

# hermann

News from the Helmholtz Association



Controlled by software capable of learning, the robotic arm can be moved by the power of thought.

Photo: DLR

## Brain Signals Control Robotic Arm

*A worldwide unique assist system enables fully paralysed people to control a robotic arm by using brain signals only. For this development, Prof. Dr Patrick van der Smagt, expert for robotics at the German Aerospace Centre (DLR) and the neuroscientist Prof. Dr John P. Donoghue, Brown University, USA, receive the Erwin Schrödinger Prize 2012, awarded by turns by the Helmholtz Association and by the Stifterverband für die Deutsche Wissenschaft, the business community's innovation agency for the German science system.*

In order to enable the patient to control the robotic arm with the power of thought only, the researchers have developed a software capable of learning, which translates signals from the patient's brain into signals controlling the robotic arm. In 2011, a female patient thus managed to use the robotic arm to lift a drinking bottle and straw to her mouth. This was the first time the woman could independently drink since a stroke 15 years ago left her paralysed from the neck downwards. Controlling the robotic arm did not require her to first complete extensive training. All she needed to do was to imagine mov-

ing her own arm in a corresponding manner. This image triggered signals within the brain's motor cortex. A small implant, developed in cooperation with the Brown University, which was placed inside the patient's skull, transmitted these signals, so they consequently could be processed by a learning algorithm to translate into the desired control commands. The scientists then constantly optimised this algorithm. Neuroscientists had previously proven that it is possible to control the cursor on a screen by "thoughts" alone. Patrick van der Smagt, however, now has managed to transfer this basic possibility to the significantly more complex, three-dimensional control of a robotic arm.

This development is a technological breakthrough with great potential in significantly facilitating the lives of people with disabilities. This breakthrough was made possible only by close cooperation between experts from the fields of neurosciences, robotics and software development.

With the Erwin Schrödinger Prize, the Stifterverband and the Helmholtz Association intend to honour teams of scientists incorporating several disciplines and thereby achieving special innovations.

## Dear Readers,



Sustainability has many faces. For the Helmholtz Association, two aspects are of particular relevance: "Sustainable Research" and "Sustainability

Research". Sustainable research includes the endurance it takes to conduct large-scale research projects such as verifying the existence of the Higgs boson. Such basic research is the basis for gaining new knowledge, for creating new technologies and innovations. Conversely, sustainability research concretely addresses the major challenges of our present time: How can we ensure the future of our energy supply, how can we use the resources available on our planet in a more sustainable manner and how can we provide for health and quality of living in an ageing society? The Helmholtz Association makes an important contribution to these issues with many related projects, as also presented in our new annual report.

*Yours faithfully, Jürgen Mlynek, President*

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## In Brief

### DEEP Epigenome Programme Launched

21 research teams from all across Germany have joined forces within the German epigenome programme (DEEP) in order to decode and map 70 epigenomes of human cell types. Their purpose is to gain insight into the cell-specific programmes of healthy and diseased as well as old and young cells. The field of epigenetics researches cell characteristics that are passed on to filial cells even though these are not encoded within the DNA. DEEP is the official German contribution to the worldwide operating International Human Epigenome Consortium (IHEC) and is funded by the German Federal Ministry of Education and Research (BMBF) with a total of 16 million Euro over the course of the next five years.

