CERN Bulletin

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More articles at *http://home.cern/cern-people*

ANNUAL CHECK-UP AND UPGRADES FOR THE INJECTORS

Maintenance, upgrades and new equipment for the accelerator complex during the year-end technical stop

The first two radiofrequency crab cavities were installed in the Super Proton Synchrotron (SPS) to be tested with beam for the first time. (Image: Maximilien Brice, Julien Ordan/CERN)

The LHC isn't getting all the attention during the year-end technical stop (YETS). The whole injector chain is undergoing its annual check-up. In addition to the maintenance work traditionally done during the YETS, this year a significant amount of the activity is devoted to the LHC Injectors Upgrade (LIU) project. In view of the challenging proton and ion beam parameters that are required for the High-Luminosity LHC (HL-LHC), the LIU project team is charged with planning and executing wide-ranging upgrades to the complex.

In the Proton Synchrotron (PS), a major de-cabling campaign is taking place. Many surface and underground structures are congested with obsolete cables, some of which were installed back in the 1960s or even earlier. They prevent the installation of new cables, particularly those needed for the LIU project. Some 4000 cables with a combined length of 240 km are currently being removed from the PS. Similar de-cabling campaigns took place in the PS Booster and the Super Proton Synchrotron (SPS) during last year's extended year-end technical stop (EYETS), when 9000 cables were removed.

(Continued on page 2)

A WORD FROM THE DIRECTOR GENERAL

BRINGING SCIENCE TO DAVOS

Last week, I attended the World Economic Forum's annual meeting in Davos, accompanied by an impressive amount of snow and an equally remarkable number of world leaders. This was not my first Davos, but it was the most memorable so far, since I had the privilege of co-chairing the meeting, along with six other women from all walks of life.

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A WORD FROM THE DIRECTOR GENERAL

BRINGING SCIENCE TO DAVOS

This was the first time that the head of a scientific organisation had been asked to serve as one of the co-chairs, and it provided a unique opportunity to promote the crucial role of science in addressing the major challenges facing society today to an audience of leaders of government, industry and civil society.

The main theme of Davos this year was "Creating a shared future in a fractured world", a theme that could not have been better suited to science. One of my key messages was that science can play a leading role in connecting people because it is universal and unifying. It is universal because it is based on objective facts and not on opinions. It is unifying because the quest for knowledge and the passion for learning are shared values and aspirations of all humanity. Scientific knowledge has no passport, no gender, no race, no political party.

Scientific laboratories like CERN bring people together from all around the world, sometimes from countries that are in conflict. These people all work together peacefully, animated by the same passion for knowledge in pursuit of common goals. Certainly, places like CERN cannot directly solve geopolitical conflicts, but they can help break down barriers and nurture the young generation in a respectful and tolerant environment that values diversity and inclusiveness. Places like CERN and other scientific institutions can plant seeds of peace.

My other key message at Davos was that scientific knowledge is the fuel of progress because it pushes the limits of what we know. It is therefore essential if we are to successfully address societal challenges, such as those covered by the Sustainable Development Goals. Without innovative ideas and scientific breakthroughs, progress stagnates. History shows us that major breakthroughs often come from fundamental research. For instance, quantum mechanics and relativity, considered as useless knowledge by many at the time they were developed, are now the underpinnings of much modern electronics and of GPS systems.

My fellow co-chair, Christine Lagarde, had the task of moderating an hour-long discussion among the seven co-chairs last Tuesday. She opened with a quote from Leonard Cohen: "There is a crack in everything, that's how the light gets in". We spent an hour discussing the cracks and the light, and science emerged as one of the main components of the light.

On Thursday, I took part in another panel together with Canada's Prime Minister, Justin Trudeau, and Nobel peace prize winner Malala Yousafzai. The theme was "Creating a shared future through education and empowerment". I emphasised the importance of STEM (Science, Technology, Engineering and Mathematics) education, not only for those pursuing a scientific career, but also as an education for life. The scientific method, the value of evidence-based assessment and the meaning of a measurement and its uncertainty should be taught to everybody. These are skills we all need, whether scientists or not, if we are to be well-rounded citizens in the modern world.

