

## Commissioning of the European XFEL begins

350 guests celebrate completion of Europe's new X-ray laser



On 6 October representatives from politics and science symbolically installed the final piece of the vacuum system of the X-ray laser European XFEL, thus completing the facility and releasing it for commissioning. Over the following months, DESY and the European XFEL colleagues will power up the free-electron laser in many small steps.

"In a way we've been starting up the accelerator for a long time," said DESY physicist Winfried Decking who coordinates the commissioning of the accelerator. "Every time an individual system was completed it was tested as far as possible." The nearly 40 metre-long injector which shoots the electron bunches into the main accelerator was already completely in operation. How-

ever, only now the operating team will be able to test the interaction of the facility's individual components.

The DESY team prepared the superconducting accelerator for cooling down to 2 degrees above absolute zero – almost 300 degrees centigrade below room temperature. According to Decking, the cooldown is one of the most critical phases during commissioning. It must be carried out very slowly to avoid extreme mechanical tensions within the materials submitted to cooldown. Therefore, helium at room temperature initially flows through the accelerator's cooling pipes. This eliminates all foreign gases from the pipelines through filter systems.

The last piece: DESY's Director Helmut Dosch, Polish deputy science minister Piotr Dardziński, European XFEL CEO Massimo Altarelli, Hamburg's science senator Katharina Fegebank and Beatrix Vierkorn-Rudolph from the federal science ministry install the last piece of the vacuum pipe.

Photo: Fred Dott/ European XFEL

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Dear colleagues,

Another year comes to an end much too early—and it is time to review what we have achieved.

DESY has mastered the past years exceptionally well. They were characterised by several highly sophisticated construction projects: the world's best linear accelerator which from 2017 on will provide high-energy electron beams to the European XFEL is now completed. Parallel to this, FLASH 2 and the two PETRA III extension halls have been erected and commissioned. The DESY team impressively demonstrated its mastery in the construction of modern accelerators and again delivered a very good example of how to manage projects. Kudos to all colleagues who contributed to this great success, to our accelerator team, to the scientists and engineers in the numerous divisions, to our teams in the workshops and in administration.

We are looking towards the future with great self-confidence. DESY has kicked-off an internal process to sharpen the strategy of the research centre for the coming 15 years. We are supported by an external strategy consultancy and expect first results in spring 2017.

For DESY's outstanding role in the area of research and innovation in the metropolitan regions of Hamburg-Schleswig-Holstein and Berlin-Brandenburg, technology transfer and cooperation with industry is becoming more and more important, parallel to research and development. Moreover, we continue to intensify the modernisation of our infrastructures in Hamburg and Zeuthen. I am very glad about the special funding DESY was granted for this purpose by the federal government. In 2017 there will be more large projects, for example the start of the civil construction of the Innovation Centre and of the new photon science building with our NanoLab. In addition, we will have the possibility to celebrate several events in Hamburg: the inauguration of the Elbphilharmonie, the completion of our CSSB building and, in summer, the starting shot for the European XFEL.

Many reasons to look forward to the new year. A peaceful Christmas break to all of you.

Yours,

Helmut Dosch

“The complete cryogenic system must contain nothing but helium,” said Tobias Schnautz, member of the helium cryoplant operating team. “Other gases than helium would freeze out during the cooling process, thus clogging the valves or even damaging important components like our expansion turbines or cold compressors.” When after a couple of days the pipes are adequately “flushed”, more and more cold helium is mixed into the perfusing gas. When the helium partly liquefies in the centre of the accelerator, the pressure within the helium system is reduced to 30 millibar and vaporised helium is pumped out to finally reach the target value of two kelvin.

It takes about one month until the accelerator reaches its operating temperature. However, operators have to wait a bit before starting to shoot electrons from the injector. First, the experts feed radiofrequency (RF) from the transmitters in the tunnel into the individual accelerator sectors. Only when the accelerator fields in the cavities have been adjusted sufficiently to be stable these sectors can be operated with electrons. Four accelerator modules form a technical unit and are supplied by a RF transmitter. “Our plan is to operate each sector one week without beam and the following week with beam,” said Decking.

When the complete accelerator is running the experts will quickly proceed and steer the electrons through the first undulator line. “First, the North branch with the undulators SASE1 and SASE3 will start operation,” said Decking, “and two colleagues from the European XFEL will join our shift team for this purpose.” With the help of the electron beam, the beamline magnets in the undulators, which have already been calibrated by the geodesy department with an accuracy of approximately 300 micrometres, will be aligned to an accuracy of less than 10 micrometres. Only at the very end, the two halves of the undulator will be closed in order to produce the long awaited extremely intense laser light.

In many small steps, the physicists will learn how the very complex individual components of the facility interact. “In the end, as many processes as possible should run automatically, but during the entire commissioning a lot of ‘hand-work’ will still be necessary,” said Decking. Even in the future user operation phase when many processes become routine, as many as 230 DESY staff members, above all from the accelerator division, will be needed to run the European XFEL accelerator. (tz)

## Robert Feidenhans'l will succeed Massimo Altarelli



Robert K. Feidenhans'l has been appointed as the new Chairman of the Management Board of the European XFEL GmbH. The X-ray physicist, aged 58, is currently head of the Niels Bohr Institute at the University of Copenhagen, Denmark. He is also a member of the European XFEL Council, the supreme organ of the company, for which he served as a chairman from 2010 to 2014. Feidenhans'l will join European XFEL on 1 January 2017. His predecessor Massimo Altarelli, who has been at the head of the non-profit company since it was founded in 2009, will retire at the age of 68 at the end of the year.

Robert Feidenhans'l studied at Aarhus University and holds a Ph.D. in surface physics, a field which has evolved into nanophysics. Starting in 1983, he worked at the Risø National Laboratory in different scientific and leading positions, until joining the Niels Bohr Institute in 2005. As a researcher, he is an expert in new groundbreaking X-ray technologies and research at large-scale X-ray synchrotron research facilities, such as the European Synchrotron Radiation Facility ESRF in France, Paul Scherrer Institute PSI in Switzerland, and DESY in Hamburg.

# DESY inaugurates new research halls at PETRA III

Halls named after Ada Yonath and Paul Peter Ewald

DESY held a special inaugural ceremony on 14 September for two new experimental halls at the X-ray lightsource PETRA III which have been named after famous scientists: the Israeli Nobel laureate in Chemistry 2009 Ada Yonath and Paul P. Ewald, one of the pioneers of structural analysis using X-rays.

