



Role of CERN in Fundamental Research and Technology

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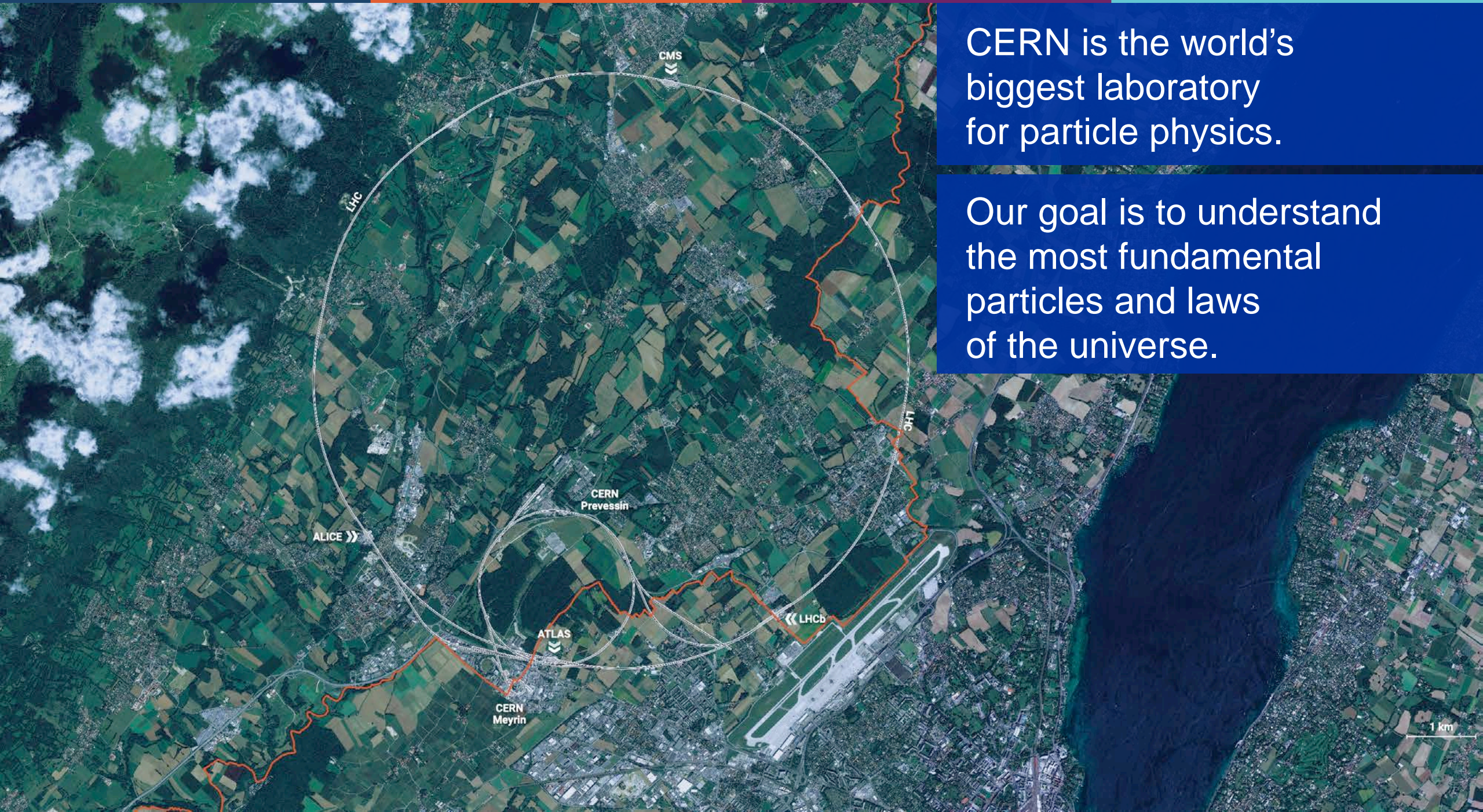
Head of Associate Member State and Non-Member State Relations

