Strategic Advisory Board Matter

Report of the president

Prof. Otmar D. Wiestler
President of the Helmholtz Association
DESY, May 03, 2023

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Report of the president

- Zeitenwende - Challenges in the context of recent international developments
- PoF V – steps towards the evaluation process
- Selection of two new Helmholtz Institutes in 2023
- Helmholtz Incubator Information & Data Science
- Scientific highlights from the research fields

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Zeitenwende

Challenges in the context of recent international developments

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„Zeitenwende“

50 Million € for rapid response initiatives at Helmholtz

€25 Million for **accelerated translation projects in the energy field** (each project 6,25 Mio.€)
(coordination H. Hanselka/ Helmholtz Energy)

Accelerated transfer of a next generation of solar cells to mass production	FZJ, HZB & KIT
GEOZeit: Geotechnologies towards a significant change in Germany’s energy supply	GFZ & KIT
RESUR: Helmholtz platform for design of robust energy systems and their supply chains	FZJ & KIT
Pilot project towards circular economy and recycling	HZDR & KIT

€25 Million for **strengthening informatics and cybersecurity**

- €15 million for pilot projects at CISPA
- €10 million for pilot projects at KIT

→ Part of the funds to be used for cooperation with other Helmholtz centers

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„Zeitenwende“ and its implications for Helmholtz :

Termination of strategic cooperations with Russia, support programs for scientists of the Ukraine, significant financial challenges

- **Suspension of cooperation with Russian partners** with dire consequences, especially in polar research
- **Foreseeable loss of contributions by international partners**, especially Russia, to major infrastructure projects such as FAIR or European XFEL
- **Helmholtz support program for refugee scientists from Ukraine:** unbureaucratic temporary funding (max. 12 months) for Ukrainian colleagues. So far 46 funded applications, total amount of € 760.000 from INF
- **Increases in operating costs** have direct impact on the budgets of Helmholtz Centers and on our scientific competitiveness
  - High additional energy costs (particular relevance for large-scale research infrastructures), above-average increases in salaries in the public sector & significant inflation rates
  - Centers must plan their budgets conservatively for the coming years; this may have a negative impact on recruitment and infrastructure investments
  - Development of contingency plans including internal reallocation of funds
  - Research Ministry has set up a contingency fund for energy-intensive research

PoF V

Steps towards the evaluation process

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Program-oriented funding (PoF)

Key steps towards Pof V

Program-oriented funding (PoF)

Key steps

- Discussions are currently ongoing with all board members to define high potential topics and overarching programs

- The Strategic Advisory Boards will be involved in the following activities :

  Search for PoF V reviewers

  Discussion of potential future programs

  Interpretation of the results of the scientific evaluation in 2025

Helmholtz Institutes

Selection of new Helmholtz Institutes in 2023

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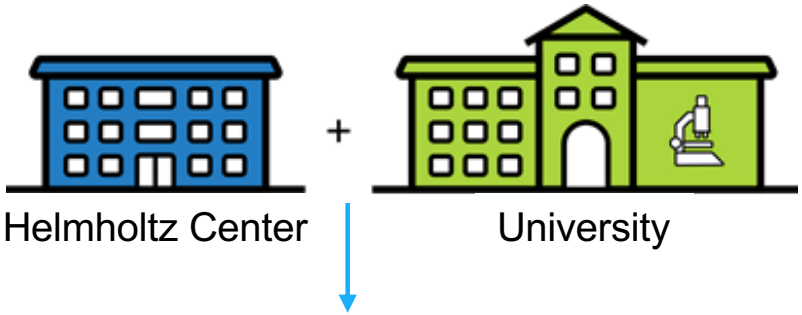
Helmholtz Institutes

Innovative structures for long-term research collaborations

- Joint exploitation of challenging research areas with a long-term perspective
- Strong synergistic partnership between Helmholtz and universities to implement innovative joint research strategies, leverage substantial added value, and achieve critical mass
- High level of complementarity of the research portfolios
- High potential for transfer into practical applications and dissemination
- Potential for the recruitment of world-class talents



