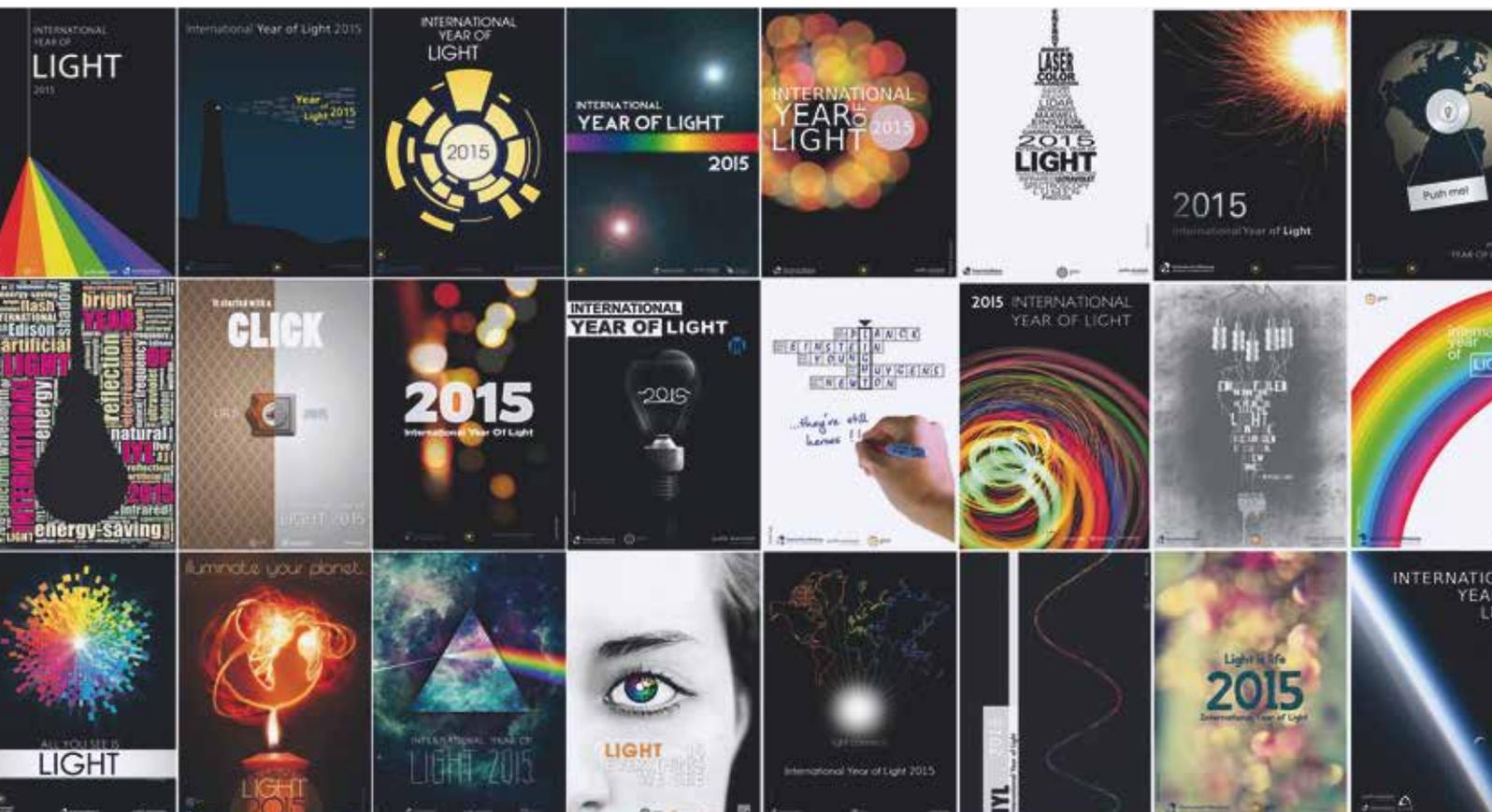


Let there be light!

The United Nations proclaims 2015 as the International Year of Light



Illustrations for the International Year of Light:
Hochschule Offenburg

You can probably feel it too: the days are getting longer again and people are enjoying the increasing hours of sunlight. Without sunlight, life would be impossible – at least our familiar life which depends on the photosynthesis of plants. But sunlight is not only an elementary precondition for the lives of humans, animals and plants, it is also a central element of science and culture. This is the reason why the UN General Assembly has proclaimed the year 2015 as the “International Year of Light and Light-based Technologies”.

2015 is also the anniversary year of many important publications in the field of optics and light: one thousand years ago, the Islamic scholar Ibn Al-Haitham published early works on optics, 400

years ago, French engineers developed the first prototype of a solar-powered machine. Two hundred years later, Augustin Jean Fresnel published his first work on the wave theory of light. In 1865, James Clerk Maxwell described a theory of electromagnetic radiation including light with his classical electrodynamics. In 1915, Albert Einstein presented his general theory of relativity. In 1965, Arno Penzias and Robert Wilson detected the cosmic microwave background radiation, the oldest light in the Universe, and provided proof for the big bang theory.

Scientific knowledge on light facilitates a better understanding of the cosmos, provides better treatment possibilities in medicine and offers new means of

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communication. DESY is in the vanguard of research with light. The intensive X-ray light generated with the help of powerful particle accelerator opens up views into the dynamic world of atoms



Dear colleagues,

I hope that you started the new year in good health and relaxed.

2015 is not only an exciting new year for DESY but also the beginning of the new funding period. Thanks to the excellent results our research centre obtained in the Helmholtz evaluation, we are well positioned to fulfil our mission in the coming years. In 2015, our research facilities will restart user operation. Our FLASH laser will welcome users from all over the world in two experimental halls, and the Max von Laue Hall of the PETRA III facility will again take up operation while the two extension halls will be quickly completed.

2014 was an outstanding and successful year for DESY. I am sure that we will again set a strong scientific emphasis in 2015 and further expand our leading international position. The trouble-free construction progress of the X-ray laser European XFEL plays a key role in this respect. This is also true for the outcome of the negotiations between DESY, the Federal Ministry and the Helmholtz Association on how to organise the German contribution to the operation of the facility as from 2017. The directorate will deploy all its skill to succeed in keeping enough resources for our ambitious research programme. This is not only decisive for DESY but also for the scientific development of the metropolitan region. Admittedly, there are political uncertainties.

One thing is certain: without the legendary commitment of the DESY staff at their individual workplaces, the achievements in the past would have been unthinkable and this also guarantees success of our future projects.

Thank you very much to all of you for your commitment, and I wish you a good start into the new year.