“Through his dynamical theory of X-ray diffraction, Paul P. Ewald created the foundations that are essential to the type of research we are doing here,” explained Helmut Dosch, the Chairman of DESY’s Board of Directors. “The work of Ada Yonath at DESY’s lightsources contributed to the Nobel-winning decipherment of the extremely complex structure of ribosomes. Both researchers symbolise the tremendous progress that has been made in modern-day X-ray structural analysis, which researchers at the PETRA III measuring stations are now able to benefit from.”

In addition to Ada Yonath herself and Olaf Scholz, the First Mayor of Hamburg, the event was also attended by Harsh Vardhan, India’s Minister of Research, Edelgard Bulmahn, Vice President of German’s Bundestag, Georg Schütte, state secretary at the Federal Ministry for Education and Research, and Eva Gümbel from Hamburg’s Department of Science, Research and Equal Opportunities, as well as members of Ewald’s family and high-ranking visitors from Sweden, Russia and India.

“We are pleased that, with the new experimental halls, Hamburg has been able to satisfy the science community’s exacting expectations of a research centre,” said Olaf Scholz, the First Mayor of Hamburg. And state secretary Georg Schütte emphasised: “At DESY, fundamental research is conducted at the highest level and in international cooperation. Thus, the Federal Ministry supports the extension of the lightsource PETRA III with about 57 million Euros.”

The two new experimental halls at PETRA III open a new chapter in its success story: the accelerator PETRA III went into operation in 2009 as the largest and the most brilliant source of synchrotron radiation in the world. The time slots available for doing research at the



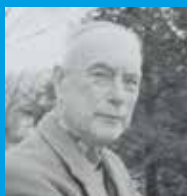
Naming ceremony for the two new experimental halls. Photo: Gesine Born/DESY,

storage ring, which operates around the clock, are allocated by means of a strict selection procedure based on excellence. The interest among international researchers was huge, and very soon all 14 beamlines constructed in the first phase were overbooked several times over. At the end of 2013, construction work therefore began on the two additional halls that have been inaugurated today. These halls can house up to five additional PETRA III beamlines each, expanding not

only the capacity but also the range of research that can be carried out at PETRA III. Two of the beamlines have already gone into operation for research. The others will follow in early 2017.

Three of the beamlines in PETRA III’s new experimental hall “Ada Yonath” were built in collaboration with scientists from India, Sweden and Russia. The ceremonial handover of the keys for these beamlines took place alongside the inaugural ceremony for the halls themselves. (tz)

## About the individuals after whom the halls are named



At the beginning of the 20th century, Paul Peter Ewald (1888 - 1985) developed his theory on the interaction between X-rays and crystals, the so-called Dynamical Theory, thereby laying an important foundation stone for the subsequent development of X-ray crystallography.



Ada Yonath received the Nobel Prize in Chemistry in 2009 together with Venkatraman Ramakrishnan and Thomas A. Steitz for deciphering the structure and function of the ribosome, the protein factory in living cells. From 1986 until 2004, she was the head of the Max Planck Research Unit for Ribosomal Structure at DESY in Hamburg.



The DESY campus is host to a large number of partner institutes. Photo: DESY

# Better together

## New forum unites DESY campus partners

By Nina Hundoegger

The DESY research campus in Hamburg is developing dynamically and the number of institutes and people is continuously increasing. Currently, in an area with laboratories and offices of more than 275,000 square metres, more than 3000 employees are working at six legally independent science institutes: DESY, University of Hamburg, Max Planck Society, European XFEL GmbH, European Molecular Biology Laboratory EMBL and Helmholtz-Zentrum Geesthacht. In addition, a number of not legally independent science cooperations are located on the campus, for example the Center for Free-Electron Laser Science CFEL, the Centre for Structural Systems Biology CSSB, or PIER, the strategic partnership between DESY and the University of Hamburg. About 13 percent of the total campus area are used by the University of Hamburg, around 87 percent by DESY.

“At DESY, we can be proud of a development which impressively illustrates the success of this science location. At the same time, it is also necessary to professionalise and strategically manage the future development and operation of the campus,” emphasises DESY’s Director of Administration Christian Harringa. “We have to gradually establish a modern and professional campus management in order to realise existing and future

development potential of the organisations and institutions and to make them clearly visible towards politics as well.”

The users on the campus do not only expect a quick and simple access to DESY’s research facilities but also a professional and a smooth integration on the campus and its infrastructure including various services. DESY wants to pool its competences in the field of campus management and networks with the campus partners and initiated the campus management project with the aim to create the organisational and technical conditions to further develop the dynamically growing campus successfully.

The project should also ensure the coordination and joint financial support of the shared use of infrastructural resources. Last but not least, topics like safety need a campus-wide organisation in order to guarantee high service and safety standards that are to be valued by all campus users.

Representatives from all institutes located on the campus and from the Hamburg Ministry of Science, Research and Equalities will start meeting twice a year at the campus forum created by DESY. At the kick-off meeting in September at DESY, the first working

groups were established. DESY and the University of Hamburg are also making plans for a future-oriented campus guidance system to help users and visitors to orient themselves on campus. At present, a competition is being held for a concept study.

### 30 million euros for DESY infrastructure

At its budget session on 25 November, the German Bundestag decided to grant DESY special funding of 30 million euros for the next five years for the modernisation of the DESY buildings’ structural appearance. “The additional funds give us the possibility to submit extensive sectors of our constructional and technical infrastructure to a fundamental modernisation. This allows us to set architectural and functional standards for our presentation as a major research centre,” said Christian Harringa, Director of Administration. Hamburg’s Member of Parliament in the Bundestag Johannes Kahrs strongly supported the decision.

## Chinese Vice Premier Liu Yandong visits European XFEL and DESY



As part of her official visit in Germany, the Chinese Vice Premier Liu Yandong came to DESY and European XFEL in late November. The Vice Premier's particular interest was the X-ray laser European XFEL. Liu was greeted at the DESY campus by the Chairman of DESY's Board of Directors Helmut Dosch, the Chairman of the European XFEL Council Martin Meedom Nielsen, and the Chairman of the European XFEL Management Board Massimo Altarelli.

