Beacon of infection research
Nine partners establish Centre for Structural Systems Biology at DESY

Malaria is a malicious killer. The pathogen hides in the red blood cells and reproduces until the cells burst and infest the body with new parasites. Every 45 seconds, somewhere in the world someone dies from malaria. Ominously, first resistances to artemisinin – one of the most important anti-malaria drugs – have been detected in Asia. It is high time that we better understood the molecular processes of a malaria attack to find approaches for new medication. This is one of the goals of a new research centre that DESY is building on the campus in Hamburg together with eight partners. Scientists at the new Centre for Structural Systems Biology, CSSB for short, will screen a broad spectrum of infectious diseases at the molecular level. A typical question is: “How does the malaria parasite enter the red blood cells?” says Chris Meier from the University of Hamburg, chairman of the CSSB task force. “This is an extremely complex procedure which involves not one but many proteins, and which has not been clarified so far.” According to Meier, CSSB will decisively advance infection biology by decoding the interplay of proteins in medically relevant infections caused by viruses, bacteria or parasites. “The light sources at DESY are perfect for this,” says Meier. “Such diverse combinations of examination methods are available nowhere else in the world.” Moreover, institutes as the Center for Free-Electron Laser Science (CFEL) and the Hamburg Centre for Ultrafast Imaging (CUI), which will be closely linked to CSSB, are located in the immediate vicinity. “The CSSB will be a beacon of research,” Meier says.
Dear Colleagues,

Science at DESY is multi-coloured, and another dash of colour has just been added: with the foundation of the Centre for Structural Systems Biology (CSSB), DESY and its partners are creating a new research centre to investigate the interaction between pathogens and their hosts at the atomic level. Once again, DESY demonstrates the extensive scientific opportunities provided by its “super microscopes” PETRA III and FLASH.

There is also news in the field of astroparticle physics. One hundred years after the discovery of cosmic rays, scientists uncovered their origin. A research team including DESY scientists was able to clearly identify supernovae explosions as sources of cosmic radiation. The next question is how these gigantic accelerators work. With our participation in the gamma telescopes H.E.S.S., MAGIC and VERITAS, we will contribute to answering this question. We are also well positioned for the future: the three existing experiments will be replaced by the CTA gamma observatory. Already now, DESY is one of the leading centres in this international large-scale project and has a the “pole position” thanks to its participation in all three currently operating international experiments.

There is news from the South Pole as well: last year, the search for cosmic neutrinos with the IceCube detector found evidence of high-energy cosmic neutrinos. For many years, cosmic neutrinos with low energies have been an active field of research, and the future experiments are promising a rich scientific harvest.

Last but not least, the German particle physics network “Netzwerk Teilchenwelt” will again receive funding from the Federal Ministry of Education and Research. We are happy that we can thus continue to give pupils insights into the fascinating world of particle and astroparticle physics.

And, perhaps, we will be able to welcome pupils who participated in one of the “Netzwerk Teilchenwelt” events to one of the next German regional “Jugend forscht” youth science competitions.

We are looking forward to it…

Yours,

Christian Stegmann

CSSB is a joint undertaking of DESY with the University of Hamburg, the University Medical Center Hamburg-Eppendorf, the Bernhard Nocht Institute, the Heinrich Pette Institute, the Hannover Medical School, the Helmholtz Centre for Infection Research, the Forschungszentrum Jülich research centre and the European Molecular Biology Laboratory (EMBL). The Swedish Karolinska Institute will also be associated. A novelty at DESY will be the foundation of an in-house infection biology research group. “The realization of CSSB on our campus and the DESY decision to establish its own strong workgroup in the field of infection research is an important step for the future of DESY,” says Edgar Weckert, DESY director of photon science. “This step represents a substantial expansion of our scientific expertise, which is in accordance with the diversification process we have been pursuing for some years.” This will also create a close connection between research activities at CSSB, CFEL and the DESY photon science department, Weckert explains. “We will not only act as host for high-profile institutes focusing on life sciences, as for example EMBL, but assume a leading role ourselves in this field of research.”
Teaching quantum mechanics in Ghana

