SA-CERN 15 Year Celebrations

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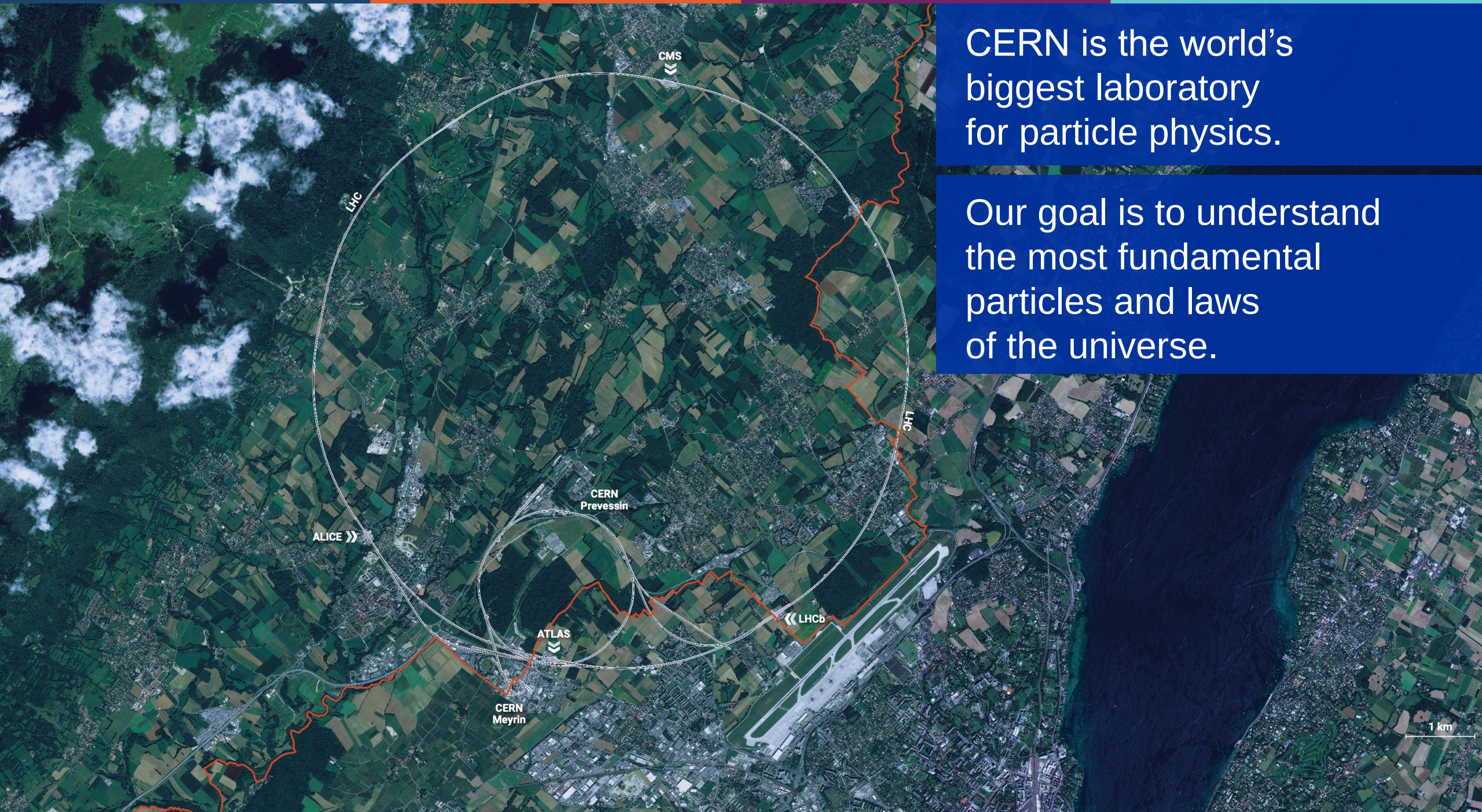
Head of Associate Member State and Non-Member State Relations
CERN

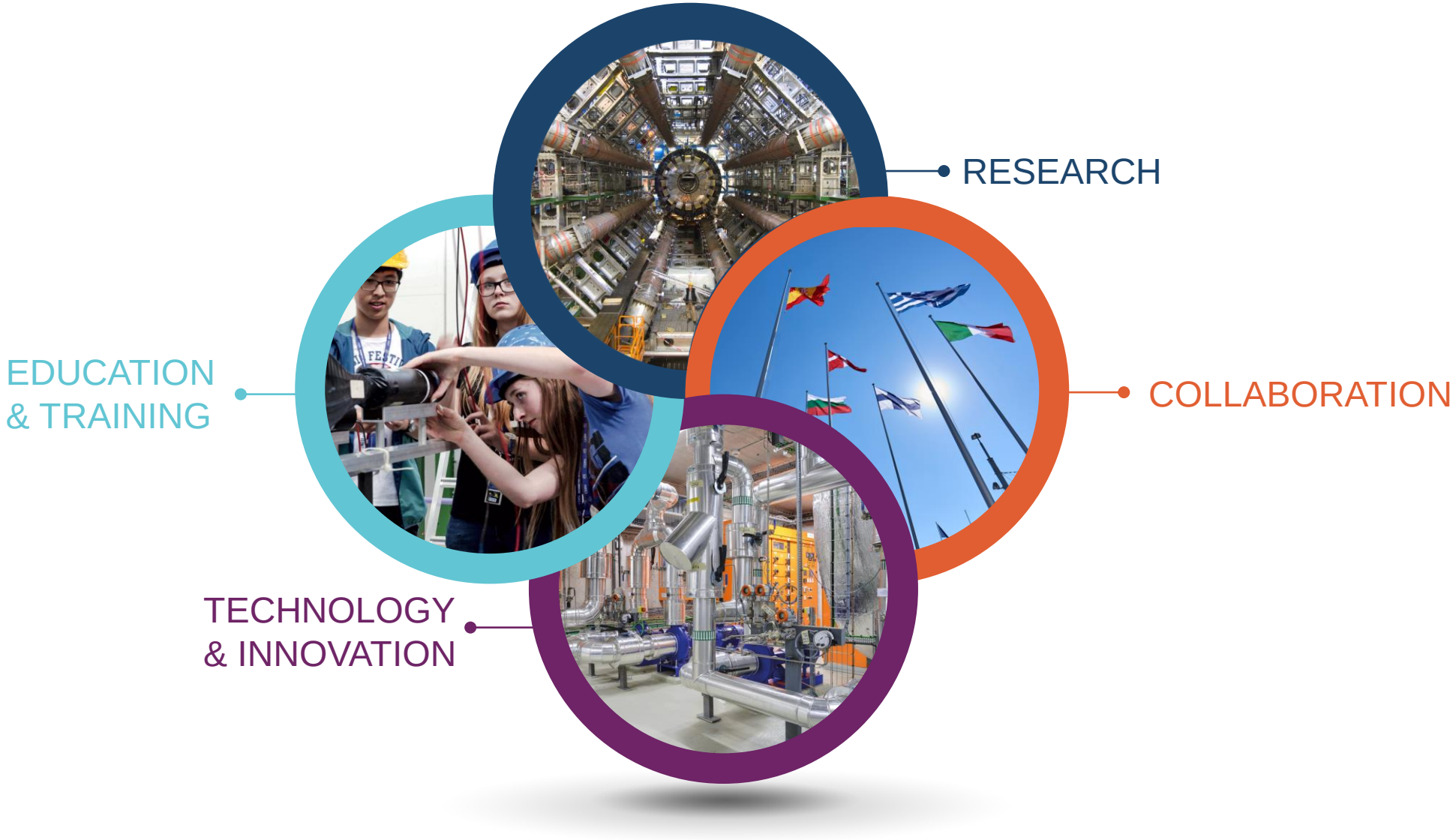
Celebration of 15 Years of South Africa – CERN (SA-CERN)
Cape Town, 21 January 2025

