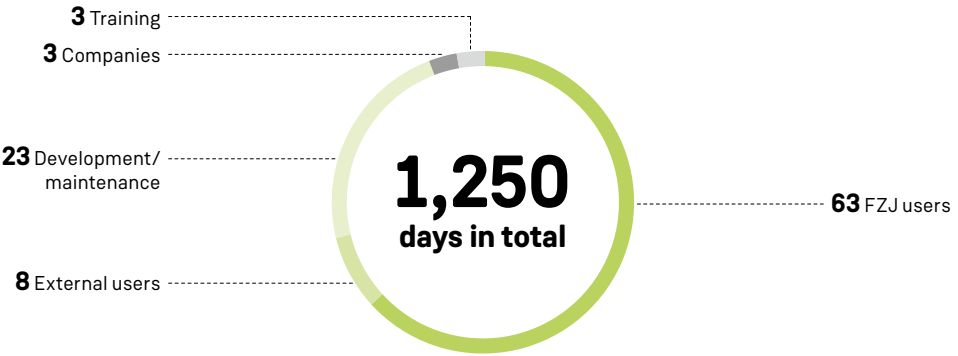
2023, in per cent



1) **Bioelectronics/sensorics:** the combination of biological and electronic systems | **Cell mechanics:** behaviour of cells under different mechanical conditions | **Quantum optics:** systems for the interaction between light and matter | **Energy technology:** energy generation systems | **Quantum computing/information:** circuits based on the laws of quantum mechanics | **Neuromorphic computing:** computers and circuits modelled on the brain | **Photovoltaics:** converting light into energy/increasing the efficiency of solar cells | **Nano-/microelectronics:** electronic components with a very low energy requirement for processing or storing information | **Energy microfluidics:** behaviour of liquids in the smallest space

Allocated usage time[2)]

2023, in per cent

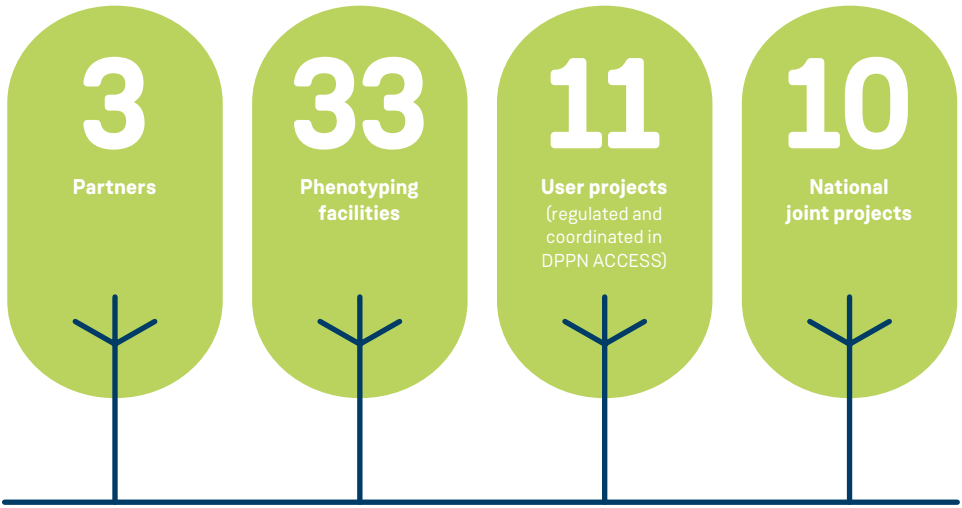


2) Days of use, rounded

GERMAN PLANT PHENOTYPING NETWORK (DPPN)

The DPPN is a German infrastructure for the phenotyping of plants. Innovative facilities have been developed and set up at three locations to analyze the external appearance of plants, the phenotype, in different environments at high throughput. The root architecture and the number of leaves are measured and analyzed, for example. The facilities at Forschungszentrum Jülich, the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) Gatersleben and the Helmholtz Zentrum München (HMGU) enable researchers to build bridges between knowledge of the plant genome and the phenotype. This paves the way for more efficient crop production in a changing climate – which is essential for a sustainable agricultural economy and a secure food supply in the future.

The three partners have joined forces in the DPPN e. V. association in order to make the infrastructure available to users from science and industry on a long-term and sustainable basis.



JÜLICH UNIFIED INFRASTRUCTURE FOR QUANTUM COMPUTING (JUNIQ)

The D-Wave quantum annealer in the vibration-free JUNIQ building

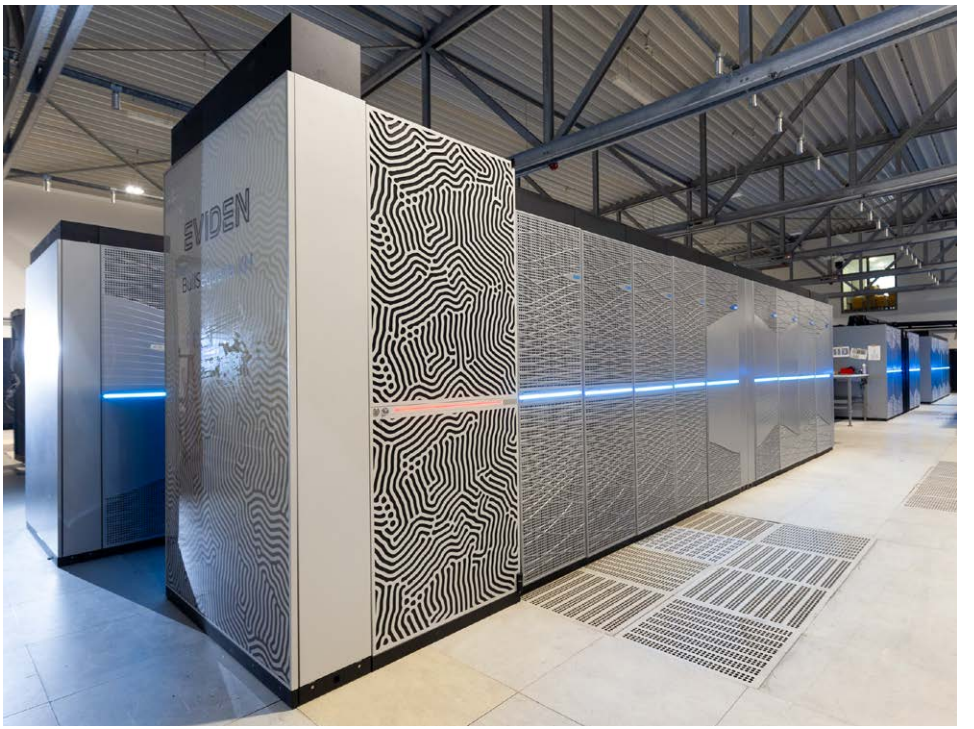
Quantum computing and quantum annealing are considered the computing methods of the future when it comes to solving extremely complex problems. While there is still a long way to go before these technologies will be fully developed, the first experimental systems, prototypes and commercial devices can already be used today. The "Jülich UNified Infrastructure for Quantum computing"(JUNIQ) provides German and European users with access to various of these quantum machines. JUNIQ thus permits science and industry early first steps into the practice of quantum computing. Moreover, JUNIQ supports users in the development of algorithms and applications for quantum computing.

JUNIQ includes a quantum annealer with more than 5,000 qubits from the company D-Wave. At the end of 2024, a quantum simulator from the French start-up PASQAL will go into operation at Jülich. The simulator will be closely linked to the Jülich supercomputer JURECA DC. The quantum annealer and the quantum simulator are housed in the UNIQ building, which was built specifically for this purpose. The range is constantly being expanded, for example with the eleQtron quantum computer pilot system from the EPIQ development partnership.

JÜLICH SUPERCOMPUTING CENTRE (JSC)

The Jülich Supercomputing Centre (JSC) provides computing capacity and the largest German data capacities to scientists at Forschungszentrum Jülich, at universities and research institutions in Germany and Europe as well as to the industry. The Centre also supports them in their research projects. It responds promptly to new user requirements – be it the use of cloud services, large-scale artificial intelligence (AI), interactive supercomputing or the development of concepts and services for long-term data curation.[1)]

Since the introduction of the Top500 list of the world's fastest supercomputers, the systems operated at the JSC have consistently been among the fastest on this list. The supercomputers are used for a wide range of applications, from basic research to climate and materials research to life and engineering sciences. By the end of 2024, JUPITER will



JUPITER development system JEDI in the JSC computer hall

have been installed step by step: the first system in Europe to exceed the threshold of one trillion computing operations per second (exaflops)[2] – which is a 1 with 18 zeros.

Energy efficiency (flops per watt) plays an increasingly important role in the operation of high-performance and supercomputers. The first module of the exascale supercomputer JUPITER, named JEDI, was the most energy-efficient system in the world in May 2024 and made it to the very top of the Green500 list.

JUPITER is funded in equal parts by the European supercomputing initiative EuroHPC JU (European High Performance Computing Joint Undertaking) and by German government agencies. It will be available to a wide range of European users. Access to the computing resources is managed jointly by EuroHPC JU and the German agencies as part of their investment. The German contribution will be part of the national supercomputer infrastructure, which is provided by the Gauss Centre for Supercomputing.

JUPITER is designed for simulations as well as for AI applications in science and industry that require maximum computing power.

Users according to region

Computing time projects peer-reviewed by an independent panel of experts

Germany	1,500
Europe (without Germany)	200
Countries outside Europe	150

Users

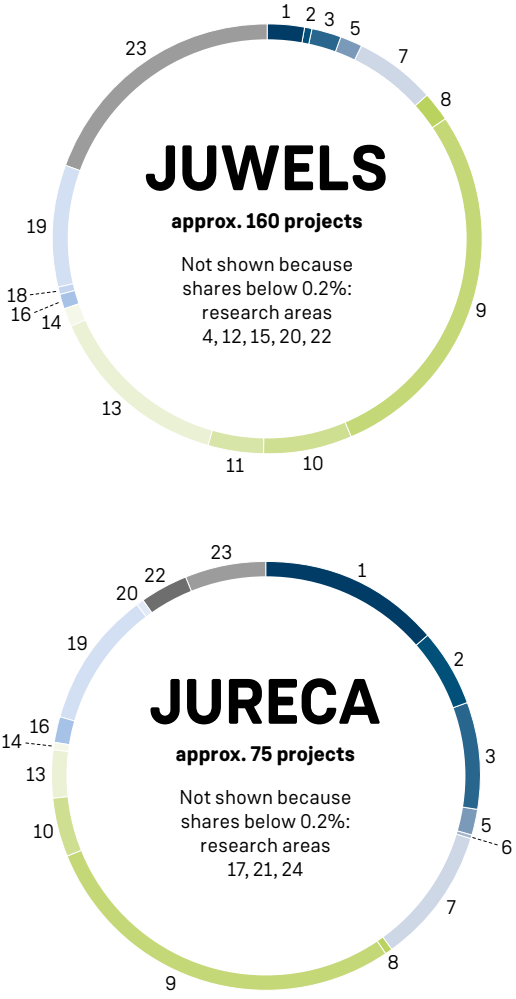
- In 2023, the computers JUWELS and JURECA operated at the JSC were used by about **1,850** scientists in some **235** projects.
- In addition, more than **1,000** users were involved in smaller collaborative projects with the JSC in 2023.
- About **10** per cent of users consume about **90** per cent of the resources, since Jülich, as a national supercomputing centre, is primarily intended to support large-scale projects.unterstützen soll.

