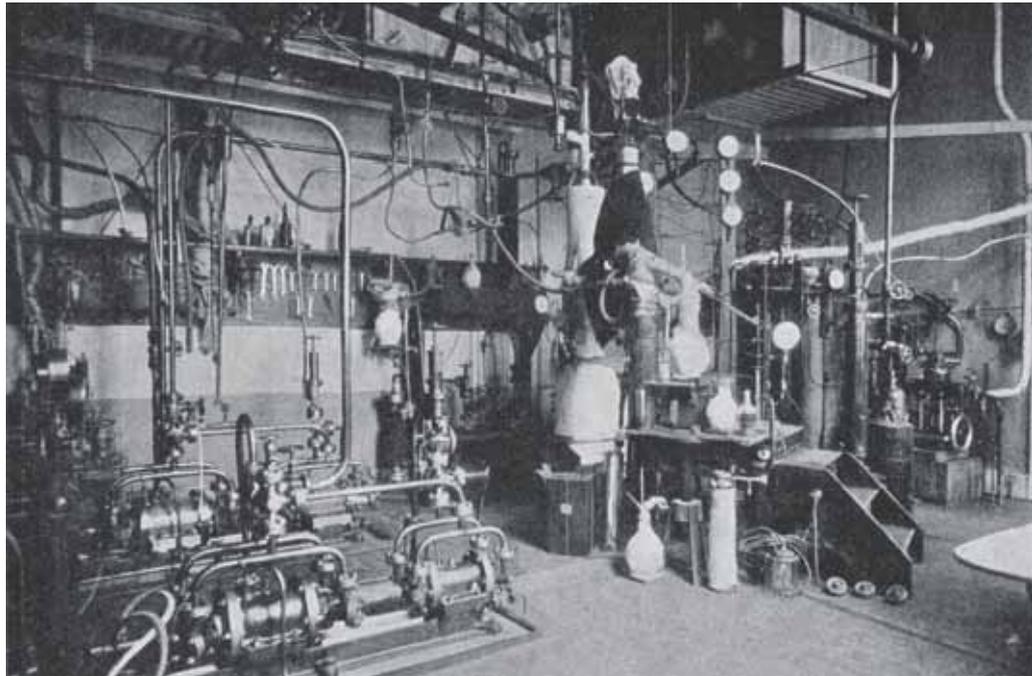


## No resistance

Superconductivity discovered a hundred years ago

These are the electrifying moments to make a scientist's life worth living: take up work at a laboratory, carry out measurement series and, suddenly, see absolutely unexpected results – a tiny detail which is wrong. The measurements are repeated and tested for possible mistakes – but the unexpected proves true.

This is what the Dutch physicist Heike Kamerlingh Onnes might have experienced when, on 8 April 1911, he observed an effect which made him famous and enriched our society with a new technology: superconductivity. Actually, the scientist's goal was to describe the characteristics of liquefied gases. For this purpose, he penetrated deep into low temperatures. When he liquefied oxygen and nitrogen, he obtained temperatures down to minus 180 degrees centigrade; in 1908 he managed to produce liquid helium for the first time – a cooling bath of minus 269 degrees centigrade, 4 degrees centigrade above absolute zero. On 8 April 1911, Kamerlingh Onnes wanted to use this as a new method to determine the electrical conductivity of metals at low temperatures. He continuously cooled down a sample of pure mercury and determined its resistance. At 4.19 Kelvin, the unexpected happened: the electrical resistance disappeared abruptly! Soon after, Kamerlingh Onnes found this phe-



History was made here: Kamerlingh Onnes' laboratory at the University of Leiden (Photo: AIP Emilio Segre Visual Archives, Brittle Books Collection)

nomenon in other metals, but not in all. He discovered the effect of superconductivity which – as he presumed – could only be described with the help of quantum mechanics.