Management Liaison for Greece

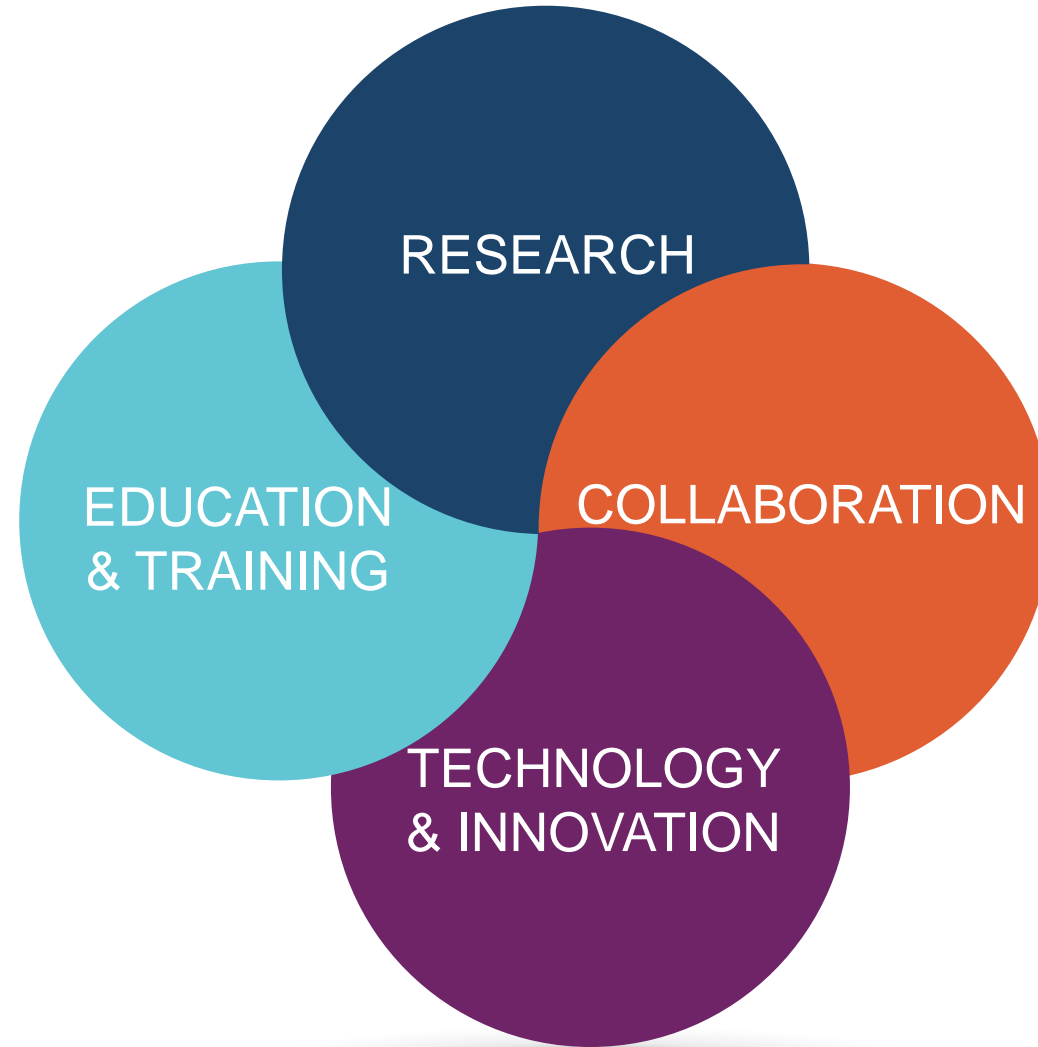
CERN International Relations

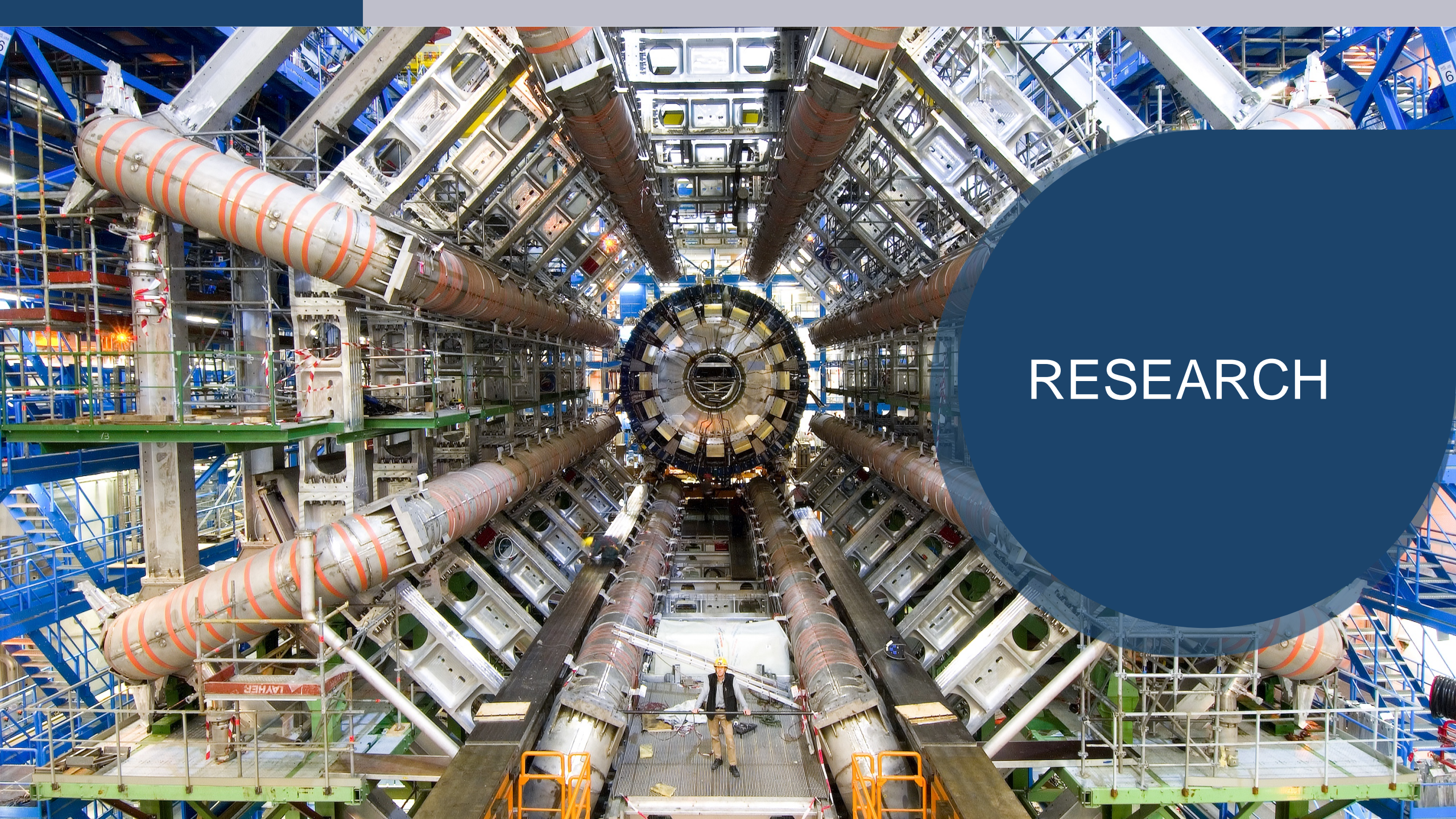
CERN is the world's biggest laboratory for particle physics.

