CERN Bulletin

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THE MICROSCOPE THAT DIGS DEEP FOR ANSWERS

The microscope is located in a climate-controlled room in order to maintain a constant temperature and humidity and to minimise vibrations induced by noise. A Faraday cage is also used to reduce the influence of neighbouring magnetic fields. (Image: CERN)

XB540 – it may look like the code name of a secret agent, but in fact it is a scientific tool used for nanoscale investigations at CERN. For the past year, this extraordinary machine – a focused ion beam scanning electron microscope (FIB-SEM) – has been digging beneath the surface to answer some long-standing questions in material science.

The XB540 FIB-SEM is an electron microscope and a 3D nano-machining workstation in one. While the high-resolution-scanning electron column can identify features as small as one millionth of a millimetre (10^{-9} m), or just about the size of ten atoms, it only shows the surface of a sample. The additional FIB column, on the other hand, uses an ion beam to cut through the matter and gives an insight into what lies underneath.

The machine makes 3D reconstructions of regions of interest in a process that resembles conventional tomography. The ion beam sequentially removes nanoscale slices of the material and an image of every new layer is made. Combining thousands of these images results in a precise 3D reconstruction of the internal structure of a sample.

"There was a real need for this microscope. It helps us understand phenomena that otherwise would have remained unexplained, either because of difficulties in preparation of the sample or due to limited resolution," says Stefano Sgobba from the Engineering department, leader of the Materials, Metrology and NDT section managing the scanning electron microscopy laboratory.

(Continued on page 2)

A WORD FROM CHARLOTTE LINDBERG WARAKAULLE

CERN - FULLY ENGAGED WITH THE SUSTAINABLE DEVELOPMENT GOALS

At the end of 2012, CERN became an Observer to the United Nations General Assembly. This was an important move designed to allow CERN to offer the General Assembly and the United Nations family the benefit of its scientific expertise with a view to promoting the essential role of basic science for peace and development.

(Continued on page 2)

In this issue

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A WORD FROM CHARLOTTE LINDBERG WARAKAULLE

CERN - FULLY ENGAGED WITH THE SUSTAINABLE DEVELOPMENT GOALS

In September 2015, the UN adopted the 2030 agenda for sustainable development, based around a set of 17 Sustainable Development Goals – the SDGs. They represent the most comprehensive set of shared goals that the international community has ever set for itself, and will serve as the overarching roadmap for the entire international system for the coming decades.

The SDGs are ambitious; the UN's goals have always been so, and history shows that that ambition has paid off. Over the decades, the UN development goals have kept a range of critical challenges in the spotlight, and they have made a real difference to millions of people's lives. To cite just one example, over the timeframe of the last cycle (2000-2015), the Millennium Development Goals, the percentage of people in developing regions surviving on under $1.25 per day fell from 50% to 14% – a fantastic accomplishment, though there's still much to be done.

So what are the SDGs, and what have they got to do with CERN? There's no short answer to the first of those questions; within the 17 SDGs, which range from eliminating poverty and hunger to promoting peace and justice through strong institutions, there are some 169 targets to be achieved, all of them described in detail on the UN website. The second question is easy: CERN is already engaged in support of the SDGs.

Just by carrying out our core mission, CERN contributes globally to five of the 17 SDGs. Goal number three aims to ensure health and well-being. This is an area that particle acceleration and detection technologies have been contributing to for decades through applications such as medical scanners and accelerators for hadron therapy. Goal four is about universal access to education, a mission very close to our hearts at CERN. We run educational programmes, formal and informal, for students and educators from around the world, and we inspire new generations to take up careers in STEM subjects through our guided visits. Goal nine promotes innovation, which we cover with our knowledge transfer activities and the growing number of business incubation centres, the CERN BICs, in our Member States. Goal 16 seeks to promote peaceful and inclusive societies, which is not only in our DNA at CERN, but also in our governing convention. Finally, goal 17 aims to strengthen the means of implementation of the preceding 16 goals by revitalising the global partnership for sustainable development. Here, we could be a template: CERN is a model for global cooperation in science, which continues to inspire and provide practical guidance in different areas of science and in other regions.

The SDGs can also be seen as a positive driver to set internal goals in the everyday life of countries or international organisations, with clear targets on gender (goal five), water management (goal six), sustainable energy (goal seven) or land protection (goal 15), to mention just a few.