By Babette Döbrich

In many countries, huge science and research potential is wasted because there is no good educational system. Apart from the fundamental unfairness – no one can earn the right to be born in a country with good education and research opportunities – we possibly missed a revolution in physics or other research areas in the past decades because many young talents simply had no access to a good education. These ideas form the background of the Next Einstein Initiative (NEI) and the first African Institute for Mathematical Sciences (AIMS), which was founded about ten years ago in South Africa (see “Nature”, 474, 567-569). At AIMS, talented students from all over Africa are given the opportunity to gain an extensive overview of various disciplines in mathematics and physics in a one-year master programme. After South Africa and Senegal, Ghana now also has an AIMS centre.

In January, my colleague Astrid Eichhorn from the Perimeter Institute in Canada and I had the opportunity to give a lecture in quantum mechanics for the first AIMS students in Ghana. Selected from a large number of applicants, 26 students from 12 African countries, including Ghana, Congo, Sudan, Somalia, Ethiopia, Madagascar and others, had been awarded a scholarship. The campus structure of the institute, which is located on the edge of a very small fishing village, provides a very intense learning atmosphere. The lecturers must react flexibly to the educational background of the students and be ready to adapt their lecture concept every day, if necessary. A great advantage for the students is that they have “access” to the lecturers almost the whole day, and long discussions about the lecture, and sometimes far beyond, are not uncommon. The teachers too are submitted to a selection process. Our concept, which did not only include the mathematical structure of theory, but also the motivation to deal with fundamental ideas of quantum mechanics by doing simple experiments, fitted well into this year’s lecture agenda. Fortunately, we were able to rely on the valuable help of the DESY school lab and others for designing the experiments.

A special challenge for us was to pack our suitcases not only with clothes and ten books for the lecture, but also with space-saving and cheap equipment for optical and electronic experiments for all the students. Equipment had to be cheap in the first place, because we did not know how the customs officers would react when seeing all those cables, foils, laser pointers, multimeters and the like filling half of the suitcase.

One motivating result of our efforts was, among other things, the amazement in the faces of several students at a qualitative measurement of the photoelectric effect, which they carried out after having assured themselves of the wavelike nature of light using interference experiments. In the end, the results of physics and mathematics and the fascination they engender are something universal – beyond all national and cultural borders.

Seventeen out of 26 students opted to hear the lecture of Babette Döbrich (centre, DESY postdoc at ALPS) and Astrid Eichhorn.

Measuring Planck’s constant with a light-emitting diode – an experiment based on an idea of the DESY school lab.

INFO

The AIMS centres are looking for lecturers. For applications and general information about the programme, check www.nexteinstein.org
March

11-15 Conference (www.terascale.de/capp2013)
Computer Algebra and Particle Physics
DESY, Zeuthen

18-22 School (www.terascale.de/statistics2013)
Introductory Statistics School 2013
DESY, Hamburg

20 Public Lecture
Schwarze Löcher – Himmelsobjekte mit Imageproblem
Marc Hempel, DESY, Hamburg, auditorium, 19 h

20-22 XII. Research Course on X-ray Science
Theoretical Foundations of Research with X-ray Free-Electron Lasers and Synchrotron Radiation Sources
DESY, Hamburg

21 Series of Events Music & Science
Physik in Hollywood – Wo Regisseure sich irren und wo sie recht hatten
Marc Wenskat (DESY)
DESY, Hamburg, auditorium, 17.30 h
Liebeck String Trio
DESY, Hamburg, auditorium, 19.30 h

27 Science Café DESY (http://sciencecafe.desy.de)
Die Corioliskraft – Geschichte, Missverständnisse und Mythen einer Scheinkraft
Frank Lehner, Hamburg, DESY Bistro, 17 h

April

19 Series of Events Music & Science
Einstein’s Universum
Brian Foster (DESY & Uni Hamburg) & Jan Liebeck
DESY, Zeuthen, auditorium, 17.30 h
Southern Cross Solists
DESY, Zeuthen, auditorium, 19.30 h

24 Science Café DESY (http://sciencecafe.desy.de)
Kommt der nächste Einstein aus Afrika?
Babette Döbrich, Hamburg, DESY Bistro, 17 h