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



Four pillars underpin CERN's mission

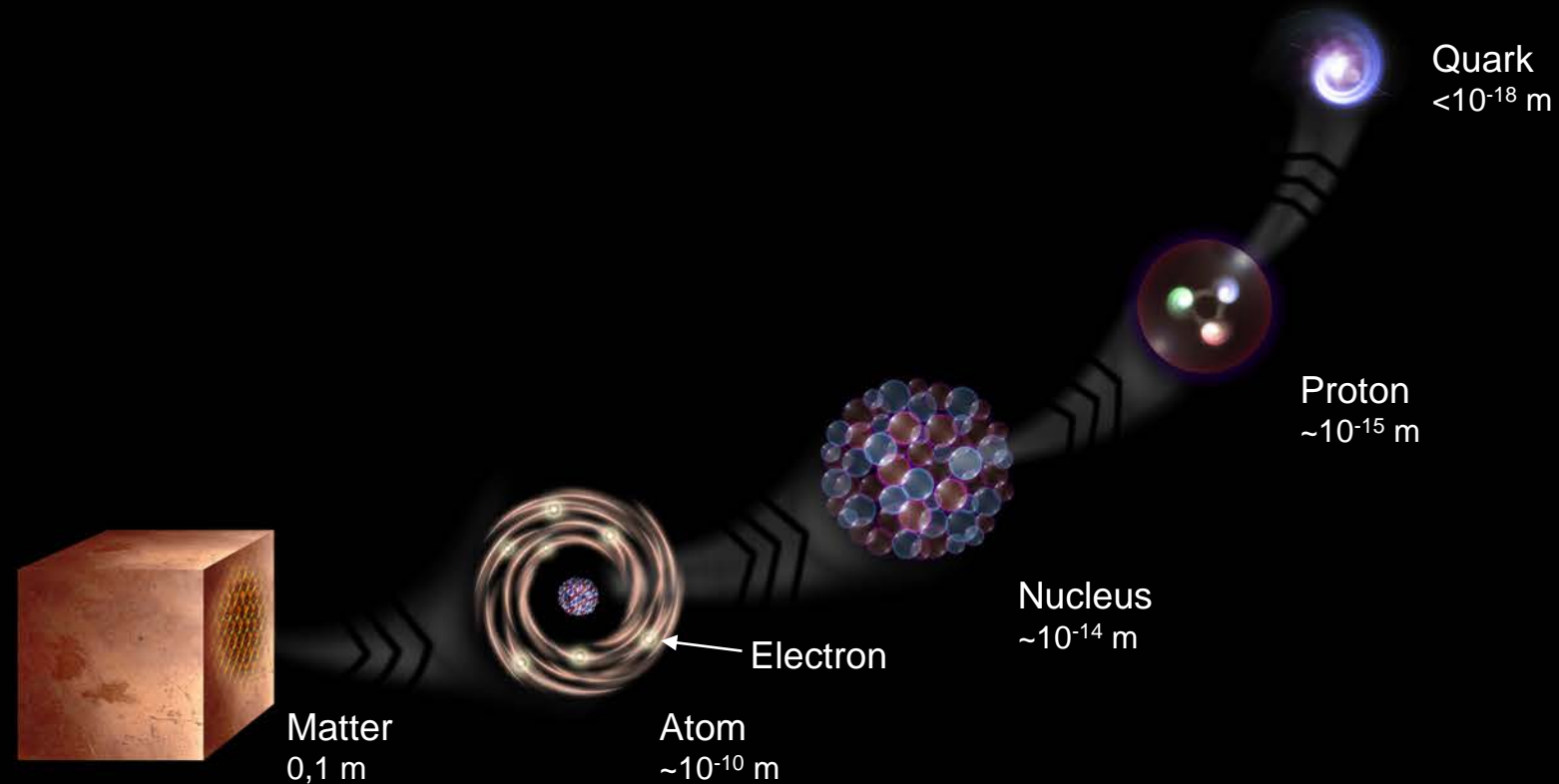


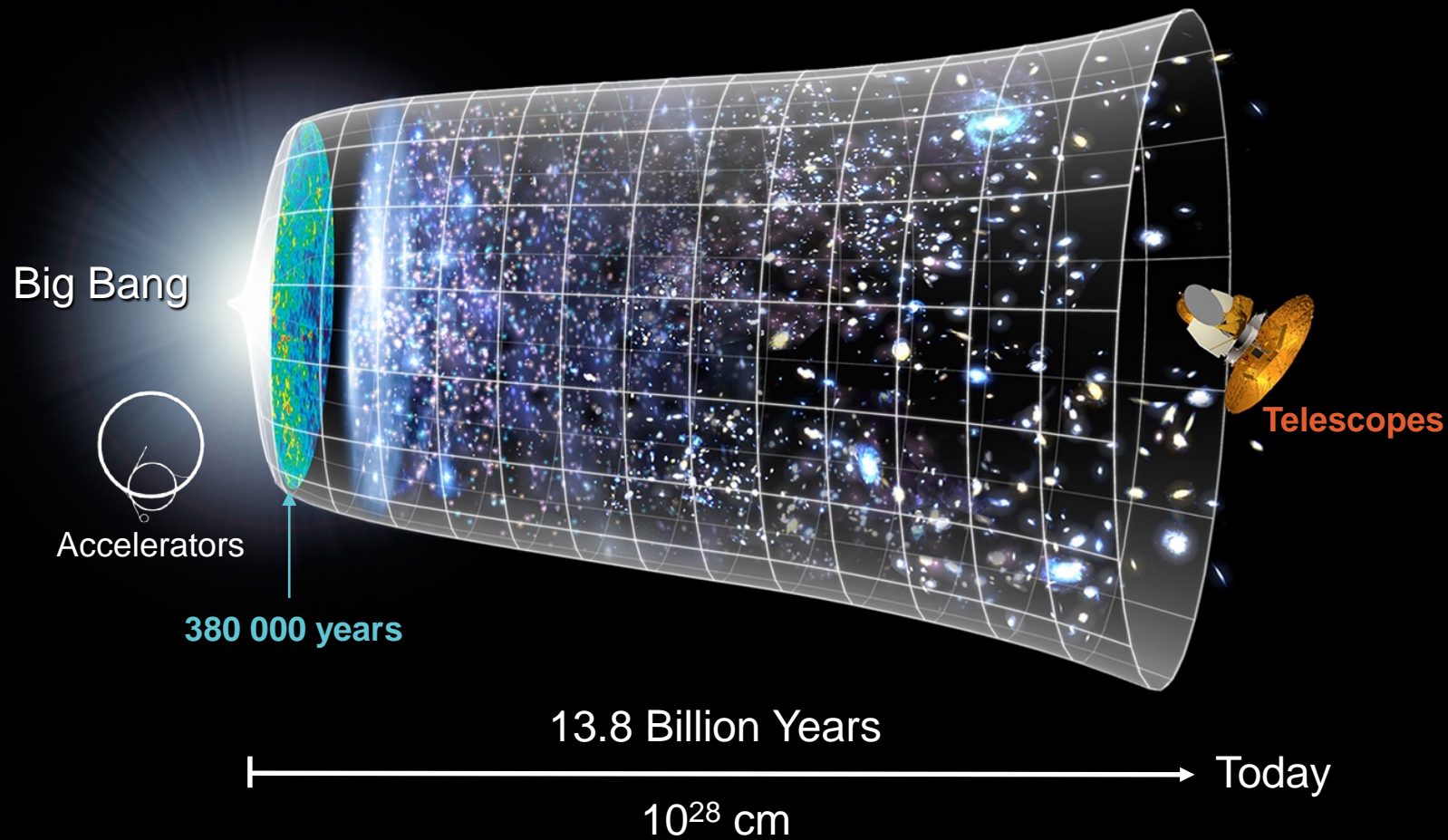


RESEARCH

What is the universe made of?