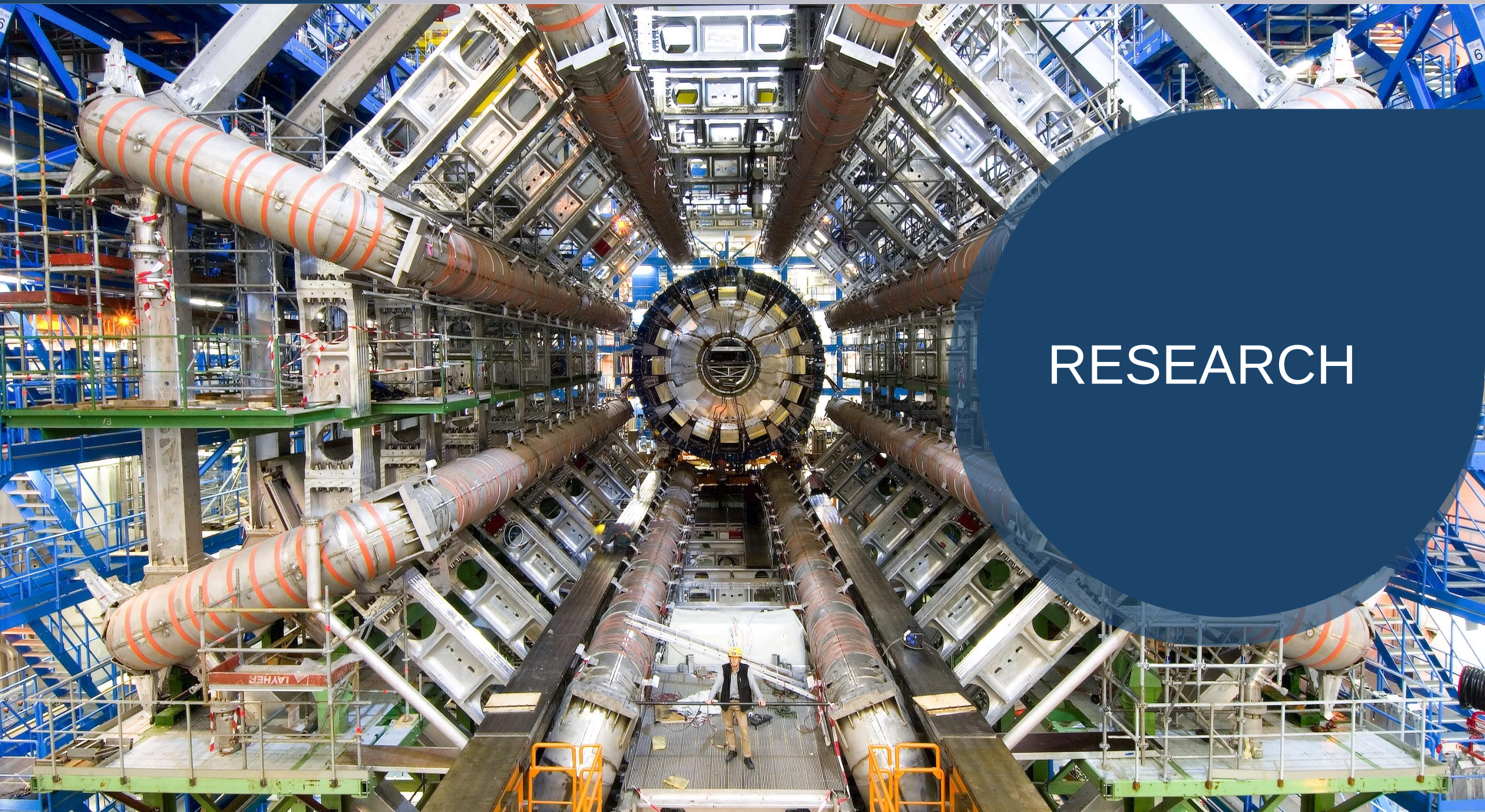


CERN is the world's biggest laboratory for particle physics.

Our goal is to understand the most fundamental particles and laws of the universe.