### Risk of Earthquakes in Europe

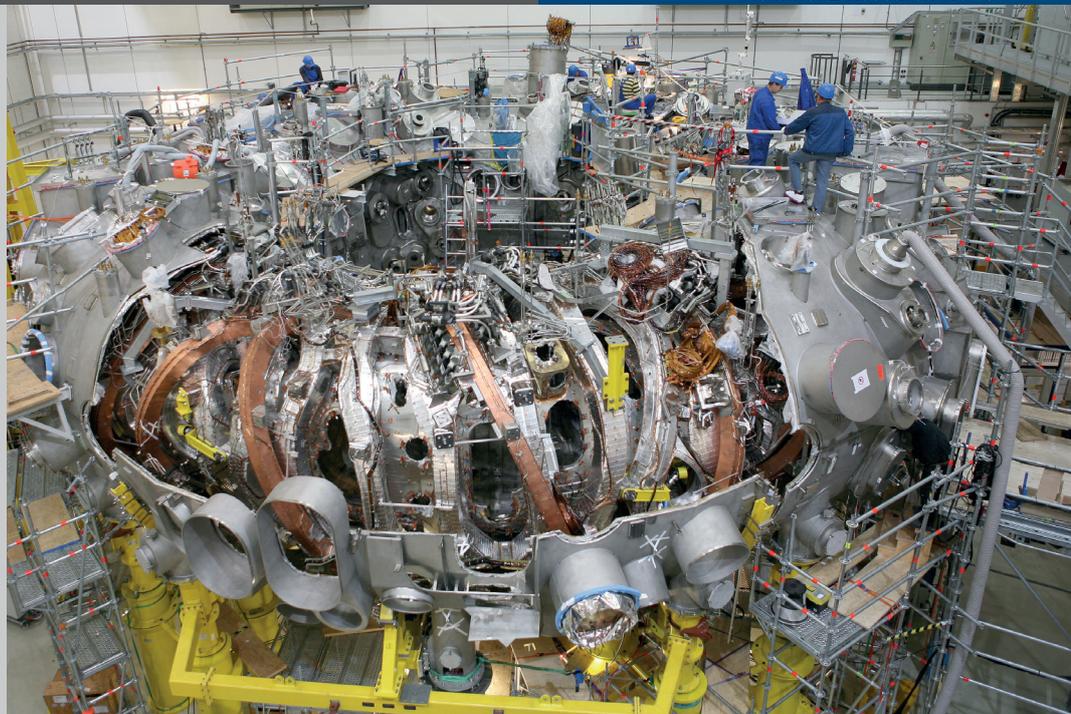
Scientists from the GFZ now have compiled the first ever earthquake catalogue for Europe and the Mediterranean region also including historic earthquake reports. The "EMEC Catalogue" comprises about 45,000 earthquakes over the course of the past one thousand years and thus constitutes a reliable basis for assessing the risk of earthquakes and earthquake-related tsunamis.

### HALO Research Aircraft

At the DLR, the new research aircraft HALO has taken off for its first measurement projects. HALO is equipped with numerous measurement devices and includes optical windows for remote sensing instruments. Specially developed sensor technology as well as an integral system for data collection and evaluation allow scientists to gain information regarding the atmosphere and the aircraft itself already during flight operation. For the period until 2015, more than ten scientific missions are scheduled.

### Diabetes Information Service Online

Created by the Helmholtz Zentrum München, the new Diabetes Information Service Munich now is online. The website provides comprehensive and reliable information on the diagnostic investigation, treatment and prevention



By now, the gap has been closed: Wendelstein 7-X prior to fitting the final Cryostat device. Photo: IPP, Anja Richter-Ullmann

## Wendelstein 7-X now with Lid

*The installation works at the research facility Wendelstein 7-X at the Greifswald branch institute of the Max-Planck-Institut für Plasmaphysik (IPP) are in full swing: By now, the facility displays its final shape. Wendelstein 7-X will be the worldwide largest fusion device created using the stellarator concept and is intended to demonstrate whether this design is suitable for a future fusion power plant.*

Wendelstein 7-X is comprised of five almost identical modules. Each module contains part of the plasma vessel, the heat insulating cladding, 14 superconducting magnetic coils as well as part of the supporting ring structure – a weight of about 120 tonnes per module. Now, all modules have been placed on the machine's foundations and encased in a steel shell. The last part to be fitted was a lid weighing approximately 14 tonnes, which is part of the heat insulating outer shell.

"It is a pity, though", says Dr Hans-Stephan Bosch, Associate Project Director, "that

nothing remains to be seen of the entire inner life of the machine, in particular, of the coils that are the trademark of Wendelstein 7-X."

Numerous research institutions are involved in building Wendelstein 7-X: For instance, the Karlsruhe Institute of Technology (KIT), together with the University of Stuttgart and an European enterprise, developed the plasma heating system and the entire microwave heating system. The KIT also provided the power supply lines for the coils. The bus system of superconducting wires connecting the magnetic coils with each other and with the power supply lines was developed and manufactured by the research centre "Forschungszentrum Jülich". The implementation of the bus system was the domain of engineers and technicians from the Institute of Nuclear Physics in Krakow.

Numerous works inside the facility and in its periphery need to be completed before Wendelstein 7-X can be put into operation in two years' time.

## Research Lab for HZB and FU

The Helmholtz-Zentrum Berlin (HZB) and the Freie Universität Berlin (FU) have established a new research laboratory for researching modern metallic materials and biological substances in solution. The laboratory is located on two sites: at the

BESSY II synchrotron radiation facility in the Adlershof technology park and at a new laser laboratory at the Freie Universität. The institution is headed by Prof. Dr Emad Flear Aziz, Junior Professor at the Department of Physics at the FU.