Helmholtz Institute
at University site

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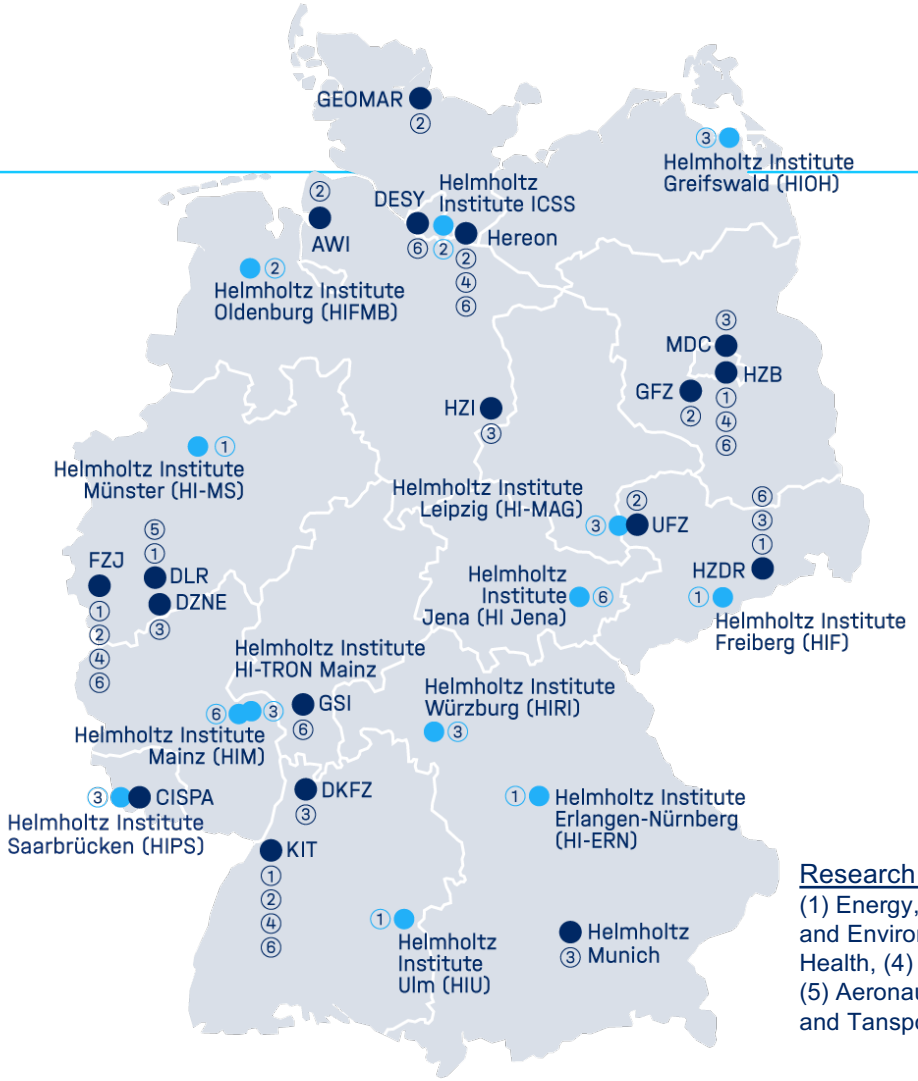
Helmholtz Institutes
Locations

- Helmholtz Institute Mainz (HIM), GSI & University Mainz
- Helmholtz Institute Jena, GSI, DESY, HZDR & University Jena
- Helmholtz Institute Saarbrücken, HZI & University Saarland
- Helmholtz Institute Ulm, KIT, DLR & University Ulm
- Helmholtz Institute Freiberg, HZDR & University Freiberg
- Helmholtz Institute Erlangen-Nürnberg, FZJ, HZB & University Erlangen-Nürnberg
- Helmholtz Institute Münster, FZJ & University Münster
- Helmholtz Institute Würzburg, HZI & University Würzburg
- Helmholtz Institute Oldenburg, AWI & University Oldenburg
- Helmholtz Institute Mainz, DKFZ & University Mainz, TRON
- Helmholtz Institute Leipzig, Helmholtz Munich & University Leipzig
- Helmholtz Institute Hamburg, HZG & University Hamburg
- Helmholtz Institute Greifswald, HZI & University Greifswald, Greifswald University Hospital, Friedrich-Loeffler-Institut