Four pillars underpin CERN's mission

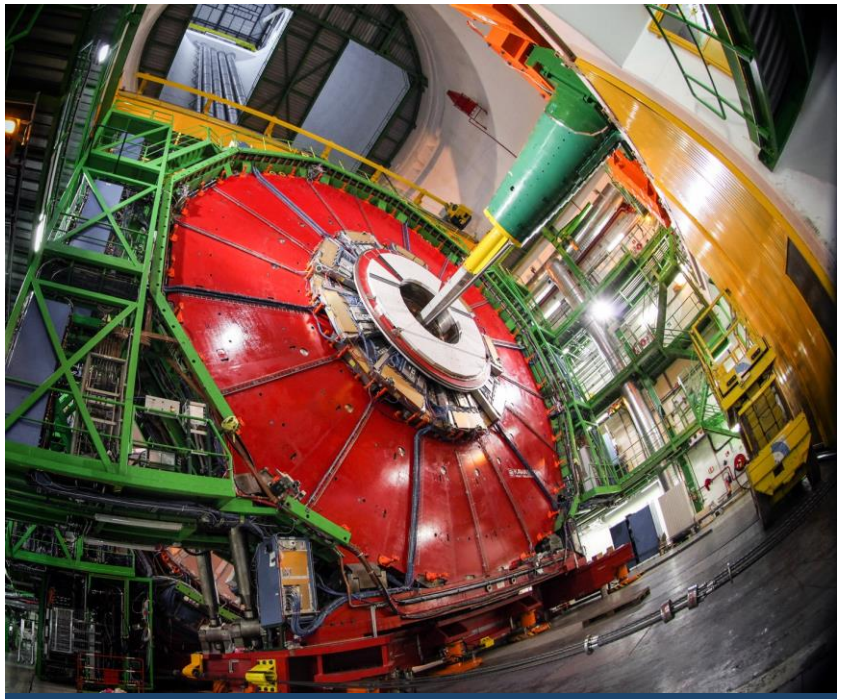




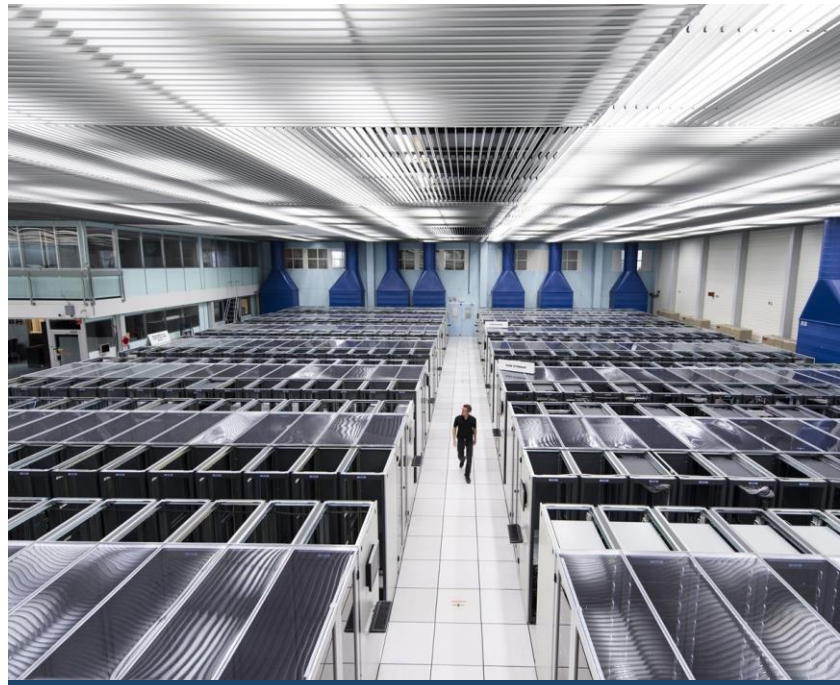
RESEARCH

We develop technologies in three key areas

ACCELERATORS



DETECTORS



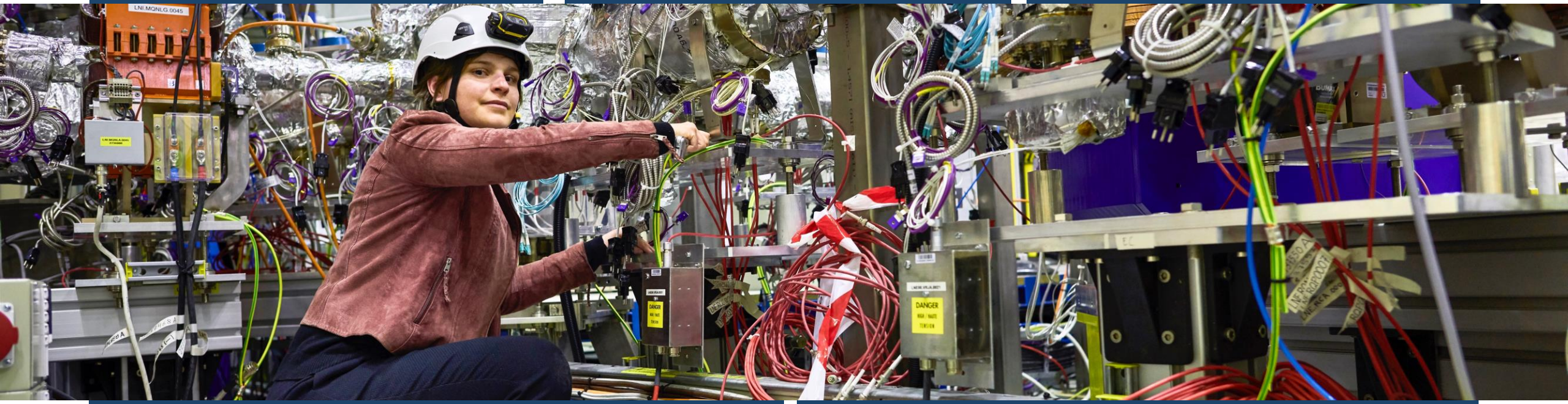
COMPUTING

CERN has a diverse scientific programme

Nuclear Physics
(ISOLDE, n_TOF)

Antimatter Research
(Antiproton Decelerator)