Yours
Helmut Dosch

and molecules. Applications are possible in almost all fields of natural sciences and in industry. A small insight into this extremely diverse research is provided by the events throughout Germany which are listed in an agenda (see info box). DESY will also organise events and conferences on the theme of light, kicking off with a Science Café about polar lights on 21 January.

In Germany, a national steering committee will coordinate the various activities of the international year of light, the Deutsches Komitee für das Internationale Jahr des Lichts. Its members are the Deutsche Physikalische Gesellschaft, the Deutsches Optisches Komitee and other organisations and communicators linking the different aspects of the subject light seen from science, industry, culture and other sectors of society. There are four focus areas: light science, research into light, light technology (photonics), i.e. the application of light in science and technology, light and culture and light in nature.

Seen from these different points of view, light might offer an incentive also to those who work with a very special application of this universal radiation to



INTERNATIONAL
YEAR OF LIGHT
2015

see their work in the context of an exciting integral whole. After all the organisers of the year of light started with the intention to inspire people and offer them the possibility to learn something new and to network themselves across the globe (uw)

INFO

<http://www.jahr-des-lichts.de/>
<http://www.light2015.org>

50 years of synchrotron radiation research at DESY

On 28 October 2014 DESY celebrated the anniversary of a very special kind of light: for 50 years, scientists have been conducting research at DESY with extremely intensive X-ray light generated at particle accelerators – synchrotron radiation. “DESY was one of the first places in the world specifically investigating the properties of this at that time very new light and recognising its potential for research,” said DESY director Helmut Dosch. “In those days, the DESY pioneers did not only coin the development of our research centre but created the basis for the global success story of a whole research discipline.”

It was in 1964 when the first measurements started at the newly completed ring accelerator DESY to characterise the synchrotron radiation. At the following accelerator DORIS many pioneering experiments were made; for example by Nobel laureate Ada Yonath who carried out numerous experiments to identify the structure of the ribosome. In 2005, FLASH went into operation, and in 2009, the PETRA III became the world’s most brilliant third-generation synchrotron radiation source. “Today, with PETRA III and the free-electron laser FLASH, DESY operates two real flagships of synchrotron research,” said research director Edgar Weckert. “Every year, far more than 2000 users from more than 40 nations come to DESY to use these excellent light sources.”



Peter Stähelin

1924-2014

By Peter Schmüser and Bernd Sonntag

Peter Stähelin, professor emeritus of experimental physics at the University of Hamburg and former member of the DESY directorate, passed away at the age of 90 on 22 October 2014.

Peter Stähelin, who in the 1950s has made a name for himself at the University of Illinois with beta decay investigations, was appointed professor at the II Institute of Experimental Physics at the University of Hamburg in 1960. From 1960 to 1967, he was also the first director of research at DESY. He headed the planning and preparation of the first particle physics experiments at the 6 GeV electron synchrotron and laid the foundations for its early scientific successes.

Stähelin's vision to use the electron synchrotron not only for particle physics but also in parallel as an intensive ultraviolet and X-ray radiation source for scientific purposes, produced first experiments with synchrotron light as early as 1964. Due to Peter Stähelin's pioneering spirit, DESY became a nucleus for the global success story of research with synchrotron radiation took its beginning.

As PhD students of Peter Stähelin, we, the authors of this obituary, were offered the great opportunity to actively shape the experiments in DESY's pioneering phase and to contribute to the first scientific achievements: Peter Schmüser in particle physics and Bernd Sonntag in research with synchrotron radiation.

In the years after 1967, Peter Stähelin mainly devoted himself to university tasks. His foresight and initiative led to the establishment of the computer science department. With his proposal to create a faculty of technology, he provided crucial impetus for the foundation of the Hamburg university of technology TUHH.

Peter Stähelin has also made important contributions to teaching. In the early 1970s, he decided to redesign the basic education in physics in Hamburg. It was



a great honour and benefit to get the opportunity to participate in this project based on the models of the Berkeley Physics Course and the Feynman Lectures on Physics, eliminating the artificial separation of experimental and theoretical physics. The jointly developed and tried and tested Physics I-IV course was quickly approved by students and professors of the department and – with some small changes – has been successful until today.

Admittedly, it was not only fun but also quite a challenge to work with Stähelin. He was very intelligent and able to think and grasp quickly. Peter Stähelin loved to devise sophisticated exercises for tutorials which in fact were very difficult to solve even for the tutors. His solutions were often not easily traceable but (almost) always correct. (Back then, we used to say: Stähelin thinks with a left-hand thread.) The discussions were very inspiring for all of us and as a result, the assistants showed great commitment in the tutorials and conveyed their enjoyment of physics and their tricks to the students. To communicate this joy and intellectual curiosity is an important task of a university teacher. Peter Stähelin has achieved much in this regard as well.

In the mid 1970s, Stähelin returned to active research. He established a research group working within the framework of the CHARM Collaboration with the focus on neutrino scattering by electrons and nucleons. With great enthusiasm, Stähelin participated in the technical design, particle reactions' simulation and evaluation of measurement results. His originality and unconventional ideas always amazed his colleagues. For example, during the construction of the large detector, he used his experience as a mountaineer bringing along the appropriate equipment. For him, the use of computers was an intellectual incentive and he often detected problems, the solution of which brought experts to the verge of despair.

With Peter Stähelin we have lost a great scientist and innovator who deeply coined the faculty of mathematics and natural sciences at the University of Hamburg and the research centre DESY. In 2014, he was awarded the DESY Golden Pin of Honour for his services. We will always keep him in our remembrance.

A mars rover with tunnel vision

Cooperation project develops inspection robot for accelerators



Time is a precious commodity for accelerator experts. Light sources such as FLASH and PETRA III – frequently over-booked – should be available for science to the maximum possible extent and shutdowns should be as short as possible. In their search for optimisation possibilities, the accelerator physicists have considered sending on patrol a fully automatic inspection robot through the accelerator tunnel to find out during operation if something is not working correctly.

This was the idea presented by Reinhard Bacher from the Machine Control Systems (MCS) group at the annual DESY Accelerator Ideas Market. “There are many optional features: We could measure voltage, temperatures, sounds and radiation, and carry out visual inspections. By this, we can virtually have the finger on the pulse of the machine, with and without particle beam,” Bacher explained. The supreme discipline would be to equip this autonomous robot with an X-ray unit to control by fluoroscopy the correct position of sensitive RF transitions in flanges during accelerator operation.

