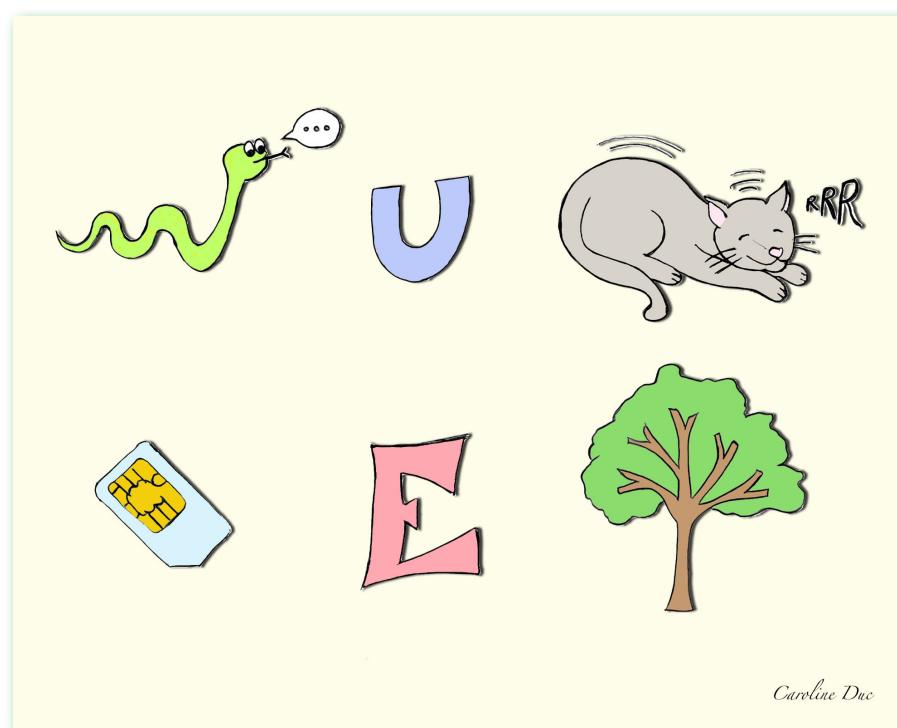




Nos 35 & 36 – 29 August & 5 September 2012

## Where is SUSY?



Can you work out this rebus? Source: Caroline Duc.

**S**o far, SUSY is "just" a theoretical physics model, which could solve problems beyond the Standard Model by accounting for dark matter and other phenomena in the Universe. However, SUSY has not been spotted so far, and might be hiding because of features different from what physicists previously expected. "Currently, there is no evidence for SUSY, but neither has any experimental data ruled it out. Many searches have focused on simplified versions of the theory but, given the recent information we are gathering from experiments, theorists should rethink the way we are looking for it

**Recent information from the LHC experiments, the relatively low mass of the new boson and other data coming from experiments looking for dark matter worldwide are placing new constraints on the existence of supersymmetry (SUSY). However, there is a large community of scientists that still believes that SUSY particles are out there. Like lost keys at night, perhaps we have been looking for SUSY under the wrong lamp-posts...**

and the ways we should search for it in the future," says John Ellis, professor at King's College London and visiting professor in CERN's Theory Group. "Maybe SUSY is hiding under a different experimental lamp-post; perhaps one we passed by, perhaps one further down the LHC road."

A recent paper on SUSY was submitted to the European Journal of Physics C by a group of scientists including John Ellis: "We have combined information coming from

(Continued on page 2)



### Strength in diversity

**D**iversity has always been science's big secret, yet it's a secret we've always been keen to share. CERN was founded on the basis of bringing a diverse mix of people together to pursue common aims, and it's one of the things that's driven this Organization's success over the decades.

(Continued on page 2)

### In this issue

#### News

- Where is SUSY? 1
- A word from the DG: Strength in diversity 1
- LHC Report: Timeout is over! 2
- Testing begins on Linac4 3
- From calorimetry to medical imaging: a shining example of successful transfer! 4
- Warmer amps for the LHC 5
- Small but powerful 6
- The elegant lines of the new Building 774 7
- CAS Accelerator Physics (Ion Sources) in Slovakia 8
- Go on a particle quest at the first CERN webfest 9
- Powerlifting: a new opportunity to stay fit! 10
- Acquiring a taste for the Higgs boson 10
- News from the Library: the CERN Web Archive 11
- When the "Lion" eats your data 11
- Ombuds' corner: Zen and conflict resolution 12

#### Official news

- Take note 13
- Technical training 14
- Management & Communication training 15
- Language training 16
- Seminars 16

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(Continued from page 1)

## Strength in diversity

**Now, we are launching a new diversity programme aimed at strengthening our tradition of inclusiveness. This programme is being launched with a range of key goals in mind for the 2012-2014 timeframe. We'll be striving to achieve a fair gender balance across all professional categories, and to provide strong gender role models across the Organization. We'll be improving our career development processes to allow people to progress through both technical and managerial pathways, and we'll be re-launching workshops that bring people from diverse professions and generations together to share their experience on key aspects of life at CERN. We'll be looking at ways to continually improve work-life balance, and we'll be organising events to stimulate inclusiveness and mutual respect. And last, but not least, we'll continue our robust efforts to recruit excellent people from the full range of our Member States. We're proud of our diversity at CERN, where all individuals can contribute to their full potential, without the need for groupings or associations that foster separateness.**

**CERN's Directors and Department Leaders have played a full part in developing our new diversity programme, which is being rolled out now. I encourage you all to take part and to celebrate the diversity that is our strength.**

*Rolf Heuer*

## Where is SUSY?

(Continued from page 1)

CERN's ATLAS, CMS and LHCb experiments; he continues, "as well as the XENON100 dark matter search, assuming that the new boson discovered with a mass around 125 GeV is indeed the Higgs boson. In the paper we discuss how this information can be combined to give new estimates of the masses of the supersymmetric particles. Before the advent of the LHC, low-energy data, in particular from muon ( $g-2$ ) experiments, gave hope that SUSY might be discovered at the LHC within its first year of operation. This has not been the case."

Does this mean that the LHC will not be able to find SUSY if it exists? "No," replies John Ellis. "If the newly discovered boson is indeed the Higgs boson, some SUSY particles could still be accessible to the LHC

experiments." In other words, the search for SUSY is still open, even though data indicate that the masses involved are higher than originally expected. "If the masses of SUSY particles are in the lower or medium part of the range still allowed in simplified models, we could hope to discover them at the LHC operating close to its design energy of 14 TeV, otherwise we might need a different experimental tool," explains John Ellis.

And let's not forget that SUSY might also be discovered "indirectly" as deviations of known particles from their expected Standard Model behaviour could suddenly point scientists to where SUSY is. There are still many lamp-posts to look under!

*Antonella Del Rosso*

## LHC Report: Timeout is over!

**P**revious LHC reports have mentioned that the peak luminosity at the beginning of the "stable beams" period had gone down by about 10% with respect to previous records. This is explained by the reduction of bunch intensities, as higher bunch intensities were leading to beam instabilities and important beam losses. When beams become unstable, octupole magnets can be used to correct them. These magnets can be powered at two different polarities and several days were needed to find new optimum machine settings with the octupole polarity reversed relative to the polarity used over recent years. This paid off, as with the reversed polarity the beams became more stable when brought into collision and the bunch currents could be increased from  $1.5 \times 10^{11}$  to  $1.6 \times 10^{11}$  protons per bunch. Together with an important effort from the injector team to deliver beams with a smaller cross-section, a peak luminosity of  $7.4 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$  in ATLAS and CMS was reached, which is about 10% above previous records.

