

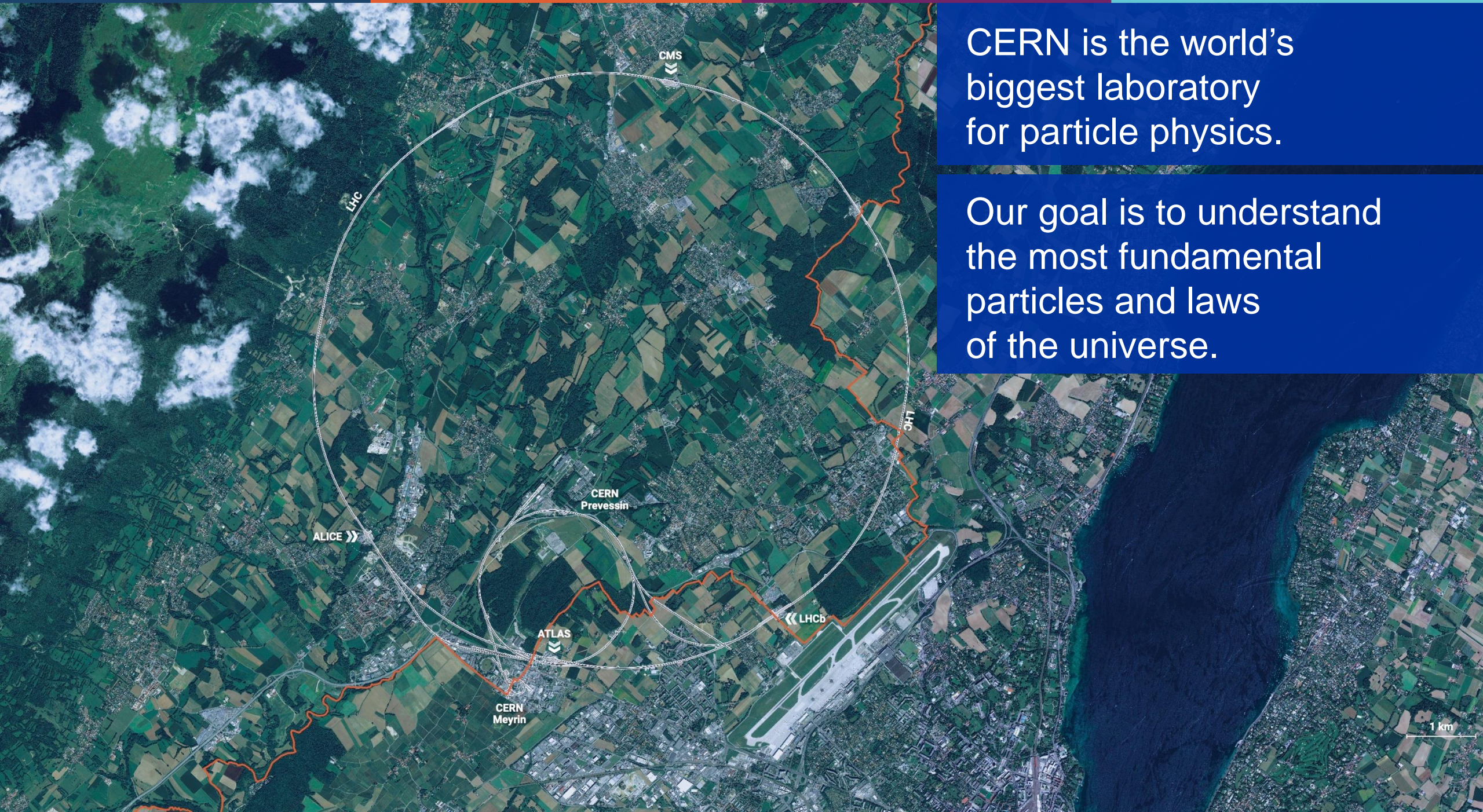


WELCOME TO CERN

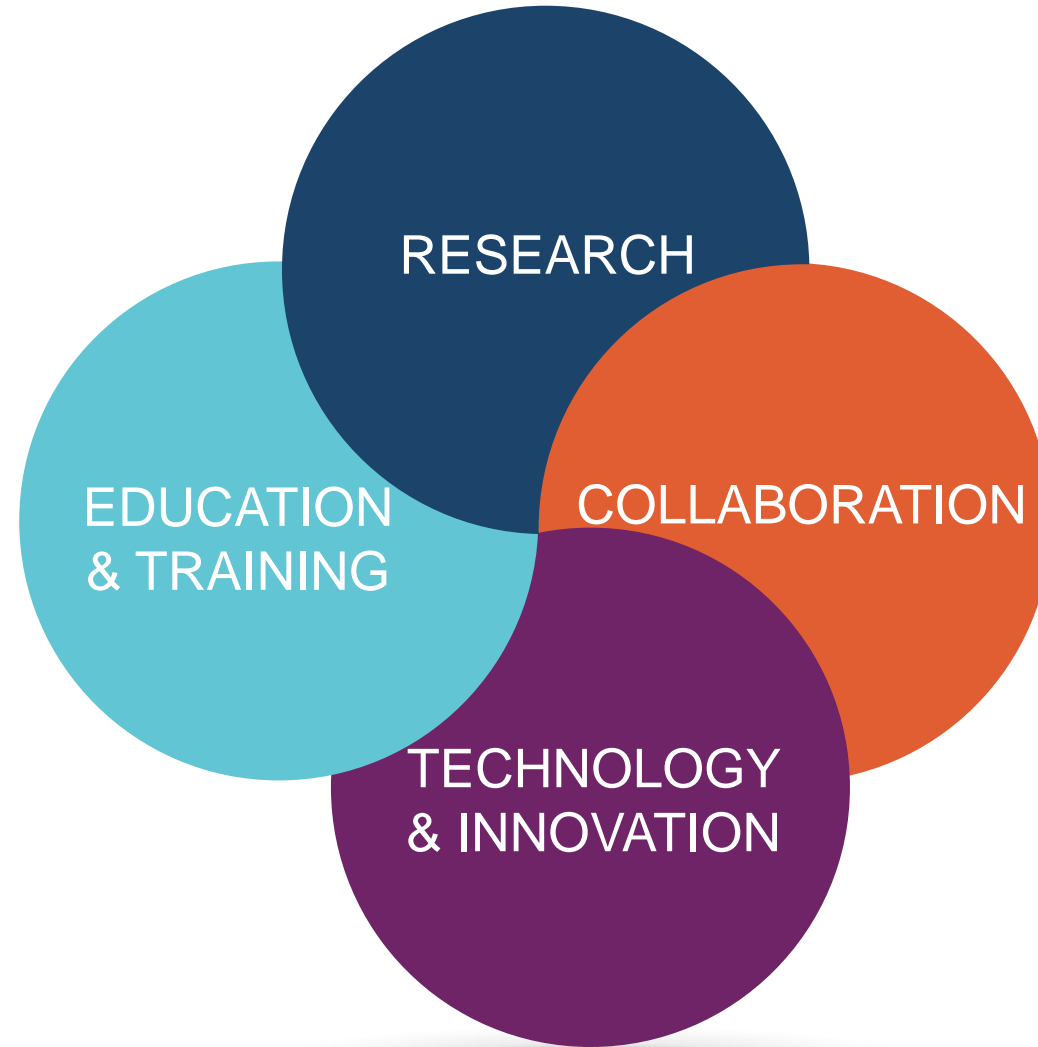