Research Fields:
(1) Energy, (2) Earth and Environment, (3) Health, (4) Information, (5) Aeronautics, Space and Tansport, (6) Matter

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Establishment of new Helmholtz Institutes

Evaluation of 5 applications on site

Energy	Earth and Environment	Health	Aeronautics, Space and Transport	Matter	Information
HIPOLE Polymers in Energy Applications Chair Brigitte Voit Feb 21-22 in Jena	**HI-UCES** Urban Climate & Environmental Sciences Chair Diane Pataki March 29-30 in Freiburg	**HI-TAC** Translational AngioCardio Science Chair Anja Bosserhoff Jan 31 - Feb 1 in Heidelberg		**HIHED** High Energy Density Chair Christian Rüegg Feb 28 – Mar 1 in Rostock	**HI-KIEL** Digital Implant Research Chair Carlijn Bouten Jan 10-11 in Kiel

The research field Aeronautics, Space and Transport is funded by a different ministry and therefore not eligible in this call.

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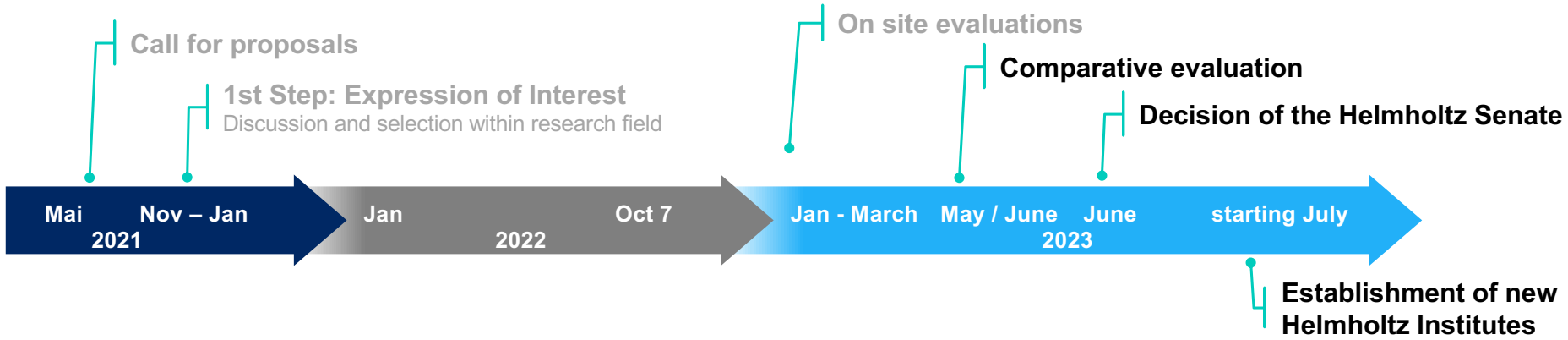
Establishment of new Helmholtz Institutes

Timeline



- Jan - Mar, 2023 On-site evaluations of the proposals
- April 30, 2023 Deadline for the review report
- May 31, 2023 Comparative Evaluation (with panel chairs, cross-reviewers, senate members)
- June 2023 Final decision of the Helmholtz Senate

Helmholtz Institutes

Criteria for the evaluation

- **Outstanding scientific quality by international standards**
- **New, challenging research areas** with a **long-term perspective** and a clear added value for the research portfolio of the Helmholtz Association and the partner university
- High level of **complementarity** of the research portfolio between Helmholtz and the partner University
- **High potential for transfer** in University, economy, and society & **strengthening of transfer culture** (e.g. integration in University teaching, promotion of an entrepreneurial mindset and entrepreneurship training)
- Potential for the **recruitment of talented scientists in an exciting research area,** including a convincing proposal to promote young researchers and equal opportunities
- Outstanding **leadership personality** as founding director
- **Sound and adequate budget plan** in the range of 5.5 Mio. € p.a. with substantial contributions of the state and the University, especially in the initial period (2023-2027)
- Adequate **research building and facilities**
- Convincing **organizational and management concept**

Helmholtz Incubator Information & Data Science

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Helmholtz Incubator Information & Data Science

Information & Data Science for the research programs

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- Information & Data Science technologies pose a significant **strategic challenge and opportunity** for all 18 centers and 6 research fields
- Helmholtz has **leading expertise in numerous subfields**
- Helmholtz has **excellent data resources and computing infrastructure**
- Outstanding **synergy potentials** for all programs when technology, know-how, data and brains interact systematically.