While the machine was ready for weeks of stable operation with the new optimised settings, the CMS solenoid magnet

**Over the last two weeks the LHC has been collecting luminosity at a steady pace, but not delivering the canonical  $1 \text{ fb}^{-1}$  per week. This is because machine timeouts were necessary to solve some beam-stability problems. Also, the beam development programme was moved forward, taking advantage of a timeout caused by an emergency ramp-down of the CMS solenoid magnet. With all these problems solved and with good injector performance, the past week has seen the LHC back to new record luminosities.**

had an emergency ramp-down, leading to the magnet being warmed up to 70 K and four days required for recovery. To minimize the time subtracted from data taking for CMS, the LHC teams quickly put together a machine development programme. The programme included a check of the octupole polarities; LHCb polarity switching; successful commissioning of injection and RF-capture using new SPS optics, called the Q20 optics, which allows for even higher bunch intensities; development of tune measurement using the transverse damper and the polarity switch of the ALICE experimental magnets, which was followed by a 48-hour commissioning programme with the new ALICE magnet polarity.

With the beams more stable than before and no special gymnastics announced for the coming weeks, the stage is set for a new period of record luminosity production.

*Jan Uythoven for the LHC Team*

# Testing begins on Linac4

Over the next Long Shutdown (LS2), Linac4 will replace the current Linac2 linear accelerator as the first link in CERN's accelerator chain. It will deliver particles at 160 MeV to the PS Booster, more than triple the energy currently delivered by Linac2. But before the accelerator team can pop the champagne, the various elements of Linac4 will be tested and re-tested in facilities across CERN.

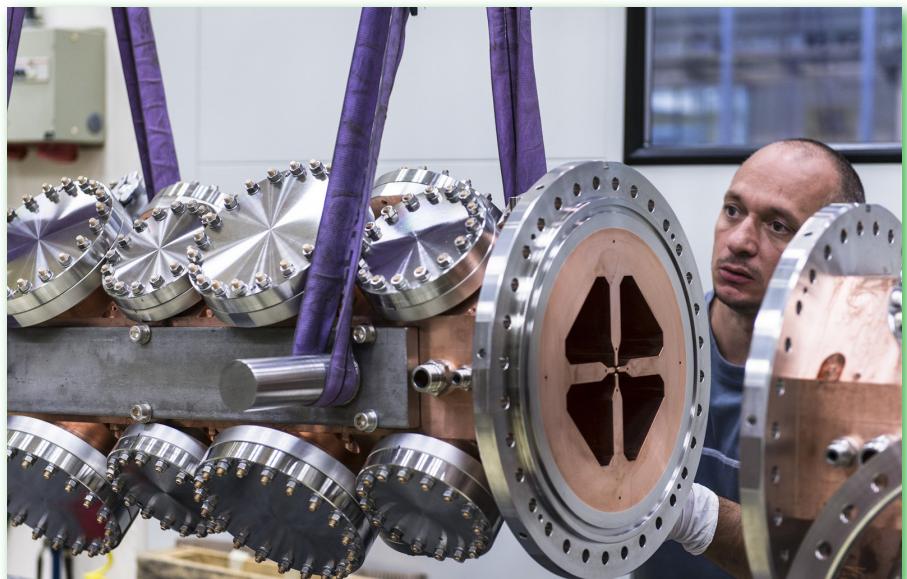
"The first Linac4 tests are currently underway, starting with the CERN-built RFQ," says Carlo Rossi, a physicist in the RF Group of the BE Department and the RFQ project coordinator. "It's an extremely impressive module. Measuring just 3 metres in length, it can take the beam from 45 keV up to 3 MeV – just the right energy for injection into a typical accelerator." The RFQ will be able to accelerate both protons and hydrogen ions directly from the source. It will also compact the beam into the "bunches" needed for further acceleration and will provide longitudinal and transverse focusing, defining the beam characteristics and quality for the entire accelerator chain.

Currently, the Linac4 team are preparing the module for radio-frequency tuning – calibrating the module's electromagnetic fields to reproduce the precise pattern defined

On 3 August 2012, the Linac4 radiofrequency quadrupole (RFQ) module was installed at the accelerator test-stand in Building 152. The site will be the module's home for almost a year, as the linear accelerator enters the assembly and testing stage.

by the beam dynamics team. While this is in progress, the ion source that will provide particles to the accelerator is being installed and connected to the module. In October, once both steps have been completed, the team will begin testing the RFQ and the subsequent transport line with beam.

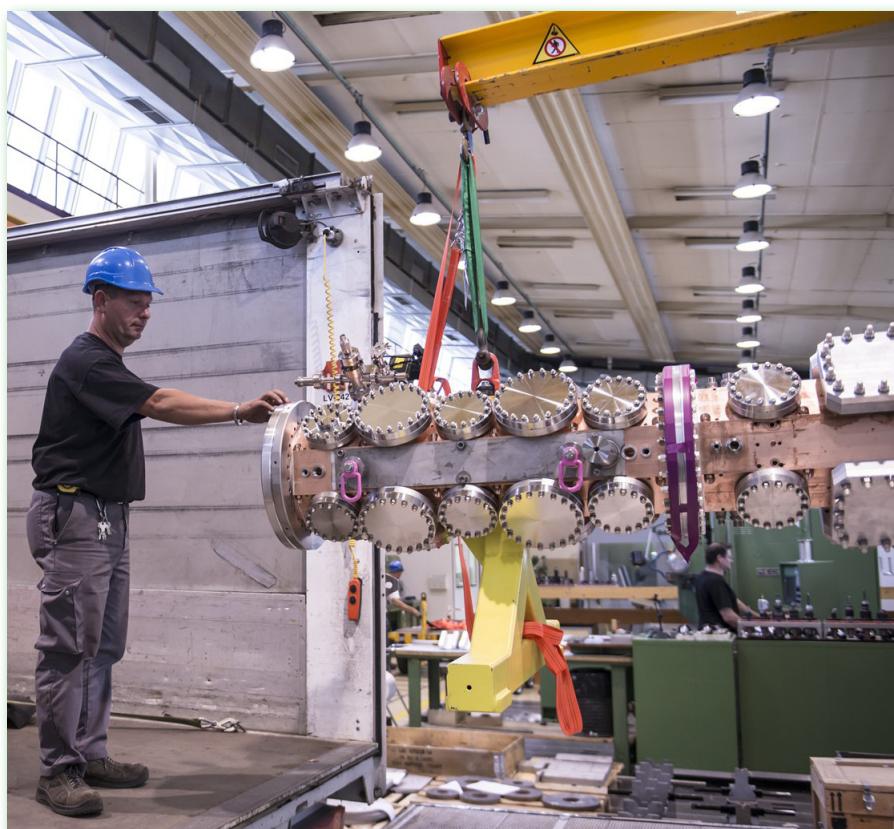
This testing brings to a close over three years of work on the RFQ module, whose entire machining was done at CERN. "RFQs are quite special: they are very delicate, sensitive modules," says Serge Mathot, a physicist in the Engineering (EN) Department. "They are always a challenge to construct. The primary difficulty is with the mechanical tolerances, i.e. ensuring the size of the module with a precision of a few tens of microns." Read more about the challenging construction of the Linac4 RFQ in a previous Bulletin article, Issue 24-25/2010.



Final module assembly is carried out before installation in Building 152.

Local testing with beam is scheduled for completion in mid-2013, after which the RFQ and line will be permanently installed in the new Linac4 tunnel. There they will be connected to the rest of the Linac4 accelerator modules, including the Alvarez drift tube linac (DTL), a cell-coupled drift tube linac (CCDTL) and a Pi-mode structure (PIMS), which are all still under construction across Europe.

Katarina Anthony



The RFQ module is delivered to the new Linac4 test line.

