



UK news from CERN

Issue 40: 18 March 2014

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Speaking up for CLIC

The CLIC accelerator collaboration has elected a new Spokesperson. Phil Burrows (Oxford) succeeds Roberto Corsini (CERN). Over the next three years, Phil will be engaging with the institutes that are members of CLIC and helping to ensure that CLIC's R&D programme pushes ahead during the critical phase ahead of the next update of the European Particle Physics Strategy. Roberto will continue his technical leadership of CLIC/CTF3.



Phil Burrows © University of Oxford

The most recent European Strategy for Particle Physics was published in 2013. Recognising the international collaborations that will be needed to make scientific advances, it sets out the future priorities for European particle physics research.

It's due to be updated in 2018, and that's likely to be the timescale for decisions on the future direction for CLIC. With other potential successors to the LHC on the table,

Phil acknowledges that there will be tough decisions to be made about the best choice for the next big particle physics machine in Europe. "Any future proposed project would be expensive to build. We might be able to afford one in Europe, but definitely not two or more."



Model of the collision point at the heart of the proposed CLIC detector © CERN

"CLIC remains the only viable technology today that could take us to multi-TeV centre of mass electron-positron collisions. But we need more LHC results to assess whether it is the right machine to take us into new areas of physics research. LHC results over the next few years of running at higher energy and luminosity will be key to determining the way forward."

The LHC has already discovered the Higgs boson. The proposed ILC in Japan is, in essence, a Higgs and top-quark factory for better understanding these particles. If the LHC finds evidence of additional new particles, for example supersymmetric particles, around the 1TeV mass scale, there could be a compelling



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physics argument for CLIC. In this and other scenarios there could also be strong motivation to pursue a high-energy proton:proton or electron:positron supercollider.

Using the CLIC Test Facility (CTF3), the key concepts of CLIC have already been tested and proved. Probably the most innovative element of the CLIC design is that it has two beams – a drive beam and a main beam. “We’ve demonstrated that it is possible to transfer energy from the drive beam and feed it to the main beam,” explains Phil. “Now we need to work on more of the technical implementation and system optimisation, not least how to mass produce the components that we need – essential for keeping the cost of the project as low as possible.”

For the next few years, the focus is definitely on CLIC R&D, but Phil will undoubtedly have more than half an eye on results coming out of the LHC when it starts operating again in 2015.

First-hand inspiration

Physics teacher, Raxa Popat shares her experience of bringing her students to CERN for the first time.

“What is our Universe made of? Some of it may be stuff that scientists call ‘dark matter’. We wondered if the LHC could solve any of this mystery.

[Lady Margaret School](#), a comprehensive all girls Church of England Academy recently made its first trip to CERN. 15 girls and three staff arrived to a wonderful welcome by CERN staff. There was a positive feel about this place, very busy, and full of scientists; conversations ranged from ‘what’s next in physics’ to ‘proton flashes and electron magnitudes’- staff on their lunch break.

The questions in our mind continued, what kind of Universe do we live in? Physicists say that the Universe has more dimensions than the four that we are aware of. We needed to know more, much more. We started off by visiting CERN’s Globe. It is 27 metres in height and 40 metres in diameter, and the landmark by day and by night. Its wooden structure constitutes a

symbol of sustainable development, and sends a clear message on science, particle physics, cutting-edge technologies and their applications in everyday life. From the infinitely large to the infinitesimally small, this exhibition gave us the key to understanding the secrets of matter. We explored some of the mysteries of the Universe and the massive apparatus used by physicists, the accelerators and detectors.

A short introduction to CERN's work from a CERN scientist explained how the experiments are carried out and how the LHC recreates the conditions that existed a billionth of a second after the Big Bang. He also went through how the Universe is made up of matter, the mass of particles, and the point that some particles have mass and others don’t! All this was fascinating, the girls really enjoyed it; one of our girls immediately asked how she could come and work at this fascinating place!



Lady Margaret School outside the Globe © R Popat

We were then taken to the LHC Control Centre where we were met by a member of staff. He explained the Control Centre’s role in particle acceleration, and a series of screens could be seen behind a large window. We then headed off to see, CMS.

CMS uses an array of detectors to track the decay modes of particle collisions. Our guide talked us through the total make up of CMS, before taking us 100m below the ground. The CMS detector is built around a huge solenoid magnet. This takes the form of a cylindrical coil of superconducting cable that generates a magnetic field, about 100,000 times that of the Earth. The magnetic field is confined by a steel ‘yoke’ that forms the bulk of the detector’s weight of 12500 tonnes. We were told that an

unusual feature of the CMS detector was that instead of being built in-situ underground, like the other giant detectors of the LHC, it was constructed on the surface, before being lowered underground in 15 sections and reassembled.

