

# INSPIRING AND EDUCATING NEW GENERATIONS

***CERN engages with society through a wide range of outreach and education activities. Their main objectives are to broaden understanding of science and of CERN's activities, to inspire young people, to improve science education at secondary school level, and to train a new generation of scientists and engineers.***

*In 2016 S'Cool LAB, CERN's learning laboratory, offered more than 5800 school students the opportunity to carry out hands-on physics experiments. In this picture some of these students have just built a cloud chamber to observe the tracks left by particles. (OPEN-PHO-LIFE-2017-008-3)*



## EDUCATING THE SCIENTISTS OF TOMORROW

CERN's involvement with science education focuses mainly on secondary school teachers and students. A passionate and knowledgeable teacher can resonate with students and provide inspiration for young minds. CERN's goal is to empower teachers in this role by keeping them up to date on current research in particle physics.

In 2016, 953 science teachers from 46 countries took part in one of 35 one-week training programmes (in their national language) or in the three-week international high-school teacher programme (in English), to learn more about the fundamental discoveries of particle physics and cosmology, share their experience with other teachers and, most importantly, be inspired to foster a love of science in future generations of students. Visiting CERN and interacting with scientists also gives more insight into the scientific method and the interplay between hypotheses, theories, experimental data, peer review, open critical thinking and discussion.

School students represent about 60% of CERN's visitors; in 2016, the Laboratory welcomed a total of 70 000 pupils. One of the most important aspects of such visits is the potential to inspire young people and to help them understand how science works – and, for some of them, to arouse the passion for a career as a scientist or engineer.

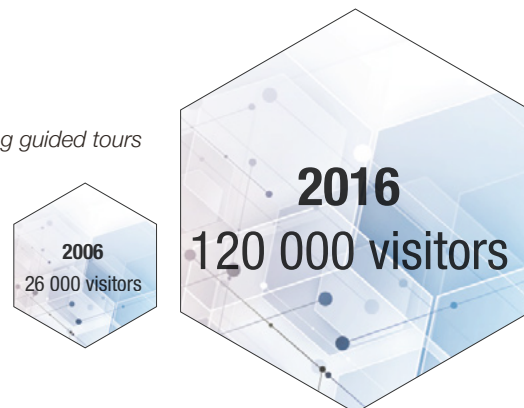
Beyond guided tours, CERN offers educational programmes for the more motivated students. S'Cool LAB gave more than 5800 school students the opportunity to attend a workshop in CERN's learning laboratory. This initiative offers students the chance to carry out hands-on physics experiments independently in half-day workshops: in small groups of

two to four they can build cloud chambers, visualise X-rays with pixel detectors, trap elementary particles and learn the basics of particle acceleration or the principles of a PET scanner.

The Beamline for Schools competition is open to teams of high-school students aged 16 or older. It gives budding scientists a chance to propose and carry out a real particle physics experiment at a fully equipped CERN beam line, using a pre-determined set of detectors that the teams can choose from. In 2016, the third edition of Beamline for Schools attracted proposals from 151 teams across 37 countries. Two teams were selected and invited to carry out their proposed experiments: the Pyramid Hunters from Poland studied the tomography of Egyptian pyramids and the absorption of muons in limestone; and the Relatively Special team from the United Kingdom tested the validity of the theory of Special Relativity using the decay rate of pions.

International Masterclasses are an exciting way to experience life at the cutting edge of research, giving school pupils the opportunity to become particle physicists for one day. The idea behind this annual programme, organised by IPPOG (International Particle Physics Outreach Group) and supported by CERN, is to encourage pupils to work as true scientists, using authentic and recent data from the LHC experiments. In 2016, more than 13 000 high-school students in 52 countries visited universities or research centres in their region. There, they listened to lectures about how particle physics research works, what the big questions are, and the process leading to a scientific discovery. Reflecting the international nature of particle physics, the programme was joined in 2016 by five new countries: Bangladesh, Georgia, Montenegro, Russia and Rwanda.