# From calorimetry to medical imaging: a shining example of successful transfer!

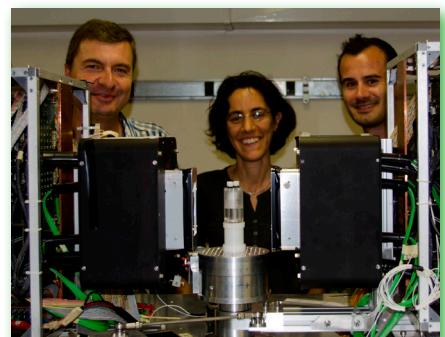
**P**ositron-emission tomography (PET) is a medical imaging technique based on the matter-antimatter interaction that can provide a three-dimensional representation of the metabolic activity of an organ. To do so, radioactive marker molecules are first injected into the subject. As the marker decays, it emits positrons (antimatter particles), which are annihilated upon encountering electrons in the surrounding environment. The resulting flash, consisting of two photons, is detected by the PET machine. In conventional PET systems, it is impossible to improve spatial resolution without losing sensitivity. AX-PET offers a way around this trade-off, improving the quality of the imaging. Thus, AX-PET can achieve millimetre-scale resolution, while conventional PET resolution is limited to 4 to 6 millimetres.

The AX-PET technique, whose development began in 2007, relies on calorimetry methods commonly used in particle physics: a lattice of crystals transforms the incoming photons into scintillating light. Each crystal is connected to a photodetector, which transmits analog information. The innovation in AX-PET compared to older technologies lies in the positioning of the crystals with respect to the photon source (see figure below). "Unlike the traditional layout, where the photosensitive crystals are positioned radially to the subject being examined, AX-PET uses elongated crystals, 100 mm in length, that are aligned parallel to the machine's bore axis," explains Matthieu Heller, a Marie Curie fellow in CERN's PH Department who is one of the names behind the project. "In this way, if you want to improve sensitivity, all you have to do is add more layers of crystals." Behind each row of crystals there is a perpendicular row of plastic strips, which is used to record the

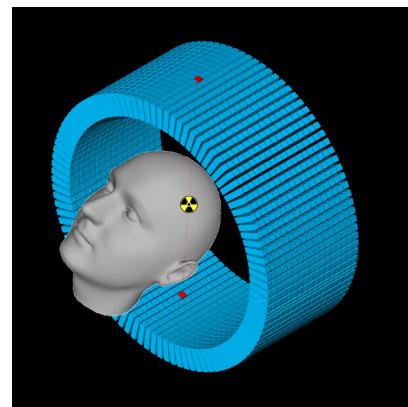
A team at CERN has drawn inspiration from calorimetry methods developed for high-energy physics to create a new positron-emission tomography system for use in medical imaging, which they've dubbed AX-PET. With support from European and American laboratories\*, the project is reaching fruition, as initial tests confirm its promise.

position at which a photon has impinged on the crystal. The resulting three-dimensional lattice can be used to measure the precise point of impact of a photon.

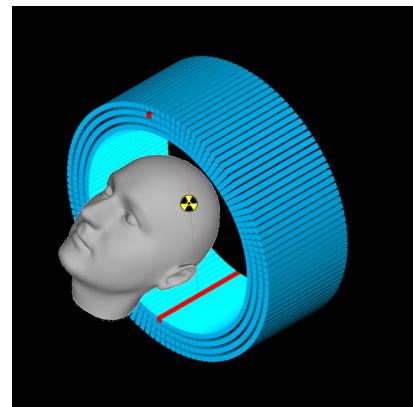
In June the project team performed initial



Some members of the project team: Christian Joram (CERN), Chiara Casella (ETH Zürich) and Matthieu Heller (CERN) pose behind AX-PET.



A traditional PET scanner showing the crystal layout.



The axial orientation of elongated crystals in AX-PET.

tests with small animals at the ETH Zurich laboratories that are specialised in small-animal imaging. "The results showed us that our demonstrator has reached the stage of maturity," notes Christian Joram, the leader of the PH Department's Detector Technology Group and the person in charge of the AX-PET project. "There are now several possibilities. One of them would be to couple the PET machine with an MRI machine so as to give a combined snapshot of the metabolic and structural aspects of the subject. This would require some further work, because MRI—magnetic resonance imaging—relies on very strong magnetic fields, which must be protected against any interference from our detector."

Other avenues of research are aimed at improving the performance achieved by AX-PET, now that the demonstrator, which was manufactured at CERN, has shown that the new PET principle works and is feasible for bigger-scale application. These research ideas include simulations (using different crystals and geometries) and tests with new Digital SiPM photodetectors, which convert light directly into digital data. Coupled with the crystals, such detectors could be used

to distinguish the time-of-flight of photons emitted by the source. This temporal information would improve the detection sensitivity and reduce the background noise, providing a much sharper image.

"As CERN researchers, our role isn't to build a complete scanner, but to transfer the technology," concludes Christian Joram. "We have demonstrated the performance that is possible with our principle, and now we are helping our partners to develop suitable applications. Recently we have also started working with manufacturers and medical imaging experts on a detector that would incorporate both MRI and PET functionalities." From calorimetry to medical imaging, there is an unmistakable drive to move ahead!



Snapshot of a "phantom", a test object, surrounded by the AX-PET photon detectors.

Caroline Duc

\* Laboratories involved in AX-PET project : INFN Bari, INFN Cagliari, INFN Roma, CERN, University of Michigan, Ohio State University, University of Oslo, Tampere University of Technology, IFIC Valencia, ETH Zürich.

# Warmer amps for the LHC

When it comes to consuming electricity, the magnets that steer particles through large accelerators can be characterised with just one word: greedy. For the LHC, the total current can reach 1.5 million amps. At the present time, this current is brought in via copper cables of up to 10 cm in diameter. In the tunnel, these cables connect the current leads - which provide the transition between the ambient-temperature cables and the magnets in their bath of superfluid helium - to the power supply. In the accelerator, the current leads are connected to the niobium-titanium (Nb-Ti) superconducting cables that bring the current to the magnets (see figure 1).

Until now, this supply system did not pose any major problems. However, in the future it could become a serious handicap. This is because the electrical power supplies, when the LHC reaches its design energy,

CERN is working together with an Italian company to develop superconducting cables that can function at temperatures of up to 25 K (-248°C). This will make it possible to move LHC magnet power supplies out of the tunnel, protecting them from exposure to the showers of very high-energy particles produced by the accelerator.

will be exposed to streams of very high-energy particles, which could interfere with their operation. "In an ideal world, we would take the power supplies right out of the tunnel," says Lucio Rossi, in charge of the High Luminosity LHC project (HL-LHC). "That would have the added benefit of making them accessible rapidly, without having to worry about precautions for radiation. Unfortunately, the voltage drops that are incurred with copper cables rule out using them over long distances. So what we need to do is find a way to do so with superconducting cables." This is the heart of the matter. The niobium-titanium superconducting cables in the LHC depend on a sophisticated cryogenic system that uses liquid helium at temperatures between

4.2 K and 1.9 K (-268.8 °C and -271.1 °C). The system is already as big as it can be. So this is where the new candidate comes in. "Currently we are working with an Italian company called Columbus to develop new SC wires based on magnesium diboride ( $MgB_2$ )," explains Amalia Ballarino, head of the Superconductor and Devices (SCD) Section in the TE Department. " $MgB_2$  is considerably less expensive than High Temperature Superconductors, and offers the major advantage that it remains functional at up to 25 K (-248 °C). The material has been around since the 1950s, but its SC properties were only discovered in 2001." With this wire, CERN will be able to build cables that can transport the high currents needed to operate the magnets—above 100 kA - from the surface to underground.

"This superconductor can be cooled using helium gas (as opposed to liquid helium), greatly simplifying the demands made on the cryogenic system (see figure 2)," stresses Amalia Ballarino. "In addition,  $MgB_2$  can function with a temperature margin of several degrees, which is a great advantage from the machine operation point of view. However, we have been faced with a difficulty: until now, the  $MgB_2$  ex situ\* has only been available in flat ribbons, which are unsuitable for high-amperage cables." To overcome this problem, Amalia's team and Columbus developed high-performance round wires. An important step forward!

Anais Schaeffer

\* This is the name given to a variant of the technology used for manufacturing superconducting wires.

