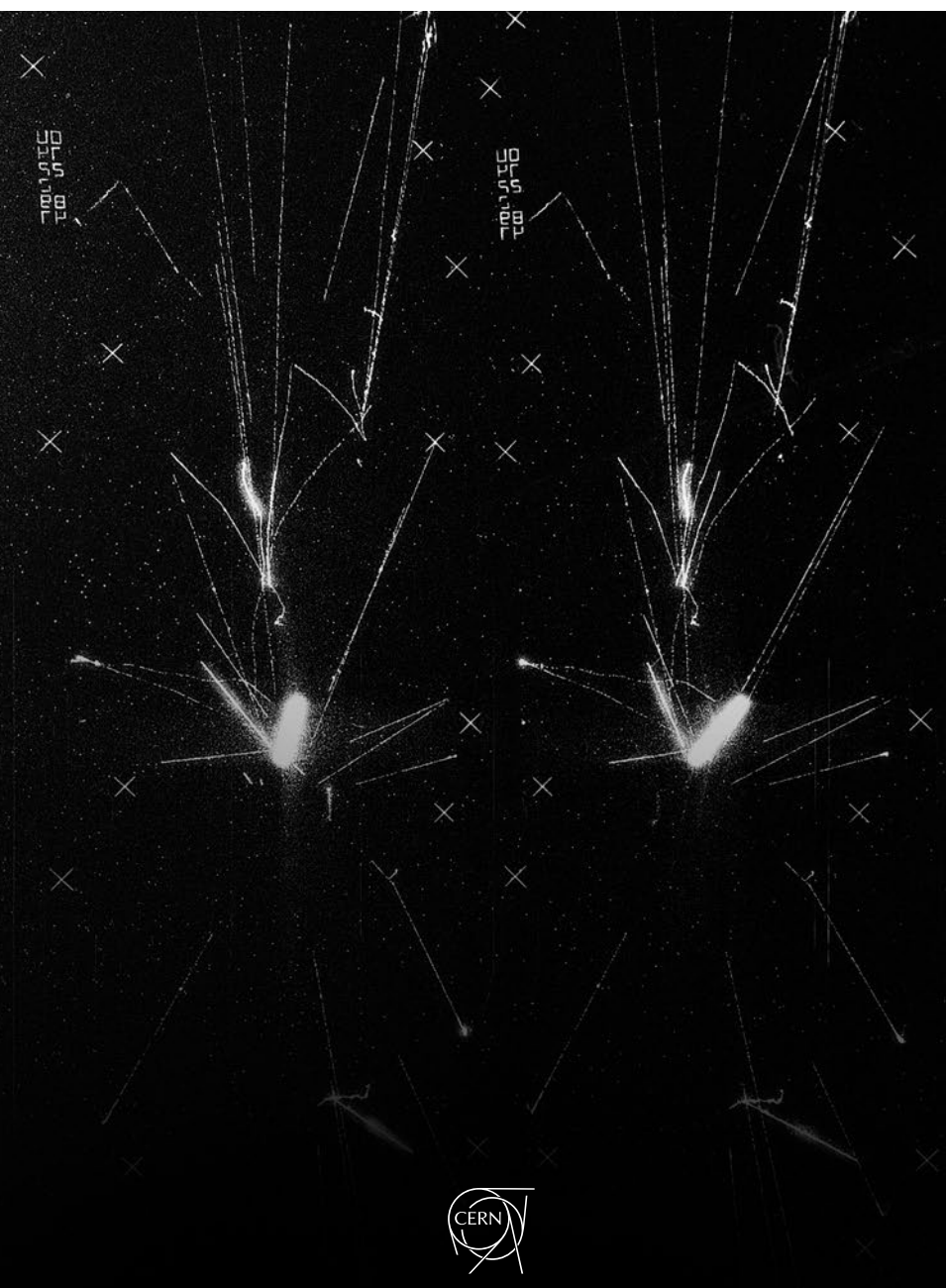




FIRST INTERACTIONS AT THE CERN PROTON-ANTI-PROTON COLLIDER  
AS SEEN BY THE STREAMER CHAMBER OF THE UA5 EXPERIMENT IN APRIL 1981.



