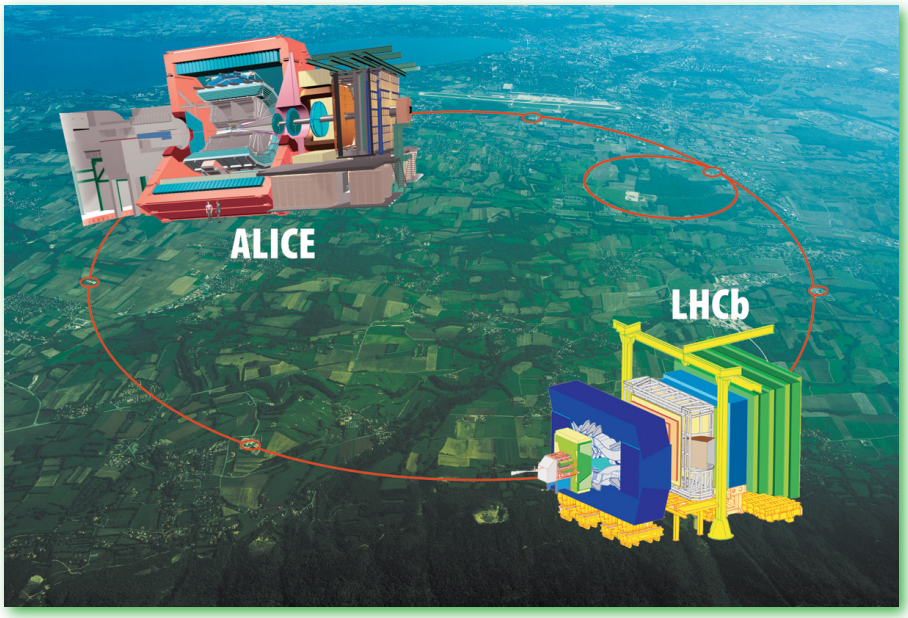
CERN Bulletin

Nos 35 & 36 – 24 & 31 August 2009

ALICE & LHCb: refinements for the restart



Following the previous issue, the Bulletin continues its series to find out what the six LHC experiments have been up to since last September, and how they are preparing for the restart. Previously we looked at CMS and ATLAS; this issue we will round up the past 10 months of activity at ALICE and LHCb.

ALICE

Having already performed a lengthy cosmic ray test run, ALICE decided to immediately start consolidation work after the shutdown last autumn. "We wanted to use the additional time for improvements and upgrades," explains Paul Kuijer, ALICE Deputy Spokesperson, "for example, we realised that the access to the main tracking device, the TPC, was rather difficult, which could lead to unreasonably long service and repair times in the future, so we spent a lot of time moving all the cabling of the inner tracking system to give more space and better access." This was a major operation, running from October 2008 until July 2009. All cables and services have been re-tested and the inner tracking system is again on-line.

Future maintenance was pre-empted in other areas too, such as replacing a number of capacitors on the time projection chamber (TPC), which were suspected to have a reduced lifetime. The shutdown also gave ALICE the chance to install several new detector systems that were originally scheduled for after the first LHC run. Additional transition radiation detector (TRD) modules were installed and more of the Photon Multiplicity Detector (PMD) is now available, but the biggest new part is the new electro-

(Continued on page 2)

Published by:
The European Organization for Nuclear Research - CERN
1211 Geneva 23, Switzerland - Tel. + 41 22 767 35 86
Printed by: *CERN Printshop*

A word from the Director of TRIUMF

As part of a series of exchanges between CERN and other laboratories world-wide, this issue's message is by TRIUMF Director, Nigel Lockyer. In exchange, CERN Director-General Rolf Heuer, wrote a message to TRIUMF personnel (see page 4).

Onward to the Higgs!

Particle physics has made real progress in communicating its message to the world: 20 years ago when I referred to "CERN" in a conversation with my seatmate on an Air Canada flight, it would take me a good 10 minutes to explain what and where the laboratory is and what particle physics is all about. Just recently, I mentioned "CERN" on another long-distance flight, and my neighbour said instantly, "Oh, isn't that the big machine in Europe that may end the universe?" Progress of sorts!

If it's a Canadian seatmate, I'll tell them about how TRIUMF and Canada contributed to the construction of the LHC and the ATLAS detector. I

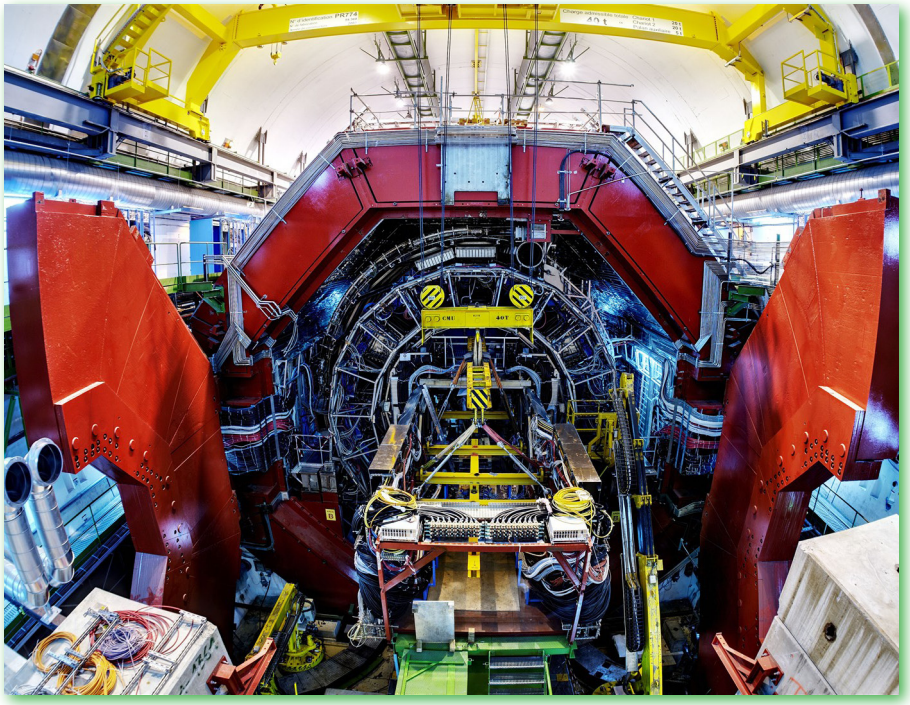
(Continued on page 4)

In this issue

News

LHC Experiments: refinements for the restart

(Continued from page 1)



Reinstalling the modified and improved 'mini' space frame, which carries all the supply cables for services inside the detector. During the shutdown a lot of cabling was repositioned to give better access to the inner detectors.

magnetic calorimeter (EMCAL).
The EMCAL, which is already partially installed, is a very recent addition to the ALICE design with funding only fully approved (by the US, France and Italy) in early 2008. Its installation means ALICE can now perform more extensive measurements of photons and neutral hadrons (which are not seen by ALICE's charged-particle tracking system) as well as charged hadrons in the jets created when quarks and gluons recombine after having formed a plasma - crucial for determining the overall energy of the jets.

Early in 2009 the muon spectrometer took several weeks of cosmic data with which a first check of the internal alignment of the system could be made. However this is a tricky task since the muon spectrometer is designed to be sensitive to horizontally arriving muons only. Luckily, like LHCb, ALICE also had the chance to use 'horizontal muons' created during the testing of the LHC transfer system. Known as a TED run, particle bunches sent from the SPS through the transfer line are directed into a 'beam stopper' creating a shower of particles that could be seen in the ALICE detector (See the video on CERN's YouTube channel).

"This was actually very useful," says Kuijer, "because last year we didn't dare switch on all the detector during the TED run for fear of causing damage. But with the data from last year we could figure out the particle density. So two weeks ago when the LHC made injection tests we could switch on most of the trigger detectors, which allowed us to tune the relative timings," explains Kuijer. Data from the transfer line test was also used to align sub-detectors that are oriented such that they cannot be calibrated using cosmic rays, namely the forward detectors.

Before the eagerly awaited restart of the LHC the collaboration will start another new full-detector cosmic ray run, from mid August to mid October. "But this year we will be able to reach higher efficiency as we know how to operate the detector better. We've also developed an additional trigger derived from the time of flight (TOF) modules to facilitate triggering on muons." This test run will allow ALICE to verify the improvements and new detectors installed over the past 10 months and help the personnel prepare for continuous operation once the LHC restarts.

Watch a video of the activities at ALICE this year:

http://cdsweb.cern.ch/record/1194734

Outreach

This year has seen a big increase in visits to the ALICE cavern. "We must have had thousands of people visiting this year," said Despina Hatzifotiadou, ALICE Outreach Coordinator. "ALICE was never on the official visit itinerary, so it started with people just arranging visits for their friends and relatives, then progressed to their schools and universities, and it grew and grew, especially with the excitement caused by the first beam."

As with all the other LHC experiments, ALICE will be closed to the public when the LHC restarts, so there are also plans to extend the current exhibition space at point 2. "Once we've finished installing new detector parts, it will be much clearer what space is available, then we can start planning an extension to the exhibition, so that there are still things to see once the cavern is closed."

LHCb

This year has given LHCb the chance to install the 5th and final plane of muon chambers, which will improve the triggering at nominal luminosity. This is the final piece of the experiment to be installed. "Now the detector looks exactly as it does in the technical design report," confirms Andrei Golutvin, LHCb Spokesperson.

"We also took advantage of this shutdown to make several improvements. For example, we modified the high voltage system of the electromagnetic calorimeter to reduce noise further to a negligible level. We also took some measures to improve the ageing behaviour of the outer tracker caused by radiation. And we replaced a few inefficient Hybrid Photo Devices (HPD) in the RICH detector in order to reach full performance."

