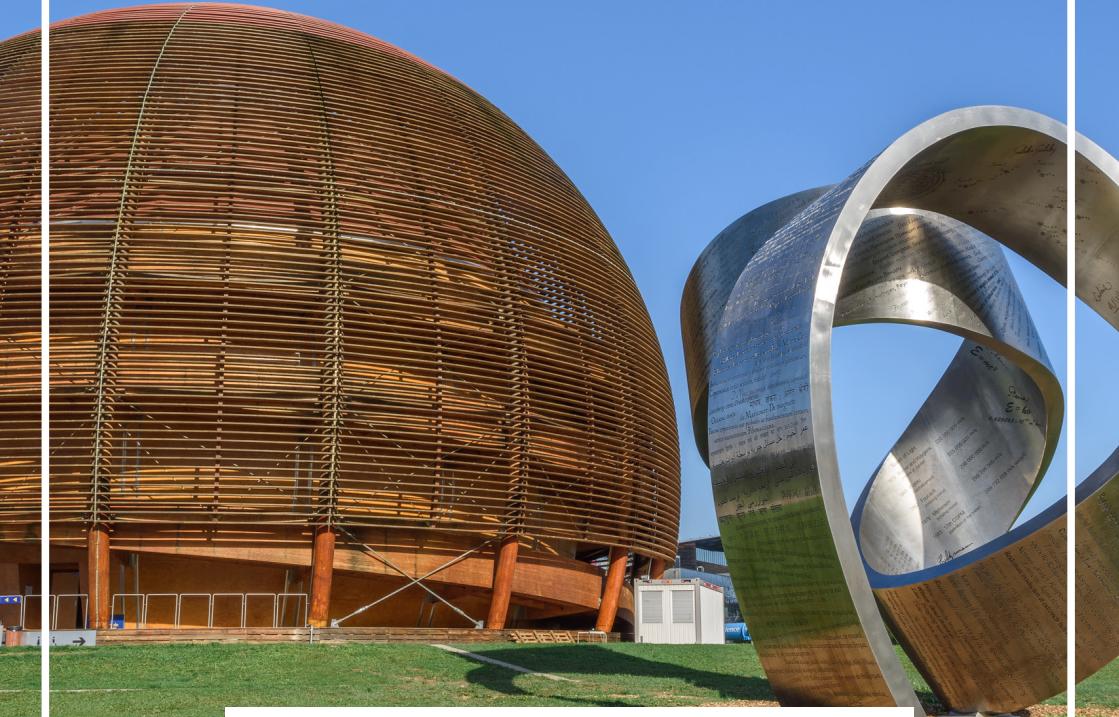
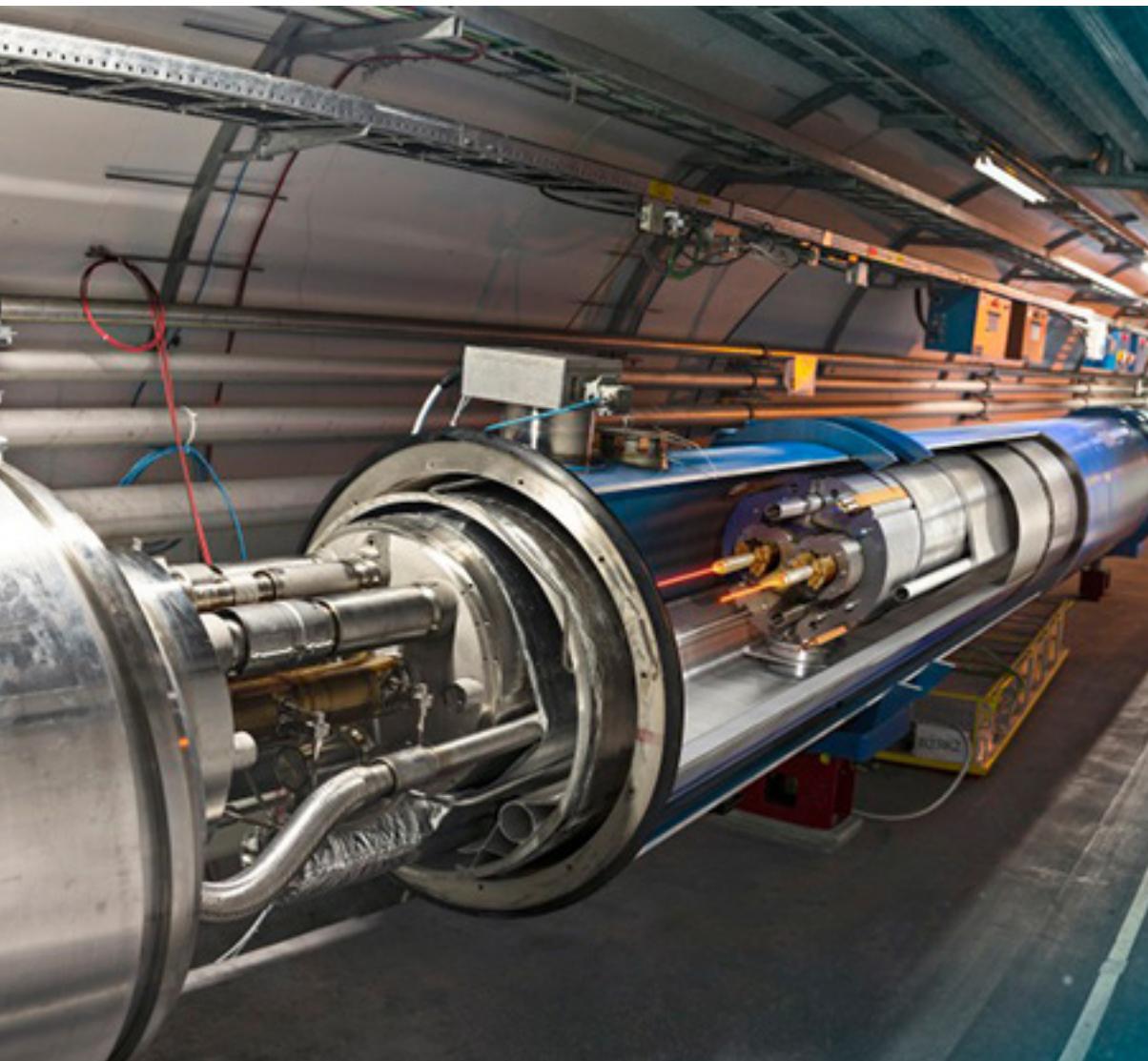