CERN & Society

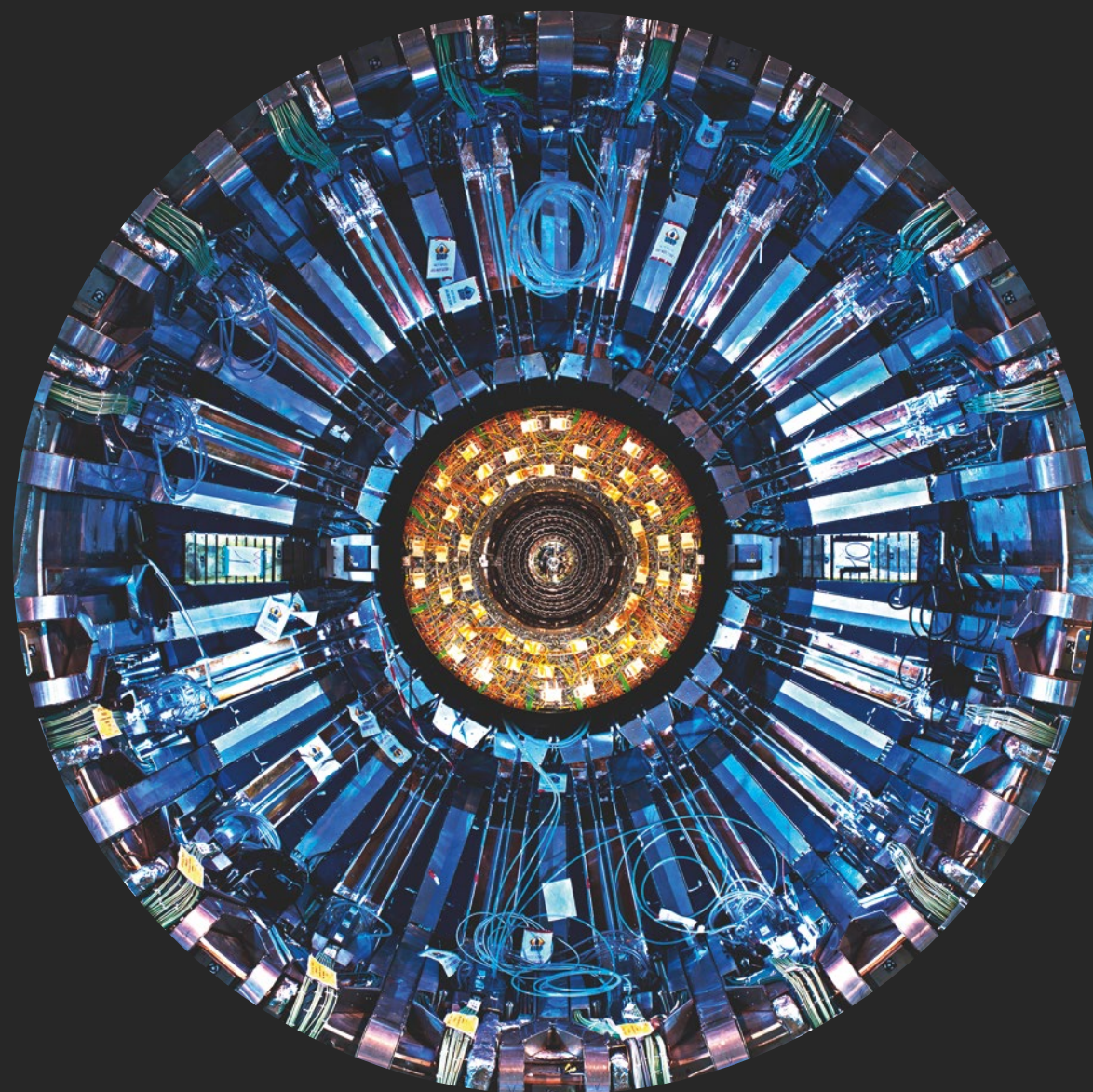
# CERN & SOCIETY FOUNDATION

ANNUAL REVIEW 2014





# OUR FIRST YEAR



I am delighted to serve as the first Chairperson of the CERN & Society Foundation. My introduction to CERN as a student in the mid-1980s was a life-changing experience. On graduation I returned as a research fellow working on the Large Electron-Positron Collider, but eventually moved into a career in investments. More than 20 years after leaving CERN, I met Rolf Heuer, the current Director-General. When I heard his vision of creating a foundation that would expand CERN's ability to reach a wider audience, I was keen to be involved.

Science is, in some respects, a field of study that is open largely to the most privileged. To do it well requires resources – trained educators, good facilities, textbooks, access to research and, of course, opportunity. These are not available universally. I was fortunate to become a summer student at CERN, but that is only possible for a lucky few, and there are many places in the world where even basic access to textbooks or research libraries is limited or non-existent.

To those outside of the field of science, there is not always a good understanding of why these things matter. The return on a country's investment in science will come years into the future, beyond short-term electoral cycles. There can appear to be more immediate and pressing concerns competing for limited spending, so advocacy of the wider benefits to society of investment in science is important.

These include a philosophy of sharing, of 'science for peace', arising from CERN's roots as a post-war intergovernmental organisation with a purpose beyond the concerns of individual nation states, where people from many different cultures and languages come together to exercise their curiosity and apply diverse intelligences to understanding the origins of our Universe.

CERN can directly benefit society through related projects that exist outside its fundamental research remit, and which therefore require external funding. The spirit of scientific discovery, conjured by the CERN name, is attractive to young people and CERN has infrastructure with spare capacity that can be put to productive use, for instance to make a unique contribution to biomedical research.