With over 30 international organisations, some 400 non-governmental organisations and more than 250 permanent missions and delegations, International Geneva is the operational centre of the international system, and therefore has a particularly important role to play in the implementation of the SDGs. New ways of working together are being found to enable this reservoir of know-how and practical experience to take forward the SDGs. And CERN is working with many partners – both organisations with which we have enjoyed a long-standing cooperation and new entities such as the SDG Lab – to enable our expertise to serve this global agenda.

Later this year, many of these organisations will come together to show how International Geneva contributes to the SDGs, and you'll have a chance to learn more about the SDGs and how CERN contributes to them. On 7 October, the *Palais des Nations* will open its doors to the world for the UN Geneva Office's 2017 Open Day, and CERN will be there. Do come along with family and friends. It promises to be a fascinating day with much to do and learn. Better still, volunteer to help staff the CERN stand, and take CERN's messages about the importance of basic science and education to the world.

Charlotte Lindberg Warakaulle
Director for International Relations

THE MICROSCOPE THAT DIGS DEEP FOR ANSWERS

So far studies have been done on a diverse range of samples, including thin films, pressure vessels, structural materials, bulk assemblies, electrical components, insulating materials and beam-interaction samples.

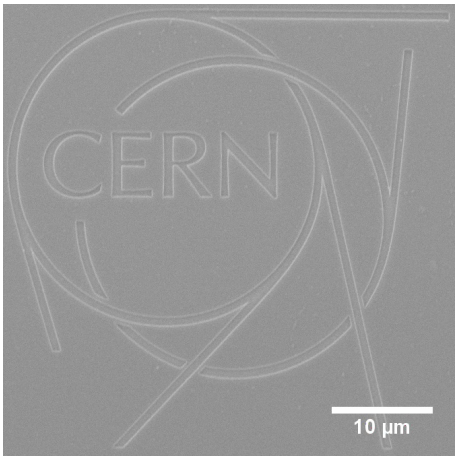
The thin film experts from the Vacuum, Surfaces and Coatings group have been among the first to put the results to use. "For a long time, they wanted to associate different production parameters with the impact they have on the film. Up until now it has been very difficult to quantify this behaviour. They produced multiple samples with different parameters and we gave them an insight into the microstructure, the thickness and the porosity of each of them. Thanks to this information, they now know more about which production parameters are the most suitable," explains Alexander Lunt, who is responsible for managing and operating the FIB-SEM laboratory.

In addition to its milling and imaging functions, the microscope was also designed to perform different analysis techniques like elemental characterisation. Designated detectors inside are able to identify the elemental composition of the sample. "We know precisely what the material is made of, with very high resolution," says Floriane Léaux, who is responsible for electronic microscopy activity at CERN.

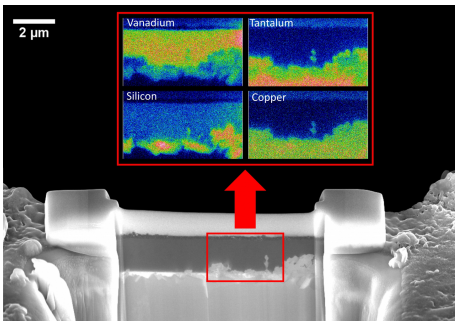
Another analysis technique is the production of a lamella – a small slice of the material, less than 200 nanometres thick. It allows the researchers to look through the sample at a resolution of 0.9 nanometres. "In a lamella we can see a plane of atoms that have become misaligned in the crystal and have formed a dislocation. This tells us what has to be optimised in the production technology to improve the final product," explains Alexander.

The Mechanical and Materials Engineering group drew up a specification and procured the FIB-SEM with support from other CERN departments and the Accelerator Consolidation project. Stefano adds: "We would like to thank everybody who supported us in this achievement. This situation clearly shows that there is a single unified community at CERN working to reach our specific scientific goals."

Elemental distribution inside a heat treated stainless steel weld. The video shows the elemental distribution of three different elements – Molybdenum (red), Manganese (green) and Chromium (blue) – within a 20 µm × 20 µm × 20 µm region of a heat treated stainless steel weld. This data has been collected using the FIB-SEM microscope and an elemental characterisation analysis technique called Energy Dispersive X-ray Spectroscopy. High resolution (75 nm) mapping is necessary to gain insight into the distribution of regions with distinct elemental composition (phases), which are shown in purple (sigma) and yellow (delta ferrite) in the video. These features have important implications for the toughness and the magnetic properties of the weld, especially at cryogenic temperatures. The video shows the individual slices which were collected in a direction perpendicular to the weld bead direction, followed by a 3D representation of the volume. (Video: Alexander Lunt/CERN)