→ Cross-research-domain approaches offer great opportunities to add value and to support science in all programs !

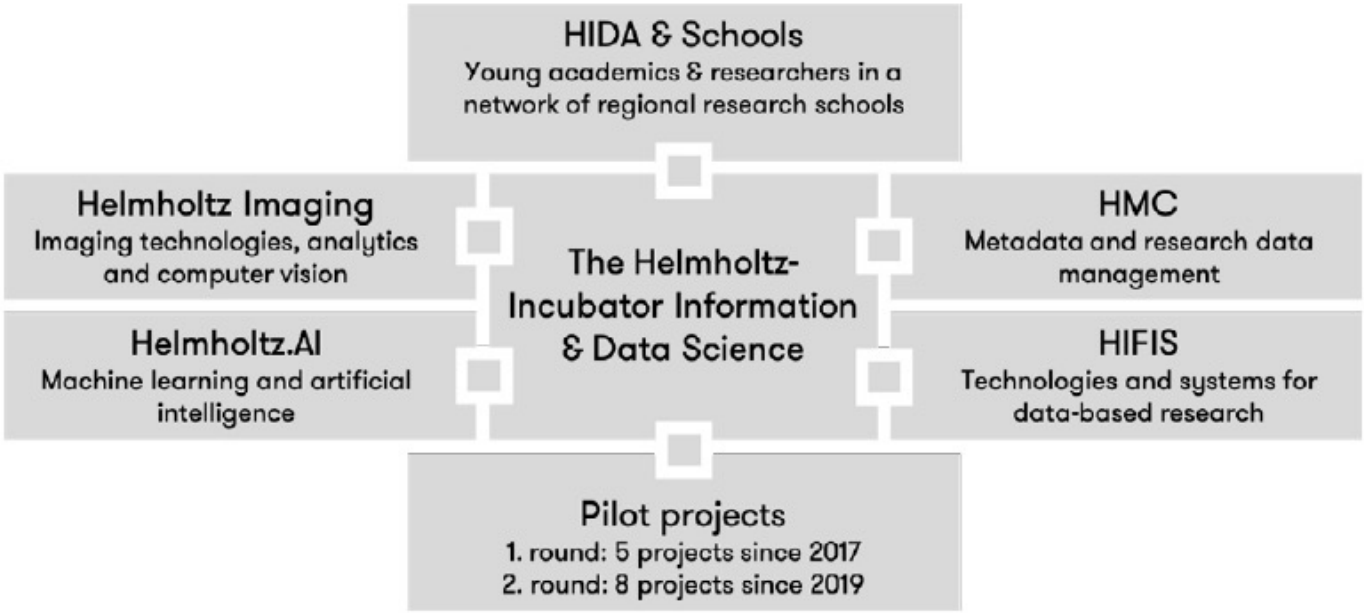
→ New ways of collaboration across research areas and programs have been successfully explored !

→ **The Helmholtz Incubator was created to address these tasks and has delivered impressive results for over five years !**

Helmholtz Incubator Information & Data Science

Think tank: 100 experts from all centers meet twice per year

Mission: Address challenges with synergistic and interdisciplinary approaches



Helmholtz Incubator Information & Data Science

Address common challenges for Information & Data Science in **five interactive platforms**

- Helmholtz AI
- Helmhotz Imaging
- Helmholtz Metadata Collabortion
- Helmholtz Federated IT Services
- Helmholtz Information and Data Academy

These platforms are intended to

- **catalyze exchange and the transfer of know-how and expertise within Helmholtz**,
- as a permanent structure, **continuously leverage synergies**,
- **promote collaboration** in key technology areas,
- train a new generation of data scientists
- increase the overall impact of I&DS in the entire Helmholtz Association

Scientific highlights from the research fields

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Helmholtz high-impact research