CERN

Conseil Européen pour la Recherche Nucléaire
European Organization for Nuclear Research



Permanent Mission of
Argentina to the international
Organizations in Geneva

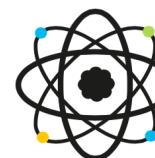


CERN

The European Organization for Nuclear Research (CERN) is the world's largest **research nuclear center**. It was founded in 1954 and it is located in the city of Geneva, Switzerland.

The CERN is a set of interconnected particle accelerators. Its main objective is to study the elementary constituents of matter and the origins of the **universe**. Besides, a number of experiments based on the study of medicine and environmental science take place there, just to mention some of them.

CERN operates with The Large Hadron Collider (LHC), the biggest world particle accelerator, where four wide-scale experiments (ATLAS, CMS, LHCb, ALICE) are being conducted.



CERN Community: Integrated by over 14,000 collaborators from more than 100 nationalities.

Large Hadron Collider (LHC). Copyright © CERN.



ARGENTINA & CERN

The Argentine Community participates actively at CERN both through different cooperation research agreements, as well as with the involvement of professionals collaborating directly with the center.

Argentina integrates the **EPLANET** exchange and scientific collaboration program.

There are various **cooperation agreements** signed between Argentine Universities and CERN

More than **eight Argentine** researchers are at present working on a permanent basis at CERN.

Picture: ATLAS Calorimeter. Copyright © CERN.

COLLABORATION WITH ACCELERATORS

Since **1983**, the Instrumentation and Control Laboratory (LIC) from Mar del Plata National University (UNMdP) has been working with CERN on activities related to the development in the field of electronic power, with a view to providing energy to different types of electromagnets, which are present in particle accelerators.

