CERN Bulletin

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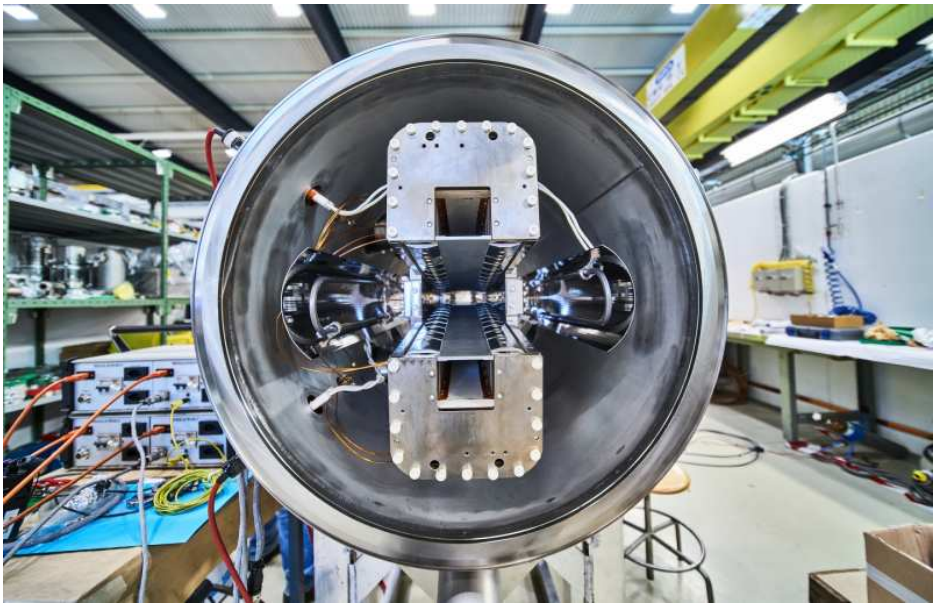
NEW MAGNETS TO FEED THE PROTON SYNCHROTRON BOOSTER

New septum magnets will send the beam to the four rings of the PS Booster after the Long Shutdown 2



The new booster injection vertical septum magnets in their vacuum tank. They will distribute the beam from Linac4 to the four rings of the Proton Synchrotron Booster. (Image: Julien Ordan/CERN)

Do not deflect your attention, or you might miss an important achievement on the way to the high-luminosity era of the LHC. Like the completion of the new deflection magnets which will transfer the beam between the first two elements of the CERN accelerator complex, Linear Accelerator 4 (Linac4) and the Proton Synchrotron Booster (PSB).

As part of the LHC Injector Upgrade (LIU) project, the Vertical Booster Injection Septum Magnets (BISMV10) successfully passed their final test on 8 November. Hosted in their vacuum tank, they will be installed on the transfer line between LINAC 4 and the four superimposed rings of the PS Booster during the second Long Shutdown in 2019-2020.

In the future configuration, the beam coming from Linac4 will be divided in slices with the help of kicker magnets installed on the transfer line. Each slice will then be vertically deflected by the new septum magnets to reach the first, the second and the fourth ring of the PS Booster. Since ring number three is at the same level as the incoming beam, no deflection is required for it.

Septum magnets are designed in such way that the magnetic field stays only in the magnet gap through which the beam passes.

(Continued on page 2)

A WORD FROM LLUIS MIRALLES VERGE

IT'S RECYCLING AWARENESS WEEK AT CERN

In 2016, CERN recycled 543 tonnes of wood, 294 tonnes of paper and cardboard, 5.4 tonnes of PET and many other things as well. Almost everything we throw away is sorted at a dedicated plant, with anything that's not recyclable in one way or another being incinerated at the Cheneviers plant near Aire-la-Ville to generate energy.

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A WORD FROM LLUIS MIRALLES VERGE

IT'S RECYCLING AWARENESS WEEK AT CERN

Similarly, what remains on our trays after we've eaten in the CERN restaurants is sorted by the restaurant staff to ensure that everything is in its rightful place to be recycled or composted. Less visible to many of us is the waste sorting that is now routine at worksites around the Laboratory.

All in all, around 50% of the waste produced by CERN is recycled. That's not bad, but we could do better, and that's why our waste contractor, Transvoirie, is running a recycling awareness campaign.