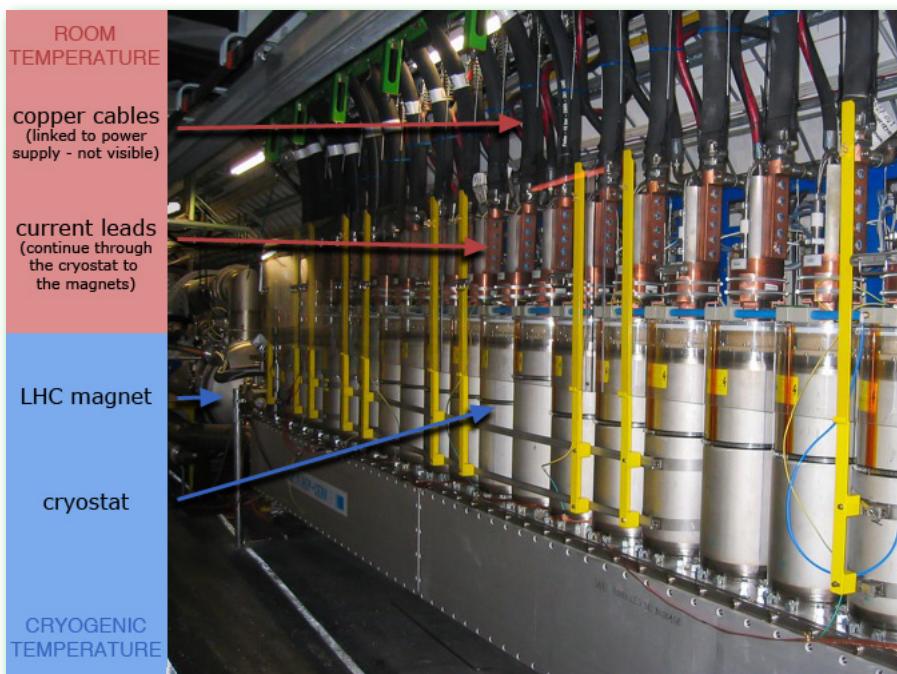


Figure 1: devices of this type, which measure approximately 10 metres in length, are inserted between the accelerating magnets at different points along the LHC.

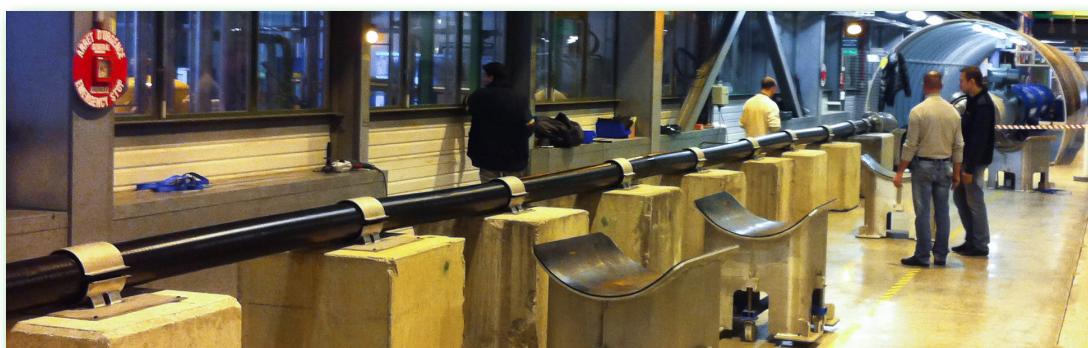


Figure 2: the black tube is the semi-flexible cryostat that will cool the  $MgB_2$  cables from the tunnel to the surface. This particular tube, which is currently in SM18 undergoing testing, is 20 metres long with a diameter of approximately 16 cm.

# Small but powerful

The HL-LHC (High Luminosity LHC) represents the future of CERN's flagship accelerator. From around 2020, this major upgrade will allow a substantial increase in the rate of collisions compared to today. The project poses various technical challenges, some of which appear to be close to being resolved.

The success of the HL-LHC hinges on two essential conditions: the installation of more powerful magnets to guide the beams, and the addition of extra collimators to mitigate the increase in radiation. However, one of the key questions is how to insert additional collimators in a 27 km ring already full to bursting. The answer is to replace the current magnets by shorter but more powerful magnets, which is what Fermilab's engineers have been working on in collaboration with CERN. "The idea originated from a proposal made by Lucio Rossi, the head of CERN's Magnets, Superconductors and Cryostats group, in 2010," explains Giorgio Apollinari, head of Fermilab's Technical Division. "During a discussion he suggested replacing a few of the LHC's 8 Tesla dipole magnets with shorter 11 Tesla magnets. His idea aligned well with the goals of Fermilab's R&D programme for projects including the

Magnet size is crucial to an accelerator as it determines the final circumference and power. This spring, Fermilab unveiled a 10.4 Tesla magnet that is shorter than the 8 Tesla magnets currently installed in the LHC. These new magnets will be a valuable asset to the HL-LHC, the next step of the LHC machine.

muon collider, so we decided to collaborate."

It was not long before the decision started to pay off. In spring 2012, only 20 months after the research had begun, Fermilab unveiled a 10.4 Tesla two-metre-long prototype magnet. Once several more development phases have been completed, an 11-metre-long magnet should see the light of day. Nothing short of a revolution when you think that the existing magnets are 14 metres long. "We achieved this using niobium-tin ( $Nb_3Sn$ ) instead of niobium-titanium ( $Nb-Ti$ ), which was the material used in the manufacture of the superconducting cables of the LHC magnets in the 1990s," adds Giorgio Apollinari.

Looking at what the CERN-Fermilab collaboration has achieved in less than two years, we think it's safe to assume that 11 Tesla magnets are not far off...

Anais Schaeffer



An 11 T magnet ready for cryogenic testing.



Members of the CERN-Fermilab team wind the magnet coil. From left to right: M. Whitson, A. Zlobin, B. Auchmann, M. Karppinen, F. Nobrega and J. Alvarez. A. Zlobin (Fermilab) and M. Karppinen (CERN) are the technical heads of the 11 T Collaboration.

# The elegant lines of the new Building 774

In July Building 936, which was too small, rundown and no longer suitable for requirements, disappeared

from the map of the Prévessin site. It will be replaced by a new building - numbered 774 - whose construction is due to commence in September. More functional, modern and economical in its energy consumption, the new building will house the BE Department's Controls (CO) Group from the end of 2013.

Situated opposite the CERN Control Centre (CCC), this new four-storey building (basement, ground floor and two upper storeys), with over 3400 m<sup>2</sup> of usable space, will be capable of accommodating up to 110 people along with their laboratories, which means that the entire Controls Group can all be housed under one roof. With near-direct contact with the CCC, they will be ideally placed for the LHC re-start in 2014, following its first long shutdown. "This will be the first time since the CO Group's creation that we will all be housed in the same building," underlined Pierre Charrue of the Controls Group, who is responsible for the project. "Much of our history until now has been linked to Building 936, and now that building will give up its place to Building 774. It's the end of an era!"

Prévessin will shortly see an addition to its stock of buildings. Functional, elegant and in compliance with the latest regulations regarding energy consumption, it will bring a modern touch to CERN's French site.

Building 774 will comprise over sixty offices, a dozen laboratories, several meeting rooms and a 140 m<sup>2</sup> auditorium for one hundred people. Michael Poehler, who is handling the project for the GS Department, points out: "The auditorium, which is on the ground floor, could be used for welcoming visiting groups as well as by CERN Users. Visitors and CERN employees will be able to relax in the adjoining cafeteria,

where Novae will sell snacks. A 'glass box' type restaurant on the first floor will be reserved for VIP visitors to the French site." Pierre Charrue adds: "We tried to satisfy the needs expressed by the Controls Group's members and those of all future users. This has required no less than 12 versions of the building layout! Now, with part of the first floor reserved for the offices of the BE Department's management, Building 774 and the CCC will become a focal point of the Prévessin site."