1) Activities required to maintain research data over the long term so that it remains available for reuse and retention

2) The computing power of computer systems is expressed in floating point operations per second (FLOPS). This value indicates how many floating point number operations (additions or multiplications) can be performed by a system in one second.

Usage according to research area

As of November 2023



Research areas

- 1 Fundamentals of biology and medicine
- 2 Medicine
- 3 Neuroscience
- 4 Molecular chemistry (JUWELS only)
- 5 Chemical solid state and surface research
- 6 Physical and theoretical chemistry (JURECA only)
- 7 Condensed matter physics
- 8 Optics, quantum optics and physics of atoms, molecules and plasmas
- 9 Particles, nuclei and fields
- 10 Statistical physics, soft matter, biological physics, nonlinear dynamics
- 11 Astrophysics and astronomy (JUWELS only)
- 12 Mathematics (JUWELS only)
- 13 Atmospheric, marine and climate research
- 14 Geophysics and geodesy
- 15 Geochemistry, mineralogy and crystallography (JUWELS only)
- 16 Water research
- 17 Process engineering, technical chemistry (JURECA only)
- 18 Mechanics and constructive mechanical engineering (JUWELS only)
- 19 Thermal energy technology, thermal machines, fluid mechanics
- 20 Materials technology
- 21 Materials science (JURECA only)
- 22 System technology
- 23 Informatics
- 24 Biological chemistry and food chemistry (JURECA only)

EBRAINS

EBRAINS (European Brain Research Infrastructures) is a unique digital research infrastructure developed by the Human Brain Project, which was co-funded by the EU, from 2013 to 2023. In the EBRAINS 2.0 project, it is now transitioning to become a permanent research infrastructure in the service of neuroscience. At the beginning of 2024, six partner institutions founded the German EBRAINS hub, which is coordinated by Forschungszentrum Jülich.

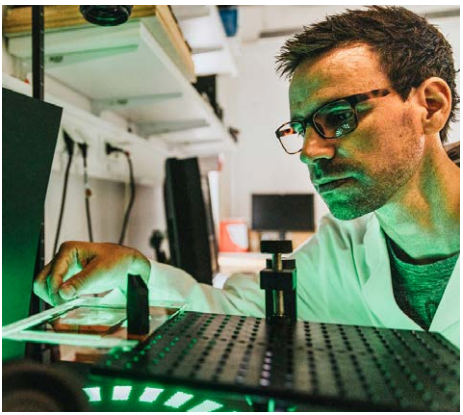
EBRAINS allows scientists to explore the complexity of the brain using AI and supercomputing tools, high-resolution 3D atlases, various simulation approaches and "digital twins".

The EBRAINS research infrastructure is thus contributing to a deeper understanding of the brain throughout Europe. It enables numerous projects for the development of new forms of treatment and diagnostic procedures for brain diseases as well as neuro-inspired innovative computer technologies, robotics and AI. Researchers from industry can use the platform as part of special agreements.

EBRAINS in figures

As of May 2024

- **59** partner organizations from **16** European countries are cooperating in EBRAINS.
- The pan-European EBRAINS network has **11** full members and over **50** associate members.
- EBRAINS contains more than **1,000** data sets, **255** models and **225** analysis programmes from **2,190** scientists.
- **1,431** institutions in Europe and around the world use EBRAINS.
- National EBRAINS hubs are being established in **11** countries; EBRAINS Germany started in 2024 with **6** founding institutions (coordinator: Forschungszentrum Jülich).
- Around **11,000** registered users



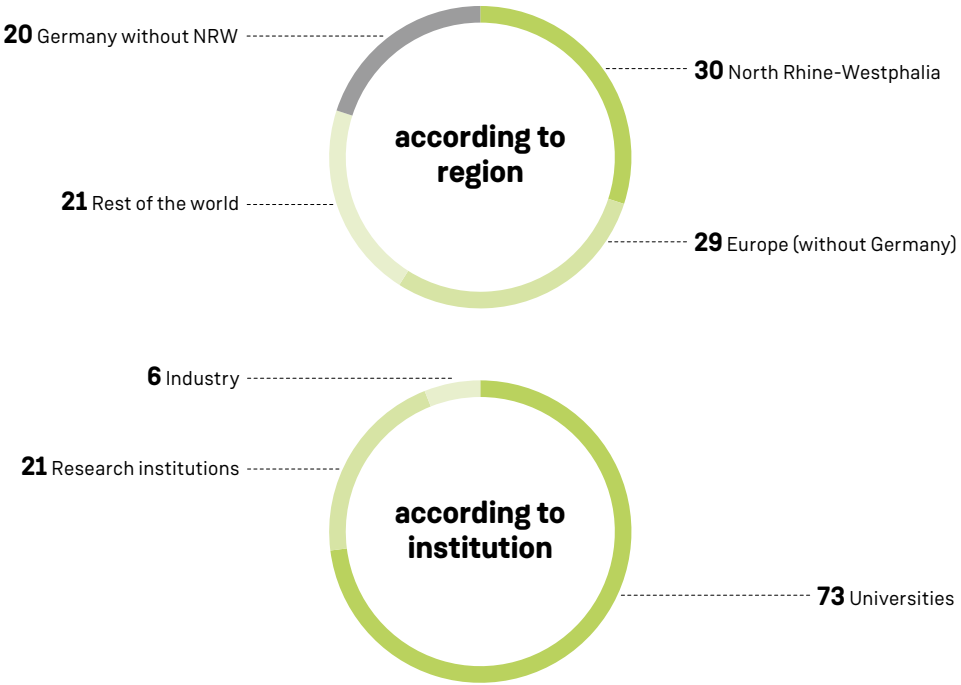
Researchers like Philipp Schlömer use 3D Polarised Light Imaging (PLI) to visualize nerve fibres in the brain with high resolution.

ERNST RUSKA-CENTRE (ER-C)

The Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C) is the national research infrastructure for ultra-high resolution electron microscopy. It is jointly operated by Forschungszentrum Jülich and RWTH Aachen University. The electron optical instruments provided and further developed by the ER-C can be used to investigate and describe structures at the atomic and molecular levels. The knowledge gained helps, for example, to develop innovative materials, to better understand the structure of proteins and to investigate medical substances. In addition to PICO, one of only three electron microscopes in the world that correct the important lens error of chromatic aberration, KRIOS is now also available for this purpose: a high-performance device with which biological samples can be examined in their natural state on the nanometre scale. In the ER-C 2.0

External users

2023, in per cent (rounded)



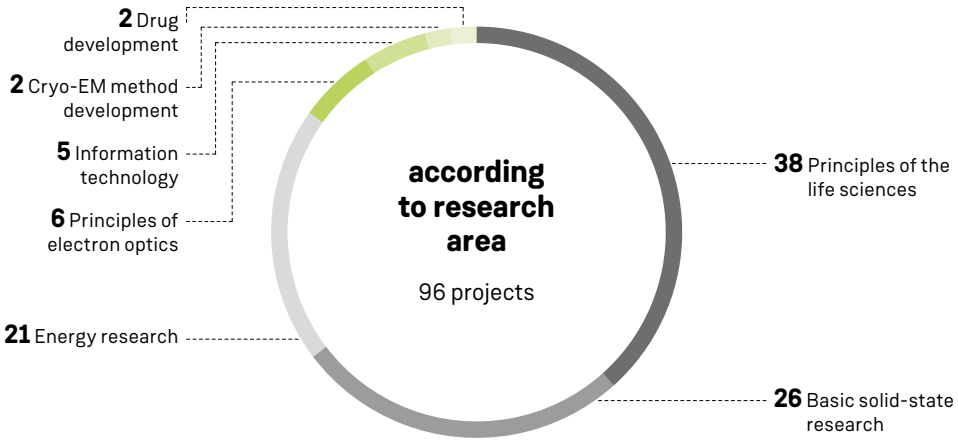
Model of the new research building

project, the Centre's infrastructure is being specifically expanded as part of the national road-map for research infrastructures.

The ER-C creates incentives for companies working with novel materials and technologies to settle in the Rhineland region and contribute to the development of a competence region for innovative materials technologies and, ultimately, to the success of structural change.

Usage according to research area

2023, in per cent (rounded)



JÜLICH CENTRE FOR NEUTRON SCIENCE (JCNS)

The Jülich Centre for Neutron Science (JCNS) operates neutron scattering instruments at top sources in Germany, Europe and globally, offering them to a large user community. Neutrons serve as microscopic probes to conduct research in the fields of soft and condensed matter, biosciences and energy materials. Neutron research provides important contributions to meeting the major challenges that society is facing, for example with research into modern, high-performance materials for energy storage or in environmental analysis.

Together with its partners, the JCNS designs, builds and installs new instruments at neutron sources, such as for the European Spallation Neutron Source ESS in Lund, Sweden, or for a future high brilliance accelerator-based neutron source (HBS).

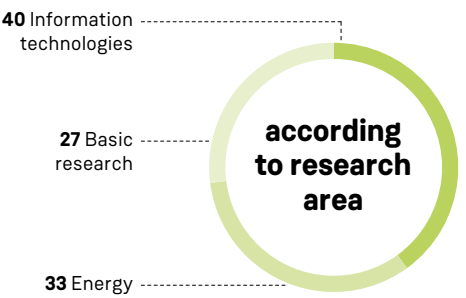
Experiment duration at the ILL, Grenoble[1)]

2023, in days

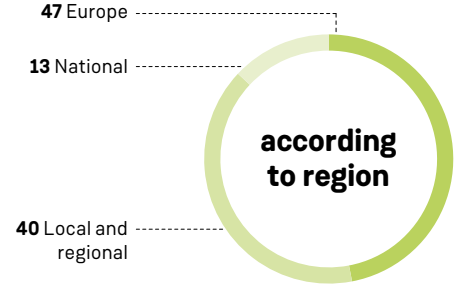
1–3 days	7%
4–7 days	73%
8–15 days	20%

Usage of the neutron source of the ILL, Grenoble[1)]

2023, in per cent



2023, in per cent



1) The FRM II reactor was not in operation in 2023 due to technical reasons. These figures refer to the JCNS instruments at ILL, which do not cover all research areas.