Unlike the other LHC experiments it is not easy to align LHCb using cosmic rays. "The use of cosmic data is rather non-trivial for LHCb because our detector has a horizontal geometry," explains Golutvin, "and since it is located deep under the ground it is very challenging to select the 'horizontal' tracks, which are much less frequent."

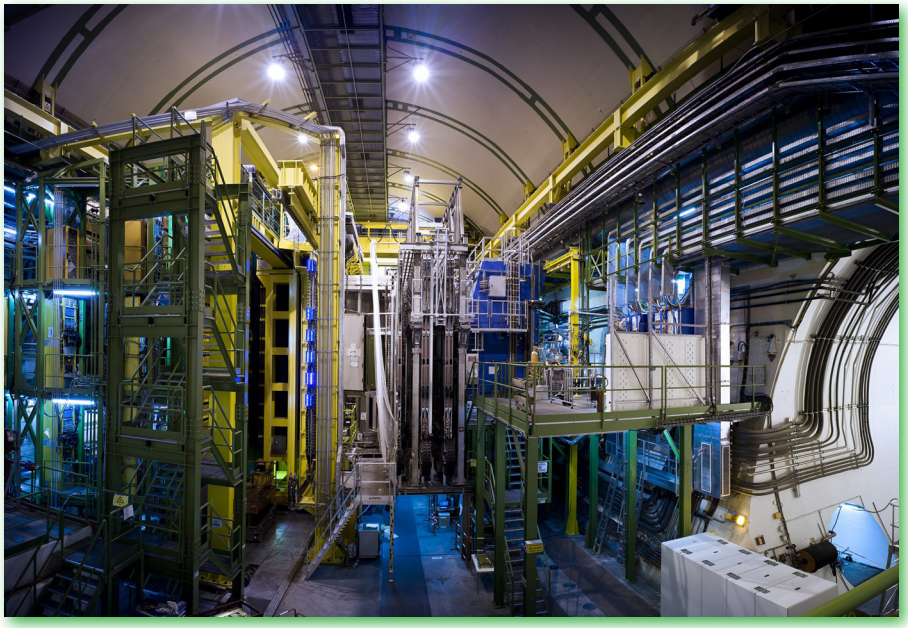
"Nevertheless we succeeded in collecting sufficient cosmic data to synchronize timings of the big subsystems, like the outer

LHC Experiments: refinements for the restart

(Continued from page 2)

tracker, the calorimeters and the muon chambers." Eventually all the LHCb detectors have to be synchronized to a nanosecond precision. In addition cosmic ray tracks are used to align the outer tracker spatially. However, close to the beam pipe are the small and fine granular detectors, the vertex locator (VELO) and inner tracker, "these are simply impossible to align using only cosmic rays," he adds.

Luckily enough LHCb is located very close to the LHC injection point and during the tests of the transfer line from SPS to LHC the beam is directed into a beam stopper, and produces muons that cross LHCb horizontally. "For us this is really useful," says Golutvin, "the particle flux is actually very dense, about 10 particles per square cm, and we use these tracks to align the vertex detector and the inner tracker to a few microns."



The cavern of the LHCb experiment.

But there is also a downside to being located so close to the injection point. "We have to be very careful not to destroy the vertex detector during the injection procedure, so the VELO is built in two halves that can slide away from the beam to a distance of about 3 cm in order to be protected during injection," explains Golutvin. "It is very important to test the mechanism, which we did during the last injection test. In fact we turned it into a sort of competition - the people reconstructing the tracks were not told the distance between the two halves of the VELO and they had to work it out from the data. Some managed to work it out to a couple of microns, and were even awarded with chocolates." There will be at least one more of these test runs before the start up, which will allow further alignment improvements.

"Having finalized the work on the detector, the commissioning activities will continue until we get first collisions, " Goluvin continues. " We will also use the time left before the start-up to prepare for physics. There are several different phases in the start-up scenario of the LHC in the first year, so we want to work out how best to use the luminosity available during these phases. We are exploring the charm sector for instance, which would probably require smaller luminosity to be competitive with other experiments."

Videos of the injection test runs of both LHCb and ALICE are available on CERN's YouTube channel:

http://www.youtube.com/cern

Outreach

Before the cavern closed to the public, LHCb inaugurated their new exhibition at point 8 just before the first beam last September. "But with this period of shutdown we've actually had the chance to take many more visitors down to see LHCb," says Bolek Pietrzyk, LHCb's Outreach Contact. "In fact, with the excitement of the start up, and the Angels and Demons film we've had more visitors than ever this year."

With both official CERN tours and LHCb's privately arranged visits, so far in 2009 over 6500 people have visited the cavern at point 8. "And we are going to keep giving tours as long as possible, hopefully all the way until the end of October," adds Pietrzyk.

Even after the LHC restart there will still be plenty to see on the surface - in fact, this year another 6000 people visited point 8 without descending into the cavern. At the new exhibition visitors can see real parts of the detector and take a virtual tour. (You can see the exhibition panels here: http://cdsweb.cern.ch/record/1177862 . LHCb also have a new brochure: http://cdsweb.cern.ch/record/1194057)

Being a dedicated antimatter experiment, LHCb enjoyed a lot of extra attention from the recent blockbuster film, Angels and Demons. With the public interest in antimatter, many LHCb physicists have found themselves with even more requests to give talks and lectures. "So we want to try and get together some interesting resources, like images and animations, so that people can use them when giving talks at universities, for example" explains Emma Stokes, who is creating the new presentations. "But we also want to make 'kits' available for school teachers with all these resources, plus instructions on how to build simple demonstrations out of things you can easily get hold of in the class room. For instance, using a magnet against an old cathode ray computer monitor to show how charged particles are bent in a magnetic field."

A word from the Director of TRIUMF

(Continued from page 1)

Onward to the Higgs!

explain the excitement of the science of the LHC. That always gets them interested. People in general certainly enjoy learning about particle physics. The mind bending questions and lofty goals are indeed exciting. True to Canadian form, they politely ask "But what's it all good for?" Although people are aware the LHC competes for the most spectacular technological marvel ever built, the link to their livelihood or benefits to society are not clear to them. This probing question is usually my chance to revert back to TRIUMF and describe to them our "spin off" success with making millions of medical isotopes per year with a private sector partner. That hits home. Then they are sold! OK,.... back to talking about extra dimensions.

Canada's work at CERN spans many decades, but let me comment on work related to the LHC. Initially the accelerator contributions made by TRIUMF involved upgrades to the injector synchrotrons (Proton Synchrotron and PS Booster) to provide proton beams with the necessary brightness and time structure for the LHC. This work was completed in March 2000. The other main responsibilities have been in providing warm "two-in-one" quadrupoles for the LHC beam-cleaning insertions and components for the LHC injection kickers. TRIUMF also contributed to a number of beam modelling, diagnostic, and control systems through the entire accelerator complex. And, of course, the ATLAS Canada team has played a major role in ATLAS with the endcap calorimeters and leadership roles in some of the physics-analysis working groups. And our partnership will continue. TRIUMF and CERN are finalizing an agreement to collaborate on developing superconducting cavities for elements of the SPL project—a proton injector linac that forms part of the upgrade of CERN's proton injector chain.

In my mind, these activities that join CERN and Canada are absolutely critical—and not just for the cutting edge accelerator technology, and for Canadians to participate in what will hopefully be the discovery of the century at the LHC. Rather, what makes these partnerships so valuable is that they bring together people—scientists, students, opinion leaders, the media, and even politicians—from separate parts of the world to pursue a common quest. That's what CERN is about and that's one reason why Canadians are committed to the success of the LHC and its detectors. Now, onward to the Higgs! Eh?

Nigel S. Lockyer, Director of TRIUMF

TRIUMF is Canada's National Laboratory for Particle and Nuclear Physics and one of the world's leading subatomic physics laboratories. In August it will celebrate its 40th anniversary. Rolf Heuer's message to TRIUMF is available at: http://www.triumf.ca/headlines/-director/guest-column-cerns-director-general. For more information on TRIUMF, visit: http://www.triumf.ca/

The latest from the LHC

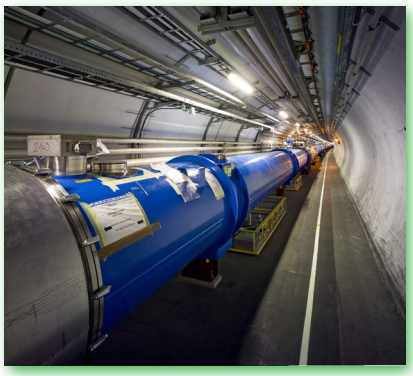
Three weeks ago vacuum leaks occurred in both **Sector 8-1 and 2-3** (See previous update - http://cdsweb.cern.ch/record/1190783?ln=en). While the cause and exact locations of the leaks are still unknown, it is suspected that they occurred in both cases from a flexible hose in the liquid helium transport circuits, which vented helium into the vacuum insulation.

In **Sector 8-1** the leaks occurred while it was being maintained at 80 K in order to perform the resistance measurements on the copper part of the superconducting busbars. Less than 24 hours later a similar leak occurred in Sector 2-3 while it was being warmed from superconducting temperatures to 80 K to perform the busbar resistance measurement.

Both leaks happened where the final magnet of the sector (known as Q7) joins the electrical feedbox (called the DFBA). The end vacuum subsectors – a 200-metre stretch of the LHC sealed off by vacuum barriers – will be warmed to room temperature to locate the leaks and repair them. The rest of the sector will 'float' in temperature from 80 K. In Sector 2-3 the copper busbar measurements have already been made and the final subsector is currently being warmed. Once the busbar measurements have been made in Sector 8-1 the end subsector will also be warmed.