The Vice Premier was accompanied by several high-ranking officials from the government of the People's Republic of China, including the Minister of Science and Technology Wan Gang, the Chinese Ambassador in Germany Shi Mingde, the Deputy Secretary-General of the State Council Jiang Xiaojuan, and the Vice Minister of Education Hao Ping. The Free and Hanseatic City of Hamburg was represented by Second Mayor and Senator for Science, Research, and Equality Katharina Fegebank. Photo: Axel Heimken/DESY

## From lab to industry

### Helmholtz Association funds novel magnetic sensors from DESY

The Helmholtz Association is providing almost 900,000 euros to fund the development of a novel type of magnetic sensor from DESY's laboratories. The grant from the Helmholtz Validation Fund is to be used to develop the sensors to commercial viability over the next two years. DESY and an industrial partner are together providing the same amount of money again to support the project. "The successful application for the grant by Ralf Röhlberger and his team demonstrates the innovative potential to be found at DESY," says DESY's Chief Technology Officer Arik Willner. "Developments like these emerging from DESY meet with keen interest in the industrial sector."

Magnetic field sensors are becoming increasingly popular in the computing and automotive industry, for example to measure engine speeds in ABS systems. Their sensitivity and comparatively small

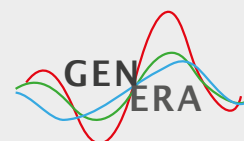
size make so-called magnetoresistive sensors particularly interesting. Industrial users are always calling for new types of sensor concepts, in order to expand their areas of application and to branch out into new markets. However, conventional magnetoresistive sensors are only partly able to cover these needs, since their potential functionality is limited.

A new manufacturing process, which has been developed at DESY and for which a patent is pending, changes all this by using a new coating procedure, whereby the layers of the magnetoresistive sensors are not applied vertically from above, but rather at an angle, allowing the properties of the sensor to be adjusted flexibly. "Until now, it has often been necessary to adjust the application to fit the sensor; our technology means that we can customise the sensor to fit the intended application," explains inventor and project manager Kai Schlage. (tim)

### Cultures and careers in physics

The "Cultures and Careers in Physics" conference will be held in Hamburg on 12 January, organised by the EU project GENERA led by DESY. On behalf of the German GENERA Partners DESY, Helmholtz Association, Karlsruhe Institute of Technology, Fraunhofer-Gesellschaft and Max Planck Society, all scientists at DESY are invited to help to shape this day.

"Cultures and Careers in Physics" will provide a forum to elaborate and discuss innovative solutions on how to significantly alter the traditional under-representation of female scientists in order to strengthen joint scientific work in mixed teams.



Gender Equality Network in the European Research Area

The team led by Thomas Berghöfer, head of the GENERA project with by now more than 20 participating physics-oriented European institutions, is convinced that they have organised an extraordinarily exciting programme. Lia Lang, the team's gender scientist, affirms: "With the physicist Tomas Brage from Lund University, we won a renowned expert who with his interactive introduction will enthuse the auditorium to participate in the subsequent workshops."

Lisa Kamlade who has joined the GENERA project after completing her career training at DESY, adds: "In our afternoon programme, we will welcome Elisa Resconi from TU München for a short scientific talk. She will show that in the discovery of the first cosmological neutrinos in the data of the IceCube detector in 2013 women physicists played a central role." The event will end with music from the DESY Zeuthen band and the opening of the "Patente Frauen" (ingenious women) exhibition.

This event is dedicated to scientists and science students, executive managers in administration and equal opportunities officers. The event is free of charge, only registration is required.

Registration and more information:  
<http://indico.desy.de/events/gjp>  
Contact: [genera@desy.de](mailto:genera@desy.de)

# Equal opportunities at DESY

Anna-Christina Jauch appointed new equal opportunities officer

Sixteen years ago, DESY elected its first equal opportunities officer and women's representative; and equal opportunities have been an important topic at DESY ever since. Sylvie Faverot-Spengler, DESY's first equal opportunities officer, remembers: "During the first years, after long discussions, we established the guidelines for our work. We defined and initiated everything from scratch." Little by little, the presence of the equal opportunities officer gained acceptance in selection committees. "In the early days, the first response of some group leaders who I contacted for a selection procedure was 'what for? We have nothing against women,'" Faverot-Spengler remembers.



Sylvie Faverot-Spengler. Photo: Gesine Born/DESY

Today, 130 DESY female staff members are expert professionals who parallel to their normal work give advice to committees. Many other fields of activity were added, for example DESY events within the framework of MINT, a programme to target schoolgirls in particular and introduce them to the fields of science and engineering. Work-life balance, i.e. the compatibility of work and private life, is another important topic.

"We have developed more mutual understanding," Faverot-Spengler sums up.

"Equal? More equal...? Undoubtedly, our male colleagues must cope with a stronger female competition than was the case 30 years ago, and they must acknowledge these female colleagues appropriately. However, the so-called glass ceiling within the science system will still be reality for a long time. When will we see more women in leading positions? This includes not only professorships but also specialist management positions which deserve a better recognition."

In July this year, Sylvie Faverot-Spengler passed the baton to the lawyer Anna-Christina Jauch who, as assistant of the Director of Administration, has already gained substantial insight into DESY structures. She sees a real challenge in the balancing act between the tasks resulting from the selection procedures and the work on concepts and events concerning equal opportunities.

"We have not yet reached our goal regarding equal opportunities," Jauch emphasises. "If people ask 'who wants to be a quota woman?', I answer, every self-respecting woman should! An adequate proportion of women must finally be reached in all professional fields and the possibility to participate and to help to promote this should make women feel proud. Women are and have been doing their jobs very well. Now, it is important to obtain the corresponding recognition." The plan of the new equal opportunities officer is to make shared leadership and leadership in part time a reality as well as promoting female role models in male-dominated jobs and male role-models in family and domestic work.

"At DESY, we have a staff policy plan that includes many noble objectives. I have the impression that not all colleagues are familiar with this staff policy plan. I want to make sure that more DESY colleagues realise the opportunities and obligations that come with the plan," Jauch explains. Once the rules for equal opportunities included in the DESY central staff agreement and



Anna-Christina Jauch. Photo: Marta Mayer/DESY

staff policy plan are a desired and lived reality we don't need an extra equal opportunities plan anymore."

