DESY inFORM.

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Staff Magazine of the Research Centre DESY

FLASH – fit for the future

Hamburg's Mayor Olaf Scholz and the Swedish State Secretary Anders Lönn name experimental hall

In a festive ceremony, Beatrix Vierkorn-Rudolph from the Ministry of Education and Research, the Swedish State Secretary Anders Lönn, DESY Director Helmut Dosch, Hamburg's Mayor Olaf Scholz and the son of Kai Siegbahn – Hans Siegbahn – (from left to right) named the two FLASH experimental halls after the physics Nobel Prize winners Albert Einstein and Kai Siegbahn. Photo: Lars Berg/DESY

On Wednesday, 20 May, approximately 450 guests participated in the naming ceremony for the two FLASH experimental halls named after the physics pioneers and Nobel Prize winners Albert Einstein and Kai Siegbahn. Before the installation of the first measuring stations in the newly erected "Kai Siegbahn" hall, among others, Hamburg's First Mayor Olaf Scholz and Anders Lönn, Swedish State Secretary to the Minister for Higher Education and Research, unveiled the hall names' letterings. The comprehensive technological upgrade and expansion of the facility enables entirely new experimental opportunities and opens up ground-breaking technologies to the international scientific community. "The further technical refinement of our successful X-ray laser FLASH will now give researchers from all over the world even more precise insights into the nanocosm," said DESY Director Helmut Dosch. In the future, scientists will be able to peer into the nanocosm using FLASH at up to twelve different experimental stations, for example to make film recordings of chemical reactions, to examine the dynamics of new types of data storage devices, or to observe biomolecules at work. The research capacity of the X-ray laser is thereby doubled. "The double FLASH is a further element by which the DESY campus in Bahrenfeld is being expanded, turning it into one of the world's leading sites for studying the structure of materials," emphasised Scholz.

"We are greatly honoured that you chose to name one of the laboratory

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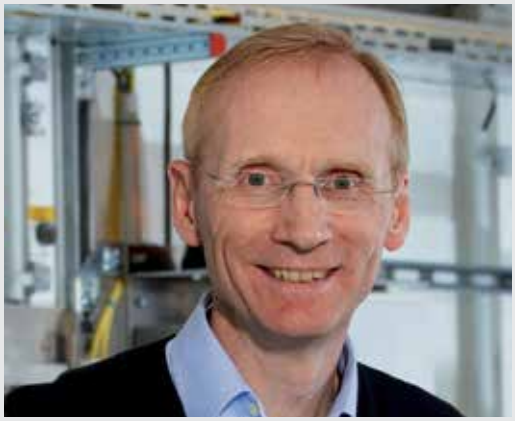
DIRECTOR'S CORNER



Dear colleagues,

DESY is one of the world's leading research centres for the construction and operation of large-scale accelerator facilities and corresponding experiments. Everywhere around the world, this research field is currently in an emergent phase with regard to new developments at photon sources. Free-electron lasers and storage rings with an extremely small emittance, i.e. with extremely parallel and fine light beams for even more precise measurements, are already being planned or constructed at several research centres. For both technologies, DESY is very well positioned with FLASH and PETRA III, as well as the European XFEL. However, in order to remain internationally competitive in the long run, DESY already now must plan the future expansion potential of its facilities, since the lead times for such projects may take 5 to 15 years.

As a result of the recent Helmholtz evaluation (POF III), the research field Matter is to develop a roadmap for the future of photon sources in Germany within the coming one to two years. Based on the very positive experience with FLASH2, the installation of tunable undulators at FLASH1 is of highest priority to substantially reduce the photon energy changing time. Moreover, for FLASH, there is the idea to generate a slight energy increase of the Linac and a higher pulse repetition rate.

Currently, PETRA III still is the storage ring with the smallest emittance worldwide. DESY considers the development of the facility towards a so-called diffraction limited storage ring to be realised in about ten years. In cooperation with the European XFEL GmbH, a suitable and compatible proposal will be elaborated for the future XFEL extension. We are confident that with these plans, DESY will be excellently positioned for the future and for the roadmap process.

Yours,
Edgar Weckert

halls after the Swedish scientist Kai Siegbahn," said Lönn. He also said that the Swedish-German cooperation in the framework of the Röntgen Ångström Cluster is not only bringing together world-class research in Germany and Sweden. The comprehensive research infrastructures in the region are also very competitive in attracting high-tech industries.

"The FLASH expansion creates completely new research opportunities for scientific experiments and opens up new scientific territories," said Beatrix Vierkorn-Rudolph, representative of the German Ministry for Education and Research. "These opportunities also enable new possibilities for cooperation with industry."

About 450 guests participated in the naming ceremony of the new Kai Siegbahn hall. Photo: Lars Berg

FLASH delivers extremely short and intense X-rays flashes, which can be used to observe the ultra-fast processes taking place in the world of molecules and atoms. Every year, the facility is used by some 200 scientists from all over the world, but this represents only a small fraction of the research proposals submitted. Over the past three years, DESY has extended the facility for a cost of 33 million euros, adding a second laser line and a second experimental hall. In doing this, however, DESY is not just increasing the number of experimental stations available; the quality of the X-ray flashes has also been improved thanks to new technological developments. The facility will also be more flexible allowing the wavelength of the X-rays on the new laser line to be altered during operation which is currently not possible at the original laser line.

"There is a special relationship between Albert Einstein, Kai Siegbahn and the research carried out at FLASH," said Dosch. "Einstein's explanation of the photoelectric effect using the idea that light behaves like particles is what enables us to take a sort of chemical fingerprint of our samples." 50 years later, the Swedish physicist Kai Siegbahn came up with photoelectron spectroscopy, a method that allows one to decode the chemical composition of samples. "This method has become an indispensable tool for materials scientists, and is actually being further developed at FLASH to study ultra-fast processes," said Dosch. "The choice of names emphasises the close and fruitful German-Swedish collaboration in research, which has been taken to a new level with the Röntgen Ångström Cluster." *(uw/tim)*

Job chances

First natural sciences mentoring programme for women

By Ingeborg Adler

The course for a scientific career is set quite early. In April, a new mentoring programme was started on the DESY campus, especially designed for women. The aim is to address women from natural sciences who see a career perspective in this environment – with the goal to keep female academics in science.