CDSE Lab

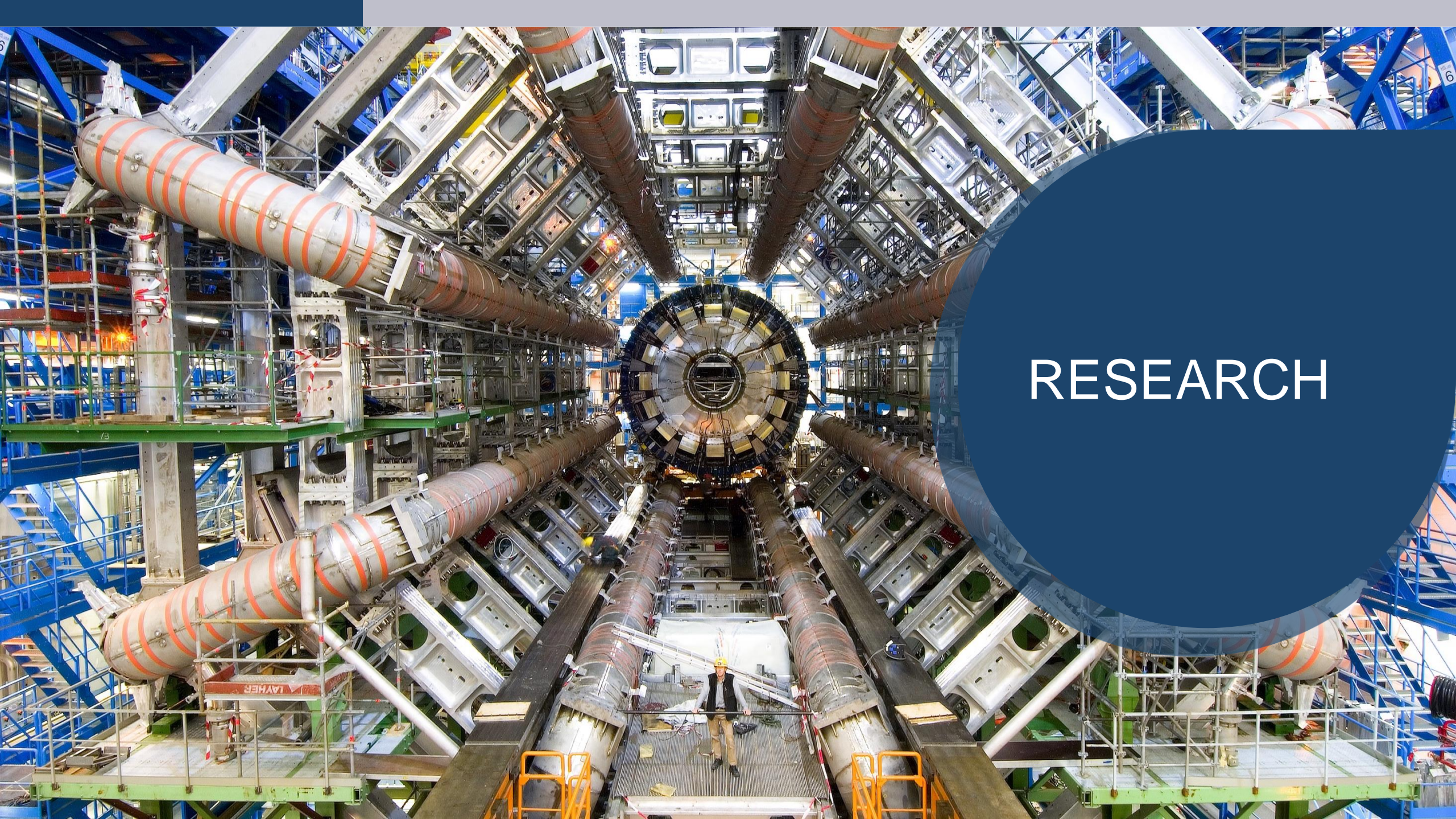
CERN is the world's biggest laboratory for particle physics.

