The UK Atomic Energy Authority (UKAEA) has appointed plasma-physicist Ian Chapman as its new chief executive. Taking over the role from Steve Cowley on 1 October, Chapman will lead the UK’s magnetic-confinement fusion research programme at Culham Science Centre and operation of the JET fusion device on behalf of European scientists. Aged 34, Chapman is one of the youngest scientists to lead a major research centre and held various roles at Culham prior to the appointment, including head of tokamak science and fusion programme manager. “I hope my profile means that fusion, and its huge potential to give the world cleaner energy, will get noticed,” he says. “Furthermore, I hope my appointment will inspire the next generation of scientists and engineers to make a success of ITER, the international fusion project that in my opinion is the most important experiment mankind has ever done.”

New leader for UK fusion programme

QCD pioneer wins Prange prize

Theorist Frank Wilczek of the Massachusetts Institute of Technology in the US has been named the 2016 recipient of the Richard E Prange Prize and Lectureship in Condensed Matter Theory and Related Areas. He received a $10,000 honorarium and delivered a public lecture, “Some Intersections of Art and Science”, at the University of Maryland, which established the award, in September. Wilczek, who shared the 2004 Nobel Prize in Physics, is a pioneer of asymptotic freedom, which underpins quantum chromodynamics (QCD). The Prange Prize honours the late Richard E Prange, whose career at Maryland spanned four decades.

QCD pioneer wins Prange prize

Order of Alfonso X the Wise

Head of CERN’s technology department, José Miguel Jiménez, has been awarded a Spanish civil decoration called the Order of Alfonso X the Wise for his outstanding experience in research and scientific management in particle physics. The ceremony took place at the National Library of Spain, Madrid, on 12 July, in the presence of government ministers.

Order of Alfonso X the Wise

CERN tours more popular than ever

CERN is Geneva’s top tourist attraction, according to TripAdvisor, welcoming almost 110,000 visitors per year. The laboratory has been listed on the TripAdvisor website since 2012 and currently tops the charts of both the 24 tours and the 28 museums listed for Geneva. CERN has also received a 2016 Certificate of Excellence from the firm in recognition of the quality of its tours and the service it provides to visitors.

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Faces & Places

Appointments

Awards

Exhibitions

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CERN hits the festival circuit

More than 30,000 people attended the WOMAD festival in the UK this summer.

On 28–31 July, CERN continued its efforts to reach new audiences by organising a “physics pavilion” at the annual WOMAD music festival in the UK countryside. A three-day programme of talks and events was on offer, including topics such as “What’s the matter with antimatter?” in addition to shows featuring the Cosmic Piano and a musical piece created from the sonification of LHC data. Activities such as two “Build your own cloud chamber” workshops and a live link-up with the ATLAS visitor centre took festival-goers up close and personal with particle physics.

The physics pavilion, which was organised in conjunction with the UK Institute of Physics, the University of Lancaster and the Science and Technology Facilities Council, received more than 3000 visitors and generated considerable media attention. The event culminated in a packed audience, which had queued for 90 minutes to hear about the science of the long-running science-fiction series Dr Who. “I knew we’d got something right when a little girl raised her hand at the end of one session and asked the speaker: ‘How old were you when you knew you wanted to be a physicist?’” says pavilion manager Connie Potter of CERN. ● womad.co.uk/the-physics-pavilion/

Vintage silicon detectors preserved

The Nikhef laboratory in Amsterdam has teamed up with the Museum Boerhaave in Leiden to preserve some of the earliest silicon detectors. Developed for the “BOL” nuclear research project between 1967 and 1977, 64 silicon units were located inside of a cast-bronze spherical frame that fully surrounded the beam target. The system’s 4π coverage, position measurements for several coincident particles and full-absorption energy determination for hadrons precluded the standard concept used today in collider experiments in particle physics. Although the historical roots of the silicon detectors in the LHC experiments can be traced to this “checkerboard” design, today the position precision of the silicon trackers is at least 50 times better. The BOL inner-detector box, together with silicon-detector units, the associated front-end electronics, read-out boards and multiple-ADC boards, will become part of the Dutch scientific heritage collection in the Rijksmuseum Boerhaave – where they will join the helium liquefier used by Heike Kamerlingh Onnes in 1908 to discover superconductivity and microscopes made by Antoni van Leeuwenhoek in the late 17th century.

View of the BOL chamber, which was installed in a beam at the IKO cyclotron in Amsterdam in 1969.

10,000th teacher visits CERN

This summer, CERN welcomed its 10,000th school teacher, who was a participant of this year’s International High School Teacher (HST) programme. This three-week-long residential programme, which has taken place every July since 1998, saw 48 teachers come to CERN from across the world. The HST programme aims to increase teachers’ knowledge about the research being carried out at CERN and offers a range of educational resources for use by the teachers to inspire their students’ curious minds (see also p53).