OTHER RESEARCH INFRASTRUCTURES

ESS Competence Centre
Coordinates the Jülich contributions to the European Spallation Source ESS, the world's most powerful neutron source

Imaging Core Facility (ICF)
Pools the imaging methods of neurosciences and medicine

IAGOS
Operates a European infrastructure for global observations of the composition of the atmosphere, using passenger aircraft as a measuring platform

Jülich Synchrotron Radiation Laboratory (JSRL)
Operates state-of-the-art photoemission spectroscopes and photoemission electron microscopes at the synchrotron sources DESY (Hamburg), ELETTRA (Trieste, Italy) and BESSY (Berlin)

SuFIDA Helmholtz Innovation Lab
Is a platform that helps to better recognize diseases that are difficult to diagnose

SAPHIR and SAPHIR-PLUS
For researching processes in the atmosphere

Biomolecular NMR Center
With ultra high-field spectroscopy for structural biology

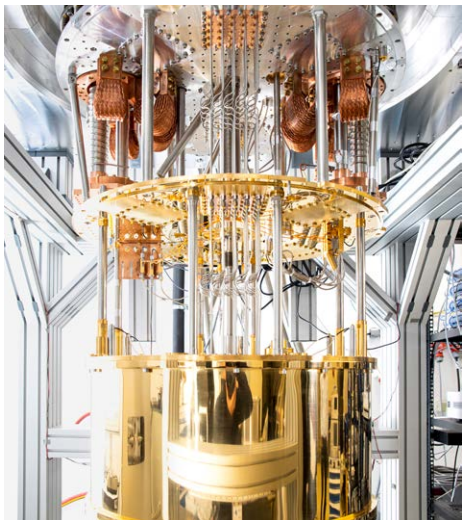
Membrane Centre
For developing membrane systems for new energy-efficient technologies

Helmholtz Energy Materials Characterization Platform (HEMCP)
For materials research in energy technologies.

ENVRI-FAIR
Makes data from all European Earth system research freely accessible worldwide via the European Open Science Cloud (EOSC)

Helmholtz Quantum Center (HQC)
Technology laboratory on the quantum computing research spectrum, from quantum materials to quantum computer systems

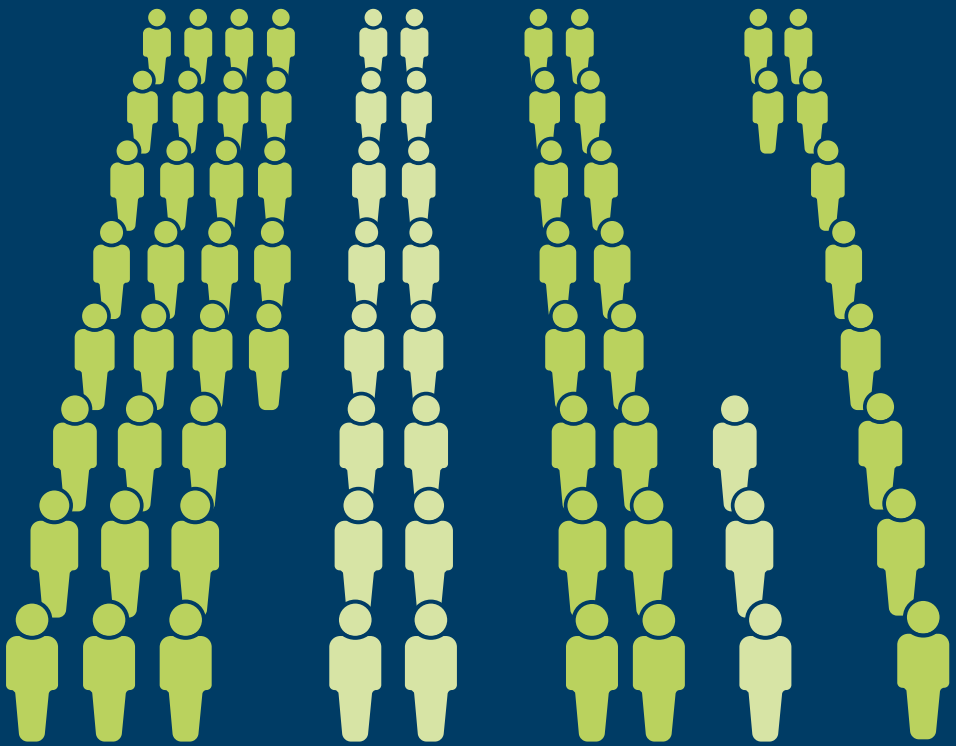
Terrestrial Environmental Observatories (TERENO)
Captures long-term regional impacts of global change – ecological, social and economic – across Germany



Cryostat of the OpenSuperQ quantum computer

TRANSFER AT JÜLICH AT A GLANCE

7,423
Employees[1)]



2,931
Scientists
(education included)

1,603
Technical staff

1,628
Project management organizations

288
Trainees and placement students

973
Administration

STAFF ACCORDING TO NATIONALITY[1)]

49
America (North)

6,621
Europe

73
America (South)

588
Asia

83
Africa

from **114** countries in total

9
Australia

PROPORTION OF WOMEN

In per cent, FTE (full-time equivalent)

NATIONAL RESEARCH PROJECTS

638
Project participations

66
Associations (coordinated by Forschungszentrum Jülich)

968
Doctoral researchers with employment contract and salary[1)]

309
Postdocs[1)]

Vocational training positions

92
New hires

19
Different professions

1) As of 31 December 2023

Science Meets Politics

NRW LAUNCHES QUANTUM SUPERCOMPUTER PROJECT

Ina Brandes, Minister for Culture and Science of the State of North Rhine-Westphalia (MKW NRW); Prof. Astrid Lambrecht, Chair of the Board of Directors of Forschungszentrum Jülich; Hendrik Wüst, Minister President of the State of North Rhine-Westphalia (from left)

The Jülich Supercomputing Centre (JSC) at Forschungszentrum Jülich and the Siegen-based start-up eleQtron are jointly building a modular supercomputer that is unique in the world. It consists of a quantum module and a classic digital module. Hendrik Wüst, Minister President of North Rhine-Westphalia (NRW), and Ina Brandes, NRW Science Minister, came to Siegen in March 2024 for the launch of the EPIQ project, a development partnership for a trapped-ion quantum computer in NRW. At a press conference, Wüst explained that North Rhine-Westphalia, with its strong economy, offers ideal conditions for technological innovation. He emphasized that the country wants to expand its leading position in quantum computing and become the technology leader in quantum technologies. “The partnership between eleQtron and Forschungszentrum Jülich is an important step in this direction.”

SUMMER PARTY IN BERLIN

In June 2023, some 1,500 guests from politics, business and the media attended the summer party at the Representation of the State of North Rhine-Westphalia in Berlin. Forschungszentrum Jülich was there with a science lounge. The Jülich representatives held talks with the politicians about research work and contributions to the success of structural change in the Rhineland region, such as the transformation of the economy and the preservation of digital sovereignty. The Helmholtz Hydrogen Cluster HC-H2 presented a Lego model that visualized the opportunities for hydrogen in the energy system of the future for the Rhineland region. The model was a real eye-catcher, also for Mona Neubaur, the NRW Minister for Economic Affairs, Industry, Climate Protection and Energy, and Hendrik Wüst, the NRW Minister President.

50

high-ranking political meetings are held with Jülich experts throughout the year

Bettina Stark-Watzinger, Federal Minister of Education and Research, and Prof. Dr. Dr. Thomas Lippert, Director of the Jülich Supercomputing Centre at Forschungszentrum Jülich

ACTION PLAN FOR AI

Artificial intelligence is a key technology of the 21st century. The “ChatGPT moment” has highlighted the potential of AI applications. In November 2023, the Federal Ministry of Education and Research presented an AI action plan, which comprises eleven fields of action designed to help Germany and Europe achieve a leading international position in this sector. The computing infrastructure plays a key role in this. Prof. Thomas Lippert provided insights. The Director of the Jülich Supercomputing Centre had been invited as an expert and explained: “Since 2020, Forschungszentrum Jülich’s supercomputer JUWELS has been one of the world’s most powerful supercomputers for AI. From 2024, JUPITER will massively expand the computing capacities for AI at Jülich, outperforming JUWELS in AI applications by a factor of around 45.”

MINISTER BRANDES AT THE STAND OF FORSCHUNGSZENTRUM JÜLICH

“Hey, democracy!” This was the motto of the North Rhine-Westphalian state government’s open day in Düsseldorf’s government district in August 2023. Forschungszentrum Jülich joined the event at the “Mile of Democracy” on the banks of the River Rhine. At the stand of the Ministry of Culture and Science, Jülich scientists presented their research on the brain, on artificial intelligence and quantum computing. Exciting hands-on activities, information stands and models attracted numerous visitors – including Science Minister Ina Brandes, whom Jülich CEO Astrid Lambrecht herself welcomed. The state government’s open day is a public festival open to all interested citizens. It offers the opportunity to find out about science and research in NRW.

NRW Science Minister Ina Brandes (centre), accompanied by Prof. Astrid Lambrecht, visited Prof. Markus Axer to find out about the content and goals of brain research at Jülich.

NEUROMORPHIC COMPUTING DAY

200

guests from science, business and politics learnt about the current status of developments in the NEUROTEC project and the NeuroSys future cluster

Neuro-inspired computer chips modelled on the human brain could reduce the energy consumption of artificial intelligence in the future. Scientists at Forschungszentrum Jülich and RWTH Aachen University are decisively advancing the technology in the NEUROTEC project and the NeuroSys future cluster. At the Jülich-Aachen Neuromorphic Computing Day in August 2023, they updated around 200 guests from science, industry and politics about the current status of developments. Partners from high-tech companies and start-ups supported the presentations. Prof. Sabine Döring, State Secretary at the BMBF at the time, emphasized the importance of NEUROTEC and NeuroSys for structural change in the Rhineland region. These initiatives are intended to make the greater Aachen area one of the leading locations for European AI hardware.

Science Meets Politics

VISITING GOOGLE AND MICROSOFT

A one-week trip in April 2024 took Minister President Hendrik Wüst and a delegation from North Rhine-Westphalia, including the Jülich Chair of the Board of Directors, Prof. Astrid Lambrecht to the west of the USA. One of the main topics of the visit was artificial intelligence. The delegation visited the companies Google and Microsoft as well as Stanford University. Lambrecht contributed her expertise and campaigned for the transfer of knowledge and technology to the Rhineland region. At an international symposium in Silicon Valley, she presented Forschungszentrum Jülich to numerous AI experts. Lambrecht emphasized the importance of North Rhine-Westphalia for Europe's technological competitiveness and sovereignty in the fields of Future IT and AI. "With the new exascale computer JUPITER, we are entering a new era of supercomputing in Europe this year," she said.

Jülich's Chair of the Board of Directors, Prof. Astrid Lambrecht at a symposium on artificial intelligence in Silicon Valley.

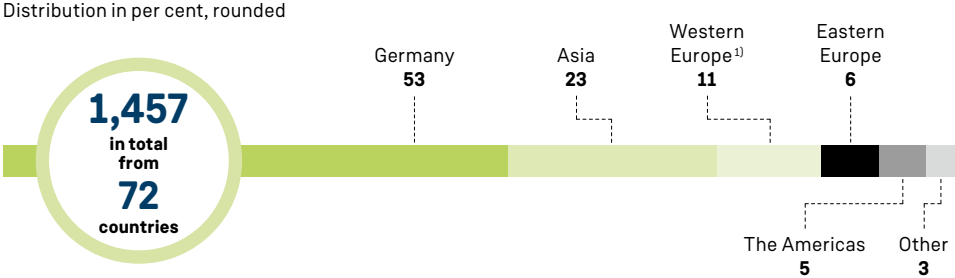
INTERNATIONAL AND NATIONAL COOPERATIONS

Forschungszentrum Jülich works closely with numerous partners in Germany and abroad. In 2023, it was involved in 638 nationally funded research projects, 132 of which had a contract volume of €1 million or more. 277 projects were carried out together with several partners, and 66 research associations were coordinated by Jülich.