Two years ago, a similar leak occurred in **Sector 4-5** during the first cool-down of the sector. The flexible hose was found to be the source of the leak and was replaced. The sector is currently at room temperature after busbar tests at 300 K. While the sector is still warm the flexible hose (left-of-point 5) has been cut out and replaced with a smaller, solid tube. Preliminary investigations showed signs of initial wear on the outside of the hose, probably due to friction between it and the stainless steel braid that encases it. In this way a repair solution has already been validated, and could be used in Sectors 2-3 and 8-1 if the flexible hoses are confirmed as the cause of the leaks.

In **the four sectors** that do not have the new pressure-release ports installed, work is still ongoing to remove the clamps on service ports and replace them with 'pressure release springs'. This in effect turns the normal 'service' ports into pressure-release ports in the event of an increase in pressure. About half of the springs have already been fitted.



View of the LHC tunnel after the repairs.

No borders for Information Technology

The technology gap between first world countries and developing nations is growing at an ever-increasing rate. An organization founded at CERN, Informaticiens Sans Frontières (ISF), hopes to alter this trend with their current project, MANGO NET. Starting in Africa, they aim to lead these nations to use Information Technologies to positively influence their economy, education and lifestyle.

Information Technology has long since been introduced within African countries, but there are many daunting problems that have stalled widespread application. The literacy rate within small African communities is very low. "The interface used to operate a computer requires literacy", explains Silvano De Gennaro," member of the CERN Communication Group and President of ISF. "Technology alone is not the solution, you have to adapt it to the cultural level and the abilities of the people who receive it." Also, the price of purchasing and operating a computer is often unreasonable with respect to the average cost of living. For many, spending 3 hours in an Internet café equates to an entire day's pay. Further problems include political, geographical and financial inhibitions.

African universities are also faced with difficult challenges. Without essential IT resources, it is nearly impossible to participate in current research. Teachers and students are often forced to share a limited number of computers to learn and stay current in their fields. Conducting experiments and sharing results is often beyond their reach. "The students are really missing the first element in IT development – the computer," describes De Gennaro.

Based at CERN, ISF was founded in 2003 as a result of discussions during the World Summit for the Information Society (WSIS). It has already approached the IT issues from various angles, preceding the current initiative with three other projects – Computer Recycling, LIFE (Linux Integrated Free Environment) and AFRICA@home (see box).

After these initial actions, ISF is now working on MANGO NET (Made in Africa NGO NETwork), a project whose objective is to develop a network of schools and production labs across the continent that can teach IT students how to assemble computers. "This will provide a source of ready to use computers that do not need to be imported from other countries", explains De Gennaro. "Initial hardware costs will be much lower as parts will be bought in bulk quantities and the computers will be assembled and marketed within the continent". Students will be trained not only to assemble the computers, but also to provide technical support for users using the Linux based LIFE interface. MANGO NET will provide a basis for an African IT industry that can keep capitals within the participating countries.

In his role as Coordinator for non-Member States, John Ellis is also collaborating in the ISF project. He sees it as a useful tool for giving African universities the chance to be part of CERN research, and he emphasized this need in a recent CERN colloquium about ISF, showing a world map of all the CERN Member and non-Member states coming from all continents, with the noticeable exception of Africa. Honorary CERN staff member Ben Segal also supports the efforts of ISF. As author of both AFRICA@home and LHC@home, he sees a future applying these technologies in developing nations. Both initiatives participate with ISF to provide these technologies, focusing primarily on the universities.

Once universities are appropriately equipped to international standards, they can excel. "What we would like to do is give the African universities a chance to join international research – a chance to actually conduct research," says De Gennaro, "Instead of removing scientists from the countries to come work in Europe, we want to bring them the Grid. With the Grid, they can join international research projects such as the LHC for instance."

Although MANGO NET is only in its preliminary stages, support for the project is quickly growing within Europe and Africa. "Participating universities will play a large role in the project, providing teachers and IT resources, and the possibility of donations of parts from IT companies such as Sony and Toshiba is being explored." concludes De Gennaro, "The road to development starts with digging the foundations of science and building a competitive infrastructure for research."

To participate in the ISF projects, contact Silvano de Gennaro at: Silvano.de.Gennaro@cern.ch.

Did you know?

The Computer Recycling programme ran for a number of years, but was eventually abandoned because the great input of time and effort yielded very little output. The computers arrived with very limited computational capacity, as they were often recycled from the Grid (at CERN), where they do not require a video card or a significant amount of RAM. As an alternative, the LIFE programme provided newly designed software that translates Linux into a user-friendly interface that can be used as an educational resource (it does not require literacy at its basic level). AFRICA@home is a BOINC project that uses private household computers from all around the globe to compute accurate predictions about the spread of Malaria.

Wisdom comes with age?

'A relativistic generalization of the Navier-Stokes equations to quark-gluon plasmas' – the work of a CERN physicist perhaps? No, actually it is the title of a high school student's project! Thirteen of the world's brightest young scientific minds were recently treated to a tour of CERN. The Bulletin finds out more.

Thirteen science wunderkinds came to CERN for a three-day visit on 29 June. The high school students, aged between 16 and 18, were all winners of this year's Intel International Science and Engineering Fair (Intel ISEF), the world's largest pre-college science competition. As part of their prize they won a visit to CERN organized by the CERN openlab collaboration (see box).

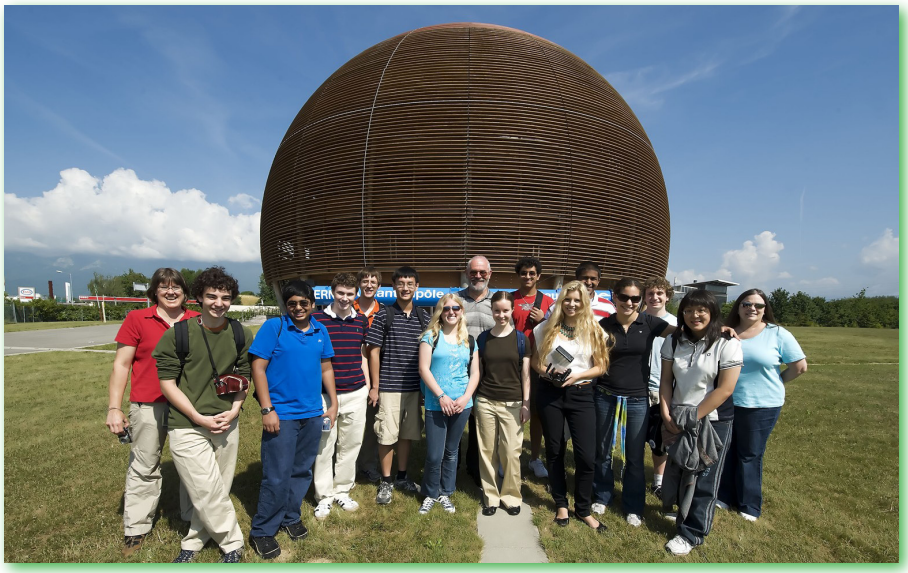
"The whole trip has been incredible, and this is my first time in Europe as well so that makes it even more exciting," said Ryan Alexander, just 16 years old, who won in the Energy and Transportation category for his research into cheap and easily built devices that capture wind energy. "I worked on a new sort of windmill that uses aeroelastic flutter to generate electricity, then I designed a version that could be made cheaply out of bamboo. So one of the things that interested me was how work done at CERN could be applied in future energy research."

The students were given a comprehensive tour of CERN, visiting CLIC, the antimatter experiments, the ATLAS visitor centre, the CERN Control Centre (CCC) and the Computing Centre. But for most the highlight of the trip was a guided tour of the CMS cavern by Jim Virdee, CMS Spokesperson, who spoke at this year's ISEF opening ceremony, held in Nevada, United States. "I've always been interested in particle physics, so I've seen loads of pictures of CERN, but to actually go down and see CMS in real life was just amazing," said Erika DeBenedictis, who created a novel way of identifying asteroids from astronomical images, "and the best bit was that we could ask questions about it as we were given the tour."

The students who came to CERN had all won the "best of category" awards, each representing a different area of science. But even the non-physicists were still inspired by their visit. "I'm a biologist, not a physicist, but the incredible thing about CERN is that you don't need to understand the science in order to understand collaboration!" said Ronit Abramson, who won the best in Cellular and Molecular Biology category with her project: 'Cell wall formation from marine diatom protoplasts: implications for novel transformation and nanotechnology techniques'. "Walking around the CERN canteen and hearing so many languages, it's incredible," she continued, "there's something about coming to this place, it's really like a city of research."

Among the other winning projects were an investigation of Styrofoam-digesting microbes, a new computer program that splits tasks among computer chips, and even research into therapeutic treatments for prostate cancer. More information about the Intel ISEF is available on the website

http://www.societyforscience.org/ISEF/



The Intel ISEF students during their visit to CERN.

Did you know?

CERN openlab is a framework for collaboration between CERN and industry, welcoming major industrial partners (HP, Intel, Oracle and Siemens). These partners bring equipment, solutions, experts, as well as funding to hire young engineers and scientists. In turn, CERN provides a demanding computing environment to stress solutions and push cutting-edge technologies to their limits.

The programme has operated in 3-year phases, starting in 2003 with openlab–I, which focused on the development of an advanced prototype called opencluster. openlab–II addressed a range of domains from platforms, databases and Grid to security and networking. Disseminating the expertise and knowledge has also been a key focus. The third phase, which started in 2009, involves projects from four Competence Centres – Automation and Controls, Database, Networking, and Platform - in collaboration with HP, Intel, Oracle and Siemens.

Corrigendum

In the previous issue of the Bulletin we reported that Maurizio Pierini won the European Physical Society (EPS) Young Physicist prize. In fact Pierini shared the prize with Niki Saoulidou, who was rewarded for her contribution to neutrino physics, through experiments at Fermilab.

We apologize for failing to mention Niki Saoulidou in the original article, which has now been corrected.

Teachers staying ahead of the game

Even though the school holidays are in full swing, some 40 high-school teachers have come to CERN to take part in the High School Teachers (HST) programme organised by the CERN Education Group (see box). Far from considering this as a piece of holiday fun, the teachers are getting their hands dirty and putting in some serious hours' learning.