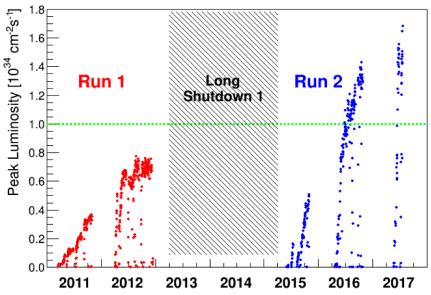
The CERN logo at the microscale. The microscope's ion beam milling capabilities have been used to reproduce the CERN logo on a silicon wafer at a milling depth of 50 nm. (Image: Alexander Lunt/CERN)



Nanoscale resolution elemental mapping in a thin cross section of a V3Si superconducting thin film. Ion milling can be used to generate thin (less than 200 nm) cross sections of regions of interest in order to enable high resolution elemental mapping. In this study, the suitability of a tantalum barrier coating between a copper substrate and a superconducting film was assessed and was determined to be unsuitable due to the diffusion observed. (Image: Alexander Lunt/CERN)

Iva Raynova

LHC REPORT: BACK ON TRACK



Evolution of the LHC peak luminosity over the past seven years. The green dotted line is the design luminosity.

A new LHC luminosity record was established in the middle of July, just two weeks after the first fill with 2556 bunches delivered luminosity to the four experiments on 28 June. This record was achieved in spite of some anomalous losses observed while ramping up the beam intensity.

Following the re-commissioning of the LHC with beam in May, the number of bunches circulating in each beam was progressively increased during an intensity ramp-up, culminating on 28 June when two beams, each with 2556 bunches, collided. However, as the intensity was increased, unexpected losses were observed for both beams in a number of fills near a magnet interconnection in the arc between ATLAS and ALICE, eventually leading to beam dumps. The presence of nuclei in the passage of the beam, most likely in the form of a gas, could be a possible explanation for such localised beam losses. Verifications of the vacuum chamber aperture at injection did not reveal any obstacles.

In the past, LHC operation has been affected significantly by events nicknamed UFOs (Unidentified Flying Objects), which are now believed to be due to dust particles of around ten micrometres in diameter that fly into the beam. The resulting interactions between the beam protons and the dust particle nuclei are able to generate losses, resulting in quenching of the LHC superconducting magnets when the dust particles are large enough. In most cases, the beam loss monitors installed around the circumference of the LHC detect the losses before a quench occurs and dump the beam preventively. In previous years, up to around 20 LHC fills were lost per year due to large UFOs. Fortunately the rate

of UFO events is decreasing steadily and their impact on operations is diminishing.

After the first long shutdown in 2015, an object given the nickname ULO (Unidentified Lying Object) was detected. This object is lying on the bottom of the beam two vacuum chamber between LHCb and ATLAS. Fortunately the vacuum chamber is sufficiently large and the ULO sufficiently small that the steering magnets can be used to 'bump' the beam around the ULO. With this measure in place, the ULO does not affect LHC operation even at the highest intensities.

The newly observed losses share some similarities with UFOs and the ULO, but the exact mechanism is not yet understood. Data on beam observables are collected parasitically to physics operation to characterise the losses and define mitigations. In the week of 20 July, it was observed that the introduction of a sufficiently large magnetic field in a nearby steering dipole mitigates the losses. This technique is currently being applied to provide stable physics production in the presence of this effect. Despite this issue, a new LHC luminosity record was set at 1.67×10^{34} $cm^{-2}s^{-1}$ in the second week of July.

The three days from Wednesday, 26 July to Friday, 28 July were dedicated to measuring the absolute scale of the luminosity at 13 TeV. The luminosity of a collider is a very important parameter because the precision obtained in measuring the production cross-section of a given physics process depends critically on the accuracy with which the luminosity is known. Luminosity is also the usual figure used to benchmark the efficiency of the collider's operation.

Special beam optics and parameters are necessary to perform this task; both are tailored to obtain the smallest possible uncertainty in the measurement. The method was pioneered by Simon van der Meer in 1968 at CERN's Intersecting Storage Rings. The inelastic proton-proton collision rate is monitored by dedicated luminosity detectors at the experiments as the beams are moved across each other, first in the horizontal and then in the vertical direction. This "VdM scan" provides a measurement of the beam-overlap area, which is proportional to the transverse beam size, the first ingredient needed to solve the luminosity equation. The second main ingredient is the simultaneous precision measurement of the bunch currents, which is performed using various devices from the machine and the experiments. This information, combined with the total number of bunches per beam, provides a direct calibration of the experiment's luminosity detectors. Following a day of preparation, two fills lasting between 8 and 14 hours were dedicated to these "VdM" scans at each experiment.