In June 2014, after many months of hard work, the CERN & Society Foundation was established "to spread the CERN spirit of scientific curiosity for the inspiration and benefit of society". Through the projects we support, we aim to excite young people in the understanding and pursuit of science; to pro-



vide researchers in less privileged parts of the world with the tools and access they need to enable them to engage with the wider scientific community; to advocate the benefit of pure scientific research to key influencers; to inspire cultural activities and scientific crossover with culture and the arts; and to further the development of science in practical applications for the wider benefit of society as a whole, whether in medicine, technology or the environment. The excitement generated by the Large Hadron Collider – not dissimilar to space flight in the 60's – gives us a unique opportunity to contribute to society in ways not possible within the constraints of dedicated member-state funding.

To translate this vision into reality will, of course, take time. The Foundation currently has a three-person board, made up of myself, Peter Jenni and the CERN Director-General. We are fortunate to have received some initial generous donations to get the initiative off the ground and allow us to fund our first projects.

The Foundation benefits from the advice of the CERN Fundraising Advisory Board (FAB), a body of CERN staff, chaired by Markus Nordberg, which ensures our compliance with CERN's Ethical Policy for Fundraising; the hard work of CERN's Development Office, led by Matteo Castoldi; the support of our governance and development consultant, Lucy Blythe; and help from volunteer project manager Stuart Storr. FAB helps us filter ideas for projects looking for support, and recommends those that are likely to have the highest impact in our three areas of activity: education and outreach; innovation and knowledge exchange; and creativity and culture.

Our website has details of current projects, and a digital version of this Annual Review will be available from summer 2015 with more information and interactivity.

We wish to thank all the supporters who contributed to CERN & Society projects in 2014. In the coming year, we look forward to welcoming enthusiastic partners – the early adopters who at the beginning of our journey share this spirit of curiosity and want to make an investment to help us make a difference.

Anne Richards CVO CBE  
CERN & Society Foundation Chairperson





But CERN's golden era is important for other reasons too. The LHC has put particle physics on the map like never before, and it gives us the opportunity to re-engage with society at a time when science is more important for the well-being of humans than ever.

With its extraordinary international standing and reach, CERN is uniquely placed to help accelerate a global response to the urgent, critically important challenge of public engagement in science and technology. CERN, like NASA in the 60's, excites young people and adults alike and we have seen that its spirit of scientific discovery can attract much-needed talent into STEM (science, technology, engineering and mathematics) study and careers. Furthermore, CERN's infrastructure, knowledge and open-source software can help catalyse valuable capacity building, innovation and research in disciplines beyond fundamental physics.

Through CERN & Society, we are sharing the benefits of our research in diverse ways. We are already making a difference through training programmes for the scientists and citizens of tomorrow and will soon contribute valuable biomedical research for cancer treatment using CERN's facilities and expertise.

When the LHC started up, there was just one key element of the Standard Model remaining to be discovered: the Brout-Englert-Higgs (BEH) mechanism responsible for giving the fundamental particles their mass, along with its associated Higgs boson. In 2012, we announced that discovery. The following year, François Englert and Peter Higgs were awarded the Nobel Prize for their development of the BEH mechanism in the 1960s. Englert's co-author, Robert Brout, had passed away in 2011, sadly too soon to witness the discovery he'd anticipated almost 50 years earlier.

CERN's current golden era is important for science. Although the Standard Model describes with beauty and elegance all the fundamental particles we know, we also know that there is much more to the Universe. The known particles account for no more than 5% of the total matter and energy that makes up the Universe. The rest is waiting to be discovered, and over the coming years, we're hopeful that the LHC experiments will begin that journey, writing the opening lines of the next chapter in humankind's exploration of the Universe we inhabit.

To take one example, the feedback from our first Beamline for Schools competition in 2014 has been overwhelmingly positive, from everyone who participated, not just the winners. *"This project has created authentic and deep learning in an enquiry-based model that has induced intrinsic motivation in my students,"* said one teacher. *"They are now incredibly excited about the possibility of entering the field of scientific research and are looking forward to their science lessons like never before."* Many urged us to make Beamline for Schools an annual event, and with your help, we can make that happen.

In an era in which society needs science more than ever, initiatives such as those supported by the CERN & Society Foundation are vital if we wish to ensure a sustainable future. We will rely on support from individuals, trusts and foundations and those companies who share our values. I extend my gratitude to everyone who has helped us so far and I hope that all our readers will enjoy discovering the achievements of the Foundation in its first year and will consider supporting us in the future.

**Professor Rolf Heuer**  
Director-General, CERN  
CERN & Society Foundation Trustee, ex-officio

## MAKING AN IMPACT

Ever since the first high-energy collisions were recorded for research in the Large Hadron Collider (LHC) in 2010, CERN has been enjoying a golden age. In 2010 and 2011, our experiments effectively re-discovered the Standard Model, a theory painstakingly pieced together in laboratories around the world over half a century to account for the fundamental particles of which we are all made. The Standard Model is a triumph of modern science, and the fact that the LHC experiments were able to repeat all the key measurements so quickly is testimony to the power of CERN's flagship facility. Following this success, we are eager to increase our efforts to satisfy the surge of public interest. Beyond CERN's core physics research, CERN & Society projects provide wider engagement opportunities, build capacity in developing countries, and use CERN knowledge and infrastructure for the benefit of society.