At the EU level in 2023, Forschungszentrum Jülich was involved in 186 projects from the Horizon 2020 and Horizon Europe framework programmes for research and innovation as well as from the DIGITAL, Euratom 2027, EU4Health and EURMET programmes. Of these, Forschungszentrum Jülich coordinated 34 projects. In 41 projects, the Jülich contract volume exceeded €1 million.

Visiting scientists in 2023

Distribution in per cent, rounded



1) Excluding Germany

Participation in EU programmes in 2023

Programme	Number of project grants	Coordinated by Forschungszentrum Jülich	Funding amount Forschungszentrum Jülich (in euros)
Horizon 2020	101	16	100,092,009
Horizon Europe	77	16	57,543,405
Euratom 2027	4	–	19,050,278
Digital Europe (DIGITAL)	2	1	545,031
EU4Health	1	1	368,753
EURAMET	1	–	135,000
All programmes, total	**186**	**34**	177,734,476

EU-funded projects involving Forschungszentrum Jülich in 2023

Funding grant exceeding €1 million

	Acronym	Project title	Jülich contract volume (in euros)
	HBP SGA3	Human Brain Project Specific Grant Agreement 3	19,223,934
	EUROfusion	European Consortium for the Development of Fusion Energy (Horizon Europe)	18,614,484
	CETP	Clean Energy Transition Partnership	7,877,261
C	**3D MAGiC**	Three-Dimensional Magnetization Textures: Discovery and Control on the Nanoscale	6,841,603
	ICEI	Interactive Computing E-Infrastructure for the Human Brain Project	5,203,968
	IMPRESS	Interoperable electron Microscopy Platform for advanced RESearch and Services	3,756,460
	VirtualBrain Cloud	Personalized Recommendations for Neurodegenerative Disease	3,736,729
C	**GNeuS**	Global Neutron Scientists	3,310,200
C	**Orbital Cinema**	Photoemission Orbital Cinematography: an ultrafast wave function lab	2,714,366
C	**IntelliAQ**	Artificial Intelligence for Air Quality	2,498,761
C	**HPCQS**	High Performance Computer and Quantum Simulator hybrid	2,404,263
	EURAD	European Joint Programme on Radioactive Waste Management	2,387,521
C	**OpenSuperQPlus 100**	Open Superconducting Quantum Computers	2,312,281
C	**MUON**	Lattice determination of the muons anomalous magnetic moment	2,085,625
	Solar Cofund 2	SOLAR-ERA.NET Cofund 2	2,016,413
C	**PROSPER**	Production of a second phase of hydrophobic aromatics with solvent-tolerant Pseudomonas	1,999,485
	eBRAIN-Health	eBRAIN-Health-Actionable Multilevel Health Data	1,992,772

C Forschungszentrum Jülich as coordinator

Table continued on page 50 >

Continued from page 49 >

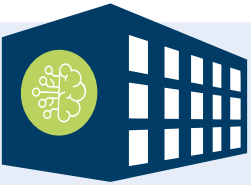
	Acronym	Project title	Jülich contract volume (in euros)
C	**C2C-PV**	Cradle-to-Cradle Design of Photovoltaic Modules	**1,962,404**
C	**ENVRI-FAIR**	Environmental Research Infrastructures Building Fair Services Accessible for Society, Innovation and Research	**1,897,975**
	CSP ERANET	Joint Programming Actions to Foster Innovative CSP Solutions	**1,783,693**
C	**DEEP-SEA**	DEEP-Software for Exascale Architectures	**1,762,172**
C	**MATERIALIZE**	Material Realizable Energy Transformation-Navigating the Material Bottlenecks of a Carbon-Neutral Energy System	**1,499,948**
C	**CHANEL**	Household Chemicals Amplifying Urban Aerosol Pollution	**1,499,359**
C	**LightCas**	Light-Controlled Synthetic Enzyme Cascades	**1,498,125**
	EN SGplusRegSys	A European joint programming initiative to develop integrated, regional, smart energy systems enabling regions and local communities to realize their high sustainable energy ambitions	**1,498,053**
	M-ERA.NET3	ERA-NET for research and innovation on materials and battery technologies, supporting the European Green Deal	**1,492,567**
C	**QNets**	Open Quantum Neural Networks: from Fundamental Concepts to Implementations with Atoms and Photons	**1,486,439**
C	**PRO_PHAGE**	Impact and Interaction of Prophage Elements in Bacterial Host Strains of Biotechnological Relevance	**1,482,672**
C	**CM3**	Controlled Mechanical Manipulation of Molecules	**1,465,944**
C	**Genies**	Gas-water-mineral interfaces in confined spaces: unravelling and upscaling coupled hydro-geochemical processes	**1,450,931**
C	**DECODE**	Decentralised cloud labs for the industrialisation of energy materials	**1,403,969**
	SUSTAINCELL	Durable and Sustainable component supply chain for high-performance fuel cells and electrolysers	**1,298,419**
C	**AISee**	AI- and Simulation-Based Engineering at Exascale	**1,224,751**
C	**BRAIN-ACT**	Biohybrid Synapses for the Interactive Neuronal Networks	**1,166,650**

	Acronym	Project title	Jülich contract volume (in euros)
C	**VIRTUAL TIMES**	Exploring and Modifying the Sense of Time in Virtual Environments	**1,161,574**
	AgroServ	Integrated Services supporting a sustainable Agroecological transition	**1,098,023**
	EPI SGA2	Specific Grant Agreement 2 of the European Processor Initiative	**1,078,789**
	TELEGRAM	Toward Efficient Electrochemical Green Ammonia Cycle	**1,061,114**
	EMERGE	Emerging Printed Electronics Research Infrastructure	**1,009,793**
C	**SusCrop**	ERA-NET Cofund on Sustainable Crop Production	**1,007,800**
	SBEP	A climate neutral, sustainable and productive blue economy partnership	**1,007,411**

C Forschungszentrum Jülich as coordinator

Industry cooperations and industry partners in contract research

Selection



Information

Mercedes-Benz AG, Robert Bosch GmbH, Volkswagen AG (VW), BMW AG
Quantum technologies in the automotive industry

TRUMPF, ModuleWorks
Quasim: quantum computing

PRIAVOID
Diagnostic detection method for synucleinopathies

GlobalFoundries
Semiconductor neuromorphic chips, quantum computing chips

Racyics GmbH
System-on-chip design electronic systems

Zurich Instruments AG
Software and hardware optimization quantum computing, quantum technology

Rosenberger Hochfrequenztechnik GmbH & Co. KG
High-frequency technology, quantum technology

Qruise GmbH
Quantum technologies

Pasqal, BULL SAS
Quantum simulations, quantum computers

Quantum Brilliance
Quantum computing

ParTec AG, Siemens AG
Supercomputing/HPC/exascale/ quantum computers

Eviden
Exascale computing

FEV Europe GmbH
Calculation time customer

D-Wave Systems
Quantum annealer

Energy

Total Energies
Electromobility

BASF
Membrane for fuel cells/ electrolyzers

RWE
Climate-neutral fuels

CAC
Fuel synthesis, climate-neutral fuels

FEV
Electrolysis, Power-to-X systems

ThyssenKrupp
Electrolyzers for H2 production

Westnetz GmbH, NOWEGA GmbH, Thyssengas, Open Grid Europe, Neumann & Esser
Energy system models

LG Energy Solution
Materials and processes for lithium-ion batteries

Robert Bosch GmbH
Fuel cells/SOFC

Siemens AG
Electrocatalysts, electrolyzers

BASF, Shell Global Solutions International BV
Green chemistry

Hydrogenius LOHC Technologies GmbH
Hydrogen research/SOFC

Bosch
Solid oxide cells

Rolls-Royce
Protective coatings gas turbines

hte, Shell
Membrane reactors

Bioeconomy

SenseUp
Biosensors/biotechnology

EnzyMaster Deutschland GmbH
Biocatalysis/biotechnology

AMGEN
Biotechnology

Novozymes
Biodegradation of eco-polymers

B4Plastics
Biobased eco-polymers

Henkel
Biobased products

EVONIK Industries AG
Water supply in the food industry

Bayer AG, Crop Science Division
Phenotyping technologies

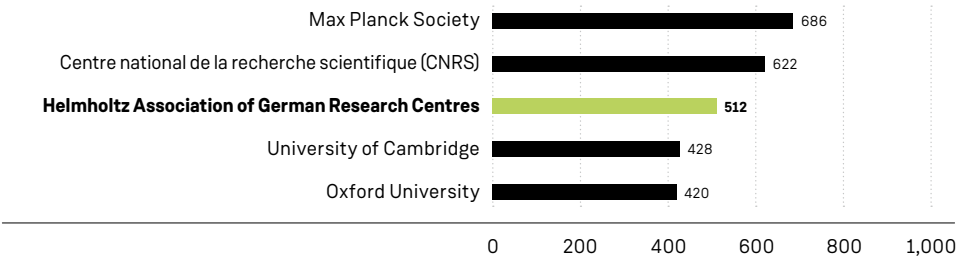
INTERNATIONAL PUBLICATIONS

JÜLICH IN THE VANGUARD OF THE ATURE INDEX

The Nature Index is an annual ranking of more than 10,000 leading international research institutions. It is based on the number of an institution's academic publications in 82 international scientific journals selected by an independent panel. It measures Count (summing up the number of publications with at least one authorship from the institution) and Share (indicating the relative share of authorship of an institution in each article). The Helmholtz Association, to which Forschungszentrum Jülich belongs, ranked third among European institutions and 11th in the international ranking in the Nature Index. Among all 18 Helmholtz Centres, Jülich ranks third, and 25th nationally.

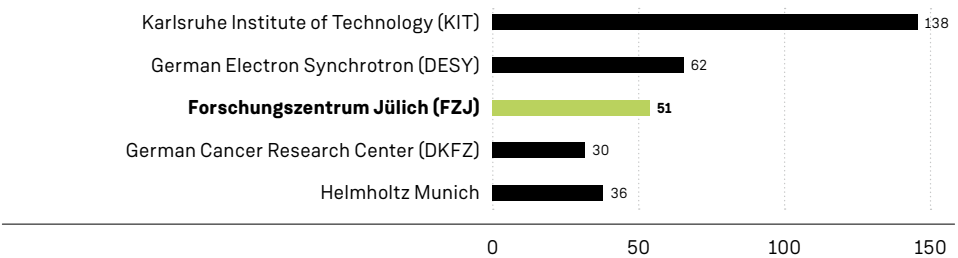
The top 5 in Europe

Institutions with Share[1] according to "Nature Index" (as of March 2024)



The top 5 in the Helmholtz Association

Institutions with Share[1] according to "Nature Index" (as of March 2024)



1) Proportion of authorship of an institution in each article

JÜLICH RESEARCHERS MUCH CITED

Seven Jülich researchers are among the most frequently cited scientists worldwide: Prof. Simon Eickhoff from Brain and Behaviour, Prof. Björn Usadel from Bioinformatics, Dr. Hendrik Poorter from Plant Sciences, Prof. Thomas Kirchartz from Photovoltaics, Prof. Michael Saliba, who heads the Helmholtz Young Investigator Group FRONTRUNNER at Photovoltaics, Prof. Christoph Brabec from the Helmholtz Institute Erlangen-Nürnberg for Renewable Energy and Dr. Wolfgang Zeier from the Helmholtz Institute Münster: Ionics in Energy Storage.