I was encouraged by the very positive reactions of some of the participants. I could see that science is increasingly recognised as an integral part of global efforts to shape a more inclusive, better world. The challenge is, naturally, to ensure that this recognition is complemented by adequate funding.

I also had the opportunity to have brief discussions with a number of leaders from our Member States, Associate Member States and beyond, including the Presidents of France, Switzerland and Lithuania and the Prime Ministers of Italy, Norway, Canada, Estonia and Latvia. I took away from these meetings valuable messages of support and praise for CERN's mission and accomplishments.

It is my hope that science will have an equally prominent place at future annual meetings of the WEF, as an essential component of global discussions about the direction our world is taking.

The 2018 WEF programme and sessions are available on the WEF website (*https://www.weforum.org/agenda/2018/01/your-day-by-day-guide-to-davos-2018/*).

Fabiola Gianotti
Director-General

ANNUAL CHECK-UP AND UPGRADES FOR THE INJECTORS

In the meantime, the TT2 transfer line located between the PS and the SPS is undergoing a major consolidation programme, with all its 43 quadrupole magnets being replaced. These magnets were installed in the 1980s and recently started to show signs of damage. Fifteen of them will be replaced during the YETS, and the rest during the second long shutdown. The new magnets have been taken from the former Intersecting Storage Rings collider, fully renovated and certified to meet the requirements.

On another transfer line, between the PS and LEIR, new instrumentation for beam monitoring is being installed. The beam instrumentation of Linac3, the accelerator that supplies lead ions to the experiments, is being modified and upgraded, and new power converters for the magnets on its transfer lines have been installed. Brand-new emergency lighting and new cables for the GSM network have been installed in the experiment areas of all injectors.

Preparations are continuing for the newest member of CERN's accelerator family, Linac4. Two permanent laser-based emittance monitors have been installed. Developed specially for the new linear accelerator, their purpose is to non-invasively measure the transverse emittance of the Linac4 H^- beam at its operating energy of 160 MeV. The monitors use a pulsed laser beam and diamond detectors to obtain the required H^- beam profiles and emittance.

Moving away from the LIU project to the HL-LHC, two radiofrequency crab cavities are being installed in the SPS. This will be their home for a year, during which time they will be tested with beam for the first time. The crab cavities, which were assembled at CERN in 2017, will tilt particle bunches before they collide in the HL-LHC. This will maximise the overlap of the beams and increase the probability of collisions each time they meet, otherwise known as luminosity.

Iva Raynova

NEW PERMANENT ALICE EXHIBITION INAUGURATED

Located at ALICE's experiment site, the exhibition is now open for guided tours

Part of the new ALICE exhibition (Image: Kate Kahle/CERN)

On 17 January, the ALICE collaboration inaugurated a new permanent exhibition at its visits point at the experiment site (LHC point 2). Designed primarily for the general public and for high-school and university students, the new installation will be open for guided tours, making visits to ALICE possible even when the experiment cavern is not accessible. It will also be included in the official itineraries for tours organised by the CERN Visits Service (*http://visit.cern/*).

Developed by the Spanish company Indissoluble – which also designed and built the current Microcosm (*http://microcosm.web.cern.ch/en*) – the exhibition includes three main components: a full-scale mock-up of part of the detector, display cases and information screens, and a periscope that shows the underground cavern in real time.

The highlight of the exhibition is the immersive video projected all along the mock-up and the adjacent wall. The film presents the history of ALICE and how the experiment works.

"It is my pleasure to present the new ALICE exhibition and pass it into the hands of the ALICE collaboration and CERN's Visits Service," declared spokesperson Federico Antinori at the inauguration. "I really want to acknowledge and thank all the people who followed the project through to completion and made this possible".

As of now, the exhibition is officially open to people at CERN and to the general public for guided visits. Training sessions for guides are being organised.

To visit the new ALICE exhibition, contact alice-visits@cern.ch.

Virginia Greco

PRIME MINISTER OF ESTONIA VISITS CERN

On 24 January, His Excellency Mr Jüri Ratas, Prime Minister of the Republic of Estonia, visited CERN

(Image: Maximilien Brice/CERN)

On 24 January, His Excellency Mr Jüri Ratas, Prime Minister of the Republic of Estonia, visited CERN for a tour of the site and facilities.

