DESY inFORM.

08/2008
Newsletter of the
Research Centre DESY

Hidden Van Gogh Picture Uncovered

HASYLAB helps art historians to reveal a hidden Van Gogh

Van Gogh's pictures are fascinating – even more so when one masterpiece conceals another one under its surface. At HASYLAB, an expert team from Belgium and the Netherlands has revealed a hidden Van Gogh painting. Materials scientist Joris Dik from Delft University, conservator Luuk Rutgers van der Loeff from Kröller-Müller Museum in Otterlo and chemist Koen Jansens from Antwerpen University were thrilled to be able to reconstruct not only a sketch but a real painting – the portrait of a peasant woman. Previous research had already shown the vague outline of a head underneath the painting entitled "Grasgrond" (grassy landscape). For a clear identification, however, the picture had to travel to Hamburg.

Karen Rickers-Appel at the experiment: With intense synchrotron radiation the team of experts was able to measure very small amounts of mercury and antimony in the lower layers of paint.

Preparations for the revealing measurements at DORIS were quite sophisticated: an insurance, special transport and air-conditioning of 55 percent humidity at 24 degrees were absolutely essential. DORIS coordinator Wolfgang Drube and scientist in charge Karen Rickers-Appel made sure that the experiment ran smoothly. For the first time such a painting has been made visible using a special measuring method: micro X-ray fluorescence analysis. Using so-called dot measuring, the picture is scanned dot per dot without damaging it. The kind and quantity of the elements were analysed this way, making the distribution of the pigments visible. Two elements were especially important in this analysis: antimony and mercury. Although only traceable in low concentration, the intense antimony fluorescence line reveals the bright areas of nose and chin. Pigments containing mercury were used for the reddish lips and cheeks. The scientists examined the chemical mixture of the pigments with the help of absorption spectroscopy at HASYLAB's beamline C. They identified a pigment which is characteristic for Van Gogh: Naples yellow (lead antimonite). The colour of the mercury compound is vermillion, i.e. mercury sulphide. These analyses created a detailed coloured reconstruction of the underlying picture and led to new answers. Van Gogh painted his portrait of a peasant woman in the early period in Nuenen, between 1884 and 1885. From the exchange of letters it is known that he had sent some of these portraits to his brother Theo, who was an arts dealer in Paris. When Van Gogh came to Paris one year later, the artist might have deemed his painting too old-fashioned, which is why – the experts believe – he painted it over. *(she)*

Without damaging the masterpiece, the exact colour gradients of the hidden painting could be revealed.

Patented Performance

The European Patent Office has granted a patent for a design developed by Karsten Hansen and his group FEC. Their silicon drift detector module is able to measure the spectrum of fluorescent light of samples examined with synchrotron radiation very quickly and nearly undisturbed. This can for example be used for testing catalysts. Its modular and compact design makes it possible to place several of these modules around a sample and to measure simultaneously in various spatial directions. Apart from the compact shape, the patented detector has very sophisticated interference resistance and cooling.

DIRECTOR'S CORNER

Particle physics rarely goes on summer holidays, and this year is no exception. Quite the contrary: my deputy and I, the leaders of the research groups and my colleagues from the directorate are all very busy planning the future of particle physics at DESY for the coming five years. We are currently drafting the proposal for the next programme-oriented funding period 2010 to 2014, which will then be evaluated internationally. We are putting great emphasis on the research fields of the Alliance and on networking with our partners, and we are facing an exciting future at DESY, with our research projects completely maintained. This is also relevant for my successor, who will soon be announced officially. We all can hardly wait for the moment when the first protons are injected into the Large Hadron Collider at CERN. The eight sectors are already cooled down, but not all sectors have reached the operating temperature of 1.9 Kelvin. Nevertheless we expect the first particles to circle the ring by the end of the month. The first collisions can be expected a few weeks later. However, I'd rather not predict when we will have the first scientific results! I cannot imagine a more exciting time, and DESY is right in the middle of it all with the experiments, computing and communication.

Make sure to mark the date of 21 October in your calendars. This is the day of the official LHC inauguration. Many heads of state are expected at the ceremony at CERN. In Germany, we will have an event at the large LHC exhibition that starts on 14 October in Berlin, with the participation of DESY in a leading role. For one month, you will have the opportunity to get a lot of information on the LHC and Germany's role in this project in the new subway station "Bundestag".