They were listed as “Highly Cited Researchers” by the Web of Science Group, which is part of Clarivate Analytics. This means that their publications are among the one per cent of the most cited papers in their field in the year of publication. Only those scientists who are involved in several of these particularly influential publications will be accepted as one of the “Highly Cited Researchers”. In the current evaluation, these comprised 6,849 researchers from 67 countries worldwide.

7

Jülich scientists are among the “Highly Cited Researchers”

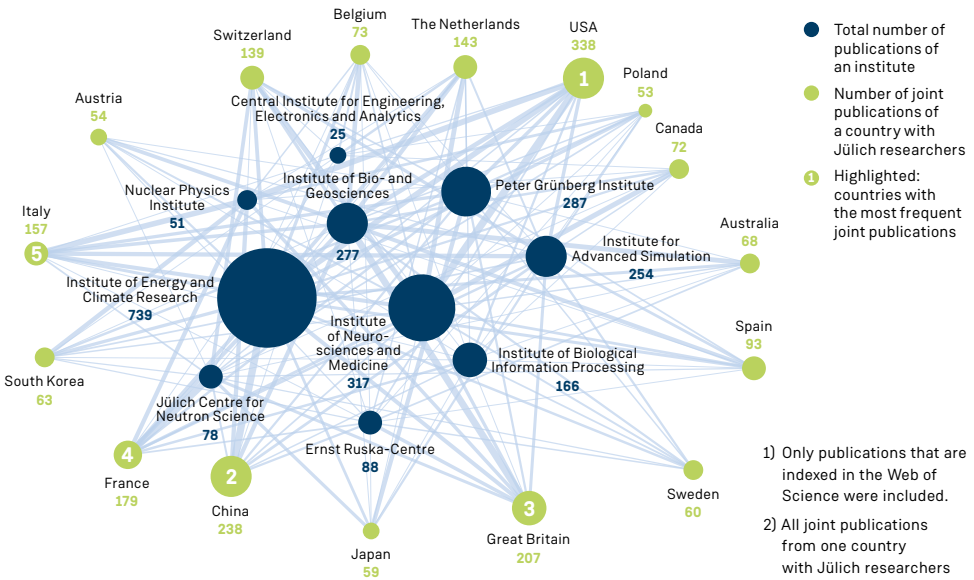
PUBLICATIONS WITH INTERNATIONAL PARTNERS

The international orientation of Jülich research is reflected in numerous joint publications with scientists all over the world. In 2023, there were 1,193 publications with international partners[1] involving scientists from 73 other countries. 20 countries had a share of 3 per cent or more in these joint publications, 30 countries at least 2 per cent. On average, each of the joint publications was cited about 3.8 times by other researchers (citation rate 3.75).

International network of Jülich institutes

In relation to the respective total number of publications, there was a particularly high proportion of joint publications of Jülich institutes with 16 countries. The width of the connection lines shows the scope of the collaboration between an institute and a country relative to the total output of the institute and the country[2] – "Salton's Collaboration Strength". It is calculated using the formula

$$\text{Saltons Collaboration Strength} = \frac{\text{Number of joint publications of institute with partner country}}{\sqrt{\text{Total number of institute publications} \times \text{Total number of publications of partner country with Jülich}}}$$



1) Only publications that are indexed in the Web of Science were included.

2) All joint publications from one country with Jülich researchers

INTERNATIONAL EXCHANGE

Every year, students from all over the world come to Jülich to gain experience early on in a research-intensive environment. The mobility of young researchers fosters their scientific development, propels the transfer of ideas and intensifies the international collaborations of Forschungszentrum Jülich.

In April 2023, students from the International Master's Programme in Energy and Green Hydrogen (IMP-EGH) from 15 West African countries came to Germany to write their Master's theses. With the two-year study programme, under the umbrella of the Jülich Aachen Research Alliance (JARA), Forschungszentrum Jülich and RWTH Aachen University are qualifying young people in West African countries for the future topic of green hydrogen. The Federal Ministry of Education and Research (BMBF) is funding the IMP-EGH with €8 million until 2025 as a start. The 5,930 graduates successfully completed their Master's degree at Forschungszentrum Jülich and were given a ceremonial farewell in October 2023. Shortly afterwards, six of the graduates received full or partial scholarships to attend the Conference of Youth (COY18) and the Student Energy Summit (SES). Two young scientists also received an invitation to the COP28 World Climate Conference in Dubai.

Scholarships and Science Bridges

As of 31 December 2023

- The China Scholarship Council (CSC) programme supported the stay of **18** doctoral researchers and **2** postdocs at Jülich in 2023.
- As part of the Palestinian-German Science Bridge (PGSB), **20** doctoral researchers and **7** postdocs worked at the Forschungszentrum Jülich. In addition, **9** PGSB bachelor and master students also completed their projects at Jülich in 2023.
- The Georgian-German Science Bridge (GGSB) made it possible for **4** master students and doctoral researchers to conduct research at Jülich in 2023.
- In 2023, as part of the RISE Germany programme, the German Academic Exchange Service (DAAD) awarded **12** scholarships to bachelor students for a placement at Jülich.

Proud of their Master's degree: the graduates from West Africa

ACCOLADES

International

Name	Award
Prof. Katrin Amunts Institute of Neurosciences and Medicine	Justine and Yves Sergent Award
Prof. Sebastijan Brezinsek Institute of Fusion Energy and Nuclear Waste Management	Nuclear Fusion Award of the International Atomic Energy Agency IAEA
Prof. David DiVincenzo Peter Grünberg Institute	Admission to the US National Academy of Sciences NAS
Prof. Jesus Gonzalez-Julian Institute of Energy Materials and Devices	Young Scientist Award of the European Ceramic Society
Prof. Astrid Lambrecht Chair of the Board of Directors	Médaille d'honneur of the French Centre national de la recherche scientifique CNRS
Dr. Guillaume Lobet Institute of Bio- and Geosciences	ERC Consolidator Grant
Prof. Wolfgang Marquardt Chair of the Board of Directors until July 2023	Elected as an International Fellow of the British Royal Academy of Engineering
Prof. Karl Mayrhofer Institute of Energy Technologies	ERC Synergy Grant
Dr. Bo Persson Peter Grünberg Institute	Tribology Gold Medal of the Tribology Trust Fund
Prof. Carsten Sachse Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons	ERC Synergy Grant
Prof. Martin Winter Institute of Energy Materials and Devices	• NAATBatt Lifetime Achievement Award of the North American trade association NAATBatt International • Elected as a Corresponding Member of the Slovenian Academy of Engineering

ERC GRANT AWARDEES

The ERC Grants are prestigious EU funding programmes for outstanding researchers.

The ERC Synergy Grant supports interdisciplinary research projects that push the boundaries of knowledge and cannot be addressed by a single research group alone.

Prof. Karl Mayrhofer

Prof. Carsten Sachse

With the Consolidator Grant, the European Research Council funds outstanding project proposals from scientists seven to 12 years after their doctorate.

Dr. Guillaume Lobet

National

Name	Award
Prof. Wulf Amelung Institute of Bio- and Geosciences	**Admission into the North Rhine-Westphalian Academy of Sciences, Humanities and the Arts**
Prof. Katrin Amunts Institute of Neurosciences and Medicine	**Elected to the German National Academy of Sciences Leopoldina**
Prof. Astrid Lambrecht Chair of the Board of Directors	**Elected to the German National Academy of Sciences Leopoldina**
Dr. Felix Lübke Peter Grünberg Institute	**Emmy Noether funding of the German Research Foundation DFG**
Dr. Casey Paquola Institute of Neurosciences and Medicine	**Emmy Noether funding of the German Research Foundation DFG**

Helmholtz Association awards

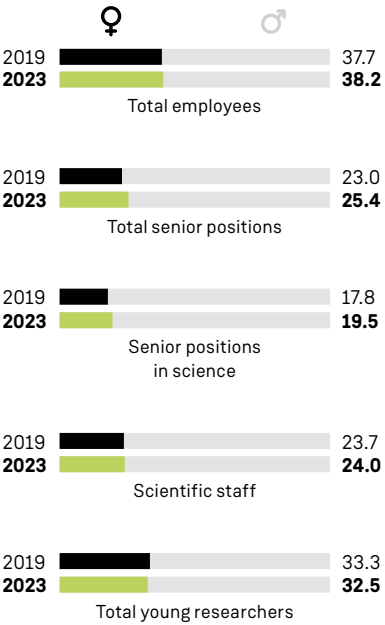
Name	Award
Dr. Iulia Cojocariu Peter Grünberg Institute	**Excellence Prize of Forschungszentrum Jülich**
Dr. Alexander von Meegen Institute for Advanced Simulation	**Excellence Prize of Forschungszentrum Jülich**
Prof. Michael Saliba Institute of Energy Materials and Devices	**High Impact Award of the Helmholtz Association and the Stifterverband für die Deutsche Wissenschaft**
Dr. Moritz L. Weber Institute of Energy Materials and Devices	**Excellence Prize of Forschungszentrum Jülich**

STAFF

Forschungszentrum Jülich offers a wide range of career opportunities in science, technical or administrative infrastructures and in research management. Our staff are committed to ensuring that our research meets the highest scientific standards and contributes to solving social problems. Their motivation, creativity and potential is the driving force behind the shaping of research for a changing society. Collegiality and diversity are the basis for us, as a multidisciplinary research centre with an international workforce, to make the most of our opportunities. In addition to excellent research infrastructures, we offer support in balancing work and family life. We want to make real equality of opportunity possible.