For a long time, this phenomenon was considered exotic and useless. However, today it has a broad range of applications. Scientists know of superconducting metals, ceramics and even organic materials that are able to transport high currents without any losses.

Superconductivity has made its way into medicine and is used, for example, in magnetic resonance scanners to generate ultra-strong magnetic fields needed for diagnostic purposes. Superconductors are also used as electrical conductors in numerous facilities. Meanwhile, materials have been found that have a much higher transition temperature – the temperature at which superconductivity begins. At present, only cryogenic superconductors offer technical advantages because they are

**CONTINUED ON PAGE 2**

### New head of theory group

Markus Diehl is the name of the new head of the DESY theory group. The 42-year-old physicist works in the field of strong interaction. He came to DESY in 2003 and takes over the office of Volker Schomerus; this position is replaced every two or three years. Phenomenologist Georg Weiglein will be his deputy.

### Substitute seminar rooms

During construction work in building 1b, the seminar rooms located there are not available. For that time, there are substitute seminar rooms 10 and 11 which you can find in building 1c, and seminar room 13 in building 66.



## DIRECTOR'S CORNER

Dear colleagues,

The most valuable goods at DESY are our staff members. Our expectations are high, we are demanding a lot from you. One important factor for successful work is our special identification with DESY.

Together, we experience mutual successes and defeats. Currently, it is mostly the great successes – the European XFEL project, FLASH II, PETRA III upgrade; the new

research activities in the M sector, and the additional infrastructural changes. We will be judged by the outcome of these projects and this obliges us to be successful.

As to the fulfilment of our tasks, the people working at DESY are the most important guarantors for success. Success is easily enjoyed. However, there must also be

enough time for worries and needs. Both, stress at work and private fates must be taken seriously.

We are affected by blows of fate, for example severe illnesses or accidents of persons affiliated to our working environment. Thus, our best wishes and hopes for a good recovery, and the energy to proceed are important. This also includes not returning

immediately to daily routine. A dramatic break suffered by persons who are standing close to us may give us the motivation to make a break at work for the things that really matter in live.

Yours

Christian Scherf

mechanically malleable; however, ceramics losing resistance at higher temperatures might soon also be suitable for wire drawing.

Of course, DESY also has a long tradition in the development of superconducting technologies, especially for accelerators. At HERA, these were the magnets of the proton ring with their strong fields, making protons circle the 6.3 kilometre path with the energy of nearly one tera-electronvolts. At HERA, first superconducting cavities to accelerate electrons were also installed for testing purposes. The superconducting accelerator technology was brought to perfection with the TESLA cavities: 9-cell structures of pure niobium, designed to speed up the electrons at FLASH, the European XFEL, and the ILC. They transmit the inserted energy to the flying particles with unmatched efficiency. Even packing the supercon-

ducting components into sophisticated thermos flasks, the so-called cryostats, and constantly cooling them with liquid helium of minus 271 degrees centigrade, is worth the enormous effort for a current transport without loss.

At the beginning of the 20th century, numerous discoveries were made, that have a great impact on today's science – and especially on DESY: in 1911, not only superconductivity was discovered, but in addition, the physicist Ernest Rutherford from New Zealand created the basis for the scattering experiments as applied in today's particle physics.