Helmholtz initiatives, national and international activities

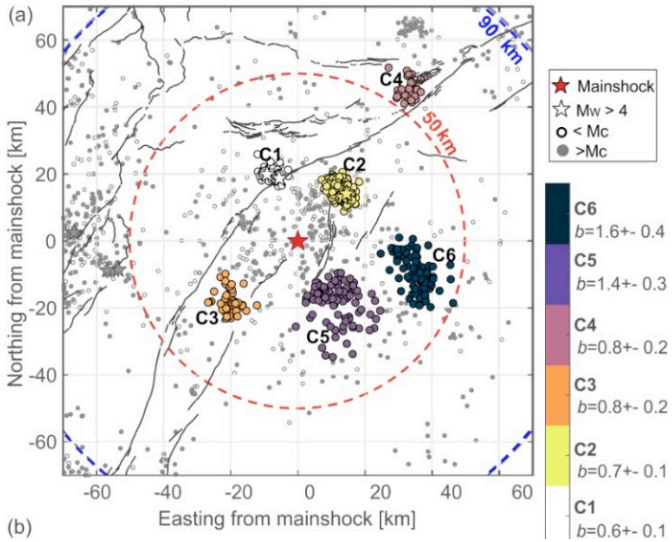
- Helmholtz Quantum:
  From basic research to application
- Helmholtz Climate Initiative:
  “Net Zero 2050” (Mitigation) and “Adaptation to extreme events”
- Energy System 2050:
  Concrete understandings and technological solutions
- LOHC:
  Future technology for green hydrogen (Helmholtz H2-cluster)
- Applied AI:
  Earth observation, robotics, autonomous vehicles, matter data, digital health
- Future predictions for integrated mobility:
  Land, water, airspace, outer space
- National Center for Tumor Diseases:
  Translational cancer research at a national scale
- European XFEL:
  Map atomic details of biological structures, molecular movies, interior planetary processes
- MOSAiC:
  International Arctic expedition with Polarstern
- Human Brain Project:
  FET flagship computational neuroscience and brain simulations

Scientific highlight from the research field

Earth and Environment

Earthquake in Turkey/Syria on 6 February 2023

- GFZ has been conducting seismic monitoring in the country since the 1980s
- AI-based algorithms significantly expand earthquake catalog (fore- and aftershocks): unique insights
- Analysis of foreshocks for prediction signatures
- Comparison of fault movement, ground shaking, and losses with predictions from risk models
- Technical/scientific support of the Turkey's *Disaster and Emergency Management Authority* (AFAD)
- Development (with AFAD) of an improved monitoring network (focus on Istanbul and Izmir)
- Earthquake-resistant constructions and building regulations



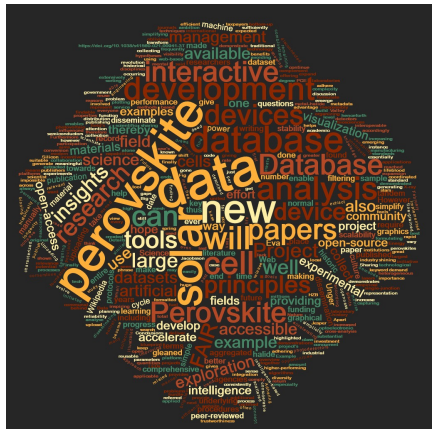
Kwiatek, G. et al. Months-long preparation of the 2023 MW 7.8 Kahramanmaraş earthquake, Türkiye. Submitted to Nature

Scientific highlight from the research field

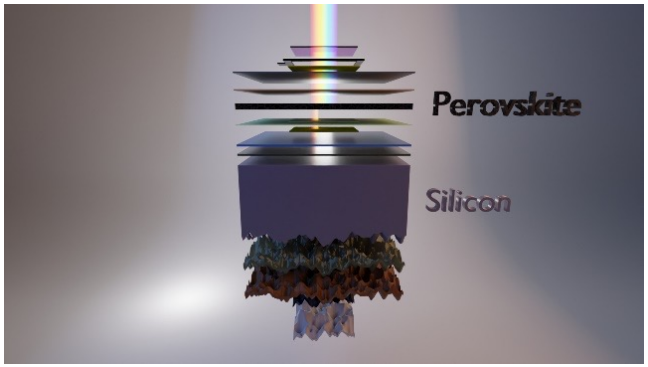
Energy

Next generation of solar cells

- World record efficiency for silicon-perovskite tandem solar cell (HZB)
- Worldwide first Perovskite/Perovskite tandem solar module (KIT)
- Perovskite solar cell with ultra-long stability (HI ERN, FZJ)
- Wiki and open access database for Perovskite solar cell research based on 15,000 publications (lead by HZB)



