

## FIRST TESTS OF CRAB CAVITIES PROMISE A LUMINOUS FUTURE



First niobium crab cavity assembled for the High-Luminosity LHC project (HL-LHC) (Image: Ulysse, Fichet/CERN)

Yet another success in the creating of a bright future for the Large Hadron Collider (LHC) was achieved when, on 27 February 2017, the first tests of a new kind of radio-frequency (RF) cavity – crab cavities – were performed. They are one of the key elements for the High-Luminosity LHC (HL-LHC) project – the future upgrade of the LHC, which will be operational from 2025.

Constructed from high-purity niobium sheets, the crab cavities will operate at 2 Kelvin to reach their nominal performance. Unlike the accelerating RF cavities at LHC Point 4, the crab cavities give the bunches a time-dependent transverse kick in a plane that is perpendicular to their motion. The present configuration of the LHC interaction regions, and that of the future HL-LHC, features an intrinsic crossing angle with which the beams collide. By placing the crab cavities near the interaction regions of ATLAS and CMS, the

bunches are rotated around their barycentres in order to maximise their overlap at the collision points.

So far, two superconducting crab cavities have been manufactured at CERN. RF tests at their operating temperature of 2 K were performed in a super-fluid helium bath in the SM18 test facility. The first cavity tests demonstrated a maximum voltage reach in excess of 5 MV transverse kick voltage, surpassing the nominal operational voltage of 3.4 MV. This kick voltage corresponds to extremely high electric and magnetic fields on the cavity surfaces: 57 MV/m and 104 mT respectively.

By the end of 2017, the two crab cavities will have been inserted into a specially designed cryomodule.

*(Continued on page 2)*

## A WORD FROM ECKHARD ELSSEN

### A FEAST OF PHYSICS AT THE WINTER CONFERENCES

This year's winter conferences are giving us a first glimpse of what the LHC's extraordinary performance in 2016 means for physics. We are now in the second week of the Moriond conference. Week one gave us a wealth of exciting new results in electroweak physics, and week two promises a feast of QCD.

*(Continued on page 2)*

## In this issue

<b>News</b>	<b>1</b>
First tests of crab cavities promise a luminous future	1
A word from Eckhard Elsen	2
EYETS report: a cool preparation for the LHC	3
Help us build a better CERN website	3
Computer Security: Stepping Up in User Education	4
New arrivals-March 2017	4
CERN: ideal for entrepreneurship, for those who take a leap	4
Hidden Figures into the light	5
<b>Announcements</b>	<b>5</b>
<b>Ombud's corner</b>	<b>8</b>



# A WORD FROM ECKHARD ELSEN

## A FEAST OF PHYSICS AT THE WINTER CONFERENCES

For me, the key message from Moriond is that we are really beginning to see how the large quantities of new data are extending the reach of LHC searches, while also bringing precision to our analyses of known physics. The LHC experiments are achieving the kind of precision at a hadron collider that once was only possible with an electron machine. This is a great tribute to the machine, the experiments and the computing infrastructure.

Hadrons are composite; the hard collisions occur between constituents, which only rarely carry a large share of energy of the hadron. This is why a large luminosity is needed to reach out to the highest collision energies. Maximising the number of collisions maximises the number of high-energy collisions, and that extends the energy reach. With the rich harvest of 2016 the experiments at the LHC have reached out much further in energy than ever before.

Exciting though this is, if there's new physics to be found in the 2016 data, it's likely to take some time to surface. It will not be like the discovery of BEH mechanism and the Higgs boson, which – as a relatively low mass particle by LHC standards – rapidly became apparent as soon as the collisions reached the energy needed to produce Higgs

particles. New physics will need a combination of more data, increasingly sophisticated analyses and sound theoretical understanding, and that takes time.

Nevertheless, Moriond is providing a very appetising entrée to run-two physics to follow the amuse-bouche of last summer's conferences. Highlights already presented include an updated measurement of the W particle mass from ATLAS's run one data, which now has similar precision to the world's best measurement. This shows how well the LHC collaborations understand their detectors, and how good they are becoming at extracting precise physics results and thus narrowing the phase space for new physics to hide. As an example of how well we are coming to know the Higgs particle, the CMS experiment's measurements of the Higgs coupling to top quarks is impressive, and both experiments are giving us a solid understanding of the quark content of protons, a key ingredient for all LHC analyses.