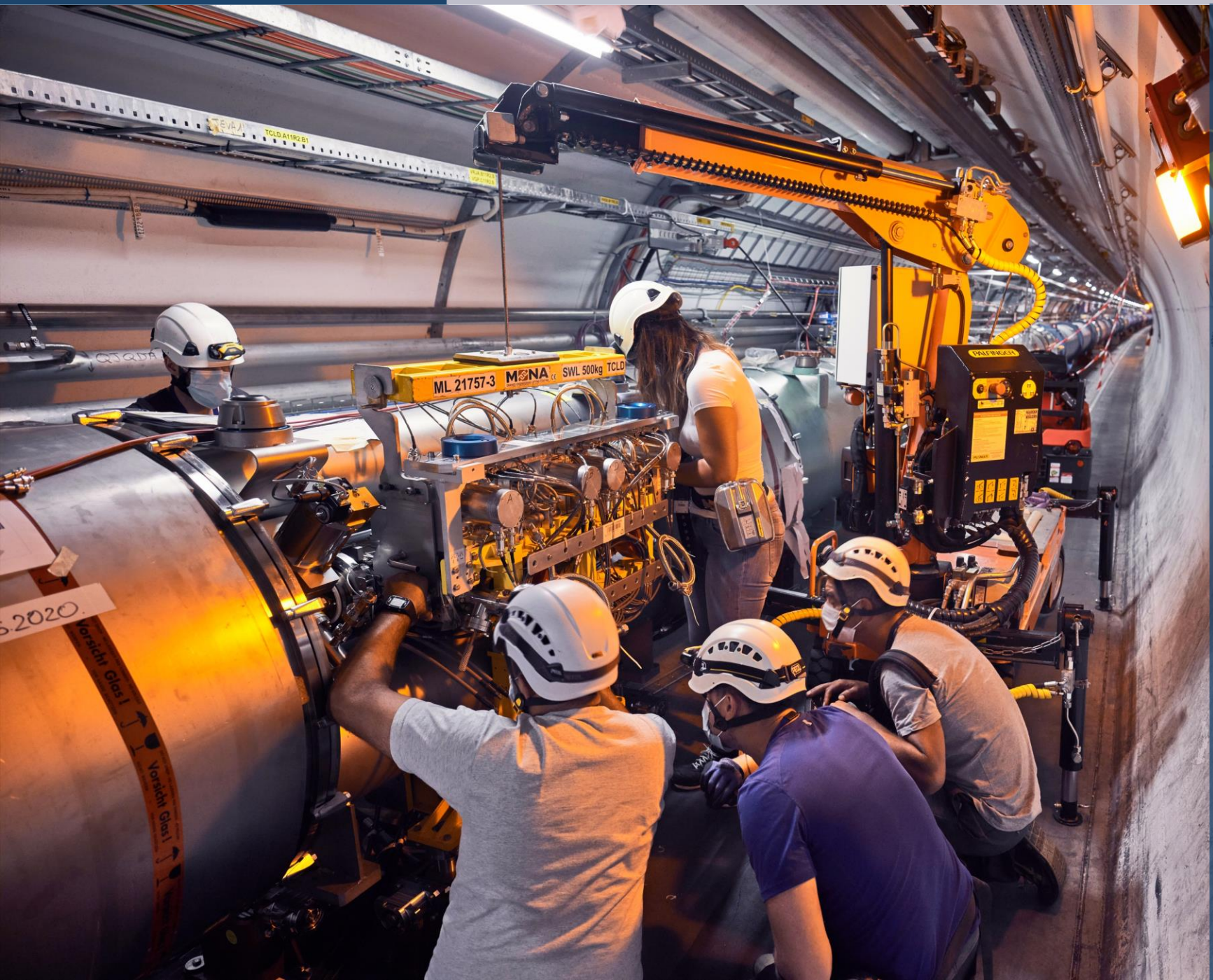
Cosmic rays and cloud formation
(CLOUD)



Fixed-target experiments,
which include searches for rare phenomena

Contribution to the Long Baseline
Neutrino Facility in the USA (LBNF)

and Theoretical Physics



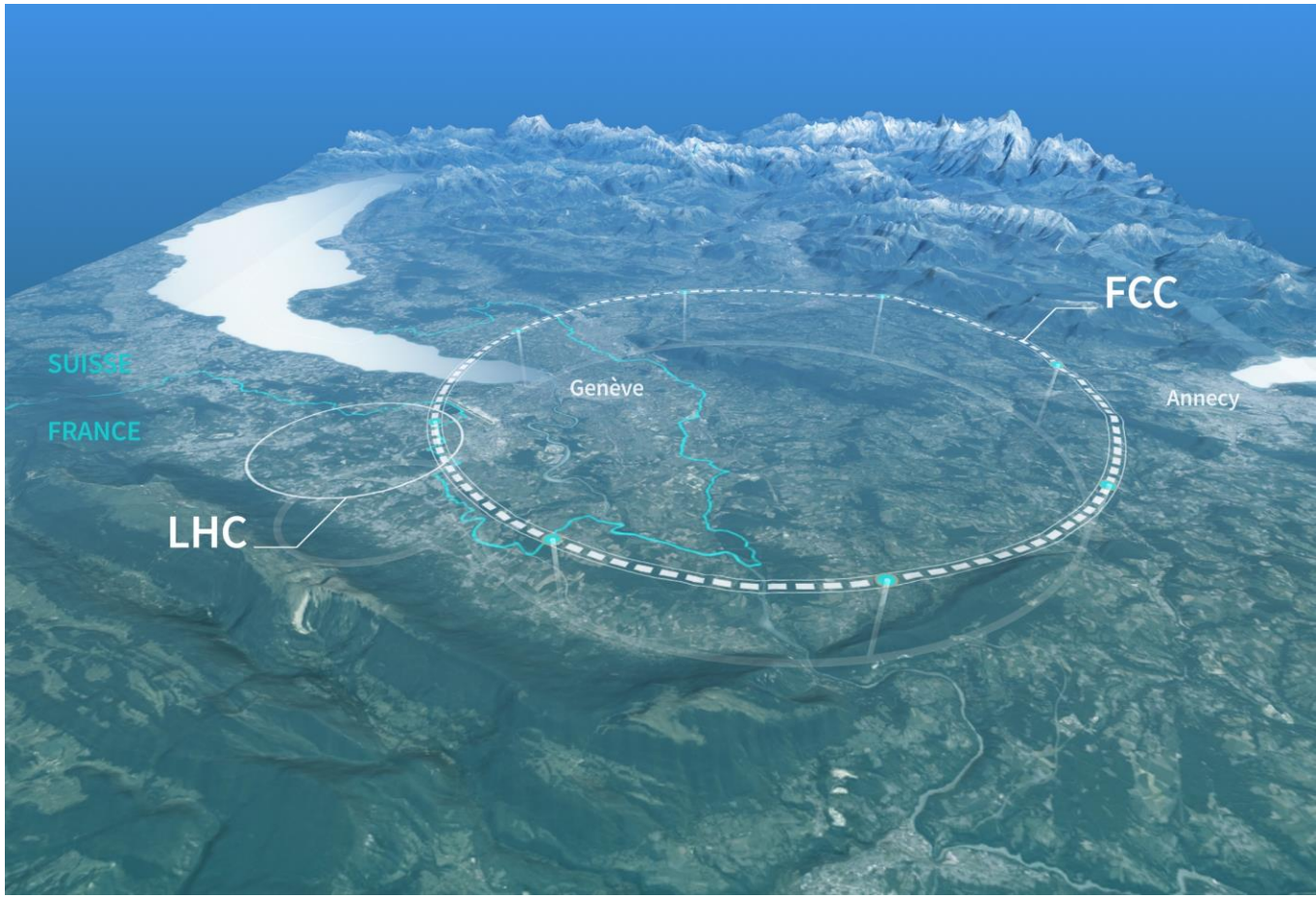
Upgrade to the High-Luminosity LHC is under way

