DESY inFORM.

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Staff Magazine of the Research Centre DESY

Zeuthen to become scientific centre of CTA

Research with the international gamma-ray observatory will be coordinated on the DESY campus

Model of the CTA Science Management Centre

Image: Dahm Architekten & Ingenieure

Zeuthen welcomed the news with great joy: at the shareholders' meeting of the planned gamma-ray observatory Cherenkov Telescope Array (CTA) in June the decision was taken to locate the Science Data Management Centre and the seat of the CTA Scientific Director on the DESY campus in Zeuthen. This means that Zeuthen becomes the scientific centre of the international project. "With this decision, Zeuthen has reached an important milestone on the way to becoming a national centre for astroparticle physics with high international reputation," said Christian Stegmann, head of the DESY institute in Zeuthen at the staff meeting held the day following the announcement. "At the same time, the international project has taken a significant step forward."

The gamma-ray astronomy observatory CTA will consist of more than 100 individual reflecting telescopes of different sizes, located in groups at a larger site in the southern hemisphere and a smaller site in the northern hemisphere. Over 1000 scientists and engineers from more than 30 different countries have joined forces to set up the facility over the next five years and to operate it for at least 20 years. With the decision to bring the scientific coordination to Zeuthen and the administrative headquarters of the CTA organisation to Bologna, Italy, the project picks up more and more speed. Negotiations on the telescopes' locations are currently underway and will be completed by the end of the year. The next step will be the detailed building design. "Before long, the CTA researchers at Lake Zeuthen will use gamma radiation to study how, deep inside the universe, shock waves

CONTINUED ON PAGE 2

DIRECTOR'S CORNER

Dear colleagues,

we have good news to report. In June, the decision was taken to locate the Science Management Centre and the seat of the Scientific Director of the future astroparticle project CTA at DESY in Zeuthen. This is an important milestone for us, as DESY confirms its role in astroparticle physics and the Zeuthen institute strengthens its profile. More than five years ago, the DESY directorate had decided to expand astroparticle physics in Zeuthen. With the site choice of the CTA Scientific Management Centre to be located in Zeuthen we have taken a major step forward. Soon scientists from all over the world will set up measuring campaigns and make available the data from their observations to science in Zeuthen. The small institute near Berlin will thus become the "Oberpfaffenhofen of astroparticle physics".

DESY plays a powerful role in science: in astroparticle or particle physics, in photon science or accelerator development. However, in addition to fundamental research, we have much more to offer: we develop technologies for tomorrow. The MicroTCA TechLab is a good example of DESY's innovation power because it gives the innovation issue a new perspective. We have created a new administrative department for Innovation and Technology Transfer and appointed physicist Arik Willner as Chief Technology Officer (CTO). Arik Willner and his team will raise awareness for our innovative capability and build bridges between science and industry – a pioneering task which goes along with my best wishes for success.

I would also like to wish much success to our new Director of Administration Christian Harringa. In the past months, he has already impressively demonstrated his competence as acting director of administration. I am looking forward to our future cooperation in the exciting times to come and hope you will enjoy reading this new DESY inform issue.

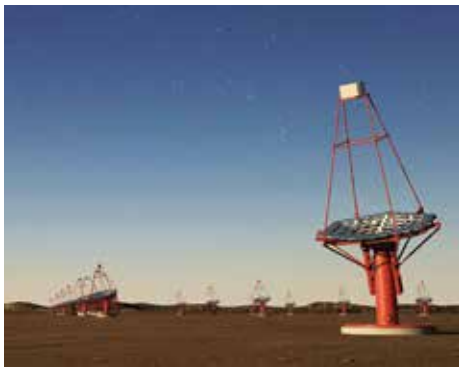
Yours
Christian Stegmann

from huge stellar explosions plough their way through our Milky Way, or how matter is carried off by huge maelstroms in the neighbourhood of black holes," Stegmann beams.

The leadership of the CTA scientific centre in Zeuthen will be assumed by the CTA Director of Science Operation, with his or her office also at Zeuthen. The proposals for observations put forward by the scientists from all over the world will be collected in Zeuthen, under the management of the CTA Scientific Director, and prepared for future measurement campaigns of the telescope array, and the data from the observations will be processed here and then made available to the research community.

Siting the CTA science management in Zeuthen sharpens the research profile of the institute. For many years scientists at DESY have been carrying out research in the field of gamma-ray and neutrino astronomy, collaborating closely with the surrounding universities and research institutions in the Berlin-Brandenburg region. "This makes it the ideal scientific setting for CTA science," said Stegmann, "and it will also make use of major synergies between existing facilities at DESY."

The decision will also have a great economic impact on the region. A new building will be erected on the Zeuthen campus. This building will host more than 20 new staff members and a number of guest scientists who will analyse their CTA data at Lake Zeuthen. *(tz)*



The Cherenkov Telescope Array will be located at a site in the southern hemisphere and another site in the northern hemisphere. Image: G. Pérez, IAC (SMM)

New web portal and new master's degree programme in astrophysics in Potsdam

Starting in the winter term of 2016/2017, the University of Potsdam will launch a new "Astrophysics" master's degree programme. This programme includes significant participations of DESY, the Leibniz Institute for Astrophysics Potsdam (AIP) and the Max Planck Institute for Gravitational Physics. At the same time, a joint web portal of this research network goes online. It offers insight into the astrophysics activities of the region and it is a platform meant for future students and specialists alike.