Every day this week in the Main Building, you can find out what happens to what you throw away, what you could be doing to make life easier for those who sort our waste, and how over three quarters of what goes in your bin is recyclable. Do take time to drop by, and if you'd like to know more about recycling at CERN, all the information you need is available here: http://smb-dep.web.cern.ch/en/Waste/Introduction.

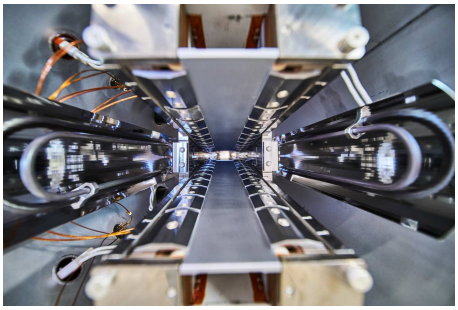
Lluis Miralles Verge
Head of the SMB department

NEW MAGNETS TO FEED THE PROTON SYNCHROTRON BOOSTER

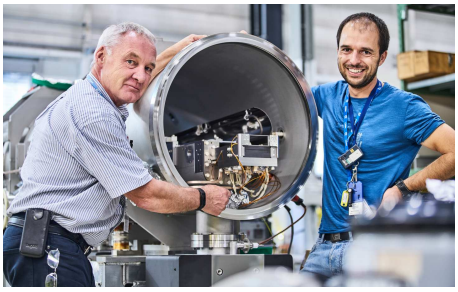
The leakage magnetic field on the outside of the septum is kept to an absolute minimum. This allows the septum magnets to be positioned as close as possible to the circulating beams in the PS Booster without inducing any unwanted oscillations. It also allows the beam that goes to ring three to pass unaffected between the two magnets.

The predecessors of the new magnets, currently in use, are made of ferrite and are only capable of dealing with a 50 MeV beam coming from Linac2. The new system, on the other hand, is able to deflect the 160 MeV beam of negative hydrogen ions produced by Linac4. Each of the six new magnets is made of stacks of one thousand five hundred steel laminations, each one 350 microns thick.

The upgrade of another component on the transfer line, the Beam Injection Distributor (BIDIS) which cuts the beam from Linac4 in six individual slices, is also currently in its final stages of testing. In early 2018 the assembly of new septum magnets based on the eddy current principle for the injection of the beam in the Proton Synchrotron will begin.



Magnets 2 and 4 inside the vacuum tank with the small space between them for the passage of beam for the third ring of the PS Booster. (Image: Julien Ordan/CERN)



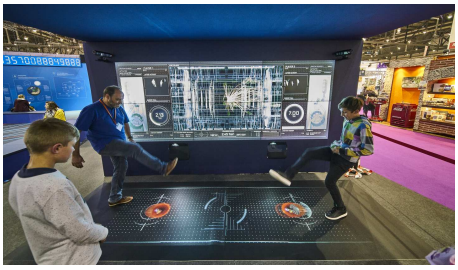
Michael Hourican (left), the project engineer who designed the system, and Miro Atanasov (right), technical engineer, near the completed BISMV10 vacuum tank. (Image: Julien Ordan/CERN)

Iva Raynova

THE AUTOMNALES: TEN DAYS OF SUCCESS

Tens of thousands of people visited CERN's stand at the Automnales, where they were welcomed by enthusiastic volunteers

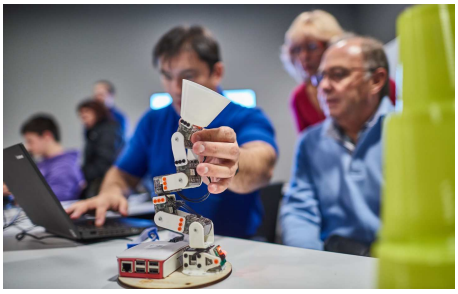
The CERN stand was designed to resemble a particle collision, at the centre of which visitors could take a virtual-reality tour. (Image: Maximilien Brice, Julien Ordan)



You don't have to be called Ronaldo to play proton football. Teenagers take their best shot! (Image : Maximilien Brice, Jules Ordan/CERN)

The CERN exhibition sparked numerous exchanges between CERN volunteers and the Laboratory's neighbors. A mutual discovery. (Image: CERN)

On Sunday, 19 November, the curtain came down on the Automnales, bringing to a close ten days of activities and exchanges at CERN's magnificent blue stand. Some 145 000 people attended the fair, and most of them stopped at the CERN stand. There, they learnt about fundamental science by taking part in activities and workshops and meeting volunteers, who shared their passion for research. 114 workshops, shows and presentations complemented the continuous activities. 159 pupils came especially to visit the CERN stand, as did around 150 elderly people each morning. A huge thank you to the 172 volunteers who welcomed, guided and informed the public with great enthusiasm. Relive the event in pictures.