Jorg Wenninger for the Operations group

INAUGURATION OF THE SECOND CERN NETWORK HUB

The second CERN network hub, located near the CERN Control Centre in Prévessin, was inaugurated on 19 July 2017 (Image: Sophia Bennett)

The day-to-day operation of CERN is heavily reliant on IT services and preventing their potential long-term interruption is hence crucial. To this end, a project to create a second network hub was approved in 2014 and, three years later, building 773 has been handed over to the IT and EN departments. Its inauguration took place on 19 July 2017 in the presence of the CERN Director-General Fabiola Gianotti, the Director for Research and Computing Eckhard Elsen, the Engineering department head Roberto Losito, the Information Technology department head Frédéric Hemmer as well as many of the people involved in the project. Located close to the CERN Control Centre in Prévessin, the building houses a computing room for IT equipment, a storage room, a fibre room operated by EN/EL, and a main cooling room relying on cost effective and very energy efficient technologies. Building 924 close by provides additional technical rooms such as electrical rooms as well as a cooling room.

Internal and external network communications are essential for CERN – imagine a day without access to email or the web! – and used to rely heavily on equipment and fibre concentrated in building 513.

This second network hub, with fibre connectivity to the outside world, the CERN data centre and its extension in the Wigner Research Centre for Physics in Hungary, the CERN Control Centre, as well as all the major star-points, provides redundancy for the CERN data network. Henceforth, should there be any major incident in the CERN data centre, CERN network connections will continue to work. This project required extensive work, planning and coordination: many thanks to all the departments and services that contributed to its completion!

Mélissa Gaillard

COMP. SECURITY: THE INTERNET OF THINGS: THE WALLS HAVE EARS

Having “intelligent” devices at home is nothing really new. Aren’t our washing machines, robot vacuum cleaners, coffee machines, etc. all sufficiently smart to serve our needs? Apparently not, as the consumer electronics market is now going full steam towards the “Internet-of-Things” (IoT): home appliances that are fully interconnected and, by using central cloud service computing power, able to help you improve your life. Seriously?

To give you a few examples of what I mean: the thermostats developed by Google build up a complete home automation system to manage the temperature of every room. They learn your daily room usage so that you don’t even have to adjust the temperature settings anymore. Some “smart” thermometers easily surpass standard healthcare thermometers, as do smart toasters: control them via a smartphone app, share your settings with friends, upload information to Facebook, etc. The new generation of voice-controlled intelligent personal assistants come with a webcam that allows you to rate your outfit. For the best hairstyle ever, a smart hairbrush can optimise your look, taking weather reports, i.e. humidity and temperature, into account!

So what could go wrong? With the advent of the IoT at home, “privacy” is at stake:

- Some Smart TVs are able to use voice recognition to listen to what is happening in your living room;
- The manufacturer of the most famous doll in the world had a similar idea with its latest doll, but this was badly received by privacy advocates;
- Once, a smart voice-controlled smart assistant even created some unwanted online orders when a TV news anchor said “Alexa, buy me a doll house”. The voice-activated assistant Alexa simply complied... Data registered by a smart assistant have even been subject to a legal case where “Alexa” might have been a witness to a murder and recorded everything that happened. Similarly, do not commit a crime if you happen to be wearing a fitness wristband – it might be used against you;

... and this list is not exhaustive.

In addition, from the "security" perspective, readers of the CERN Bulletin might recall "IoTs: The Treasure Trove at CERN", outlining a few security risks related to such devices that are part of the Internet-of-Things, and there are many more examples. In October 2016, the Mirai botnet affected close to a million customers of Deutsche Telekom by misusing poorly secured IoT devices. However, it will be much more difficult to keep all those devices up-to-date, so broader protection, like your wireless access router at home, or CERN’s outer perimeter firewall, once again become the last and only line of defence... So, we have interesting times ahead. How much "security" and "privacy" are we prepared to trade for more convenience?

It is up to you to make a conscious choice as to how much "privacy" you want to hand over to companies. Check whether you can control which aspects of your personal data you want to expose. When it comes to "security", don’t expect too much. As shown by our treasure trove tests, but also by many other reports like those from the last "BlackHat" conference, IoT devices cannot be expected to be secure. The important thing is that, as much as at CERN, your personal firewall at home (usually part of your wireless access point and router) is fully locked down so that no incoming traffic can try to exploit your devices.