25 Event
Zukunftstag für Mädchen und Jungen
DESY, Zeuthen

25 Event
Girls day
DESY, Hamburg
With new detectors to new horizons

Heraeus seminar on neutrino physics

By Christian Spiering

Underground neutrino detectors with masses of 100 to 50 000 tonnes have produced a rich harvest of discoveries: solar neutrinos accurately confirmed our concepts of energy production inside the sun, and with the help of neutrinos from a supernova in 1987, it was possible to determine the temperature in the interior of the collapsed star – about 40 billion degrees Celsius! These two discoveries, which opened up a completely new observation window into the universe, won the Nobel Prize in Physics in 2002.

Using underground neutrino detectors, it was also possible to confirm a four-decades-old hypothesis, which assumes that neutrinos of one type can change into another one of three types – a procedure called neutrino oscillation. However, this is only possible if neutrinos have mass. This discovery was thus a first step beyond the standard model of particle physics. The icing on the cake later was the measurement of the missing third “mixing angle” of these particles. These angles determine the strength of the oscillations.

The future projects will tackle numerous completely different issues. At the heart of the research programme is the precision study of solar and geo-neutrinos, i.e. neutrinos from our sun and our planet. There is still room for surprises, even with these ostensibly known objects! If a supernova explosion should happen in our galaxy, we would register not only two dozen neutrino events as in 1987, but several ten-thousands – a gold mine for both astroparticle and particle physics.

Another key area is the search for proton decay, which is predicted by Grand Unified Theories of particle physics and which would be of fundamental importance for the origin of the universe. Last but not least, some detectors are able to determine which neutrino is the heaviest, the second heaviest and the

Windows 8 still nicher solution at DESY

By Martin Gloris

Because of cost–benefit considerations, there will be no large-scale implementation of Microsoft’s new operating system Windows 8 at DESY. The new standard will be Windows 7, which is already being used on about 2800 computers. Admittedly, Windows 8 offers a better support for touch-screen devices such as tablets or smartphones. For these niches, an at least rudimental, centrally supported application is being evaluated. The Windows operating system has been used at DESY since about 1995. Since 2002, the DESY standard version has been Windows XP. Because Microsoft will end support for Windows XP as of 8 April 2014, DESY has been gradually implementing the new DESY standard Windows 7 since mid-2011. The Windows “Vista” version released by Microsoft between Windows XP and Windows 7 was not used at DESY either, also because of cost–benefit considerations.

Seminar on Scientific Computing

Starting with the summer semester 2013, the long-time Monday DESY Computing Seminar will be held under a new name – the “Seminar on Scientific Computing”. The new name reflects the changing research scene on the DESY campus. The seminar is a forum for the exchange of ideas and concepts regarding current computing themes across the various science sectors at DESY. Topic suggestions and speakers are highly welcome. www.desy.de/dvsem

Funding continues for “Netzwerk Teilchenwelt”

The particle physics network “Netzwerk Teilchenwelt”, a successful educational collaboration of 24 German research institutes and CERN in Geneva, will be funded for three additional years by the Federal Ministry of Education and Research. The network gives young people the opportunity to evaluate original data from CERN, including true Higgs particle candidates, during project days. In this new funding period, interested youths will also be able to use the detectors developed within the network to collect their own data measuring cosmic particles. DESY in Zeuthen will continue to manage and ensure the scientific coordination of the “Cosmic” project, which also receives additional support by the Helmholtz Alliance for Astroparticle Physics.
Scientists at DESY in Zeuthen are currently investigating the feasibility of PINGU, a possible extension of the IceCube Antarctic neutrino telescope, which hopefully would be able to determine the mass hierarchy. The University of Hamburg is involved in preparations for LENA, a scintillator detector in a Finnish mine, which will cover the complete programme mentioned above.

The event was a multidisciplinary initiative. Particle physicists who did not know why you need to measure geo-neutrinos to understand the thermal balance of the earth had the opportunity to learn it here, as did those who wanted to understand which unsolved mysteries of the sun can only be unravelled with neutrinos. Experts in solar or geophysics unfamiliar with oscillation physics were able to learn more about the concept. In the end, all participants felt that they were working in one of the most exciting and promising fields of research.

