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Will shortage of accelerator scientists hold back technological advances?

Although the discovery of the Higgs boson may be accelerator science's most headline grabbing application, this branch of physics is fundamental to many of the most exciting technological advances of recent years. Integrated circuits, mobile phones, the internet, food sterilisation techniques, advanced reactor technologies and proton beam therapy for cancer have all been made possible with particle accelerators; however, there is a real concern that a skills shortage will delay future advances.

Prof. Carsten P. Welsch of the Cockcroft Institute (UK), a centre of excellence in accelerator science, warns: "Europe is investing heavily in world-class research facilities that will allow us to create beams of ever higher energy and intensity, that provide beams of low energy antimatter particles of unprecedented quality and is also leading in research into so-called 'novel accelerators' that can achieve significantly higher accelerating gradients and are hence more compact than any other technology. However, we are not investing in the people we need to exploit these unique opportunities."

The market for medical and industrial accelerators alone currently exceeds 3.5 billion euros a year, and it is growing at more than 10% annually. Still, large research infrastructures are frequently the driving force behind smaller accelerator applications and are vital for Europe's international competitiveness.

Prof. Welsch is a partner in the new European Circular Energy-Frontier Collider (EuroCirCol) project, which is designing a possible successor to CERN's Large Hadron Collider (LHC), as well as in the EuPRAXIA design study which targets a fundamentally new type of accelerator that can provide plasma-accelerated electron beams with industrial beam quality.

He explains that these two initiatives are exciting as they offer the potential for new discoveries and technologies: "The LHC went beyond previously explored energy levels and allowed us to see something never seen before. Future accelerator facilities will help us understand nature even better and will also provide beams for various health, security and energy applications. To design, build and optimise them, however, we first need to develop a whole range of new technologies, enhanced beam diagnostics and simulation tools."

Accelerator science is a very dynamic research area, but without greater investment in training there will simply not be enough researchers to commission and operate the research facilities while at the same time supplying the growing demand of experts from the accelerator industry.

Only a small number of universities across Europe have established accelerator physics as part of their undergraduate courses. It is hoped that international consortia of universities, research centres and private companies can now form new networks that provide the essential cross-sector environment for state-of-the-art research. This will ensure that the full potential of these important infrastructures can be exploited and allow for the key technologies to be developed.

Contact details

Prof. Dr. Carsten P. Welsch, Department of Physics, University of Liverpool, and the Cockcroft Institute, Sci-Tech Daresbury
www.cockcroft.ac.uk
www.quasar-group.org
carsten.welsch@cockcroft.ac.uk