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

HARDRONIC 2017: A SUCCESS

Around 500 people attended the Hardronic Festival 2017 (Image: Noemí Caraban Gonzalez/CERN)

The Hardronic Festival 2017 is over and it has been a very successful 26th edition. Eleven of the finest CERN bands offered their best throughout the day to an enthusiast crowd (peaking at around 500 people). The MaNaGe DJs closed the party after midnight, bidding farewell until 2018 with an energetic set.

Thanks to a great collective effort and with really good weather, it has been a wonderful evening* that gave an opportunity to many *cernois* to enjoy a great time among colleagues, family and friends onsite, while also supporting a charity fundraise at the food and drinks stands.

The organization would like to thank everybody that took part in the organization of the festival, one way or the other, CERN Management, the Staff Association, plus our sponsors and supporters. You can find a complete thank-you-all statement on the Hardronic website.

**Of course, nothing is perfect, so if you would like to make any complaints or suggestions, please send an e-mail to contact-hardronic@cern.ch and the organization will do its best to make next year’s an even better edition.*

Daniel Vazquez Rivera

POTATO POWERED COSMOS

UK artist Rachael Nee has been working with international teachers on the CERN High School Teacher programme to develop the Potato Powered Cosmos, an art-meets-science installation that demonstrates how CERN works, but not as you might expect.

"This is CERN," says Rachael pointing to 25kg of parboiled potatoes, sliced and sandwiched between thin sheets of zinc and copper held together by elastic bands, wired in series to make an energy source, and connected to a theremin and loud speaker. There's a camera suspended above the speaker, connected to a screen. "It represents CERN as an interrelated system of experiment, machine, energy and people," she explains.

Essentially, the voltage created by the potatoes is connected to the speaker which converts the electrical energy into kinetic energy through the vibrations. By covering the speaker with a sheet of latex and some water, you can see the vibrations as movement on the surface of the water. As the voltage changes, the interference pattern on the water changes.

And that's where the theremin comes in. By moving your hand around the wand of the theremin, you can change the voltage, simultaneously creating a change in the frequency of the sound from the instrument and the interference pattern on the water. The camera records the changes and the screen enables you to view the pattern.

Rachael and her teacher colleagues have set the experiment up in one of CERN's main thoroughfares. Throughout the day it attracts a steady stream of curious passers-by.

"Nothing happens unless someone interacts with the theremin," explains Rachael. "It's that same at CERN; nothing would happen without the people."

Rachael and her teacher colleagues have prepared a comprehensive guide for other art and science teachers to set up the installation in their own schools. It's intended to be an interdisciplinary spark for curious minds.

Of course, there's some serious science underpinning the artistic concept, but it's also great fun; who knew that watching a group of physicists attempting to play Twinkle, Twinkle, Little Star on a theremin could be so entertaining?

The project is part of the Art@CMS programme.

Stephanie Hills

Official communications

CERN HEALTH INSURANCE SCHEME (CHIS): NEW RULES AS OF 1 SEPTEMBER 2017

Further to the official communication on 12 July 2017, please note that a corrected version of the CHIS Rules, dated 31 July 2017 on the cover, has been released and replaces the previous one. The correction concerns the text of Article VII 3.02, paragraph 1, first bullet (page 25) and Annex I, item B.8 (page 43).

If you obtained a copy of the CHIS Rules before 31 July 2017, please discard it and obtain a new copy.

USE OF THE GLOBE CAR PARK

The flagpole car park has been permanently closed since work on the *Esplanade des Particules* started in April 2017.

Options for parking near CERN's Reception area are therefore limited, especially for the many people visiting the permanent exhibitions, taking guided tours and attending public events in the Globe, who have no alternative but to use the Globe car park.

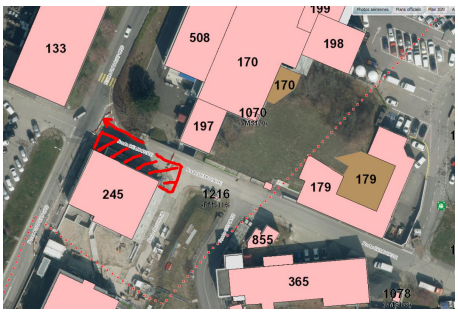
Over the last few weeks, we have noticed an increase in the number of people using the Globe car park as a long-stay car park – a use that is unacceptable but unfortunately not new.