# WHERE WE'VE INVESTED OUR ENERGY

## EDUCATION & OUTREACH

ACCELERATING THE KNOWLEDGE OF THE NEXT GENERATION.



### CERN BEAMLINE FOR SCHOOLS

Teams of high-school students from all over the world compete for the chance to conduct a genuine science experiment at the CERN campus using a fully-equipped particle beamline on CERN's Proton Synchrotron accelerator with support from CERN scientists and engineers.

This project inspires young people to get involved in science by working in teams, learning about the scientific process, exchanging ideas with students in other countries, collaborating with scientists from around the world, and encouraging them to consider STEM careers – even if they don't win! The winning teams work at CERN as if they are real CERN scientists – complete with stimulating discussions with peers and mentors, late nights, health and safety training, and all the rest that goes with world-class science in an inspiring international environment.

Last year, 4500 students from 60 countries registered, 3000 students submitted proposals and videos and 12 students came to CERN and conducted real research (with winning teams from Greece and the Netherlands). The results of their experiments have been submitted for publication in a high-impact journal.

*"My students did not have any idea about particle physics and CERN and now they are enthusiastic."*

– Teacher of Beamline competitors, Spain

### CERN-UNESCO SCHOOLS FOR DIGITAL LIBRARIES

CERN-UNESCO Schools for Digital Libraries aim to increase the impact of African researchers' work, and to improve their access to research resources from around the world. Librarians and IT specialists from African research institutions learn the skills and tools to establish online document repositories. We now anticipate that more African researchers will join the global network of digital libraries and build capacity in their own countries.

Hands-on training from CERN experts equips participants to run a digital library, and enables them to install and configure an open source digital library system on local computers during the one-week course. About 30 participants from several adjacent countries attend each School.

Successful Schools have been run in Rwanda, Morocco and Senegal. To date, 90 African librarians and researchers from 15 countries have been trained and 50,000 previously unavailable documents have been uploaded to digital libraries. The programme's capacity-building effect has already had an impact in the development of a virtual library for eight countries in the West African Economic and Monetary Union (Union Economique et Monétaire Ouest Africaine, UEMOA), following a 2014 workshop in Dakar led by previous School participants.

The next School will be held in Ghana in 2015, for 30 participants from 15 institutions in five or six countries in West Africa. In 2016-2018, we hope to run two Schools per year in other African countries.



## CREATIVITY & CULTURE

CREATIVE COLLISIONS BETWEEN THE ARTS AND SCIENCE.

### ARTS@CERN

Both particle physics and the arts explore our existence – what it is to be human and our place in the Universe. The two fields are natural creative partners for innovation, research and development in the 21st century.

Arts@CERN is a platform for collaborative work between the arts and science and has three strands: **Collide@CERN**, a three-month residency; **Accelerate@CERN**, a one-month residency; and the **Visiting Artists programme**, which invites selected artists to undertake a two-day curated visit. Monica Bello, an expert arts/science curator, heads the programme and Julian Calo is the coordinator.

A Cultural Advisory Board supports Arts@CERN, and consists of Andrea Bellini, Director of Centre d'Art Contemporain de Genève; Laurent Le Bon, President of Picasso Museum, Paris; Serge Dorny, Director of Opéra National de Lyon; Ariane Koek, Founder and former Head of the Arts@CERN programme; Carena Schle Witt, Director of Kaserne Basel; and CERN scientists Frédéric Bordry, Director of Accelerators and Technology, and Dr. Bilge Demirköz.

*"Knowledge is limited...  
imagination embraces the entire world."*

– Albert Einstein



*"Together science and the arts form culture, our expression of what it is to be human in our Universe. Our work is in science, but when we engage with the arts, we want to ensure we approach it at the same level of quality."*