Proportion of women in Forschungszentrum Jülich's workforce[1)]

In per cent, FTE (full-time equivalent)



1) On an FTE basis and including administration of the institutes

Staff overview

As of 31 December 2023

Area	Number[1)]
Research and technical staff	4,534
of which research staff incl. individuals in scientific training	2,931
· of which doctoral researchers[3)]	968
· of which scholarship holders	14
· of which student assistants	135
· of which joint appointments with universities[2)]	167
· of which W3 professors	74
· of which W2 professors	89
· of which W1 professors	4
of which technical staff	1,603
Project management organizations	1,628
Administration	973
Trainees and placement students	288
Total	7,423

1) Only including employees with a contract paid by Jülich
2) Not including members of the Board of Directors
3) Including 125 employees covered by collective agreements with the intention of obtaining a doctorate

JOINT PROFESSORIAL APPOINTMENTS WITH UNIVERSITIES

In the case of a joint appointment, the appointed person holds the office of a professor at a university and, at the same time, has a position at Forschungszentrum Jülich GmbH. In 2023, the following scientists were newly appointed to professorships:

New appointments in 2023

Name	Institute	University
Prof. Jürgen Dukart	Institute of Neurosciences and Medicine	**Heinrich Heine University Düsseldorf**
Prof. Jun Huang	Institute of Energy and Climate Research	**RWTH Aachen University**
Prof. Holger Pagel	Institute of Bio- and Geosciences	**University of Bonn**
Prof. Regina Palkovits	Institute for Sustainable Hydrogen Economy	**RWTH Aachen University**
Prof. Andreas Peschel	Institute for Sustainable Hydrogen Economy	**RWTH Aachen University**
Prof. Alexander Sczyrba	Institute of Bio- and Geosciences	**Bielefeld University**
Prof. Hans-Georg Steinrück	Institute for Sustainable Hydrogen Economy	**RWTH Aachen University**
Prof. Markus Ternes	Peter Grünberg Institute	**RWTH Aachen University**

Number of joint professorial appointments with universities

As of 31 December 2023

University	Number of professorial appointments	of which new appointments
RWTH Aachen University	70	5
FH Aachen University	5	–
Ruhr Universität Bochum	6	–
University of Bonn	15	1
HHU Düsseldorf	24	1
University of Duisburg-Essen	6	–
FAU Erlangen-Nürnberg	5	–
University of Cologne	16	–
KU Leuven	1	–
UCL Louvain	1	–
JGU Mainz	1	–
University of Münster	1	–
Goethe University Frankfurt	1	–
Saarland University	1	–
University of Stuttgart	2	–
Aarhus University	1	–
University of Wuppertal	9	–
University of Würzburg	1	–
Bielefeld University	1	1
Total	**167**	**8**

PROMOTING YOUNG TALENT

JULAB – AWAKENING THE RESEARCH INSTINCT

Getting young people excited about research and science, thus promoting the next generation of scientists – this is the mission of the Schools Laboratory. JuLab shows students that they could play an important role in shaping a society fit for the future. In addition, teachers and educational specialists are reached through professional development.

Online formats

The various online formats have become an integral part of the Schools Laboratory's programme. A fixed date in the annual calendar is the national reading aloud day organized by the reading foundation "Stiftung Lesen". In 2023, the JuLab team ventured a literary look across borders with Georgian colleague Marina Burjanadze under the motto "Reading connects". This year's interactive "Mission Research Online" took students into brain research and other exciting fields.

Helmholtz students' congress

In November 2023, the Schools Laboratory invited students to the Central Library under the title of "Climate – Research – Society". Around 170 young people accepted the invitation – some as part of a course group, some on their own. Participants at the congress had the choice between guided tours of various institutes, lectures and workshops on a wide range of climate research topics.

Schoolgirls at the Helmholtz Students' Congress speaking with "Scientists for Future"

Experimental days

Last year, more than 2,000 students from primary schools to senior school levels attended the experiment days at JuLab together with their teachers. Topics such as neurobiology and biotechnology for older kids and electricity and soil for primary school kids proved to be particularly popular.

Project courses

Senior school students from three schools in the region attended project courses at Forschungszentrum Jülich. Coordinated by JuLab and accompanied by mentors from Forschungszentrum Jülich, the young people spent an entire school year working on their own questions in three courses on the topics of agri-photovoltaics, climate research and energy storage.

Training courses and workshops

A total of 338 teachers, educational specialists and parents took part in the programmes offered by the Schools Laboratory in 2023. JuLab organizes training courses for the experiment kits developed in-house on the topics of electricity, magnetism, soil and DNA, which can then be lent to entire learning groups. It also offers events from the catalogue of topics of the Litte Scientists Foundation, of which JuLab is a network partner. Particularly popular at Forschungszentrum Jülich are the preparatory workshops for the annual "MINTmach" join-in days (formerly known as "Little Scientists' Day"), which were held last year under the motto of "Space adventure – come along!".

Exciting insights during an excursion as part of the biology and chemistry career discovery internship 2023

Promotion of girls, career guidance and STEM education

As part of the JuGirls format, JuLab offered 12 schoolgirls the opportunity to take part in an exclusive three-day programme on "Materials" during the autumn holidays in 2023, giving them an insight into laboratories and workshops. During the summer holidays, ten students spent a week immersing themselves in the world of research, laboratories and experiments as part of the biology and chemistry career discovery internship. 11 young people took part in the microbiology internship during the Easter holidays. It offered excursions to various institutes at Forschungszentrum Jülich, independent experimentation and learning about microbiological laboratory methods.

PROMOTING YOUNG SCIENTIFIC TALENT

Young researchers make a significant contribution to scientific progress through their commitment and innovative ideas. It is a declared objective of Forschungszentrum Jülich to promote them. The measures are based on the principles of diversity and inclusion, innovation and networking, and scientific excellence.

There are centre-wide programmes for EU qualification levels R1 (doctoral researchers) and R2 (postdocs). In addition, so-called excellence programmes are aimed at young scientists at all career levels who wish to pursue a scientific career with the goal of a leadership role. The Jülich Center for Doctoral Researchers and Supervisors (JuDocS) and the Career Center and Postdoc Office offer broad support and advice.

Innovation and entrepreneurship are promoted through the JUICE programme: it helps to examine and develop research results in such a way that they can lead to technologies, products or applications. The internal and external networking of young researchers is supported by the advice on the Researcher Grants of the Helmholtz Information & Data Sciences Academy. The same applies to the networking doctoral programme: five interdisciplinary and cross-institutional projects were selected in which doctoral researchers will receive specific support.

The young scientists Dr. Alexander van Meegen, Dr. Iulia Cojocariu and Dr. Moritz L. Weber (from left) were awarded the Jülich Excellence Prize in 2023 for their outstanding dissertations and achievements in the postdoctoral phase.

JuDocs – Jülich Center for Doctoral Researchers and Supervisors

The structured doctoral support JuDocS forms the basis for the subject-specific offers in the institutes, research training groups and graduate schools, such as HITEC (Helmholtz Interdisciplinary Doctoral Training in Energy and Climate Research) or HDS-LEE (Helmholtz School for Data Science in Life, Earth and Energy).

JuDocS offers Jülich's doctoral researchers and supervisors a targeted onboarding process. In addition, JuDocS supports doctoral researchers with an interdisciplinary transferable skills programme, a low-threshold counselling service in case of supervision conflicts, and independent monitoring of the progress of the respective doctoral project. In 2023, 55 compulsory courses and 11 optional courses were offered in the transferable skills programme. A total of 780 doctoral candidates participated in them.

In the course of 2023, 1,388 supervised doctoral researchers[1)] worked at Forschungszentrum Jülich. Around 33 per cent of them were women and around 46 per cent came from abroad. They were supervised by the institutes, the doctoral supervisors and the academic supervisors at Jülich, adding up to 457 people. As of 31 December 2023, there were 309 postdocs at Jülich, including 98 women. Some 52 per cent of all postdocs came from abroad.

Young investigators groups

Forschungszentrum Jülich offers superb starting conditions for a scientific leadership career to excellent postdocs with the opportunity to set up their own young investigators group. In 2023, five new groups were established at Forschungszentrum Jülich, which meant a cumulative total of 23 young investigators groups. Four of the group heads held a junior professorship; there were three W2 professorships and one W3 professorship; five of the group heads were funded by the EU through an ERC Starting Grant.

1) This figure also includes doctoral researchers who do not have a contract with Forschungszentrum Jülich, but are financed through scholarships, for example.

VOCATIONAL ORIENTATION, VOCATIONAL TRAINING AND DUAL STUDIES

Forschungszentrum Jülich offers a wide range of opportunities for career orientation. In 2023, 116 school students were accepted for their compulsory school internships, while 182 students were supervised in the context of compulsory internships and voluntary study-related internships. Internships for students are generally remunerated in such a way that international and mobile domestic students can also take advantage of the attractive internship positions. In addition to internships for school students, Forschungszentrum Jülich also offers individual career exploration days as part of the "no graduation

without follow-up steps" state initiative for career guidance, KAoA. It is the aim of this initiative to provide young people with good career guidance and to strengthen their career choice skills. This is intended to help young people make a conscious decision in favour of or against a particular training/study programme. A total of 120 career explorations were carried out with school students.

As one of the region's largest companies that takes on trainees, Forschungszentrum Jülich looks back on more than 60 years of experience in vocational training and assumes a special social responsibility for securing the next generation of skilled workers. It offers up to 100 trainee positions in one of around 20 different occupations that require formal training every year. Since 1961, more than 5,500 young people have received qualified vocational training at Jülich. Many former trainees are in ongoing employment at Forschungszentrum Jülich today.

In 2023, 85 apprentices completed their training. About 70 per cent of them passed the exam with the top grades of either "very good" or "good".

19

different occupations that require formal training started in 2023

Vocational training positions

New trainees in 2023

Occupations	Total	incl. a dual study programme
Laboratory technicians	28	8
Electricians	14	–
Metal workers	9	–
Office staff	10	1
Mathematical-technical software developers	26	26
Other	5	–
Total	92	**35**

Forschungszentrum Jülich is partnering with the neighbouring FH Aachen – University of Applied Sciences in offering a total of five dual study programmes in the natural sciences as well as in the commercial and technical fields. Dual study programmes combine sound vocational training at Forschungszentrum Jülich with a bachelor's degree course at the university of applied sciences, such as the training of mathematical-technical software developers (MaTSE) in conjunction with the "Bachelor of Science – Applied Mathematics and Computer Science" course that accompanies the training.

Trainees who started in 2023

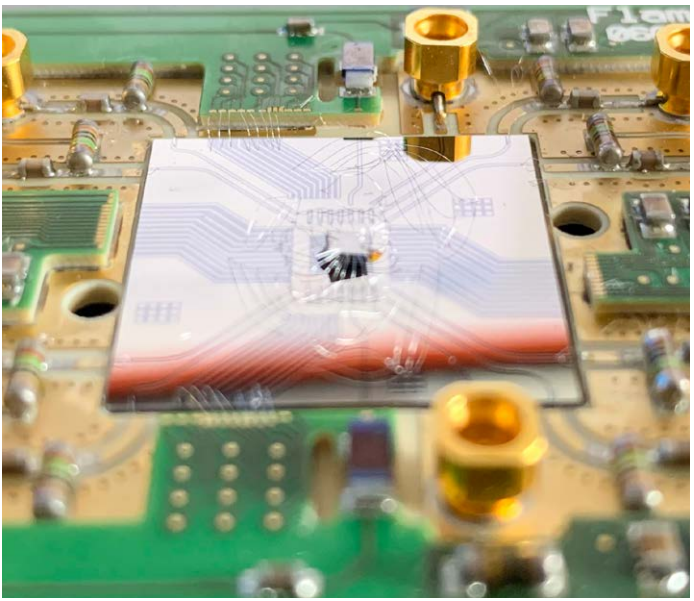
A total of 92 trainees in 19 different professions – including four dual study programmes – were hired for the 2023 recruitment year. Around 38 per cent of the 92 new hires account for a dual qualification as an IHK (Chamber of Commerce and Industry) specialist and a bachelor's degree.