The 3-week HST programme hosts dozens of teachers from around the world, offering a deeper insight into particle physics through a variety of lectures, visits and workshops. The programme's ambitious overall aim is to help these teachers to inspire their students to follow careers in science. In the second week, they split up into working groups to evaluate CERN's existing educational tools or create new ones. "This year, one of the groups is reviewing some of the CERN visits service itineraries," says HST programme manager Mick Storr. "From their perspective as teachers they can give us a valuable insight into the quality of our tools and thus help us improve them. Another group is sifting through the video archives on the CERN website and drawing up a league table of CERN videos highlighting those which provide the most educational benefit."

In so doing they're not only working for CERN and their colleagues, but also and above all fulfilling their mission as teachers by working for the benefit of their students. One participant, Juliana Mitrevski, has shown devotion beyond the call of duty. She's from Australia, where schools are not on holiday at the moment, and has set up a blog to enable her students to carry on learning even while she's at CERN: "I record what I do every day on the blog and describe the lectures I've attended," she explains. Juliana hopes her light-hearted, avant-garde approach will have the desired effect of triggering her students' interest: "I've included a link to the video of the LHC rap and set up an HST group for my students on Facebook," she says.

Beyond the strictly educational and scientific aspects, the participants also appreciate the social side of this international programme. "When you're working with people from 23 different countries it's a real cultural melting pot and a great opportunity to compare teaching methods," notes Polish teacher Mazgorzata Karulak. "After three weeks together, the teachers grow very close and it's sad to think we'll all be returning home soon," says Terrence Baine, a Canadian teaching in Norway, who is attending the programme for the second time as part of his research for a PhD in Physics Education. "I've kept in touch with the good friends I made during last year's programme and I'm sure it'll be the same for those attending this year."

For more information and the full list of working groups for 2009:

http://teachers.web.cern.ch/teachers/

http://education.web.cern.ch/education/Welcome.html

http://julianaatcern.blogspot.com/

Did you know?

When it was launched for the first time in 1998, the HST programme had only 9 participants. Today, 35 to 40 people are selected every year out of more than 100 applications from all corners of the globe: CERN's Member States, of course, but this year the programme also included teachers from the United States, Chile, Mexico, South Africa, India and, for the first time, Croatia, Japan and Australia.

The educational resources created by the participants can be accessed on-line via the programme website: http://teachers.web.cern.ch/teachers/materials/default.htm

The High School Teachers 2009 at CERN.

The fine art of 'sourcery'

The commissioning of the new Linac4 source – first element of the new acceleration chain for the upgrade of the LHC (sLHC) – started at the beginning of July. After years of preparation but after only a few hours of fine-tuning of the numerous parameters involved, the source has delivered its first negative ions.

While the LHC is preparing for restart, teams of experts involved in the sLHC project are also working on the new facilities that will allow the LHC to run at higher luminosity. The beginning of the new chain of accelerators is Linac4, whose excavation works started October last year. "The particle source that we are commissioning now will be installed at the beginning of the path", explains Maurizio Vretenar, Linac4 project leader. "It is a critical element of the chain as all protons that will circulate in the CERN accelerators will originate from it."

The Linac 4 source is different from the sources currently in use at CERN because it delivers negative ions of hydrogen (H^-) instead of protons. "H^- ions have an important advantage over protons because you can obtain denser beams and you have less losses at injection into the first circular accelerator", explains Vretenar.

In an H^- source, ions are created in a plasma of hydrogen that gets ignited by a 2 MHz radiofrequency field. "Given the complexity of the physics processes that take place in a plasma", explains Richard Scrivens, responsible for the low energy section of Linac4, "it is not obvious to know what parameters we will have to adjust in order to improve the performance of the source and increase the number of particles emitted per second (the current) to produce the 80 mA required by Linac4". And this is why people speak of the 'art of sourcery'…

The plans for the source came originally from the DESY laboratory in Germany but teams at CERN still had to integrate the source into the future Linac4 facility, as well as design all the source's sub-systems. "Back in 2004 when the R&D on Linac4 started", recollects Scrivens, "we started looking at the types of sources used by other laboratories. We knew we needed something reliable because this will be the source for the whole complex. It took us one year just to integrate DESY's plans on the Linac4 project".

The project is on schedule and the source will join the rest of the Linac in the new tunnel in 2012.

Further reading
http://cdsweb.cern.ch/record/1137358?ln=en

You can watch a clip of the civil engineering work here:

http://cdsweb.cern.ch/record/1194527

The civil engineering work for the new Linac4 going on near Restaurant 2.

Did you know?

Controlling the natural spreading of a beam at low energy is more difficult than at higher energy. Particles spread out because they have the same charge and repulse each other. At high energy, relativity comes in and particles "see" bigger distances between each other, and the repulsive effects become smaller. In linacs, experts put several quadrupole magnets (that correct the spreading of the beam) close to each other at the beginning of the path, where the energy of particles is lower. The space between quadrupoles increases as the energy of the beam increases.

Trained to battle cancer with particles

The successful treatment of tumours with hadrons – hadron therapy – is only possible when accelerator experts, physicists, biologists and oncologists combine their efforts and share their expertises. The PARTNER project aims at training young students to become the future leaders in this field. Four of them are affiliated to CERN as fellows.

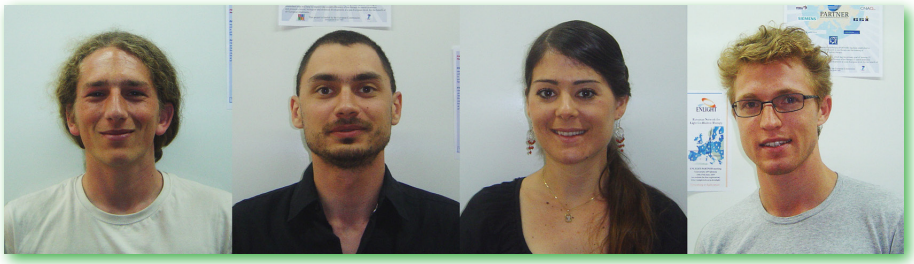
Till (Germany), Faustin (Romania), Vassiliki (Greece/Germany) and Daniel (Germany) are the four PhD students based at CERN and working for PARTNER – a Marie Curie programme funded by the European Commission over four years. Its main goal is training researchers who will help to improve the overall efficiency of particle therapy in cancer treatment. "PARTNER training network was launched in October 2008", explains Evangelia Dimovasili, technical co-ordinator of the project. "We will recruit a total of 25 students who will collaborate with the institutes and private companies that participate in the programme".

"My task here is to compare the results of MonteCarlo simulation with real data that is made available by various experiments", says Till. Faustin and Daniel work together to build a "collaborative platform based on the GRID technology that will allow hadron therapists to share data in a more effective way". "I will rely on the infrastructure that Faustin and Daniel are working on to build a new database, which should allow oncologists to better evaluate the outcome of particle treatments on their patients", adds Vassiliki.

The students recently participated in the first school organised by PARTNER in Valencia. "We followed lectures on medical accelerators and detectors used in hadron therapy", explains Faustin. "The topics included also Grid technologies and image reconstruction techniques", adds Till. In addition to the technical matters, the career development plan for students foresees courses in leadership and project management techniques.

"Working for the PARTNER project and at CERN was my dream job", says Vassiliki, whereas Daniel wanted to learn more about hadron therapy and "PARTNER is a unique opportunity to be trained in this field". And Faustin adds: "This is a challenging project and I am particularly motivated to apply the most advanced Grid techniques to medical treatment".

All four CERN students will obtain their PhD thesis in the framework of the PARTNER project. "This is a very rich experience because you get a very diversified insight into all aspects related to hadron therapy", observes Till. "The opportunity to effectively network with all people involved in the project is one of the key features of this programme", says Faustin. "And, of course, one of the most important aspects of this project is that we are put in direct contact with the key players in the field of hadron therapy", adds Daniel. "After these three years in PARTNER, I hope to find my place as researcher in medical applications of physics", concludes Vassiliki.



The four CERN students participating in the PARTNER project. From left to right: Daniel Abler (Germany), Faustin Laurentiu Roman (Romania), Vassiliki Kanellopoulos (Greece/Germany) and Till Tobias Boehlen (Germany).

Details on the PARTNER project:

http://partner.web.cern.ch/partner/Welcome.html

Further reading:

http://cdsweb.cern.ch/record/1110739?ln=en

http://cerncourier.com/cws/article/cern/29777

Students attending the first course organised in June 2009 by the PARTNER Network in Valencia, Spain.

New opportunities for EU projects at CERN

In July 2009 the European Commission (EC) finalised how it will spend research funding for 2010, within its Framework Programme 7 (FP7). On 31 July the EC is expected to publish new calls for European project proposals, many of which are relevant to CERN.

In the first two and a half years of Framework Programme 7 (2007-2013), CERN has been very successful – the Organization is participating in around 30 EU projects, with total EC contribution of nearly 35 million Euros.

The now finalised 2010 Work Programmes for FP7 outline how the EC will allocate budgets within each research field. From these Work Programmes, a series of calls for proposals are published so researchers can apply for targeted funding within given deadlines. The first calls are expected to be launched on 31 July and closed later in the year.

The web-site of the CERN EU Projects Office contains a list of all new calls of potential interest to CERN, as well as the relevant Work Programmes and Guide for Applicants: http://cern.ch/eu/fp7/calls/. For a complete list of the recently published calls, see the EC Cordis web-site: http://cordis.europa.eu/fp7/dc/

New calls of interest to CERN include those within FP7's specific programmes entitled "Ideas", "Capacities" and "People":

The "Ideas" call is for European Research Council (ERC) Starting Grants. These grants fund frontier research projects led by young researchers (with 3-8 years of post-doctoral experience) in all fields of science. For this highly competitive FP7 scheme, selection is made solely on excellence, of the proposal and of the researcher.