One challenge at DESY is the fact that women are still inadequately represented in physics and therefore must be specifically promoted. Jauch believes that the campus-wide "Women in natural sciences" mentoring programme which was created by her predecessor proved to be a powerful instrument that should definitely be continued. She also wants to include gender equality and equal opportunities as topics of the compulsory leadership training seminars. This means a lot of issues and work for the dedicated equal opportunities officer and mother-of-one. "People see me and entrust themselves to me, they tell me their stories. The trust they place in me is something very valuable and worth protecting and it motivates me anew every day to do the work of the equal opportunity officer." (uw)

## INFO

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# New leading scientists at DESY

Francesca Calegari and Beate Heinemann appointed in the framework of the Helmholtz recruitment initiative

DESY welcomes two new leading scientists. Francesca Calegari and Beate Heinemann accepted appointments in the framework of the Helmholtz recruitment initiative, which aims to bring outstanding international researchers to Germany and to strengthen the sustainable linking of Helmholtz centres with universities.

Francesca Calegari, who worked up to now at the Institute of Photonics and Nanotechnologies IFN-CNR in Milan, Italy, also becomes professor at the University of Hamburg. The focus of her inter-



Photo courtesy of Francesca Calegari

nationally highly respected research is the atto- and femtosecond laser spectroscopy of biologically relevant molecules and nanosystems. For this purpose, she also develops experimental methods and detection techniques. Her great interest is the understanding of electronic, atomic and molecular processes at their

natural length and time scales. In 2015 she was awarded an ERC starting grant to investigate the role of electron dynamics in UV light induced photochemical processes of biomolecules, potentially leading to DNA damage for instance.

Calegari already knows Hamburg from a research stay at the Max Planck Institute for the Structure and Dynamics of Matter (MPSD) in 2014. "Here in Hamburg, I find the ideal combination of light sources – free-electron lasers and laboratory-based lasers – and scientific areas of research, which offer unique opportunities for the successful achievement of my research goals," she explains. "A new class of groundbreaking experiments will be triggered by the interaction with numerous resident research groups, for instance at CFEL, European XFEL, CSSB, MPSD and the Centre for Ultrafast Imaging."

Particle physicist Beate Heinemann joined DESY's ATLAS Group in August as leading scientist and also takes up a post as professor at the University of Freiburg. Heinemann has most recently been a professor at the University of California, Berkeley. She completed both her diploma and her doctoral thesis at DESY. Since 2007, she has been a member of the ATLAS collaboration, becoming its deputy spokesperson in 2013, a position she will continue to hold until February 2017. In Hamburg and Freiburg Heinemann will be closely involved in the planned detector upgrade



Photo courtesy of Beate Heinemann

for the high-luminosity phase of the LHC, starting in 2026. This requires new, substantially more radiation-resistant detector components, which are currently being designed. DESY and the University of Freiburg are working together very closely on building an endcap for the silicon strip detector for the ATLAS detector.

Another focus of her research is the search for dark matter and related measurements, examining, for example, whether Higgs bosons decay into dark matter or whether dark matter is formed in the LHC by other means, for example through the decay of supersymmetric particles. "The ATLAS groups at DESY and Freiburg University are both excellent, and I am really looking forward to working with scientists at both these sites," says Heinemann, "especially since I hope and expect the next few years at the LHC to be extremely interesting ones." (tz)

## Helmholtz International Fellow Award for Linda Young

Linda Young, one of the pioneers of X-ray laser science, has received an International Fellow Award from the Helmholtz Association, following a proposal by DESY. The physicist from Argonne National Laboratory and the University of Chicago in the US will use the 20,000 Euros associated with the award to visit DESY in Hamburg as a research fellow. Young is one of the leading international experimental researchers looking into the fundamental

interaction between matter and light. She also has significant influence on the development of AMO (atomic, molecular and optical) physics.

"Linda Young is an outstanding science personality," underlines DESY director Helmut Dosch. "I am very happy that we will be able to welcome her in Hamburg." Her stay as a visiting scholar at DESY will also further enhance the cooperation with US facilities in the field of AMO physics.



Photo: ANL

# Seven weeks at DESY

104 summer students from 33 nations came to Hamburg and Zeuthen

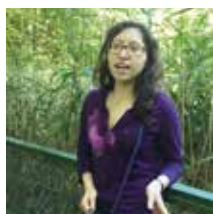
Internationality and practical experience are the main incentives that make the annual DESY summer school so popular among students. For seven weeks this year, 104 young scientists from 33 nations became part of the various research activities at DESY: 86 students in Hamburg and 18 students in Zeuthen did not only study the theoretical principles of accelerator, particle, astroparticle and X-ray physics but they were also involved in practical work at the heart of current research projects. "It is not only science that matters to the students – it's also about exchange among the students," said co-organiser Olaf Behnke from Hamburg. "The diversity of nationalities creates a special atmosphere." The participants share this view:



Eighty-six students from 28 countries came to Hamburg.



**Yousuf Hemani from the University of Eastern Finland** worked at the CFEL Laser-Lab: "The classes at our university are rather theoretical, we do not get much practical experience. At DESY, I had the opportunity to work at a genuine research project on ultrafast optics. This was a great experience and now I would like to do my master thesis in this field."



**Tania Martinez Cortes from Benemérita Universidad Autónoma de Puebla (Mexico)** worked at the DESY CMS group:

"At my home university, you do not often see students from other countries. Here, I just have to go to the kitchen to meet people of many different nationalities! At DESY, I worked with Monte Carlo simulations. This was quite a challenge but I am glad that I learned this. Now I can use this for my thesis."



**Connor Innes Thorburn from the University of Turin** worked also at the DESY CMS group: "In the future, I would really like to work in basic research. In the DESY summer

student programme I had the opportunity to get to know work within a genuine research environment. This

reinforced my idea that this is it what I really want to do. Moreover, I made friends with people from many different countries. This experience makes the world a smaller place."