JARA – JÜLICH AACHEN RESEARCH ALLIANCE

The RWTH Aachen University of Excellence and Forschungszentrum Jülich have been pooling their expertise in the Jülich Aachen Research Alliance (JARA) since 2007. Oriented towards the major challenges facing society, they carry out joint projects in the five research sections of brain research (JARA-BRAIN), sustainable energy (JARA-ENERGY), particle physics and antimatter (JARA-FAME), future information technologies (JARA-FIT) and soft matter (JARA-SOFT) as well as in the JARA Center for Simulation and Data Sciences (JARA-CSD). JARA was one of the first cooperations between a university and a research institution in Germany. It contributes to advancing the German scientific landscape by overcoming the juxtaposition of university and non-university teaching and research.

70

joint appointments at JARA as at 31 December 2023[1)]



JARA researchers developed this semiconductor quantum chip. Its quantum shuttle enables electrons captured on quantum dots to be transported without the quantum information being lost.

1) Not including members of the Board of Directors

PUBLICATIONS

SUCCESSFUL NEGOTIATIONS WITH SCIENTIFIC PUBLISHERS

On behalf of the Alliance of Science Organisations in Germany, the DEAL consortium concluded a licence agreement with the scientific publisher Elsevier in 2023. This agreement enables the organizations' researchers to access around 2,500 Elsevier journals, while they can also publish open access at no additional cost. This strengthens free access to publicly funded research.

The DEAL consortium's negotiations took seven years and were broken off midway through. Dr. Bernhard Mittermaier, Head of the Jülich Central Library, was part of the eight-member negotiating group. Compared to the situation at the beginning of the negotiations, Forschungszentrum Jülich saves around €300,000 per year.

In 2018 and 2019, respectively, the DEAL consortium had already concluded similar agreements with the two other major scientific publishers, Wiley and Springer Nature. These contracts were renewed at the end of 2023. The DEAL contracts have the potential to transfer around half of German research output in scientific journals to open access every year over the next five years. This means that research results from Germany will be freely available immediately, accessible worldwide free of charge, and reusable.

Jülich publications

In the past five years

Year	Total	in peer-reviewed journals	of which with researchers from other institutions	Books, other publications	Doctoral theses, habilitations
2019	**2,487**	1,908	1,581 | **82,9%**	455	124
2020	**2,473**	1,938	1,597 | **82,4%**	324	118
2021	**3,081**	2,610	2,133 | **81,7%**	368	136
2022	**2,737**	2,228	1,845 | **82,8%**	405	104
2023	**2,511**	1,984	1,630 | **82,2%**	430	97

Dr. Bernhard Mittermeier, Head of the Jülich Central Library

Journals with the most publications by Jülich researchers in 2023

Journal	Number of publications
Meeting Abstracts	40
Physical Review B	34
Scientific Reports	28
Nature Communications	27
Atmospheric Chemistry and Physics	27
Advanced Energy Materials	22
Nuclear Materials and Energy	19
Nuclear Fusion	16
Journal of the Electrochemical Society	16
Journal of Power Sources	16
The Journal of Physical Chemistry C	15
NeuroImage	15
Microscopy and Microanalysis	15

PATENTS AND LICENSES

PATENT PORTFOLIO

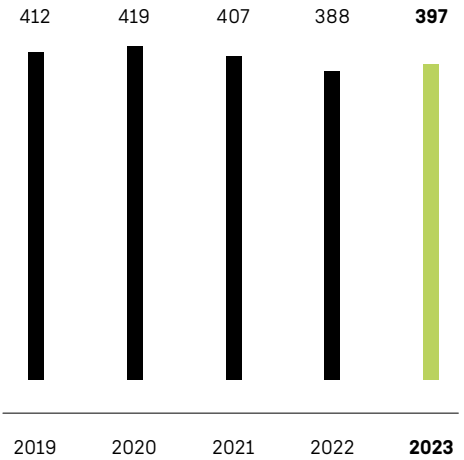
Jülich research generates innovations from which industry and society benefit and which result in property rights and license agreements. Property rights include inventions for which patent applications have been filed as well as patents granted. An invention is patentable if it is novel, involves an inventive step and is commercially usable.

The patent portfolio is made up of the patent families and the total number of property rights. A patent family, in turn, consists of one or more patents in Germany or abroad that relate to one patentable technology. The total number also includes European patent applications and international applications under the Patent Cooperation Treaty (PCT), each of which comprises several individual property rights. The PCT is an international treaty that makes it possible to apply for a patent for all contracting states of the PCT by filing a single patent application.

A license grants the licensee the use of an industrial property right, of know-how or software. For example, a company or research institution can use a patent of Forschungszentrum Jülich as a licensee.

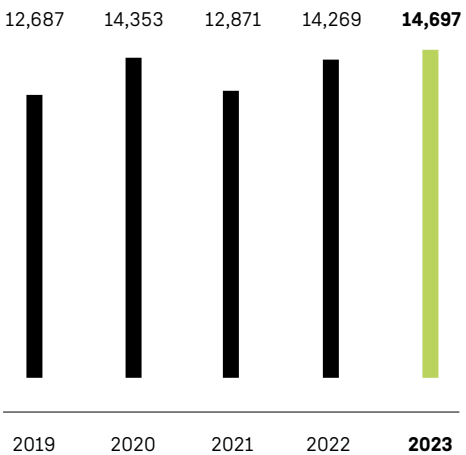
Patent families

2019–2023, as of 31 December 2023



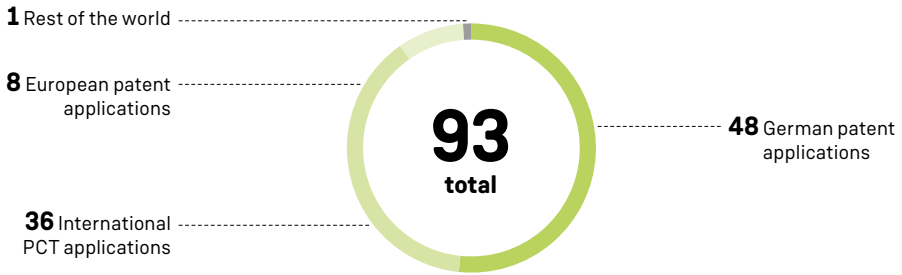
Total number of property rights

2019–2023, as of 31 December 2023

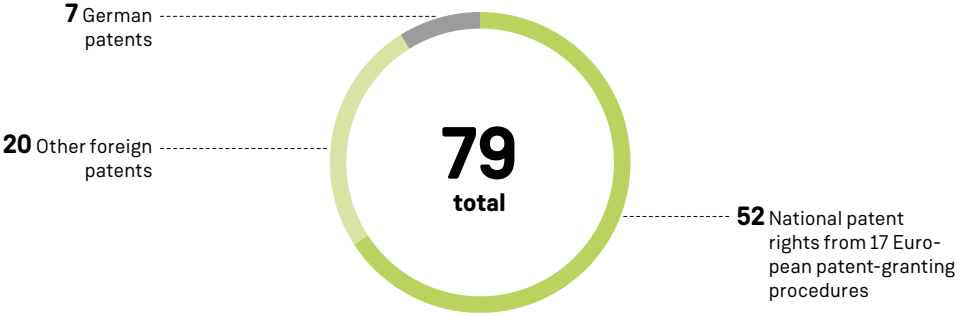


CURRENT PATENT ACTIVITIES

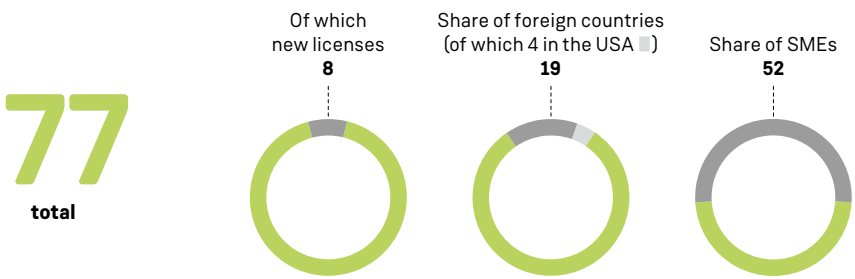
New patent applications in 2023



Patents granted in 2023



Licenses in 2023



PROJECT MANAGEMENT JÜLICH

As one of the leading project management organizations in Germany, Project Management Jülich (PtJ) supports its clients in the federal and state governments and the European Commission in realizing their funding policy goals. PtJ implements research and innovation funding programmes that are geared towards socio-political needs, integrating national and European funding. The project management organization has pooled its experience and expertise into three business areas: Energy and Climate, Sustainable Development and Innovation, and Research and Society NRW.

The funded projects cover the entire innovation chain, from basic research to market entry. One of the goals is the advancement of funding instruments to accelerate the innovation process. Through regional networking of science and industry, the aim here is to exploit local innovation potential in particular.

PROJECT MANAGEMENT JÜLICH IN FIGURES (as of 31 December 2023)

The funding volume managed by PtJ rose to €3,392.05 million in 2023 spread over 30,770 ongoing projects. Of these, 22,291 projects

PtJ Director Dr. Stephanie Bauer in conversation with Michael Weber, Head of the Sustainable Development and Innovation business area

with a funding volume of around €3,029.28 million were accounted for by federal programmes. For the programmes of federal states, PtJ managed a total of 8,479 projects with a funding volume of around €362.77 million.

About €1,653.56 million of the funding volume went to the business area Energy and Climate, €1,449.62 million to the business area Sustainable Development and Innovation, and €288.87 million to the business area Research and Society NRW.

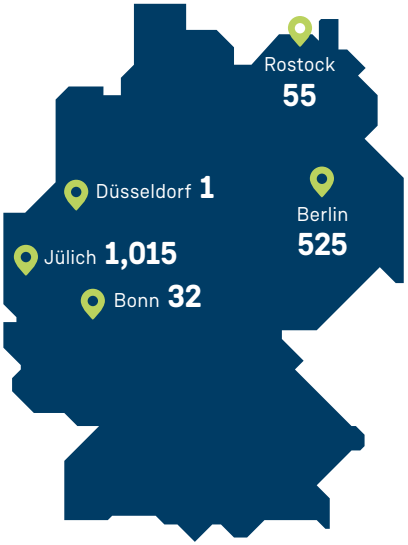
Of the 30,770 ongoing projects, 10,326 were in small and medium-sized enterprises, 3,267 in large companies, 6,323 at universities and 4,277 at research institutions.

PtJ had 1,628 employees at its locations in Jülich, Berlin, Rostock, Bonn and Düsseldorf as at 31 December 2023.