"Mentoring for Women in Natural Sciences", this is the name of the programme which is a joint project of the Hamburg Centre for Ultrafast Imaging CUI, DESY, the collaborative research centres 676 and 925, and the PIER Helmholtz Graduate School. It addresses female doctoral students and postdocs of the participating institutions. Over a period of twelve months, it offers participants the opportunity for intensive discussions with an experienced mentor and the chance to attend networking events and workshops. "We are glad that we can provide female top-class researchers a mentoring programme which optimally supports their individual career path," said Marie Lutz, equal opportunity officer at CUI, who is leading the project together with Sylvie Faverot-Spengler, equal opportunity commissioner at DESY.

The pilot phase includes four to five dates per year where the participants engage in a discussion with an individually selected female mentor to obtain informal information about their career paths and strategies within science. To guarantee the most suitable mentor for the mentee, the project leaders are supported by an expert counselling network/mentoring of the University of Hamburg during the pilot phase. "What is special about the mentoring programme is the cooperation between the partners located on the DESY campus. We pool our competences in 'womanpower', thus leading the way for an equal opportunity measure across institutions which addresses and connects women from different research institutions," Faverot-Spengler points out. The project is supported by the MIN faculty of the University of Hamburg. Provided a positive evaluation of the first phase of the programme, it may also be extended to other programme partners.

PIER extends funding instruments

Workshops and fellowships for new research ideas

By Mirko Siemssen

The Partnership for Innovation, Education and Research PIER of DESY and the University of Hamburg in future will not only fund research projects within the framework of PIER Seed Projects but has also created two additional funding lines: PIER Workshops and PIER Fellowships. All three instruments support the inter-institutional generation of ideas.

The PIER Seed Projects support the identification, testing, elaboration and implementation of innovative ideas in research and development in the four PIER research fields. The funding concentrates on projects at an early stage where a rapid and non-bureaucratic financial support can significantly contribute to advances in knowledge.

The PIER Workshops funding line supports inter-institutional and interdisciplinary cooperation. PIER workshops are characterised by following a topic beyond what is discussed in specialized scientific communities, by giving the participants plenty of time for discussions and by attracting scientists from different organizations and disciplinary fields. The aim of the workshops is to create new ideas and new cooperation.

The PIER Fellowships fund guest stays of scientists at any stage of their career for a period ranging from two weeks to up to two months. The guest stays – in terms of PIER funding – must be aimed to develop new ideas in interdisciplinary or inter-institutional context. Accordingly, PIER fellows should have an intensive exchange with more than one group during their stay.

PIER

UH DESY Eine Partnerschaft der Universität Hamburg und DESY

INFO

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50 years of „Jugend forscht“ science competition

Regional competition at DESY

50 years of “Jugend forscht” science competition! This, indeed, is a reason to celebrate for the DESY competition participants. Photo: Marta Mayer

By Kim Susan Petersen

The “Jugend forscht” science competition celebrated its 50th anniversary. For 50 years, this competition for young people encourages them to engage in the fields of mathematics, natural sciences and technology. For the third time, DESY organized the regional competition in Bahrenfeld, which is one of the three regional competitions in Hamburg. In February, more than a hundred participants met in the premises of the DESY “physik.begreifen” school-lab to present a total of 64 projects and discuss them in detail with a group of jurors.

Twenty-five projects were part of the “youth science” competition and 39 projects were in the “student experiments” competition which already admits applications from students in the 4th school grade. Once the jury interviews were over around noon, the kids and youths could sigh with relief. The jurors, however, still had some work ahead of them namely the determination of the ranking. Certainly not an easy task given the large number of fascinating and interesting projects!

At the last day, many visitors – not only parents and relatives, but also interested DESY people and representatives of the local press – used the opportunity to have a look at the exhibited projects being explained by the young researchers. This was followed by a ceremonial event in the DESY auditorium, with DESY Director Reinhard Brinkmann and Michael Just from the Hamburg school board presenting diplomas to the participants.

A total of eight projects were awarded a 1st prize, thus qualifying for the Hamburg state competition. Some special prizes were also endowed: Joscha Löwe and Andreas Rausch from Gymnasium Hochrad, for example, received the Renewable Raw Materials special prize for their “Investigation of the suitability of Chlorella vulgaris as foodstuff”. The Environmental Technology special prize was presented to Jakob Grzeskowiak, Tim Barabas and Jan Hoffmann from Lise Meitner Gymnasium for the “Performance increase of a solar cell through cooling and alignment”.

At the Hamburg state competition, two projects from the DESY regional competition qualified for the national finals in Ludwigshafen: Chaim Lukas Maier from Deutsche Schule Toulouse in Colomiers and Colin Maier from the University of Hamburg focused on different methods to shuffle playing cards, and Qimu Wang from Gymnasium Blankenese pursued the question of whether the famous clone sheep Dolly was really a clone.

Angela Meyer zu Rheda, head of the regional competition, is already looking forward to cooperating with DESY next year. “It is fun to jointly organise this competition. The DESY school-lab rooms are perfect for the presentation of the research results of the young talents. With great commitment, school-lab leader Karen Ong and her dedicated team provide for a smooth order of events and a wonderful competition atmosphere every year. This feedback was given by the participants, the supervising teachers and the jurors as well. For this, I would like to thank you very much!”

Dark matter in the mirror

FUNK experiment is on the track of unknown ultralight elementary particles

By Babette Döbrich

When you read this article, you will probably have the so-called dark matter directly in front of you. This mysterious form of matter is presumably so close to you that it literally catches your eyes – yet, it is still invisible. This is due to the fact that dark matter, according to current knowledge, is mainly interacting with ordinary matter via gravity and not via electromagnetic radiation, to which our eyes are sensitive.

What is dark matter made of? According to astrophysical measurements, it is five times more abundant in the universe than the kind of matter familiar to us; but currently, this question is completely unresolved, although there are different model concepts. Equally unresolved is the question whether dark matter never interacts electromagnetically or only extremely weakly. With many different detectors, physicists seek traces of this unknown form of matter.