As an example of the elaborate experimental techniques now possible with the LHC experiments, I'd like to mention the LHCb's measurement of the extremely rare, few-per-billion-level, decay of the Bs meson to a pair of muons, for which now even the lifetime has been extracted. With more data, this contin-

ues to be a powerful probing ground for new physics.

Although not the main outlet for heavy-ion physics, the ALICE experiment is presenting results at Moriond QCD that underline the value of the end-of-year proton-proton and proton-lead runs. Comparison of the experimental signatures in all these constellations is contributing greatly to our understanding of the process of quark gluon deconfinement in the Quark Gluon Plasma, matter as it would have been just after the Big Bang.

This is just a snapshot of the plethora of new results being presented at Moriond, and you'll be able to learn more about some of them as they appear here on the CERN website as the conference progresses. As an idea of how bright the LHC future is, I'd like to leave you with this: at last year's summer conferences, run two analyses were based on the first glimpse from 15 inverse femtobarns of data. The Moriond analyses included 40 inverse femtobarns, with much more still to come. I for one can't wait for the main dish to be served as we proceed to the summer conferences.

*Eckhard Elsen  
Director for Research and Computing*

---

## FIRST TESTS OF CRAB CAVITIES PROMISE A LUMINOUS FUTURE

During the next year-end technical stop, the cryomodule will be installed in the Super Proton Synchrotron (SPS), where it will undergo validation tests with proton beams. This will be the first time that a crab cavity has ever been used for manipulating proton beams. In total, 16 crab cavities will

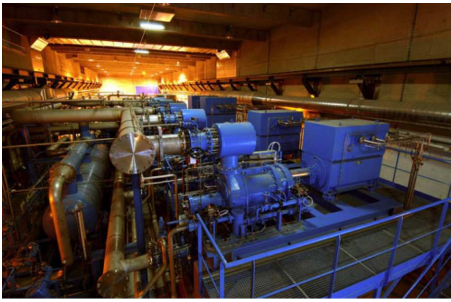
be installed in the High-Luminosity LHC – eight near ATLAS and eight near CMS.

“With the tests in the SPS, we want to make sure that the proton beams can be injected and accelerated and establish stable circulating proton beams with the crab cavities in operation. We want to manipulate

the parameters of the crab cavities like we would in the LHC,” explains Rama Calaga, the RF physicist behind the technology and currently leader of the crab cavity work package within the HL-LHC project.

*Iva Raynova*

# EYETS REPORT: A COOL PREPARATION FOR THE LHC



A typical helium compressor station in the LHC, enabling the delivery of 18 kW @ 4.5 K of cooling power (Image: CERN)

The Extended Year-End Technical stop (EYETS) this year is special for many reasons. One full sector of the LHC, sector 1-2 – the arc between point 1 (ATLAS) and point 2 (ALICE) – was warmed up to room temperature to allow the replacement of one of the 15-metre-long superconducting dipole magnets, which had exhibited abnormal behaviour on a few occasions during the 2016 physics run.

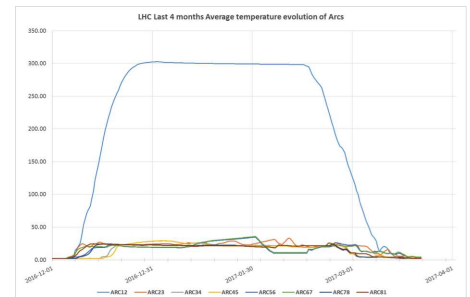
Also, at the beginning of the EYETS, just before the Christmas break, the LHC was emptied of its precious coolant, liquid helium. Most of the helium inventory (130 tonnes) in the LHC was removed from the tunnel and securely stored in CERN's surface premises, while a small fraction was stored at the helium suppliers' premises, to allow for a certain degree of operational flexibility. The temperature of the LHC magnets – except for those in sector 1-2 – was maintained at approximately 20

Kelvin (-253 degrees Celsius). The decision to keep the sectors at 20 Kelvin and remove the helium from the LHC tunnel was taken in order to secure the helium inventory from any major operational issue during the Christmas closure period.