Such cooperation has been going on since 1976, with Dr. Mario Benedetti

Such cooperation has been going on since 1976, with Dr. Mario Benedetti. Among the researchers that have taken part at CERN, there are Dr. Daniel Carrica, Director of LIC and of the Institute of Scientific and Technological Electronic Research (ICYTE) from UNMdP; Gustavo Uicich; Alejandro Rudometkin; Joaquín Fernández Rovira; Dr. Sebastián Maestri; Dr. Rogelio García Retegui; Dr. Nicolás Wassinger; Dr. Pablo Antosczuk; and Daniel Calcoen and José Luis Gómez Costa (who are working at CERN at present).

As a result of this extensive collaboration, in 2009 Argentina and CERN signed The PO92/LHC/A1 Cooperation **Protocol**.

The research and development agreement (I+D) co-signed by CERN and CONICET, made it possible for the LIC to be completing their work on the update of the converters for one line of transference, called TT2. Such work consisted of the study of various power converters and different control strategies to deliver efficiently the energy required by magnets, minimizing any possible disturbances in the electrical network. **>>>**

COLLABORATION WITH ACCELERATORS

On the other hand, LIC will soon start working on the study of different topological structures meant to feed the

superconductor magnets of HL-LHC (High Luminosity) Project, whose objective is to increase the luminous flux of the LHC. The project requires the presence of Dr. Sebastián Maestria on the CERN premises for 5 months, period after which, LIC will continue working at the local level.

The **I-D agreements** of cooperation and collaboration allow for the development and training of human resources. The projects various discussion topics have directly resulted in 6 PhDs (from researchers who have stayed at the CERN), together

with 3 indirect PhDs theses (from researchers who have participated in various activities from Argentina).

The country has **benefited** largely from the application of this high demand collaborative work, especially when it comes to lines of research in the fields of power control related to converters used to manage the energy that comes from renewable sources.

TECHNICAL -SCIENTIFIC COLLABORATION- ATLAS PROJECT

The Large Hadron Collider (LHC) and its detectors have led scientists to conduct wide-scale discoveries, of which the **Higgs boson** is the one that has made the vastest impact. The data from the proton-proton collisions of LHC are collected by detectors, particularly ATLAS and CMS, both LHC multi-purpose detectors. Each one of them is over 40 meters long, weighs over 7,000 tons and has millions of electronic channels.

As of 2006, high energy groups from [Buenos Aires University](#)/ [IFIBA-CONICET](#) and [La Plata Physics Institute](#), are full **members** of the LHC ATLAS collaboration project. This agreement has been the result of a joint effort of the directors of both high energy groups (Dr. Piegaia and Dr. Dova, respectively) to contribute to position Argentina as the world leader in scientific knowledge. The collaboration agreement was reached thanks to the academic level of Argentine scientists and the institutional support of the Ministry of Science, Technology and Productive Innovation (MINCyT), as well as CONICET.

At LHC about 800 million collisions per second are produced between protons advancing at opposite directions around a 27 kilometer circumference. These **collisions** take place at the center of the detectors that capture each one of these events. However, the existing storage technology allows for the recording of only 1,000 events per second, with the challenge of selecting the most significant collisions in micro seconds.

The High Energy Groups from The National University of La Plata and Buenos Aires University have the responsibility of selecting, through complex algorithms, the collisions relevant to the line of research pursued. The rigorous selection of these events >>>

TECHNICAL -SCIENTIFIC COLLABORATION- ATLAS PROJECT

allowed for the discovery of Higgs boson, as well as it encourages the search of new particles predicted from theoretical models, and contributes to the development of science based on the analysis of unexpected events.

The researchers and fellow teams from both groups are also dedicated to the **study** of properties of Higgs boson, and the search of new particles and forces, which could explain other issues, such as the dark matter of the Universe.

This challenge of innovative and collaborative work in scientific and technological **development**, has led the CONICET and MINCyT to receive a project to participate in the development of electronic components for ATLAS system. This project includes the technological developments for the design and production of a System of Programmable Gate Arrays (FPGA) and firmware, which will be implemented in the phase II or High Luminous flux phase LHC (HL-LHC), as from 2024.

ATLAS TASK FORCE



Universidad de
Buenos Aires

The **Discrete Event Simulation** group at Buenos Aires University is made up of:

- Rodrigo Castro, PhD CONICET professor and researcher
- Lucio Santi, Daniel Fogelman and Matias Bonaventura, doctoral fellows.
- Andrés Laurito and Matías Ré Medina, undergraduate students.