Yours,
Rolf Heuer

Cosmic Particle Symphony with and without Radio

Acoustic particle detector to support the neutrino telescope IceCube

by Rolf Nahnhauer

For the third time since 2005, the year in which DESY in Zeuthen started the series "ARENA - Acoustic and Radio EeV Neutrino detection Activities," around 100 physicists from four continents met in Rome to discuss new procedures for the detection of cosmic neutrinos with highest energies.

The measurement of these neutrinos provides important information to cosmologists, astrophysicists and particle physicists. However, detection is difficult. The expected interaction of neutrinos on earth is so small that even the volume of the cubic-kilometre neutrino telescope IceCube can only "see" approximately one event per year. This is why the IceCube collaboration is discussing to supplement the neutrino telescope with radio and acoustic sensors within a radius of ten kilometres.

The advantage: radio and acoustic signals are measurable over distances of several kilometres. Neutrinos would be "audible" in a volume a hundred times as large.

Deployment of a SPATS string in an IceCube drilling hole at the South Pole.

With the help of the South Pole Acoustic Test Setups (SPATS), developed and built under DESY leadership, the acoustic properties of Antarctic ice have been tested for one and a half years. SPATS consists of four strings, each 400 to 500 metres long and carrying seven acoustic stations with transmitters and sensors with a 10 to 100 kHz-range. The first measurement of background noise and acoustic velocity deep down in the ice make scientists optimistic about this method. In contrast, testing the attenuation of acoustic signals in the ice has taken more time. Results are expected in the next months.

10 Years of Fascination

The study group „Faszination Physik" (fascination physics) celebrated its tenth anniversary in July. The project started in 1998 when retired teacher Waldemar Tausendfreund held the first lecture on "Time Travel and Paradoxes." Since then, many sixth form pupils have met on Saturdays and sometimes also on Fridays to discuss special topics on physics and mathematics. The topics are selected democratically by the teenagers and presented to each other in lectures. The kids don't stop at differential and integral calculus. New participants are always welcome. More information (in German): www.desy.de/faszination.physik/

DESY's EU Projects

HadronPhysics

by Jan Dreyling-Eschweiler

Particles made of quarks and gluons are called hadrons – for example the nuclear building blocks protons and neutrons. The force that is responsible for holding the quarks together with gluons is called the strong force. And everything that has to do with this is studied by the around 2000 participants of the EU project "Study of strongly interacting matter", or in short: HadronPhysics.

HadronPhysics is an international project which intends to bring together and advance this field of research in Europe. In 2004, the project started with a funding amount of 17.4 million Euros for five years. A total of 150 research institutes across Europe are participating, including all large European accelerator and data processing centres.

HERMES is one of the cross-national initiatives. For example, data from COMPASS (CERN) and HERMES were amalgamated to study the quark spin distribution of a proton more closely.

DESY is also the head of the Computational Hadron Physics Network which develops methods to numerically solve calculations in quantum chromodynamics (QCD), the theory of hadrons. Under the name of LatticeQCD, and under the coordination of Gerrit Schierholz (DESY), this sub-project will continue to be supported from 2009 on, the starting time of the follow-up project HadronPhysics2.

INFO

More on HadronPhysics
http://hadronphysics.infn.it

Yoji Totsuka, former Director General of KEK, died at the age of 66

Remembering Yoji Totsuka

by Albrecht Wagner and Rolf Heuer

With great sadness and a strong sense of loss we have heard that on 10 July Yoji Totsuka lost his long and brave struggle against cancer.

Yoji Totsuka worked at DESY from 1972 to 1976 at DORIS as member of the DASP experiment and from 1976 to 1980 at PETRA on the JADE experiment. This was the time of small collaborations and an exciting period where we all worked very closely together on the discovery of the gluon. Yoji said in a recent article that DESY was his second home.

Yoji also became strongly engaged in the very intense phase of planning for the OPAL experiment at CERN. OPAL was based on the well-tried concept of JADE and became a big success.

Before the construction of the OPAL experiment started, Yoji left Europe for Japan, to join Professor Koshiba at the University of Tokyo and the experiment seeking proton decays in the mountains of Japan, in Kamioka. This experiment paved the way for one of the most important recent discoveries, the evidence that neutrinos have mass, made by its bigger brother, Super-Kamiokande.