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



Four pillars underpin CERN's mission

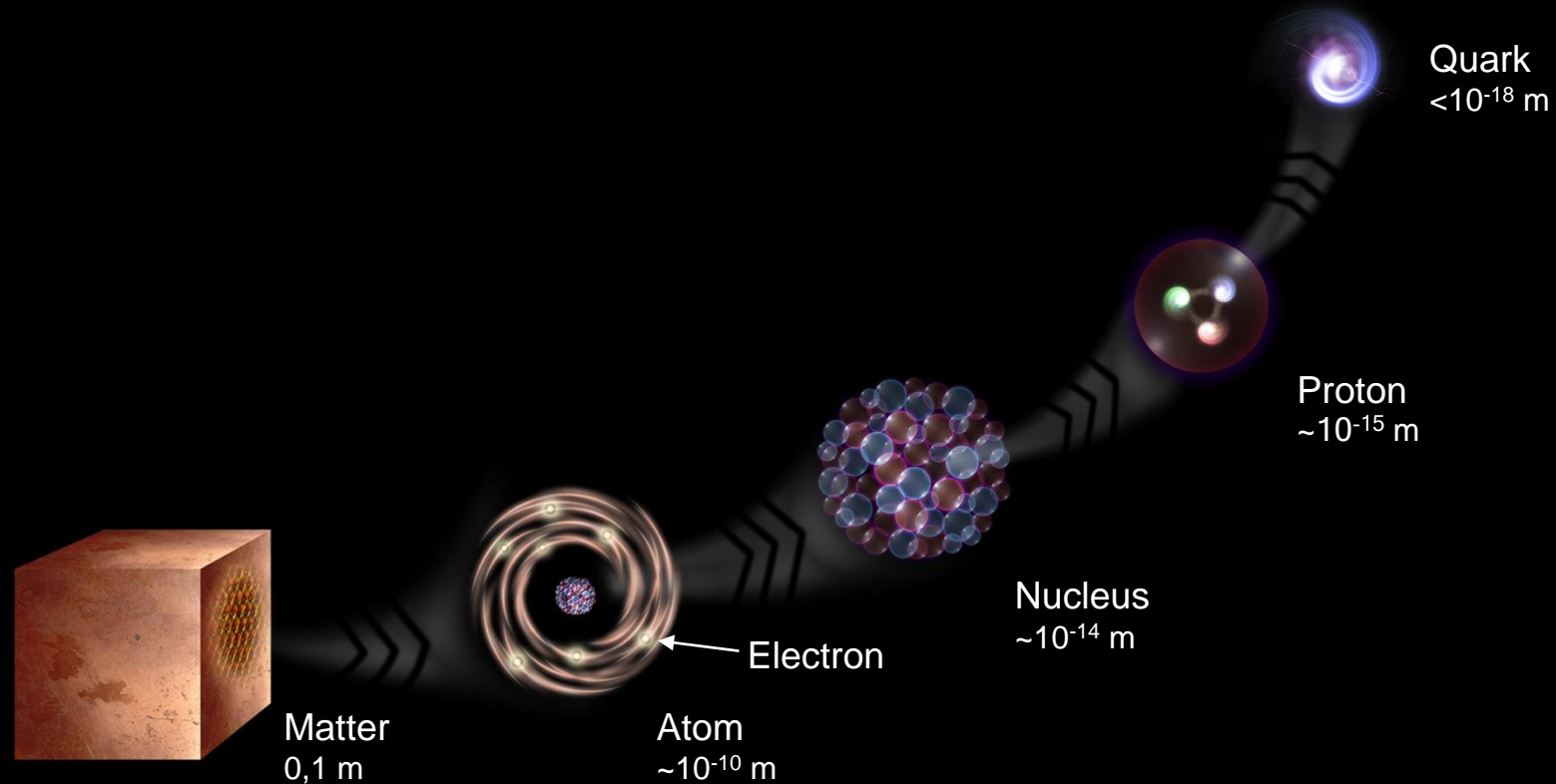


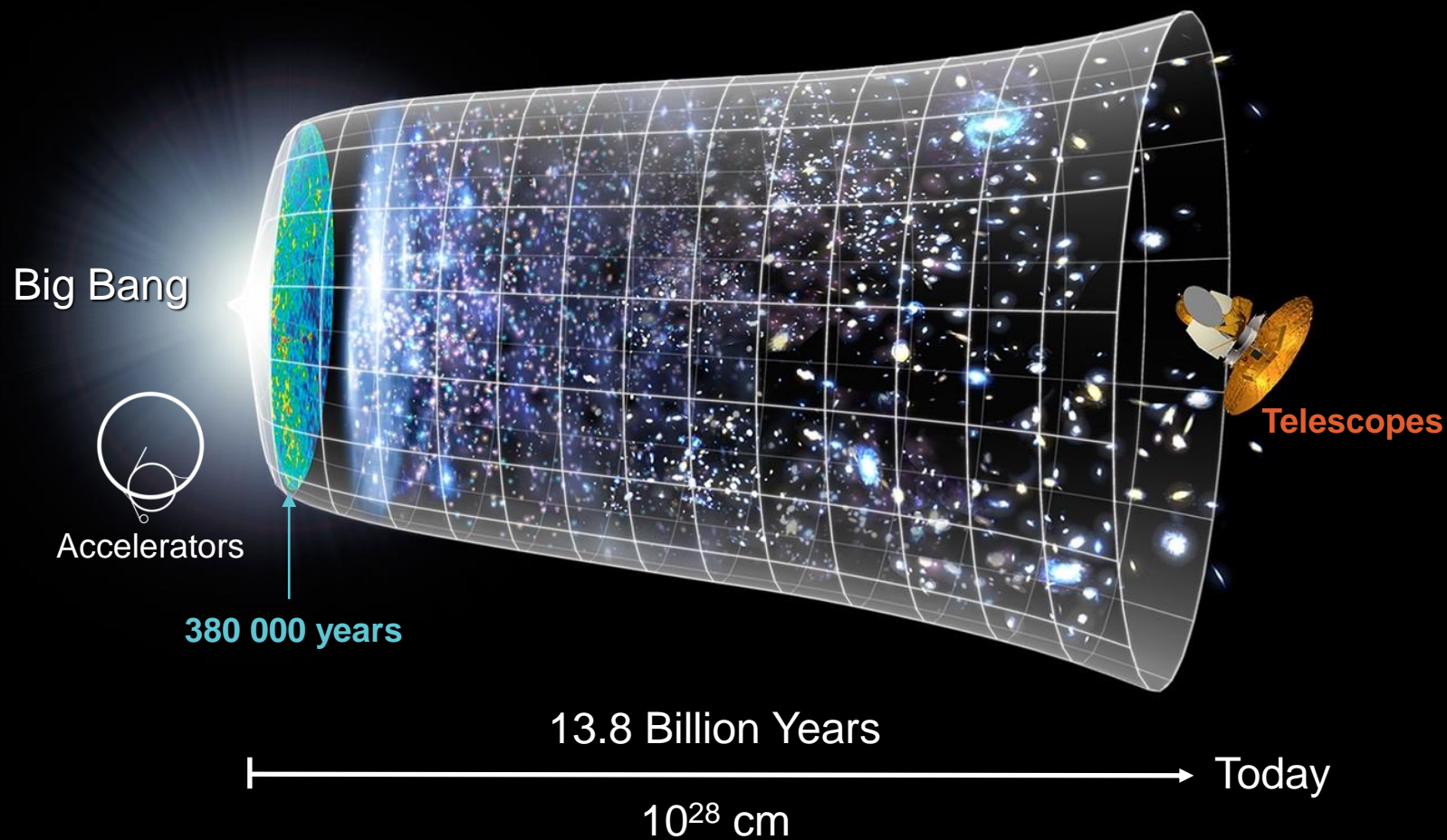


RESEARCH

What is the universe made of?

We study the elementary building blocks of matter and the forces that control their behaviour





How did the universe begin?

We reproduce the conditions a fraction of a second after the Big Bang, to gain insight into the structure and evolution of the universe.

There are many unanswered questions in fundamental physics

Including

95% of the mass and energy of the universe is unknown.

Is there only one Higgs boson, and does it behave exactly as expected?

Why is the universe made only of matter, with hardly any antimatter?