www.helmholtz-berlin.de



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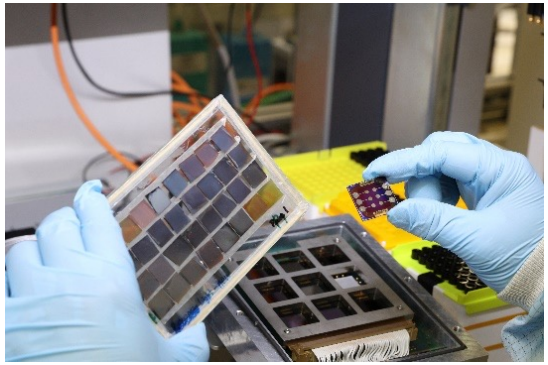
www.kit.edu



www.fz-juelich.de

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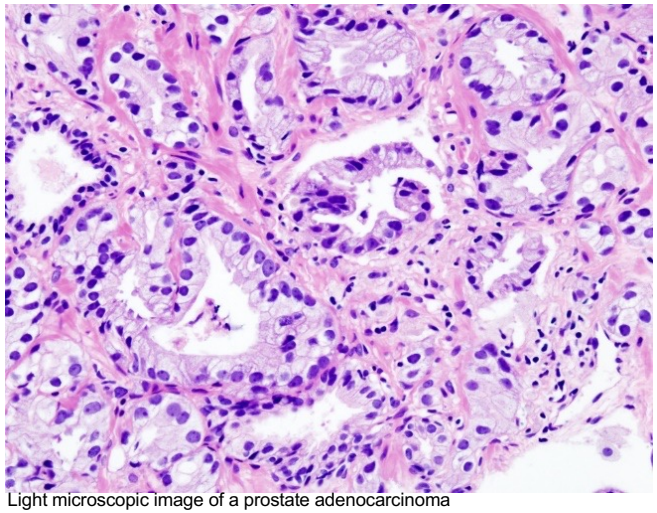
Scientific highlight from the research field

Health

Lutetium-177 PSMA-617 for the treatment of prostate cancer

- With 70,000 new cases/year, prostate cancer is the most common cancer and the second most common cause of cancer death among men in Germany.
- Majority of all prostate cancer cells express the surface molecule PSMA (prostate specific membrane antigen). PSMA is virtually absent from other somatic cells.
- Lutetium-177 PSMA-617 is a ligand coupled with radioactive Lutetium-177. It accumulates in the tumor and delivers its lethal dose of radiation.
- Invented and patented by DKFZ, the University of Heidelberg and Heidelberg University Hospital.
- Introduced into clinical trials by ABX GmbH in Radeberg, developed by Novartis until FDA approval.
- Approval in USA in March 2022 and Europe in December 2022



Light microscopic image of a prostate adenocarcinoma

Scientific highlight from the research field

Information

Exascale Supercomputing

- European High Performance Computing Joint Undertaking (EuroHPC JU) has chosen FZJ as the site of Europe's first exascale computer
- JUPITER – Joint Undertaking Pioneer for Innovative and Transformative Exascale Research will be installed on the Jülich campus **starting in 2023**
- Funding of EUR 500 million by EuroHPC and Germany (BMBF, MKW NRW)

JUWELS at FZJ (Copyright: Forschungszentrum Jülich / Sascha Kreklau)