The 114 workshops and shows that took place over the ten days were very popular. In this image you see one of the workshops dedicated to robot programming. (Image: Maximilien Brice, Julien Ordan/CERN)

Physics is fun, and sometimes so surprising that it makes your hair stand on end. This is what spectators experienced at the very popular electric show, animated by the Physiscope of the University of Geneva, CERN's partner during the Automnales. (Image : CERN)

Corinne Pralavorio

A journey through time and space. At the opening, two eras collided as the Geneva Yodelers, in traditional costume, took a futuristic virtual reality trip into the LHC and the CMS experiment. (Image: Maximilien Brice, Julien Ordan/CERN)

CERN isn't selling anything at this trade fair, just offering up knowledge and surprises. Visitors wanting to take home a souvenir had a choice of sugar packets bearing scientific facts or a temporary tattoo proclaiming "I love protons" or "my mother is a supernova". (Image: CERN)

RECYCLING: WE ALL HAVE A ROLE TO PLAY

From 20 to 24 November, head over to the Main Building (500) to find out about waste sorting and recycling at CERN

This week, come and learn about how waste is sorted and recovered in the Main Building (500), where the contractor responsible for collecting waste at CERN*, in partnership with the SMB department, will explain how to sort waste at CERN for optimal recycling. We can all make a difference, however small, to help protect the environment, so get involved!

What is recycled?

Paper, card, PET, aluminium cans, glass, Nespresso capsules, wood and worksite waste: in 2016, CERN produced no less than 5700 tonnes of waste, about 50% of which was recycled. How can we improve on this? With your help! **Numerous waste containers, skips and bins for recyclable materials are provided on the CERN sites – please use them!**

In particular:

- Every office has a paper/card recycling box.
- Recycling bins for PET items, aluminium cans and Nespresso capsules are available throughout the CERN sites**. Several skips for these kinds of waste have also been installed near Building 156 (Meyrin site) and Building 904 (Prévessin site).
- 19 recycling containers for glass bottles are spread out across the Meyrin and Prévessin sites.
- For larger volumes, skips ranging from 4 to 40 m^3in volume are available.

Moreover, to facilitate the recycling of worksite waste, any firm working for CERN can make use of the waste collection service. To promote the use of this service, we have established a procedure for informing worksite managers about CERN's waste sorting and recycling policy. This service ensures better traceability of CERN's worksite waste and a reduction in the amount of waste that is not sorted for recycling, as such waste is now separated out at the source into the different categories (wood, inert waste, scrap metal, etc.), which was very difficult before.

CERN's waste is sent to a recycling plant in Switzerland, where it goes through a second, more thorough, sorting process. Each different type of waste then goes through the appropriate recycling or recovery process: paper/card is recycled into new paper; used wood can, for example, be used to make chipboard; scrap metal goes to steelworks; glass can be used in the manufacture of glass wool; certain plastics can be recycled into polystyrene, etc.

What is incinerated?

Waste to be incinerated (including the domestic waste collected by the cleaning service) is disposed of in containers outside each building. This waste is then sent to a recycling plant in Switzerland, where any potentially recyclable materials are extracted. The remaining non-recyclable waste is then sent to a Swiss incineration plant located near CERN, where it is converted into electrical and thermal energy.

What about the restaurants?

At the moment, not enough recycling bins are provided in the Novae restaurants at CERN. To address this issue, five recycling stations for the disposal of household waste, PET items and compostable coffee cups will be installed in Restaurant 1. Other recycling solutions will be implemented gradually in CERN's restaurants. Glass bottles and organic waste are already recycled by Novae staff in the kitchens.

Of course, it's not enough just to throw your rubbish into a recycling bin; please make sure you put each material in the correct bin - this is essential! (In particular, please note that plastic cups are not PET.)