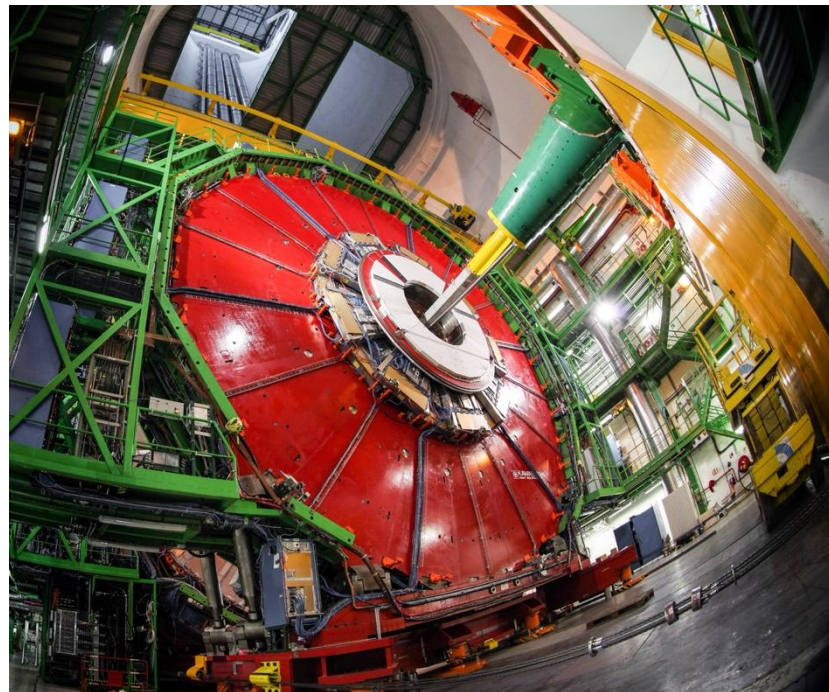
Why is gravity so weak compared to the other forces?

How do we do it?

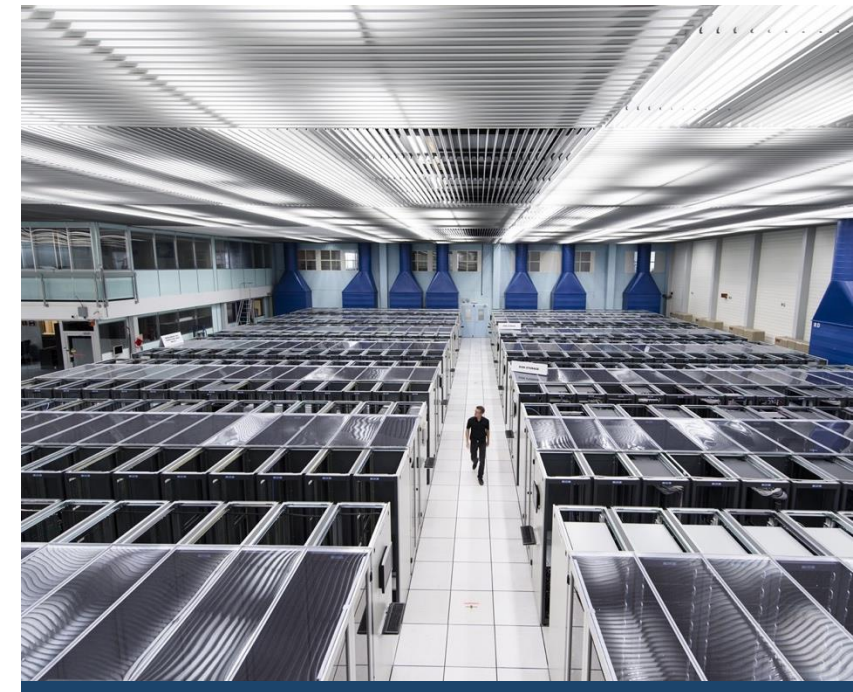
- We build the largest machines to study the smallest particles in the universe
- We develop technology to advance the limits of what is possible
- We perform world-class research in theoretical and experimental particle physics