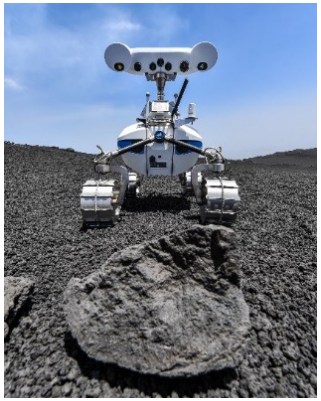
- ➢ One trillion (“1” followed by 18 zeros) calculations per second
- ➢ Should help to solve important and urgent scientific questions such as climate change, strategies to combat pandemics, and sustainable energy production, while also enabling the intensive use of artificial intelligence and the analysis of large data volumes

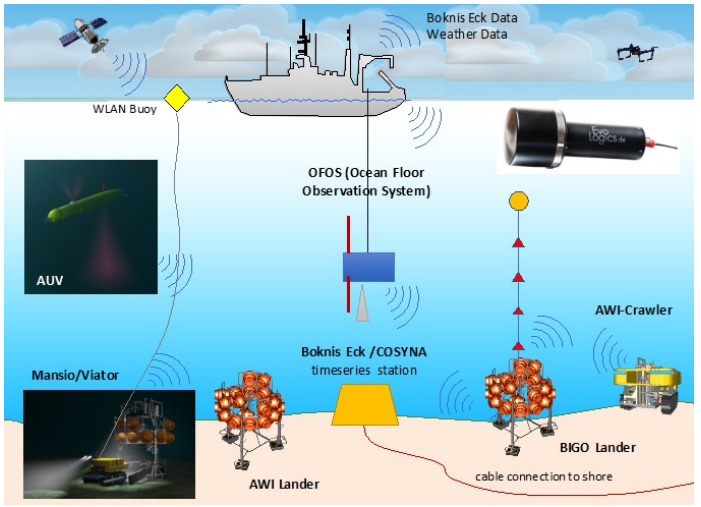
Scientific highlight from the research field

Aeronautics, Space and Transport

ARCHES (Autonomous Robotic Networks to Help Modern Societies)

- Development of heterogeneous, autonomously linked up and integrated robotic systems
- DLR-Demonstration: rock sampling on the Etna volcano (Sicily) with subsequent analysis and communication of the results to a control center.
- Fields of application from exploration of the solar system (DLR) to technical crisis intervention and environmental monitoring of the oceans (AWI)
- Other potential fields of application: innovative medical devices, logistics and autonomous urban transport.





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Scientific highlight from the research field

Matter

MML: Mechanism of an ATP-driven molecular motor

- DNA recombination is a process that ensures genetic diversity in all forms of life: two DNA double strands separate into their four individual arms and recombine crosswise. A cross-shaped Holliday junction was discovered as early as 1964; it moves along the DNA with the help of a molecular machine (RuvAB).
- With the aid of time-resolved cryo-electron microscopy (cryo-EM) at CSSB and the high-performance computing facility at DESY , the mechanism of the underlying ATP-driven molecular motor has been elucidated.
- J. Wald, D. Fahrenkamp, et al.: Mechanism of AAA+ ATPase-mediated RuvAB–Holliday junction branch migration. Nature 609, 630–639 (2022).

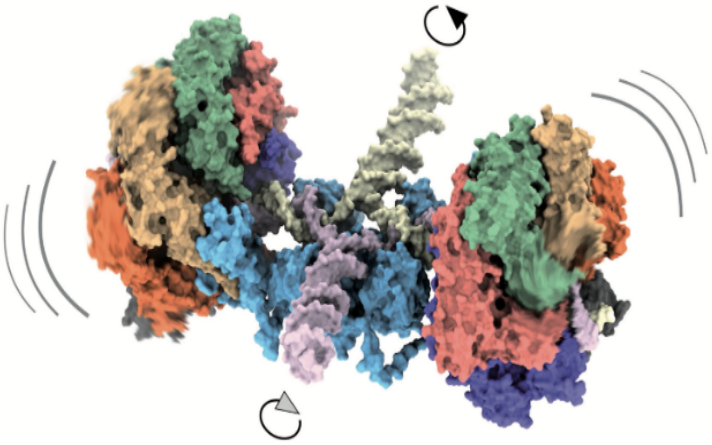

Illustration: RuvAB-Holliday junction complex where the RuvB motors rotate together with the DNA substrate during recombination

Thank you so much for all your support !

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