It was decided immediately to pursue this project for the new European XFEL accelerator. However, what seemed to be simple at first sight is in fact very sophisticated: A tunnel patrol vehicle must orient itself autonomously in the two-kilometre accelerator tunnel, connect

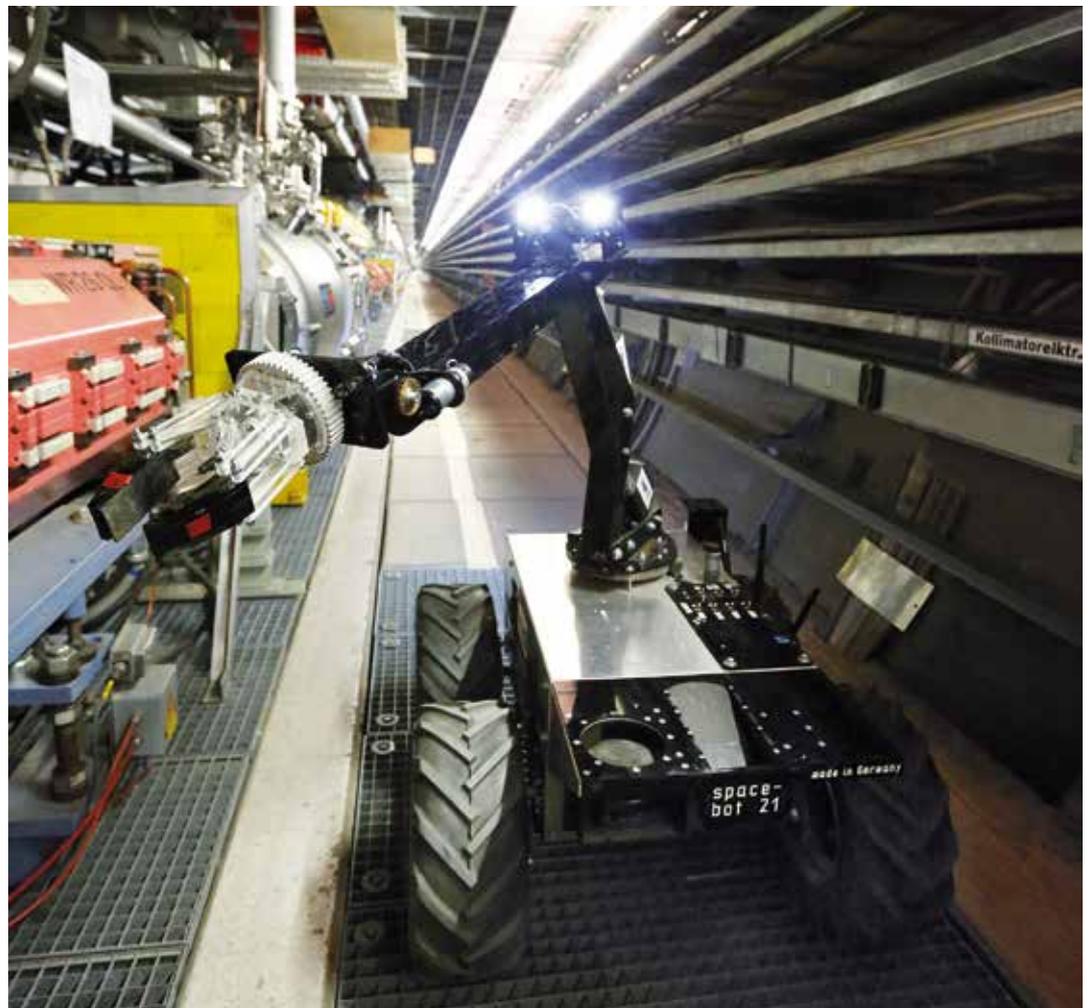
to a charging station automatically when its battery is empty and, above all, independently reboot in case of a control system error and instantaneously orient itself again. Especially the last point is difficult to calculate because in the accelerator tunnel, just like in outer space, particles can traverse the circuit boards and chips and put the electronics’ radiation resistance to an acid test. “When a neutron passes through the memory chip, the robot must be able to manage this with 100 per cent reliability,” said Bacher. Several approaches to

build such robots have already been made, but presently none of them really works. Thus, in the search for providers, the accelerator experts found out that such a robot – even a basis version for this – is not available off the rack.

Then coincidence helped them out. When reading the daily newspaper in the morning, Reinhard Bacher found an article on a competition of the German aerospace centre DLR. For the „Space-Bot Cup“, the participants were asked to develop a vehicle which should be



Discussions in the HERA tunnel (Photo: Dirk Nölle)



The robot of the Hochschule21 during testing at the HERA tunnel.
(Photo: Dirk Nölle)

able to autonomously explore the surface of an alien planet and take samples. One of the participating teams came from Hochschule 21 in Buxtehude – a university specialised in dual courses of study – in the immediate vicinity of Hamburg. “The HS21 team has done a good job in the SpaceBot Cup contest,” said Bacher. “Basically, our control requirements are not far away from those of a Mars vehicle.” So he contacted the students on the phone and invited them for a presentation.

In the HERA tunnel, the students introduced the Mars Rover they had built for the Cup: The smooth tunnel surface certainly was no obstacle for the 85-kilogramme all-terrain vehicle, and with its gripper arm it even managed to activate electrical door openers. “Our challenge however will be the autonomy, operational reliability and the energy management,” Bacher pointed out. The

HS 21 students readily accepted this task and there was an agreement on a common objective: For the start of operation of the European XFEL in 2017, a prototype of the inspection robot should be completed which independently travels through the tunnel and regularly measures the radiation dose at certain spots and in a certain distance to the accelerator. “Of course this is a very sophisticated project but we will use our experience,” said Thorsten Hermes, professor of computer engineering at HS21. He and his colleague Thorsten Uelzen, professor of mechatronics, supervise this 240 000 euros project on the part of Hochschule 21. The two-year project is carried out by two students, the job opening for a direct advisor has recently been advertised. HS 21 will develop the complete robot control and mechanical system, DESY will be responsible for the development of data taking and transfer from the tunnel.

“If everything works well, we will be the first team who is able to inspect an accelerator tunnel during operation in-situ,” Bacher said. “We could save valuable maintenance time by using the robot during operation to verify possible defects and – for shutdowns – by making clearance measurements automatically in advance. Later, it will certainly be possible to equip the prototype with additional functions and adapt it to all our tunnels and for example think about the management of ramps and stairs.” Bacher could also imagine to operate the robot by remote control in order to carry out special tasks and measurements. For this purpose, the Rover could be provided with a 3D camera transferring the image to virtual eyeglasses that the “navigator” wears in the accelerator control room. (tz)

Top grades for DESY

2015 is the start of the third round of Programme-oriented Funding (POF)

Joachim Mnich new ICFA chairman

DESY director of research Joachim Mnich is the new chairman of the International Committee for Future Accelerators (ICFA). The committee that was founded in 1976 coordinates global cooperation in the development of new accelerators for particle physics. ICFA is a working group of the International Union of Pure and Applied Physics (IUPAP). It has 16 members from all over the world, selected primarily from the regions and centres involved in high energy physics. Mnich was elected head of the committee for three years, taking over from Fermilab director Nigel Lockyer.