The Republic of Estonia has been an active member of the CERN community since joining the CMS collaboration in 1997. The country operates a Tier-2 Grid computing centre in Tallinn, and a team of Estonian scientists has joined the TOTEM experiment.

After being welcomed by three of CERN's Directors – Frédérick Bordry, Martin Steinacher and Eckhard Elsen – who introduced CERN's history and activities, the Prime Minister was given a tour of the ATLAS underground experiment area, before signing the guest book (see photo).

The Prime Minister was joined by his staff, representatives of the Permanent Mission of Estonia to the UN in Geneva, and two Directors from the Estonian National Institute of Chemical Physics and Biophysics.

Harriet Jarlett

USING VIRTUAL REALITY TO IMPROVE SAFETY

CERN recently carried out its first safety experiment in virtual reality

In November 2017, the first virtual reality (VR) safety experiment took place at CERN, giving more than 100 participants the opportunity to experience the Future Circular Collider (FCC) (*https://home.cern/about/accelerators/future-circular-collider*) tunnel through a virtual model. For one week, a team of researchers from Lund University were on site, working closely with CERN's HSE unit to conduct the VR tests as part of the FCC study.

A conceptual particle accelerator housed in a new 100 km tunnel offers a unique opportunity to rethink current approaches to safety and to come up with novel concepts, such as the use of virtual reality tools to assess safety. he stereoscopic 3D and motion-tracking capabilities of virtual reality headsets create an immersive and interactive 360°environment, where different safety features and scenarios can be easily tested.

The aim of this VR experiment was twofold. Firstly, to assess how virtual reality can be used to understand human behaviour in a simulated environment, and secondly, as safety is a top priority for CERN, to test some of the safety measures currently planned for the FCC.

The VR experiment was designed to test how those present in the tunnel would interpret different way-finding systems guiding them to evacuation routes. Quick identification is vital since it minimises the evacuation time. In addition, the experiment allows the concept of compartmentalisation, an option that is being actively explored for the FCC tunnel, to be tested. “Is the proposed flashing light signal effective? Can we use robots similar to the overhead monorail inspection system currently operating in the LHC to correctly deliver the message and reduce evacuation times while improving safety? These are just two of the questions the VR experiments will help us answer,” explains Oriol Rios from the HSE unit, who is involved in the FCC study.

The results of CERN's VR experiment are valuable not only for the FCC. They can also be applied to other large-scale research facilities and extended to other scenarios. “The high immersion level obtained allows different emergency situations to be simulated in a safe, economical and efficient way,” explains Rios.

In the coming months, the team will analyse the results and draw conclusions about the feasibility of the VR approach with a view to refining it for both the FCC study and the existing research infrastructure. The results will also be used on further studies in the framework of the FCC fire safety collaboration, a global network including experts from Fermilab, DESY, MAX IV, the ESS and Lund University, led by Saverio La Mendola of CERN's HSE unit.

COMPUTER SECURITY: SPECTRE AND MELTDOWN, JUST THE BEGINNING?

The beginning of the year has been dominated by two security vulnerabilities, known as Meltdown and Spectre

The beginning of the year has been dominated by two security vulnerabilities, known as Meltdown and Spectre (*http://spectreattack.com/*). Both, in their own way, allow any local user to access a system's memory and misuse the contents for malicious purposes. Let's see why this is bad and why it may become worse in the future...

In technical terms, Meltdown breaks down the boundary that prevents user applications from accessing privileged system memory space. This vulnerability has been confirmed to exist in all Intel processors produced since 1995, except for Intel Itanium and Intel Atom before 2013. This includes computers by popular vendors such as Apple, Microsoft, Dell, HP and Lenovo. Spectre is similar, but allows an attacker to use a CPU's cache channel to read arbitrary memory from a running process. Unlike Meltdown, Spectre is known to affect Intel, AMD and ARM processors. This includes computers, tablets and smartphones made by Apple, Microsoft, Dell, HP, Google and Lenovo, among others. Spectre is much more difficult to successfully exploit than Meltdown, as its attack surface is limited to user space processes, such as web browsers and desktop applications.