Following the successful replacement of the dipole magnet in sector 1-2, the re-connection of all electrical and cryogenic services and the closure of the interconnections, pre-cooling of the sector started on Friday, 17 February. Sixty thermally insulated trucks transporting a total of 1200 tonnes of liquid nitrogen were required to complete this first cool-down phase and to reach a temperature of 80 Kelvin (-193 degrees Celsius) by Saturday, 4 March.

The re-filling of the arcs with liquid helium started about 1 week later and, if all goes according to schedule, the arcs will gradually become available for electrical quality assurance (ELQA) tests between 30 March and 3 April. These ELQA tests are co-ordinated by the Machine Protection and Electrical Integrity group (TE-MPE) within the Technology (TE) department. Powering tests will then follow, carried out by a collaboration of people from the Electrical Power Converters group (TE-EPC), the Machine Protection and Electrical Integrity group (TE-MPE) and the Operations group (BE-OP). The last phase before commissioning with beam is machine check-out, coordinated by BE-OP in close collaboration with all equipment and service groups.

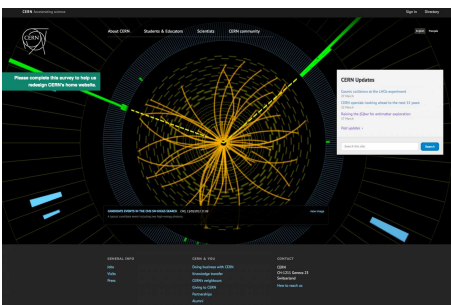
The next challenge for the cryo team is to measure the maximum thermal power they can charge to the beam screens, in order to cross-check the refrigeration performance of the system. Following the completion of these tests, operational activities will not diminish for the cryogenics team. With a foreseen increase in the number of bunches in the LHC and longer bunch trains coming from the SPS in 2017, more heat will be deposited in the cryogenics circuits: this will require further regulation adjustments and optimisation of the refrigeration power.



The average temperature evolution of the LHC arcs during the EYETS. Seven sectors were maintained at around 20 Kelvin, while sector 1-2 was warmed up to ambient temperature to allow the replacement of one dipole magnet. The vertical scale is the temperature in Kelvin and the horizontal scale is the date. The 8 sectors are represented by different colours. The warming up and cooling down of sector 1-2, in blue, is clearly visible.

Gerard Ferlin and Rende Steerenberg for the Cryo LHC Operations groups

## HELP US BUILD A BETTER CERN WEBSITE



Change is coming to CERN's website. Help us to decide what the new site should do, by filling in this short survey (Image: CERN)

You may, or may not, have heard that CERN is rebuilding its digital portfolio (a.k.a. the home.cern website, and the way all websites using the CERN theme look). The decision was made because our current website isn't doing what we need it to anymore and it already (despite only being five years old) looks dated. As the birthplace of the web we think CERN deserves something new!

The project was kicked off last month with an event hosted by Everis, the company helping us to build the new digital portfolio.

Everis have used what they learnt there to put together a short quiz to help us understand what people want from the CERN website, and how best we can get that information to them. Please share it with everyone you know. We'll be updating everyone about the web project processes in a blog, stay tuned for more information.

You can take the quiz here: <http://everis-exd.typeform.com/to/EYXuGv>

Harriet Jarlett



# COMPUTER SECURITY: STEPPING UP IN USER EDUCATION

Over the years, we have tried and succeeded in using a number of different methods to educate people on computer security problems and issues: posters, videos, courses, presentations, monthly reports, and Bulletin articles. We would now like to step up a level and introduce haptic feedback for unsecure user actions. Enter: the "Digital Feedback Keyboard" (DFK).

Today, using a computer does not come without risks. Browsing to the wrong webpage, opening a malicious attachment or downloading a bad plugin or software can quickly infect your computer, destroy its inherent defences and render you, your work, your data and subsequently CERN completely naked and unprotected (see for example "Drive Bye" or "One click and boom"). An attacker "owning" your computer in such a way also owns your computing account as, usually, such attackers install malware on your computer which will log any keystroke you make (including your account's password), enable your webcam and microphone to spy on you, search through your hard disk for juicy documents and, if there is nothing better, try to extort some money from you ("Ransomware-when it is too late...").