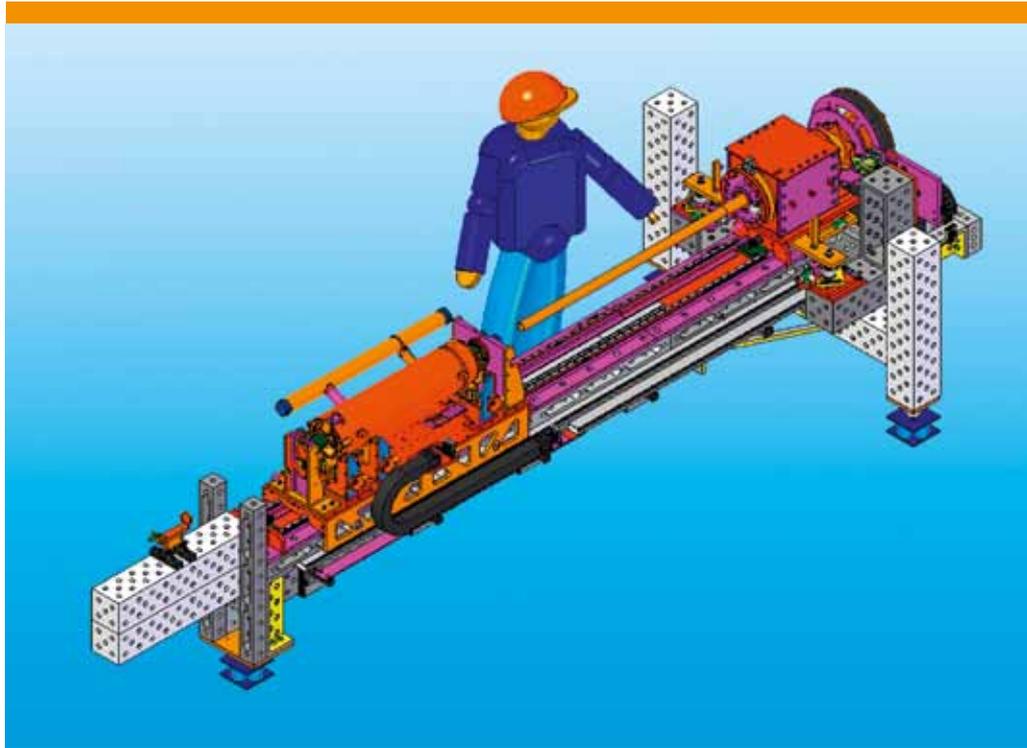
The scattering experiments, where Rutherford shot radioactive alpha particles against a gold foil, brought about a revolutionary new atomic model with a very small and heavy nucleus surrounded by a nearly empty shell. HERA brought this experimental method to perfection: with

electron proton collisions, a most precise image of the structure of a proton was obtained, with a resolution 10000 times better than Rutherford's.

Last not least, in 1912, scientist Max von der Laue and his colleagues carried out the first X-ray diffraction experiment – the basis of today's photon science.

And nobody knows if discoveries presently made, and which some people shrug off as fascinating but useless, may create an important basis for research in hundred years' time. (tz)

This is how work with  
OBACHT will soon look like



## A robot to watch out for defects

Automated cavity inspection makes progress at DESY

A small group of young researchers at DESY is working on a robot that might be able to drastically reduce the time to optically inspect a cavity. Their work covers everything from pure mechanics of the workbench and fine-tuned motors for moving the heavy parts to developing sophisticated methods of automatically analysing the pictures. With the help of robot “OBACHT”, cavities might eventually pass the check in two hours instead of the one and a half days it takes today.

“OBACHT” is currently under construction at DESY and will enter its first test series this spring. OBACHT, German for “watch out”, stands for Optical Bench for Automated Cavity inspection with High-res images on short Timescales. Part of the EU-project ILC-HiGrade, developed by ZM1, it will make optical inspection for cavities not only quicker, but also more precise. High-precision motors fitted on a Meccano-like workbench, and great flexibility in the movement of both, camera and cavity, together with test data from the world-

wide cavity database, and a custom-written end tested inspection software, could get the time it takes to optically test a cavity down from more than a day to a couple of hours. Rather than turning the cavity around the camera, the camera will be able to rotate around its own axis, and the horizontal movement of the cavity is controlled by precision motors. In the industrialisation process for cavities that meet the specifications for the International Linear Collider ILC this robot could play a major role. OBACHT will catalogue the surface of the delivered cavities and essentially maintain a topographic map of all cavities. Such a picture inventory lends itself to automated feature recognition to locate spots on the cavities’ surface that could cause problems during operation. A map of such spots may be useful to relate performance limitations to surface features that otherwise would go unnoticed.