Robin Santra elected APS Fellow



CFEL scientist Professor Robin Santra was elected Fellow of the American Physical Society (APS). He is awarded for his successful theoretical description of the interaction of light with matter. This knowledge is fundamental for experiments with free-electron lasers. With more than 50 000 members, the APS is the second largest physics association worldwide, after Germany's Deutsche Physikalische Gesellschaft (DPG). Outstanding scientists can be elected as Fellows. Only 0.5 per cent of the APS members receive this distinction per year.

Photon science teachers' training

DESY has launched a teachers' training programme in the field of research with light. During the past autumn school holidays, nine teachers from greater Hamburg participated in a one-week training course. They experienced current research projects, among others at DESY's X-ray sources. This teachers' research course will take place every year during autumn school holidays and can be extended if there is positive feedback.

Record-breaking participation at photon science users' meeting

The users' meeting of DESY's research light sources and of the future European XFEL X-ray laser attracts more participants than ever before: more than 880 attendees have registered for the three-day event that runs from 28 to 30 January – a new record. Topics include the state of the numerous construction and extension projects as well as research highlights at the light sources.

<http://photon-science.desy.de/usersmeeting>

By Petra Engelbert

The new year 2015 starts with the third round of Programme-oriented Funding (POF) of the Helmholtz research field Structure of Matter, which also includes DESY. The efforts of everybody who presented the many facets of research at DESY to the evaluators in written form and at on-site inspections last year are paying off. "DESY got top grades for its research," DESY Director Helmut Dosch points out. "The preparation for the evaluation was a major effort which would not have been possible without the commitment of everybody involved."

After reviewing the written applications, the evaluators complemented and put down in writing the impressions of their assessments. Senate recommendations were then worked out on the basis of the evaluator assessments. In October 2014, the Helmholtz Senate adopted the recommendations as regards content and funding, and in December the final results were officially presented to DESY. The evaluators fully confirmed DESY's scientific plans for the coming five years. The Helmholtz Senate agrees with the evaluators' judgment and recommends to provide the necessary resources.

For the period from 2015 to 2019, DESY will receive funds amounting to 1050 million euros. Starting with an initial value of 193 million euros in 2014, this corresponds to an average annual increase of about 3 per cent. At DESY, a large amount of these funds are committed to the operating costs of the large-scale facilities. Nevertheless, the financial results of the POF III evaluation provide good conditions to keep our high level of research.

With this financial framework, it will now be the task of DESY scientists and their colleagues from other Helmholtz structure-of-matter centres to give life to their own concepts which are reflected in the content-related recommendations. For the "Matter and the Universe" programme for example, a strategy for

astroparticle physics in the Helmholtz Association is necessary. Moreover, activities at the LHC should have priority and a new, joint structure of the Helmholtz Alliances is to be worked out.

In the programme "From Matter to Materials and Life", a coordinated strategy will be worked out for photon science. Particularly for this programme, the third round of POF will for the first time include a special regulation: the currently operated large-scale science facilities will be examined carefully according to specific criteria. Funding is also carried out on a separate principle. This is true for the DESY research facilities FLASH and PETRA III and for the TIER2 centre within the "Matter and the Universe" programme.

A series of recommendations were also provided to the newly established programme "Matter and Technologies". This programme will work on the development of a long-term perspective in the field of detector technologies and systems. Another recommendation is to give priority to research on laser plasma acceleration and on the superconducting high-frequency technology (CW RF) for FLASH and the European XFEL.

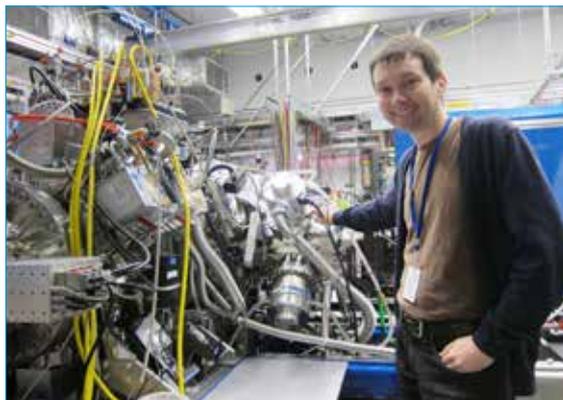
Apart from these programme-specific recommendations, the evaluators generally approved to continuously strengthen the management of large amounts of data for these three programme fields in the future. This clearly defines the course of DESY research and guarantees financial planning security within the next five years. The progress achieved in scientific research work and the development of costs of the programmes are reported to the Helmholtz committees every year. This ensures a continuous process of controlling. International experts attested DESY a very high, sometimes even worldwide unique scientific quality and performance. With this, we are well prepared for future evaluations.

Leibniz Prize for Henry Chapman

CFEL professor receives prime German research award

DESY scientist Henry Chapman will be awarded the prestigious Gottfried Wilhelm Leibniz Prize 2015 by the German research foundation Deutsche Forschungsgemeinschaft (DFG). This prime German research award honours outstanding scientists. Chapman receives the 2.5-Million-Euro prize for his pioneering work in the development of femtosecond crystallography. It allows to decode the structure of serial complex biomolecules in its natural environment at the atomic level with the help of X-ray lasers.