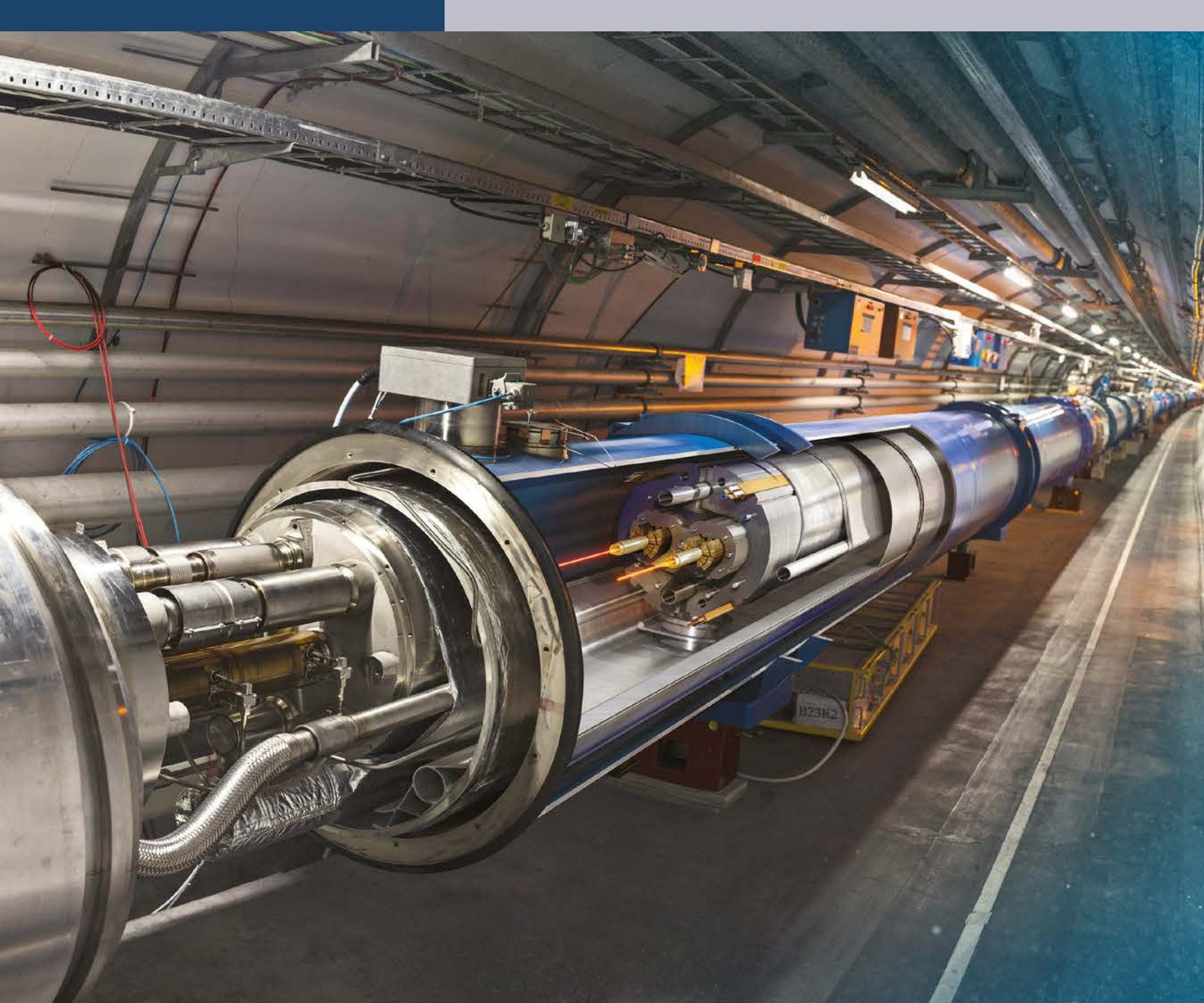
We study the elementary building blocks of matter and the forces that control their behaviour





How did the universe begin?