As a reminder, members of the personnel undertaking duty travel lasting more than five consecutive working days can obtain authorisation for the long-term parking of their private vehicle in one of the three car parks reserved for this purpose (see the procedure in the Admin e-Guide). The Globe car park is not one of those three car parks and therefore must not, under any circumstances, be used for long stays.

CERN kindly asks the users of the Globe car park to respect these rules.

Announcements

10-11 AUGUST: ACCESS TO ROUTE DEMOCRITE MODIFIED



Due to works on building 245, the route DEMOCRITE will not be accessible from route RUTHERFORD Thursday 10 August and Friday 11 August.

Thank you for your understanding.

SMB Department

TACKLING TOMORROW'S ICT CHALLENGES TODAY

CERN openlab's new white paper on future ICT challenges will be published at the Open Day on 21 September.

CERN openlab is organising an open day on 21 September 2017 — everyone is welcome! Come and learn about our work: collaborating with leading ICT companies and research institutes to accelerate the development of cutting-edge solutions for the worldwide LHC community — as well as for wider scientific research.

As CERN openlab's current three-year phase comes to a close, discover the technical highlights from our diverse range of projects. And find out more about future ICT challenges we aim to tackle too! The event will see the launch of the new CERN openlab white paper on future ICT challenges: this is the culmination of a process of deep consultation with representatives of the experiments here at CERN.

The event will take place at CERN in the Council Chamber, as well as in the upstairs mezzanine area ("salle des pas perdus") of the Main Building. It will feature hands-on technology demonstrations from companies working with CERN openlab, so that you too can discover the latest ICT innovations.

If you're interested in finding out more about how research and industry can work together in close partnership to drive innovation in support of the scientific community, then this event is for you.

More information: http://indico.cern.ch/e/COOD17/.

Andrew Purcell

8-11 AUGUST: NEW ACCESS TO THE MEDICAL SERVICE (BUILDING 57)

The Medical Service would like to inform you that, during building work, access to the infirmary (Building 57, Geneva side) will only be possible via the side entrance off Route Einstein, next to the ambulance parking.

Access to the first floor will be limited and by appointment only. Please contact the medical secretariat on: medical.service@cern.ch, tel. 73186.

Blood tests will take place in the infirmary on the ground floor during the work.

Thank you for your understanding.

The Medical Service

OPEN ACCESS POLICY EXPANDS TO INSTRUMENTATION

CERN issued its Open Access Policy in October 2014, requiring all CERN physics results to be published Open Access. This policy has now been expanded to include instrumentation articles.

The policy favors publications in journals supported by SCOAP^3 which facilitates Open Access of HEP articles at no costs for authors. As SCOAP^3 does not support instrumentation journals, the Scientific Information Service has put in place arrangements for the following journals:

- *IEEE Transactions on Nuclear Science* (and other IEEE journals)
- *Journal of Instrumentation*
- *Nuclear Instruments and Methods* Section A and Section B.

CERN authors are encouraged to also explore the following new Open Access instrumentation journals:

- *EPJ Techniques and Instrumentation*, is a "sister title" of the well-established physics journal EPJC and was established in 2014. More information can be found here (*http://blogs.springeropen.com/springeropen/2017/08/01/cern-sponsoring-apcs-methods-articles-epj-techniques-instrumentation/*).
- *Instruments* was launched in 2016 by the Basel-based publisher MDPI. The Editor-in-Chief is Prof. Dr. Antonio Ereditato, well known to most CERN physicists.

CERN affiliated authors submitting instrumentation papers need to ensure that the papers will be published Open Access and that corresponding costs are covered by one of the above-mentioned arrangements.

If you wish to publish in any other outlet or for further questions, please contact library.desk@cern.ch.

25-29.09: SUMMER SCHOOL "OPEN SCIENCE IN PRACTICE"-EPFL

Summer School "Open Science in Practice", 25-29 September 2017, EPFL, Lausanne, Switzerland. "One week to learn how to boost the quality and impact of your research."

You wonder what Open Science is really about and how important it could be for your research and career?

The summer school "Open Science in Practice" will take place on 25-29 September 2017 at EPFL, Lausanne, Switzerland. It is a week packed with exceptional speakers who will explain where open science comes from, what are their motivations to embrace open practices and what are the tools researchers can use to be more efficient, more visible and more relevant in their community.