For many years, the astrophysics research field at the University of Potsdam has intensively cooperated with non-university partners. Meanwhile, DESY has three joint appointments with the University of Potsdam in this field. "The new web portal provides a valuable insight for different target groups – from prospective students up to young scientists – of the excellent cooperation of the three institutes with the university offering unique study and career perspectives," emphasises Christian Stegmann, head of the DESY institute in Zeuthen and University of Potsdam professor, one of the initiators of the portal.

Potsdam astrophysics portal:
www.astrophysik-potsdam.de

Innovation at DESY

Interview with Arik Willner, the new chief technology officer

DESY breaks fresh ground in matters of innovation. That is why, the directorate has created the position of chief technology officer, who will be responsible for the new Innovation and Technology Transfer ITT department. Arik Willner, who is currently working as head of business development at DESY, has been appointed to this new position.

Image: DESY, Gesine Born

Arik Willner, who are you?

I am 34 years old, physicist, and I have been working at DESY for 11 years. I started as a student in the vacuum division and after graduation, I assumed a science management position. I particularly enjoy the relationship between technology, management and politics.

What are your future tasks?

As chief technology officer, I will be something like a innovation manager at DESY. In principle, I will be the lead scientist for the department of innovation and technology transfer, the one who advances this subject, who represents it in the directorate, promotes it within the institute and the one who has a department as his team. With its close link to the chairman of the board of directors, this position plays a central role.

What will be different from now on?

Innovation development will increase its internal and external visibility. With a strong mandate from the directorate, I will convey this message of innovative development to those outside of DESY. We would like to strengthen both our impact and visibility as drivers of innovation; this is true for the innovation strategy of the metropolitan region of Hamburg as well as that of the European Union and beyond.

What will be different at DESY?

The renaming of the department from Technology Transfer (TT) to Innovation and Technology Transfer (ITT) is a symbol of our claim to support and coordinate an innovation strategy of our research centre and of the entire campus. ITT as a central unit will build a network of innovation drivers who feel responsible for this subject within their research areas and the administration.

What is innovation?

Innovation automatically arises in research and development, but application is also an important aspect. Nowadays, the public expects not only pioneering findings for 50 or 100 years to come but also more rapid applications. DESY has to meet these demands. This means that we must recognise and exploit potentials – sometimes, only one or two additional steps are needed to make a technology applicable.

Are there more possibilities beyond actual applications?

At DESY, we can find the best minds in the world and we want to use their know-how to act as innovation drivers – on a regional, national and international level. Companies have just started to think "open innovation", i.e. to open themselves, also to centres like DESY, with the aim to keep the dynamics in innovation and to recognise potentials at an early stage. We are already having in-depth discussions with firms, e.g. with Philips, which is very interested in a strategic partnership.

Would this curtail basic research?

We do not want to change our mission. We do basic research – but this is not in contradiction with innovation and transfer, it interlocks. We will have to ask ourselves how to exploit our resources for better use. This is an exciting challenge.

Interview: Ute Wilhelmsen

Industrial alliance with "MicroTCA.4 Tech Lab"

DESY is setting up the "MicroTCA.4 Technology Lab", along with private enterprises. This cooperative venture will continue to develop the electronics standard MicroTCA.4 and establish it for a large market. Over the next three years, the project will be funded as a "Helmholtz Innovation Lab", with the Helmholtz Association providing almost 2.5 million euros. Together with the funds contributed by DESY and private-sector companies, the budget of the Innovation Lab will come to 5.07 million euros. "DESY is fundamentally restructuring the way in which innovation is promoted on the campus. The MicroTCA.4 Technology Lab is an important building block in the research centre's innovation strategy. It will open up a new dimension of cooperation between DESY and private enterprises," says DESY director Helmut Dosch.

Reinhard Brinkmann elected EPS fellow

Reinhard Brinkmann, director of DESY's Accelerator Division, has been appointed fellow of the European Physical Society, EPS. The EPS Council elected him to the circle of honorary members in recognition of his leading role and his outstanding achievements in the field of accelerator physics. The EPS Council not only emphasised his ground-breaking role in developing new types of free-electron lasers and linear accelerators based on superconducting accelerator technologies, but also his successes with the spin polarisation of electron beams in the HERA collider, which allowed the HERA experimental programme to be expanded. The EPS is the umbrella organisation for 42 national physical societies in Europe.

Helmholtz Prize for science at FLASH

For their high-precision measurements carried out at DESY's free-electron laser FLASH, five research scientists from the Goethe University in Frankfurt am Main received the Helmholtz Prize in Metrology. The team surrounding Reinhard Dörner, professor for atomic physics, used a special apparatus to study extremely weakly bound helium molecules. In the process, the scientists also discovered a molecule made of three helium atoms, which had been predicted 40 years ago but which scientists had hitherto failed to find. The Helmholtz Prize, which is endowed with 20,000 euros, is awarded for outstanding achievements in metrology, the science of measurement, and is presented to European researchers every three years by the independent Helmholtz Fund.

Reinhard Dörner and Maksim Kunitski in front of COLTRIMS. Image: Uwe Dettmer

As a noble gas, helium does not normally form chemical bonds and occurs as solitary atoms. However, under special circumstances quantum physics does allow very weakly bonded helium molecules to form, consisting of two or even three atoms. Dörner and his colleagues, Till Jahnke, Maksim Kunitzki, Jörg Voigtsberger and Stefan Zeller, succeeded in precisely measuring the minute binding energy of He2 molecules to within a few nanoelectronvolts (neV), with the help of the reaction microscope COLTRIMS (Cold Target Recoil Ion Momentum Spectroscopy) developed at the Goethe University.