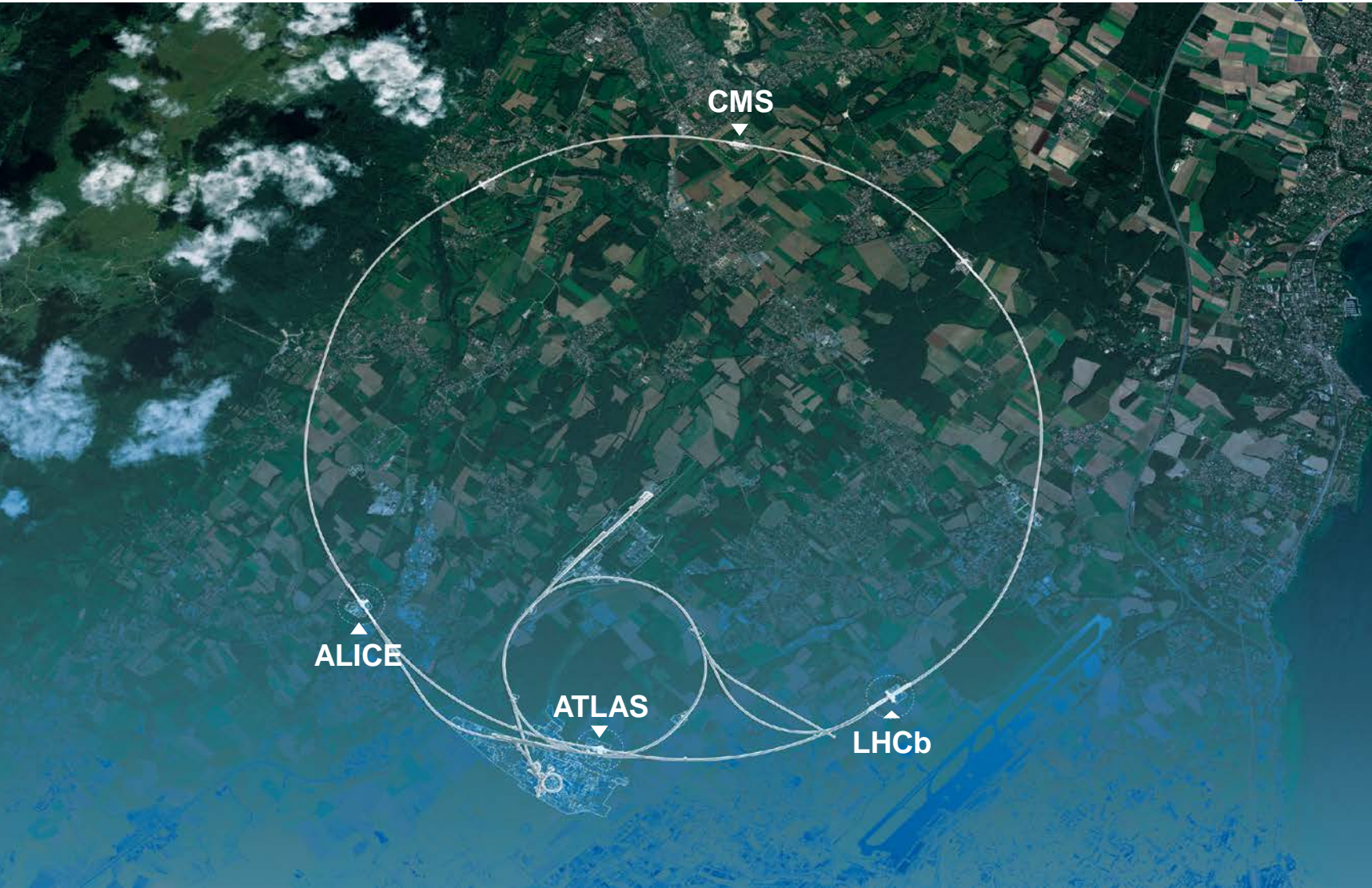
We reproduce the conditions a fraction of a second after the Big Bang, to gain insight into the structure and evolution of the universe.