It is for doctoral students and early career researchers who are interested in learning more about how academic research is being transformed by digital technologies. The core idea behind this summer school is to propose a pragmatic and practical approach to Open Science, for researchers, by researchers.

More information, full program and registration is available at https://osip2017.epfl.ch.

Course fee: CHF 150.-

Course credits: 2 ECTS (students enrolled in another institution than EPFL must enquire with their home institution whether they can receive the credits)

***** Please note, the registration deadline is Friday 11 August! Places are limited! *****

Join us! If you have any question, write to osip@epfl.ch.

Luc Henry for the OSIP team

CERN OPENLAB STUDENTS GIVE "LIGHTNING TALKS" ON 11 AND 15.08

The CERN openlab summer students, here in front of the Globe of Science and Innovation, have spent their summer gaining hands-on experience with cutting-edge technology.

Want to learn about the exciting projects the CERN openlab summer students have been working on? Then come along to the "lighting talk" sessions on Friday, 11 and Tuesday, 15 August. The students will each give five-minute presentations on their projects, explaining the technical challenges they have faced and describing their results so far. Topics covered in the students' projects this summer include machine learning, distributed computing, data analytics, and "the internet of things".

This year, the CERN openlab Summer Student Programme is hosting 37 students — representing 22 different nationalities — for nine weeks. Undergraduate

and Masters students in computer science, mathematics, engineering and physics have come from all over the world to spend a summer at CERN working on advanced computing projects with applications in high-energy physics.

As part of the CERN openlab Summer Student Programme, the students have also been invited to attend a series of lectures given by IT experts on advanced CERN-related topics and had the opportunity to visit the CERN facilities and experiments, as well as other organisations.

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*The lightning talks will take place in the IT Amphitheatre (*31/3-004*) from 1.30 p.m. to 3.30 p.m. on Friday, 11 August and from 3.30 p.m. to 6 p.m. on Tuesday, 15 August. Following the second session, there will be an opportunity to discuss the students' work with them over drinks and snacks. For more information, please visit the Indico pages for the two sessions: 11/08/2017 and 15/08/2017.*

Andrew Purcell

SAFETY BULLETINS 2017-1, 2 AND 3

The HSE Unit would like to inform you that the Safety Bulletins 2017-1, 2 and 3 entitled "Hot works", "Electricity – It's a profession" and "Transfer of hazardous liquid chemicals" have been released.

The Bulletins are available on EDMS under the following numbers, respectively: 1765366, 1798935 and 1798938. We would like to remind you that HSE Safety Bulletins are published in English and French and incorporate feedback from incidents/near misses/accidents that have occurred on the CERN site, with the aim of improving prevention.

We remain at your disposal in case you have further questions: safety.bulletin@cern.ch.

HSE Unit

HELP PROMOTE CERN AND ITS SCIENCE AT THE AUTOMNALES FAIR!

From 10 to 19 November, CERN will be going somewhere you might not expect: to the *Automnales* fair!

The Organization will be the guest of honour, with its very own magnificent 1000 m^2 stand, which will feature games, film screenings, an auditorium, workshops, lectures, virtual reality headsets... and much more! And the subjects covered will run the gamut from accelerators to IT, technology transfer, detectors, international collaboration and physics in general.

So what's the link between the Organization and all the other commercial exhibitors at this event?

There isn't one: that's the interesting thing! The attendees at this event are exactly the type of people with whom we want to engage. Let's meet our neighbours – your neighbours – who have probably never thought of visiting CERN, thinking that it's beyond their reach. Let's surprise them with our unexpected presence and explain to them that CERN is more than just "that globe thing" and that it's an exciting place.

Are you already a CERN ambassador or would you like to help us out by becoming one? Here's how you can present CERN to your neighbours in three simple steps:

1/ Complete this Doodle (*https://beta.doodle.com/poll/z8qfgy5vc7rmsktp*) opposite with your availability. Deadline for responses: 8 October. Don't worry, you won't have to be there the whole time.

2/ Put on a lovely CERN polo shirt (which we will provide) and your best smile to attract people to our stand.

3/ Wow them with all our activities!

The ideal profile is someone from CERN who has a knack for explaining things (patiently), has at least C1 level French (very few people from Geneva's international community visit the *Automnales*) and is full of enthusiasm. You don't need to be an official guide!

Everyone who helps out on the stand will be compensated for their time and invited to a dinner at the end of the *Automnales*.

Obituaries

GUIDO PETRUCCI (1926 - 2017)

Guido Petrucci, one of the engineers who contributed to CERN's reputation as a centre of technological excellence, passed away on 9 July after a long illness.