The "Capacities" calls include research infrastructures and e-infrastructures. One of the targeted topics will be Detectors for Future Accelerators, another will be Research Infrastructures for Nuclear Physics, both of primary importance for CERN.

Another activity that will be funded under the same call is the Preparatory Phase of new Research Infrastructures, primarily reserved for projects on the ESFRI Roadmap (link to http://cordis.europa.eu/esfri/). The new call will contain a topic suitable for the preparatory phase of one project from the European Strategy for Particle Physics of CERN Council.

Under the ICT-based (e-Infrastructures) programme, a new call will fund projects for the development of the European Distributed Computer Infrastructure, new Simulation Software and Services, strengthening of Virtual Research Communities, and coordination actions supporting the development of e-Infrastructures.

In September a call is also expected for Initial Training Networks (ITNs) as part of FP7 "People" Marie Curie actions, overseen by HR Department. The ITN projects are built around a network of partners (with industrial involvement highly recommended) offering a joint research training programme for young researchers.

If you have an idea for an EU project and need information about FP7 programmes and the new calls, please contact the CERN EU Projects office. We can help you prepare and submit projects and give guidance for the CERN approval procedures. Please visit http://www.cern.ch/eu or email eu.projects@cern.ch.

New arrivals

On Monday 22 June 2009, members of CERN Management welcomed recently-recruited staff members and fellows at the second part of the Induction Programme (photographed here with Enrico Chiaveri, Head of HR Department).

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.

ANNUAL REPORT OF THE PENSION FUND

The 2008 Annual Report and Accounts of the Pension Fund which was approved by Council at its session of 19 June 2009, is now available from the Departmental secretariats.

It is also available on the Pension fund site:

http://pensions.web.cern.ch/Pensions/

Pension beneficiaries can obtain this document from Emilie Clerc (tel. + 41 22 767 87 98), building 5-5/017.

Secretariat of the Pension Fund
72742

GENERAL MEETING OF THE PENSION FUND

All members and beneficiaries of the Pension Fund are invited to attend the

Annual General Meeting
to be held

in the CERN Council Room
on Wednesday 9 September 2009
from 14:00 to 16:30 p.m.

The Agenda comprises:

1. Opening Remarks - F. Ferrini
2. Results and presentation of the Annual Report 2008. - C. Cuénoud

   Recent evolution of financial markets. 2009-2010 work plan - T. Economou.

   Copies of the 2008 Report are available from departmental secretariats.
3. Report on Funding policy and principles of the Pension Fund: Working Group 2 Report. - F. Ferrini
4. Questions from members or beneficiaries

   Persons wishing to ask questions are encouraged to submit them, where possible, in writing in advance, addressed to the secretariat of the Pension Fund.
5. Conclusions - F. Ferrini

As usual, participants are invited to drinks after the Meeting.

NB The minutes of the 2008 General Meeting are available from the Administration of the Fund (tel. + 41 22 767 27 42 ; e-mail Sevda.Budun-Kocaturk@cern.ch)

SUMMARY OF THE PENSION FUND'S ACTIVITIES IN 2008

(For more information, please refer to the Annual Report)

Introduction

The Pension Fund Governing Board (PFGB) held seven meetings in 2008. At the end of the year, it unanimously approved the appointment of R. Balfe as successor to P. Lambert, who had stepped down. The PFGB approved the new strategic asset allocation, which was also submitted to CERN's governing bodies in June. The PFGB also took in particular the following decisions:

- Appointment of PriceWaterhouseCoopers as a specialised external auditor, in line with the new governance measures decided by the CERN Council;
- Adoption of the International Public Services Accounting Standards (IPSAS).

The year 2008 was characterized at the institutional level by a further implementation of the new governance structure in the Pension Fund and the four working groups set up by the PFGB in 2007 continued their work in 2008.

Working Group 1 completed its tasks on the composition of the Investment Committee and on the code of conduct, and also continued its work on the status of the Fund's personnel and the terms of reference of the PFGB and Investment Committee, as well as setting up a new internal control system. Regarding the code of conduct, it entered into force on 1st January 2009 following approval by the Council on 12 December 2008, applies to the personnel of the Fund, the members of its bodies and its commercial partners, and can be consulted on the Fund's website (under the "Rules" heading).

Working Group 2, which is responsible for defining the Pension Fund's funding policy and principles, is making steady progress. A preliminary report on the important matter of full capitalisation in the context of the funding strategy is due to be submitted before the end of 2009.

Working Group 3 was entrusted with the selection of Investment Committee experts. As a result of this work, the PFGB was able to appoint Susanne Haury von Siebenthal, Chief Investment Officer of the Publica Pension Fund in Bern, and Stewart Colley, former head of the British Steel Pension Fund in London, as new experts to the Committee.

Working Group 4, whose remit included the selection of a new General Manager, made a recommendation to the PFGB following a series of interviews. In the meantime, the appointment of Mr. T. Economou was approved by the Council in June 2009 for an entry into function on the 1st September 2009.

Governing Board (as of 31 December 2008)

Members	**Appointed by:**
F. Ferrini, Chairman	CERN Council
D.-O. Riska	CERN Council
C.J. van Riel	ESO Council
S. Lettow	Director-General of CERN
G. Deroma	CERN Staff Association
D. Duret, Vice-Chairman	CERN Staff Association
F. Derie	ESO Staff Association
F. Wittgenstein	CERN-ESO Pensioners Association
Ph. Lambert	CERN Council, on the proposal of the Governing Board Members
J.-A. Schneider	CERN Council, on the proposal of the Governing Board Members

Administrator: C. Cuénoud — appointed by the Council on the proposal of the PFGB with the consent of the Director-General.

Summary

The Pension Fund provides coverage against the economic consequences of old age, invalidity and death.

The Fund also pays transfer values in cases where a Fund member leaves the Organization prior to retirement, or under certain conditions it may offer a deferred pension.

Key figures

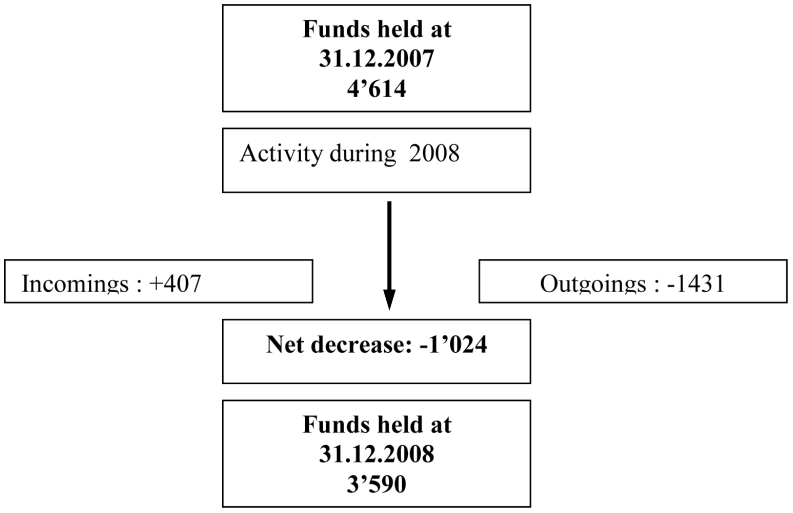
	2008	**2007**
Overall performance of the assets	-19.3%	6.2%
Swiss average (Swisscanto)	-15%	2.1%
Net operating result	-1024.3 MCHF	+140.2 MCHF
Fund assets	3589.7 MCHF	4'614.0 MCHF
Active membership	3086	3183
Number of beneficiaries	3198	3105
Benefits paid	265.1 MCHF	256.1 MCHF
Funding ratio[1)]	82.0	106.3

1) Closed-end fund calculation: assuming liquidation of the Fund without pension indexation (see also Actuarial results below)

Overall assets

Financial Position

The overall trend in the Fund's financial position in 2008 is summarised below. It should be noted that the result of the Fund's overall accounting movements, namely the sum of investment results at end-of-year market prices, taking account of value adjustments, and the balance between contributions and benefits, is -1'024 MCHF.



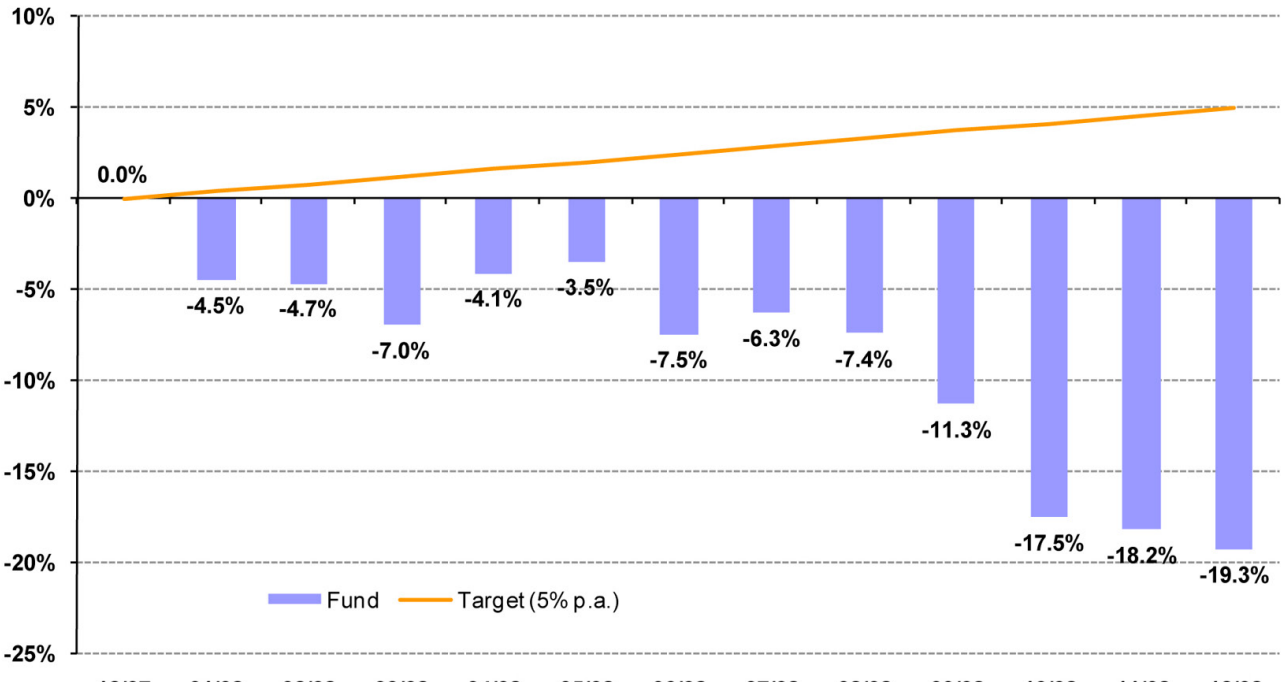
Investment Performance

In 2008, like most institutional investors, the CERN Pension Fund was impacted by the market turmoil. At the end of the year, the performance of the Fund's assets stood at -19.3% according to the Time Weighted Return method. This result is under the average of other Swiss pension funds, but over a longer term horizon, CERN Pension Fund still out-performs its peers.