ATLAS TASK FORCE



UBA

Universidad de Buenos Aires

The **Atlas Experimental Energies physics** group from the University of Buenos Aires, is made up of:

- Ricardo Piegaia, Gustavo Otero y Garzón, both PhDs CONICET professors and researchers.
- Sabrina Sacerdoti, Jonathan Bossio Solá, Gino Marceca, María Florencia Daneri and María Roberta Devesa, doctoral fellows.

In this group, 11 students received doctoral degrees, and 17 received bachelor's degrees.

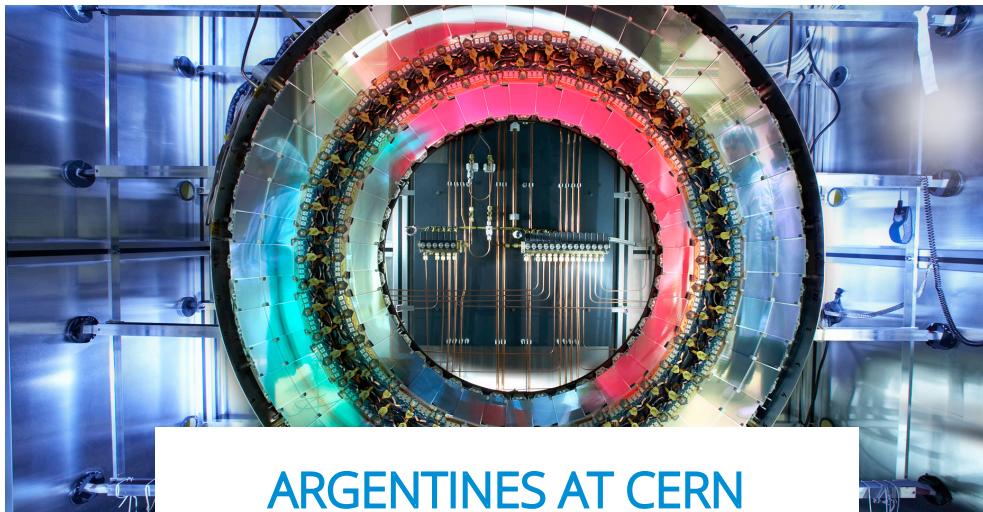


UNIVERSIDAD
NACIONAL
DE LA PLATA

The **High Energies** Group at La Plata University is made up of:

- María Teresa Dova, Dr. Hernán Wahlberg, Dr. Alejandro Szynkman, Dr. Fernando Monticelli and Dr. Ernesto Arganda, all PhDs CONICET professors and researchers.
- Francisco Alonso, postdoctoral fellow.
- Josefina Alconada Verzini, Francisco Arduh, Joaquín Hoya, Joaquín Bogado, Nicolás Mileo, Roberto Morales e Indira Vergara, CONICET and ANPCyT doctoral fellows.

In this group, 10 students received doctoral degrees, and 14 received bachelor's degrees.



ARGENTINES AT CERN

The nuclear engineer, Dr. Hernán Furci, works as a senior fellow on the CERN premises. He is responsible for the design of 3D maps, which allow for the tracing of **quenches*** on the basis of the detection of second sound in superfluid helium, from the development of tools for acceleration cavities test and the production of thermometers based on micro manufacturing techniques.

* Superconductor devices which lose their superconductor condition.

Graduated from Balseiro Institute (2010). Master's degree in Nuclear Fusion (2012, Université Aix-Marseille, France) and PhD in Cryogenics for Accelerators (2015, Université Paris- Saclay, France).

Picture: A disk for the ATLAS STC endcap in its testbox at NIKHEF.
Copyright © CERN.

Dr. Franco Mangiarotti, nuclear engineer, integrates the superconductors **electromagnet** testing section, where he is responsible for planning, executing and analyzing projects.

Standard electro magnets and prototypes are tested in this section:

- The electro magnet testing allows for the study of the physics of superconductors, with the aim of analyzing their performance before they are placed in the LHC tunnel.
- The objective of prototype testing is to evaluate the performance and detect improving opportunities.