Once the whole system functions reliably, a robot like OBACHT could be installed everywhere where cavities are

produced or treated. In particular, if completed in time, it could help tremendously in assessing the quality of the cavities delivered for the European XFEL and hence provide the knowledge base for ascertaining the quality of the more demanding cavities for the ILC. (baw)

### INFO

[www.ilc-higrade.eu](http://www.ilc-higrade.eu)



## May

- 10-13** TERASCALE (<http://terascale.de/geant2011>)  
Geant4 Training: Calorimetry in HEP  
DESY, Zeuthen
  
- 11** Science Café DESY (<http://sciencecafe.desy.de>)  
Schöne neue Welten – Die Entstehung von Planetensystemen  
Marc Hempel, DESY Bistro, 17 h
  
- 11** Informationsveranstaltung Gesund Bleiben  
Work-Life Balance  
Norbert Struck, DESY, Hamburg, auditorium, 16 h
  
- 17** Colloquium  
Retirement of Joachim Bartels  
DESY, Hamburg, FLASH hall, 16 h
  
- 19-20** Symposium  
Solar Energy for Science
  
- 23-24** PT-Tag  
Treffen aller Projektträger
  
- 25** Science Café DESY (<http://sciencecafe.desy.de>)  
Sonnenstrahlen und Geisterpartikel  
Daniela Käfer, DESY Bistro, 17 h
  
- 25** Öffentlicher Abendvortrag  
Wenn Licht durch dicke Wände geht – Teilchenphysik bei kleinsten Energien  
Axel Lindner, DESY, Hamburg, auditorium, 19 h
  
- 28** [www.langenachtderwissenschaften.de](http://www.langenachtderwissenschaften.de)  
Lange Nacht der Wissenschaften  
Berlin
  
- 31** Seminar and Concert  
80th birthday of Erich Lohrmann  
DESY, Hamburg, auditorium, 16:15 h

## June

- 8** Science Café DESY (<http://sciencecafe.desy.de>)  
Kryptographie entschlüsselt – Moderne Verschlüsselungsverfahren und digitale Signaturen  
Martin Köhler, DESY Bistro, 17 h
  
- 15-17** TERASCALE (<http://terascale.de/geant2011>)  
Standard Model Benchmark Processes at the LHC  
DESY, Zeuthen
  
- 21** Colloquium  
Retirement of Ahmed Ali  
DESY, Hamburg, auditorium, 14 h
  
- 22** Science Café DESY (<http://sciencecafe.desy.de>)  
Woher wissen wir, was wir wissen? – Der Unterschied zwischen Wissenschaft und Pseudowissenschaft  
Martin Göttlich, DESY Bistro, 17 h

### Steel structure

Progress is made on DESY construction sites. Only recently, the steel structure for the roof of the CFEL building was set up. It is planned to be ready for occupation in April 2012.

# LHCPhenoNet

## A new EU network to strengthen the theoretical research field at the LHC

In February 2011, there was the kick-off meeting of the new LHCPhenoNet in Valencia. This network is an EU project funded with 4.5 million euros. It is made up of groups from 28 European universities and research institutes, the University of Buenos Aires, CERN, and three industrial partners. The goal of this network research is to improve and enhance theoretical predictions which are of considerable importance for the experiments at the LHC. A special focus is therefore on precise predictions for the particle physics standard model, i.e. in processes that are currently very precisely measured and analysed at the LHC. It also includes the development of user-oriented open source software for LHC physics. Within the funding framework, new research and training possibilities dedicated to particle theory are being developed for young physicists from all over Europe.