To build a detector for such unknown forms of matter, it is necessary to postulate some of their characteristics. Since the dark matter models are so different, the detectors vary as well. Only recently, a new experiment in Karlsruhe, with the participation of DESY scientists, joined this colourful group: FUNK is sensitive to a group of very light dark matter candidates which weakly couple to electromagnetic waves. The ALPS II experiment at DESY also looks for particles of this class.

If such a coupling is present, dark matter will interact with components which were actually designed for photons. The simplest way is to use a mirror. The larger the mirror, the more likely something will be seen. FUNK (Finding U(1)'s of a Novel Kind) therefore measures the electromagnetic radiation which is emitted by a 13 square metre and spherically curved mirror set up in an extremely dark environment.

In complete darkness, nothing should be seen – unless dark matter definitely interacts with the mirror. If such a signal appears, the wavelength emitted by the mirror should roughly correspond to the mass of the dark matter particles. This has the advantage that, with a broadband measurement, it would be possible to scan a broad measuring range of such dark matter candidates. Experimentally, the easiest way is to start the search within visible light. Therefore, FUNK uses a special detector (a low-noise photomultiplier) sponsored by the Helmholtz Alliance for Astroparticle Physics, which this summer for the first time will hold a mirror up to dark matter. Let's see if it will show its face.

Members of the FUNK team in front of the mirror. Photo: Ralph Engel

Hinrich Meyer becomes HAP Senior Fellow

In recognition of his abundant merits regarding the progress of physics, particularly astroparticle physics, DESY scientist Hinrich Meyer was elected Senior Fellow of the Helmholtz Alliance for Astroparticle Physics (HAP). The emeritus physics professor of the University of Wuppertal has done particle physics research in several DESY groups for decades, and he substantially contributed to the development of the astroparticle physics research field. Meyer is still member of the DESY groups H1 and BELLE II. Moreover, he works with colleagues at an experiment at DESY to measure gravitation with high precision, developed at the University of Wuppertal.

Emmy Noether grant for DESY theorist

Elli Pomoni from DESY's theory group received funds from the Emmy Noether Programme of the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) amounting to almost one million euros. The Emmy Noether Programme supports young scientists to carry out independent research in the early phase of their scientific career. Elli Pomoni will use the grant to establish a group of young researchers including two PhD students and one postdoc. Over a funding period of five years, Pomoni and her team will conduct a research project on "Exact results in gauge theories".

Innovation award for DESY start-up

With an innovative high-speed X-ray camera, the DESY spin-off X-Spectrum GmbH has won the Hamburg Innovation Award in the category Start. The newly developed camera enables cutting-edge research in a fraction of the time previously needed, as the jury emphasized. The company's founders received the award at the Hamburg Innovation Summit. The fast X-ray camera with high resolution named LAMBDA (Large Area Medipix Based Detector Array) is equipped with 750 000 pixels and takes up to 2000 images per second.
http://hamburg-innovation-summit.de

1st CSSB International Symposium

What is systems biology? How can systems biology approaches advance infection biology research? Investigating these key questions was the focus of the 1st CSSB (Centre for Structural Systems Biology) International Symposium, held from 9 to 11 April at the Bernhard Nocht Institute for Tropical Medicine in Hamburg. The symposium organized in cooperation with the Joachim Herz Stiftung, focused on understanding "Systems in Infection Biology – From Molecules to Organisms" and examined the potential synergies and interdisciplinary opportunities existing between CSSB's three research areas; systems, infection and structural biology.

"Bringing together means among many other things: learning from each other, listening to each other, working and collaborating with each other," explained CSSB Scientific Director Matthias Wilmanns in his welcome speech. "We are happy to support and to strengthen interdisciplinary research in the new Centre for Structural Systems Biology here in Hamburg. With its interdisciplinary focus, the symposium helps to broaden research and to come up with new ideas to tackle existing questions," added Andrea Pauline Martin, Vice-Chairwoman of the Executive Board of the Joachim Herz Stiftung, in her welcome speech.

During the symposium, renowned speakers addressed different facets of systems biology such as the systems biology of apoptosis, the use of omics data to understand interactions between pathogen and host and the biotechnical applications of systems biology. A tour around the DESY campus was also on the agenda. Several group leaders from the European Molecular Biology Lab (EMBL) gave a guided tour to the PETRA III research facilities and explained the beamline technology and the services available for protein preparation and crystallization.

At the end of the symposium, Wilmanns highlighted the importance of conducting interdisciplinary research and the enormous potential lying in the combination of systems, infection and structural biology. The symposium has paved the way for the establishment of an international and interdisciplinary cooperation in this field. "We are truly looking forward to hosting our next symposium in 2017 in the lecture hall of the new CSSB building," said Wilmanns.

Matter and Technology

Kick-off meeting of new Helmholtz programme at DESY

At the end of February, approximately 200 scientists, including 50 PhD students and postdocs, met at DESY for the kick-off meeting of the new Helmholtz "Matter and Technologies" research programme. "The aim of the meeting was to put in concrete terms the goals formulated in last year's programme proposal and to determine the scientific projects for the coming five years," said DESY scientist Ties Behnke, organiser of the workshop and spokesman of the programme. In a mixture of plenary talks and parallel theme-sessions, the scientists coordinated the goals of the programme and presented their latest research as well as new ideas and projects.

The talks on accelerator and detector development presented among others by Norbert Holtkamp, US accelerator centre SLAC, and by Rasmus Ischebeck, Swiss Paul Scherrer Institute, showed clear starting points for linking these two research themes more closely, as Behnke pointed out. A hot topic was also the proposal offered by DESY accelerator physicist Ralph Aßmann to develop a common infrastructure for the investigation of future accelerator technologies. Parallel to the meeting, this idea was reviewed by an international commission chaired by Alan Caldwell, Max Planck Institute for Physics in Munich. Finally, DESY scientist Henry Chapman presented the technological challenges which will arise with the experiments at the X-ray laser, European XFEL making it evident that the technology developers of instrumentation will have plenty of work for years to come.