European meeting of user offices

Image: European XFEL

Organised by the user offices of DESY Photon Science, EMBL Hamburg and the European XFEL, the "2nd Meeting of European User Offices" took place in Hamburg in April. About 50 participants from 20 national and international research institutes in Germany, Spain, France, Great Britain, Poland, Sweden, Switzerland, Italy and Hungary discussed questions on user operation and services at synchrotron radiation sources, free-electron lasers as well as at neutron and muon sources and laser facilities.

Particularly in view of the increasing complexity of the research landscape and financing circumstances, the user administration also undergoes a rapid change and this needs an effective and prompt reaction. After the first meeting of European user offices in 2014 in Barcelona, the second meeting in Hamburg also turned out to be a useful platform for the joint discussion of current and future challenges relevant to user administration. These meetings are to be continued within a fixed framework to ensure a mutual substantial and organisational exchange.

French ambassador visits DESY and the European XFEL

On 28 June, the Ambassador of France to Germany, Philippe Etienne (center), visited the European XFEL and DESY. During a tour to the European X-ray laser European XFEL, currently being under construction, and to DESY's synchrotron radiation source PETRA III, Etienne and France's Consul General to Hamburg, Serge Lavroff (right), gained insight into the various research possibilities with the intensive X-ray light of both facilities, including the cooperation of French institutes that are playing an important role. "We are glad that we could give an impression of the successful cooperation with our French partners," said DESY Director of Administration Christian Harringa (left). France is one of the nine shareholders of the European XFEL GmbH, the non-profit company of the European X-ray laser.
Image: Nina Laskowski

Milestone in Schenefeld

400 guests at the inauguration of the European XFEL main building

By Joseph Piergrossi

European XFEL, that is to begin operation in 2017, reached a major milestone on 29 June: the inauguration of the new headquarters in the town of Schenefeld. Guests from politics, administration, and the diplomatic corps, the European XFEL Council and employees from European XFEL and the organization's largest shareholder and close partner DESY celebrated the event at the new research campus.

By cutting the red ribbon for the inauguration of the main building. From the left: Christiane Küchenhof, Reinhard Meyer, Katharina Fegebank, Massimo Altarelli, Ludmila Ogorodova, Martin Meedom Nielsen and Beatrix Vierkorn-Rudolph. Image: Axel Heimken

The inauguration of the building comes near the close of the civil construction of the new research facility. The headquarters building houses the workplaces of most of the about 300 scientists, engineers, technicians, administrative staff, and guests, as well as support and sample preparation laboratories. Starting in 2017, scientists from around the world will be coming to the campus to use the intense, ultrashort X-ray flashes that the facility will produce to perform studies of ultrafast processes, tiny structures, and extreme states of matter.

European XFEL Managing Director Massimo Altarelli thanked the partner countries, companies, and institutions involved in the construction of the facility as well as the employees of DESY and European XFEL. "This is a very important milestone for us. We now feel every day more than ever how close we are to the start of operation of the facility, which is scheduled to begin in mid-2017. Together with the scientific community, our shareholders, and our partners at DESY, we are looking forward to this important day with impatience and great expectations," Altarelli said.

"The European XFEL is a project that is truly based on a joint European effort," said Hamburg's Second Mayor and Senator for Science, Research, and Equality Katharina Fegebank. "Eleven countries contribute more than a billion euros to the construction of this research facility. With the help of the high-intensity and ultrashort X-ray flashes of the European XFEL, it will be possible to film chemical reactions at the atomic level and investigate the structure of biomolecules. Researchers from around the world are looking forward to the start of the facility's operation. I am happy that the staff has already been able to move into the new headquarters. I wish all the employees a good start and lots of success in their new workplace."

NEWS

Christian Harringa new Director of Administration

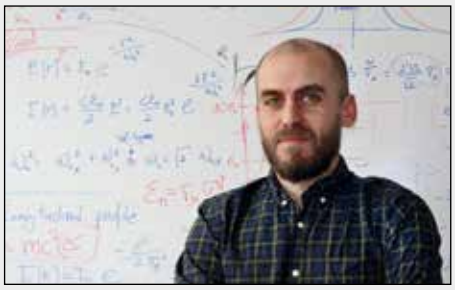
In the previous issue of DESY inForm, Christian Harringa introduced himself as "only" Acting Director of Administration; now that the DESY Foundation Council has officially appointed him as Director of Administration, he will have more time to implement his plans for DESY. The 46-year-old jurist follows Christian Scherf, who moved to the European Molecular Biology Laboratory in Heidelberg in November last year.

Apart from large-scale projects like the European X-ray laser European XFEL and the science management centre of the gamma-ray observatory CTA, Harringa thinks that the advancement of the campus idea and the implementation of a DESY innovation concept are important future-oriented tasks of the research centre.

Before coming to DESY in April 2015 as head of administration, Harringa had worked for the Free and Hanseatic City of Hamburg as head of the university medicine and life sciences division in the science administration and as head of the senator's office at Hamburg's Science Department. He also worked for four years as a national expert at the Directorate-General for Competition of the European Commission.

"John von Neumann Excellence Project" at DESY

DESY scientist Alberto Martinez de la Ossa was awarded the "John von Neumann Excellence Project 2016" for his simulation project set up at FLASH Forward: "Electron-injection methods in plasma-wakefield accelerators for the production of high-energy and high-quality beams." The John von Neumann-Institute for Computing (NIC) emphasised that Martinez de la Ossa's simulation framework OSIRIS facilitates a complete numerical execution of relevant problems of plasma-based acceleration in three dimensions. The NIC is a joint foundation of Forschungszentrum Jülich, GSI Helmholtzzentrum für Schwerionenforschung and DESY and provides supercomputer capacity for Computional Science in Germany and Europe.