It is generally very difficult to spot those risky actions. "Stop, think, do not click!" does not always enter into our minds promptly. Hence, with these new DF keyboards, a user will get direct feedback from unsecure actions through a series of small electrodes integrated into the keys. These electrodes will distribute a short spike of a few volts for potentially dangerous actions like opening an infected attachment, typing your CERN password into a non-CERN-owned webpage or browsing to a malicious webpage. Higher voltages can be expected when opening applications which directly violate CERN's Computing Rules or are illegal, such as software using pirated licenses ("Do you have 30 kCHF pocket money?") or violating copyright ("Protect CERN — Respect Copyrights"). After a while, such electric feedback will help you subconsciously to practice "Stop, think, do not click!". "It is basically like teaching cows not to touch the fence by using electric wires," says Chris Lloyd from the IT procurement team.

A first pilot phase will start on 1 April, with about 100 users randomly selected from among all members of the personnel. As other CERN services have already

expressed their interest for their particular use cases (e.g. for eLearning, MERIT appraisals, expensive purchasing), the pilot might quickly be expanded throughout CERN. The CERN procurement team and IT department are currently investigating how to efficiently roll out and distribute DF keyboards to every single user. If you prefer not to join this pilot phase for now, just start to practice "Stop, think, do not click!" now. Please beware of strange e-mails sent to you — learn how to identify malicious e-mails — and do not click on random links just because you find them appealing. Better think first and refrain from clicking.

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

*The Computer Security Team*

---

## NEW ARRIVALS-MARCH 2017



On Tuesday 21 March 2017, recently-recruited staff members and fellows participated in a session in the framework of the Induction Programme. (Image: S. Bennett/CERN)

*HR Department*

---

## CERN: IDEAL FOR ENTREPRENEURSHIP, FOR THOSE WHO TAKE A LEAP



*Entrepreneurship students brainstorming potential applications for CERN technologies during the NTNU Screening Week in 2016. (Image: Sophia Elizabeth Bennett/CERN)*

A hub for top-notch scientists, engineers and professionals from all corners of the world, CERN is an ideal place to explore and get started new business ideas, to discover exciting technologies and to build a skilled, diverse start-up team. Creating platforms where people can meet is an important part of facilitating entrepreneurship

here at CERN, and through initiatives such as THE Port, Challenge Based Innovation (CBI), the Entrepreneurship Meet-ups and the Knowledge Transfer seminars, future change-makers meet and opportunities are created.

Many incredible start-ups have already been founded thanks to those initiatives. Read about them here (<http://home.cern/about/updates/2017/03/cern-ideal-entrepreneurship-those-who-take-leap>).

---

## HIDDEN FIGURES INTO THE LIGHT



*Maite Barroso Lopez, Andry Rakotozafindrabe, Stéphanie Beauceron and Anne-Marie Magnan (from left to right) shared their experiences in a debate moderated by the science journalist Tania Chytil at the advanced screening of the movie Hidden Figure.*

On Thursday, 2 March, Pathé cinema at Balexert, in collaboration with 20<sup>th</sup> Century Fox and CERN, hosted an advanced screening of the movie *Hidden Figures*, followed by a debate on the position of women in science.

The film tells the story of three African-American female scientists who played key roles in the United States' space conquest,

contributing in particular to the preparations for putting astronaut John Glenn into orbit. African-American Ayana Arce (ATLAS) contributed to the event via a recorded interview that was shown before the film. After the film, Maite Barroso Lopez (IT department), Stéphanie Beauceron (CMS), Anne-Marie Magnan (CMS) and Andry Rakotozafindrabe (ALICE) shared their experiences and their visions with the audience in a debate moderated by science journalist Tania Chytil.