Technicalities apart, abusing Spectre or Meltdown allows an attacker to download the contents of the memory from your device and dissect it offline to extract your passwords, private SSH keys or certificates, or any other juicy information. Fortunately, the memory does not come with a big sign saying “Password here!”. Therefore, any extraction process would be slow, cumbersome and not straightforward. Hence, while proofs of concept do exist, no systematic exploitation of either Spectre or Meltdown has yet been reported.

So far, so good, no? Not quite. First of all, and most problematic so far, the fixes greatly depend on your computer's hardware, i.e. the chip set. While the most recent and popular chip sets will receive fixes in a timely manner, other hardware might not: think of your computer's BIOS, or your Internet-of-things device (see our Bulletin article “IoTs: The treasure trove of CERN”). So we may end up with many embedded devices that will never receive a fix for Spectre or Meltdown. Secondly, there are fears that applying the current fixes will naturally slow down any computer: depending on what your computer is used for, reported performance drops vary between a few per cent and up to 30%. But there is no need to panic (yet), as newer fixes might correct that, too. Thirdly, Intel and probably others have allegedly known about these vulnerabilities for a while. This may mean that people with malicious intent were already exploiting these vulnerabilities long before they became public knowledge. However, so far no reports have confirmed whether or not this has actually happened. And, as a result of all these things, this may be just the beginning. As with past scares of this nature, the focus of security research and the way in which the vulnerabilities are exploited will change! Think of the POODLE SSLv3 vulnerability found in the aftermath of the Heartbleed OpenSSL vulnerability : Spectre and Meltdown are probably just the first known vulnerabilities linked to exploiting hardware weaknesses. The next generations of Spectre and Meltdown may be more intrusive and easier to exploit, and may not quickly become public knowledge. A feast for security agencies and criminals, a pain for those of us responsible for defending our IT systems...

So, this is just the beginning. Be prepared for more to come. Raise the bar! Make sure that all your systems are automatically updated when your hardware or operating system provider issues new fixes. Use the standard (automatic) update mechanisms of Windows, Linux, Mac, Android or iOS devices. And keep an eye on your embedded devices. Try to keep them up-to-date, too. Or, if you can't, don't connect them to the Internet or allow just anyone to access them.

You can find more details on CERN's strategy regarding Spectre and Meltdown here (*http://security.web.cern.ch/security/advisories/spectre-meltdown/spectre-meltdown.shtml*).

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

Official communications

ADJUSTMENTS TO FINANCIAL BENEFITS WITH EFFECT FROM 1 JANUARY 2018

In accordance with decisions taken by Council in December 2017, certain financial benefits impacting salaries and stipends have been adjusted:

- An increase of 0.39 % has been applied to the scale of basic salaries paid to Staff Members and to the scale of stipends paid to Fellows (Annexes RA 5 and RA 6 of the Staff Regulations) with effect from 1 January 2018.

No adjustments have been made to subsistence allowances and family benefits.

STAFF RULES AND REGULATIONS – MODIFICATION N°12 TO THE 11TH EDITION

Modifications to the Staff Rules and Regulations have been implemented in accordance with the decisions taken by the Council in December 2017 relating to:

- non-eligibility for performance rewards during special leave for professional reasons (CERN/FC/6172),
- cost variation index for 2018 (CERN/FC/6170-CERN/3333).

These modifications entered into force on **1 January 2018**.

- Chapter II, Conditions of Employment and Association
  - Section 2 (Classification and merit recognition) – *amendment of page 17*
- Annex RA5 (Monthly basic salaries of staff members) - *amendment of page 71*
- Annex R A 6 (Stipends of fellows) – *amendment of page 72*

The complete updated electronic version of the Staff Rules and Regulation is accessible via CDS (*https://cds.cern.ch/record/1993099?ln=en*).

HR Department

Announcements

CERN ALUMNI FIRST COLLISIONS: FOLLOW THE LIVE WEBCAST

The CERN Alumni Network First Collisions event will be held on Friday, 2 and Saturday, 3 February, bringing together some 400 members who have joined the network since its official launch in June 2017.

The programme features inspiring talks from CERN alumni speakers, presenting how CERN has contributed to shaping their professional trajectories. You may download the programme here (*http://cern.ch/go/gD8G*). All members of personnel will be able to follow the event on webcast (*https://indico.cern.ch/event/625910/page/12697-webcast*) with no need to register beforehand. Plenary sessions will be interpreted into French.