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 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.

There are many unanswered questions in fundamental physics

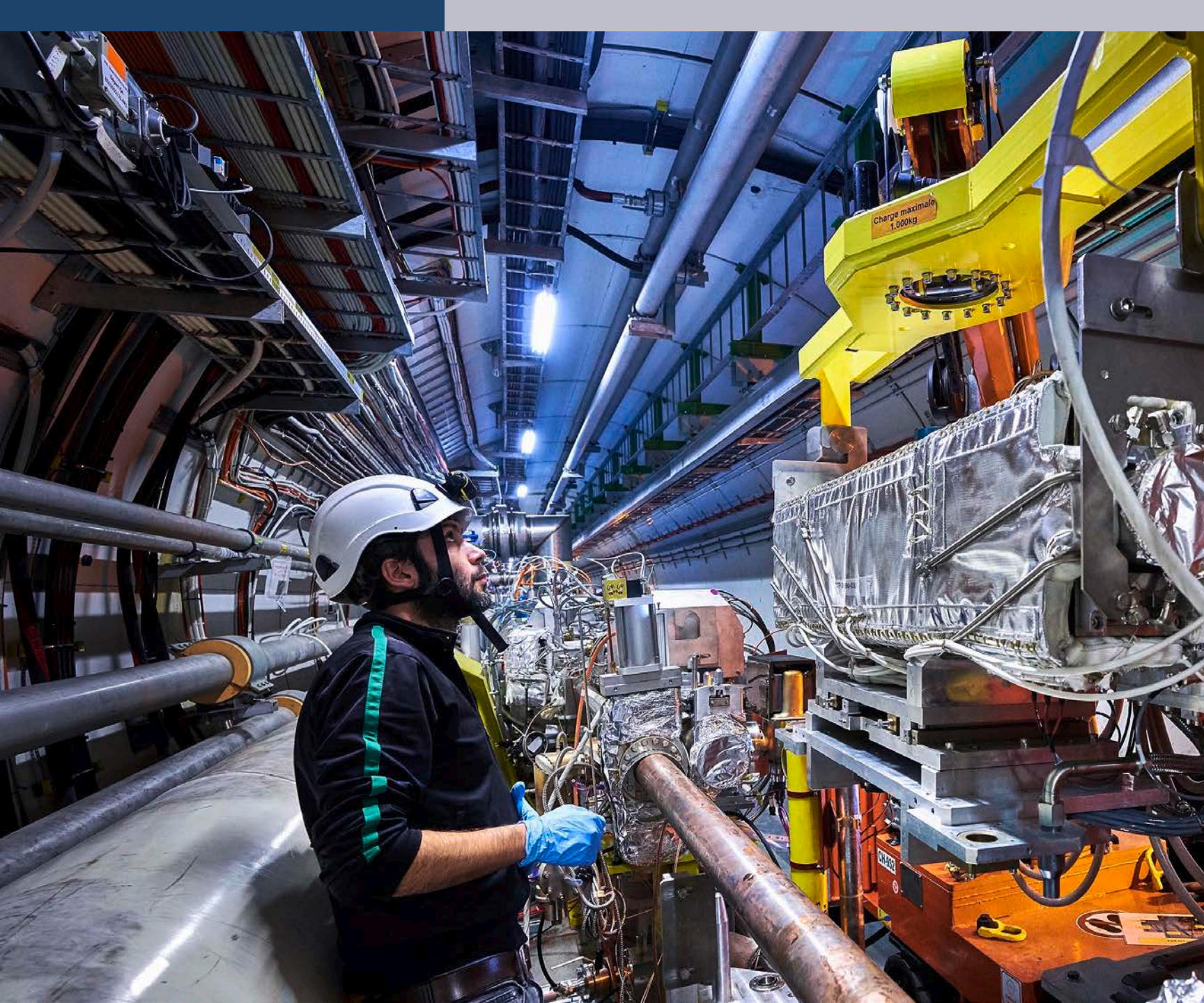
Including

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?