**Eline De Weerd from the University of Edinburgh** worked at the DESY FLC group: "Currently I am trying to find

out in which field I would like to work after my graduation. Gaining practical experience in a true research group was extremely important to me. However, as a particle physicist, I also liked the photon science lectures very much. The summer school was really a unique experience during my studies!" *(tim)*



Eighteen students from 14 countries spent their summer in Zeuthen. All photos: DESY

## INFO

Applications always start in December for the coming year. The application period for the summer student programme 2017 is from 15 December 2016 until 31 January 2017. <http://summerstudents.desy.de>



# Insight – Open Day in Zeuthen



Photo: Lars Berg/DESY

What is the world made of? Where do cosmic rays come from? And what are the technologies we need to answer these questions? On 11 September on a wonderful late summer day nearly 900 visitors came to DESY in Zeuthen to learn more. They looked around the laboratories and workshops, got to know the fascinating research projects, attended lectures,

watched movies or discussed with DESY staff members. They also explored the world of everyday phenomena with hands-on experiments. A living jukebox entertained guests who took a rest by the lake. A group of DESY colleagues from Hamburg also took the opportunity to get to know the Zeuthen campus better. (ub)

## 25 Years of DESY in Zeuthen

“Two gems in a new setting,” read the headline of the Märkische Allgemeine Zeitung 25 years ago, when the Federal Republic of Germany signed the contract with the states of Hamburg and Brandenburg on 11 November 1991 for the Zeuthen Institute of High-Energy Physics, part of the former Academy of Sciences in East Germany, to be integrated into the large-scale research centre DESY. The contract came into force on 1 January 1992, and since that day DESY has been operating at two sites.

DESY has become a fixture in the scientific environment of the Berlin-Brandenburg region, jointly appointing staff with both the University of Potsdam and the Humboldt University in Berlin. “The Zeuthen site has evolved into a pearl of science and an important factor in the Brandenburg metropolitan region. Today, Zeuthen is an essential and indispensable part of the research centre,” says DESY Director Helmut Dosch. (ub)



# 100-megapixel camera for CMS

International cooperation makes the world's heaviest particle detector fit for the future

By Nina Laskowski

With a length of 21 metres, a diameter of 15 metres and a weight of nearly 14,000 tons the Compact Muon Solenoid (CMS) at the European particle research centre CERN is the heaviest particle detector ever built in an accelerator.

With the help of the huge detector at the world's largest particle accelerator LHC, the CMS scientists are searching for new particles like the Higgs boson discovered in 2012, supersymmetric particles, gravitons and even microscopic black holes. CMS is a large and a technically highly sophisticated detector with active layers around the collision point like the skins of an onion. Each layer has a special task.

Altogether, the layers help scientists identify the emerging particles and exactly measure their energy and momentum. To guarantee that the detector will continue to provide precise reconstructions of the particle collisions in the coming decades, it is necessary to upgrade in several steps the single components of the detector. One of the next components – the silicon pixel detector – is hidden deep inside of CMS.

The pixel detector forms part of the so-called tracker, it is located in the core of the experiment and is built around the beam pipe and the collision point. It allows the reconstruction of particle tracks and the calculation of the particles' momentum. Moreover, the tracker enables to reveal the positions at which long-lived unstable particles decay.

“Because of its proximity to the beam pipe, the pixel detector is a very important tool to identify new particles,” said CMS scientist Daniel Pitzl from DESY. “However, the high particle flux – that means radioactive radiation – brings about a short lifetime of the detector. This is why these components must be replaced after a while.”

The existing silicon pixel detector has been designed for the collision rates



Work at the CMS detector during the first long shutdown LS1. Photo: CERN

originally planned at the LHC. With considerably higher collision rates, the detector is no longer able to reconstruct the abundant particles with the necessary precision. The LHC is even starting to exceed the so-called design luminosity of  $10^{34}$  particles per square centimetre per second. For this reason, the CMS scientists decided to develop a new detector: the ‘Phase 1 Upgrade’ detector.

Just like the first detector, the new one will be a silicon pixel detector. However, unlike its predecessor, it will have an additional layer of modules – i.e. four central layers with a total of 1184 modules and three instead of two end caps. The four layers of modules will be constructed by several institutes from various countries participating in CMS. The two inner layers, the closest layers around the beam pipe, come from the Swiss Paul Scherrer Institute (PSI) in collaboration with the Swiss universities, the third layer of modules was produced by CERN and several Italian institutes.

Half of the fourth layer with 512 modules was provided by the Karlsruhe Institute of Technology (KIT) in collaboration with RWTH Aachen University, the other half was produced by DESY in Hamburg in collaboration with the University of Hamburg.

“With the replacement of the modules we were able to build in twice as much storage space into each module and to double the readout rate,” said Pitzl. All layers will be assembled at PSI to form the new pixel detector and after extensive tests at CERN it will be built into the detector.

This winter is expected to be very exciting for the CMS scientists, when the new silicon pixel detector will be placed around the CMS beam pipe. This is planned for the shutdown at the turn of the year.



Photo: DESY

## H.E.S.S. camera upgrade finished

The renewal of four cameras in the H.E.S.S. gamma-ray telescopes in Namibia is complete. A DESY team from Zeuthen led by Stefan Klepser needed only four weeks to connect and install the detectors. The complete electronics of the highly sensitive H.E.S.S. cameras had to be updated. After the modernisation of the first telescope (CT1) in June 2015, telescopes CT2 to CT4 followed this September. Routine operation of the observatory is supposed to start at the beginning of next year. With H.E.S.S., scientists look for gamma-rays from natural cosmic particle accelerators like supernova remnants and active galactic nuclei. The H.E.S.S. telescopes record the faint blue glow that cosmic gamma-rays produce in Earth's atmosphere.

## Starting Signal for Innovation Centre

### Partners set up a limited-liability company

The innovation centre jointly planned by DESY, the University of Hamburg and the City of Hamburg is getting under way: the three partners have set up a limited-liability company that will run the centre, which is supposed to be established on the research campus at Hamburg-Bahrenfeld. This paves the way to begin construction work and provide additional funding for the innovation centre aimed at research spin-offs, technology start-ups and small companies that want to settle near DESY.

“The innovation and start-up centre will offer an attractive environment for young businesses, which will promote the transfer of know-how and information from the excellent research conducted by DESY and its partners,” says DESY’s Chief Technology Officer Arik Willner, who has provisionally taken over the

management of the operating company together with DESY’s Administrative Director Christian Haringa. A CEO will be appointed next year. DESY holds the largest share in the newly founded limited company with 44 per cent, followed by the City with 30 per cent and the University of Hamburg with a 26 per cent share.