- The HL-LHC will use new technologies to provide 10 times more collisions than the LHC.
- It will give access to rare phenomena, greater precision and discovery potential.
- It will start operating in 2030, and run until 2041.

Preparing CERN's future

Driven by the **2020 Update of the European Strategy for Particle Physics**

- Technical and financial feasibility study of a Future Circular Collider (Spring 2025)
- Accelerator R&D to develop technologies for FCC and for alternative options
- Detector and computing R&D
- Maintain and expand a compelling scientific diversity programme
- Continue to support other projects around the world



CERN Scientific Programme

The participation of physicists, computer scientists and engineers from **Africa** in CERN experiments and other activities has become **increasingly visible**, offering **interesting prospects for the future**.

Algeria – PhD student in **ATLAS**.

Egypt – Member of **CMS.**

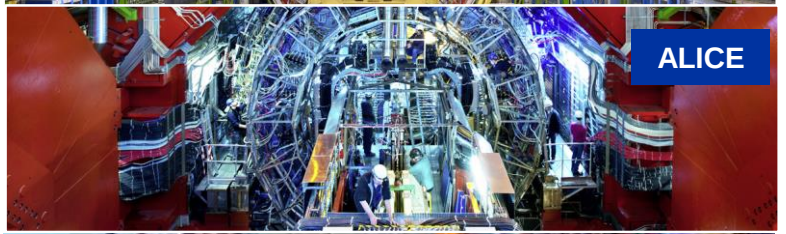
Madagascar – CLIC / CTF3.

Morocco – Member of **ATLAS**.

Nigeria – Member of **CMS**.

South Africa – Member of **ALICE, ATLAS, ISOLDE**.

Tunisia – Associated Institute of **CMS**.



Interest to collaborate with CERN from:
Botswana, Ethiopia, Kenya, Namibia, Rwanda, Sudan, Tanzania

COLLABORATION

Science for peace

CERN was founded in 1954 with 12 European Member States

Egypt and Morocco have signalled interest in applying for CERN Associate Membership

CERN's annual budget is 1200 MCHF (equivalent to a medium-sized European university)

As of 31 December 2023
Employees:
2666 staff, **1002** graduates
Associates:
12 370 users, **1513** others

24 Member States

Austria – Belgium – Bulgaria – Czech Republic
Denmark – Estonia – Finland – France – Germany
Greece – Hungary – Israel – Italy – Netherlands
Norway – Poland – Portugal – Romania – Serbia
Slovakia – Spain – Sweden – Switzerland – United Kingdom

10 Associate Member States

Brazil – Croatia – Cyprus*– India – Latvia – Lithuania
Pakistan – Slovenia* – Türkiye – Ukraine

4 Observers

Japan – USA – European Union – UNESCO

~ 50 Cooperation Agreements

Albania – Algeria – Argentina – Armenia – Australia – Azerbaijan – Bahrain - Bangladesh – Bolivia – Bosnia and Herzegovina
Canada – Chile – Colombia – Costa Rica – Ecuador – Egypt – Georgia – Honduras – Iceland – Iran – JINR – Jordan
Kazakhstan – Lebanon – Malta – Mexico – Mongolia – Montenegro – Morocco – Nepal – New Zealand
North Macedonia – Palestine – Paraguay – People's Republic of China – Peru – Philippines – Qatar – Republic of Korea
Saudi Arabia – Sri Lanka – **South Africa (signed in 1992)** – Thailand – Tunisia – United Arab Emirates – Uruguay - Vietnam

* Associate Member State in the pre-stage to Membership

Chile & Ireland: Associate Membership applications being considered by CERN Council.