Born in Trieste on 27 September 1926, Guido obtained a degree in electrotechnical engineering from the University of Rome in 1951. In 1954, he was recruited to work at CERN by Edoardo Amaldi. He first joined the PS Magnet group, and then a physics group involved in cosmic ray experiments at the Jungfraujoch (there were no accelerators yet in operation at CERN in those early years). In this environment, he developed a keen interest in physics that shaped his career for the years to come. He became one of the leading engineers in the CERN physics research divisions and always worked in close contact with physicists (for this reason, he liked to define himself as an "atypical engineer").

After designing the magnet for the two-metre hydrogen bubble chamber, he soon became an expert in beam optics and designed a large number of beam lines for the CERN South and East zones. For some of these, he designed special magnetic elements, such as a magnet with two septa, used to split the proton beam slowly ejected to the East Area into three branches.

In the second half of the 1960s, Guido designed the storage ring for the third muon *g* – 2 CERN experiment. At the end of the experiment in 1976, under Guido's leadership, this ring was transformed into a strong-focusing synchrotron for the Initial Cooling Experiment (ICE). ICE demonstrated that stochastic cooling, and later electron cooling, work well. This was a crucial step towards the operation of the SPS as a proton–antiproton collider in the 1980s. He then went on to design the magnet for the UA1 experiment and, in the 1980s, the magnetic structures of the ALEPH and DELPHI solenoidal spectrometers at LEP.

Guido retired from CERN in 1991, but continued to work on various projects, such as TERA, the ELETTRA 2.4 GeV electron synchrotron in Trieste, the KLOE experiment at the electron–positron collider DANE in Frascati, and the PVLAS experiment at the Legnaro INFN laboratory.

Guido was an exceptionally bright engineer, always able to find simple and elegant solutions to difficult technical problems, and always willing to provide advice to his colleagues. He was also very cultured, with an interest in all aspects of the arts, such as music (he had a piano diploma from the Rome Conservatory), architecture and painting. A discussion with him was always an enriching experience. Guido will be sorely missed by all those who had the privilege of being among his collaborators and friends.

Ombud's corner

EMPATHY - A MANAGER'S KEY TO EMPOWERMENT

Empathy, or 'the ability to understand and share the feelings of another' is a key ingredient of the emotional intelligence that characterises a good manager. It is all about seeing things from others' point of view, taking into account their thoughts, views and feelings, and being able to put oneself in their shoes.

Empathy on the part of a manager is a competence that reflects a willingness and ability to connect with others, to understand what they may be experiencing and to demonstrate a genuine interest in and concern for their wellbeing. When people feel that their voices are heard, they feel valued, and this in turn leads them to engage more fully in their work. Without empathy, working relationships remain superficial and many an opportunity to build trust and foster motivation may be lost.

Managers therefore have everything to gain from taking the time to listen to their staff, and this implies *really listening actively* to them, using empathy to understand what they are thinking or feeling – without trying to change them or argue their points or even solve their problems – and acknowledging this by reflecting back to them an understanding of what they have heard.

By using empathy in this way, managers are able to acknowledge the legitimacy of others' experience, without necessarily agreeing with them, thus establishing trust and building a rapport that will lead to co-operation and, if needed, a willingness to

hear another point of view. Following this, if indeed there is a need for constructive feedback or corrective action, colleagues will be more prepared to listen and even accept responsibility for their actions because their perspective will also have been taken into account.

So what does it take to be more empathetic? And what keeps managers from acting accordingly?

For one thing, it takes time, and managers need to be willing to stop and take the time to care. It also requires a certain degree of self-awareness, including the ability to challenge their own assumptions or point of view. Previous experience may also cause them to have developed a history with the other person that needs to put aside if they are to look at the present situation with fresh eyes.

Another obstacle, indeed sometimes the most challenging of all, is that managers often feel that if someone shares a problem with them they automatically need to solve it. Rather than demonstrating empathy, however, this says more about themselves and their own need to impress their colleagues, or even simply to be right, and often proves to be counter-productive, as it diminishes the other person instead of helping them to take responsibility for themselves.

In the final analysis, empathy is a choice: managers who choose to take the time to listen, to overcome their own inner bias and to focus on communicating with their staff are managers who value individuals. Moreover, in creating an empathetic environment in this way, managers go a long way towards empowering their colleagues by allowing them to be fully present in the workplace and able to give their best.

Sudeshna Datta Cockerill