All future alumni of CERN, and current members of CERN who wish to interact with the alumni community, are invited to join the network at http://alumni.cern.

EMERGENCY STOP TESTS ON 3 FEBRUARY

The emergency stop tests of the West area and the ISR area on the Meyrin site are planned on Saturday 3 February, from 7 :00 am to 8:00 pm.
Frequent power cuts will occur on the Meyrin site, West and ISR area. The EN-EL group recommends that you turn off all your critical equipment and computer equipment.

For any further information please refer:
For the West area:

"Note de coupure": *http://edms.cern.ch/ui/file/1747871/1/ENNC_EL_2017_011_AUG_ZO.pdf*

Map of the Meyrin site showing buildings affected by these power cuts *http://edms.cern.ch/ui/file/1747871/1/ENNC_EL_2017_011_AUG_ZO_PLAN.pdf*

For the ISR area:

"Note de coupure": *http://edms.cern.ch/ui/file/1894652/1/ENNC_EL_2018_013_AUG_ZONE_OUEST.pdf*

Map of the Meyrin site showing buildings affected by these power cuts *http://edms.cern.ch/ui/file/1894652/1/ENNC_EL_2018_013_AUG_ZONE_OUEST_PLAN.pdf*

CERN LIBRARY: CANCELLATION OF PRESSREADER SUBSCRIPTION

As the scope of the Scientific Information Service continues to expand, we had to cut down on less used subscriptions in 2018. As a consequence, in addition to the other resources already cancelled (*https://home.cern/fr/cern-people/announcements/2017/11/cern-library-cancellation-online-subscriptions*) at the end of 2017, the access to PressReader (*http://www.pressreader.com*) (previously known as PressDisplay) will be discontinued as of the end of February 2018.

The access to the other online journals, ebooks and databases will be maintained in 2018.

Please don't hesitate to send any feedback on this subject to library.desk@cern.ch

The CERN Library

NEW CERN SHUTTLE SERVICE CONTRACT

As of 1 February 2018, a new supplier, will be operating the CERN regular and on-demand shuttle services.

The CERN regular shuttle service will be running with buses provided by the contractor with an adapted capacity, notably for circuit 4 (to and from Geneva Airport).

With the implementation of this new contract, the timetables will shortly be adapted to the recent TPG changes. This allows for a better connection for the CERN community with the regular TPG circuits. All details are available on the SMB website: http://smb-dep.web.cern.ch/en/ShuttleService

The CERN mobility services are working towards further improvements, at a later stage, in particular to the service between the Meyrin and Prevessin sites – as a part of the CERN mobility strategy.

SMB Department

WORK ON THE ESPLANADE DES PARTICULES

As work continues on the *Esplanade des Particules*, the worksite will be temporarily extended to include part of the road at Entrance A.
To keep traffic flowing in both directions, the lanes will be temporarily narrowed from 26 January until 2 March.

CLIC WORKSHOP 2018

The **CLIC workshop 2018** will take place from 22 to 26 January 2018. It will cover Accelerator as well as the Detector and Physics studies, with their present activities and programme. Special focus of the workshop will go to the preparations for the European Strategy Update, for which the CLIC documentation is due by the end of 2018.

For the Accelerator studies, the workshop spans over 5 days: 22nd-26th of January.

For CLICdp, the workshop is scheduled from Tuesday afternoon 23rd to lunchtime on Friday 26th.

For more information, see the CLIC workshop 2018 website (*https://indico.cern.ch/event/656356/*).

CERN ACCELERATOR SCHOOL - BEAM INSTRUMENTATION

Registration is now open for the CERN Accelerator School's course on beam instrumentation, to be held in Tuusula, Finland from 2 to 15 June 2018

Ten years after the last course on beam instrumentation in Dourdan (FR) the CERN Accelerator School (CAS) proposes again a course on beam instrumentation. This course will be of interest to staff and students in accelerator laboratories, university departments and companies manufacturing accelerator equipment who wish to learn about beam instrumentation technologies, data treatment and accelerator performance diagnostics.