Most of this performance is explained by the sharp decrease of equity markets worldwide. (the MSCI World Index decreased by 45% in CHF terms). Furthermore, it is important to note that:

- The CERN Pension Fund did not invest in Hedge Funds, mainly for transparency and liquidity reasons. No loss was recorded in that field.
- Despite the systemic risk on the markets, which translated into bankruptcies of financial institutions, the Fund did not suffer any losses linked to its relationships with banks and counterparties.

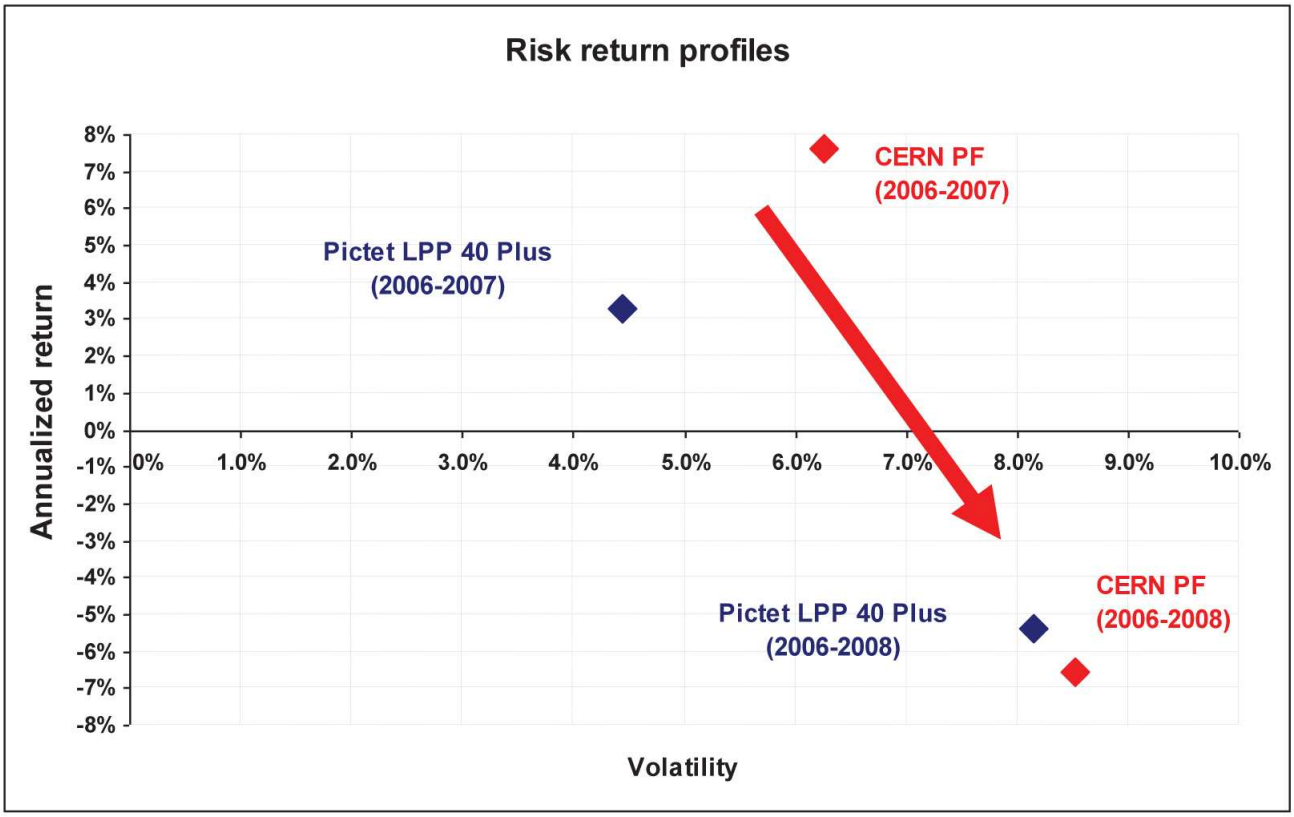
Monthly cumulated performance of the Fund



Data as at 31/12/2008 are accounting values, while monthly data are estimates. Each month, the graph shows the performance with respect to the 01/01/2008.

Risk / Return profile

The graph below shows the Fund's overall risk/return profile of the Fun and, for comparison, the risk/return profile of the Pictet LPP40 Plus index, whose asset allocation most closely resembles that of the Fund. Data is shown for 2 years (2006-2007) and then 3 years (2006-2008). This highlights the consequences of 2008 both in terms of risk (measured by volatility) and returns.



As expected, adding 2008 to the metrics brings additional risk and negative performance. Plots move to the south-west. It is interesting to note that the difference in risk between the Fund and the Index has been reduced in 2008.

Breakdown of assets

To optimise long-term risk and performance parameter assumptions, an asset-liability modelling exercise is carried out as a basis for determining the strategic asset allocation (SAA). The exercise takes into consideration all the Fund's specific characteristics (demographic data, contributions, benefits, indexation, etc.), and sets long-term objectives. Margins of fluctuation around the strategic asset allocation allow tactical adjustments. The strategic allocation is the main component of investment policy to achieve long-term target returns, while tactical adjustments reflect short-term responses to prevailing market conditions. The Investment Committee is responsible for making such tactical adjustments.

In 2008, a new Strategic Asset Allocation has been approved by Council. The main changes related to the absolute return category (10%), the introduction of Corporate Bonds (10%) and the ability to go into infrastructure investments within the real estate allocation.

ASSET CLASS Sub asset class	SAA	Tactical margins	Effective allocation as at 31.12.2007	Effective allocation as at 31.12.2008	Deviation from SAA
	1	2	3	4	5=4-1
BONDS	**37%**	**30-45%**	**35.9%**	**46.1%**	**9.1%**
Europe	17%		15.8%	21.7%	4.7%
Global	10%		5.1%	0.3%	-9.7%
Corporate	10%		0.0%	4.5%	-5.5%
Others	0%		15.1%	0.0%	0.0%
Swiss	0%		0.0%	19.6%	19.6%
EQUITIES	**34%**	**25-45%**	**38.5%**	**26.4%**	**-7.6%**
US Large Cap	8%		9.5%	7.3%	-0.7%
US Small Cap	2%		1.4%	0.9%	-1.1%
Canada	0%		0%	0.2%	
Eur. Large Cap	8%		13.7%	8.8%	0.8%
Eur. Small Cap	2%		1.7%	0.9%	-1.1%
Australia	0%		0.0%	0.3%	
Japan	9%		5.5%	4.6%	-4.4%
Emerging markets	5%	**Max 10%**	6.7%	3.5%	-1.5%
Diversifying Assets	**14%**	**10-20%**	**6.0%**	**6.3%**	**-7.7%**
Absolute return	10%		2.2%	3.0%	-7.0%
Private Equity	2%		1.9%	2.9%	0.9%
Commodities	2%		2.0%	0.4%	-1.60%
REAL ESTATE	**15%**	**10-20%**	**10.7%**	**14.8%**	**-0.2%**
CASH	**0%**	**0-10%**	**8.9%**	**6.4%**	**6.4%**

Given the change in the SAA in 2008, and for comparison purposes, the 2007 allocation was adapted to integrate investments under the previous SAA into suitable categories in the new SAA.

Over the course of the year, the main tactical decisions taken by the Investment Committee were:

- the decision not to systematically rebalance the allocation with respect to its strategic levels. Such policies often result in increasing poorly performing asset classes to the detriment of well performing ones,
- in January, the PFIC decided to move 50 MCHF out of cash into European and US equities,
- 20 MCHF were invested half in European and half in US Equities in July,
- in June, a new portfolio of 100 MCHF dedicated to corporate bonds was launched,
- in August, the PFIC decided to reduce the European Equities by 35 MCHF and to equally invest the proceeds half in Canadian and half in Australian equities,
- to maintain the tactical decision to partially hedge the currency risk of EUR denominated assets in a range between 50% and 70%.