Strong interactions in Montpellier

The 19th International Montpellier Conference in Quantum Chromodynamics (QC'D16) took place in Montpellier, France, on 4–8 July. Around 500 people took part, with equal numbers of theorists and experimentalists, to discuss all aspects of QCD. This ranged from formal field-theory approaches to confinement, in addition to phenomenological facets such as proton structure, pion form factors, exotic and standard meson spectroscopy, determinations of the strong coupling constant αs, and searches for new physics beyond the Standard Model.

Highlights from this year’s event included a summary of new determinations of αs and the experimental status of the exotic XYZ spectra by the BESIII experiment, with new improved determinations of their masses from QCD spectral sum rules at NNLO. Meanwhile, CLAS, HERA, the LHC and the NICA-SPD project have gained deeper insights on the structure functions and properties of the proton. BESIII has also obtained improved results on light hadron spectroscopy from J/ψ decays and, along with NA62, made new measurements of baryon and pion form factors. New BaBar and NA62 results on low-energy cross-sections relevant for the muon g-2 contribution were also presented, confirming previous experimental results. The meeting also saw a formal non-trivial proof of the gauge invariance of the gluon operator Aα among presentations about the non-perturbative aspects of QCD and the quark–gluon plasma. These QCD presentations were complemented by talks from ATLAS and CMS about precise measurements of the top-quark mass, electroweak parameters such as those relevant to the Higgs boson, and searches for new physics.

The 20th International Conference in Quantum Chromodynamics, which celebrated its 30th anniversary last year, come to CERN from across the world. The HST programme aims to increase teachers’ knowledge about the research being carried out at CERN and offers a range of educational resources for use by the teachers to inspire their students’ curious minds (see also p53).

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Extreme QCD weighs up results

The summer of 2016 will be remembered as a time of some confusion in particle physics. The main event of the summer conference season was the confirmation that a statistical fluctuation at an energy of 750 GeV seen by the LHC’s ATLAS and CMS detectors was indeed just that, and not evidence for a new fundamental particle, as had been hoped by many. It was therefore reassuring to spend three days discussing a theory we traditionally do not understand very well, but where there are copious experimental data and many exciting applications: non-perturbative quantum chromodynamics (QCD).

The “extreme QCD” conference, the 14th conference in the series, was held at Plymouth University in the UK from 1 to 3 August, with 80 participants. Here, “extreme” refers to conditions of high temperature or density that can occur in neutron stars, the early universe or heavy-ion collisions at the LHC and at the Relativistic Heavy Ion Collider (RHIC) in the US.

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some of the intriguing and puzzling results that have come out of the LHC, including hints of collective flow behaviour not only in heavy-ion collisions but even in high-multiplicity proton-proton collisions. In other talks, we heard of progress in lattice QCD calculations of thermodynamic quantities, which form the basis of the analysis of heavy-ion experiments, including novel ways of computing the energy-momentum tensor and calculations of transport properties of the quark-gluon plasma. There were also stimulating talks on topics as varied as the eigenvalue spectrum from the Dirac operator in QCD, and new approaches to thermalisation in heavy-ion collisions.

The ever-increasing speed of supercomputers and the continual improvement of algorithms have turned lattice field techniques into a precision tool for physical systems that can be written as a path integral with similar properties to a probability problem. However, there are still classes of problems, such as working at nonzero chemical potential, that require path integrals with complex actions, and thus are almost impossible to solve using standard Monte Carlo algorithms. Delegates heard about recent progress that has been made towards tackling this so-called “sign problem” using methods such as the density of states, complex Langevin and Lefschetz–thimble integration.

This was followed by a wide-ranging and thought-provoking panel discussion about the problems and prospects of finite-density QCD. Speakers gave a clear overview of the issues of critical interest to the experimental heavy-ion programmes, and many of the non-perturbative techniques developed to solve QCD are now being applied to other systems. For example, lattice field theory is being used to study the 2D carbon allotrope graphene, in addition to calculating the properties of novel dark matter candidates from strongly interacting theories.

The next extreme QCD conference will be held in Pisa in June 2017, where further progress on the sign problem and pertinent theory relevant to the heavy-ion programme will no doubt be reported.

PT2026 NMR Precision Teslometer
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The Metrolab PT2026 sets a new standard for precision magnetometers. Leveraging 30 years of expertise building the world’s gold standard magnetometers, it takes magnetic field measurement to new heights, measuring higher fields with better resolution.