**The firms responsible for waste sorting and treatment were selected by means of a tender process using the criteria of proximity to the site, with a view to minimising CO_2emissions resulting from transport.*

***For more information on sorting and recycling at CERN, please see the SMB department's website (http://smb-dep.web.cern.ch/fr/Waste/Introduction) .*

Anaïs Schaeffer

LHC REPORT: RECORD LUMINOSITY, WELL DONE LHC

The LHC's 2017 proton run has ended with record luminosity. The special runs will now take place before the winter shutdown

On Friday, 10 November, the final beams of the 2017 proton run circulated in the LHC. The run ended, as it does every year, with a round-up of the luminosity performance. The LHC has far exceeded its target for 2017. It has provided its two major experiments, ATLAS and CMS, with 50 inverse femtobarns of data, i.e. 5 million billion collisions.

This result is all the more remarkable because the machine experts had to overcome a serious setback. A vacuum problem in the beam pipe of a magnet cell limited the number of bunches that could circulate in the machine. Several teams were brought in to find a solution. Notably, the arrangement of the bunches in the beams was changed. After a few weeks, luminosity started to increase again.

At the same time, over the course of the year, the operators have optimised the operating parameters. Using a new system, the Achromatic Telescopic Squeezing (ATS) scheme (see the text below) put in place this year, they have notably reduced the size of the beams when they meet at the centre of the experiments (the more squeezed the beams, the more collisions occur each time they meet). Last year, the operators managed to obtain 40 collisions at each bunch crossing, with each bunch containing 100 billion particles. In 2017, up to 60 collisions were produced at each crossing.

Thanks to these improvements, the instantaneous luminosity record was smashed, reaching 2.06 x $10^{34}cm^{-2}s^{-1}$, twice the nominal value.

The LHC will continue to operate for another three weeks for two special runs and operation studies. The first special run will consist of carrying out proton collisions at 5.02 TeV, the same energy as that planned for next year's lead-ion runs. This will enable physicists to collect data with protons and set a reference for the comparison with the lead-ion data.

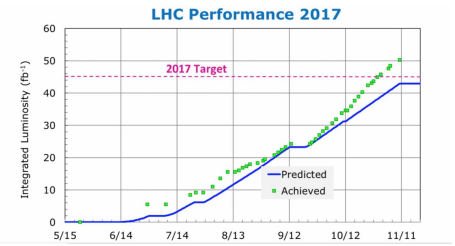
The second special run, at very low luminosity and high beta *, will provide data for the TOTEM and ATLAS/ALFA experiments. The energy will be limited to 450 GeV, i.e. the injection energy into the LHC.

Finally, the operators will carry out a “machine development” campaign. Over a period of one week, they will perform operating tests to improve the accelerator's performance still further, including tests with the Achromatic Telescopic Squeezing scheme.

The magic of the Achromatic Telescopic Squeezing scheme

At the beginning of the year, it was decided to make significant modifications to the LHC optics in order to make the optics compatible with the Achromatic Telescopic Squeezing (ATS) scheme. This scheme offers innovative and complementary optics manipulations in order to reduce the beta*, which quantifies the beam spot size at the interaction point. This scheme is now accepted as being the most cost-effective and robust way to reach the very challenging beta* target of 10-15 cm for the HL-LHC, which otherwise would be intrinsically limited.

The first challenge that had to be overcome to enable early implementation of the scheme in the LHC was to demonstrate an ATS-compatible version of the LHC optics at intermediate beta* (intermediate from the HL-LHC perspective but already beyond the LHC's nominal beta* value of 40 cm, which was used in 2016). The second challenge was to commission the scheme's telescopic techniques, to be deployed later in the year. These techniques contributed to the existing LHC's record-breaking performances, helping it to achieve a 30cm beta*, almost a factor of two below its design value.



Graphs showing the integrated luminosity of the LHC in 2017. The green squares represent the achieved luminosity, while the blue line shows the planned luminosity. (Image: CERN)

The Operations group and Stéphane Fartoukh (BE-ABP)

THE GENTNER PROGRAMME CELEBRATES ITS TENTH ANNIVERSARY

The German doctoral student programme has trained 122 students since 2007

On 1 November 2007, the very first student of the special German Doctoral Student Programme at CERN (Wolfgang Gentner Scholarships) began his work, sponsored by the German Federal Ministry of Education and Research (BMBF).