A laboratory for people around the world

Distribution of all CERN Users by the country of their home institutes as of 31 December 2023

Geographical & cultural diversity
Users of **110 nationalities**
23.7 % women

Member States (7467)

Austria 86 – **Belgium** 129 – **Bulgaria** 46 – **Czech Republic** 252
Denmark 47 – **Estonia** 29 – **Finland** 88 – **France** 842 – **Germany** 1296
Greece 112 – **Hungary** 80 – **Israel** 74 – **Italy** 1609 – **Netherlands** 167
Norway 77 – **Poland** 322 – **Portugal** 105 – **Romania** 113
Serbia 38 – **Slovakia** 67 – **Spain** 413 – **Sweden** 106
Switzerland 419 – **United Kingdom** 950

Associate Member States (581)

Brazil 135 – **Croatia** 37 – **Cyprus** 14* – **India** 145 – **Latvia** 21
Lithuania 17 – **Pakistan** 30 – **Slovenia** 26* – **Türkiye** 129 – **Ukraine** 27

Observers (2226)

Japan 219 – **United States of America** 2007

* Associate Member State in the pre-stage to Membership

Cooperation Agreements (1596)

Algeria 2 – **Argentina** 16 – **Armenia** 16 – **Australia** 26 – **Azerbaijan** 3 – **Bahrain** 3 – **Canada** 206 – **Chile** 45
Colombia 24 – **Costa Rica** 3 – **Cuba** 3 – **Ecuador** 4 – **Egypt** 24 – **Georgia** 34 – **Hong Kong** 15 – **Iceland** 3 – **Indonesia** 7
Iran 14 – **Ireland** 4 – **JINR** 293 – **Jordan** 3 – **Kazakhstan** 3 – **Kuwait** 2 **Lebanon** 7 – **Madagascar** 1 – **Malaysia** 4
Malta 1 – **Mexico** 56 – **Montenegro** 3 – **Morocco** 18 – **New Zealand** 2 **Nigeria** 2 – **Oman** 1 – **Palestine** 1
People's Republic of China 414 – **Peru** 3 – **Philippines** 1 – **Republic of Korea** 168 – **Saudi Arabia** 6 – **South Africa 61**
Sri Lanka 10 – **Taiwan** 52 – **Thailand** 17 – **Tunisia** 4 – **United Arab Emirates** 10 – **Vietnam** 1

A total of around 110 CERN Users from institutes located in Africa

CERN is a model for open and inclusive collaboration

The LHC experiments are models of consensus building, competition and cooperation.

SESAME, a synchrotron light source in Jordan, is modelled on CERN's governance structure.

CERN provides the IT infrastructure for the satellite-analysis technology used for emergency response.

CERN Director-General, Fabiola Gianotti, and
Philip Diamond, Director General of SKA Organisation
signing Collaboration Agreement (July 2017)

SKA will be the world's largest radio telescope partially hosted in **South Africa**

TECHNOLOGY & INNOVATION

CERN’s technological innovations have applications in many fields

CERN is the birthplace of the World Wide Web

And there are many more examples
Medical imaging, cancer therapy, material science, cultural heritage, aerospace, automotive, environment, health & safety, industrial processes.

EDUCATION & TRAINING

CERN's training, education and outreach programmes

1002 graduates
(including Research Fellows)

3 000 PhD students

300 Undergraduate students in Summer programmes

> 15 000 teachers participating in dedicated programmes, since 1998

Around **150 000 visitors** per year on guided tours of CERN, from >50 countries

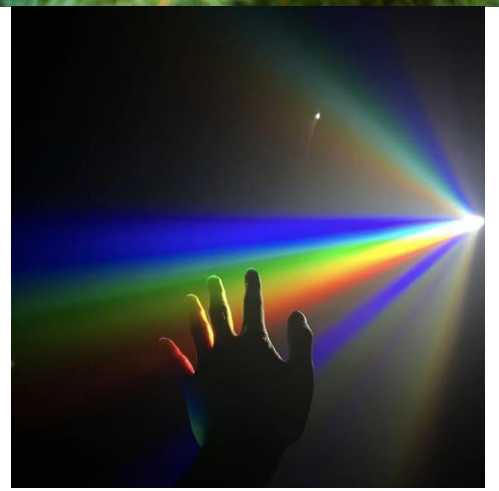
4.7M followers on social media, from around the globe

Capacity-building at CERN

- Participation in CERN **education & training** programmes
  - Students in the **Summer Student Programme** & **Doctoral Studentship Scheme** for nationals of non-Member States.
  - Students in **Beamline for Schools.**
  - Teachers in the **Teacher Programmes.**

- Capacity-building activities - CERN & Society Foundation
  - **Arts at CERN "Connect" programme with residencies for African artists at CERN** with South African Astronomical Observatory & South African Radio Astronomy Observatory.

CERN Summer Student Programme

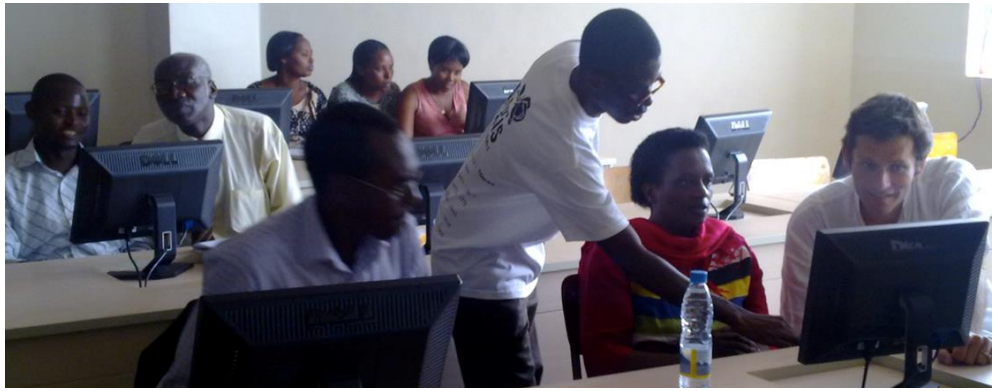


Kamil Hassim
Event Horizon installation
at Constitution Hill, Johannesburg.
Courtesy the artist