The PT2026 offers unprecedented flexibility in the choice of parameters, interfacing and probe placement, as well as greatly improved tolerance of inhomogeneous fields. And with Ethernet & USB interfaces and LaVIEW software, it fits perfectly into modern laboratory environments.
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Editorial

The home of the SPS
The article by Lyn Evans celebrating 40 years of SPS operation (CERN Courier July/August 2016 pp6–7) raised a lot of memories, but I must take issue with the author on one point. He says that the machine was initially supposed to be built in the south of France, whereas in fact there were five candidate sites advanced by the Member States. The achievement of John Adams in presenting an acceptable—and cheaper—plan for the SPS at CERN was enormous. It was helped by one simple point: CERN was where the skills were, where the people best equipped to design and build the machine lived.

This same argument played a part in the approval of LEP a decade later. Papers had been published that purported to show that the new machine should be built in Hamburg rather than Geneva. This caused problems at the political level in one Member State to my knowledge, and I guess at least two.

John Walsh, Swindon, UK.

Neutrino discovery date
Christine Sutton’s article about the detection of neutrinos (CERN Courier July/August 2016 pp17–19) correctly states that Cowan and Reines were the first to see evidence of the recoil motion. Crane himself did not claim to have detected neutrinos, but stated: “It seems now to have been adequately established that the disappearance of energy and momentum of the recoil of the nucleus and of all other particles emitted in the detection of neutrinos [by inverse beta decay] is due to the neutrino hypothesis, rather than to any other cause.”

However, a series of experiments beginning in 1936 (e.g., Proc. Camb. Phil. Soc. 32 301) searched for evidence of the neutrino’s existence by measuring the energy and momentum of the recoil of the nucleus and of all other particles emitted in a beta-disintegration decay process. These experiments showed clearly that the neutrino hypothesis was the best candidate.

In 1938, Crane and Halpern (Phys. Rev. 53 378) used a chlorine–38 beta source in a cloud chamber to observe the recoiling nucleus and the associated beta particle for individual events. Although the track left by the recoiling nucleus was not long enough to allow an energy measurement, it generated ionisation that was assumed to be proportional to the kinetic energy of the recoil motion. Crane himself did not claim to have detected neutrinos, but stated: “It seems now to have been adequately shown experimentally that there is apparent non-conservation of momentum in the beta decay, and that, quantitatively, the maximum amount of extra momentum found is in satisfactory agreement with that called for by either the neutrino hypothesis, or by much more general theoretical arguments which relate the disappearance of momentum to the disappearance of energy.”

Andrew Sabensky, Chico, California.
OBITUARIES

Martin Block 1925–2016

Particle physicist Martin M Block died on 22 July in Los Angeles, California, aged 90, following a short illness. His career was distinguished not only by the impact of the contributions he made but also by its longevity; his first paper was published in 1949 and his most recent in 2016. Block was also an active participant in the Aspen Center for Physics, where he founded its enduring Aspen Winter Physics Conferences in 1985.

Block completed his doctorate at Columbia University in 1952, where he helped to design magnets for the Nevis Cyclotron. As a young professor at Duke University, he contributed the revolutionary notion that parity was not conserved in weak interactions. The idea, which came to him while he shared a room with Richard Feynman at a Rochester meeting on high-energy physics in 1956, offered a solution to the so-called “tau-theta” paradox; two otherwise identical particles that decay into different parity states and thus were believed to be distinct.

The story was recounted in Feynman’s 1985 memoir Surely You’re Joking, Mr. Feynman: “Anyway, I was sharing a room with a guy named Martin Block, an experimenter. And one evening he said to me, ‘Why are you guys so insistent on this parity rule? Maybe the tau and theta are the same particle. What would be the consequences if the parity rule were wrong?’ I thought it might very well be an important idea.”

Important, indeed. The 1957 Nobel Prize in Physics went to Tsung-Dao Lee and Chen-Ning Yang for their theoretical analysis of the process, but it was not shared by Madame Chien-Shiung Wu for her 1956 experimental demonstration of parity violation in the beta-decay of cobalt-60 nuclei, nor was Block’s contribution acknowledged at the time.

At Duke, Block developed the first liquid-helium bubble chamber and used it to study the properties of several newly discovered particles. He left Duke for Northwestern University in 1961, where he served on the faculty for the remainder of his experimental career. He co-discovered the eta meson and later worked on collaborations at ever-higher energies involving heavy-liquid bubble chambers and, eventually, modern counter detectors. His work took him to accelerators all over the world, with extended experimental stints at Berkeley, Brookhaven, Fermilab—and particularly at CERN, which he visited in every decade from the 1960s until the 1990s.