A new building will be erected on a 5000-square-metre plot of land on the edge of the research campus in Hamburg, covering a gross area of over 4000 square metres, and offering some 2600 square metres of usable space. Construction work is scheduled to begin next year and should be completed in 2018. The contract for the work is being awarded by DESY, with the City of Hamburg paying for the construction costs of 14.2 million euros. *(tim)*

## DESY Housing Office is looking for flats

The DESY Housing Office is looking for furnished and unfurnished accommodation at reasonable prices in the Hamburg metropolitan area for employees and guests on the campus. “We realise that many lodgings are too expensive for our clients,” said Petra Kärntner from the Housing Office. “Many landlords choose internet portals to let their accommodation at high prices.” Nevertheless, due to the comprehensive and cost-free support and because of the good reputation of DESY, there are also many landlords who decide to rent their flats via the Housing Office.

The Housing Office successfully brokers more than 300 long-term accommodations per year and supports these tenancies, which often go over a period of several years, through the entire term.

Housing offers are distributed via email to all those interested who have registered at the Housing Office homepage. “Sometimes we even get desirable luxury properties which are out of reach for many employees,” said Michal Abramova from Housing Office. “We regularly send these offers to the secretaries’ mailing list.” For foreign employees, the office provides bilingual lease contracts in German and English. These may only be used for lodgings obtained through the DESY services.

Generally, the handing over and inspection of accommodations procured by the DESY Housing Office is carried out and protocolled by Housing Office employees. During the tenancy, the Housing Office acts as a mediator between landlord and tenant. However, those interested in renting an accommodation must make appointments with the landlord, arrange a viewing and sign the contract independently.

## DESY administration websites relaunched

The websites of DESY’s administration (V) sector have been adapted to the overall corporate design and have undergone a content revision in 2016. Step by step, all DESY employees should use these websites as a central information platform providing administration guidelines and online forms as well. The new websites should be optimised to become as user-friendly as possible. The administration welcomes suggestions and tips under: [verwaltung.online@desy.de](mailto:verwaltung.online@desy.de)

# Particles and the big picture

Teachers searching for particle traces at DESY

By Ulrike Behrens and Kim Petersen

Particle physics is finding its way into society: discussions on the microcosm, on Higgs particles and black holes are no longer exclusively held among scientists. These topics are also present in the media and arouse public interest. In some federal states particle physics will soon be or is already part of the school curriculum. DESY wants to help teachers gain a comprehensive and deep insight into this highly topical research field, which is why DESY offered two teacher training courses this autumn.

At the end of October, the first particle physics training taking several days was held in Hamburg, with the participants being in close exchange with DESY scientists. This concept had already been a success at the photon science teacher trainings in 2014 and 2015. Ten teachers from different federal states took part in this adventure and were offered a well-balanced mix of theory and practice.

Lectures and guided tours in the morning provided a solid basic framework; in the afternoon there was time for experiments in groups of three and four participants. For example, measurements at the test beam and the inspection of a cavity in the HiGrade Lab gave the teachers an impression of fundamental concepts in physics research and how research is done at DESY. In the school lab, they measured the properties of cosmic muons and analysed CERN data within the framework of Netzwerk Teilchenwelt



Teacher training participants analysed real data. Photo: DESY

(network particle world) masterclasses. At this occasion they were also made familiar with particle physics teaching materials developed by Netzwerk Teilchenwelt in cooperation with the Joachim Herz Stiftung, a foundation paving the way for education. The very positive feedback from both the tutors and participants calls for repeating this event.

In Zeuthen, a MINT-EC teachers training took place on 17 and 18 November. MINT-EC is the national network of excellence of schools with secondary education level II and a pronounced profile in mathematics, informatics,

natural sciences and technology (MINT). Teachers from MINT-EC schools from all over Germany came to DESY to focus on the topic “particle physics in the classroom”. Again, the teaching materials of “Netzwerk Teilchenwelt” were the main topic of the two-day training and on this basis the participants developed concrete teaching concepts. The programme was rounded off with lectures on modern particle physics, the construction of a cloud chamber and visits to DESY research facilities.

## School with science

Following the motto “inspire those who give inspiration”, the MIT Club of Germany and the Körber Stiftung jointly organised a teacher training called „Schule MIT Wissenschaft“ (school with science) on 11 and 12 November in Hamburg for some 100 teachers from the MINT sector from all over Germany.

The participants listened to various lectures from all kinds of subject areas. Among others, Nobel laureate Klaus von Klitzing talked about the upcoming new definition of the kilogramme and on how to get a Nobel Prize.

DESY physicist Franz Kärtner, who is also head of a research group at MIT (Massachusetts Institute of Technology) in the United States, explained the functioning and the benefit of particle accelerators like the European XFEL and he offered an outlook into the world of terahertz acceleration. His talk was followed by a workshop session where a DESY school-lab team presented the project “Flashmotion – How to speed up your camera”.

You can use a standard camera to make a film with thousand or more pictures per second, a

technique called “Flashmotion”. At the workshop, the teachers had the opportunity to rig up and thoroughly test the required device. The project itself was started by Markus Drescher from the Institute of Laser Physics of the University of Hamburg within the framework of the free-electron laser research focus to explain the pump-probe technique.

# All milestones met

EUCALL project successfully completes its first year



EUCALL's project participants gathered at the Annual Meeting 2016 at HZDR. Photo: EUCALL

By Graham Appleby

The European Cluster of Advanced Laser Light sources (EUCALL) project completed the first year of its three-year project period on 30 September 2016. EUCALL involves approximately 100 scientists from European XFEL, DESY, the Extreme Light Infrastructure (ELI), ESRF, Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Lund University, the Swiss Paul Scherrer Institute (PSI), and Elettra Synchrotron, as well as the clusters LaserLab Europe and FELs of Europe. Within the EUCALL project, the accelerator- and laser-driven X-ray sources of Europe collaborate for the first time in a comprehensive way on technical, scientific, and strategic issues. Within its first year EUCALL successfully fulfilled its twenty required project milestones and deliverables.

One of EUCALL's major outcomes so far is the successful compilation of a new open-source tool for simulation of photon-science experiments—the SIMEX platform. Currently SIMEX performs simulations of single-particle imaging, diffraction, and scattering experiments using user-defined FEL or synchrotron light sources and is already producing scientific results. SIMEX's capabilities will be extended into X-ray analysis of laser excited matter and to laser-plasma accelerated X-ray sources. Another important outcome is a design report for a new transparent X-ray intensity monitor for use at both European XFEL and at ELI Beamlines. The first prototype will be tested during 2017. Finally, specifi-

cations were agreed on for a standardised sample holder and sample mount for photon science experiments to be used at all of EUCALL's facilities.