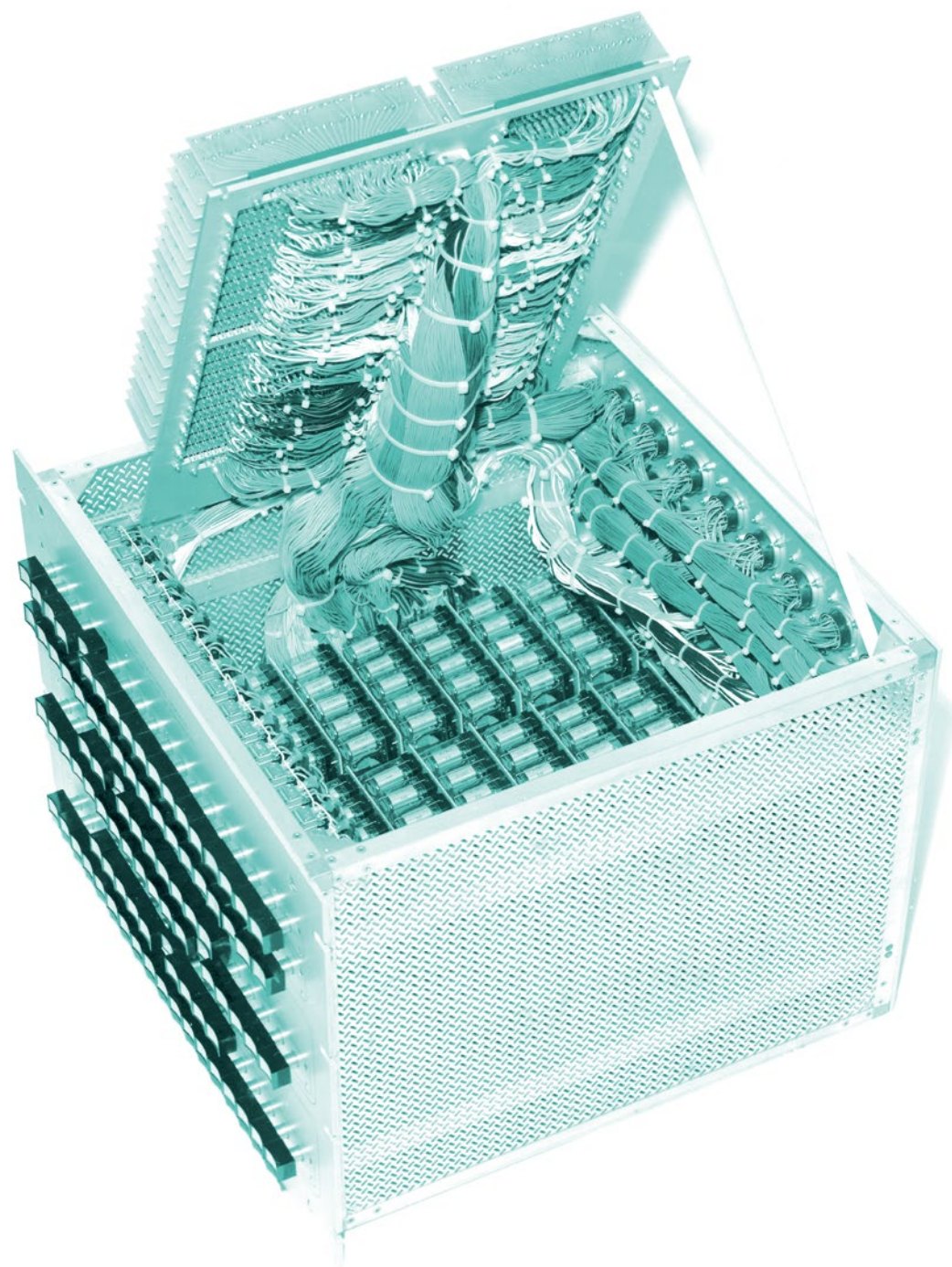
– Rolf Heuer, Director-General, CERN





LHC TUNNEL





# INNOVATION & KNOWLEDGE EXCHANGE

*BREAKING DOWN BARRIERS TO DISCOVERY AND INVENTION.*

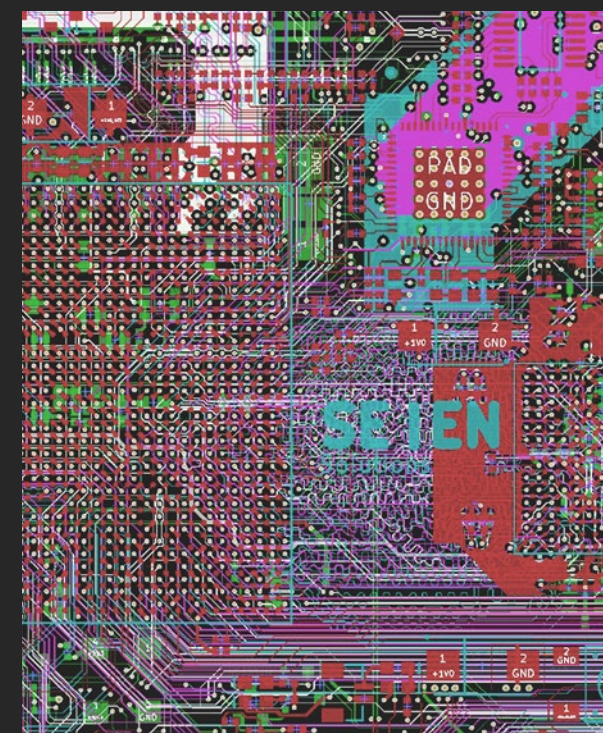
## KiCAD

CERN gave the world free and open access to the World Wide Web. In another act of scientific generosity, CERN offers open-source software that removes artificial barriers to the sharing of information, so that design and development knowledge can flow more freely.