Addressing especially young researchers, a meeting of PhD students from the "Matter and Technologies" programme took place prior to the actual kick-off. This first so-called "MT student retreat" was a forum for students to present their work and most importantly to build networks with students from other centres to develop a better understanding of the research done within the programme. The students also exchanged information on the general framework and research conditions at the various centres, identified problems and discussed possible improvements. The feedback was quite good, therefore this part of the event will certainly be continued in the future.

Participants of the kick-off meeting. Photo: Marta Mayer

"Altogether, we are looking back at four intense and very interesting days," Behnke summarized. "This meeting contributed to better define the goals of this new programme, to better get to know each other and to make a major step for 'Matter and Technologies' to develop from an idea to an operating programme." *(tz)*

INFO

http://www.helmholtz.de/en/research/matter/matter_and_technologies/

Multi-faceted cutting edge research

Designated Helmholtz President Otmar Wiestler was impressed of DESY

By Carolin Hahn

Otmar Wiestler, the designated President of the Helmholtz Association, (at right, talking with DESY Director Helmut Dosch), has not yet taken up office, nevertheless he is already very interested in the themes which await him in his new role. Wiestler, who originally studied medicine and is currently an active board member of the German Cancer Research Centre in Heidelberg, visited DESY in April, with his companions from Heidelberg and Berlin, he could experience the centre in all its facets. The visitors were not only impressed by the research but also by the liveliness and dynamics of the centre.

Apart from discussions with the directorate and leading scientists, Wiestler's agenda included visits to the European XFEL construction site, to PETRA III, FLASH and CFEL.

One highlight in the late afternoon was a round of talks with young researchers, which once again illustrated the versatility of the centre and its staff members. The interest of the future Helmholtz President in the perspectives and ideas of the younger generation was manifested once again later, at the reception in the CFEL foyer. Long after the official close of this event, he was still involved in conversations with PhD students and postdocs. Photo: Marta Mayer

Research cooperation with Turkey

DESY and European XFEL present themselves at Turkish universities

In the beginning of May, a science roadshow organised by DESY and European XFEL around the X-ray sources FLASH, PETRA III and European XFEL took place at Turkish universities. In the course of one week, German and Turkish scientists of both centres presented their research and cooperation possibilities at four universities in Istanbul and Ankara.

Presentations at the University of Istanbul. Photo: Frank Poppe

Altogether some 400 students and scientists visited the exhibition, lectures and a public colloquium with DESY Director Helmut Dosch and the scientific director of European XFEL, Sergei Molodtsov. The roadshow was part of the German-Turkish Year of Science proclaimed by the German Federal Ministry for Education and Research and the Turkish Science Ministry, which both research institutes would like to use to strengthen their engagement in scientific collaboration with Turkish institutes.

A German-Turkish workshop on accelerator-based photon sources will follow in autumn. A special "Science Day" will also be organised for the people of Turkish origin living in Hamburg which mainly addresses Turkish pupils from the metropolitan region.

Already on 8 April, the Turkish ambassador Hüseyin Avni Karslıoğlu and the consul general of the Republic of Turkey Mehmet Fatih Ak, domiciled in Hamburg, visited DESY and European XFEL. Both confirmed their full support for the various activities of both centres. *(tz)*

Business and biodiversity

A project for more sustainability at DESY

A lot of construction is going on at DESY. New experimental halls, new buildings for institutions and collaborations make for a promising development on the campus and reinforce DESY's international reputation in top-class research. However, new buildings always come with a lot of concrete and land sealing, yet there are fascinating perspectives for the remaining green areas on the DESY ground.

Green areas can differ very much – think for example of monotonous lawns, species-poor zones with exotic shrubs or industrially grown roses as decorative plants. The „UnternehmensNatur" (business and biodiversity) project, lauched by the Nature and Biodiversity Conservation Union (NABU) in 2014 together with the Hamburg Chamber of Commerce and the Hamburg Authority for Urban Development and the Environment (BSU), shows that there are alternatives though. This project presents companies with ways to create valuable and biodiverse habitats through near-natural design and maintenance of their premises, thus setting a visible example of responsible and sustainable action. This can be done by reducing the maintenance of the green areas, minimising land sealing, using native plants and trees, planting greenery on roofs and facades, creating ponds or generating room for birds or bats.

"By creating an appropriate environment for animals and plants, a very distinct and specific kind of nature can develop within a short time. For this aim, we provide information to enterprises on possible measures and we support their implementation," said Alexander Porschke, chairman of NABU Hamburg. DESY has now joined this project and, after a comprehensive inspection of the campus by a NABU expert, obtained a concept for near-natural planning which may be implemented with relatively little effort. The great success of the DESY kestrel webcam or the engagement of beekeeper Elena Chmielewski with her bee colonies on the DESY campus already show that more nature is not only good for biodiversity but also offers a great deal to DESY staff members.

In particular, several hillside areas, meadows and grass verges on the campus may be designed and developed naturally without great effort. A rough-and-ready rule is to plant native trees and shrubs, to carry out a minimum of maintenance (good for nature and cost-saving), create wildflower meadows, design near-natural waters and install nesting boxes for birds. With expert advice, simple measures already lead to visible success. Even grass verges can become optical and ecological highlights with native flowers blooming in spring – and provide some education as well, since this offers the possibility to get to know typical spring flowers: white windflowers, bright yellow buttercups and the delicate violet blossoms of liverwort.

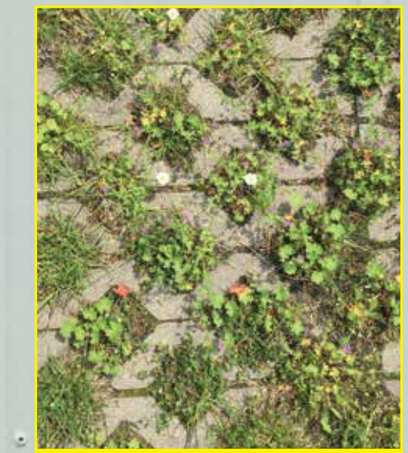
Those who believe this to be irrelevant underestimate the serious problem of loss of species and biodiversity in Hamburg. Many animals and plants live in our direct neighbourhood, including rare and endangered species. They all benefit from close-to-nature and interconnected green areas in the city. Due to the voluntary engagement of enterprises, it is possible to create ecologically valuable environments which at the same time are attractive recreation areas for employees and a model of sustainable development. Particularly because construction is not only going on at DESY but also throughout the whole region of Hamburg, a responsible handling of the remaining green areas is even more important.