Graduated from Balseiro Institute (2009). Master's degree (2013) and PhD (2016) in Nuclear Engineering from the Massachusetts Institute of Technology, Cambridge, USA. At present, he is pursuing his Post-Doctorate studies at CERN.

The electronic engineer, Daniel O. Calcoen, has been working at the CERN for seventeen years.

At present, he is responsible for directing and supervising projects associated with "quench protection" at Machine Protection Group and Electrical Integrity (TE/MPE-EP). This group **designs and builds** critical mission-systems to protect CERN Accelerator equipments from serious damage.

Graduated from Mar del Plata University (1996). Radiation Therapy Physics Specialist (IdEN – CNEA). While pursuing his studies, he was also a member of the Instrumentation and Control Laboratory (LIC) at UNMDP.

Claudia Dupraz has been working at CERN for ten years.

She started at Human Resources and as of 2007, she has been an administrative assistant in the Physics Department. At present, she is working for the Scientific Committees Secretariat, assisting members and collaborating with the committees organization.

THE ARTS AT CERN

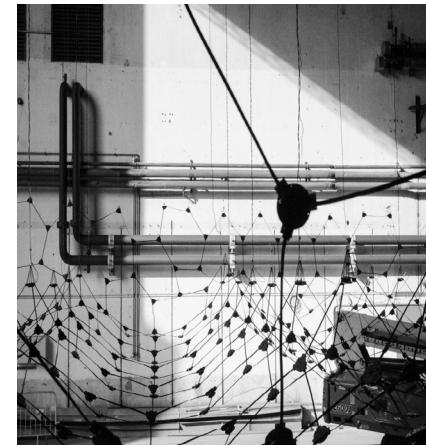
Besides the scientific field, CERN develops various **multi-disciplinary** programs, with a view to fostering the interaction between science and other areas, such as the "Arts@CERN" program.

The Arts at CERN was created in 2010 by Sinc Ariane Koek, and it promotes interaction between **artists** and scientific community, in order to challenge production techniques, develop knowledge and foster creativity.

Consequently, almost twenty artists per year are selected for an internship at CERN, to explore the principles of Particle Physics (for more information, please visit: <http://arts.cern>).

Julián Caló integrates the Art@CERN team. As **program coordinator**, he is responsible for managing the organization's both internal and external communications, as well as organizing events and generating and keeping up connections among international collaborators.

Holds a bachelor's degree in Advertising and Public Relations (2011, Málaga University). Marketing Management (2011, University of Birmingham).



Horizons Irrésolus - COLLIDE (2016)

Musical installation.

Work team: Robert Kieffer, Vincent Hänni, Diego Blas and Rudy Decelière.

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Art@CERN

Inspired by the dialog between the arts and scientific research.

Copyright © CERN.



A World Première Quantum Performance - COLLIDE (2013)

Choreographic work inspired by the principles of Physics. Director: Gilles Jobin.

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EXPERIENCE AND SCIENTIFIC RECORD

CERN is the most important world research organization. It was founded in 1954, and it is a world **leading** scientific institution, which has been the cradle for various relevant discoveries, such as:

2011 Higgs boson

2008

Start-up of LHC operations,
the world's largest particle
accelerator.

2006

Start-up of ATLAS
operations.

1990

Invention of the World Wide
Web (www.)

CERN relies on the importance of fostering research and facilitating the participation of the international scientific community.

In this sense, it promotes multilateral **cooperation** through educational and scientific exchange agreements.

Argentina started cooperating with CERN in 1976, and at present it continues promoting exchange and development of scientific **knowledge** through the above mentioned programs and the bonds generated with the teams at the University of Buenos Aires, the National University of La Plata and the National University of Mar del Plata.

Argentina's participation in the world's largest laboratory involves an array of hardware, software tasks, detectors' operations and high impact analysis in Physics and technological innovation. The country's participation in wide-scale experiments (e.g. ATLAS) shows its capacity and scientific **potential**.

These international cooperation agreements have led to the development and training of **competitive** human resources, as well as it has fostered the growth of local industry.

First half of CMS inner tracker barrel. Copyright © CERN.

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the international Organizations in Geneva

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