KiCAD is a Free and Open Source Software (FOSS) suite that people can use to freely create and share design information without compromising productivity and without the expense of high-end proprietary tools for Printed Circuit Board (PCB) design. This is a boon for academics, students and professionals, who have an opportunity to contribute to the ongoing development of the tool.

The platform is also highly valuable for small knowledge-based companies, which can now make meaningful contributions without big up-front investments. This paves the way for a much more dynamic environment for electronic design, innovation, product development and commercialisation. KiCAD development will continue at CERN through the course of 2015, with further developments coming from users in subsequent years.

Already generous contributions have been made online and we need to raise an additional CHF 375,000 to enable CERN to develop the tool's features and quality so that it can then become self-sustainable.



*"I made a small tool called apaBoard, and I had the honour to present my development at MTA (Hungarian Academy of Sciences). KiCAD changed my life. I presented KiCAD as the most important software in my work."*

*– Balint Kiss (17-yr old student, winner of the 1st prize of the Hungarian Association for Innovation)*



# CHARTING . . .

## OPENMED

*A WORLD-LEADING BIOMEDICAL FACILITY AND A COLLABORATIVE PARADIGM FOR BETTER CANCER THERAPY.*



### BIOMEDICAL FACILITY

CERN's OPENMED will enable more rapid progress in the development of hadron therapy, one of the most promising and innovative weapons in the fight against some of the most difficult-to-treat cancers.

Hadron therapy, an advanced radiotherapy technique, treats tumours with protons or other ions which can be tuned to deliver their dose precisely within the tumour target while sparing the surrounding healthy tissues.

OPENMED will provide beams of different ions at various energies, allowing medical and radiobiological collaborators to fully investigate biological impacts on tumour cells and biological material. This will ultimately provide the opportunity to optimise hadron therapy for different cancer types. OPENMED will also enable scientists to test innovative particle detectors and to perform accurate fragmentation studies, in order to improve medical imaging techniques and treatment planning.

### WHY BUILD A BIOMEDICAL FACILITY AT CERN?

The need for an open-access biomedical facility was first raised by the scientific community at the 2010 Physics for Health workshop, where CERN was asked to take the lead on this initiative. In 2012, a brainstorming meeting evaluated the possibility of modifying the existing CERN Low Energy Ion Ring (LEIR) accelerator to establish OPENMED. The medical and radiobiological communities united in broad agreement on the need for such a dedicated research facility, complementary to those existing outside CERN.

This facility will benefit from CERN's experience in international cross-disciplinary scientific collaboration as well as CERN's existing knowledge of accelerator physics and experimental techniques. **Most importantly, a base to host the research community and the accelerator infrastructure already exist at CERN, thus significantly reducing the cost of establishing OPENMED; it would be prohibitively expensive if created independently.**

OPENMED will exploit the LEIR accelerator, which is used for a few months each year for pre-accelerating heavy ions for the particle physics programme (e.g. for the Large Hadron Collider).

Adapting the existing infrastructure for biomedical use is outside the scope of CERN's core activities and therefore requires external capital funding of CHF 20.5m. The facility will be ready within 3 years of capital funding being secured.

# . . . THE FUTURE

## CERN CAMPUS

*IMPROVING ACCESS TO THE LEARNING OPPORTUNITIES AND SCIENCE AT CERN.*

The extraordinary public interest in CERN's work presents an important opportunity to grow public understanding of a large-scale, interdisciplinary scientific endeavour, the nature of our Universe, and the ways in which a deepening understanding of matter itself affects our lives.

CERN has both the occasion and the obligation to harness and harvest this interest. That is the impetus behind the CERN & Society Foundation.

CERN CAMPUS comprises the “*public facing*” aspects of CERN, on site, providing better facilities and access for the visiting public, students, academics, professionals and key representatives. These groups have distinct but overlapping requirements, many of which are either unmet or inadequately met by the current configuration of buildings and infrastructure.

CERN CAMPUS comprises a number of integrated landmark architectural components that together will provide the infrastructure for a concerted approach to the visitor and learning experience at CERN. Our vision celebrates idealism about science, international collaboration, and the duty and rewards of education, particularly for youth and future world leaders in science and technology. All new elements will be constructed from sustainable and recyclable material based on energy-efficient design with substantial use of solar panels.

New elements of CERN CAMPUS include a building (as yet unnamed), which will fulfil many of the currently unmet functions, including a large multi-modal auditorium (2200 capacity); offices to accommodate 400 people, including those for CERN Council delegations and International Relations Office; meeting rooms and seminar rooms; cafeteria and/or catering facility; and library facilities. Its architecture will be based on common open spaces to facilitate the interaction and exchange of ideas and knowledge.



