From fire to electricity, discoveries have shaped human civilization. Fundamental research is the driving force for improving our lives. In 2012, CMS announced its first major discovery, the Higgs boson, a type of particle never seen before. Over the next 20 years, CMS will continue to unveil Nature’s secrets, guiding human development in the decades and centuries to come. As with most fundamental research, exploiting this discovery for practical gain is something for the long-term future. There are, however, near-term gains from the huge scientific and engineering efforts that led to the discovery.

“Our exploration of Nature at the energy frontier has been made possible by technologies that we have been designing and developing for over twenty years. The CMS Experiment is the outcome of long-term collaboration between thousands of researchers from around the world. Although our primary motives are to extend humanity’s knowledge of the Universe, an important consequence for society is the training of a new generation of scientists and engineers, who move on to apply their unique skills for the benefit of human health and developments that improve our daily lives.”

Tiziano Camporesi, CMS Spokesperson (2014–2016)
The CMS Collaboration brings together scientists from across the globe in a quest to advance humanity’s knowledge of the very basic laws of our Universe.

The collaboration is named after the Compact Muon Solenoid, one of the general-purpose particle detectors at CERN’s Large Hadron Collider. Its components were designed and fabricated all over the world and brought to CERN for final assembly. Data collected by CMS are shared with several computing centres via the Worldwide LHC Computing Grid. From there, they are distributed to CMS institutions in over forty countries for physics analysis.

In keeping with CERN’s commitment to open access for high-energy physics, the scientific results from CMS are shared openly with the world.

**SKILLS**

Over 90% of our doctoral students continue their professional life outside the collaboration. The skills they acquire here prove invaluable in whatever career they pursue.

**TECHNOLOGY FOR SOCIETY**

“Technology transfer from high-energy physics to medical imaging is active in several domains. A key example is the dedicated breast PET imaging device, ClearPEM, the first of its kind to use a large number of avalanche photodiodes, which is a direct spin-off of the technology initially used for the CMS electromagnetic calorimeter.”

Paul Lecom and Etiennette Auffray, CMS Collaboration & Crystal Clear Collaboration

“All the accelerators developed for fundamental physics have found applications in tumour therapy. CERN’s expertise in building accelerators has played a key role in the construction of the European network of centres worldwide, which are specifically devoted to the treatment of radioresistant tumours.”

Ugo Amaldi, President of the TERA Foundation

**THE MISSION OF CMS: TECHNOLOGY**

Giovanna Davatz - Co-founder of Arktis Radiation Detectors Ltd, Switzerland CMS PhD student 2003-2007; Institute for Particle Physics, ETH Zurich, Switzerland

_We develop detection systems for homeland security and nuclear safeguard applications, involving hardware and software development for detectors and electronics, and precise simulation. Some of these skills were acquired and enhanced while working at CMS. Being part of such an international high-tech environment was a great experience._

Jacopo Givoletti, president of CAEN, Italy

_Working with CMS on the LHC project represented for CAEN a real revolution that put every department of our company to the test. From this experience CAEN came out stronger, ready to face the new technological challenges that the future holds for LHC and CMS._

Jan Heyninck - R&D Manager for DENTSPLY International, Belgium CMS PhD student 2003-2007, Vrije Universiteit Brussel, Belgium

_The CMS collaboration trained me in breaking down complex problems into tangible targets and gave me a valuable perspective on working towards results in an international context. Skills I apply for R&D on 3D digital dental solutions._

Eva Medel Baez

_Chief Medical Physicist, Instituto Mexicano del Seguro Social, Puebla Mexico CMS student, 2004, University of Puebla, Mexico_

_I work in radiation therapy and benefited from my experience at CERN. Working on CMS taught me about fundamental physics, detectors, and radiation safety and I learnt how these can be applied for the benefit of human health._

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