Many prizes have underlined Yoji Totsuka's outstanding role in this experiment. The most prestigious prize in Japan, an Order of Culture, was awarded to him for his distinguished research in neutrino physics, in particular for discovering the oscillation of atmospheric muon neutrinos with the Super-Kamiokande detector. He received the prize directly from the Emperor of Japan at the Imperial Palace.

From 1996 to 1998 Yoji Totsuka was member of DESY's Physics Research Committee (PRC), which advises DESY in its particle physics programme.

In 2003 Yoji Totsuka was appointed Director General of KEK, where he played a key role in positioning the laboratory for the future and in strengthening it to play a lead role in the construction of J-PARC and the development of the International Linear Collider. His close links to DESY helped a lot in working together in the global collaboration towards the ILC. When he announced that he would not run for a second term as Director General due to health reasons we were worried and sad.

All those who had the pleasure to work with Yoji Totsuka share the admiration for him as scientist and the sadness about the loss of a friend. We will keep very fond memories of him.

Inspiring

The world's large particle physics centres plan to build a new scientific information system for high-energy physics publications' research. At a meeting in Hamburg at the end of May, representatives from CERN, Fermilab, SLAC and DESY agreed to start the INSPIRE system. It is being built by combining the SPIRES database with the Invenio platform developed at CERN. As of 2009 - with easy operation tools and Web 2.0 applications - particle physicists will be able to find the requested publications very quickly. INSPIRE also provides a vision for information management in other fields of science.

Professors from left: Christof Wetterich (Universität Heidelberg), Bernulf Kanitscheider (Universität Gießen), Thomas Naumann (DESY, Zeuthen), Brigitte Falkenburg (TU Dortmund), Hermann Nicolai (MPI für Gravitationsphysik Potsdam/Golm)

Is Our Universe Unique?

Discussion "Universe – Multiverse" in the Einstein Forum

by Thomas Naumann

Einstein reportedly wondered "whether God had any choice in the creation of the world". At the Einstein Forum in Potsdam on 8 July, scientists and philosophers discussed the question why the world is governed by so many numbers the origin of which we do not know.

Why, for example, is there only the tiny amount of matter left after the Big Bang which our Universe is made of? Why do we live in three dimensions while modern string theories predict ten dimensions? Why do an electron and a quark have exactly the masses that allow us to exist? If only one of these numbers was different our world would be hostile to life.

Some theories postulate that our Universe is only one of many. Hence we could say that we live in the one out of many worlds that makes our existence possible. However, this was not the solution favoured by the experts at the Einstein Forum. They trust another path: the search for the fundamental laws of the Universe which make our world exactly the world it is. With the LHC at CERN, we hope to make a decisive step to discover these laws.

INFO

In German
www.einsteinforum.de
www.tagesspiegel.de/magazin/wissen
Article: „Der kosmische Jackpot"
www.dradio.de/dlf/sendungen
Broadcast: „Viele Welten statt einer"

Gateway to Physics

On 23 July the moment arrived for 82 students from 20 countries to swap the auditorium for a laboratory workplace at DESY in Hamburg and Zeuthen. For the majority of the summer students it is the first time that they work as a member of a research group. The immersion into experimental practice and the international working atmosphere boosts the motivation of many students. Coordinator Joachim Meyer knows this for a fact because of feedback from surveys he conducts with the students.

In nearly eight weeks, the students in physics or related disciplines join in day-to-day science and the work of DESY research groups. General and specialist physics lectures help them to better understand the complex experiments. At the end, the students present their projects. In mid September they return to their home universities with a lot of new experiences. *(she)*

Imprint

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DESY-PR
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Kopierzentrale DESY (print)

HELMHOLTZ GEMEINSCHAFT

PETRA III Crew is Moving in

The first PETRA III scientists are now ready to move into their new offices on the first floor of the experimental hall. Office furniture was delivered last week and the first network power points were installed.

Starting in August, a total of 30 persons will be moving in gradually. Then they will be able to watch the "finishing touches" on the experimental hall right from their offices. Since the official hand-over of the building at the end of June, the installation of the accelerator and of the experiments is going on at full speed. At the end of July the new girders were set up. They will carry the magnets that hold the electron beam precisely on track.