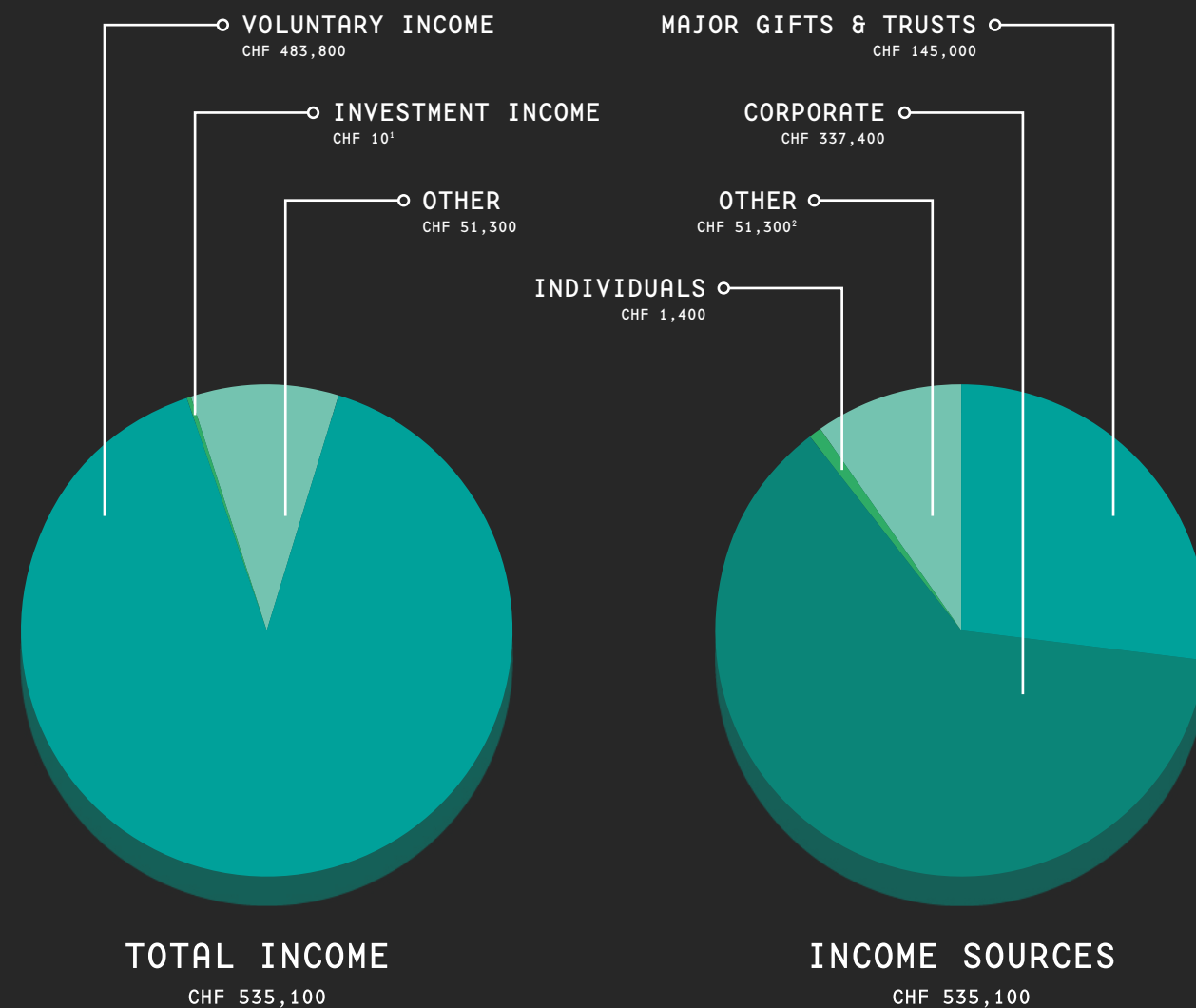
In addition, we plan an annex building near the Globe of Science and Innovation to serve visitor needs, including reception and education spaces, a cafeteria, shop and toilets. There will also be an exciting space called IdeaLab, focusing on detector technology innovation by interdisciplinary teams of young people, which may contribute to the future creation of an on-site technology park; and SchoolLab, which offers 10 to 12 modern physics experiments for school classes visiting CERN. Finally, to link the Globe to the main campus, we plan to run a pedestrian tunnel under the Route de Meyrin. This will simulate the LHC tunnel to further educate visitors about Collider engineering and the evolution of the Universe.

We need to secure support for our efforts, which cannot be accommodated within our traditional funding model as a publicly-funded fundamental particle research laboratory – and certainly not at the level of quality desired in order to meet public expectations. This means that we are reaching out to foundation, corporate and individual partners who share CERN's commitment to education and international collaboration and who grasp the opportunity that we have before us.

We are therefore looking for a few key partners to invest in realising our vision for CERN CAMPUS, which is the physical manifestation of our commitment to public education and outreach.