On the occasion of the tenth anniversary of the Gentner Programme, which is based

on cooperation between BMBF, CERN and DESY, the regular meeting of students and their supervisors held on 25 October 2017 was dedicated to celebrating this event.

Guest speaker Thomas Roth from BMBF highlighted the success of the programme, and the first “Gentner Doktor”, who is now working at the Karlsruhe Institute of Technology (KIT), gave some insights into his time as a Gentner Doctoral Student and his later career. Students' presentations and a poster session completed the programme for the “Gentner Day”.

Students, university supervisors and CERN groups are benefiting greatly from the Gentner Programme, which was recently extended by 3 + 3 years until 2023, with a significant increae in funding.

See also the article published (*https://home.cern/cern-people/updates/2016/07/hundredth-gentner-doctoral-student-has-started-cernhttps:/home.cern/cern-people/updates/2016/07/hundredth-gentner-doctoral-student-has-started-cern*) last year about the arrival of the 100thstudent.

Michael Hauschild

COMPUTER SECURITY: CERN UNDER FRIENDLY POKING

If you also want to become a penetration tester and identify potential areas for improving CERN's computer security sign up to the WhiteHat Challenge

At the beginning of September, CERN's computing systems came under attack. Adversaries tried to find their way into CERN's Windows infrastructure with the aim of taking over the essential central Domain Controllers. And the experts from the University of Toronto did a great job!

Reviewing CERN's computer security defences is part of our catalogue of best practices, as it is naturally better to identify suboptimal configurations under friendly fire than to succumb to evil BlackHats exploiting them for their malicious deeds. Therefore, CERN's Computer Security Team repeatedly reviews and audits the various computing services, control systems, web applications, and software implemented and deployed at CERN.

But having an independent review can shed light from a different angle and highlight weaknesses and vulnerabilities missed by our audits. Enter the University of Toronto, where Allan Stojanovic and his team of professional hackers took up the challenge of trying to break into CERN, namely its Windows computing infrastructure.

During the first weekend of September 2017, Allan and his colleagues scanned CERN's computing infrastructure as it is visible from the Internet – the “reconnaissance” phase. Having identified potential areas of interest, they then tried to take over servers and websites belonging to the Windows computing infrastructure – i.e. they tried to penetrate computing facilities that are usually protected behind CERN's outer perimeter firewall.

Once inside, their mandate would have allowed them to continue as far as they could to show that they could have taken over administrator rights on the so-called central Domain Controllers, the core systems of the Windows infrastructure. Becoming administrators of those servers would have provided them with full access to any other centrally managed Windows system at CERN. In order to avoid any accidental damage, every step taken by them was coordinated and authorised by CERN's Computing Security Officer. After three days of heavy poking, some frustration, and lots of pizza and coffee, the exercise ended and Allan provided CERN with a detailed report of significant, less significant and collateral areas for improvement. Thank you very much, Allan and colleagues!!! All of those weaknesses have now been addressed.

And we have not finished yet. The IT department and the Computer Security team is considering teaming up with other professional companies and teams to further poke around for areas for improvement under the umbrella of CERN's WhiteHat Challenge. Given the complexity and vastness of CERN's computing facilities, there must be more weaknesses!

And you can join in: if you also want to become a penetration tester and learn how to detect vulnerabilities, poke for weaknesses and identify potential areas for improving CERN's computer security in general – or the security of your computing service, control system, web application or software in particular – sign up to the WhiteHat Challenge. Roughly 140 people plus six universities have done so far, constantly improving CERN's computer security defences!

Do you want to learn more about computer security incidents and issues at CERN? Follow our Monthly Report (http://cern.ch/security/reports/en/monthly_reports.shtml). For further information, questions or help, visit our website (http://cern.ch/Computer.Security) or contact us at Computer.Security@cern.ch.

The Computer Security Team

Announcements

SYMPOSIUM TO MARK 25 YEARS OF THE LHC EXPERIMENTAL PROGRAMME

Friday, 15 December 2017 from 11 a.m. to 4 p.m.
in the Main Auditorium (500-1-001)

Twenty-five years have passed since the Evian meeting in March 1992, when the LHC experimental programme was launched. The Evian meeting was a crucial milestone in the design and development of the LHC experiments. Detector ideas discussed at Evian evolved into Letters of Intent that were submitted between 1992 and 1995, and which subsequently led to the construction of the LHC experiments.