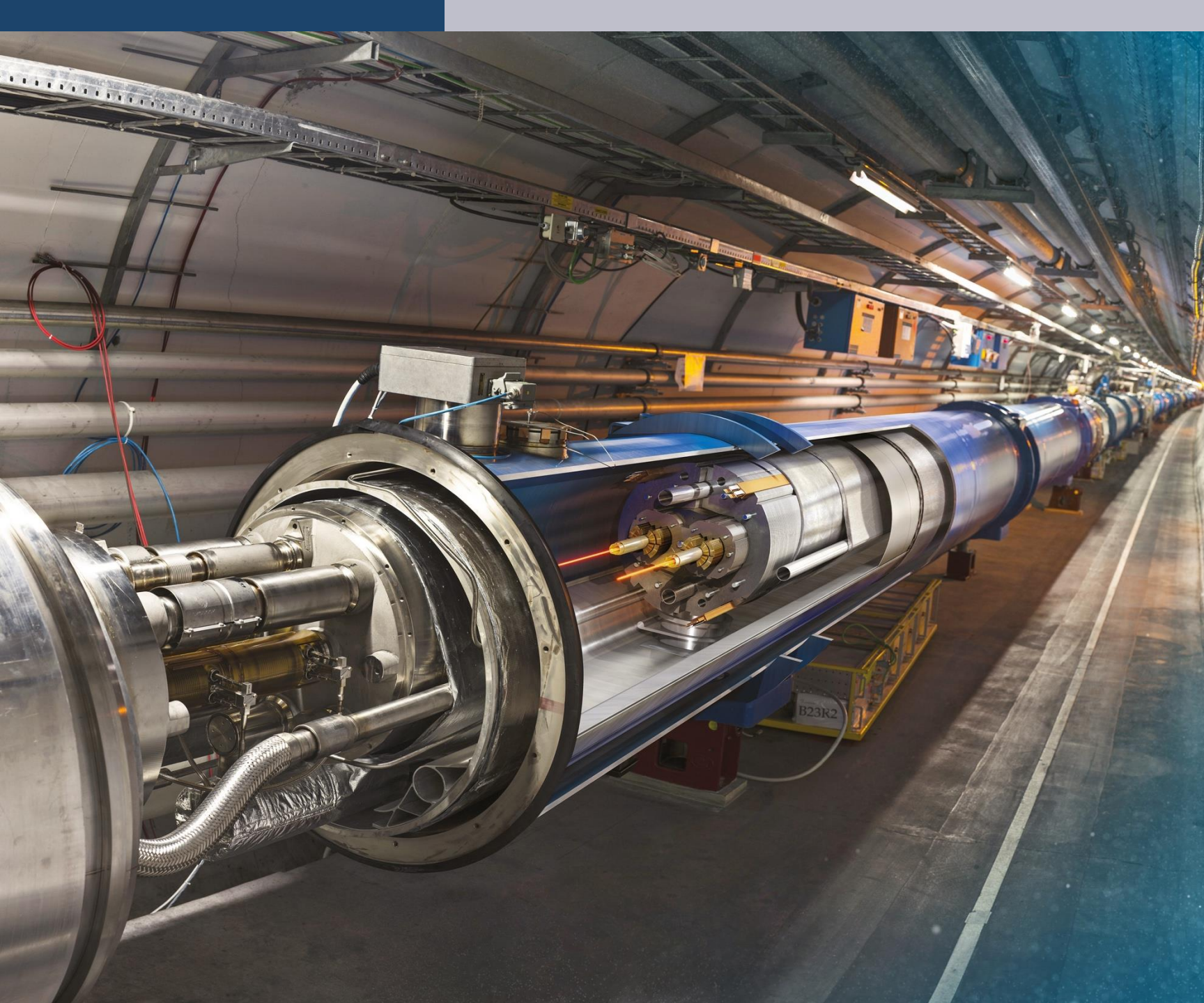
ACCELERATORS



DETECTORS



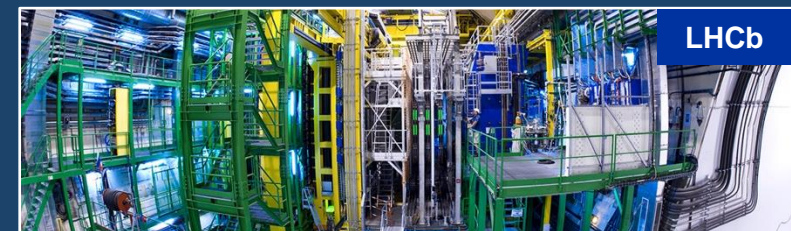
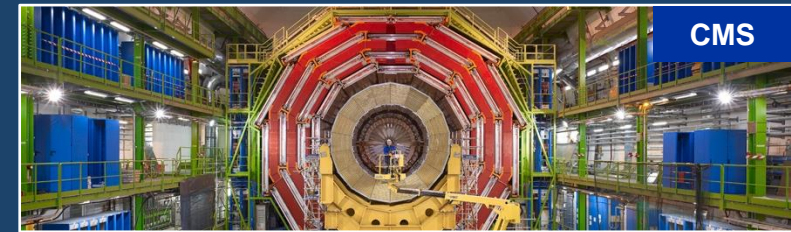
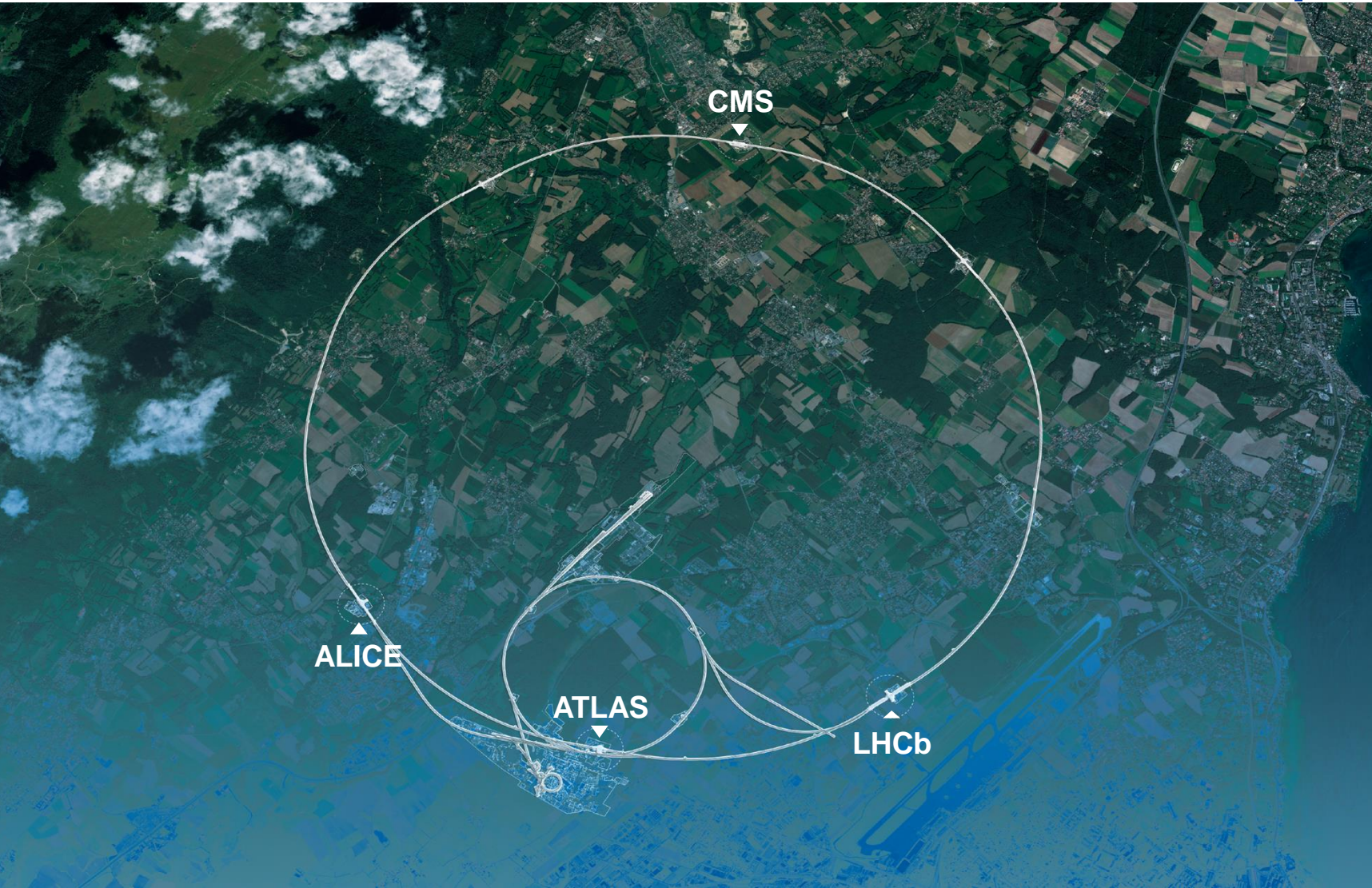
COMPUTING