COLUMN

Sustainability at DESY

By Andreas Hoppe

DESY, like the Helmholtz Association, has committed itself to sustainability with a focus on energy consumption and efficiency. In order to identify energy saving potential on the DESY campus, it is necessary to identify both the energy flows and the consumers. This is accomplished using new electricity and heat meters that are connected to corresponding evaluation software. Moreover, there are many individual projects with energy efficiency measures. This includes heat extraction at cryogenics processing which saves about 30 percent of long-distance heating, optimisation of rack cooling at the computing centres with an increase in energy efficiency of about 10 percent and the construction of a cooling ring for the maintenance of buildings and other facilities.

It was also possible to obtain additional funding for this project. Moreover, there are plans to introduce a so-called individual network billing. The idea is that DESY should have relatively constant power consumption without high current peaks. To achieve this, large energy consumers at DESY must coordinate with each other and switch the power on and off when necessary. This could save millions of euros.

In 2013, DESY voluntarily committed itself to take part in an initiative of the Hamburg Senate, with the goal of saving 5000 tons of CO_2 annually until 2018. DESY also joined a regional network which is an initiative of the German government. There, the major electricity consumers of Hamburg regularly meet to share experiences with the goal to save CO_2. Last but not least, DESY participates in the Helmholtz Association's CAMPUS 2030 project to discuss perspectives and potentials and to develop a plan for the DESY campus in 2030.

Baton change at AIDA-2020

First annual meeting of the EU project at DESY

Image: DESY, Barbara Warmbein

Felix Sefkow, particle physicist at DESY, is the new coordinator of the project AIDA-2020, which receives ten million euros in funds from the European Union. AIDA is short for Advanced European Infrastructures for Detectors at Accelerators and the project brings together physicists and engineers from 38 institutions in 19 countries, as well as CERN, to develop and optimise research facilities, testing tools and installations that are fundamental to developing future detectors and new technologies.

One of Sefkow's first jobs as coordinator was to chair the first annual meeting of AIDA-2020, which took place at DESY in June. Some 130 AIDA-2020 researchers reported from their various workpackages and received positive initial feedback from the international scientific advisory panel.

AIDA-2020 paves the way for future projects in particle physics such as the upgrade to the Large Hadron Collider, LHC, at CERN or the planned International Linear Collider, ILC. They will need detectors that set high demands on radiation hardness, fast read-out times and best resolutions, as well as detailed reconstruction of particle signatures after a collision. The people who develop these detectors need facilities like test beams where they can test their prototypes and which are equipped to meet the increasingly high demands; they need efficient micro-electronics, good software and, most of all, a lively exchange of expertise and experience.

"What distinguishes AIDA-2020 from its predecessors AIDA and EUDET is the fact that it brings together the gas detector specialists, silicon experts, and calorimeter developers from different project communities, such as the LHC and ILC, in joint projects, so they can more easily talk to each other and to industrial users," says project coordinator Sefkow. "This will help us with the big challenges of the future."

One of the concrete goals is a database, which will list in detail all the irradiation facilities in Europe. Short videos describing the various testing facilities at AIDA-2020 institutions will facilitate access to them as well. DESY provides three workpackage coordinators, it is a leader in software development, beamline equipment and use, and it is building new beam telescopes for use at DESY and CERN. *(bw)*

Helen T. Edwards

1936-2016

By Reinhard Brinkmann

On 21 June, Helen T. Edwards passed away at the age of 80 at her home in Illinois, USA. Helen Edwards was the chief scientist in charge of building and operating the Tevatron at the US Fermi National Accelerator Laboratory (Fermilab), and from the early 1990s onwards she played a key role in developing the TESLA superconducting accelerator technology. She maintained close ties with DESY for over three decades and was together with her husband Don an essential driving force behind years of fruitful collaboration between Fermilab and DESY.

During the early stages of the HERA project, DESY profited enormously from her experiences at Tevatron, and in the course of numerous visits to DESY Helen Edwards also contributed towards getting the proton ring accelerator up and running. In the course of the TESLA collaboration, she was behind various crucial contributions made by Fermilab towards the design of the linear collider as well as the design and construction of the TESLA Test Facility, from which FLASH later emerged. Numerous colleagues at DESY remember and value Helen Edwards from many years of collaboration, and were extremely fond of her.

With her curiosity and her desire to get to the bottom of things, she worked with accelerator physicists at DESY until shortly before her death to analyse beam effects at FLASH. She will be remembered at DESY as a competent, dedicated and open-minded scientist who was always open for discussions, and her memory will always be cherished.

Image: Fermilab

Beamtime

User operation at first PETRA III extension beamline

The first undulator beamline of the new PETRA extension north took up regular user operation in early June. Beamline P65, offering the so-called X-ray absorption spectroscopy (EXAFS) technique, is now open to groups of scientists that have applied for beamtime in a review process. “Three and a half years after the shutdown of DORIS III we can now offer a dedicated EXAFS beamline again,” says Edmund Welter, who oversees the beamline. “Many researchers have been eagerly awaiting this moment.”

The first users of P65 came from the Karlsruhe Institute of Technology and the University of Paderborn. With the help of the PETRA III light they checked in which way their catalyst samples age during operation, to find out what is the ideal geometry and process of application of the catalytic material on a support structure. “By means of X-ray absorption spectroscopy one can selectively improve the efficiency of industrial catalysts,” explains Edmund Welter. “For example, nowadays car catalysts include much less of the expensive noble metals than in the past, but they perform much better.”

Edmund Welter (left) and a user of the new station P65 mount the gas supply to a catalyst sample cell.