*Evolution of number of visitors taking guided tours of CERN from 2006 to 2016*



*CERN's visits and outreach were hugely successful in 2016. In particular, CERN offers a wide range of outreach activities to raise school pupils' awareness of fundamental science.*

- ◆ **Teacher training** 953 teachers from 46 countries • 10 000th teacher
- ◆ **School student programmes** Beamline for Schools: 191 teams applied • S'Cool LAB: 5800 pupils  
International Masterclasses: 13 000 pupils in 52 countries
- ◆ **CERN exhibitions** Permanent exhibitions: 70 000 visitors • Travelling exhibitions: 100 000 visitors
- ◆ **CERN tours** 142 protocol visits, 120 000 visitors, including 70 000 school pupils





*The fourth edition of TEDx CERN, which took place in November, explored how scientific curiosity and understanding spark innovation. (OPEN-PHO-LIFE-2017-005-2)*

## WORLDWIDE INTEREST BY NUMBERS

The interest of the general public and the international media in CERN is remarkable: in 2016, 145 000 articles about CERN were published in the world press, and the Press Office organised 242 media visits for 628 journalists from around the globe. Four million unique visitors to CERN's core websites and 1.7 million mentions on social media show the strength of the public's interest in CERN and its research.

Visual and multimedia resources play a crucial role in supporting all of CERN's education and outreach activities. More than 100 video clips and several animations were produced in 2016 for use in online digital content, visit points across the CERN site and exhibitions. In the spirit of being an open institution, all resources are freely available online, and are regularly used for educational and non-commercial purposes, thus spreading awareness of the process and results of fundamental research and CERN's activities internationally.

## VISITING THE LABORATORY

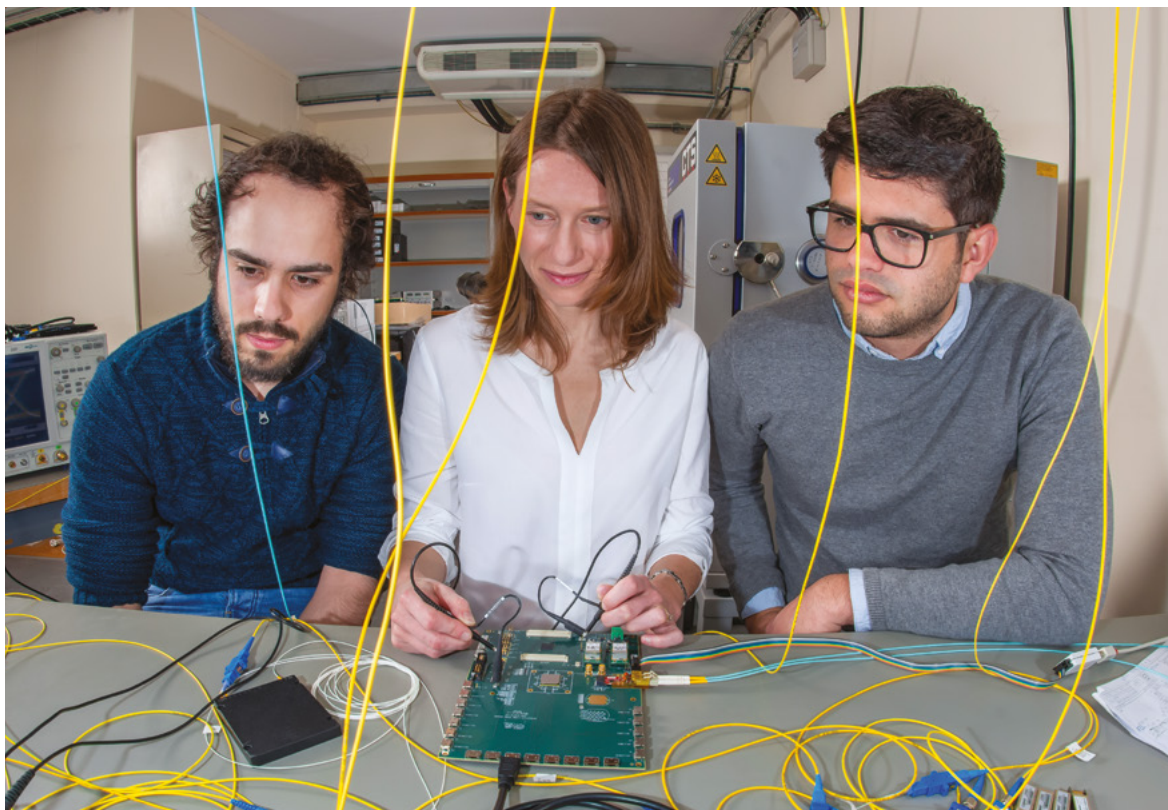
Visiting CERN has become a popular activity, even for busy world leaders: in 2016, the Laboratory welcomed five heads of state or government and organised 142 protocol visits. CERN is also highly attractive for the general public, including teachers and students, who discover how research in the world's largest laboratory for fundamental physics helps to answer the big questions about the universe. The annual number of visitors continues to increase, rising from 26 000 in 2006 to 120 000 in 2016. However, the demand for group visits is about three times higher, and "open tours" – guided tours for individual visitors – are usually fully booked within the first five minutes after registration opens. In addition, more than 70 000 people visited the two permanent exhibitions at CERN (Microcosm and the Universe of Particles).