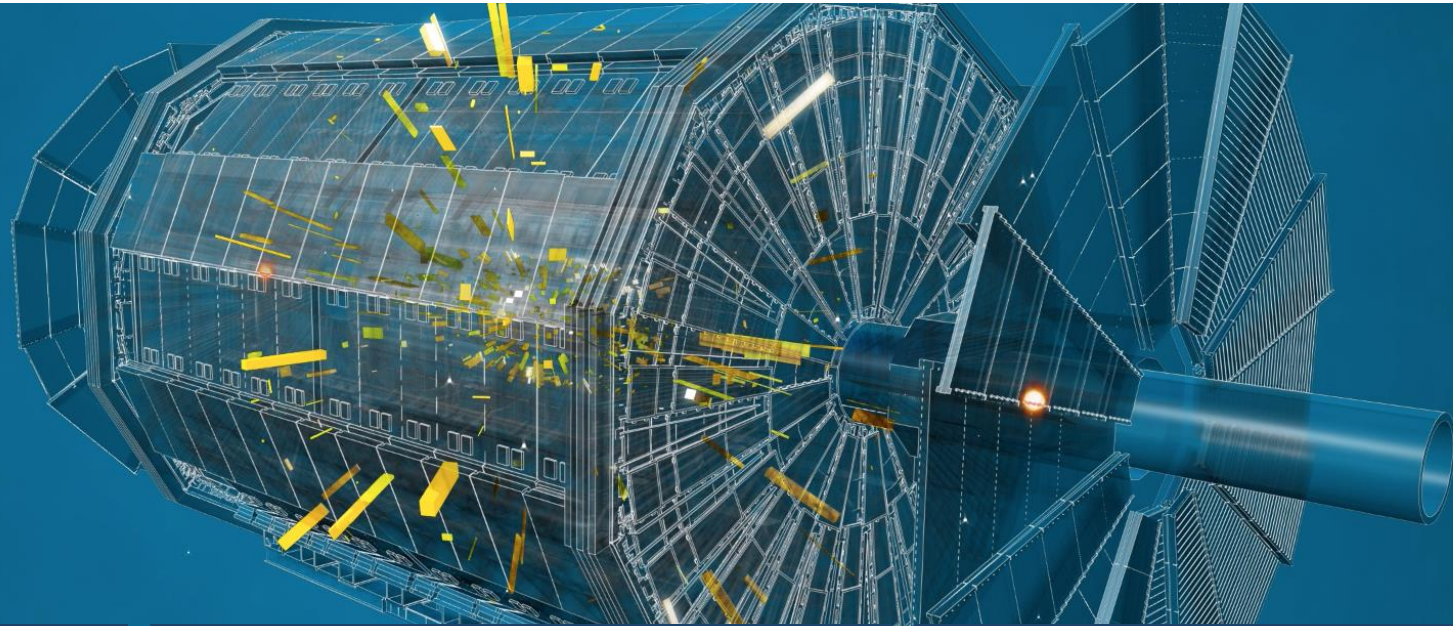
Large Hadron Collider (LHC)

- 27 km in circumference
- About 100 m underground
- Superconducting magnets steer the particles around the ring
- Particles are accelerated to close to the speed of light

Giant detectors record the particles formed at the four collision points



The LHC detectors are analogous to 3D cameras



The detectors measure the energy, direction and charge of new particles formed.



They take 40 million pictures a second. Only 1000 are recorded and stored.



The LHC detectors have been built by international collaborations covering all regions of the Globe.

The Worldwide LHC Computing Grid (WLCG)



Used to store, distribute, process and analyse data.

1 million processing cores in about 170 data centres and 42 countries.

More than 1000 Petabytes of CERN data stored world-wide.

COLLABORATION



Science for peace

CERN was founded in 1954 with 12 European Member States



23 Member States

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

3 Associate Member States in the pre-stage to membership

Cyprus – Estonia – Slovenia

7 Associate Member States

Croatia – India – Latvia – Lithuania – Pakistan
Türkiye – Ukraine

6 Observers

Japan – Russia (suspended) – USA
European Union – JINR (suspended) – UNESCO

Around 50 Cooperation Agreements with non-Member States and Territories

Albania – Algeria – Argentina – Armenia – Australia – Azerbaijan – Bangladesh – Belarus – Bolivia
Bosnia and Herzegovina – Brazil – Canada – Chile – Colombia – Costa Rica – Ecuador – Egypt – Georgia – Honduras
Iceland – Iran – 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 – Thailand – Tunisia – United Arab Emirates – Vietnam

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

As of 31 December 2022
Employees:
2658 staff, **900** fellows

Associates:
11 860 users, **1516** others



TECHNOLOGY & INNOVATION

CERN's technological innovations have applications in many fields

CERN is the birthplace of the World Wide Web

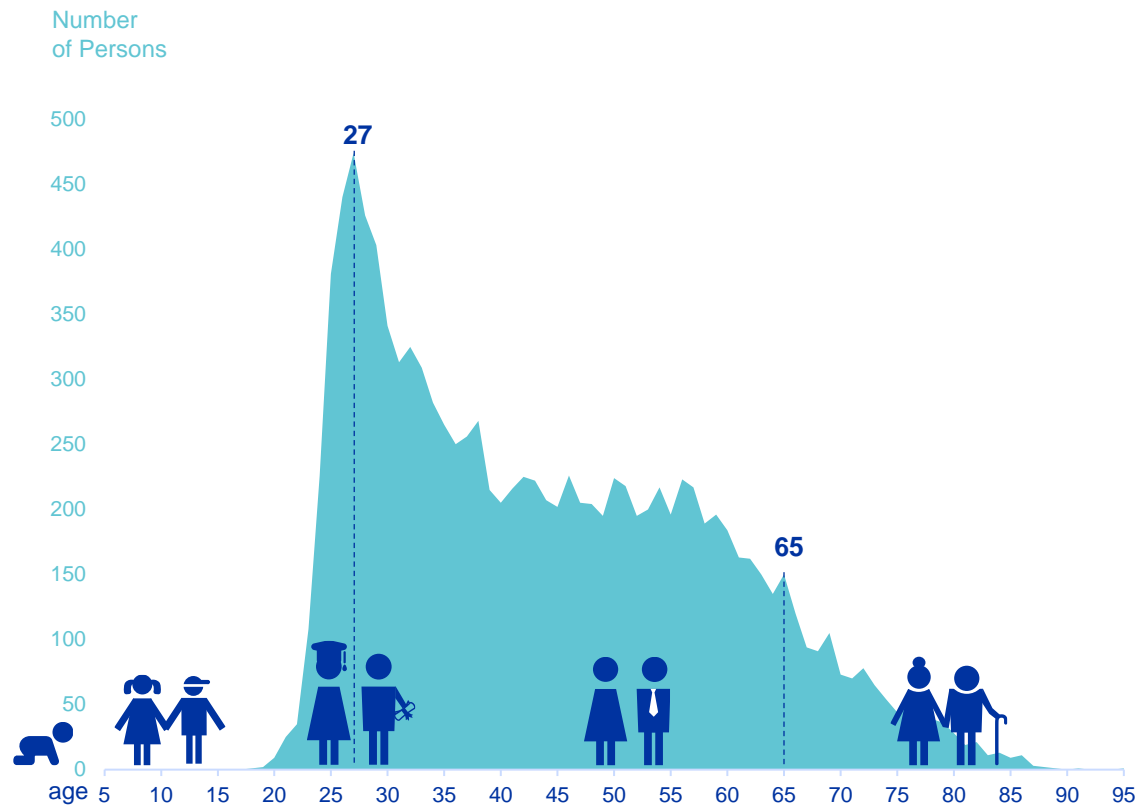
And there are many more examples

Medical imaging, cancer therapy, material science, cultural heritage, aerospace, automotive, environment, health & safety, industrial processes.