His lifelong passion for the mountains, especially skiing and fly fishing, eventually took him to Aspen, where he purchased a home and joined the Aspen Center for Physics in its nascent years. There, he embarked upon a second career in theoretical and computational physics. A central focus of this work concerned the forward-scattering amplitudes of hadron collisions, specifically the issue of why the proton–proton transition cross-section grows with the square of the logarithm of the energy. His work anticipated quantitatively measurements that were eventually performed at the LHC. In one of his final papers, he showed that data demonstrate convincingly that both the proton–proton and antiproton–proton transition amplitudes asymptotically approach those of a so-called “black disc,” presumably as a consequence of gluon saturation.

Block is survived by his wife, Beate, his two children, Steven and Gail, and two grandchildren.

Steven Block, Stanford University, and Francis Halzen, University of Wisconsin-Madison.

Mady was awarded a PhD in 1970 and appointed professor of electrical engineering in 1986. In 1988, he left Stanford to take up a tenured position at Duke University, moving his FEL research laboratory with him the following year. He joined the University of Hawaii at Mānoa in 1996.

Mady was bestowed with numerous awards and international recognitions, including the Stuart Ballantine Medal from the Franklin Institute in 1989, the 2012 Robert R Wilson Prize from the American Physical Society and the 2016 Willis E Lamb Award for Laser Science and Quantum Optics. He was also the keynote speaker at the 2015 Nobel Symposium on Free-Electron Lasers in Sigtuna, Sweden. Mady held 13 patents on FEL-related technological inventions and published many important papers. These included a seminal publication on stimulated emission in 1976 (Phys. Rev. Lett. 36 717) and, more recently, a comprehensive review article on the history of the FEL invention (Phys. Rev. ST Accel. Beams 17 074901).

Our dear colleague Roberto Petronzio passed away on 28 July at the age of 67. He was a CERN fellow from 1977 until 1979 and a staff member in the theory division from 1980 until 1986. He played a significant role in our field as a professor at the University of Tor Vergata, president of the INFN (2004–2011) and as a member of the CERN Council. Roberto was a major contributor to the development of QCD. He was involved, among other projects, in the first complete calculation of the NLO anomalous dimensions, and in the resummation of soft-gluon emission in partonic processes. He was also involved in the non-perturbative analysis of the theory. In particular, along with Cabibbo and Parisi, he was one of the first members of the APE collaboration, which managed to construct the famous series of supercomputers for numerical simulations. Together with Cabibbo and Martinelli, he proposed the use of lattice simulations to compute weak amplitudes. These results are of great importance in flavour physics, for example in analyses of B factories and in studies of weak decay at LHCb, ATLAS and CMS collaborations. Roberto was well-anchored in the Standard Model but always looking for harbingeres of new physics. He had an eclectic knowledge of particle physics and related subjects. His legacy is also represented by several generations of brilliant young physicists spread across different laboratories and universities throughout the world. He had a charming and wonderful personality and was a great asset to our community. He will be dearly missed.

His colleagues and friends.
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Important, indeed. The 1957 Nobel Prize in Physics went to Tsung-Dao Lee and Chen-Ning Yang for their theoretical analysis of the process, but it was not shared with M. M. Block — a decision made by the Nobel Committee at the suggestion of Wolfgang Pauli, who feared that the distinction might dampen Block’s enthusiasm for research. Block’s contribution was described by the committee as the “suggestive experiment” that “aided the theoretical discovery” (see Lee & Yang, Phys. Rev. Lett. 9, 773 (1962)).

Block was also an active participant in the Standard Model but always looking for harbingers of new physics. He was an eclectically knowledgeable person of particle physics and related subjects. His legacy is also represented by several projects, in the first complete calculation of the NLO anomalous dimensions, and in the resummation of soft-gluon emission in pertonic processes. He was also involved in the non-perturbative analysis of the theory. In particular, along with Cabibbo and Parisi, he was one of the first members of the APE collaboration, which managed to construct the famous series of supercomputers for numerical simulations. Together with Cabibbo and Martinelli, he proposed the use of lattice simulations to compute weak amplitudes. These results are of great importance in flavour physics, for example in analyses of B factories and in studying the bottom quark at SORR by the LHCb, ATLAS and CMS collaborations. Roberto was well-anchored in the Standard Model but always looking for harbingers of new physics. He had an eclectic knowledge of particle physics and related subjects. His legacy is also represented by several generations of brilliant young physicists spread across different laboratories and universities throughout the world. He had a charming and wonderful personality and was a great asset to our community. He will be dearly missed.

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Pui Lam, University of Hawaii, Vladimir Shiltsev, Pernilah, and Frank Zimmermann, CERN.

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Roberto Petrozzi 1949–2016
Recruitment

For advertising enquiries, contact CERN Courier recruitment/classifieds, IOP Publishing, Temple Circus, Temple Way, Bristol BS1 6HG, UK.
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