They answered questions about the alleged rivalry amongst women, about whether there is a link between CERN and NASA as pictured in the film, and about their mentors. They also recalled awkward situations in their careers. For example, one day, when visiting CMS with Stéphanie Beauceron, a journalist asked the press officer accompanying them when she would meet the CMS physicist for the interview, even though she had actually been talking to her – yes, her – for the past hour. Another time, a thesis supervisor scrutinised Anne-Marie Magnan and claimed that “being a woman and being

short, you will never make it”. Women's toilets can also be tricky to find, since in some buildings they are on a different level – or not there at all, as experienced by Andry Rakotozafindrabe. Unsurprisingly, the key conclusion of the evening was that mentors, parents, teachers and thesis supervisors all play a big role in many decisions. Yet in all cases, the members of the panel unanimously agreed that female students should never give up their dream of pursuing a career in science or technology. The good attendance at this event is a sign that the general public is definitely interested in such topics. Approximately half of the audience stayed for the post-film debate.

Maite Barroso Lopez and Anne-Marie Magnan were also interviewed by cinema journalist Raphaële Bouchet from RTS for a podcast, available here (<https://www.rts.ch/play/radio/vertigo/audio/cinema-les-figures-de-lombre-vu-par-deux-chercheuses?id=8413519>) (in French). (Image: Clara Nellist)

*Laurianne Trimoulla*

## Announcements

### 5 APRIL | BLOOD DONATION

#### BLOOD DONATION

Wednesday 5 April 2017

from 9.00 to 17.00 - CERN, Restaurant n°2 (Build. 504)

After the donation: snack offered by NOVAE and the HUG

[www.dondusang.ch](http://www.dondusang.ch)  
GIVE BLOOD - ONE DAY YOUR LIFE MIGHT DEPEND ON IT



## NEW NUMBER TO MAKE EXTERNAL CALLS FROM FIXED LINES-79999

This number is available for users occasionally calling outside CERN for professional or personal purposes. It replaces 76111 for this service. In order to use the service, you can call 79999 from **any fixed line** at CERN (including conference rooms or telephones not belonging to you), follow the instructions and your call will be transferred providing you have a valid budget code associated to your CERN identification number.

Paid members of the personnel holding a contract of three months or more can also use the 79999 to make occasional private calls (the expenses can be deducted from their monthly salary). Please, remember the use of this service is governed by the Operational Circular N°5 (OC5).

### NOTES:

*In order to call externally from your CERN mobile phone, you must fill this EDH form (<https://edh.cern.ch/Document/General/GSM>) . The 79999 only accepts calls from CERN landlines. Users who regularly call external numbers from a landline can obtain the rights to do so via this EDH request (<https://edh.cern.ch/Document/PhoneRequest>) in agreement with their management.*

## MAINTENANCE OF THE CERN TELEPHONE EXCHANGES

Maintenance work will be carried out overnight on the CERN telephone exchanges on **05 April between 8 p.m. and 2 a.m.**

During this intervention, the fixed telephone services may be disrupted. It includes the red phones communications (the fire brigade will receive an alarm even if there is no voice) and the telephone of the elevators.

The CCC (72201) and the Fire Brigade (74444 and 74848) landline numbers will remain reachable at any time.

Mobile telephony services (GSM) will not be affected by the maintenance work.

## ITALY AT CERN 2017: COLLABORATION ITALIAN INDUSTRY-CERN

We are pleased to announce that 40 Italian companies will be hosting stands in CERN's Main Building from 5 to 7 April for the 2017 "Italy at CERN" exhibition. A detailed programme of the exhibition, including the side events scheduled, is available at: [www.italy-at-cern.org](http://www.italy-at-cern.org). CERN staff, users and visitors are invited to drop in and meet the firms' representatives, who will be there to provide information about their products and services, to learn about challenging new customer requirements and

to discuss new opportunities for collaboration. Individual meetings with the companies can also be booked in advance by following the instructions on the website. We invite you to go to [www.italy-at-cern.org](http://www.italy-at-cern.org) to discover the Italian companies participating. Then register and book meetings with the companies' representatives using the service that has been setup for you.