Image: DESY, Marta Mayer

While the beam time at P65 has already been assigned until the end of the year, the other beamlines in the PETRA III extensions are being built. Already this year, first experiments on the adjacent beamline P64 are supposed to be carried out. In Extension Hall East new beamlines will be put into operation in spring 2017. *(tz)*

Social Hour

The DESY Campus Social Hour in June proved to be a crowd puller and a big success. It was organised by Nicole Kosian and Petra Kaertner from the DESY Guest Service in collaboration with the DESY Indian Community. Gajendra Kumar Sahoo (MPY) and Kollassery Swathi Sasikumar (FLC) as well as many other colleagues from the Indian community created a colourful and lively atmosphere with a huge variety of culinary delights, traditional clothing, an informative presentation about India, incense sticks, bindis, name tags written in Sanskrit, and music.

With the support of the Association of the Friends and Supporters of DESY (VFFD), the Campus Social Hour exists since Spring 2015 and takes place every three months. It is meant to provide the opportunity for an informal get-together with colleagues from different areas and groups on the DESY Campus in Hamburg, providing the possibility to network and to learn more about the many nations located on Campus. The next Social Hour will take place in autumn 2016.

Images: DESY, Marta Mayer

From metal sheet to particle accelerator – part 4

Hot summer for ice-cold technology

Meeting in the tunnel: the status poster shows which kind of work comes next at a cryostring

Image: DESY, Dirk Nölle

By Ricarda Laasch

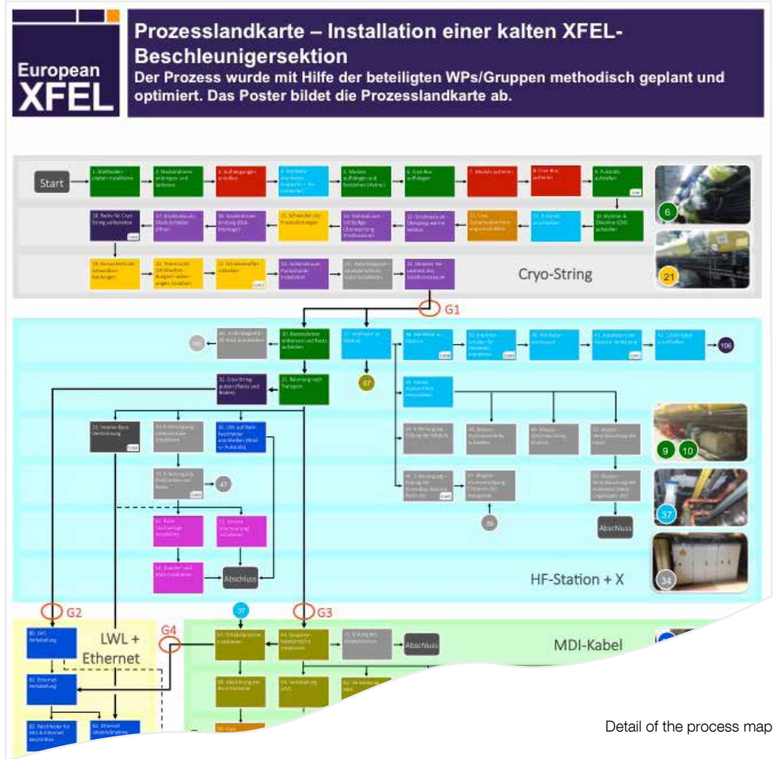
In the previous three issues of DESY inForm we have shown how more than 14,000 niobium sheets are turned into superconducting accelerator modules. Now it is time that these modules find their way into the tunnel. That sounds easy? It absolutely isn't! Thirteen different DESY working groups are involved in installing and connecting the modules in the tunnel.

In the injector building the modules are lowered seven stories by crane and are brought to their position within the tunnel by the special vehicle "Mullewupp". After their arrival each module is hung from the ceiling. But this is not enough: as soon as the modules are hanging they need to be aligned very precisely; tubes need to be welded, the vacuum system of the cavities connected and all the cables to be run; this is followed by installation and connection of the high-frequency power supply and the electronics cabinets. Electricity and network connections are also needed down there for all the sensors which monitor the operation and send their data to the control room.

All these connections and supplies are indispensable for operating the linear accelerator and are installed in parallel by various working groups. "At the beginning of the installation phase we had a theoretical plan for all the work steps but of course no real experience how the workflow would spread out in the limited space of the tunnel," explains Markus Hüning. As technical coordinator he and his team oversee all work and act as an interface between the involved groups and the project management.

The European XFEL tunnel may not be the first accelerator tunnel DESY is setting up, but there is a significant difference compared with all previous tunnels: instead of standing on the ground the modules hang from the ceiling. The space underneath the modules is used for the infrastructure to operate the accelerator. "At first we had a few doubts regarding this set-up. We have to be very careful with the installation order, and the accessibility of the parts during installation and operation is limited," explains Hüning. "However, the modules in the injector are already running – including maintenance and sensor read outs. Everything turns out as planned."

For every so called cryostring – consisting of 12 connected accelerator modules – roughly 100 working steps by 13 working groups are executed during installation. Within the last two years more than 50 people have been working in the tunnel on a daily basis. At the very beginning it became obvious that the theoretical working order was not suited for an accelerator of this size and complexity so that the installation of the very first cryostring was slower than expected.



Detail of the process map

Frank Eints and Michael Bousonville, who organise the installation steps, together with the responsible technical coordinator Markus Hoffmann and all working groups developed a new installation step plan within a small number of very active meetings. This plan included all optimal working conditions and prerequisites for all working steps.