As regards its energy consumption, the new building will be in compliance with the latest French regulations on thermal insula-



tion, and will be fitted with 300 m<sup>2</sup> of solar panels, designed on the basis of technology developed at CERN. "The solar panels will heat the offices in the winter and cool them in the summer," says Michael Poehler. "Depending on requirements, it will also be possible to heat the building using CERN's heating system. The building's façade and large bays of triple-glazed glass will be fitted with sun-shading to keep the interior well lit while preventing over-heating in summer and avoiding creating a greenhouse effect." The principle of sustainable development is also reflected in the decision to have part of the roof covered with vegetation, making it capable of absorbing a significant portion of rainwater. This will not only enhance the building's "green" credentials, but will also substantially enhance its insulation properties.

The layout of Building 774 will look like the Greek letter π. It will have a terrace next to the cafeteria and another on a section of the roof, and will be strategically sited opposite the CCC. With its elegant, contemporary architecture, the building will undoubtedly become a landmark on the Prévessin site, as can be seen in the three mock-ups.



Anaïs Schaeffer

# CAS Accelerator Physics (Ion Sources) in Slovakia

**F**ollowing some background lectures on accelerator physics and the fundamental processes of atomic and

plasma physics, the course covered a wide range of topics related to ion sources and highlighted the latest developments in the field. Realistic case studies and topical seminars completed the programme.

The school was very successful, with 69 participants representing 25 nationalities. Feedback from the participants was extremely positive, reflecting the high standard of the lectures. The case studies were performed with great enthusiasm and produced some excellent results.

In addition to the academic programme, the participants were able to take part in a one-day excursion consisting of a guided tour of Bratislava and free time.

**The CERN Accelerator School (CAS) and the Slovak University of Technology jointly organised a specialised course on ion sources, held at the Hotel Senec, Senec, Slovakia, from 29 May to 8 June, 2012.**

A welcome event was held at the Hotel Senec, with speeches given by Roger Bailey, Head of the CAS, Marta Čimbáková, representing the Ministry of Education, Science, Research and Sport of the Slovak Republic, Peter Ballo, a vice-dean of the Faculty of Electrical Engineering and Information Technology of the Slovak University of Technology in Bratislava, Michal Petrás, Director-General of the Hotel Senec, and Vladivoj Řezník, representing the company Slovenské elektrárne.

The CERN Accelerator School would like to thank the following sponsors (in alphabetical order):

- City of Senec
- EBG MedAustron Wiener Neustadt
- GSI Helmholtzzentrum Darmstadt
- Ministry of Education, Science, Research and Sport of the Slovak Republic via the KEGA project (number 019STU-4/2012)
- Nadačný fond Slovenských elektrární v Nadácii Pontis
- ZŤS VVÚ KOŠICE, a.s.

The next specialised CAS course will be on "Superconductivity for Accelerators" and will take place in Erice, Italy, from 24 April to 4 May, 2013. Information is available on the CAS website at:

<https://www.cern.ch/schools/CAS>

*CAS School*



# Go on a particle quest at the first CERN webfest

Projects dreamt up by the students included a browser-based dashboard for the Large Hadron Collider (LHC), a new CERN open-data initiative, and a virtual world for the LHC@home platform. However, the highlight of the event was the ParticleQuest game, which was selected by a panel of judges as the weekend's overall winning project. The ParticleQuest team members selected Alejandro Avilés to go to the Mozilla Festival in London in November. Congratulations, Alejandro!

ParticleQuest, which can be played online here, is a hack of Mozilla's new open-source game BrowserQuest. In the current version of the game, which was modified after the event, players have to help find the Higgs boson among a crowded zoo of particles. The game's main aim is to educate. Each of the particles have had charming sprites created for them by graphic designer André-Pierre Olivier and when you encounter them in the game they'll even tell you a little bit about themselves. "These beautiful graphics were the real inspiration behind the project," explains Alejandro Avilés, who goes by the pseudonym 'OmeGak' online. "Each of the designs reflects the actual behaviour of the particle represented – it's really amazing."

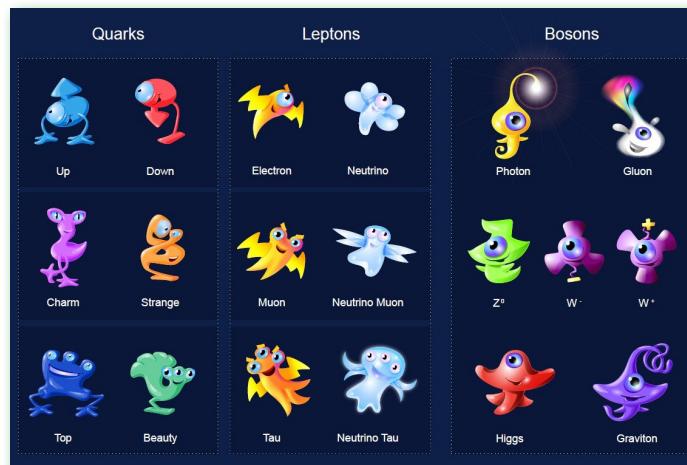
Other highlights from the weekend include an Android-based cosmic ray detector, and an attempt to create a standard infographic for the Standard Model (pictured right). This project was inspired by the announcement of the discovery of a particle consistent with the Higgs boson on 4 July. However, the project went much further than simply adding a slot for the Higgs boson to the usual representations of the Standard Model. Instead, the group sought to make their infographic as informative as possible, with additional information about each particle contained within each cell – along the lines of the periodic table of elements. Francesca Valery Day, one of the students who worked on this project explained that the team was aiming to "explain the Standard Model from the beginning in an intuitive order for someone who doesn't know any maths or physics, in a way that's fun and interactive".

Of course, this being a webfest, the team weren't satisfied with merely creating a brand-new infographic to revolutionise the way the most fun-

From 3 to 5 August, CERN played host to its very first webfest. Organised by the Citizen Cyberscience Centre (CCC) and the Peer 2 Peer University, the 2012 CERN Webfest saw pizza-fuelled summer students hacking their way almost non-stop through an entire weekend to produce a host of weird and wonderful innovations. As each of the teams raced against time in the hope of winning the grand prize of a trip to the Mozilla festival in London, sleep was hard for the students to come by, but fortunately great ideas were not.

see what's going on."

Francois Grey of the CCC, who helped to organise the event, said: "I was really impressed by the students' enthusiasm – many of them stayed up most of the night to get their hack done – and by the creativity they have shown... I mean, we're talking about some of them doing browser-based Feynman diagrams, I'm sure no one's even dreamed of doing that kind of thing before."



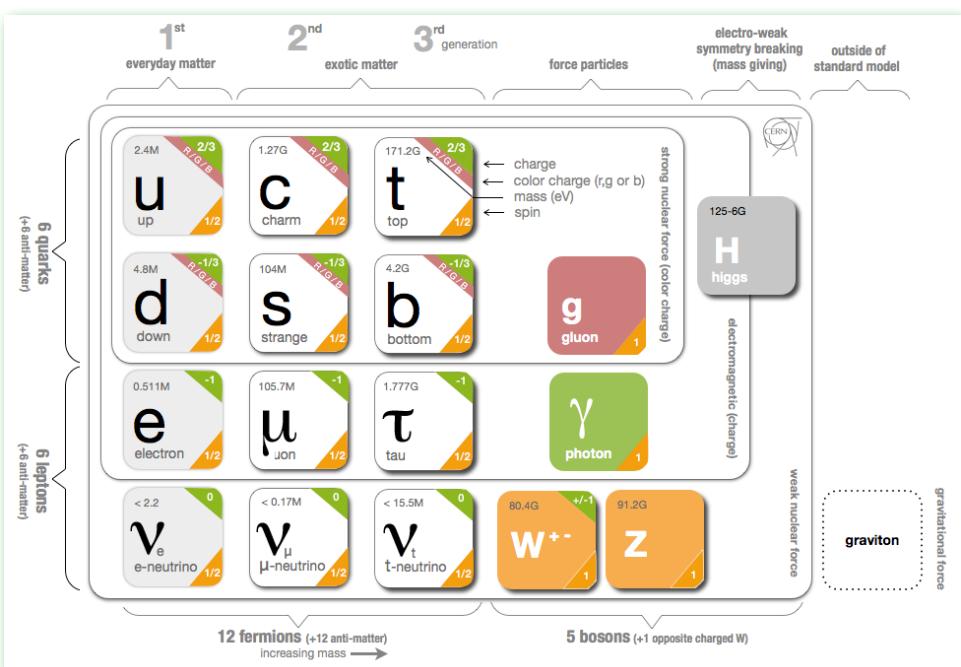
Particle quest sprites. Source: André-Pierre Olivier.