Upgrade to the High-Luminosity LHC is under way

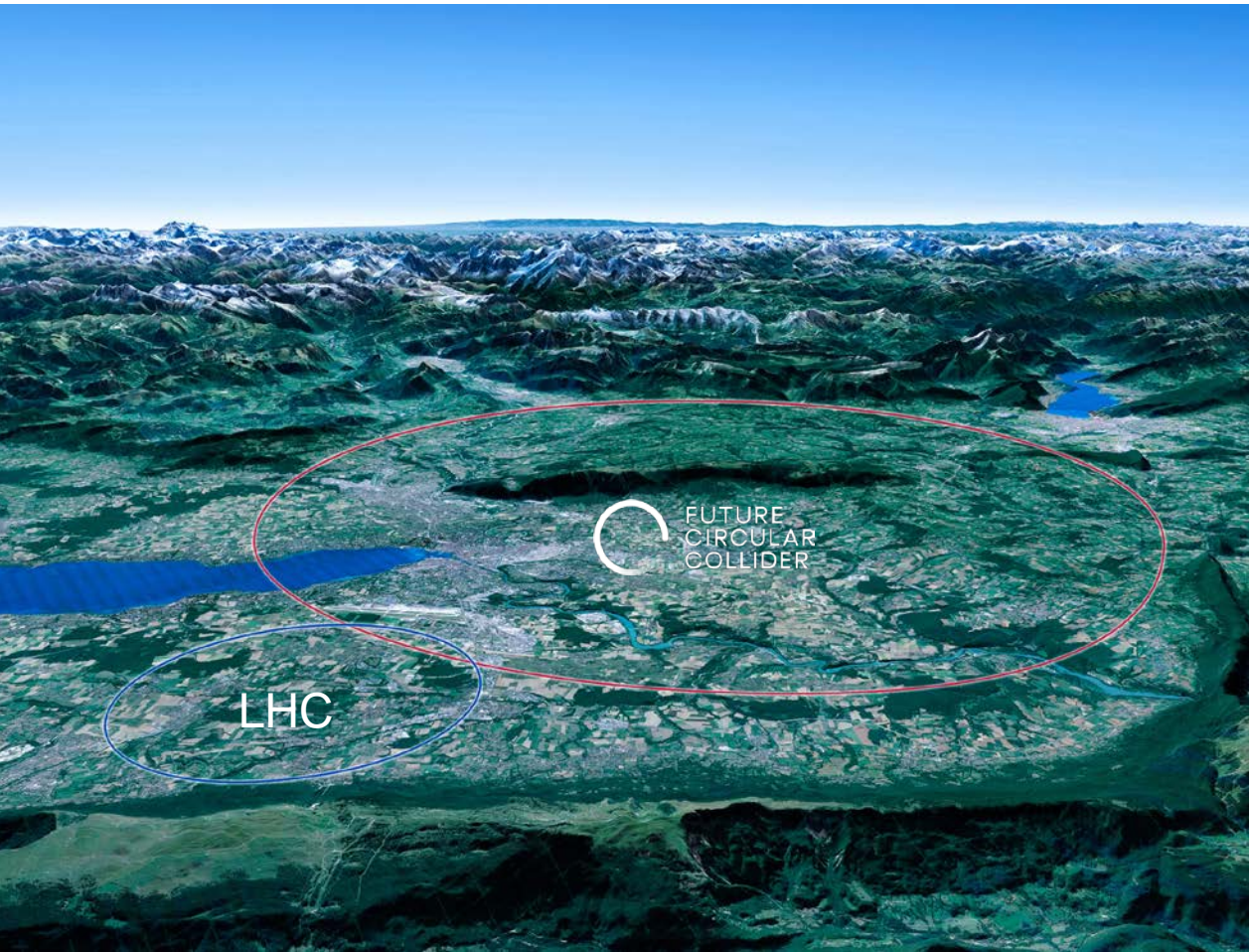
- The HL-LHC will use new technologies to provide 10 times more collisions than the LHC.
- It will give access to rare phenomena, greater precision and discovery potential.
- It will start operating in 2027, and run until 2040.