"The EUCALL project brings together experts from different types of light sources. The exchange of know-how and the joint developments will enable to develop these sources further and will pave the way towards new science and technology applications," said EUCALL's Project Director Thomas Tschentscher from European XFEL.

The EUCALL participants held their first Annual Meeting at HZDR from 31 August to 1 September, while EUCALL's Scientific Advisory Committee (SAC) had its first meeting at European XFEL on 20 and 21 September. "The technical developments in the EUCALL project are not only relevant for the facilities that are directly involved, but are of significant importance to other light sources that could profitably be involved on rather short notice, for example LCLS. The relevance of EUCALL is not limited to the project period—a strategy should be urgently developed to sustain the synergies that are developed within EUCALL beyond the project duration", reported EUCALL's SAC.

## INFO

[www.eucall.eu](http://www.eucall.eu)

## AWARDS

PhD Award 2016 goes to Cornelius Gati



The Association of the Friends and Supporters of DESY (VFFD) has awarded its 2016 prize for doctoral students to Cornelius Gati. The VFFD is doing so in recognition of Gati's doctoral thesis entitled "Data processing

and analysis in serial crystallography at advanced X-ray sources", which was researched at DESY and the University of Hamburg. The award was presented on the occasion of the DESY Science Day. In his dissertation, Gati describes among other things the hitherto smallest protein crystals for which data has ever been collected on an atomic scale, the first structure of a human membrane protein at room temperature, and the first completely unknown protein structure to be solved using serial femtosecond crystallography (SFX).

Two Helmholtz Young Investigators Groups for DESY

The Helmholtz Association has given DESY the go-ahead to set up two Young Investigators Groups. Elisa Pueschel and Anna Franckowiak will be able to set up their own research groups at DESY's Zeuthen site, drawing each on an annual grant of 300,000 euros over the next five years. Half of this will come from DESY, while the other half will be covered by the Helmholtz Association.

Pueschel's group will search for the signs of new particles produced in astrophysical processes, using the new gamma-ray observatory Cherenkov Telescope Array (CTA). CTA will be sensitive to extremely energetic gamma-rays, which could provide information about the decay or annihilation of new, heavy particles that have not been detected in particle accelerators. This would shed light on the nature of dark matter.



Franckowiak's Young Investigators Group is looking into the riddle of the origins of high-energy cosmic neutrinos that the IceCube neutrino telescope at the South Pole first detected in

2013. So-called multi-messenger observations will combine the neutrino data with data from optical and gamma-ray observations.

**Golden Pin of Honour for Erich Lohrmann**

He already had the silver one, now he has been awarded the golden one too: experimental physicist Erich Lohrmann has made outstanding scientific contributions in the field of particle physics and towards the development of DESY and has now been awarded DESY's Golden Pin of Honour in recognition of these achievements. "For more than five decades, Erich Lohrmann has played a key role in shaping research at DESY in many different capacities," as DESY director Helmut Dosch pointed out. "He is one of the old hands of DESY in the best sense of the word, and in addition to his numerous publications, he has also written a cult book on the 50-year history of DESY."



**CMS Achievement Award for Özgür Sahin**

DESY researcher Özgür Sahin has received one of the Achievement Awards of the CMS Collaboration. The Collaboration Board honours his work on the modification of the hadronic calorimeter of the Compact Muon Solenoid (CMS), one of the large detectors at the world's largest particle accelerator LHC in Geneva. The calorimeter has been completely remodeled to allow more data readout channels and thus a finer image of the particle collisions. Sahin has done excellent work for the data readout using the advanced electronic standard Micro-TCA that is being further developed by DESY. Sahin, who also held a scholarship of the Joachim Herz Foundation, is the third DESY researcher, after Beni Lutz and Ekaterina Kuznetsova, to be awarded a CMS Achievement Award.

**FEL Science and Applications Award for Kartik Ayer**



DESY physicist Kartik Ayer from the Center for Free-Electron Laser Science (CFEL) was awarded the "FEL Science and Applications award" of the international "Science@FELs

2016" conference in Trieste, Italy. The Indian researcher works as a postdoctoral research associate in the team of Henry Chapman.

The award is given to young researchers during the conference and comprises of a certificate, a sum of 1500 euros and the opportunity to give a presentation of the work at the conference. Ayer was honoured for his contributions to the research field of free-electron lasers and their applications.

# Accelerating ions instead of making coffee

School internship students do experiments at PETRA III



Photo: Nina Laskowski/DESY

*By Celine Knauth*

For many school internship students, making coffee and spending days standing at the printer is a common experience. This however is not true at DESY and its research facilities. Here, pupils are confronted with real challenges and they may even actively assist in research. The attraction of DESY for school internships manifests itself in the increasing number of applications – unfortunately, not all candidates can be successfully placed.

Four pupils from the physics advanced course of the Lise Meitner secondary school in Hamburg applied successfully and spent a holiday internship at DESY, carrying out calibration and transmission measurements at an ion accelerator in the Max von Laue hall. They used the inert gas xenon because of its typical and therefore easily identifiable isotope structure. The obtained data will help to identify more complex systems, e.g. amino acids, which are not recognisable as easily.

For two weeks, Vladislav, Sven, Dominik and Esmart did not only have the opportunity to look over the shoulder of DESY scientist Stephan Klumpp, they were also allowed to carry out their own tasks. They participated in running experiments so that later they could take data and evaluate them.

The four school students learned a lot about work at DESY's X-ray light source PETRA III and about DESY as well. They informed themselves about the research centre, the employees and their jobs and they got to know professions which they can imagine to perhaps practise in the future.

Only boys formed this pupils' group, but this is not the rule, Klumpp said: "Often people think that physics is just a male domain. In fact, there are also many girls fascinated by physics who are very interested in getting an internship in the field of science."

# Experiencing research, questioning stereotypes

20th Women in Physics Conference on the DESY campus in Hamburg

By Ingeborg Adler

What are the current questions in research? What are women physicists investigating? Are the strategies for the promotion of women still up to date? The 20th Women in Physics Conference, where female physicists from all career levels met on the DESY Campus in Hamburg in early November, was marked by scientific and sociopolitical discussions.