*In the context of the exhibition "Italy at CERN", Prof. Gian Giudice, Head*

*of CERN's Theory Department, will give a special seminar on: "The transformation of Matter and Energy in the Universe: open questions that motivate and make it fascinating the research work at CERN" (in Italian) in the CERN Council Chamber (503/1-001) on Thursday 6 April 2017 from 18h10 – 18h50 .*

*The CERN ILO for Italy*

## 5 APRIL-8:00 P.M. | CONCERT BY THE BEL CANTO ENSEMBLE

**BEL CANTO ENSEMBLE**  
ROSARIA BUSCEMI soprano IVAN NARDELLI flute ANTONIO ARCURI clarinet  
MASSIMO CELIBERTO horn ALESSANDRO VUONO piano  
with the participation of MICHELE BRUNO bass  
music by Gioacchino ROSSINI Gaetano DONIZETTI Giuseppe VERDI

**AMPHITHÉÂTRE DU CERN**  
Conseil Européen pour la Recherche Nucléaire (Building 31 - Route de Meyrin - Genève)

wednesday  
**APRIL 5th 2017 at 8:00 pm**  
FREE ADMISSION

## 21-25 AUGUST 2017: ACAT 2017 INTERNATIONAL WORKSHOP

The 18th International Workshop on Advanced Computing and Analysis Techniques in Physics Research (<https://indico.cern.ch/event/567550/>) (ACAT 2017) will take place in Seattle at the University of Washington between 21 and 25 August 2017. We hope to see you there! The 18th edition of ACAT aims, once again, to bring together computational experts from a wide range of disciplines including particle and nuclear physics, astronomy and astrophysics, and accelerator science to explore and confront the boundaries of computing, of automated data analysis as well as theoretical calculation technolo-

gies. It will create a forum for exchanging ideas among the fields and will explore and promote cutting-edge computing, data analysis and theoretical calculation technologies in fundamental physics research.

There is a lot going on in physics research right now. Cloud computing is becoming very cheap, machine learning algorithms are exploding, GPU usage is becoming commonplace and easily accessible. We are firmly in the era of parallel processing and adapting to the world of high performance computing. Planning for computing for LHC's next run is well underway. The

LSST project will commence data taking soon. A HEP software foundation is getting its feet off the ground. We hope you'll join us, and perhaps considering submitting an abstract, discussing many of these topics in August in Seattle!

Subscribe to ACAT notifications here: <http://eepurl.com/coVGcf> (MailChimp site). More information here ([http://us14.campaign-archive1.com/?u=cefb4fbe69c39878d1ef6b8e4&id=b04330a405&e=\[UNIQID<http://us14.campaign-archive1.com/?u=cefb4fbe69c39878d1ef6b8e4&id=b04330a405&e=%5bUNIQID>\].](http://us14.campaign-archive1.com/?u=cefb4fbe69c39878d1ef6b8e4&id=b04330a405&e=[UNIQID<http://us14.campaign-archive1.com/?u=cefb4fbe69c39878d1ef6b8e4&id=b04330a405&e=%5bUNIQID>].)

---

## THE TELECOM LAB IS MOVING TO BUILDING 600

As of 1st April 2017, the Telecom Lab will move to the Building **600/R-010**, close by restaurant 2 and the data centre. It will be open from **8:30 a.m. to 5:30 p.m.** non-stop, from Monday to Friday. The Telecom Lab is the central point for all

support questions regarding CERN mobile phone services (provision of SIM cards, requests for modifications of subscriptions, diagnostics for mobile phone problems, etc.). New location: **Building 600/R-010**. Contact number: **77777 (Service Desk)**.

Email address: **labo.telecom@cern.ch**. CERN Service Portal: Mobile Phone Service. Webpage: <https://cern.ch/mobile-telephony>

IT/CS group

---

## THE 40TH CERN SCHOOL OF COMPUTING GOES TO SPAIN: APPLY NOW!



Applications are now open for CERN's 40<sup>th</sup> School of Computing. The CSC 2017 (<https://indico.cern.ch/event/581756/>) will take place from 27 August to 9 September 2017 in Madrid, Spain, in collaboration with the Universidad Politécnica de Madrid (UPM). The two-week programme consists

of more than 50 hours of lectures and hands-on exercises, all in advanced, interesting and challenging computing topics. It covers three main themes: data technologies, base technologies and physics computing. In particular, we will explore: Many-core performance optimization, key aspects of multi-threading, writing code for tomorrow's hardware, today and more.