"I cordially congratulate Henry Chapman on winning this prestigious prize. He designed and lead to application this method of serial femtosecond crystallography which for the first time allows to investigate the atomic structure of biological samples in an almost natural envi-



ronment," said Professor Helmut Dosch, Chairman of the DESY Board of Directors. "Chapman's pioneering work in this field will facilitate the analysis of molecular dynamics of highly complex systems. This will revolutionise biological structure research on a global scale and significantly influence its agenda in the coming decades." (tz)

To be continued

Extension of DESY and EMBL partnership



DESY and EMBL are extending their successful partnership for another ten years. During a symposium celebrating the 40th anniversary of the European Molecular Biology Laboratory at DESY, representatives of both research centres agreed upon further collaboration (from left: Edgar Weckert, Helmut Dosch, Silke Schumacher, EMBL Director International Relations, Matthias Wilmanns, Head of Outstation EMBL Hamburg). Since its foundation in 1974, EMBL has had an outstation at DESY. Today, the laboratory operates two own beamlines at the synchrotron radiation source PETRA III. (Photo: Hugo Neves)



"Particle Zoo" wins video contest

With its electronic "Particle Zoo", DESY won the web video contest "Fast Forward Science" of "Wissenschaft im Dialog" (science in dialog) and "Stifterverband für die Deutsche Wissenschaft" (a business community promoting science and education). The video "Particle Zoo – On the trail of Higgs, quarks and photons" won the first prize in the "Scitainment" category. The jury decided that with its excellent visual language and extremely comprehensible descriptions, the video above all conveys one thing: "science, especially particle physics, is a lot of fun." <http://teilchenzoo.desy.de>



VFFD honours two young scientists

The Association of the Friends and Sponsors of DESY (VFFD) presented its annual award to two young scientists. The prize endowed with 3000 euros was shared in equal parts by Stephan Stern, DESY (CFEL) and University of Hamburg, and Tigran Kalaydzhyan,



DESY (theory) and University of Hamburg. Stern (left) recorded the coherent X-ray diffraction of many identical non-crystallised molecules with a spatial alignment procedure. His thesis makes important contributions to single-molecule structure determination and to filming chemical reactions with X-ray lasers. Kalaydzhyan's thesis investigates the properties of elementary matter at extremely high temperatures and strong magnetic fields, especially of the so-called quark-gluon plasma. One special feature of the thesis is the variety of applied methods, ranging from lattice gauge theory to string theory models.

E. Bright Wilson Award for Dwayne Miller

For the development of femtosecond electron diffraction and coherent spectroscopic methods for the direct observation and control of chemical dynamics at the atomic level, Dwayne Miller will be awarded the 2015 E. Bright Wilson Award for Spectroscopy of the American Chemical Society (ACS). Miller's work has created a new field which gives scientists access to direct observation of atomic motions during chemical processes. Dwayne Miller is spokesman of CUI (Centre for Ultrafast Imaging) and Director at the Max Planck Institute for the Structure and Dynamics of Matter on the DESY campus.

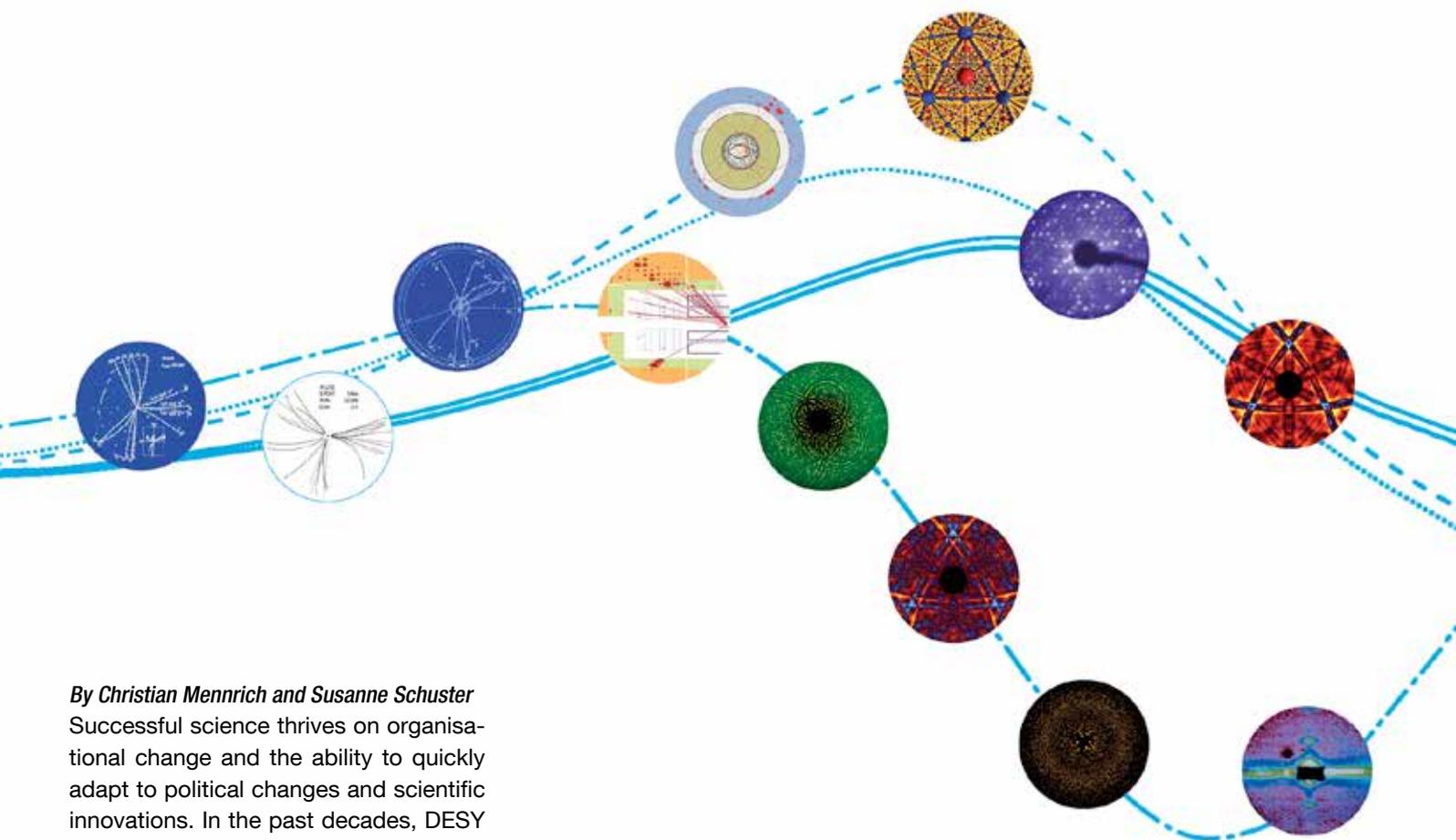


Highlight:

The extension of the free-electron laser FLASH is in full swing. This year, the first beamlines which will later guide the X-ray light to the experiments, will be installed in the new FLASH2 hall. Last year, the accelerator team had already managed to detect light at the new undulator line (photo). Undulators are fixed structures of magnets with alternating North-South polarity that generate the desired light. The existing FLASH undulator line, served by the same accelerator, continued to operate without restrictions at the same time. This makes FLASH the world's first free-electron laser that serves two laser lines simultaneously and independently from each other. This means that the extension makes possible twice as much experiments as before at the coveted research light source FLASH – the demand is very high. (Photo: Dirk Nölle)

DESY THROUGH THE AGES

Panel discussion about DESY's path into the future



By Christian Mennrich and Susanne Schuster

Successful science thrives on organisational change and the ability to quickly adapt to political changes and scientific innovations. In the past decades, DESY has continually created new things while experiencing a fundamental change, not the least by transforming accelerators that had been built for particle physics into tools for photon science. This change is not always easy, but DESY has managed to retain its traditional strengths as German centre for particle physics while at the same time creating a space for a dynamic new field of research by fostering photon sciences. Key to this development is DESY's leading role in accelerator development.