"The natural development of our green areas is an important component in a very broadly conceived initiative," said DESY sustainability officer Andreas Hoppe. "Currently, we are dealing with energy management, the use of waste heat originating from helium processing and an efficient cooling for the new computing centre." All these measures are saving resources and are also financially supported. "As a research centre which is engaged in issues concerning the future of humanity, DESY took up the cause of sustainability," DESY Director of Administration Christian Scherf points out. "In many respects, science can become the precursor of the culture of sustainability, and we would like to contribute." *(uw)*

Join in!
Help to develop more nature at DESY.
Infos: d5@desy.de

Charlock grows on building sand and wasteland at DESY. It produces plenty of seeds and spreads very quickly.

Shadowy road shoulders provide space for ferns and mosses.



The small-flowered cranesbill cuts its way through the cobblestone holes.

Buttercups and moss conquered these abandoned benches at DESY.

Poppies do not only grow at the border of fields but also on wasteland, dumps and gravel yards. At DESY, among other sites, it embellishes the containers behind building 7. Photos: tim

Car pooling at DESY

Every day, up to 1800 DESY staff members drive to DESY. They often get stuck in traffic jams or have to search for free parking space. There are many good reasons to use the DESY car pooling market, with the opportunity to meet other people from other departments, save fuel and money, reduce stress and do something good for the environment.

This initiative provides the opportunity to offer single or regular rides. Meeting points, fares and other agreements are to be agreed upon individually by driver and passenger:
http://mitfahrgelegenheit.desy.de (in German)

Research Course 2015

At the end of March, the 14th DESY research course on X-ray sciences took place in Hamburg, focusing on new trends in X-ray scattering and spectroscopy from magnetic materials. This three-day course series, established in 2001 and giving insight into current trends in the field of X-ray physics, particularly addresses master and PhD students. This year, more than 120 participants attended a total of 14 talks held by national and international speakers. The participants also had the opportunity to present their own research findings at a poster exhibition. At the closing event – a course dinner with a dinner talk of Robert Blick featuring nanoscience in Hamburg – Oles Sendetskyi (PSI), Christian Weier (FZ Jülich) and Martin Bluscke (MPI Stuttgart) won the first ever Research Course Poster Prize.

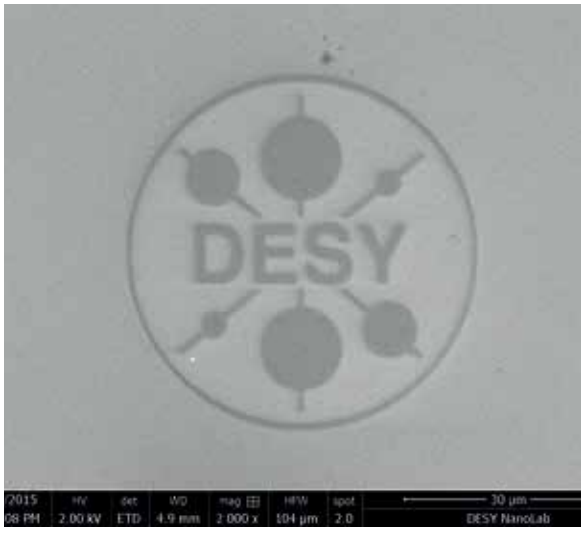
SEI meeting in Zeuthen

Once a year, developers of electronics, data acquisition and process control meet at one of the Helmholtz centres. This years' SEI meeting of the study group for electronic instrumentation at Helmholtz centres took place in March at DESY in Zeuthen. The main focus of this event is always the exchange of current activities. Apart from talks covering the fields of concept development, implementation of circuits, programming and engineering practice, the almost 80 participants of research centres and universities had the opportunity to discuss with firms during an exhibition of research-relevant products: **http://sei.desy.de**

Nano, Laser, Molecular dynamics

EU promotes networking

A new EU project with DESY participation is aimed at advancing the concentration of nano research in Europe. NFFA Europe (where NFFA stands for "nanoscience foundries and fine analysis") will further improve networking of important European nano materials research facilities with the numerous user groups in nano reseach and technology. Apart from DESY, 19 partners from ten European countries are participating. The goal is to strengthen multidisciplinary research with the utilisation of research infrastructures at the nano scale, including the synthesis of nanomaterials, nano characterisation (e.g. in the NanoLab at DESY) and the theory and numeric simulation with high-performance computers. This, for example, helps to bring more industrial products to market maturity.



Scanning electron microscopy image of a DESY logo made of platinum, inscribed on a silicon surface with a fine electron beam. This technique is used in the DESY NanoLab to label individual nano objects which are then investigated in the PETRA III X-ray beam.
Photo: Thomas Keller

DESY and the European XFEL GmbH participate in the EU project EUCALL (European Cluster of Advanced Laser Light Sources), together with eight European partners. It is focused on state-of-the-art optical lasers and accelerator-based X-ray sources, as well as on the corresponding technologies, scientific applications and user communities which in the future will cooperate more closely and exploit synergy potentials. EUCALL will also include the establishment of a widespread consortium of all optical and X-ray laser light sources in Europe. Apart from technological challenges, it also involves a comprehensive management of resources and bundling of competences.

The EU project MEDEA (Molecular Electron Dynamics investigated by IntensE Fields and Attosecond Pulse) deals with the interaction of atoms and molecules with light, taking place on the attosecond time scale (one attosecond is the billionth of a billionth of a second). Such ultrafast processes with the participation of many electrons offer new insights into molecular reactions, for example the breaking of bonds in complex molecules, and make them relevant for technological applications. Therefore, apart from twelve research institutes including DESY, eight partners from industry also joined this project.