In Germany, DESY and the MPI in Munich, the Humboldt University of Berlin, the University of Wuppertal, and KIT in Karlsruhe are participating in this project. "For DESY, the close cooperation with industrial partners from the field of computer algebra is important – Wolfram Research with Mathematica, MapleSoft with Maple, and Risc Software GmbH Linz," said Olaf Moch, responsible for the German node at DESY. The industrial cooperation is based on long-time contacts made by the Zeuthen theory group colleagues. Within the framework of LHCPhenoNet, this gives the PhD students the possibility to carry out challenging internships directly in industry – an excellent opportunity to extend knowledge and gain valuable experience. (ub)



Girls' Day on 14 April 2011

Large crowds on the campus: 100 girls took the opportunity to gain insight in DESY's working environment, tutored by DESY staff members.

## New bridge to Brazil

### European XFEL and DESY agree on collaboration with Brazilian research centre

by Lucia Incoccia-Hermes

The fifth of May could be the beginning of a beautiful friendship. Helmut Dosch and Massimo Altarelli sign an agreement with the director of the Brazilian synchrotron centre LNLS, José Roque da Silva.

This partnership had developed during the German-Brazilian Year of Science that was recently concluded. At reciprocal visits and workshops, supported by the Federal Ministry of Education and Research, the idea quickly emerged of a longer-term cooperation in the development and use of synchrotron radiation sources and free-electron lasers.

At the visit of da Silva and Brazil's Minister of Science, Aloizio Mercadante, to DESY and European XFEL in April, the decision was made for a trilateral Memorandum of Understanding.

DESY and European XFEL have more in common with the Brazilian LNLS in Campinas as one might expect. All centres were pioneers in the development

and construction of large-scale photon science facilities on their continent. All three are (or will be) successful international centres which, with outstanding experimental possibilities, attract a large number of scientists from various disciplines every year. All three are future-oriented laboratories wanting to contribute to solving the challenges of modern society.

For the decoding of the structure and dynamics of nanoscopic matter, for the design of new materials with specific characteristics, LNLS is an ideal partner for DESY and European XFEL: with a planned synchrotron radiation source of the third generation named SIRIUS, with additional analytical facilities as electron microscopy, and with connections to energy-relevant industry (Petrobras), LNLS is on its way to strengthen its own position in the community of important photon science centres, and to support Brazil's competitiveness in new technologies.

# CFEL completed

## All CFEL division heads are aboard

Although the Center for Free-Electron Laser Science building is still under construction (see page 4/5) and will only be finished in April 2012, the scientific structure of CFEL is already completed. CFEL is a joint venture of the Max Planck Society (MPG), the University of Hamburg, and DESY. Its purpose is not only to be an anchor point for designing, preparing, and implementing the scientific programme at Hamburg-based free-electron lasers as FLASH and the European XFEL, but also to exploit the world-wide potential of FELs.

Five research groups and two so-called Advanced Study Groups form the pillars of CFEL which is still located in interim buildings. MPG and the university contribute two groups who deal with the dynamics of solid and liquid matter, or

rather imaging with atomic resolution. These groups are headed by Andrea Cavalleri and Dwayne Miller. Two other experimental core groups supported by DESY are involved in ultra-fast X-ray optics and the coherent imaging of molecules – an application to produce three-dimensional molecule images using the laser properties of X-ray light in an optimal way. These groups are headed by Franz Kärtner, who at the beginning of this year came from MIT, thus completing the team of CFEL division heads, and by Henry Chapman. Last, not least, there is the group of Robin Santra, taking care of the theory of X-ray laser light interaction with instruments and samples.

Two Advanced Study Groups, one of the university and one of MPG, are

affiliated to CFEL. They bundle the competences of each organisation and will provide visible contact persons.