The LHC carries out experiments looking for evidence of new dimensions; it is the epitome of research. The girls at Lady Margaret School enjoyed it very much, and with at least two out of five girls in the upper sixth form going to university to read physics, we hope this visit will inspire the 10 lower sixth girls to do the same.”

Lady Margaret School works closely with the [Stimulating Physics Network](#), enthusing and inspiring an increasing number of students to study physics at A-level and beyond.

Wanted: summer students

Would you like to spend your summer working on an LHC experiment?

STFC Rutherford Appleton Laboratory is looking for high calibre undergraduates who are currently in their 3rd year studying physics to join the [Particle Physics Department](#) as summer students. Up to eight places are available for 2014.

You could find yourself joining an established and supportive team working on ATLAS, CMS or LHCb. Other projects include dark matter and the T2K neutrino experiment.

Studentships will typically be for eight weeks between June and September. More information is available [online](#) and the deadline for applications is 31 March.

Big Science Roadshow

UK companies interested in finding out how to become a CERN supplier can get practical information at two free roadshows organised by UKTI and partner organisations including STFC.

The roadshows, in Bristol (20 March) and

London (27 March), aim to raise awareness of the procurement opportunities associated with large-scale global scientific infrastructure projects including CERN.

At the events, UKTI, STFC, the Electronics Sensors and Photonics Knowledge Transfer Network and the UK Atomic Energy Authority will present the opportunities available at:

- CERN
- ITER, a fusion project which aims to demonstrate the potential for commercial energy from fusion
- ELI, the Extreme Light Infrastructure
- SKA, the Square Kilometre Array
- E-ELT, the Extremely Large Telescope

It is estimated that, over the lifetime of the various projects, the combined procurement budget for these facilities is upwards of £20 billion.

Delegates have the chance to book one-to-one meetings with representatives of each of the projects and there will be access to advice on how to prepare a bid as well as working in the various countries where the science facilities are based.

Places must be [booked in advance](#).

Entrepreneurial opportunities

Two great ways to take your big idea off the drawing board:

1. HEPTEch PhD Symposium

This symposium offers early career researchers in fields related to applied physics opportunities for networking with commercially experienced professionals and technology transfer experts to develop their entrepreneurial potential.

High energy physics research has been the root from which many game-changing innovations have grown; from the World Wide Web to CT/PET scanning, technologies have been transferred to the mainstream of European society giving rise to innovative industrial processes.

[HEPTech](#) is a network of technology transfer offices active in particle, astro-particle, high energy and nuclear physics. The network enables the transfer of scientific research results to society by fostering relevant collaborations between research and industry.

If you have been involved with research in particle physics, are in the process of concluding or have concluded your PhD within the last three years AND you have an entrepreneurial spirit, this is your chance to work with research experts and industrial players. It is an opportunity to become one of the people who can define the next generation of scientific discovery, innovation and technology.

For more information and an application form, contact [HEPTech](#). The deadline for applications is 15 April.

2. Enterprise Fellowships

Scientists who want to develop a business idea based on STFC-funded research are invited to apply for an [RSE/STFC Enterprise Fellowship](#).

Funded by STFC and delivered by the Royal Society of Edinburgh, this one year Enterprise Fellowship is designed to give the fellow both the time to develop the commercialisation idea and the training to develop their business skills.

Fellows will be paired with a mentor giving them a valuable insight and connection to the business world. The aim of the scheme is to make both the technology and the fellow more competitive in business.

Previous fellowships have developed the technology required to store hydrogen and taken software that was initially designed to help control spacecraft systems and developed it into revolutionary animation software. Both fellowships led to the creation of spin-out companies.

The closing date for applications is 16 May.

Atom wins award

Article drafted by Fflur Jones, a work experience student from the troisième year at the Lycée Collège International in Ferney-Voltaire.

Lyn Evans is the first winner of the prestigious St David Award for Innovation and Technology.



Lyn with his award © Welsh Assembly

Initiated by the First Minister of the Welsh Assembly, Carwyn Jones, the awards recognise and celebrate the exceptional achievements of people in, and from, Wales.

Evans the Atom (as he has been dubbed by the Welsh media) was nominated for his role as project leader for the LHC. Speaking about the award, Lyn said, "It was great to be recognised by my fellow countrymen together with the likes of opera star, Bryn Terfel, paralympian, Tanni Grey-Thompson and rugby player, Lee Halfpenny (runner-up in the sports category). I've been out of the country for nearly 45 years; it's great that they have not forgotten me."

Congratulations!

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Diary dates

CERN Council – 17-20 March
[Collider exhibition](#) in London until 6 May
Collider in Manchester 23 May–28 September