To better connect the European and Russian research institutions in the field of large-scale facilities for science is the target of the collaborative project CREMLIN (Connecting Russian and European Measures for Large-scale Research Infrastructures). Altogether 13 European and 6 Russian large-scale research facilities are associated in this project. While Russia participates in European research facilities such as the European XFEL, FAIR, ESRF or in the LHC experiments, CREMLIN on the other hand will help European scientists to participate in new Russian large-scale projects. *(uw)*

Considerable back-up in particle physics

DESY welcomes three leading scientists within the framework of the Helmholtz Recruitment Initiative

Since the beginning of the year DESY has three new leading scientists for particle physics. Within the framework of the Helmholtz Recruitment Initiative, some of them were appointed together with the University of Hamburg. Within this recruitment initiative that aims at persuading excellent scientists to work at Helmholtz research centres while at the same time improving networking with universities, DESY proposed candidates for leading positions which were then selected by Helmholtz committees in an interdisciplinary procedure.

Elisabetta Gallo was appointed together with the University of Hamburg. She joined the CMS group at DESY. The experimental physicist had coordinated particle physics at the Istituto Nazionale di Fisica Nucleare (INFN) and taught at the University of Florence. With her research focused on Higgs physics, she continued work she started in 2008 at the LHC at CERN in Geneva, building a bridge to research with the planned International Linear Collider ILC.

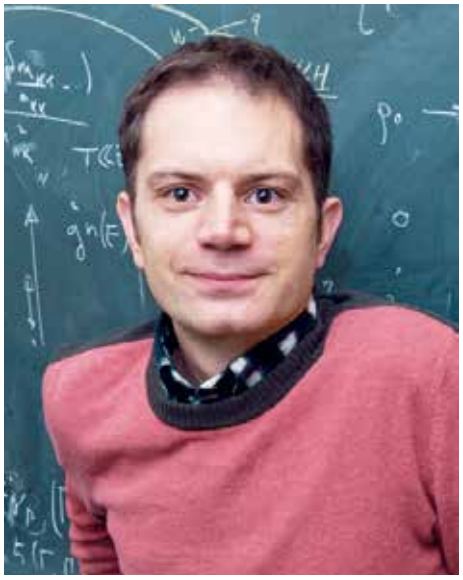
Elisabetta Gallo graduated at the University of Florence and did research at Imperial College (London). From 1992 to 2007, she had worked as a scientist at the ZEUS experiment at DESY; from 2006 to 2007, she was spokesperson of the ZEUS collaboration.

Elisabetta Gallo

Geraldine Servant

Geraldine Servant joined the DESY theory group, also appointed together with University of Hamburg. She comes from Barcelona where she has been Research Professor at ICREA (Catalan Institution for Research and Advanced Studies) since 2013. Geraldine Servant got her PhD in 2001 from University Paris 11 for theoretical research conducted at CEA Saclay and McGill University in Montreal. After postdoc years at the University of Chicago she returned to CEA Saclay and eventually moved to CERN's theory group in 2006, first as a fellow and then on a five-year contract with an ERC grant. Her major direction of research is on the particle cosmology interplay, in particular on dark matter and the origin of the matter-antimatter asymmetry of the universe. She has worked on models of new physics at the TeV scale and their collider phenomenology and is eagerly awaiting the avalanche of new data coming not only from the LHC but also from Dark Matter direct searches at underground laboratories, indirect searches at cosmic ray telescopes, as well as from large-scale structures simulations.

Christophe Grojean also joined the DESY theory group in January, also coming from Barcelona. Grojean started his research work in theoretical high energy physics at CEA Saclay and got his PhD from Orsay University in 1999. After two years at the University of California in Berkeley he returned to Saclay, followed by a visiting professorship at the University of Michigan in Ann Arbor and a seven-year employment at CERN theory. In the fall of 2012, he joined the Institut de Física d'Altes Energies at Universitat Autonoma de Barcelona as an ICREA Research Professor. Christophe has worked on various topics in particle physics beyond the Standard Model. A few years ago he specialised in the physics and the dynamics of the Higgs boson and its possible various incarnations, which fit into the several theories



Christophe Grojean

behind, respectively. In his new position he is working in close contact with experimentalists to establish the profile of this new particle. He is also involved in various working groups to define the physics case of the next colliders after the LHC. *(tz)*

PETRA III starts up again

New experimental possibilities with brilliant X-ray light

Photo: Dominik Reipka

In April, after a shutdown of about one year, the X-ray light source PETRA III started operation again with 14 existing experimental stations. During the shutdown, two additional experimental halls were built which will now be gradually equipped with beamlines. In total, up to eleven of them will be possible if the necessary funding is provided.

The new PETRA III beamlines will be used to continue important and successful measurement techniques, for example X-ray absorption spectroscopy, and to create new experimental possibilities which exploit the extremely brilliant light of PETRA III. During shutdown, the PETRA III storage ring tunnel was completely dismantled over a distance of 80 metres for the north and east extensions respectively, and the ring tunnel was torn down. In these areas, PETRA III was rebuilt with new components to provide room for nine additional undulators supplying X-ray light for the new experimental stations. Another measuring station in the north extension will get light from the already existing 40-metre-long damping wiggler which is actually used to improve the beam quality. One experimental station for experiments on luminescence will be placed in a small measuring hut at the PETRA III ring between the Kai Siegbahn and the Max von Laue hall, and fed with the ultraviolet light of a deflecting magnet. The experiments at the PETRA III extensions will mainly investigate the properties of new materials.

Both extensions are furnished with office space covering a total of 690 square metres and with laboratory space of 640 square metres to prepare the samples for the measurements. The buildings have already been completed. Since May, the first two measuring huts are being erected in the north extension which receive X-ray light for tests in autumn. It will then also be possible to submit the first beamtime applications, and first experiments at the two first beamlines will begin in spring 2016. For the establishment and operation of three beamlines, there is an international cooperation with India, Sweden and Russia. “We have an ambitious schedule for the construction of the PETRA III extensions,” said Wolfgang Drube, project leader of the PETRA III extensions. “With a little luck due to good weather conditions, the very punctual construction handover by the building

contractors, and particularly because of the excellent collaboration between all those involved, we always managed to remain on schedule."

At the existing 14 beamlines of the Max von Laue hall, the shutdown was used to repair two undulators and to fundamentally upgrade and modernise the technical equipment of the experimental huts. When electrons travel through an alternating magnetic field across the undulators, they produce X-ray light for the experiments. Some of the undulators lost one to two percent of their magnetic field strength by the interaction of their permanent magnets with a few electrons going astray. Even though this effect is small, it caused a loss of 50 percent of the X-ray light and doubled the time of data taking. The magnet structure of one undulator was newly aligned, the magnet structure of a second undulator was replaced by a magnetically harder material.