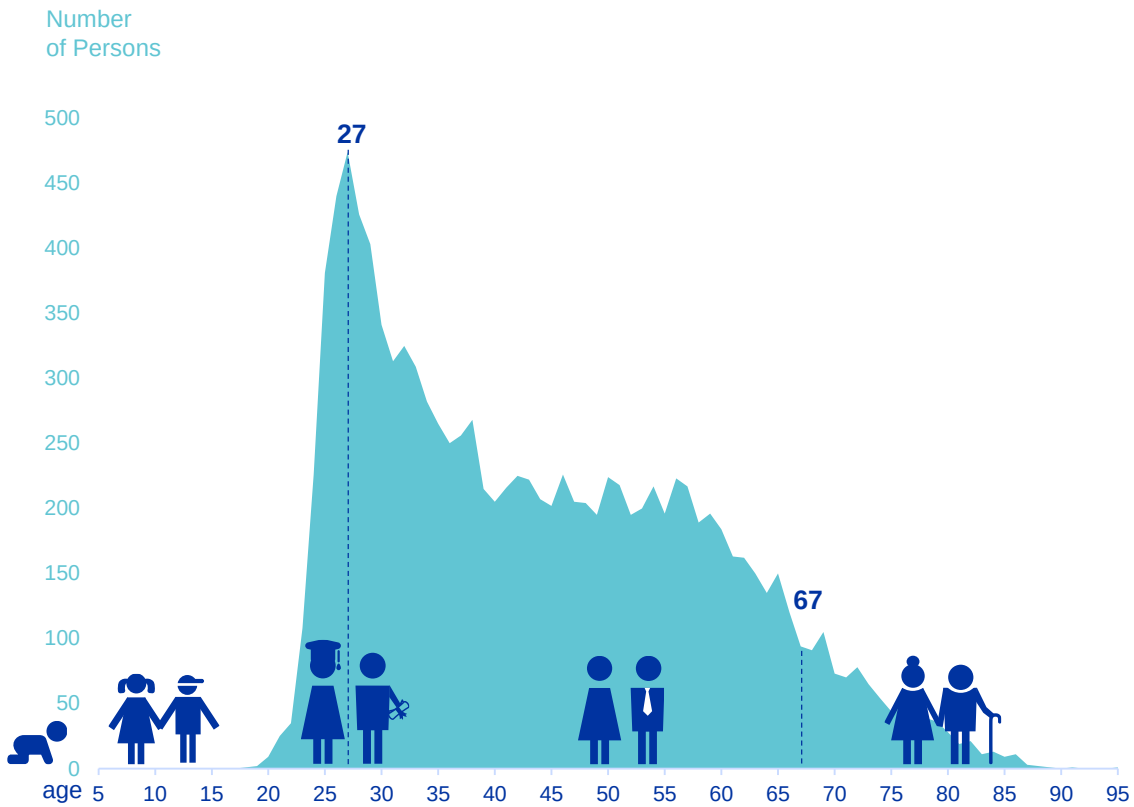
Capacity-building in Africa

Capacity-building activities - **CERN & Society Foundation**

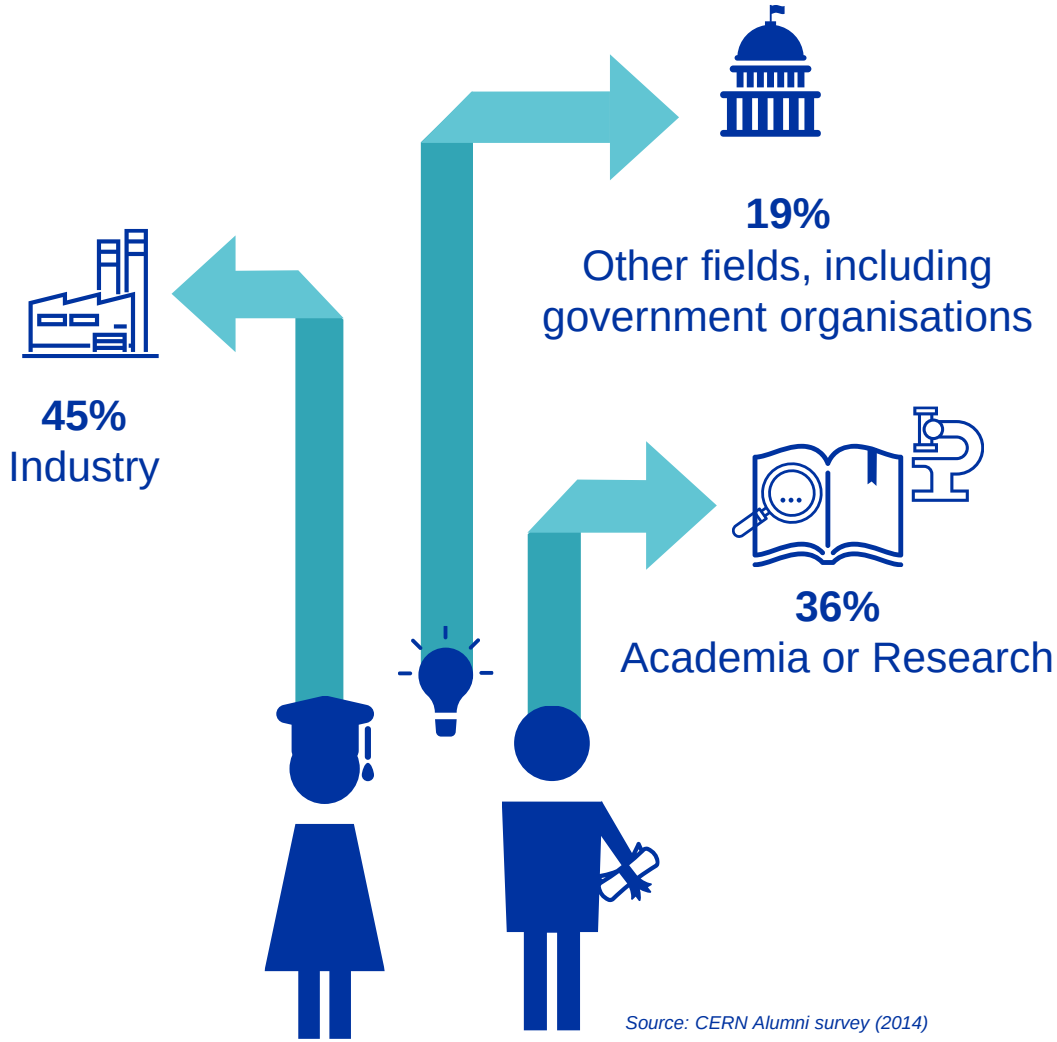
- **CERN-UNESCO Schools on Digital Libraries** → 5 schools (Ghana, Kenya, Morocco, Rwanda, Senegal) organized across Africa with 25 countries.
- Funds are available for one more school and this will be organised in collaboration with the Africa Open Science Platform — an NRF (South Africa) supported initiative.
  - Planning to have the school in **Pretoria** in **February 2025**.