During the "50 Photon Years" celebrations at DESY, former and current fore-runners and planners of the research

centre met in the DESY auditorium together with the interested public to discuss the topic "DESY through the ages". It crystallised that successful change is always based on the dedication and enthusiasm of the staff members. The event started with three keynote talks which portrayed the various aspects of change from different perspectives, thus creating the basis for the subsequent panel discussion.

First, Thomas Heinze, organisational sociologist at the University of Wuppertal, presented the results of a comparative

study on institutional change processes at large-scale research centres. Based on the example of SLAC and DESY, he worked out common features and differences which brought about an individual institutional structure in the course of the shift from high energy physics to photon science. He identified particularly important and helpful factors for a successful change to a new research field: the existence of scientific entrepreneurship, scientific and organisational independence and close interaction between universities and research facilities.



On the podium (from left to right): Hermann Schunck, former division leader in the federal ministry of research, Thomas Heinze, organisational sociologist at the University of Wuppertal, Jürgen Lüthje, former President of the University of Hamburg, Christian Scherf, Administrative Director of DESY, Helmut Dosch, Chairman of the DESY Directorate, Helmut Krech, former Administrative Director of DESY. (Photo: Thomas Walter)

The second talk was held by Hermann Schunck, former division leader in the federal ministry of research and in this role responsible for DESY for many years. He presented the aspect of change from the perspective of the funding agencies. The deliberate decision for so-called “global control” and against micromanagement of the research centres made sure that decisions about the construction and conversion of large-scale facilities were mainly taken by the scientific community and that only the financial framework conditions were a matter of political responsibility. This relatively large independence of “global control” created a large amount of flexibility and thus strengthened DESY’s ability to change.

Helmut Krech, former administrative director of DESY, highlighted DESY’s ex-

ceptional ability to constantly adapt to new conditions. He outlined three different aspects of change: The emancipation of synchrotron radiation, the (re-)organisation within the Helmholtz Association and the successful integration of GDR’s institute for high-energy physics at Zeuthen after German reunification. He specifically emphasised the outstanding role of the employees as a key success factor for DESY’s positive development.

In the subsequent panel discussion moderated by DESY’s current Director of Administration Christian Scherf, the speakers together with Helmut Dosch, Chairman of the DESY Board of Directors, and Jürgen Lüthje, former president of the University of Hamburg, discussed how DESY managed the successful change in the past and how

it can prepare for alterations in the future.

As a conclusion, the round defined the following key success factors for a fruitful change at DESY: scientific (entrepreneurial) personalities with new ideas and visions supported by the whole organisation, the employees as a whole being committed to these scientific entrepreneurs and their plans, and the close cooperation with other research institutions and universities which again create new impetus and ideas.

One message emerged from the evening: change is a continuing process and will never conclude. DESY will have to continue to combine existing strengths with innovation spirit in order to stay at the top through change.

ERC grants for three young researchers

Melanie Schnell, Sebastian Loth and Francesca Calegari, currently working at the Max Planck Institute for the Structure and Dynamics of Matter on the DESY campus, each receive one of the coveted Starting Grants of the European Research Council (ERC). This grant supports young researchers who are at the beginning of an independent career but have already been noticed for their excellent achievements.

Melanie Schnell receives an ERC grant of 1.5 million euros for starting her project ASTOROT. It will investigate chemical processes in the universe using broadband microwave spectroscopy and observation data from next-generation telescopes.

Sebastian Loth receives 2 million euros from the ERC for his project dasQ. It will record at atomic level the fast dynamics of correlated electrons in novel materials, so-called quantum materials.

Francesca Calegari will use the grant of 1.5 million euros for her STARLIGHT project. It aims to understand the role of the electron dynamics in the UV light induced photo-chemical processes of biomolecules and investigates the type of damages occurring for example in DNA.

Ground-breaking ceremony for CHyN

On the former "Reemtsma" terrain at DESY in Hamburg, construction has started for the Center for Hybrid Nanostructures CHyN of the University of Hamburg. "Unique research possibilities are being created around DESY and the University," said Hamburg's Senator for Science Dorothee Stapelfeld at the ground-breaking ceremony in December. "CHyN is an important additional element to this infrastructure. Its research will help to develop ultramodern treatment methods. The close exchange with scientists from various disciplines and institutes will make the decisive difference."

The building will provide 4650 square metres of floor space to 180 staff members. The construction budget amounts to 61 million euros. The objective of the centre is the investigation and application of nanostructures which offer an enormous potential for new applications in medicine, biology and physics. In the future, for example, smallest bio-electronic implants may replace damaged sensory cells and enable humans to see or hear or to move their arms and legs.



Mecca of nano research

13th International Conference on Surface X-ray and Neutron Scattering at DESY

By Bridget Murphy and Andreas Stierle

From 7 to 11 July 2014, the 13th International Conference on Surface X-ray and Neutron Scattering took place at DESY, with 140 participants from 23 countries. The aim of this conference was to bring together scientists from different research areas that are using surface-sensitive X-ray and neutron scattering and complementary techniques for the characterisation of solid and liquid surfaces, interfaces and nanostructures in order to exchange scientific results and recent developments of the techniques. The SXNS is a long-established forum to discuss X-ray and neutron scattering techniques on a broad range of solid, liquid, biological and soft matter and to develop interdisciplinary procedures. During the four-day conference, 25 (15 of them invited) speakers – celebrities and also young "rising stars" – held lectures about their current research. In addition, 90 poster contributions were discussed at two sessions.

accepted. The SXNS conference revealed many new research opportunities which are made possible due to the establishment of new X-ray sources with outstanding coherence properties and ultra-short time structures.

The scientific activities were complemented by several entertaining events: A public lecture by Metin Tolan from the University of Dortmund with the subject "Shaken not Stirred! James Bond in the Focus of Physics", a city tour showing Hamburg's most important places of interest and, following an old SXNS tradition, a boat trip through the impressive Hamburg harbour including a dinner, with the opportunity to continue discussions in a relaxed atmosphere. All this and the scientific highlights made it an exciting conference and the participants are already looking forward to the next meeting in two years on Long Island.