The CSC is not a conference but a true summer university. As with every summer CSC, the programme is audited by the hosting university (UPM), and this year we are aiming to deliver 6 ECTS credits upon successful completion of the CSC exam.

However it's not all study; the social and sporting programme is also a vital part of the School. Madrid is famous for its culture, sports and cuisine, which we will be exploring together over the course of the School! The CSC 2017 school is aimed at postgraduate engineers or scientists, working at CERN or at other research institutes, with experience in particle physics, in computing or in related fields. We welcome applications from all nationalities, and encourage all qualified persons to apply! **Apply now at: [www.cern.ch/csc](http://www.cern.ch/csc). The deadline is 10 May – places are limited!**

Sebastian Lopienski



## A SOUVENIR LIKE NO OTHER



(Image: S. Bennet/CERN)

There was a time when you had to choose between buying a souvenir and making a donation for a good cause. But now, you can do both. At the CERN shop, you can buy an **authentic LHC data tape**, and support young talent, all in one go. In 2012, the LHC experiments stored data on such tapes during their search for the Higgs boson. Now, these authentic tapes are available as souvenirs at the CERN shop with a **contribution of 10 CHF or more**. 100% of your donation will go directly in support of CERN & Society projects. Each tape

is unique and contains 30 minutes of data taking of around 600'000 proton-proton collision events at 8 TeV. Perhaps, even a Higgs boson event. So, what are you waiting for? Don't forget your LHC Tape and make a difference today.

*For more information, visit the CERN & Society website and subscribe to the CERN & Society newsletter.*

*CERN Society*

## Ombud's corner

### WATCH OUT FOR THOSE WARNING SIGNALS!

Have you ever found yourself listening to someone and, although all the words make absolute sense, you have the feeling that something is not quite the way it sounds? Without being able to put your finger on exactly what is causing the doubt, you start to question their motives in your mind, and recognise a growing feeling of being manipulated.

Manipulative behaviour comes in many forms, it may be disguised as helplessness, good intentions or simply working for the good of the team, and if it is not managed correctly, it can lead to an extremely toxic work environment. It differs from healthy interpersonal influence in one critical aspect – the actual aims or objectives underlying the actions are either obscure or different from their stated purpose – and therefore it may take some time before we realise that we have been misled.

*Eric noticed that his colleague Pierre always challenged his interventions at meetings. When he took him aside to tackle the issue, he was surprised to learn that Pierre felt that the project leadership was turning a blind eye to Eric's needs and that, con-*

*trary to appearances, Pierre's comments aimed to underline the difficulties that Eric faced in order to ensure they were taken into account. Eric accepted this explanation and chose to ignore the persistent, gnawing feeling of being under personal attack. However, as the weeks went by, he found he had less and less support from his colleagues, until one day his group leader informed him that the project was to take a strategic change of direction and would henceforth be led by Pierre.*

When we realise that we have fallen prey to manipulative behaviour, it is often too late to take action against it, because we have actually unconsciously been collaborating with it by allowing it to continue unchallenged for too long. It leaves us feeling angry at the injustice of the situation, whilst at the same time confused or angry with ourselves for having ignored the warning signals from our gut feelings. Research shows that, far from being arbitrary, our gut feelings are based on our own antennae picking up on the minute incongruities between verbal and non-verbal behaviour that warn us that something is not quite right, and as such we should be attentive to how we choose to interpret and react to it.

One way to address such situations is by asking direct questions in order to try to get to the bottom of it.

*"I appreciate your support in wishing to ensure that these difficulties are taken into account – but I feel that there is more going on here. Can we talk about your concerns to see how we can address them together?"*

Such an approach may encourage the other person to reveal their real motives – such as a need for more personal visibility or technical recognition – both of which can only be addressed if allowed to surface.

On the other hand, of course, the other person may choose to stick to the initial position, and not admit any other motive, in which case we can only accept what they say. Nonetheless, in this case, it is advisable to be attentive to our inner warning signals and remain extremely vigilant in all further interactions.

*Sudeshna Datta Cockerill*