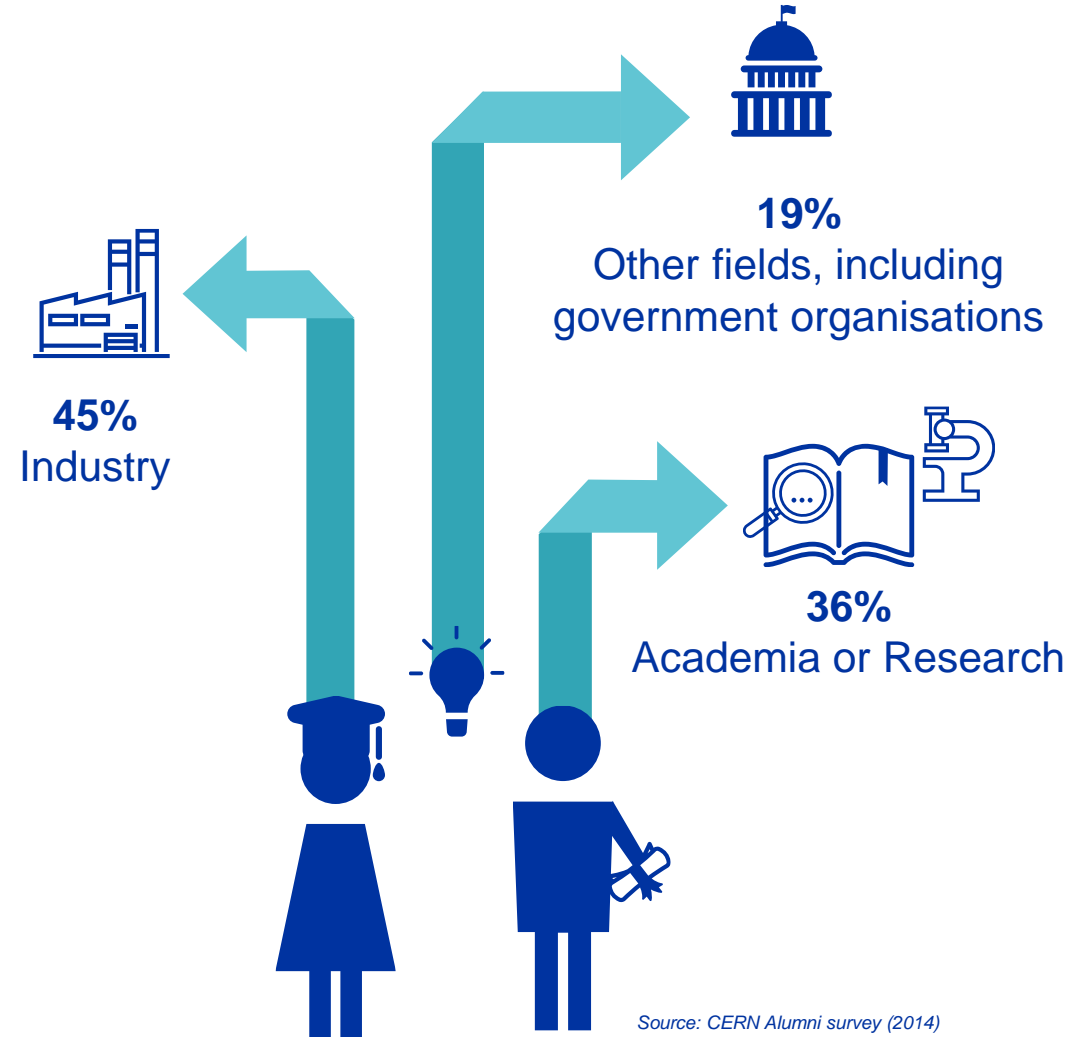
A group of students, both male and female, are wearing hard hats (yellow and blue) and are focused on a large, black, cylindrical piece of equipment mounted on a metal frame. They appear to be in a laboratory or workshop setting. One student in the foreground is adjusting the equipment. In the background, there are other students and a green exit sign with a white arrow pointing down. A teal circular graphic is overlaid on the left side of the image, containing the text 'EDUCATION & TRAINING'.

EDUCATION & TRAINING

CERN opens a world of career opportunities



Age Distribution of Scientists working at CERN



PhD and Technical students leaving CERN

CERN's training, education and outreach programmes

300 Undergraduate students in Summer programmes
>3000 registered PhD students.

>1000 Fellows, Technical and Doctoral Students in research and applied physics, engineering and computing.

13 304 teachers since 1998 and 2000 participants in the webinar since 2020.



151 000 visitors on guided tours of CERN in 2019, from 95 countries.

CERN engages with citizens across the globe:
on-site and travelling exhibitions in 15 countries, > 1 million visitors

Science Gateway expands CERN's outreach reach and impact, locally and globally.