Hosted by the German Physical Society (DPG) and their associated working group on equal opportunities, the annual forum has been taking place since 1997. The anniversary event in Hamburg, which took place under the patronage of Federal Minister of Education and Research Johanna Wanka, was organised by the Department of Physics of the University of Hamburg and the cluster of excellence "The Hamburg Centre for Ultrafast Imaging" (CUI).

"The anniversary is a nice occasion for looking back at the last two decades' road to success," the Minister emphasised in her greeting. "During that period many women have been thrilled about physics. I'd like this dynamics to continue. Physics is an important basis for technological developments and thus for economical progress in our country. Also in the future we will need the valuable contributions of women for pushing innovation processes." Moreover, Wanka praised the conference's idea in a video message and em-

phasized the ideal location at DESY.

Almost 250 women had registered for this year's conference. "It was great to see, what kind of a platform our conference could offer to the physicists to discuss their topics in an open and relaxed atmosphere," said Max Planck Research Group leader Melanie Schnell, who is a member of the CUI board.

This proved to be true in the fully occupied auditorium, where a panel discussed paths towards gender equality in natural sciences. Hamburg's Senator of Science, Research and Equality, Katharina Fegebank, even stayed longer than previously planned, to further participate in the discussion. She had defined insecure career paths as a problem that is already being addressed from the political side – for example via a Code of Conduct. Furthermore, the participants stressed the importance of offering an early mix of supporting measures, reducing stereotypes and creating a critical mass – so that women in natural sciences are no longer a minority.

The conference was supported by DESY and the Max Planck Institute for the Structure and Dynamics of Matter, as well as by the Collaborative Research Centers 676, 925 and PIER, the strategic partnership of DESY and the University of Hamburg.

Independent from gender, all ages are represented, starting at 15, said the DESY internship coordinators Annette Pettersson and Ieva Gilyte-Robertson. In the past year, DESY was able to place 141 pupils in an internship. However, there were 540 candidates. The internship coordinators encourage staff members from all divisions to take school internship students under their wings. "An in-

ternship is not only a good experience for the pupils but also for their tutors," Gilyte-Robertson points out.

*Celine Knauth was an intern at the PR department*

## AWARDS

Double award for DESY scientist Alessandro Ricci



DESY scientist Alessandro Ricci has been awarded twice for his innovative investigation of high-temperature superconductors. The researcher, who is working at the beamline P10 at DESY's X-ray source PETRA III, received the 2016 SILS/Bruker Young Researcher Award, which is aimed at young scientists who have made significant contributions to synchrotron radiation methods, techniques and applications. Moreover, Ricci also received a grant for a one-month stay at an Italian research centre from the Young Investigator Training Program (YTIP) by the European Colloidal and Interface Society.

Neutrino dissertation Prize for Lars Mohrmann



The Global Neutrino Network GNN Dissertation Prize was awarded for the second time and, again, a DESY doctoral student was among the winners: Lars Mohrmann from Zeuthen won one of three prizes for his thesis "Characterizing Cosmic Neutrino Sources" in which he combined the results of several preceding special analyses. He did not only manage to obtain the most reliable characterisation of the energy spectrum of cosmic neutrinos observed with IceCube so far, he also was able to narrow down the possible contributions of the three neutrino types and thus exclude certain astrophysical source models.

Helmholtz Doctoral Prize for Wolfgang Hollik



Wolfgang Hollik, physicist in the DESY Theory Group, has been awarded the Helmholtz Doctoral Prize during the annual meeting of the Helmholtz Association in September. As one of six award winners he receives 5000 euros and a monthly allowance of up to 2000 euros for travel and material costs for a stay abroad for up to six months at an international research institute. In his dissertation at the Karlsruhe Institute of Technology, Hollik explored the stability of the vacuum state in an extension of the Standard Model.



Photo: DESY

## Young people on discovery tour

### MINT Camp and International Cosmic Day give insight into DESY research

In November, DESY coordinated the International Cosmic Day for the fifth time. Young people from all over the world were invited to study showers of cosmic particles which permanently hit the earth to learn more about the field of astroparticle physics, that investigates unsolved mysteries in the universe with the help of cosmic messenger particles

At International Cosmic Day, youths, teachers and scientists meet every year to discuss research questions in this field. DESY participated with both institutes, Zeuthen and Hamburg. This year, for the first time at the international Cosmic Day, the research groups from ATLAS at CERN and from the IceCube experiment analysed their data to answer the question of the day: "Which direction do the cosmic particles come from?"

"The young people pursued this question and in video conferences discussed with other groups from all over the world," said Karolin Schwerdt, coordinator of the astroparticle school projects in Zeuthen. This event was initiated by DESY in Zeuthen in cooperation with "Netzwerk Teilchenwelt" in

Germany and with the US Fermilab research centre's teacher network programme QuarkNet as well. A total of 46 institutes and schools from more than 16 countries participated in this event.

Participants of the MINT-EC school camp learned about particle and astroparticle physics as well. In Zeuthen, 14 school students from schools of the national excellence school network MINT-EC went on a journey of discovery to the origin of the universe. The programme gave insight into current research topics and presented research methods of particle and astroparticle physics. The young researchers identified elementary particles in the particle collisions of the ATLAS detector at the LHC and discussed their results with scientists. Doing experiments individually made research come alive, among others with the construction of their own cloud chamber. *(ub)*

#### INFO

More info about International Cosmic Day:  
<https://icd.desy.de/>

#### 3D prostate model for cancer research

Prostate cancer is the most frequent cancerous disease in men. It is often only recognised at a late stage. When cancer has already metastasised, a complete cure is difficult. That is why researchers want to understand how cancer cells interact with their environment and how metastatic spread proceeds.

For this purpose, scientists from the Karlsruhe Institute of Technology (KIT) developed a cell culture model that allows to reproduce and analyse the natural processes at the development and in the course of prostate cancer. The model is based on hydrogels of synthetic polymers which allow to build three-dimensional porous structures. Their mechanical characteristics are very similar to those of natural cellular tissue.

In the future the scientists will use the model to cultivate both healthy cells and cancerous cells of prostate tissue in order to analyse and better understand the development and the process of this tumour disease. A recent publication on this project in the scientific journal "Small" managed to appear as the "Top Story of the Week" on the Prostate Cell News platform, one of the most important international databases on prostate cancer research

<http://www.helmholtz.de/perspektiven>

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