The CERN Webfest was sponsored by the Mozilla Foundation and the Shuttleworth Foundation. The source code used for all of the projects has also been made available on GitHub, so work can continue and new contributors can join in the fun (<http://www.isgtw.org/spotlight/go-particle-quest-first-cern-hackfest>).

damental concepts in modern physics are taught. Rather, they went on to produce a suite of interactive Feynman diagrams, which can be accessed in a web browser and can also be used as a learning tool. "Feynman diagrams are a really great way of understanding the Standard Model without having to know any maths or any quantum mechanics," explains Day. "You can literally

The original version of this article was published on iSGTW.

Andrew Purcell



The Standard Model infographic developed at the webfest.

# Powerlifting: a new opportunity to stay fit!

Powerlifting is a strength sport using three basic lifts (bench press, squat and deadlift) which involve using most of the muscles in the body. The "Honoured Coach of Russia" title is awarded to those who have trained world champions/world-record holders, so this was a rare opportunity to learn from the best. With participants from Hong Kong, India, Hungary, Sweden, Ukraine and Russia, the seminar was a truly international event.

For more information about the event, please read the whole text in Echo.

*Andrey D.A. Loginov*

On 19 and 20 July the Powerlifting section of the CERN Fitness Club (<http://loginov.web.cern.ch/loginov/>) hosted the "Powerlifting & Benchpress seminar of Honoured Coach of Russia\*", Askold Surovetsky.



## Acquiring a taste for the Higgs boson

The artisan brewery Hopfenstark in Quebec launched its new "Higgs boson" beer in November 2010. Ever since, it has been intriguing enthusiasts with its unique taste explosion.

The boson was a source of inspiration for brewer Frédéric Cormier, the Hopfenstark brewery's owner, who is a big fan of science programmes. "I returned from a trip to Europe in 2010 with the idea for a new beer that would be unlike any other," he explains. "I was always reading and hearing about CERN's particle accelerator in the media, so I did some research on the famous Higgs boson and decided to give my new creation the same name."

For Frédéric Cormier, it's important that the names of his beers reflect their character. For him, the name "Higgs boson" is evocative of a new, hybrid style; his new beer was inspired by beers with smoky notes, German

Before CERN's scientists had even announced the discovery of the Higgs boson, others were already attributing some interesting characteristics to it: flavoursome, sparkling and liquidi...

wheat beers and Belgian Saison beers and has a low alcohol content.

As Hopfenstark is a small, artisan brewery, its beers are only available on the North American market for the time being, so you will have to judge whether a trip across the Atlantic is called for...

More information is available on the brewery's Facebook page (<https://www.facebook.com/pages/Hopfenstark-Brewery/10141119337>).

*Caroline Duc*





## When the “Lion” eats your data

**W**hile iCloud might be pretty smart if you want to synchronize or back up all your data, it is a black hole for privacy and confidential documents. iCloud not only synchronizes your photos, music and videos, but also your e-mails, calendar entries, passwords (in encrypted form) and fully backs up your device. With “Mountain Lion” even your Microsoft Word documents locally stored on your Mac might be pushed over to the Apple computer centres. It is still unclear what Apple intends to do with these masses of data. Of course they don’t just do it because they are kind people. They have a business to run and money to earn. So maybe they will follow the Google/Facebook route and profile you and analyse your activities...

And this is where the problem starts. If you enable iCloud on your Mac (or iPhone/iPad), sensitive CERN information might leak out of the Organization. This could have serious consequences as external providers do not necessarily guarantee the same level of data privacy as that provided by CERN, as they are subject to national legislations which are less protective. Furthermore, once CERN documents are

**Welcome to “Mountain Lion” - Apple’s most recent operating system for Macs. More than 200 new and useful functions come with this version\*. But hold on! New and useful? With this Lion comes the full integration into Apple’s “iCloud”, the same iCloud already used for iPhones and iPads.**

transferred, there are implications for CERN’s privileges and immunities as an intergovernmental organisation. We have just lost control over our sensitive assets...

Of course, this is not a Mac-only issue. If you forward your CERN e-mails to any external mail provider like Gmail.com and, thus, “let your mail leak” or if you “send your data into the cloud and make it... vaporize” at Dropbox or Rapidshare, for example, proper protection of this data can no longer be guaranteed. Worse, this cannot be reversed: once the documents are out of CERN, they are totally beyond control. Just recently, Dropbox lost a list of e-mail addresses of some its customers to an attacker (see [http://news.cnet.com/8301-1009\\_3-57483998-83/dropbox-confirms-it-was-hacked-offers-users-help/](http://news.cnet.com/8301-1009_3-57483998-83/dropbox-confirms-it-was-hacked-offers-users-help/)).

Therefore, think twice if you enable “iCloud” on your Mac, iPhone or iPad, or use Dropbox, Gmail & co. For professional data, remember that CERN is also a cloud service provider. Your CERN mailbox is available, too, over the Internet, along with your

files stored on DFS or AFS. Remote log-in is possible through the LXPLUS cluster or the CERN Windows terminal service. So why not use a service which you can trust? Check the different means to connect to CERN over the Internet at:

**[https://security.web.cern.ch/security/recommendations/en/connecting\\_to\\_cern.shtml](https://security.web.cern.ch/security/recommendations/en/connecting_to_cern.shtml)**

If you have any questions, suggestions or comments, please contact the Computer Security Team or visit our website:

**<https://security.web.cern.ch/>**

Computer Security Team

\* This new version is available on CERN DFS.



### News from the Library

**T**he Internet Archive’s Wayback Machine (<http://archive.org/index.php>) includes an impressive collection of archived CERN web pages from 1996 onwards. However, their coverage is not complete - they aim for broad coverage of the whole Internet, rather than in-depth coverage of particular organisations.

**The World Wide Web was born at CERN in 1989 (<http://public.web.cern.ch/public/fr/About/Web-fr.html>). However, although historic paper documents from over 50 years ago survive in the CERN Archive, it is by no means certain that we will be able to consult today’s web pages 50 years from now.**

To try to fill this gap, the CERN Archive has entered into a partnership agreement with the Internet Memory Foundation. Harvesting of CERN’s publicly available web

pages is now being carried out on a regular basis, and the results are available at:

**[http://collection.europarchive.org/cern/\\*/](http://collection.europarchive.org/cern/*/)<http://public.web.cern.ch/public/>**

CERN Library



## Ombuds' Corner Le coin de l'Ombuds

In this series, the Bulletin aims to explain the role of the Ombuds at CERN by presenting practical examples of misunderstandings that could have been resolved by the Ombuds if he had been contacted earlier. Please note that, in all the situations we present, the names are fictitious and used only to improve clarity.

# Zen and conflict resolution

"In order to reduce conflict in our lives we must first address our inner battles. To stop our reactive behavior, we need to make peace with ourselves. This is where conflict resolution truly begins."\*

Most of the people coming to the Ombuds sincerely believe that the conflict they are in is due to the other party. They do not see that they play a key role in creating the external circumstances which lead to such a conflict. Thus, paying attention early on to your emotions and your body language, as well as recording your thoughts (positive and negative), can be very interesting. In other words, observe yourself. A close, intuitive and clear understanding of who we are will help us to avoid projecting our own feelings onto others or feeling too soon as though we may be under attack. In such positive circumstances, we can then face conflicts in an open way, instead of reacting with fight or flight. Each conflict can give us an opportunity to gain better knowledge of ourselves.

There is a zen aphorism related to this: a monk was observing two crows which were fighting over a little piece of food. He then asked his master: "Why are these crows really fighting?" And his master answered him: "It is because of you." Without going quite that far, most of the time conflicts start within ourselves and we unfortunately do not perceive this.