The SXNS13 was organised by Andreas Stierle, DESY (Chair), Bridget Murphy, University of Kiel (Co-chair) in cooperation with the colleagues Lucia Incoccia-



Group photo of the SXNS13 conference participants (Photo: Marta Mayer)

Helmut Dosch, Chairman of the DESY Board of Directors, welcomed the participants; he too is a long-time SXNS visitor. Choosing DESY as a conference site offered the participants the opportunity to see the light sources PETRA III, the free-electron laser FLASH and the European XFEL currently under construction and these tours were very well

Hermes, Matthias Kreuzeder, Ralf Röhlberger, Oliver Seek, Vedran Vonk and Susanne Weigert from DESY, and Dieter Lott from Helmholtz-Zentrum Geesthacht (HZG). Financial support came from DFG, DESY, HZG and Kiel Nano Science, and from the participating exhibitors.

PIER Graduate Week

Interdisciplinary courses and workshop for PhD students



The doctoral students used the PIER Graduate Week for an intensive, interdisciplinary exchange among themselves. (Photo: Marta Mayer)

By Mirko Siemssen

More than 100 PhD and MSc students participated in the first PIER Graduate Week at the Center for Free-Electron Laser Science (CFEL) at DESY in Hamburg in early October. The four-day event with national and international speakers offering a wide spectrum of introductory and focus courses in the PIER research fields particle and astroparticle physics, nanoscience, photon science and infection and structural biology was very positively received by both, students and speakers. With the aim to advance interdisciplinary exchange, all Graduate Week participants were invited to present their research projects at a poster session.

“We want our PhD students to receive an interdisciplinary education. This is essential for a comprehensive education at the highest international level,” said Robin Santra, spokesman for the PIER Helmholtz Graduate School.

In addition to the numerous introductory and advanced courses during the four-day Graduate Week, complementary workshops were held in which the young researchers were taught effective scientific writing in English by experienced scientists. The evening events of the PIER Graduate Week addressed a less specialised public: With his entertaining and motivating

scientific colloquium “Seeing the Invisible: The Science and Application of X-rays”, Uwe Bergmann, deputy director at the US accelerator centre SLAC, perfectly hit the nerve of the audience. Bernd Irmner, CEO of nanotools GmbH, fascinated the listeners with a lecture telling the success story of the company founded by him and others when they were graduate students at Ludwig-Maximilians-Universität in Munich.

The PIER Graduate Week organisers were happy about the great deal of positive feedback and the constructive criticism of the participating PhD students and guest speakers. Jan Louis, co-organiser and member of the PIER commission for the research field particle and astroparticle physics is certain that “there is a great demand for new interdisciplinary formats for graduate students on the campus. Thanks to the experience we were able to gain this year, the next Graduate Week in October 2015 will meet the requirements of our young researchers even better.”

INFO

<http://graduateschool.pier-campus.de/>
www.pier-campus.de/graduateweek2014
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PREISE

ERC grant for Kai Schmidt-Hoberg

DESY scientist Kai Schmidt-Hoberg has received a 1.2-million euro funding grant from the European Research Council (ERC). With the ERC Starting Grant from the European



Union research funding programme Horizon 2000, the theoretical physicist will be able to explore new research approaches to dark matter in the coming five years. According to sci-

entific observations, the existence of the mysterious dark matter in the universe must be five times higher than normal matter. But so far, no experimental evidence whatsoever has been found.

Max Born Prize goes to Andrea Cavalleri

Andrea Cavalleri from the Center for Free-Electron Laser Science (CFEL) will be awarded the Max Born Prize for his time-resolved measurements of photoinduced phase transitions in correlated electronic materials, the German Physical Society (DPG) and the British Institute of Physics, who jointly present this



German-British prize, announced. Cavalleri is director at the Max Planck Institute for the Structure and Dynamics of Matter at CFEL and professor at the University of Oxford.

Benjamin Rhode receives award of Chamber of Industry and Commerce (IHK)

Benjamin Rohde from the ZMLW group in Zeuthen passed his final examination as an industrial mechanic with flying colours, obtaining a total of 95 points. Benjamin Rohde and 24 other graduates of the year 2014 received the award in the presence of about 200 invited guests from Klaus Aha (right), President of the Chamber of Industry and Commerce in Cottbus, and from Walter Christoph Zimmerli (HU Berlin, ETH Zürich) in Cottbus in October.



Royal Swedish Academy of Sciences visits in Zeuthen

On 19 November, the Class for Physics of the Royal Swedish Academy of Sciences, who also select the Nobel Prize laureates, visited the DESY campus in Zeuthen after visiting Berlin Adlershof to see the CTA prototype in action. They gained insight into the Zeuthen strategy to expand astroparticle physics and, during the subsequent tour, into all research areas of the institute. Before visiting the federal ministry of research the next day, the guests also learned about DESY's work in the Helmholtz Association.



EU network LHCPHENOnet successfully concluded
The EU project LHCPHENOnet was successfully concluded with a three-day final meeting at the Berlin Brandenburg Academy of Sciences in November. For four years, theorists from all over Europe had joined forces in this 4.5-million-euro project to further develop the theoretical tools for support and analysis of the LHC data, with the aim to improve their precision. During this period, the network issued more than 500 scientific publications which will be used in the analysis of data from the experiments at CERN.

The project devoted special attention to the education of junior researchers, starting as graduates. By attending a variety of schools and workshops, as well as visiting scientists at other partner institutes, they had the opportunity to work in an international environment. Many young scientists also took the chance to work abroad at one of the industry partners involved: WolframResearch (USA), MapleSoft (Canada), RISC GmbH (Austria). There, they could work in leading international teams in the field of scientific computing and find solutions for current problems. A new joint project is being prepared.

Well on track

Accelerator construction at DESY at full speed

The numerous construction projects at DESY are well on track. At the X-ray source PETRA III, both tunnel sectors of the accelerator, which had to be torn down for the construction of the two new experimental halls, have been rebuilt in time on a tight schedule. Technical commissioning is due to start during January. In spring, PETRA III will restart user operation in the Max von Laue Hall. Already now, measuring time is overbooked threefold.

of a second. In the future, the FLASH2 extension will offer users the possibility to change the X-ray wavelength in only a few minutes – so far, it took hours. For FLASH, there are more than twice as many applications for experiment time as can be provided.

Moreover, it is planned to further improve the beam quality and to create optimal conditions for time-resolved measurements. To this end the so-called seeding-operation, that generates light pulses



The accelerator modules for the European XFEL will be tested in continuous operation. (Photo: Dirk Nölle)

In parallel, the two new experimental halls will be completed and the first new beamlines and experimental facilities will be installed. These halls will be inaugurated in autumn 2015 and spring 2016.