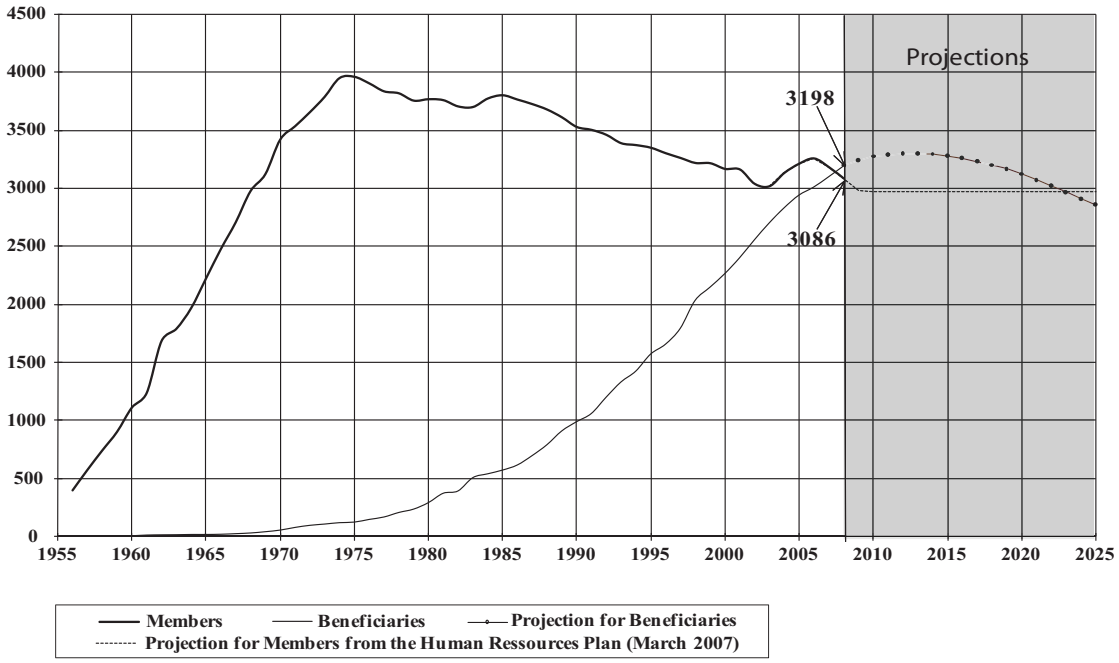
With respect to investment managers, two mandates have been stopped for performance reasons (JP Morgan on Global Bonds and Legg Mason on US equities). The amounts have been replaced by passive investments or allocated to existing mandates. A new Corporate Bond mandate has been initiated in May, managed by Franklin Templeton.

Long-term results

Considering that the liabilities of the CERN Pension Fund are long term by nature, its performance should also be contemplated over the long term. The time-weighted return (TWR), calculated for the preceding ten-year period, decreased from 5% (1998-2007) to 2.2%

(1999-2008). Over the life of the fund (since 1957) the Internal Rate of Return (IRR) stood at 4.9% (5.7% as of the end of 2007), thus below but very close of the Fund's 5% target. These figures highlight the important impact of year 2008, which has been intensified by the maturity of the Fund. It is important to note that the technical rate retained by Council (4.5%) is still consistent with the gross rate of return over 20 years or more.

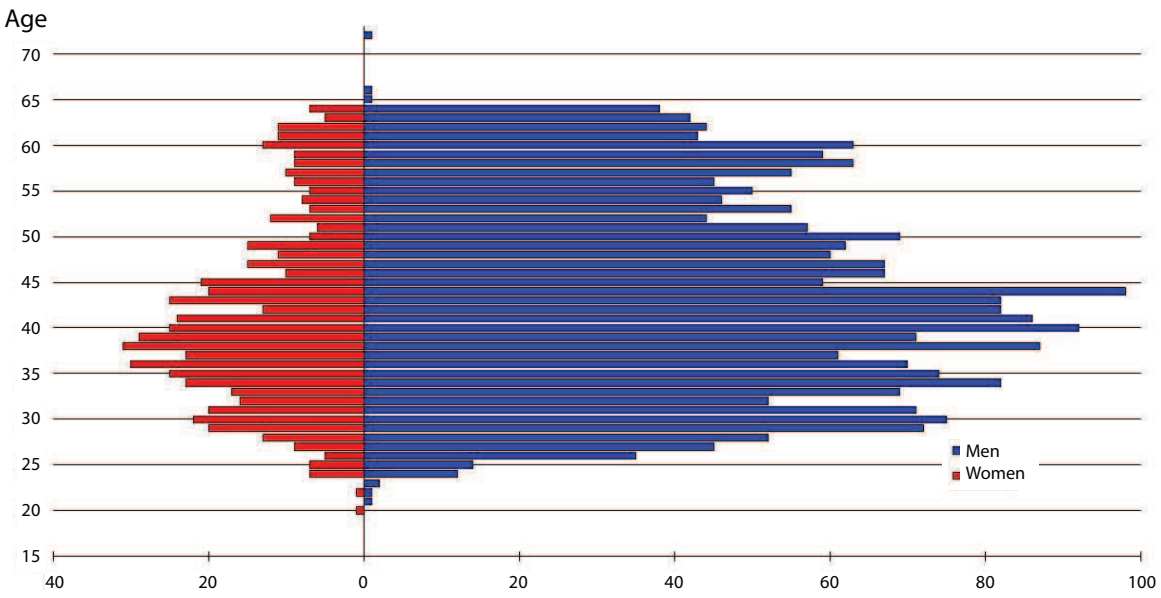
Insurance



Members

The above graph shows membership as at 31 December 2008, including those whose contract terminated on that date. There were 358 departures from the Participating Organizations. These included 112 retirements, of which 67 were early retirements, i.e. before the age of sixty-five, and 45 members retiring at 65. In 2008 the number of members decreased by 97.

At 31 December 2008, the average age of members was 41 years and 7 months for women and 43 years and 9 months for men. The graph below shows the age distribution of the Fund membership.



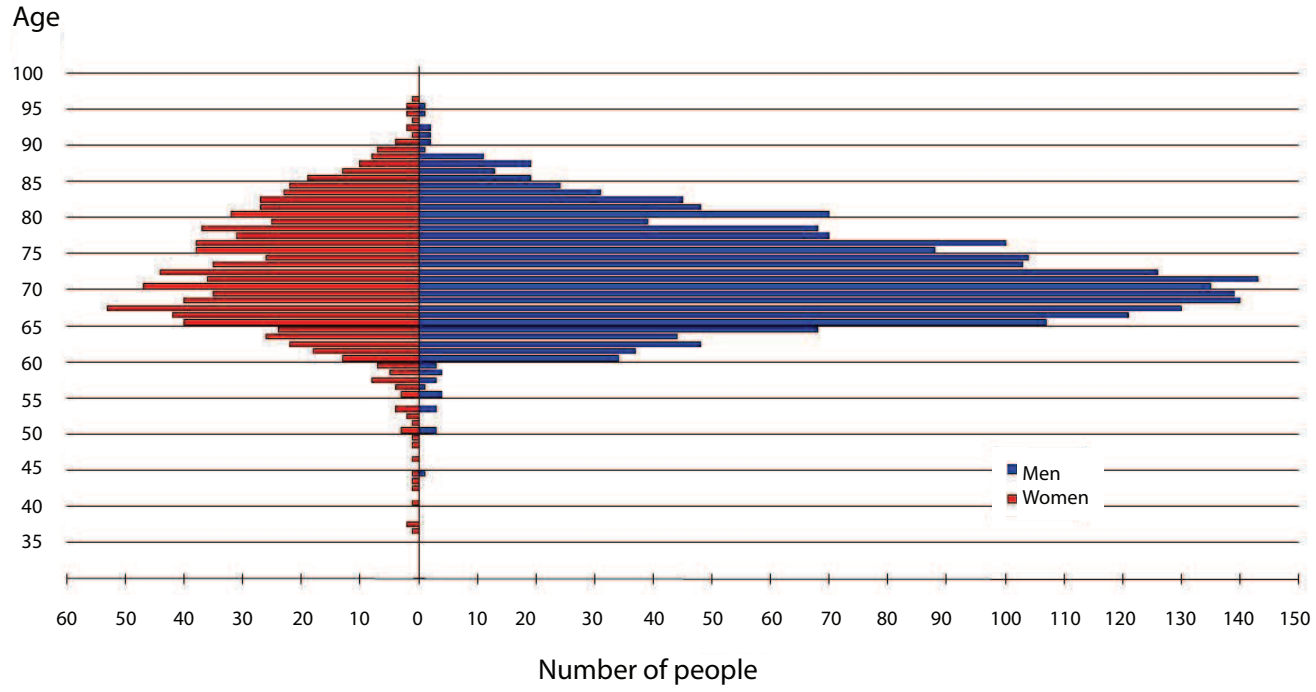
Age distribution of Fund membership at 31 December 2008

Beneficiaries

The number of beneficiaries at 31.12.2008, including participants in the Progressive Retirement Programme, was 3198, representing a 1.03% increase compared to the total at 31.12.2007 (3105).

Graph 4 shows the net fluctuations by category of beneficiary over the last two years.

At the end of 2008, the average age of those receiving retirement pensions (retired people and surviving spouses) was 72 years and 3 months for women and 71 years and 7 months for men, which represents a slight increase compared to 2007.



Actuarial Results

Every year the Fund has been reviewing its actuarial position using the closed-fund method (Accumulated Benefit Obligation, ABO or traditional method), which gives a snapshot of the financial position of the Fund at a given moment without taking future developments into account. The funding ratio has deteriorated substantially from 106.3% on 1 January 2008 to 82.0% as at 1 January 2009. The reasons are threefold: the negative result achieved in 2008 is the most important, but also the continued rise in the mathematical reserve for the pensioners, and the negative cash-flow has also played a role.

IPSAS (IAS 26)

The decision of Council to introduce International Public Accounting Standards (IPSAS) at CERN has meant that the accounts of the Pension Fund should be prepared in accordance with those principles. IAS 26 permits that the actuarial present value of promised retirement benefits can be calculated using the Projected Benefit Obligation method (PBO) which is based on the approved actuarial assumptions. Based on the PBO method the funding ratio or rate of capitalisation fell from 94.4% as at 31st December 2007 to 72.7% as at 31st December 2008.