The other point is related to our ability to let a bit things go. To reach a win-win solution, a conflict will require the various parties to abandon their position and their ego, and to be open to a resolution which will equally favors both parties. Anyone with a clear understanding of themselves would not be scared or offended to dump ballast, as they would not be concerned with losing face. Their confidence would be way beyond such childish considerations.

One night, the zen poet and master Ryokan was sleeping in his hut made of branches. A thief broke in while he slept, stealing everything including his blanket. When Ryokan woke up cold that night he wrote this haiku: "The thief has forgotten only one thing: the

moon at the window." Let us promote a culture of peace: a state of mind which values humour and, from time to time, an easy going nature.

### Conclusion

Plagiarizing Confucius, we may say: "In order to make all of CERN into a respectful workplace, we must first create respectful workplace environments in all its groups. To transform all the groups this way, we must first cultivate our personal life; we must first set our hearts right and approach deeply, intimately and in a transparent way the knowledge of ourselves." So, in conflict resolution, let us start with ourselves for a change; it will ease a lot misunderstandings, conflicts and even open disputes! Why not try a zen attitude?

### Contact the Ombuds early!

<http://cern.ch/ombuds>

Vincent Vuillemin

\* G.Stanbridge, in the foreword of the book "The Art of Conflict or How to Stay Zen." By Brigitte I.Kehrer, Janus Publishing Company, London, England, ISBN 978-1-85756-735-9.



## Official news

Members of the personnel shall be deemed to have taken note of the news under this heading. Reproduction of all or part of this information by persons or institutions external to the Organization requires the prior approval of the CERN Management.

### NEW SAFETY TRAINING FOR ACCESS TO THE PS COMPLEX AREAS

Since 10/08/2012, a new course dedicated to the specific radiological risks in the accelerators of the PS complex has been available on SIR (<https://sir.cern.ch/>). This course complements the general classroom-based Radiation Safety training.

**Successful completion of the course will be obligatory and verified by the access system as from 01/11/2012 for access to the following accelerator areas: LINAC2, BOOSTER, PS and TT2.**

Information and reminder e-mails will be sent to all persons currently authorized to access the accelerators of the PS complex. For questions please contact the HSE unit and in particular, the Radiation Protection Group (+41227672504 or [safety-rp-ps-complex@cern.ch](mailto:safety-rp-ps-complex@cern.ch)).



## Take note

### NOVAE NEWS

As announced in the previous Bulletin, Novae has opened a new snack bar on the Flagstaff car park, just a few metres from CERN's reception area (Building 33).

#### Opening hours

Currently: Monday to Friday, 8 a.m. to 4 p.m.

From September: Monday to Friday, 7:45 a.m. to 5 p.m.; Saturdays from 8 a.m. to 2 p.m.

The snack bar selection includes breakfast, starting at 2.70 CHF, cold dishes from 5 CHF, and hot dishes from 6 CHF.

Novae has also installed a 24-hour-a-day food vending machine in the CERN hostel (Building 39) and in Building 13. You can buy pasta and cooked dishes for 6.50 CHF to 8 CHF.

In addition, a groceries vending machine has been installed in the main building, just across from the news kiosk. Nearly 60 different items are available around the clock.

Finally, Novae has introduced a new payment system in several buildings on the Meyrin site. It accepts credit card payments

with Visa and Mastercard, as well as swipe payment (with smart bank cards or smart phones).



*Just a few metres from the CERN Reception, the new Novae snack point welcomes visitors and CERNois.*



## Take note

### ATTENTION: NO RADIOACTIVE WASTE ACCEPTED ON 7 SEPTEMBER

Anouncement by the RW section of the Radiation Protection Group:

**The Treatment Centre for Radioactive Waste will not be accepting waste on Friday, 7 September 2012.** Thank you for adjusting your activities accordingly.

### INTERNAL ACCIDENT REPORT: FILL IT OUT!

It is important to report all accidents, near-misses and dangerous situations so that they can be avoided in the future.

Reporting these events allows the relevant services to take appropriate action and implement corrective and preventive measures.

It should be noted that the routing of the internal accident report was recently changed to make sure that the people who need to know are informed.

Without information, corrective action is not possible. Without corrective action, there is a risk that the events will recur. As soon as you experience or see something amiss, fill out an internal accident report!

If you have any questions the HSE Unit will be happy to answer them. Contact us at [safety-general@cern.ch](mailto:safety-general@cern.ch).

*The HSE Unit*

## TECHNICAL TRAINING

If you would like more information on a course, or for any other inquiry/suggestions, please contact Technical.Training@cern.ch

Silvia SCHUH, Technical Program Responsible - Valeria PEREZ REALE, Technical Training Specialist (Tel : 62424) - Eva STERN & Elise ROMERO, Administration (Tel : 7-4924)

*HR Department*

### Electronic Design

- Comprehensive VHDL for FPGA Design
- Electrostatique / Protection ESD
- Impacts de la suppression du plomb (RoHS) en électronique
- Introduction to VHDL
- LabVIEW Real Time and FPGA
- LabVIEW for Experts
- LabVIEW for beginners
- Siemens - STEP7 : niveau 2

### Mechanical design

- ANSYS - Introduction à ANSYS Mechanical APDL
- ANSYS CFX.
- ANSYS: Introduction à ANSYS Workbench Mechanical
- AutoCAD Mechanical 2012
- Cours avancé ANSYS Workbench
- SmarTeam - CATIA data manager at CERN

### Office software

- ACCESS 2007 - niveau 2 : ECDL
- CERN EDMS - Introduction
- CERN EDMS for Local Administrators
- EXCEL 2007 - Niveau 2: ECDL
- EXCEL 2007 - niveau 1 : ECDL
- PowerPoint 2007 - Niveau 1: ECDL
- PowerPoint 2007 - Niveau 2
- Sharepoint Collaboration Workspace - niveau 1
- Sharepoint Collaboration Workspace - niveau 2
- Tirer avantage d'Office 2010, Expression Web et Lync
- Travailler avec Windows 7 au CERN
- WORD 2007 - niveau 1 : ECDL
- WORD 2007 - niveau 2: ECDL

### Software and system technologies

- Agile Project Management with Scrum
- Business Objects Basic
- C++ Part 1 - Hands-On Introduction
- Création de sites avec Drupal
- Developing secure software
- Drupal in a Day
- ITIL Foundations (version 3)
- ITIL Foundations (version 3) EXAMEN
- Intermediate Linux System Administration
- Introduction to Databases and Database Design
- Introduction to Linux System Administration
- JCOP - Finite State Machines in the JCOP Framework
- Oracle - Programming with PL/SQL
- Oracle - SQL
- Oracle Database SQL Tuning
- Python - Hands-on Introduction
- Python: Advanced Hands-On
- Secure coding for Perl
- Secure coding in C/C++

### Special

- Designing effective websites

### Next Session

### Duration

### Language

### Availability

08-Oct-12 to 12-Oct-12	5 days	English	3 places
28-Sep-12 to 28-Sep-12	3 hours	French	45 places
26-Oct-12 to 26-Oct-12	8 hours	French	14 places
10-Oct-12 to 11-Oct-12	2 days	English	10 places
13-Nov-12 to 16-Nov-12	5 days	French	5 places
24-Sep-12 to 28-Sep-12	5 days	English	6 places
15-Oct-12 to 17-Oct-12	3 days	English	5 places
08-Oct-12 to 12-Oct-12	5 days	English	3 places

### Next Session

### Duration

### Language

### Availability

04-Feb-13 to 07-Feb-13	4 days	English	6 places
10-Dec-12 to 13-Dec-12	32 hours	English	6 places
08-Oct-12 to 11-Oct-12	4 days	French	4 places
18-Oct-12 to 19-Oct-12	2 days	French	7 places
05-Nov-12 to 08-Nov-12	4 days	English	2 places
12-Nov-12 to 14-Nov-12	3 days	French	7 places