CERN opens a world of career opportunities



Age Distribution of Scientists working at CERN



PhD and Technical students leaving CERN

CERN Science Gateway

CERN’s new education and outreach centre for all publics aged 5-plus.

Inaugurated October 2023.

Number of visitors: **>450 000**

Immersive exhibitions, education labs, events and shows.

African Strategy for Fundamental & Applied Physics

- Support for process of development of **African Strategy for Fundamental and Applied Physics** to increase African education and research capabilities:
  - launched in 2020, engaging African scientists and the international community in the Strategy development;
  - suggest the direction for the field, with actionable items for the next decade, to repeated periodically, every 7-10 years;
  - expecting further opportunities for **closer collaboration between Africa, CERN and other partners**.

CERN Associate Membership I

Could this be the next stage of the South Africa – CERN Collabration?

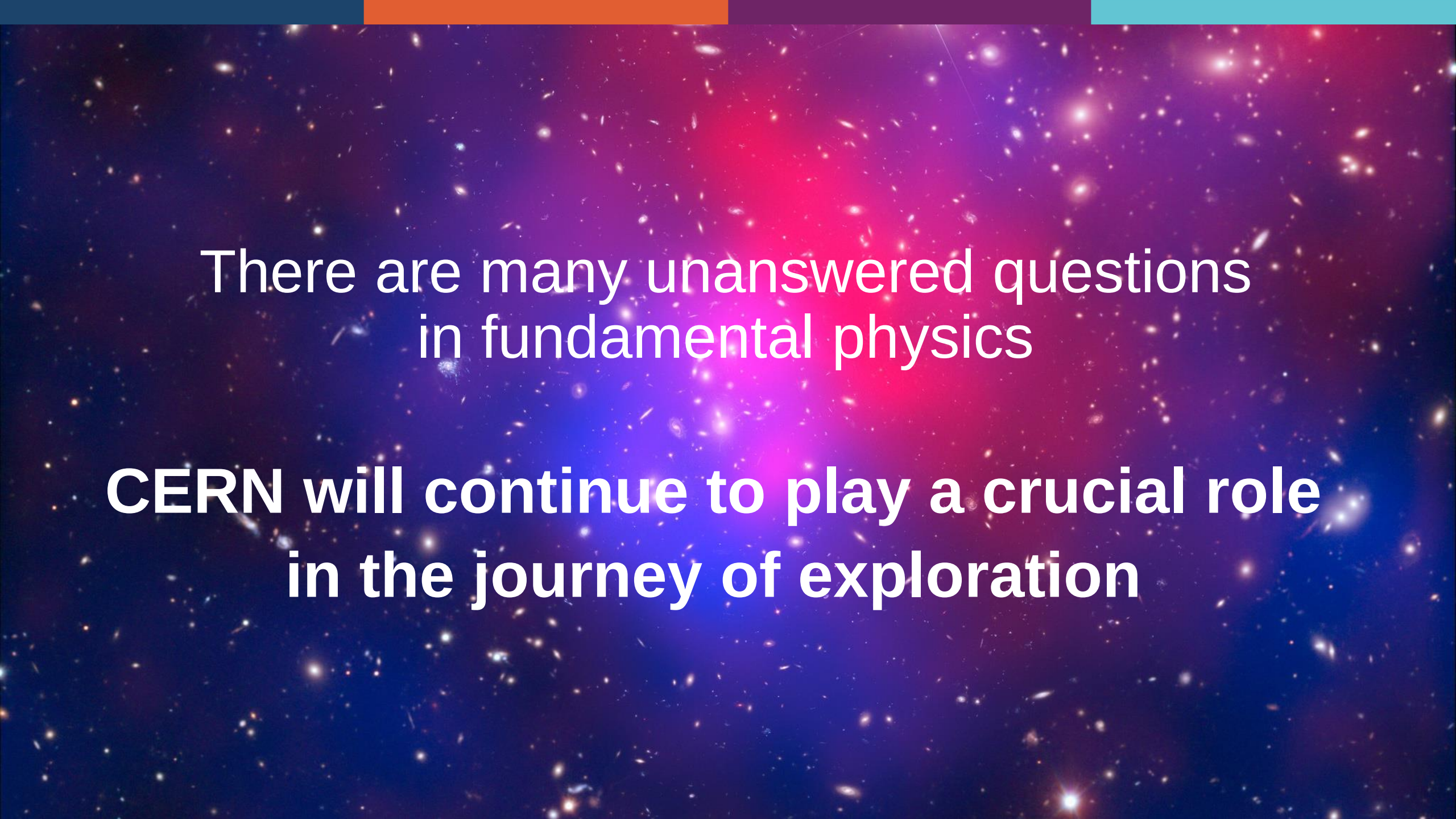
Rights, Benefits and Opportunities of Associate Membership

- Participation in CERN's Science Programme – Experimental & Theoretical Particle Physics
- Participation in CERN's Accelerator Projects
- Attendance at the CERN Council and its Committees
- Industrial Procurement
- Knowledge (and Technology) Transfer
- Capacity-building through Training and Employment
- CERN Schools of Excellence (high-energy physics, accelerator, computing)
- …

CERN Associate Membership II

The above describes some of the returns to Associate Membership in the form of direct benefits covering a broad and diverse portfolio of possibilities.

Implementation of the collaboration between CERN and an Associate Member State is facilitated by a Joint Committee that accompanies the integration into the CERN family and enables continuous dialogue and exploration of new possibilities for collaboration of mutual interest.


There are many unanswered questions
in fundamental physics
CERN will continue to play a crucial role
in the journey of exploration