It should be noted that the view of the liabilities based on ABO as well as PBO does not take into consideration the renewal of staff complements, which for an international public organisation like CERN is a very important factor. Historically, at least since1989, the actuarial reviews presenting the position of the Pension Fund have always been prepared using the concept of an "open-end fund" with a 30 year projection. The positions given by these actuarial reviews will continue to provide the framework for the decisions on how the Fund is to be managed (asset allocation, investment and funding policy)

Conclusion

Throughout the life of the CERN Pension Fund there have always been economic and financial cycles that have impacted positively and negatively on the assets of the Fund. But, no doubt, in financial terms 2008 will go down on record as the most difficult year the Fund has ever experienced in asset management and one of the worst years for equity markets since the Great Depression in the 1930's. Despite the decline in assets last year, the Fund should not be too oriented towards the short-term. Such a view has always proved over time to be a drag on return. This is the reason why the Fund maintains a long-term dynamic approach and, as much as possible, a diversified asset management style, which should allow the Fund to recover to some extent in the future.

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.

The Fund maintains intact its ability to meet pension benefit payments in the short and medium term. The present under-funding of the Fund does not mean that the institution is insolvent, but rather is an indicator of its capacity today to meet its future liabilities. These liabilities are long-term in nature and measures are already under consideration to fully address the growing long-term liabilities compared to the assets.

As decided by CERN Council, the financial statements in the Annual Report have been prepared and presented according to International Public Sector Accounting Standards (IPSAS). The structure and content of the Report are thus radically different to previous versions. Also for the first time, following a decision of the CERN Council, an additional specialized Pension Fund audit has been carried out. These initiatives have proved entirely successful and should provide additional assurance with regard to the prudent stewardship of the Fund's assets.

The graphs and data used in this summary are taken from the Annual Report for the CERN Pension Fund for 2008 (document CERN/2840-CERN/FC/5340), which members of personnel may obtain a copy from Departmental Secretariats. Beneficiaries may also obtain a copy of the Annual Report from the Benefits Service (Emilie Clerc, tel. 022-767 87 98). The Annual Report contains detailed information on all aspects of the Fund's activities. If you would like more detailed information about your Pension Fund, we strongly encourage you to read the Annual Report or to consult the Fund's Web site (http://cern.ch/Pensions) and to attend the Annual General Meeting, whose agenda is indicated above.

NEW SAFETY COURSE!

Do you need to know how to use the portable breathing apparatus ("Biocell") in order to work at CERN?

If so, you will need to sign up for a new course on how to use this personal protection system. The training starts with a refresher on how the Biocell works. You will then have an opportunity to use a training unit in realistic conditions simulating a tunnel incident: darkness, non-toxic smoke, the noise of a gas leak, an audible alarm to signal oxygen deficiency, and flashing hazard lights.

Once you have participated in this 90-minute training session (in French or English), you will know how to use your Biocell in the event of an emergency.

In the near future, completion of the course will be made mandatory in order to obtain access rights for the LHC and SPS tunnels.

Register for the Biocell course through the Safety training catalogue at:

http://cta.cern.ch/cta2/f?p=110:9:4262544393185446::NO::X_LANGUAGE:EN

Contact: safety.training@cern.ch

Take note

GATE C – WORKS ON THE BUILDING 42

Due to works being carried out on the new building 42, lorries transporting concrete will be entering and exiting the site via entrance C (during entrance C opening hours and between July and December 2009). The lorries have **PRIORITY** over other vehicles, please adapt your speed in consequence.

We thank you in advance for your patience and vigilance when using this entrance.

GS-SEM Group
Infrastructure and General Services Department

THE DANGERS OF TWITTER

(Copied from SWITCH newsletter, July 2009)

Needless to say Twitter has become a very popular micro-blogging service.

However, the more popular a service becomes on the Internet, the more attractive it appears to cyber criminals. Over the last few weeks, several entries in form of links appeared to attract users to click on them. The links point to various special prepared web sites that infect the visitors PC with malware. In order to attract many people these fake messages often cover recent, popular topics.

It is very unlikely that this trend will stop in the next few weeks. The announcement of security experts certainly supports this assumption. One has declared the month of July as the "month of Twitter bugs". On each day in July he plans to publish a different vulnerability of the micro-blogging service.

Of course many attackers will also follow these revealing secrets and use them for their own purposes.

An American couple just recently highlighted the risk of posting seemingly trivial messages. According USA Today they announced their holiday plans on Twitter. While on the road, their home was burgled. Whether the burglars where informed by the twitter messages or not is unknown.

For further reading:

http://www.usatoday.com/travel/news/2009-06-08-twitter-vacation_N.htm

Seminars

MONDAY 3 AUGUST

TH INSTITUTES

09:00 - TH Auditorium, Bldg. 4

SM and BSM physics at the LHC

I. ANTONIADIS, G. DVALI, J. ELLIS, S. FRIXIONE, C. GROJEAN, G. GIUDICE, M. MANGANO, M. SEYMOUR, J. WELLS / CERN PH-TH, M. STRASSLER / RUTGERS UNIVERSITY, B. WEBBER / CAMBRIDGE UNIVERSITY

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Introduction to Statistics (1/4)

COWAN, G / UNIVERSITY OF LONDON

10:15 - Physics at Hadron Colliders (1/4)

HEINEMANN, B / UNIVERSITY OF CALIFORNIA, BERKELEY

11:15 - Introduction to Medical Physics

AMALDI, U / TERA &CERN

12:00 - Discussion Session

AMALDI, U / COWAN, G / HEINEMANN, B

TUESDAY 4 AUGUST

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Introduction to Statistics (2/4)

COWAN, G / UNIVERSITY OF LONDON

10:15 - Physics at Hadron Colliders (2/4)

HEINEMANN, B / UNIVERSITY OF CALIFORNIA, BERKELEY

11:15 - Introduction to Nuclear Physics (2/4)

GOUTTE, H / CEA BRUYERES

12:00 - Discussion Session

COWAN, G / GOUTTE, H / HEINEMANN, B

WEDNESDAY 5 AUGUST

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Introduction to Statistics (3/4)

COWAN, G / UNIVERSITY OF LONDON

10:15 - Physics at Hadron Colliders (3/4)

HEINEMANN, B / UNIVERSITY OF CALIFORNIA, BERKELEY

11:15 - Introduction to Nuclear Physics (3/4)

GOUTTE, H / CEA BRUYERES

12:00 - Discussion Session

COWAN, G / GOUTTE, H / HEINEMANN, B

16:00 - The future of energy and climate

STEINBERGER J. /CERN

17:00 - Poster Session

TH THEORETICAL SEMINAR

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

Parton Distribution Functions

R. THORNE / UNIVERSITY COLLEGE LONDON)

THURSDAY 6 AUGUST

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Introduction to Statistics (4/4)

COWAN, G / UNIVERSITY OF LONDON

10:15 - Physics at Hadron Colliders (4/4)

HEINEMANN, B / UNIVERSITY OF CALIFORNIA, BERKELEY

11:15 - Introduction to Nuclear Physics (4/4)

GOUTTE, H / CEA BRUYERES

12:00 - Discussion Session

COWAN, G / GOUTTE, H / HEINEMANN, B

CERN OPENLAB SUMMER STUDENT LECTURES 2009

16:00 - IT Auditorium, Bldg. 31 3-004

Networking/Ryszard Erazm Jurga

RYSZARD ERAZM JURGA / UNKNOWN

CERN COLLOQUIUM

16:30 - Main Auditorium, Bldg. 500

Quantum Optics, Diffraction Theory, and Elementary Particle Physics

R. GLAUBER / NOBEL LAUREATE IN 2005

FRIDAY 7 AUGUST

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Closing Lecture

RANDALL, L / HARVARD

MONDAY 10 AUGUST

CERN OPENLAB SUMMER STUDENT LECTURES 2009

16:00 - IT Auditorium, Bldg. 31 3-004

Worldwide LHC Computing Grid

L. PONCET / CERN

TUESDAY 11 AUGUST

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Student Sessions (1/9)
10:15 - Student Sessions (2/9)
11:15 - Student Sessions (3/9)

TH STRING THEORY SEMINAR

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

TBA - E. KIRITSIS / UNIVERSITY OF CRETE

WEDNESDAY 12 AUGUST

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Student Sessions (4/9)
10:15 - Student Sessions (5/9)
11:15 - Student Sessions (6/9)

TH COSMO COFFEE

11:00 - Bldg. 1-1-025

The PAMELA anomaly: new particle physics or old astro physics?

S. SARKAR / OXFORD

CERN HEAVY ION FORUM

11:00 - Bldg. 160-1-009

Using holography to calculate Heavy Quark diffusion in the QGP

E. KIRITSIS / UNKNOWN

TH THEORETICAL SEMINAR

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

Jet algorithms - G. SALAM / LPTHE, PARIS

THURSDAY 13 AUGUST

SUMMER STUDENT LECTURE PROGRAMME

Main Auditorium - Bldg. 500

09:15 - Student Sessions (7/9)
10:15 - Student Sessions (8/9)
11:15 - Student Sessions (9/9)

CERN OPENLAB SUMMER STUDENT LECTURES 2009

16:00 - IT Auditorium, Bldg. 31 3-004

Grid Middleware

A. UNTERKIRCHER / CERN

CERN COLLOQUIUM

16:30 - Main Auditorium, Bldg. 500

Evolution of Religious Beliefs

L. WOLPERT

WEDNESDAY 19 AUGUST

TH THEORETICAL SEMINAR

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

SUSY breaking

M. SCHMALTZ / BOSTON UNIVERSITY

FRIDAY 21 AUGUST

CERN COMPUTING COLLOQUIUM

14:00 - Main Auditorium, Bldg. 500

TBA

JEFF HAMMERBACHER / CLOUDERA