The course is split into morning lectures and afternoon “hands-on” courses. During the mornings typical instruments for high- and low-energy linear and circular accelerators will be explained. Many application examples will be shown including some elementary background on particle dynamics. In the afternoons students will be split into classes working with real equipment on beam position measurements, optical diagnostics, RF measurements and digital signal processing. The course participants will rotate during the duration of the school, so every student will participate in all classes.

For more information and application, please visit the school website (*http://cas.web.cern.ch/schools/tuusula-2018*).

CATCH A CAR SHARING SERVICE NOW HAS PARKING SPACES AT CERN

From January 2018, a new mobility initiative will be implemented at CERN. This involves the car sharing-operator Catch a Car will provide two reserved parking spaces in the Globe car park. Use of these cars will be available for all personnel working on the CERN site for private use at preferential rates: the registration fee for CERN personnel will be 5CHF instead of 25CHF, and a 50CHF initial credit.

Catch a Car is a subsidiary of the Mobility Cooperative. It operates one of Switzerland's first car sharing networks in Geneva and Basel. Customers locate a car online, drive from A to B, and then leave it in a public parking space within a defined zone. The service operates in Geneva and covers the most of the canton, including the city itself, the adjoining districts of Carouge, Lancy, Vernier and Chêne-Bougeries, and Cointrin Airport.

From now on, CERN's community – with about 9,000 people working on the CERN site each day – will have the opportunity to make use of this resource-saving, cost-effective alternative to the private car. In return, Catch a Car will not only provide the vehicles, it will also check that they are available and that the parking spaces are kept vacant.

To sign up to use this service and benefit from the preferential deal please register via *http://www.catch-a-car.ch/* quoting the promotional code CATCHCERN.

Ombud's corner

PERSONAL CONFLICTS: OPPORTUNITIES FOR PROGRESS

In prehistoric times, there were only two ways to resolve a conflict: fight or flight. And there was always a winner and a loser. Then, one day, someone discovered a revolutionary new approach: negotiation, or aiming to find a solution that satisfies the interests of both parties. No more fight or flight, and everyone's a winner! Unfortunately, the human brain is still programmed like it was in prehistoric times and doesn't always have a natural negotiation reflex. This is why we have so many difficulties in dealing with conflicts.

How can we resolve a conflict?

There's an emotional aspect to every personal conflict. Conflicts create stress, which generates strong emotions, which in turn reduce our emotional, cognitive and behavioural capacities. So before anything else, we must try to manage the emotional aspect. To do this, don't fall into the trap of trying to be right at all costs, of battering your colleague with criticism or of raking over the past; this doesn't help at all, in fact it poisons the discussion. Instead, objectively describe the situation that's bothering you, the negative effects it's having on your work, the changes you'd like to make and even the advantages.

Easier said than done? Not really: it all comes down to preparation. When colleagues come to see me for advice, they are often in quite an emotional state. At the end of our conversation, I suggest that they go home, apply the above method to their situation, put everything down on paper, and then come back to see me again. More often than not, a situation that seemed impossible to resolve during the first visit appears perfectly manageable by the time of the second visit.

Many people are scared of conflict. But if it's managed well it can be an opportunity for progress. Always see a conflict as a chance to put your relationship with your colleague on a new footing, for the good of all concerned.

"A group leader has a habit of seeking out his colleagues at the end of the working day to ask them to put together a data summary for his presentation the next day, which always involves a huge amount of effort. The pressure and annoyance that this creates leads to errors and inaccuracies, which makes the situation even more tense. One day, one of the members of the team plucks up the courage to talk to the boss: 'Rob, you regularly give us this important job, which we enjoy doing. But you keep setting such short deadlines, and the requests often come at the end of the working day when everyone is tired and ready to go home. Could you possibly give us advance warning of your needs in future so that we have more time to get everything ready? It would allow us to give you more complete and reliable data.'"

Easier said than done? Not really: it all comes down to preparation. When colleagues come to see me for advice, they are often in quite an emotional state. At the end of our conversation, I suggest that they go home, apply the above method to their situation, put everything down on paper, and then come back to see me again. More often than not, a situation that seemed impossible to resolve during the first visit appears perfectly manageable by the time of the second visit.

Many people are scared of conflict. But if it's managed well it can be an opportunity for progress. Always see a conflict as a chance to put your relationship with your colleague on a new footing, for the good of all concerned.