## Contract with Copernicus Publications Facilitates Open Access Publishing

Six Helmholtz centres have entered into an agreement with the Copernicus Publications publishing house to enable scientists to easily publish their research results in Open Access professional journals. Copernicus Publications is the worldwide largest Open Access publishing house in the field of geosciences and publishes 28 professional journals under expert assessment. Moreover, the publishing house sponsors 14 scientific discussion forums. The publications' editors include also scientists from the Helmholtz Association. In future, author fees chargeable for an Open Access publication with Copernicus Publications will be centrally brought to account with the respective research centre. This means: As they are used to, first-time authors submit their articles directly to the journal of choice. If their article is published, the invoice now is directly sent to their respective research centre. So far, the following Helmholtz

centres have signed the agreement: the GEOMAR | Helmholtz Centre for Ocean Research Kiel, the Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, the Helmholtz Centre for Environmental Research - UFZ, the research centre "Forschungszentrum Jülich", the Karlsruhe Institute of Technology and the Deutsches Elektronen-Synchrotron DESY. The syndicate is open to admit further Helmholtz centres.

Prof. Dr Hermann Lühr, head of a research group at the GFZ, is a member of the scientific advisory board of Copernicus Publications. He is enthusiastic about the new arrangement: "I myself regularly publish in Copernicus journals and am delighted that now it is made even easier for my colleagues in the field of geosciences to publish their research results in the Open Access system and thereby to place these freely accessible at the disposal of all people interested." *Lisa Liebenau*

## New Data Highway for FAIR

In a first development phase, the high-speed data network "FAIR Tera Net" has been put into service. It connects the universities in the Federal State of Hessen and the LOEWE-CSC supercomputer with the future international accelerator centre FAIR (Facility for Antiproton and Ion Research) at the GSI Helmholtz Centre for Heavy Ion Research GmbH in Darmstadt. Future experiments conducted at FAIR will yield huge amounts of data, the evaluation of which requires a highly efficient IT infrastructure.

Already now, the "FAIR Tera Net" allows the LOEWE-CSC to take over data processing for physical experiments at CERN in Geneva, with which the GSI is directly connected. In 2014, the GSI data processing centre "Green Cube" is to be put into service for FAIR in Darmstadt, thus providing more supercomputer capacity for research purposes.

The "FAIR Tera Net" was jointly implemented by the GSI and the Helmholtz International Center for FAIR and is part of the Hessian Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer



"FAIR Tera Net" is put into operation by the symbolic pushing of a button. In the picture (from left to right): Prof. Volker Lindenstruth, Secretary of State Ingmar Jung, Prof. Werner Müller-Esterl, Prof. Hans Jürgen Lüdde. Photo: Frankfurt Institute for Advanced Studies

Exzellenz (LOEWE - federal state offensive for the development of scientific-economic excellence).

The Frankfurt-based high performance computer LOEWE-CSC works extremely fast and energy efficient and is fully operated with power from regenerative energy sources, making it one of the first CO<sub>2</sub> neutral computers worldwide. At present, LOEWE-CSC is the fifth-fastest computer in Germany. It now was awarded the title of "Landmark" by the "Land of Ideas" site initiative.

of diabetes mellitus and presents state-of-the-art research results and on-going clinical studies.

[www.diabetesinformationsdienst-muenchen.de](http://www.diabetesinformationsdienst-muenchen.de)

### Symposium at the KIT: Big Data in Science

On 25 September 2012, the KIT will host a symposium focusing on the issue of large amounts of data in the field of research. International experts will provide an overview regarding the current processes and infrastructures. The participation fee is 30 Euro. The symposium is sponsored by IBM. [www.helmholtz.de/kat-big-data](http://www.helmholtz.de/kat-big-data)

## International News

### Ocean Research with Canada

In the presence of Federal Chancellor Dr Angela Merkel, an ocean research cooperation agreement recently was signed in Halifax, Canada. The cooperation is supervised by the GEOMAR | Helmholtz Centre for Ocean Research Kiel; further cooperation partners are the Alfred Wegener Institute for Polar and Marine Research and the Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences. The Canadian partner is the Halifax Marine Research Institute, which was newly established at Dalhousie University in Halifax in 2011.

### GITEWS in Indonesia

In July, Federal Chancellor Dr Angela Merkel visited the tsunami early warning centre in Jakarta, which was established by the Helmholtz Association upon commission by the German federal government in the wake of the devastating 2004 Indian Ocean tsunami. For this purpose, Helmholtz experts around Dr Jörn Lauterjung from the GFZ have developed a comprehensive concept for a German-Indonesian-Tsunami-Early-Warning-System (GITEWS). In presence of Prof. Reinhard Hüttel, Head of the GFZ Executive Board, Chancellor Merkel praised the implementation and the scientific quality of the GITEWS concept. At the end of March 2011, according to schedule, the early warning system was officially delivered to Indonesia; the German partners continue to be involved in the training and continuing education of the Indonesian staff.