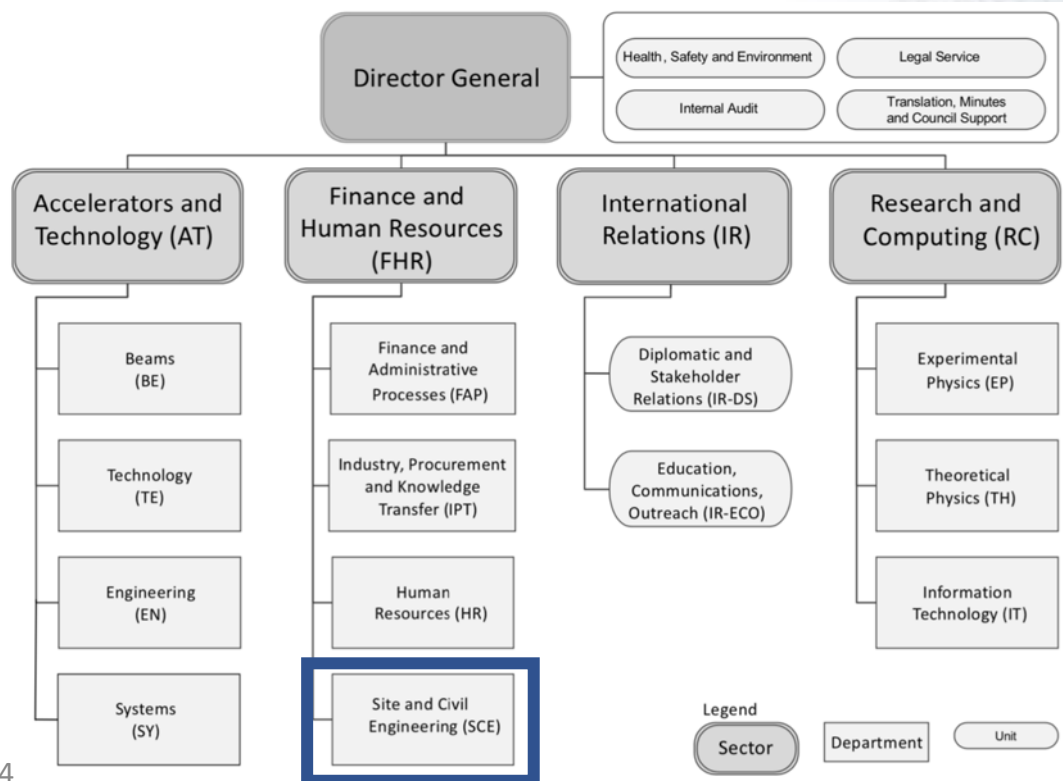
CERN SITE FIGURES

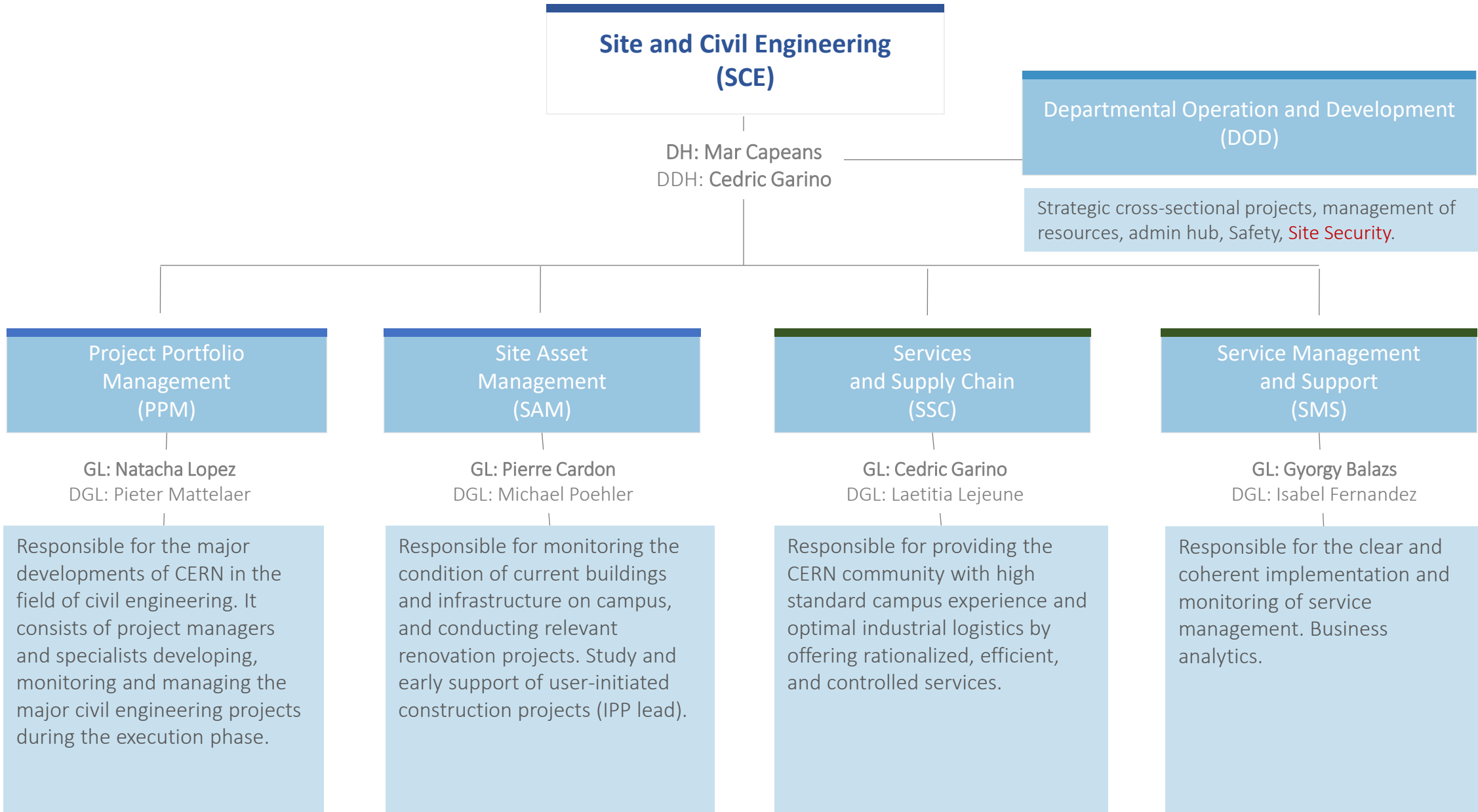
- 590 ha (220 fenced)
- 2 main sites and 15 satellite sites
- 670 buildings from 10 m² to 20.000 m²
- 65% built before the 70's
- 70 km tunnels and 80 caverns
- 30 km roads
- 1000 km technical galleries and trenches
- 9000 persons/daily
- 490 hostel rooms
- 8500 working places
- 4300 parking places in Meyrin, 1400 in Prévessin
- 25000 daily movements to- and inter-sites
- Public transport links in CH, not in FR



Site and Civil Engineering (SCE) Department

The Site and Civil Engineering (SCE) Department manages and develops CERN's real estate assets and infrastructures in agreement with CERN's scientific strategy, as well as all the services related to the caretaking and operation of the CERN site.





Examples of recent constructions

HL-LHC P1



HL-LHC P5



HL-LHC underground structures



CO₂ cooling building ATLAS



CO₂ cooling building CMS



PCC



Examples of recent renovations

R1



Site periphery



B52/CERN Library



B60



CERN Library

- Recovered the original and protected architectural essence of Steiger's design
- New contemporary interior in terms of functionality, technical installations and aesthetics
- Energy performance improved by 75%.
 - Low energy lighting: 50% less power, 40% lower consumption, automatic regulation
 - HVAC E-recovery up to 80%: heat exchangers, automatic regulation depending on occupancy, sleep mode
 - Improved building insulation

Sustainable Services

To increase the positive impact on CERN's community & the environment



Gradual replacement of Internal Combustion Engine (ICE) cars by **Battery Electric Vehicles (BEV)** for car sharing, campus logistics, shuttles



New car sharing service: 600 users registered, 8,500 reservations in the year



Central collectors of office waste in 8 buildings

Released **CERN's Waste Management Roadmap**



Completed the **inventory** of storage buildings and migration to EAM (15 buildings, ~10k assets)

Released **CERN's Storage Roadmap**



2-phase **renovation of R1**, vegan offer, catering survey

Working with all Departments to **reduce CERN's car fleet by 25%** in 2024

E-bike & e-scooters station-to-station service consolidated: 3600 registered users, 44,000 reservations in the year

Laboratory waste sorting pilot for metals in 2 buildings and **biowaste pilot** for R3 and 2 office buildings

Active **standardization** committees and sub-committees

Renovation of all bathrooms at **hotel B39**, private market integrated in CERN market, renovation of an apartment

CERN CAMPUS



SCE
Site and Civil Engineering