In spite of some extensions, the interim buildings adjacent to the FLASH tunnel are gradually bursting at the seams, since, in the meantime, CFEL has grown to more than 100 staff members. Because of this rapid staff increase, the CFEL scientists met at an internal symposium in March to intensify the exchange between the groups and to get mutually informed on current projects and problems. (tz)

# Joint manufacturing

## Reorganisation of the DESY workshop landscape

The image of the DESY workshops as a landscape is quite appropriate. Many things have just “grown naturally”. Within the framework of INFRA FIT, the infrastructure evaluation at DESY, it became evident that the long-established structures are no longer suitable for today’s requirements. “It became clear that a reorganisation of the workshops was necessary,” said Ulrich Hahn who – in collaboration with Markus Körfer – is in charge of this task. Apart from the central workshops, the individual satellite workshops will be consolidated to three associated workshops within each DESY division. “The associated workshops of the FS and M division will be established by the middle of this year,” said Körfer. “The FH workshop will be next, as soon as the premises of building 1 are brought to completion.” The consolidation of the individual workshops will bundle both, machines and – above all – competence. A coordina-

tion circle headed by Hahn supervises the good cooperation between the newly associated workshops and the central workshop. After all, the large-scale projects as FLASH II, PETRA III upgrade, and European XFEL will require lots of work from the workshops. The concept also provides for a uniform accounting system and planning tool for all workshops.

Currently, an information leaflet is being produced on the competences and equipment of the DESY workshops. Thus, everyone may quickly find out which special services, offered by each workshop will be useful for their manufacturing projects. (gh)



## Transfer of tsunami early warning system

Immediately after the natural disaster of December 2004, on behalf of the German Government, several Helmholtz Centres under the aegis of the Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences, developed a tsunami early warning system for the Indian Ocean. Already in November 2008, the "German-Indonesian Tsunami Early Warning System" took up operation and since then proved to work on many occasions. End of March, the ownership of the tsunami early warning system was transferred completely to Indonesia. "That does not mean that we will withdraw from the system. Germany continues to support the operation, in particular with education and training of the warning centre management," said Professor Reinhard Huettl, chairman of the GFZ.

All parties involved must be trained for the case of a strong earthquake or a tsunami and which preventive measures may be taken. The current Japanese earthquake tragedy shows that prevention and training measures are capable of minimising the damages even at major disasters.

[www.helmholtz.de/hermann](http://www.helmholtz.de/hermann)



## DESYrée is back!

Once again, the kestrel couple uses the DESY nesting box

by *Andreas Hoppe*

Once again, the kestrel couple that has been breeding at DESY for many years, moved to its domicile in the lofty altitude of building 2a. Last year, the nesting box was equipped with a camera to watch the rearing of the offspring. Moreover, another camera was installed on top of building 2a to see what was going on outside the box.

Kestrels are loyal in two respects: a couple usually stays together for a whole life, and rarely leaves its territory. The male has a light grey head and a few small spots on its back; the female is completely brown with many dark spots on its back. After egg deposition in mid-April, breeding takes about 30 days.

In 2010, the DESY couple reared six chicks. Let us hope for a successful

completion of breeding and rearing also this year. You have the opportunity to watch this live through our webcams.

This year, both, the young and the adult birds will be ringed to track the whereabouts of the offspring. Perhaps, a fledgling will find a new territory in Schenefeld. There, according to planning decision, three kestrel nesting boxes will be installed on the European XFEL campus. These too will be equipped with cameras.

Last year, the kestrel hen was christened DESYrée. This year, we have to find an appropriate name for "him". Please, send your proposals to D5!

### INFO

You can see the kestrels live at:  
<http://d5.desy.de>

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### Inauguration of IceCube

On 28 April, the inauguration ceremony of IceCube took place in Wisconsin (United States). The neutrino telescope IceCube was completed in December. The "IceCube invites Astroparticle Physics" conference that followed provided an overview in this new field of research, emphasising the role of neutrino physics.

### Project management meeting at DESY

On 23 and 24 May, German project management department members will come to DESY in Hamburg to attend the 6th project management meeting. The aim is the exchange of experience and information in research management, research and innovation funding, and science communication. More information: <http://pt.desy.de> und <http://ptnetz.de>