Last year, at DESY's research light source FLASH, an accelerator was feeding two laser beams for the first time. This year, two beam lines will be installed in the new FLASH experimental hall and measuring of the X-ray light properties will take place. Until 2019, three additional beam lines will follow.

The goal is to provide X-ray light with a wavelength between 40 and 4 nanometres with an uncertainty of only one per cent. The X-ray flashes will have a length of only 100 femtoseconds, i.e. 0.1 trillionth

which are more steady and better reproducible in both chronological sequence and frequency spectrum, will be further explored.

Since end of September, a completely assembled accelerator module for the European XFEL has been delivered from France every week. Therefore, all three measuring facilities in the AMTF hall are used for the modules in continuous operation. The first accelerator modules are already mounted in the tunnel and in 2015 one module will be installed per week. The accelerator will be completed in 2016. After comprehensive tests of the injector; as from summer 2016, the electron beam will be injected into the main accelerator. (hw)

DESY goes MINT

Events for youths become increasingly popular

In our modern society, knowledge of mathematics and natural sciences is an integral part of all-round education. There have been many initiatives in Germany for some years now that aim to strengthen the status of MINT (mathematics, informatics, natural sciences and technology) subjects. DESY in Hamburg and Zeuthen participate in many of these activities.

On 11 November in Hamburg, 140 girls from grades 8 to 13 followed the “Go MINT” invitation. This was the third event especially organised for girls by the DESY equal-opportunities officer. Whereas the younger participants discovered the world of the main workshop, the older ones had the opportunity to interview female role models from science, technology and educational training. A DESY tour and information on all aspects of job applications were offered in the afternoon. On 3 December, another group of girls did experiments in the school lab. Both events especially addressed girls with the aim to raise their interest in MINT.

Within the framework of the MINT:PINK project organised by the German natural sciences and technology initiative (NAT), school girls from class 9 and 10 attended the DESY school-lab for two days. Pupils could also apply for participation in the second Hamburg MINT Day on 18 November. About 80 young people joined a treasure hunt on vacuum issues in the DESY school lab. In a Science Café with Jürgen Reuter, about 50 attendees of class 9 learned why a smartphone cannot manage to find the right way without Einstein.

Two events jointly organised with the association of mathematics and natural sciences centres of excellence at schools (MINT-EC) were held in Zeuthen in November. One of the events was a two-day teachers’ training in particle physics. The other event, a one-week camp for pupils, took place from 17 to 21 November. Ten youths from MINT-EC schools from all over Germany were guests on the campus in Brandenburg.



MINT:PINK event at DESY in Hamburg (Photo: Claudia Höhne/Initiative NAT)

They heard lectures about the world’s largest particle accelerator LHC and its first discoveries and at a particle physics masterclass, the participants could independently evaluate data from the ATLAS detector at the LHC. They also watched the movie “Particle Fever” about the hunt for the Higgs boson and, after making their own data analysis, learned how more than 10 000 scientists from more than 100 countries joined forces to discover the mysteries of the universe. The highlight was the assembling of an ATLAS model at a scale of about

50:1 using nearly 9 500 LEGO bricks. “The DESY engagement in these MINT initiatives is well invested capital for the future; the young participants learn to question mathematics and natural sciences issues,” said DESY director Helmut Dosch who supports the activities offered to young people at DESY in Hamburg and Zeuthen. “Moreover, this is also an investment in new talents for DESY.” Often, the youths return to the research centre for educational training or for an internship. (ub)



Participants of the MINT camp at DESY in Zeuthen built a model of the ATLAS detector out of Lego bricks. (Photo: DESY)



The designated CERN chief Fabiola Gianotti in front of the ATLAS detector. (Photo: CERN)

The Higgs turns into a movie star

Documentary “Particle Fever” starts in Germany

Fundamental research is coming to the silver screen with the film “Particle Fever” featuring the hunt for the Higgs boson. And it’s looking very different than the (usual) cliché: no mad professors in lab coats who address each other with “Professor” or “Doctor” and happily accept blowing the world to pieces if this would help to advance their research project.

“Particle Fever” approaches the subject matter in a completely different way. The documentation follows the story of six brilliant scientists in their efforts to decode the mysteries of our universe. The film records the successes and setbacks of one of the most important breakthroughs in modern physics – the discovery of the Higgs particle.

In specific terms, the documentation shows the commissioning of the Large Hadron Collider, one of the largest and most expensive physics experiment in the history of mankind. More than 10000 scientists from more than 100 countries have joined forces to reproduce the conditions that existed immediately after the Big Bang. Here, they hope to find the famous Higgs particle

which gives all other particles mass.

The movie does not only focus on physics but shows day-to-day research and also the everyday life of scientists. For example, you see Monica Dunford from the University of Heidelberg deeply involved in discussions with other physicists – and going for a run in the fields. You also witness the excitement when the detector sees particles for the first time – and that the world is not being blown to pieces. And nobody is actually wearing a lab coat.

The movie was directed by Mark Levinson who watched, filmed and interviewed the scientists over many years, and his great commitment and enthusiasm for this subject is made evident in his pictures. With film editor Walter Murch who won two Academy Awards, “Particle Fever” is a true treasure among the films on particle physics. The film will be released in several German cinemas in January 2015 *(kh)*

INFO

www.particlefever.com

On the trail of thunderclouds

The enormous thunderclouds that form over the rain forest regularly are being studied by scientists of the ACRIDICON-CHUVA project. How do towers of clouds develop, which impact do they have on the climate system and what are the microphysical processes in clouds? In order to answer these questions, the scientists carried out measuring flights in the Brazilian Amazon region from September to October. They used the research aircraft HALO which is operated by the German aeronautics and space research centre DLR. A team of Forschungszentrum Jülich interested in the interaction of aerosol particles, cloud droplets and ice crystals and of wind and sunbeams in the atmosphere also joined this project.

Many of the aerosol particles in the atmosphere over the Amazon region come from slash-and-burn. First analyses of the measurements show that the aerosol particles evidently have a great impact on cloud formation: When the clouds are polluted, they have a larger concentration of water droplets than clean clouds; however, the water droplets are smaller and they let pass less sunlight to the earth than a cloud with larger droplets. Therefore, they have a cooling effect and, moreover, rain will occur more quickly.

www.helmholtz.de/perspektiven

Imprint

Publisher
DESY-PR
Notkestraße 85
D-22607 Hamburg

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Kopierzentrale DESY (print)