## Awards

The mathematician **Dr Dmitry A. Fedosov** from the research centre "Forschungszentrum Jülich" receives the Sofja Kovalevskaja Award, one of the most highly endowed German science awards. The prize money totalling about 1.3 million Euro over the course of five years enables Fedosov to create his own research group for researching the differences between the circulation of blood in healthy tissue and in tumour tissue.

**Dr Markus Schubert** from the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) was selected by the European Research Council to receive a "Starting Grant". Schubert is the first researcher at the HZDR to receive such a grant. With the funding, totalling almost 1.2 million Euro, the process engineer intends to for the first time render visible the complex fluid dynamics within chemical reactors and to research their impact on the operating performance.

The Helmholtz International Fellow Award is addressed at outstanding scientists and research managers from abroad, who have earned special merits by their work in Helmholtz-relevant fields. For the first time, the Helmholtz International Fellow Awards now were awarded to six scientists: **Prof. Persis Drell**; **Prof. Steve E. Koonin**; **Prof. John Mendelsohn**; **Prof. Lorne A. Babiuk**; **Prof. Nirmal Kumar Ganguly**; **Prof. Amotz Agnon**.  
[www.helmholtz.de/fellow-award](http://www.helmholtz.de/fellow-award)

**Prof. Alan Tennant** from the Helmholtz-Zentrum Berlin receives the Europhysics Prize 2012 for his discovery of magnetic monopoles. Tennant and his colleagues have proven the existence of magnetic monopoles using neutron scattering at the Berlin research reac-

## New Appointments



KIT President Professor Horst Hippler leaves the Karlsruhe Institute of Technology (KIT) to assume full-time responsibilities as President of the Hochschulrektorenkonferenz (HRK - Standing Conference of German University Presidents) in Bonn. He was elected to this post in April. Professor Eberhard Umbach, with whom Hippler has shared the KIT presidency to date, now will be

the sole KIT president. Amongst other posts, Hippler was the founding president of the TU9 German Institutes of Technology e. V. association and chairman of the Arbeitsgemeinschaft der technischen Universitäten ARGE TU/TH consortium of technical universities. In October 2002, he was elected president of the University of Karlsruhe. Since the university's merger with the Karlsruhe Helmholtz centre and the establishment of the KIT in 2009, he had shared the post of president of the KIT with Eberhard Umbach.

tor BER II. Tennant shares the award endowed with 12,000 Euro with five other scientists, who likewise have published articles regarding the observation of magnetic monopoles.

**Dr Stephanie Bertram**, influenza researcher at the German Primate Centre in Göttingen, receives the Jürgen Wehland Prize awarded by the Helmholtz Centre for Infection Research (HZI). The award honours her outstanding research on influenza viruses and new methods of treatment. The prize endowed with 5,000 Euro is named in memory of Prof. Jürgen Wehland, who was a scientific director at the HZI.

## Calls for Applications

The Helmholtz Association supports the cooperation between Helmholtz centres and foreign research institutions with a new funding instrument. The **Helmholtz International Research Groups** are to provide young researchers in particular with the opportunity of gathering their first experiences as regards international cooperation projects. As a start, the cooperation projects will

be supported over the period of three years with funds from the Helmholtz Initiative and Networking Fund and from the foreign partnering institution. During a pilot phase, Helmholtz International Research Groups can be applied for by all member institutions in the Helmholtz Association. The cut-off date for applications is 1 July 2013.  
[www.helmholtz.de/research-groups](http://www.helmholtz.de/research-groups)

For the sixth time and in close cooperation with the Allianz Chronischer Seltener Erkrankungen (ACHSE e.V. - Chronic Rare Diseases Alliance), the Eva Luise und Horst Köhler Foundation for People with Rare Diseases awards a **prize for research projects focusing on rare diseases**. The research award is to provide for the implementation or, respectively, start-up funding of a research project focusing on patient benefit and is endowed with 50,000 Euro. Sustainable, multiple disease and research networking projects are particularly eligible for the award. The closing date for applications is 01 October 2012. The award ceremony is expected to take place in Berlin on 28 February 2013.  
[www.achse-online.de](http://www.achse-online.de)

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**Note to the media:**  
All articles in the hermann newsletter are cleared for further editorial use.

**Published by**  
Helmholtz Association  
of German Research Centres (registered association)  
Berlin Office  
Communications and Media Relations  
Dr Angela Bittner (responsible according to the press law)  
Anna-Louisa-Karsch-Straße 2, 10178 Berlin  
Telephone +49 30 206329-57 · Fax +49 30 206329-60

**Basic design:** unicom-berlin.de

**Edited by**  
**Dr Antonia Rötger (Science), Prof. Dr Angela Bittner (New Appointments, Awards, Calls for Application), Franziska Roeder (Editorial Office), Lisa Liebenau (Editorial Assistant)**

**Translation:** ALPHA TRANSLATION SERVICE