"With all this assistance we developed a process map. That way we made the installation steps transparent and optimised the working conditions for every group," explains Bousonville. "Every cryostring has a status poster which shows the already finished installation steps and the current one." This whole status is updated during a weekly meeting in the tunnel. So everyone knows what is happening at every cryostring and what will follow afterwards. This reliability is also an advantage in the cooperation with the TÜV, who has to inspect and approve certain areas of the accelerator before operation.

"The installation plan and the overall transparence have assisted to accelerate the working flow," says Kay Jensch, Work Package Co-Leader Accelerator Modules. His group takes care of all cryogenic connections of the modules after they were placed under the ceiling. "Usually we work on two or three places as welding teams in parallel – on one string," he says. "Additionally we have two other teams working on the thermal shielding and on closing the insulating vacuum after all welding work is done." The cryogenic connections are as important as the beam vacuum because both sections need to be finished together. "The overall installation order is essential, due to the fact that all connections need to fit perfectly and have to be connected in the right order. There are almost no possibilities to correct errors," explains Serena Barbanotti, engineer in Jensch's group. "Luckily the work so close under the ceiling is not problem for us, so we only have to handle the space limitation."

By now the good planning and organisation ensure that the tight time schedule for the installation can be fulfilled. "I am very impressed what all groups – with all these interlocked working steps – have achieved," explains Jensch "But there is a hot summer ahead of us." The plan is to cool down the accelerator this autumn.

Unlike in the other DESY accelerator tunnels, the modules of the European XFEL are suspended from the ceiling.

Image: DESY, Michael Bousonville

Research Center Borstel joins the CSSB

In June, the Centre for Structural Systems Biology (CSSB), located on the DESY campus, signed a contract for associated partnership with the Research Center Borstel (FZB), Leibniz Centre for Medicine and Biosciences. "FZB is renowned for scientific excellence in infection biology research and we are excited to welcome them to Hamburg and CSSB. I am certain that this partnership will provide many opportunities for new and successful scientific collaborations," stated Matthias Wilmanns, Scientific Director of CSSB.

Materials science continues to be funded as collaborative research centre

The collaborative research centre SFB 986, entitled "Tailor-Made Multiscale Material Systems – M3" will be funded for another four years by the German Research Foundation (DFG, Deutsche Forschungsgemeinschaft). SFB 986 is a collaboration between the Hamburg University of Technology (TUHH), the Helmholtz Centre Geesthacht (HZG), the University of Hamburg (UHH) and DESY. Overall, a sum of 13 million euros has now been granted.

SFB 986: https://www.tuhh.de/sfb986

Two million euros for researching biomolecules at PETRA III

The University of Hamburg has been awarded two million Euros from the Federal Ministry of Education and Research (BMBF) for a joint research project at DESY´s X-ray light source PETRA III. The funding will be used for the extension of two existing beamlines at PETRA III. The project, "Hadamard crystallography as a method for time-resolved investigations of the structural dynamics of biomolecules", involves research teams from the cluster of excellence "The Hamburg Centre for Ultrafast Imaging" (CUI), from University of Hamburg, from the European Molecular Biology Laboratory (EMBL) in Hamburg and from DESY. The funding will run for three years.

"This is a great step-forward for our research," says CUI professor Arwen Pearson, leader of the project. "The grant will enable Hamburg to take a leading position in time-resolved structural biology in the coming years. Thanks to the unique combination of experienced groups in the fields of time-resolved X-ray science, the transport and handling of samples, and the structure and operation of beamlines, synergies are generated that hardly exist at any other research location."

Adventure research

Two girls from secondary school experience science at DESY

Within the framework of research days held at the city of Emden, the Johannes Althusius Gymnasium (JAG) in Emden launched a scholarship programme for their students of 10th to 12th grade last year. Internships at research centres, editorial offices and other national and international institutions offered both the opportunity to gain insight into possible fields of work as well as the chance and to strengthen students' autonomy and self-responsibility. Events of the research days in Emden extend over the whole year. In February, Rolf Heuer, former CERN Director General and now President of the German Physical Society, inaugurated the research days 2016 in Emden with a talk about research at the frontier of knowledge.

Lena Schmidt and Wolfgang Caliebe are filling liquid nitrogen with a temperature of minus 196 degrees Celsius into a spectroscopy experiment detector.
Images: DESY, Marta Mayer

Two JAG students successfully applied for a two-week internship at DESY. Maren Schumacher worked in the field of serial crystallography in the group of Henry Chapman at the Center for Free-Electron Laser Science, tutored by Dominik Oberthür. She learned how proteins are crystallised for data taking at beamline P11 of the DESY X-ray light source PETRA III and at the LCLS X-ray light source at the US research centre SLAC. The elaborately grown protein crystals must be submitted to a quality control before being used in the experiment. This includes the optical characterisation with a microscope and – when the crystals are very small – the investigation by means of laser scattering with a nano-particle tracking analyser (NTA). The goal of the experiments is the clarification of the spatial structure (3D) and of the gradually changing spatial structure (4D) of biological macro-molecules, such as proteins. Among others, one application field is the development of new medically active agents.

Maren Schumacher is filling the measuring chamber of the nanoparticle tracking analyser with virus protein crystals in order to determine size distribution and concentration.

Lena Schmidt worked in the DESY photon science group of Wolfgang Caliebe in the area of temperature measurements and their application in science and technology. She measured how quickly a temperature sensor cools down in liquid nitrogen and the precision of such a sensor without cooling. This information is important for the construction of a liquid level indicator for a spectroscopy experiment detector which must be permanently cooled with liquid nitrogen. She investigated the functioning of grating spectrometers and learned about different methods of structure analysis with X-ray radiation.