DESY and SLAC at AAA meeting
The annual meeting of the American Association for the Advancement of Science (AAAS) is the largest interdisciplinary science conference in the world. This year, from 14 to 18 February, around 8000 scientists, journalists and science communicators met in Boston under the motto “The Beauty and Benefits of Science” to get an overview of current research, science policy and new ways of communication.

The Helmholtz Association regularly hosts a press breakfast at the conference. The theme of this year’s breakfast, which was attended by about 90 journalists, was the tradition of international collaboration at the Helmholtz Association, exemplified by the long-time relationship between DESY and SLAC National Accelerator Laboratory in California. DESY director Helmut Dosch and former SLAC director Persis Drell answered questions about the joys and woes of collaborating across national and cultural borders, between countries that have completely different financial and funding policies. (fz)

New Linear Collider Collaboration
From now on, two next-generation accelerator projects will operate under one roof. The Linear Collider Collaboration, LCC for short, was established in Vancouver, Canada, at the end of February. The LCC unites the linear accelerator projects ILC and CLIC, which could one day complement the Large Hadron Collider (LHC). Both projects will continue to exist; the LCC will coordinate the research and development work for the accelerators and detectors. LCC director is the former LHC project manager Lyn Evans. The Linear Collider Board, a supervisory board that was established at the same time, is headed by Sachio Komamiya from the University of Tokyo. (bav)
www.linearcollider.org

New spokesman at H.E.S.S.
Since January, Christian Stegmann is the new spokesman of the H.E.S.S. experiment. He succeeds Werner Hoffmann, director of the Max Planck Institute for Nuclear Physics in Heidelberg, who served as spokesman for the past 12 years. H.E.S.S. (High Energy Stereoscopic System) is a system of five telescopes in Namibia for the observation of high-energy gamma rays. It is run by more than 170 scientists from 32 institutes in 12 countries. The fifth and worldwide largest gamma telescope was commissioned at the end of last year. H.E.S.S. is the world’s only system of gamma-ray telescopes with instruments of different sizes. “Besides offering prolific physics results, H.E.S.S. is perfect to prepare the future gamma observatory CTA, and I am looking forward to my new task,” said Stegmann. (ub)
„Jugend forscht“ at DESY
A swishing-fizzing car, baking powder propulsion and the refuse bin of the future

Are we going to drive around one day in cars using the popular “Mentos dissolved in Cola” principle or even baking powder as a power source? Will refuse bins of the future persuade us in a playful way with a basketball hoop on top to separate recyclable waste? A great variety of ideas was contributed by about 100 pupils who presented their research projects to the jury in mid-February at the regional youth science and experiments competitions “Jugend forscht” and “Schüler experimentieren” at the DESY school lab in Hamburg.

The results were impressive: 34 contributions were awarded and 12 qualified for the next competition round. All young researchers were in fact winners, as the participation certificate will be particularly valuable in their future job application documents. It was not easy for the jurors to make a choice between all those dedicated pupils, who presented their projects with competence and enthusiasm. The age of the participants ranged from fourth-graders to secondary-level pupils; the subjects included various themes from the working world, biology, chemistry, earth and space sciences, mathematics, computer sciences, physics and technology.

“Jugend forscht‘ mainly owes its success to the large number of motivated pupils and their great ideas,” said Dr. Nico Kock, deputy managing director of “Jugend forscht”, at the awarding ceremony. And DESY director Christian Scherf added: “We need bright minds with good ideas, and young people who are willing to develop their ideas.”

A very practical idea came from Jakob Grzeskowiak (12) and Alexander Zwingenberg (12), whose USB energy storage unit equipped with solar cells won the special award in environmental technology. This small portable solar module can supply a mobile phone with energy without requiring any power socket. The winners of the mathematics/computer science award were just as application-oriented. They presented software steering a robotic arm designed to help paraplegic people in their everyday life.

The next round is the Hamburg state competition, which will take place in early April at Airbus. The competition ends with the nationwide finale on 30 May to 2 June 2013 in Leverkusen. (uw)

INFO
www.jugend-forscht.de