PtJ employees

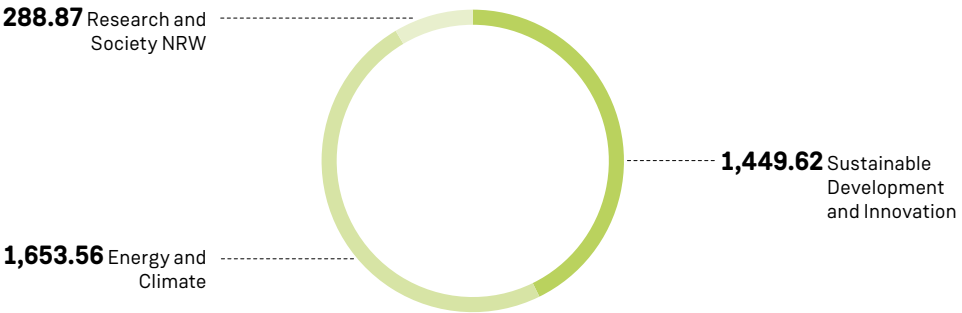
According to location, 2023

1,628
total



Proportionate funding volume by business area

2023, in millions of euros



WORK AT OTHER LOCATIONS

Forschungszentrum Jülich operates branch offices in Germany and abroad with unique, large-scale facilities, including joint institutes with universities and the sites of the project managements.

1. **Münster**
   Institute of Energy Materials and Devices (IMD-4) at the University of Münster
2. **Düsseldorf**
   Third-party funding management Life Science Service operates the office of **BIO.NRW biotechnology cluster**
3. **Aachen**
   Peter Grünberg Institute (PGI-2, PGI-13, PGI-14, PGI-15), Institute for Advanced Simulation (IAS-9), Institute of Energy Materials and Devices (IMD-4) at RWTH Aachen University and Technologiezentrum Aachen
4. **Cologne**
   Institute of Neurosciences and Medicine (INM-5) at the University Hospital Cologne
5. **Bonn**
   Project Management Jülich
6. **Bonn**
   Institute of Bio- and Geosciences (IBG-2) at the agricultural experimental campus of the University of Bonn
7. **Duisburg**
   Institute of Energy Materials and Devices (IMD-3) at the NanoEnergieTechnikZentrum (NETZ) of the University of Duisburg-Essen
8. **Bielefeld**
   Institute of Bio- and Geosciences (IBG-5) at the Center for Biotechnology (CeBiTec) of Bielefeld University
9. **Saarbrücken**
   Peter Grünberg Institute (PGI-12) at Saarland University
10. **Freiburg**
    Institute of Neurosciences and Medicine (INM-1) operates the **Bernstein Coordination Site (BCOS)** at the University of Freiburg for the elucidation of neuronal processes

11 **Stuttgart**
Institute of Energy Materials and Devices (IMD-3) at the University of Stuttgart

12 **Garching**
Jülich Centre for Neutron Science (JCNS), together with the Technical University of Munich and the Helmholtz-Zentrum Geesthacht, operates the **Heinz Maier-Leibnitz Zentrum** at the research reactor in Garching

13 **Erlangen/Nuremberg**
Institute of Energy Technologies (IET-2) in cooperation with Friedrich-Alexander Universität Erlangen-Nürnberg (FAU) and Energie Campus Nürnberg

14 **Berlin**
Project Management Jülich

15 **Rostock**
Project Management Jülich

16 **Vancouver (Canada)**
Institute of Energy Technologies (IET-3)

17 **Grenoble (France)**
Jülich Centre for Neutron Science (JCNS) operates an instrument at the high-flux reactor of the Institut Laue-Langevin (ILL); shareholder along with the Commissariat à l'Energie Atomique (CEA, France), the Centre national de la recherche scientifique (CNRS, France) and the Science and Technology Facilities Council (STFC, UK)

18 **Bangkok (Thailand)**
Institute of Bio- and Geosciences (IBG-2) with the National Science and Technology Development Agency (NSTDA) on a sustainable bioeconomy

BODIES AND COMMITTEES

BODIES

PARTNERS' MEETING

The Partners' Meeting is the principal decision-making body of Forschungszentrum Jülich GmbH. It is composed of members representing the two partners: the Federal Republic of Germany and the federal state of North Rhine-Westphalia.

SUPERVISORY BOARD

MinDir Stefan Müller
Chair
Federal Ministry of Education
and Research

The Supervisory Board supervises the lawfulness, expedience and economic efficiency of management. It makes decisions on important research-related and financial issues of the company.

BOARD OF DIRECTORS

Prof. Dr. Astrid Lambrecht
Chair

The Board of Directors conduct the business affairs of Forschungszentrum Jülich GmbH in accordance with the partnership agreement. They report to the Supervisory Board. The contact for all questions and concerns relating to the Board of Directors is the Office of the Board of Directors.

COMMITTEES

SCIENTIFIC AND TECHNICAL COUNCIL

Prof. Dr. Ruth Schwaiger
Chair
Institute of Energy Materials and Devices

The Scientific and Technical Council (WTR) advises the Partners' Meeting, the Supervisory Board and the Board of Directors on all issues associated with the strategic orientation of Forschungszentrum Jülich and on all scientific and technical issues of general importance.

SCIENTIFIC ADVISORY COUNCIL

Dr. Martin Keller
Chair
National Renewable Energy Laboratory, USA

The Scientific Advisory Council advises Forschungszentrum Jülich on scientific and technical issues of general importance. This includes Jülich's strategy and planning of research and development activities, the promotion of the optimal usage of research facilities, and any questions relating to collaborations with universities and other research institutions.

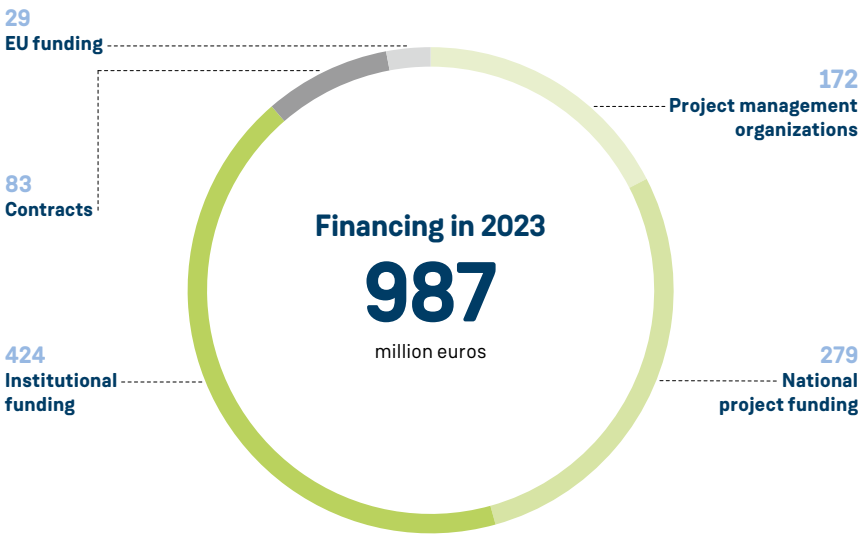
> https://www.fz-juelich.de/en/about-us/organization/company-bodies-committees

FINANCES

FINANCING IN 2023

In 2023, Forschungszentrum Jülich received institutional funding from the federal and state governments amounting to €424 million, which represented 43 per cent of the total budget, to cover operating expenses to implement investment measures. In addition, Forschungszentrum Jülich's third-party funding totalled €563 million, representing 57 per cent of the total budget.

Third-party funding consists of the acquisition of international (EU funding) and national project funding, of R&D and infrastructure services (contracts), and of project management organizations on behalf of the Federal Republic of Germany and the federal state of North Rhine-Westphalia. National project funding includes funding from the federal government, the state government, the DFG and other domestic bodies.

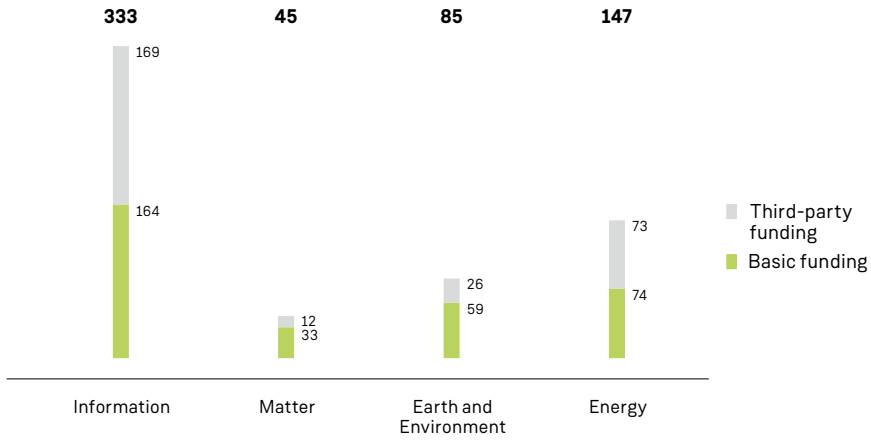


Financing in 2023 covers all research areas of Forschungszentrum Jülich as well as other statutory tasks. The majority of Forschungszentrum Jülich's financing (> 90 per cent) comes from public funds. The remainder originates from cooperations with industry partners.

BUDGET OF THE RESEARCH AREAS IN 2023

In 2023, all four research areas of Forschungszentrum Jülich – Energy, Earth and Environment, Matter, and Information – and their programmes were in the fourth round of the programme-oriented research (POF IV). The full costs are shown below in their percentage distribution. The full costs of the four research areas amounted to €610 million in 2023.

Below is a breakdown of basic and third-party funding into individual research areas. Third-party funding per research area is between 27 and 51 per cent. Only third-party funds that are allocated programmatically were taken into account.



PUBLICATION DETAILS

Facts and figures · Published by: Forschungszentrum Jülich GmbH · 52425 Jülich, Germany · Editorial team: Annette Stettien, Dr. Frank Frick, Anne Rother (responsible under German press law) · Authors: Dr. Frank Frick, Annette Stettien · Graphics and layout: SeitenPlan GmbH · Translation: ROTPUNKT·Texte & Bild · Picture credits: Forschungszentrum Jülich (p. 56/57), Forschungszentrum Jülich/IMET (p. 20), Forschungszentrum Jülich/Guido Jansen (p. 47), Forschungszentrum Jülich/Sascha Kreklau (p. 5, 8, 13, 16, 22, 26, 30, 33, 41), Forschungszentrum Jülich/Ralf-Uwe Limbach (p. 19, 34, 59 centre, 66, 71), Forschungszentrum Jülich/Martin Riese (p. 14), Forschungszentrum Jülich/Schülerlabor (p. 65), Forschungszentrum Jülich/Britta Sylvester (p. 64), Forschungszentrum Jülich/Mats Volmer (p. 69), BMBF/Hans-Joachim Rickel (p. 45), Cozine/Shutterstock.com (p. 54), European Research Council (p. 59 (background logo)), Mareen Fischinger/Forschungszentrum Jülich (p. 37), Mark Hermenau (p. 44), State of NRW/Marcel Kusch (p. 47), Martin Leclaire (p. 10), Yves Lobet (p. 59 bottom), pbr Planungsbüro Rohling AG (p. 39), Georg Pöhlein (p. 59 top), Manuel Thomé (p. 74), SeitenPlan (p. 6-7 and 42-43 (illustrations), 82), SeitenPlan using AI (cover, p. 3), WSS/Felix Wey (p. 25 (Lab-photos)) · Print: Schloemer Gruppe GmbH · Print run: 500

As of August 2024

CONTACT

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Our research magazine effzett

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