When their two weeks were over, both girls agreed that they would gladly have stayed longer. Internship opportunities at DESY are allways much in demand. *(hw)*

Image: Rohit Kumar

HERCULES summer school guest at PETRA III

From 11 to 16 April, for the first time, 20 attendees of the HERCULES (Higher European Research Course for Users of Large Experimental Systems) summer school participated in an excursion week with experiments at PETRA III. This week which was jointly organised by DESY and the European XFEL included lectures on X-ray laser physics, practical courses on the numerous experiments with X-ray radiation at PETRA III and a visit to the European X-ray laser European XFEL which is currently under construction.

During this week, the students from all over the world learned more about the applications of synchrotron radiation for investigations in solid state physics, and in the field of soft matter and biology.

http://hercules-school.eu

On the track of magnetism

Holiday programme for kids of DESY staff again well attended

By Kim Petersen

How does a compass work? Which materials are magnetic and how can I transform a simple iron nail into a magnet? Twenty-eight young researchers from grade 1 to 3 can now answer these and many other questions about magnetism because they participated in this year's Pentecost holiday programme at the Hamburg school lab.

Image: DESY

Full of curiosity, the kids investigated the invisible phenomenon of magnetism and made a lot of important and exciting observations. For example, they found out that it is possible to divert electrons with the help of magnets – and all of a sudden, it is quite easy to understand how an electric motor works! Others enjoyed DESY's magnetic levitation train – a must at such presentation days.

During their experiments, the kids were supervised by Adam Dybulla and his team of students who took much pleasure and patience in guiding the small groups of two to four children. This event which was particularly meant for children of DESY staff was initiated by the colleagues from the equal opportunities office.

The next occasion to do experiments in the school lab will be during the summer holidays. Within the framework of the Hamburg holiday activity pass for schoolchildren, the DESY school lab offers research days dealing with magnetism, air and vacuum. Registration is already open!

http://physik-begreifen-hamburg.desy.de

Cells grow crystals for research

Joint professor with the University of Lübeck develops new methods in structural biology

Proteins are tiny masterpieces. The proteins carry out and control vital functions within living cells. Depending on their different tasks, there is a large variety of these tiny molecular machines. These proteins, specialists which are often comprised of more than 100 000 atoms, have one thing in common: their atomic structure is essential for their function. Knowledge of the structure provides a starting point for the development of medication against diseases such as malaria or sleeping sickness.

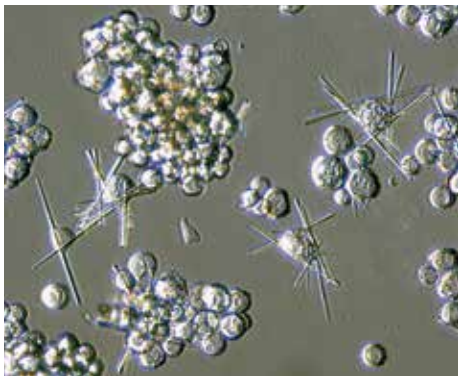
More than 90 percent of the nearly 120 000 protein structures stored in the international "protein database" have been decoded with the help of X-ray crystallography. This approach involves an X-ray beam, emitted from a synchrotron source such as PETRA III, being shot at a crystallised protein. The protein's structure is then reconstructed from the sample's diffraction pattern. The problem is that some proteins are extremely difficult to crystallise. This is often a very time-consuming process which frequently fails, especially with proteins from the cell membrane which are of particular interest.

There is however a new idea which could eliminate this obstacle. It aims directly at the objects in which the proteins carry out their day-to-day activities: cells. It has long been known that cells can crystallise proteins. Normally they do this to control their activities, thus regulating cellular functions. Lars Redecke, a chemist recently appointed to assume a joint professorship at both the University of Lübeck and DESY, and his team plan to discover whether cells can be exploited to crystallise foreign proteins. The resulting tiny crystals would then then be submitted to scientific analysis at the new extremely brilliant radiation sources.

"New experimental techniques such as serial femtosecond crystallography or serial synchrotron crystallography with the highly focused X-ray beams of PETRA III can use very small crystals for structural analysis," Redecke explains. "We want to find the research potential of cell-grown crystals at light sources such as PETRA III and European XFEL." The so-called in vivo crystallisation is one of the most important research topics of Redecke's professorship "Structural Infections Biology using new Radiation Sources" which is based on his former activities at the universities of Lübeck and Hamburg.

Lars Redecke (in the back) with his team. Image: AG Redecke, Robert Schönherr

The first successful results of in vivo crystallisation are promising. An international research group comprised of Redecke as well as Michael Duszenko from the University of Tübingen and Christian Betzel from the University of Hamburg, has decoded the structure of the enzyme cathepsin B of the Trypanosoma brucei parasite using in vivo-grown microcrystals. Trypanosoma brucei causes sleeping sickness and is a threat to more than 60 million people, the majority of whom live in the southern part of Africa. The experiments at the LCLS X-ray laser in California, resulting in the discovery of a novel target for medication, were listed among the top ten breakthroughs of the year 2012 in the scientific journal, Science.



The protein crystals protrude needle-like from the cells.