The optimisation of the technical equipment during shutdown also included the monochromators: These are light filters which only let through X-ray radiation of a selectable wavelength. The experiments have extremely high requirements regarding beam quality and stability. During operation in the past years, it turned out that monochromators are vibrating, thus producing a "wobbling" X-ray beam. It was only a slight wobble, just some thousands of a millimetre, but still not acceptable. During shutdown, the reason for these vibrations was systematically investigated. Two monochromators have been modified and now the vibrations are damped by a factor of two to three. The other devices will be modified within the next two years.

Fast and high-resolution X-ray detectors are essential for experiments at PETRA III. New detectors developed by the DESY detector group headed by Heinz Graafsma have a frame rate of up to 2000 per second and each image can have a size of up to six megabytes. This enormous amount of data is to be processed by a newly established network and data storage infrastructure.

At each beamline of the Max von Laue hall, additional new equipment has been installed. Beamline P02, for example, will in future have a robot carrying out an automatic change of samples. Beamline P03 obtained a better beam focussing system. Beamline P05 will in future allow to alternatively use a monocromator or a new double-multilayer mirror which, compared to the monochromator, provides ten times more X-ray light for the experiment. P06 has a new detector. This increases the sensitivity for X-ray fluorescence by a factor of over a hundred and for example allows the detection of the smallest amounts of trace elements in organic material. P08 will in future have a so-called pump-probe laser to investigate the behaviour of biological membranes on the water surface. P10 considerably modernised the rheometer used to observe sheared fluids.

"For the start of PETRA III experimental operation, all members of the Photon Science and Machine groups worked together in a very efficient way. We finished two or three weeks earlier than scheduled and we are glad to offer our experiments to external users again," said Oliver Seeck, head of the PETRA III experiments. *(hw)*

First undulator for the beamline P65 in the PETRA III north extension. Photo: Joachim Spengler

Experimental hall of the PETRA III north extension. In the centre of the photo, there is the concrete hut for the optical beamline components. Photo: Wolfgang Drube

New impulses

DESY Engineering and Innovation Day 2015

By Ralph Döhrmann

At the end of April, the fourth DESY Engineering and Innovation Day took place in Hamburg in the DESY auditorium. Some 120 participants listened to talks on issues like EMBL beamline monitoring, quality assurance or beam intensity measurements at free-electron lasers. As in the past years, the event also included a poster exhibition during which colleagues from all DESY divisions had the opportunity to discuss new developments, ongoing projects and their know-how in various fields.

The Engineering and Innovation Day is organised every year by the KITE initiative whose members are designers, engineers, technicians and developers. It addresses all developers, technicians and engineers at DESY and of the campus partners who were represented with numerous participants.

In his welcome address DESY Director Helmut Dosch emphasised the importance of this exchange which helps DESY to stay competitive and innovative in the long run. The existing resources can be bundled and used even better when the networking among the developers is close. An intensive exchange between the DESY groups could generate new impetus leading to bigger success of DESY. The next Engineering and Innovation Day is already being planned and KITE welcomes suggestions.

INFO

http://kite.desy.de/ (in German)

EU funding

Seven new projects in DESY particle physics

By Natalia Potylitsina-Kube

The first quarter of this year was an extremely successful one: in the FH division, seven new projects received EU funding approvals; the funding amounts to nearly 7.5 million euros in total.

With “Europe-Japan Accelerator Development Exchange” (E-JADE, Eckhard Elsen) and “Japan and Europe Network for Neutrino and Intensity Frontier Experimental Research” (JENNIFER, Carsten Niebuhr), two projects will be funded within the framework of the EU programme “Research & Innovation Staff Exchange” (RISE). Both projects will intensify collaboration with Japanese scientists, namely in the field of the advancement of accelerator technologies and of precision measurements and tests of the lepton-flavour structure in the context of the standard model of particle physics.

Another three projects will be funded by the European Research Council (ERC). Two of them are located in the theory group in Hamburg: “New avenues towards solving the dark matter puzzle” (NewAve, Kai Schmidt-Hoberg) and “Inflation in String Theory – Connecting Quantum Gravity with Observations” (STRINGFLATION, Alexander Westphal). The third project “Neutrinos and the origin of the cosmic rays” (Walter Winter) is located in Zeuthen. With the ERC grants, groundbreaking research projects will be supported by excellent scientists, and the establishment of project workgroups for independent and autonomous research activity will be facilitated.

The project “Advanced European Infrastructures for Detectors at Accelerators-2020” (AIDA 2020, Felix Sefkow) is an initiative of leading European research centres and institutes to do research in the field of new detectors. The project bundles the competences of a total of 38 partners from 19 countries with the aim to promote the development of new high-performance detectors for particle physics in order to meet the high standards which, for example, are required for the LHC upgrade.

The IT project “INtegrating Distributed data Infrastructures for Global explOitation” (INDIGO, Patrick Fuhrmann) will be funded within the framework of the EU working programme European Research Infrastructures of Horizon 2020. The INDIGO initiative will advance the development of a new cloud software platform for the scientific community and it will bring together 26 institutions and large companies from 11 European countries. The common software platform will be made available free of charge as an open source software to master future challenges in both, data processing and storage of enormous amounts of data from very different disciplines.

Researchers for a day

DESY participates in IceCube Masterclass

In March, DESY in Zeuthen participated in the IceCube Masterclass for the first time. It was created by the IceCube cooperation partners of the University of Wisconsin-Madison last year based on the model of the IPPOG Masterclasses. A total of ten research institutions in Europe and the United States opened their doors for this programme. School students were invited to learn about current astroparticle research. On the day, 20 pupils of 9th grade were guests on the DESY campus in Zeuthen.