*After 11 months of renovation work on the Globe of Science and Innovation, the Universe of Particles exhibition opened its doors again in April, and topped the TripAdvisor chart of tours and museums in the Geneva region. (BUL-PHO-VIEW-2015-002-7)*

## IMPACT ON LOCAL COMMUNITY AND CULTURE

Various activities for the local community took place at CERN in 2016: 12 well-attended public conferences, as well as the fourth edition of TEDx CERN, which explored how scientific curiosity and understanding spark innovation. Twelve renowned speakers shared ideas, ranging from new procedures for non-invasive prenatal testing to underground searches for dark matter. Four hundred people attended the event at CERN, and more than 3800 tuned into the webcast or watched at one of the 75 live-viewing parties in 33 countries. The "European Researchers' Night" was again well attended, attracting more than 400 people to presentations and visits at CERN. The Arts at CERN programme aims to reach new audiences using an interdisciplinary approach that brings the worlds of art and science closer together. The dialogue between artists and scientists takes place during one- or three-month residencies, fully funded by prominent art institutions such as FACT in the UK, Ars Electronica in Austria and ProHelvetia in Switzerland. The attractiveness of these residencies, whose winners are selected by a jury of artists and CERN scientists, is illustrated by the 904 applications received in 2016 for the 2017 FACT residency.



CERN's training programmes provide opportunities to acquire professional experience early in one's career. Here, a Master's student and an engineering Fellow, recently graduated, work alongside their supervisor (centre) on electronic systems for the experiments. (OPEN-PHO-TECH-2017-003-1)

## THE FIRST STEPS OF THEIR CAREER

The training of young scientists is also an essential part of CERN's education activities. CERN offers an enriching training environment for graduate and post-graduate students, providing business and industry in CERN's Member States with a steady stream of highly qualified young people with excellent technical skills and international experience.

The Summer Student programme provides university students with a unique two- to three-month experience of working in research groups, attending dedicated lectures given by leaders in the field, visiting CERN facilities and taking part in workshops and discussions. More than 2000 applications were received, and 278 university students from 87 countries took part in 2016.

Among these, 38 students from 22 countries came to work for two months on advanced IT projects in the context of the CERN openlab Summer Student programme, tailored specifically for university students with a strong background in computing.

The CERN fellowship programme targets recent graduates from universities and technical institutes. Out of 2170 applications, 412 fellows were selected and given the opportunity of a two- to three-year research experience in particle physics or in advanced development projects in a broad range of engineering and other technical fields.

The Technician Training Experience is part of CERN's fellowship programme, and offers highly skilled technicians a two-year professional experience to further their career or before they embark on advanced study programmes. Some 167 candidates applied, and 46 young technicians from nine countries were selected.

Out of 1486 applicants, 287 university students were selected to take part in the technical and administrative student programmes, which provide on-the-job training for a period of 4 to 14 months in applied physics, engineering, computing, and administration.

The doctoral student programme allows postgraduate students in technical fields to work on their thesis at CERN for up to three years. 85 doctoral students were selected from the 205 applicants for this programme.