Images: AG Redecke

The needle-shaped crystals used for the investigation were grown in vivo by insect cells and typically measured 4 to 15 micrometres (thousands of a millimetre). Meanwhile, more than 15 different kinds of protein crystals have been grown with this method, the majority of which could not have been produced the classical manner. "In the new DESY and University of Lübeck cooperation, we specifically want to find out how and under which conditions cells grow and disassemble crystals and we want to use these crystals on a larger scale for protein decoding at the new radiation sources. In vivo crystallisation has clear advantage because within living cells, the proteins are 'frozen' in their natural configuration and in the experiments we can see their natural structure." *(tz)*

Welcome to Zeuthen!

Open Lab Day

In July, on the occasion of the second DESY Photon Science "Open Lab Day", some 30 laboratories, workshops and beamlines opened their doors to about 250 DESY staff members from all divisions of the research centre, who followed the invitation to witness at first hand the work of their colleagues. The visitors could for eample see the DESY NanoLab, the central workshops, DESY's X-ray source PETRA III including the extension halls East and North, the experimetal hall of FLASH2 and numerous labs, for example for laser and undulator development.

Lab for detector development at the Photon Science Open Lab Day. Image: DESY, Marta Mayer

WORKSHOPS

International Technical Safety Forum
Collaborate Safely was the motto of the 12th International Technical Safety Forum ITSF 2016, which took place at DESY for the second time in May. This forum was hosted by DESY and the European XFEL GmbH. For one week, more than 90 safety experts discussed about sustainability, fire safety and safety aspects. One workshop especially focused on risk assessment. Interestingly, in Germany there are several different definitions for "risk assessment" whereas in the English language area there is only one.

REXS for the first time in Hamburg
After the successful events in Aussois, France, and in Oxford, UK, this year, the REXS2016 conference on resonant elastic X-ray scattering for the first time took place in Germany. In June, about 80 participants came to DESY in Hamburg to discuss the latest developments in research with resonant elastic X-ray scattering, which is primarily used in materials sciences.

24th DIS conference in Hamburg
More than 320 participants met for the "24th Workshop on Deep Inelastic Scattering" (DIS 2016) at DESY in Hamburg in April, one of the largest spring conferences in particle physics. The workshop was established in 1993 on the occasion of the first results of DESY's Hadron Electron Ring Accelerator HERA. It brings together experts from institutions around the world who explore the inner structure and the powerful forces inside protons or complex nuclei using the technique of deep-inelastic scattering.

In the 24th edition of the conference, which took place at DESY in Hamburg for the first time, scientists from more than 30 countries talked about current results in a wide range of experiments. Although the conference opened itself for a variety of experiments and results in the recent years, the HERA experiments are still presenting new results at the conference, even 23 years after the first workshop, stressed co-organizer Olaf Behnke from DESY.

To Japan with E-JADE

EU project provides hands-on accelerator experience to doctoral student

By Nina Laskowski

Anne Schütz works at DESY for the International Linear Collider (ILC), which may be built in Japan. Currently, she is writing her doctoral thesis which includes the simulation of various disturbance sources in an accelerator. With her findings, it will be possible to improve the accelerator design in such a way that the so-called background rate, which is caused by these disturbance sources, can be reduced within the measuring data.

"Computer simulations play a significant role in my doctoral thesis. This is why I wanted to carry out a genuine experiment, not only simulations. For that reason, my supervisor Marcel Stanitzki proposed the ATF project at the KEK accelerator centre in Japan, as some of the ILC principles are submitted to a more precise testing there," says Schütz.

With the support of the EU project E-JADE (Europe-Japan Accelerator Development Exchange Programme), the DESY PhD student had the opportunity to spend two months in Japan to gather important experimental experience which will also benefit her doctoral thesis. Apart from the specialist qualification, the exchange also offers the chance to establish contacts, share knowledge and, last but not least, get to know a foreign culture.

"I would strongly recommend anyone to take the opportunity offered by the E-JADE programme in order to gain these exciting experiences," says Schütz. Apart from gathering scientific experience she learned a lot about life in Japan and was also fascinated by the extremes: "On the one hand there are the perfectly maintained Japanese gardens, full of tranquility and harmony, on the other hand there are the bustling cities with millions of inhabitants, with neon-coloured and flashing shopping miles."

E-JADE, which was started one year ago, is coordinated by the European particle physics research centre CERN. It combines the universities of Tokyo in Japan, Oxford and Royal Holloway in the UK, the French research institutions CNRS and CEA, the Spanish particle physics institute IFIC and DESY. E-JADE does not only offer European students and doctoral students a visit to Japan but also a stay in Europe to Japanese students.

INFO

https://www.e-jade.eu/

HELMHOLTZ ASSOCIATION

Virtual deep-sea journeys for everyone

At the ocean floor, the vents of so-called black smokers are fuming like industrial chimneys. They belong to the hydrothermal vents which are regarded as possible suppliers of raw material for the future. In spring 2016, a team of researchers headed by Tom Kwasnitschka of the GEOMAR Helmholtz Centre for Ocean Research Kiel investigated a hydrothermal vent field at the Niua South volcano between Fiji and Samoa at a depth of 1100 metres. The novelty was that everyone had the opportunity to watch the photographs taken by the special cameras of the underwater robots ROPOS live over the internet. "This is quite a different dimension than before," said Kwasnitschka. "In the past, perhaps two or three scientists travelling in a submersible could see this fascinating world. Now, everyone has the chance to virtually float above the deep-sea ground." The cameras even enabled a 180 degree view and were used to measure the hydrothermal vent field of about 40 000 square metres. The pictures were used to create a three-dimensional model which helps scientists to take specific samples. Immediately after returning from the journey, the scientists began to review the data which will be used to calculate a 3D model of the complete hydrothermal vent field with an even higher spatial resolution of up to one centimetre.

http://www.helmholtz.de/perspektiven

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