The symposium will retrace the emergence of the LHC experimental programme against the backdrop of the physics landscape of the early 1990s. It will be an occasion to recall some of the ingenuity and a few of the bold decisions that led to the superbly functioning LHC detectors of today.

The symposium will end with a jamboree reviewing recent experimental results from the LHC experiments.

This symposium is open to the entire CERN community; registration is not required.

This event will be live webcast.

In the event of the Main Auditorium being over capacity, you will be able to watch the webcast of the symposium in the Council Chamber (503-1-001), in the TH Auditorium (4-3-006) and in the conference room 222-R-001.

To see the full programme for the event, visit this Indico page (https://indico.cern.ch/event/653848/timetable/?print=1&view=standard) .

WEBCAST OF SACLAY'S TEDX EVENT “IN SERVICE OF THE LIVING”

On 30 November TEDxCERN partners with TEDxSaclay (*https://tedxsaclay.com/programme/lang:en*) to webcast their event in the Council Chamber.

TEDxCERN will return in Autumn 2018, once again featuring the latest developments and issues in science and technology. Meanwhile, with so many advances happening across a range of research fields, we thought the CERN community would enjoy the programme prepared by TEDxSaclay for 2017.

As one of the leading TEDx in France, TEDxSaclay is at the forefront of science, technology and innovation. TEDxSaclay brings together up to 1000 participants from the Paris-Saclay global cluster in more than 15 venues across France, from 2017 onwards.

The theme of the event is “In Service of the Living”. It will address big questions, such as: how can we implement the full capacity of scientific research and technical and social innovation in the service of Life, while integrating the four kingdoms of mineral, plant, animal and human.

Among the speakers is André Choulika, one of the founders of Cellectis, a biotech company at the forefront of gene therapy against cancer, and the mathematician Cédric Villani, winner of the 2010 Fields Medal (equivalent to the Nobel Prize).

Note that most of the talks will be in French with live subtitles in English. The live webcast will start at 17:00 and end at 21:00, with a one hour break. The event is open to anyone with a CERN badge.

CLOSURE OF ROUTE FEYNMAN FROM 23 NOVEMBER TO 22 DECEMBER

Please note that Route Feynman will be closed for resurfacing from Thursday, 23 November to Friday, 22 December 2017.

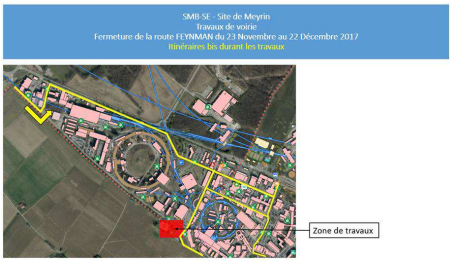
An alternative route will be signposted from Entrance E (Porte de France) (see maps).

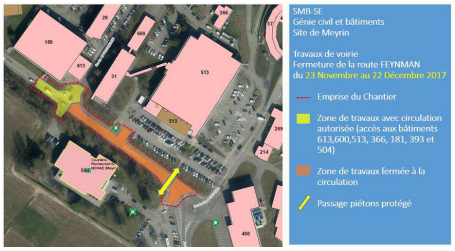
Access to buildings via Route Oppenheimer and to the Restaurant 2 delivery bay will not be affected while the work is in progress.

This road closure may have consequences on Circuit 1 of the shuttle service:

- Morning: no stop at building 504 and risk of delay on the shuttle route
- Afternoon: no stop at buildings 504 and 101, and risk of delay on the shuttle route

Thank you for your understanding.





The SMB-SE group

SUBSCRIPTION FOR PAPER VERSION OF THE BULLETIN AND ECHO

CERN's internal magazine is taking advantage of this week's focus on recycling to launch its own anti-waste campaign. Each year, 50 000 copies of the Bulletin for the CERN community and the Staff Association's Echo are printed, which represents around 300 000 sheets of A3 paper or between 30 and 60 trees.

In an age where everything is digitally accessible no matter where you are, we encourage you to read the Bulletin and the Echo online. Moreover, the online versions are more complete and are updated more regularly. You can sign up for e-mail alerts for the Bulletin and the Echo by visiting: *http://cern.ch/go/subscription*

However, if you are unable to access the web, please read the letter accompanying this paper issue of the Bulletin carefully to find out how to continue receiving the Bulletin and the Echo by post.