# SUMMING UP OUR YEAR



<sup>1</sup>Investment Income

After our first six months of operations, and without a significant founding endowment, this is not yet an important source of income. However, we hope that over time, some visionary philanthropists will choose to make endowment gifts and legacies to provide long-term income for the Foundation in order to sustain CERN & Society projects, such as the Non-member State Student programme, or to ensure that CERN can continuously refresh its education, outreach and capacity-building on site, online and around the world.

<sup>2</sup>Initial capital and registration fee paid by CERN.

## 100% IN, 100% OUT

100% of your contributions make a difference, and are applied to the purposes for which they are given. CERN provides the minimal operating costs of administration through its development office. As a matter of Foundation policy, “no funds raised shall be used for fundraising overhead costs unless specifically disclosed to the supporter”.

## CHARITABLE EXPENDITURE ON CERN & SOCIETY PROJECTS

The Foundation approved its first grants – a total of CHF 463,395 – on 30 March 2015. Further grants will be made to projects as the funds are needed, and always in accordance with donors’ wishes.

## STRUCTURE AND GOVERNANCE

The Foundation’s governing document allows for a maximum of nine and a minimum of three Trustees, including the Director-General of CERN ex-officio, and one member designated by CERN. Before establishing the Foundation, in-depth consultations with CERN staff and other stakeholders helped inform a robust ethical policy to guide our work.

In the first year of operations, the Board has approved a number of policies and conventions in order to manage its activities and pursue its purpose with integrity, transparency and confidence. These include Board Conflict of Interest; Board Code of Conduct; Ethical Fundraising; Recognition of Donors; Complaints Management; and Document Retention and Destruction. The board also maintains a risk register, reviewed at every meeting. A convention was signed with CERN, setting out the relationship between the Foundation and CERN and establishing their collaboration in supporting and promoting the benefits of CERN’s mission to the widest possible public.

## TRUSTEES

**Anne Richards CVO CBE**  
Chief Investment Officer,  
Aberdeen Asset Management  
Chairperson

**Professor Rolf Heuer**  
Director General, CERN  
Trustee, ex-officio

**Professor Peter Jenni**  
Albert-Ludwigs-University Freiburg, Germany  
Former Spokesperson, ATLAS Collaboration  
Trustee, CERN appointee





# THANK YOU

*To all the creators and sustainers  
of the CERN & Society Foundation,  
thank you for your support!*

## CERN STAFF

Without the curiosity, creativity, hard work (often as volunteers), and social conscience of the staff at CERN, CERN & Society projects would not be possible.

## MAJOR GIFTS AND TRUSTS

Fluidum Foundation  
Winton Charitable Foundation  
Engin Arik Fund\*  
Fondation Lord Michelham of Hellingly\*  
Pro Helvetia\*

## CORPORATE

A.D.A.M. SA  
Bank Julius Bär & Co. Ltd.  
National Instruments Corporation  
Pestalozzi  
Raspberry Pi  
R. Crusoe & Son  
Danfysik A/S\*  
Insight Cruises\*  
Kale Holdings LLC\*  
NETAŞ TELEKOMÜNİKASYON A.Ş.\*  
Rolex SA\*  
UBS AG\*  
UNIQA Assurances SA\*

## INDIVIDUALS

Anonymous  
Matthias Baumann  
Lucy and Tim Blythe  
Jared Boone  
Thomas Cruttenden  
Jānis Skujenieks  
Timothée Manaud  
Oliver Meier  
Donald Murray  
Bryan Newbold  
Felix Obée  
Roberto Roncella  
Gaston Schelotto  
Jennifer Smart  
Stuart Storr  
Felix Rieger\*  
Justin Shaw\*

## OTHER

Austrian Federal Chancellery\*  
Ministry of Culture,  
Republic of China (Taiwan)\*  
Ville de Genève\*

We would like to thank the leading Swiss legal firm, Pestalozzi, for their invaluable *pro bono* advice and support in establishing the Foundation, and particularly Oliver Widmer, for his commitment and wise counsel.

Finally, we would like to thank Saatchi & Saatchi Switzerland for very generously designing and working on the creative elements of our first Annual Review on a *pro bono* basis.

\*THESE SUPPORTERS CONTRIBUTED DIRECTLY TO CERN & SOCIETY PROJECTS BEFORE THE FOUNDATION WAS FORMALLY ESTABLISHED.



## THE COVER

*The cover design of this Annual Review was developed by Saatchi & Saatchi Switzerland to represent the outcome of particle collisions. As the white paint hit the paper irregularly, each copy is unique, reflecting the probabilistic nature of creating new particles.*

*To accentuate the overall design, a real picture of tracks from particles produced in collisions is displayed on the opening page, symbolising the reader's transition from the abstract cover to the details contained within the Review.*

## CONTACT DETAILS

**CERN & Society Foundation**  
c/o CERN, Route de Meyrin 385  
1217 Meyrin, Switzerland  
[development.office@cern.ch](mailto:development.office@cern.ch)  
<http://giving.web.cern.ch>