Pupils evaluating IceCube data. Photos: DESY

IceCube is a neutrino detector melted into the ice of Antarctica. It has a volume of one cubic kilometre and is the largest particle detector worldwide. A team of hundreds of scientists made this project come true, together with engineers, drillmasters, IT experts and many other technicians. DESY ranks as second partner after the University of Wisconsin-Madison in this cooperation. Ice Cube is a multipurpose detector which allows scientists to focus on various open questions of modern physics, investigating for example the nature of dark matter and neutrino oscillations.

The main purpose to build this detector however was the search for ultra-high energetic neutrinos which may help to understand the sources and properties of cosmic radiation. More than five thousand sensors, the so-called digital optical modules (DOMs) deployed underneath the ice surface, register neutrino signals. These particles come from outer space and originate from places which are also the sources of cosmic radiation. Cosmic radiation mainly consists of ultra-high energy protons and heavy atomic nuclei. Since its discovery in 1912, the exact origin remains largely mysterious.

At the IceCube Masterclass, the pupils were given the opportunity to analyse real IceCube data – neutrino signals which deliver information about extreme objects, e.g. black holes or gamma ray bursts. In the course of the day, the young people had the chance to discuss with scientists of the Zeuthen IceCube group and to communicate via live broadcasting with scientists working at the South Pole and at other institutes.

For all participants, it was a successful start and bodes well for the attendance of the IceCube Masterclass in the coming years. *(ub)*

Flea market for children's items

On Friday, 19 June, this years' flea market for children's items takes place in the foyer of the DESY auditorium in Hamburg. This is the opportunity to have fun at selling and buying used children's toys, clothes etc. without much effort. Room and tables are provided, but we recommend to bring a blanket just in case there are not enough tables available. Registration is not required. Sellers may start placing their items as from 12 o'clock.
This action is aimed at all people working on the DESY campus. For further questions, please contact the equal-opportunity office: gb-buero@desy.de or DESY extension -1831

Two DESY scientists attend the Lindau Nobel Laureate Meeting

The DESY scientists Antonia Karamatskou and Charlotte Palmer will go to this year's Nobel Laureate Meeting in Lindau. In a multi-step procedure, both were chosen from some several hundred applicants to attend the Nobel Laureate Meeting.

Antonia Karamatskou is a PhD student under Robin Santra of DESY and the Institute of Theoretical Physics of the University of Hamburg. The young researcher works at the Center for Free-Electron Laser Science (CFEL) and belongs to the collaborative research centre (SFB) 925 "Light induced dynamics and control of correlated quantum systems". She works as a scientist in the field of interaction of atoms with intense light.

Charlotte Palmer is a postdoc in the Plasma-Wakefield Accelerators group (PWA) of Jens Osterhoff at DESY. With the support of the Helmholtz Postdoc Programme, she is head of the "Controlled Generation and Advanced Diagnosis of Ultra-Short Plasma-Accelerated Electron Bunches". The PWA group investigates the plasma-wakefield acceleration, a new technology for particle accelerators.

The Lindau Nobel Laureate Meeting, held from 26 June to 3 July, brings together scientists from all over the world to meet Nobel Prize winners. This meeting already takes place for the 65th time, it was started in 1951 as a European initiative for reconciliation after the Second World War. The topics are the scientific Nobel disciplines chemistry, medicine and physics.


Photo: Kim Susan Petersen

Chocolate marshmallows & particle detectives

DESY kids do research at the school-lab

By Bettina Aßmann

The children of DESY staff spent two mornings at the „physik.begreifen“ school-lab in Hamburg to do experiments and research. It was a holiday event created and supported by the equal opportunities office.

On the first day, the DESY school-lab welcomed the very small ones between the ages of four and six years. At first, they were all eyes and quite shy when they were sitting remarkably quietly in the seminar room observing our gummy bears in the cup. Afterwards, in the lab, they developed many ideas on what to do with air. Air is not visible but one can feel it and use it to make noises. The children were asked to drag an umbrella behind them to feel the air resistance.

After a break, they eagerly followed the experiments with a bell and a balloon in the vacuum. Of course, they also enjoyed the highlight – the chocolate marshmallow in the vacuum. The research results were depicted into a lab notebook and an air diploma was awarded at the end. A very small participant asked if we had glued together the hemispheres (i.e. the Magdeburg hemispheres). She could not believe at all that they are so strongly pressed together only by air…

On the second day, the older children of ages from six to ten years came to DESY. Under the slogan “particle detectives”, they had the opportunity to spy out the world of particles. At the beginning of the event, a young participant surprised us with her knowledge of the fact that there are small particles named quarks. Unfortunately they did not explore quarks but larger pre-prepared “particles” that had to be destroyed first to see the smaller particles inside. With a lot of tricks and tools, these components were then separated. The results were depicted and written down into a lab notebook.

Afterwards, one participant took us to the ARGUS detector which already had been shown to her by her daddy a couple of times before. There, the youth researchers built their own small detector and tried to “read” tracks. The event concluded with the presentation of the particle diploma. At the end, all participants agreed: “The place where mom and dad work is really great!”

HELMHOLTZ ASSOCIATION

Protein fireworks activate Parkinson's

Dementia, such as Parkinson's or Alzheimer's disease, can be induced by protein deposits in the brain which damage the nerve cells. One of the features of Parkinson's disease is that the protein alpha-synuclein clumps and forms long fibres which spread out in all directions. “Although these structures are being studied intensively, we still do not know all the details about the exact processes of their formation,” said Dieter Willbold from Forschungszentrum Jülich. Together with his colleagues and scientists from the University of Düsseldorf, he managed to observe under the microscope how these harmful protein fibres grow.

Over a period of more than 40 hours and by using a fluorescence microscope, the scientists took snapshots of the fibres at regular intervals which, due to a special pigment, glow brightly. In this process, the scientists made the observation that there is no continuous formation of the fibre structure but that there are regular breaks. However, the reason for this stop-and-go pattern is still not understood. “This information might nevertheless be essential in the search for effective treatments – there are still no causal treatment possibilities for Parkinson's disease,” said Willbold. Scientists already observed a similar phenomenon at other fibre-forming proteins – for example amyloid beta: its fibre bundles are thought to cause Alzheimer's disease.

www.helmholtz.de/perspektiven

Imprint

Publisher
DESY-PR
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Veronika Werschner (translation)
Kopierzentrale DESY (print)