The Editorial Content Development section (IR-ECO-CO)
and the Staff Association

WHAT IS "POST-TRUTH"? THE ROLE OF THE MEDIA AND SCIENTISTS

What is "post-truth"? How can we explain the Higgs boson, and other complex scientific theories, in 30 seconds without fuelling this dangerous relativism? The aim of this lecture will be to put forward possible solutions, taking as a starting point the role of the media, scientists and you, the audience.

Conference in French with simultaneous interpretation into English.

What is "post-truth"? The role of the media and scientists
Lecture by Brice Couturier, journalist and academic

Tuesday 28 November, 20:30
Globe of Science and Innovation
Free entrance but mandatory registration on the Indico page (*https://indico.cern.ch/event/676539/*)

DATES OF PUBLICATION OF FORTHCOMING CERN COMMUNITY BULLETINS

Please note that this issue of the Bulletin for the CERN Community covers weeks 47, 48 and 49 (21 November to 11 December).

The final issue of the year, covering weeks 50, 51 and 52 (11 to 31 December), will be sent to you (with an e-mail alert) on **Tuesday, 12 December**, so that the paper version can be distributed before the Laboratory's end-of-year closure.

The Web version is updated regularly to include the latest news and announcements, so check it out every day!

The Editorial Content Development Section, Education, Communication and Outreach group (IR-ECO-CO)

RENOVATION OF THE CROSSROAD IN FRONT OF THE PRÉVESSIN SITE

The works to renovate the crossroad in front of the main entrance of the Prévessin site, initially planned for May, have restarted. They will be performed in three stages and will last until **July 2018**.

During the first stage, from 13 November to 22 December, the networks located under the new crossroad will be moved. As a result, the main entrance of the Prévessin site and the Europe road **will be closed for three consecutive nights between 19:00 and 07:00 – from Monday 27 November to Thursday 30 November.**

Between those hours an alternative entrance will be used.

The road works will take place during the second stage, which will last four month during the first semester 2018. Finally, new traffic lights will be installed by the end of June 2018. Some perturbations of the traffic flow are expected during these months.

Ombud's corner

HOW DOES A DISCUSSION WITH THE OMBUD WORK?

In a previous article, I explained the framework in which the Ombud operates. I will now talk about how a discussion is conducted and what we can do together.

When someone comes to see me for the first time, I always begin by reminding them of the framework in which I operate. I then ask them to explain why they have come: *"Now tell me what brings you here."* During the discussion, my aim will be to get as precise an idea as possible not merely of the facts but, even more importantly, of your feelings and how you are coping with the situation. Don't worry about seeming silly or flustered during the discussion. Your story is often laden with emotions and doubts, and it's completely normal to have trouble expressing yourself in an organised and controlled way! I will therefore often rephrase what I've heard to make sure that I've understood correctly.

Don't expect me to say that either party is right or wrong. This is not the purpose of the discussion. I know that this can sometimes give the impression that I'm indifferent to what you're going through, but it's not my place to judge or to take sides. My role is to help resolve the conflict in an entirely neutral way, and to enable you to make a fresh start with the person with whom you have a problem.

Once I have a full understanding of your situation and your expectations, we can consider your options together, weighing up the pros and cons of each one:

"Let's say you go and tell your colleague openly what you expect from them. What might happen? They might hold it against you and withhold information. On the other hand, they might not have been aware of the consequences of their behaviour, and you might find common ground."

By the end of the discussion, we will have identified several options, and it's up to you to decide what to do next. For example:

- No action is taken. You would rather leave the situation as it is.
- You decide to talk to the person behind the problem yourself. You may also write to them.
- You ask someone else to help, such as the Human Resources department, a trusted colleague from your own department or the Ombud.
- You decide to talk to your hierarchy.
- You initiate more formal proceedings.

A discussion doesn't necessarily have to reach a conclusion. Often, people who

come to see me just want to confide in someone neutral, in complete confidence, in order to understand their situation better.

In any event, if we don't find a way to improve your situation during our first discussion, I will suggest that you take some time to think, and we can meet again another time.

Every problem has a solution. Remember what Einstein said: “A problem without a solution is a poorly stated problem.”

Pierre Gildemyn