### Next Session

### Duration

### Language

### Availability

08-Nov-12 to 09-Nov-12	2 days	French	9 places
19-Oct-12 to 19-Oct-12	8 hours	French	8 places
17-Sep-12 to 18-Sep-12	2 days	English	8 places
01-Oct-12 to 02-Oct-12	2 days	French	4 places
20-Sep-12 to 21-Sep-12	2 days	French	3 places
17-Sep-12 to 18-Sep-12	2 days	French	6 places
15-Nov-12 to 16-Nov-12	1 day	French	6 places
04-Oct-12 to 05-Oct-12	2 days	French	4 places
08-Oct-12 to 09-Oct-12	2 days	French	5 places
17-Sep-12 to 17-Sep-12	1 hour	English	50 places
17-Sep-12 to 17-Sep-12	1 hour	English	50 places
12-Nov-12 to 13-Nov-12	2 days	French	7 places
22-Oct-12 to 23-Oct-12	2 days	French	7 places

### Next Session

### Duration

### Language

### Availability

20-Sep-12 to 21-Sep-12	2 days	English	3 places
15-Oct-12 to 16-Oct-12	2 days	French	5 places
05-Nov-12 to 08-Nov-12	4 days	English	6 places
23-Oct-12 to 24-Oct-12	16 hours	English	5 places
02-Oct-12 to 02-Oct-12	3.5 hours	English	53 places
01-Oct-12 to 01-Oct-12	8 hours	English	One more place
05-Nov-12 to 07-Nov-12	3 days	English	8 places
28-Sep-12 to 28-Sep-12	1 hour	English	5 places
15-Nov-12 to 21-Nov-12	5 days	English	4 places
25-Sep-12 to 26-Sep-12	2 days	English	4 places
15-Oct-12 to 18-Oct-12	4 days	English	3 places
03-Sep-12 to 05-Sep-12	3 days	English	One more place
01-Oct-12 to 03-Oct-12	3 days	English	7 places
21-Nov-12 to 23-Nov-12	3 days	English	7 places
19-Sep-12 to 21-Sep-12	3 days	English	4 places
19-Nov-12 to 22-Nov-12	4 days	English	11 places
24-Sep-12 to 27-Sep-12	4 days	English	One more place
22-Oct-12 to 22-Oct-12	8 hours	English	7 places
28-Sep-12 to 28-Sep-12	1 day	English	7 places

### Next Session

### Duration

### Language

### Availability

01-Oct-12 to 02-Oct-12	2 days	English	7 places
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# Management & Communication training



## MANAGEMENT AND COMMUNICATION COURSES – PLACES AVAILABLE

Please note that there are some places available in the following management and communication courses starting in September or October. For more information on the course, click on the course title, which will bring you to the training catalogue. You can then sign-up on line. For advice, you can contact Erwin Mosselmans (Tel.: 74125).

HR Department

Course	Next Session	Duration	Language	Availability
Personal Awareness & Impact	10-11-12 September	3 days	Bilingual	1 place
Personal Awareness & Impact	17-18-19 September	3 days	Bilingual	2 places
Procurement and Contract Management Training on Supplies	27 September	1 day	Bilingual	3 places
Procurement and Contract Management Training on Industrial Services	12 October	1 day	Bilingual	5 places
Core Development Package - Essentials of People Management for CERN Supervisors	01-02 October 23-24 January 2013 7-8 March 2013	6 jours	English	7 places
Conflict Resolution for Managers	02-03 October	2 jours	English	1 place
Voice and Nonverbal Behaviour in Speech Communication	04-05 September	1 jour et ½	English	4 places
Negotiating effectively	09-10 October	2 jours	English	12 places
Communicating Effectively	11-12 October - 13-14 November	4 jours	English	3 places
Managing Time	13 September - 11 October 16 November	3 jours	English	5 places
Handling difficult conversations (Adapted from Dealing with Conflict)	19 October - 26 October 7 December	3 jours	English	1 place
Quality Management	20-21 September	2 jours	English	5 places
Communiquer efficacement	12-13 September - 9-10 October	4 jours	French	2 places
Core Development Package - Développement des compétences managériales pour les superviseurs au CERN	5-6 November 10-11 January 2013	6 jours	French	8 places
Savoir gérer les discussions difficiles	15 October - 22 October 3 December	3 jours	French	4 places
Les enjeux de la voix et du comportement non verbal dans la communication orale	15-16 October	1 jour 1/2	French	4 places





# Language training

## GENERAL AND PROFESSIONAL FRENCH COURSES

The next session will take place from 8 October to 14 December 2012. These courses are open to all persons working on the CERN site, and to their spouses.

For registration and further information on the courses, please consult our Web site.

## ORAL EXPRESSION

This course is aimed for students with a good knowledge of French who want to enhance their speaking skills.

Speaking activities will include discussions, meeting simulations, role-plays etc.

The next session will take place from 8 October to 14 December 2012.

For registration and further information on the courses, please consult our Web site.

## WRITING PROFESSIONAL DOCUMENTS IN FRENCH

These courses are designed for non-French speakers with a very good standard of spoken French.

The next session will take place from 8 October to 14 December 2012.

For registration and further information on the courses, please consult our Web site.

## GENERAL AND PROFESSIONAL ENGLISH COURSES

The next sessions will take place:

From 1 October 2012 to 31 January 2013 (break at Christmas).

These courses are open to all persons working on the CERN site, and to their spouses.

For registration and further information on the courses, please consult our Web site.

## ORAL EXPRESSION

From 1 October 2012 to 31 January 2013 (break at Christmas).

This course is intended for people with a good knowledge of English who want to enhance their speaking skills.

There will be on average of 8 participants in a class.

Speaking activities will include discussions, meeting simulations, role-plays etc. depending on the needs of the students.

For registration and further information on the courses, please consult this Web page.

## WRITING PROFESSIONAL DOCUMENTS IN ENGLISH - ADMINISTRATIVE

For registration and further information on the courses, please consult our Web site.

## WRITING PROFESSIONAL DOCUMENTS IN ENGLISH – TECHNICAL

The next sessions will take place:

From 1 October 2012 to 31 January 2013 (break at Christmas).

These courses are designed for people with a good level of spoken English who wish to improve their writing skills.

There will be an average of 8 participants in a class.

For registration and further information on the courses, please consult our Web site.

For registration and further information on the courses, please consult our web pages or contact Kerstin Fuhrmeister (Tel : 70896).



## Seminars

### WEDNESDAY 29 AUGUST

#### TH THEORETICAL SEMINAR

14:00 - TH Auditorium, Bldg. 4-3-006

#### The mass of the Higgs boson, the great desert, and asymptotic safety of gravity

C. WETTERICH / U HEIDELBERG

### THURSDAY 30 AUGUST

#### COLLIDER CROSS TALK

11:00 - TH Auditorium, Bldg. 4-3-006

#### Cross section ratios between different CM energies at the LHC: Precision measurements and BSM sensitivity

J. ROJO CHACON, M. MANGANO / CERN

#### A&T SEMINAR

14:15 - Bldg. 30-7-018 - Kjell Johnsen Auditorium

#### The neutron beam and the associated physics program of the CERN n\_TOF facility

C. GUERRERO SANCHEZ / CERN

### FRIDAY 31 AUGUST

#### PARTICLE AND ASTRO-PARTICLE PHYSICS SEMINARS

14:00 - TH Auditorium, Bldg. 4-3-006

#### Multi-jet physics with BlackHat

K. OZEREN / UCLA

### MONDAY 3 SEPTEMBER

#### COMPUTING SEMINAR

11:00 - Bldg. 31-3-004 - IT Auditorium

#### Nifty Native Implemented Functions: low-level meets high-level code

I. PLOSKER / BASHO TECHNOLOGIES

### TUESDAY 4 SEPTEMBER

#### INDUCTION SESSIONS

08:30 - Bldg. 222-R-001 - Filtration Plant

#### INDUCTION PROGRAMME - 2nd Part