Scientific priorities for the future

Implementation of the recommendations
of the **2020 Update of the European Strategy
for Particle Physics:**

- Fully exploit the HL-LHC
- Build a Higgs factory to further understand this unique particle
- Investigate the technical and financial feasibility of a future energy-frontier 100 km collider at CERN
- Ramp up relevant R&D
- Continue supporting other projects around the world





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 Associates Member States in the pre-stage to membership

Cyprus – Estonia – Slovenia

7 Associate Member States

Croatia – India – Latvia – Lithuania – Pakistan
Turkey – Ukraine

6 Observers

Japan – Russia – USA
European Union – JINR – UNESCO

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

As of 31 December 2020
Employees:
2635 staff, **756** fellows

Associates:
11 399 users, **1687** others

More than 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 – 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

A laboratory for people around the world

Distribution of all **CERN Users** by the **country of their home institutes** as of **31 December 2020**



Geographical & cultural diversity
Users of **110 nationalities**
~ **23% women**



Member States **6632**

Austria 82 – Belgium 122 – Bulgaria 37 – Czech Republic 221
Denmark 35 – Finland 79 – France 794 – Germany 1185
Greece 138 – Hungary 67 – Israel 63 – Italy 1388
Netherlands 166 – Norway 78 – Poland 272 – Portugal 80
Romania 99 – Serbia 35 – Slovakia 66 – Spain 325
Sweden 96 – Switzerland 329 – United Kingdom 875

Associate Member States **27**
in the pre-stage to membership

Cyprus 11 – Slovenia 16

Associate Member States **390**

Croatia 38 – India 151 – Lithuania 13 – Pakistan 35
Turkey 124 – Ukraine 29

Observers **3071**

Japan 211 – Russia 1021 – United States of America 1839

Non-Member States and Territories **1279**

Algeria 2 – Argentina 15 – Armenia 10 – Australia 23 – Azerbaijan 2 – Bahrain 2 – Belarus 26 – Brazil 108
Canada 196 – Chile 22 – Colombia 15 – Cuba 3 – Ecuador 4 – Egypt 14 – Estonia 26 – Georgia 35
Hong Kong 20 – Iceland 3 – Indonesia 7 – Iran 13 – Ireland 6 – Kuwait 2 – Latvia 6 – Lebanon 17
Malaysia 4 – Malta 3 – Mexico 49 – Montenegro 5 – Morocco 18 – New Zealand 11 – Oman 1
People's Republic of China 334 – Peru 2 – Puerto Rico 2 – Republic of Korea 132 – Singapore 3
South Africa 57 – Sri Lanka 8 – Taiwan 50 – Thailand 16 – United Arab Emirates 2

Numbers for Greece



On 1 September 2021:

- 56 Staff
- 51 Fellows
- 15 Doctoral Students
- 31 Technical Students
- 3 Administrative Students



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

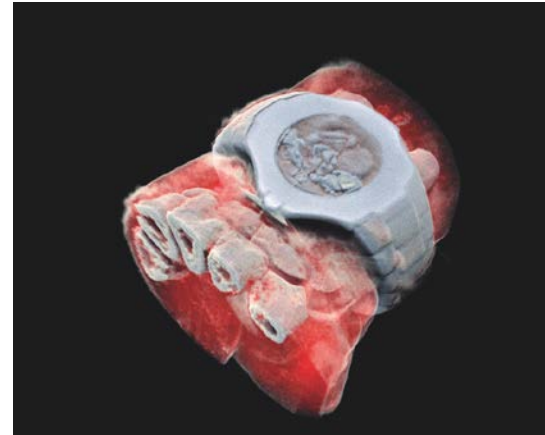
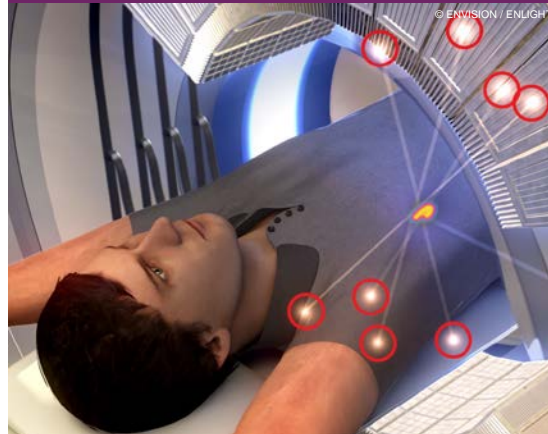
Medical imaging, cancer therapy, material science, cultural heritage, aerospace, automotive, environment, health & safety, industrial processes.

CERN's technological innovations have important applications in medicine and healthcare



Technologies applied at CERN are also used in PET, for medical imaging and diagnostics.

Accelerator technologies are applied in cancer radiotherapy with protons, ions and electrons.



Pixel detector technologies are used for high resolution 3D colour X-ray imaging.

CERN produces innovative radioisotopes for nuclear medicine research.



A group of students, both male and female, are wearing hard hats (yellow and blue) and are focused on working with a large, complex piece of equipment in a laboratory or workshop. The equipment is mounted on a metal frame. One student in the foreground is adjusting a component of the equipment. Other students are looking on, some with CERN lanyards. A green exit sign is visible in the background.

EDUCATION & TRAINING

CERN trains the next generation of physicists, engineers and technicians

>3000 PhD students are registered at CERN.

600 PhD theses are completed each year.

300 undergraduate students in Summer programmes.

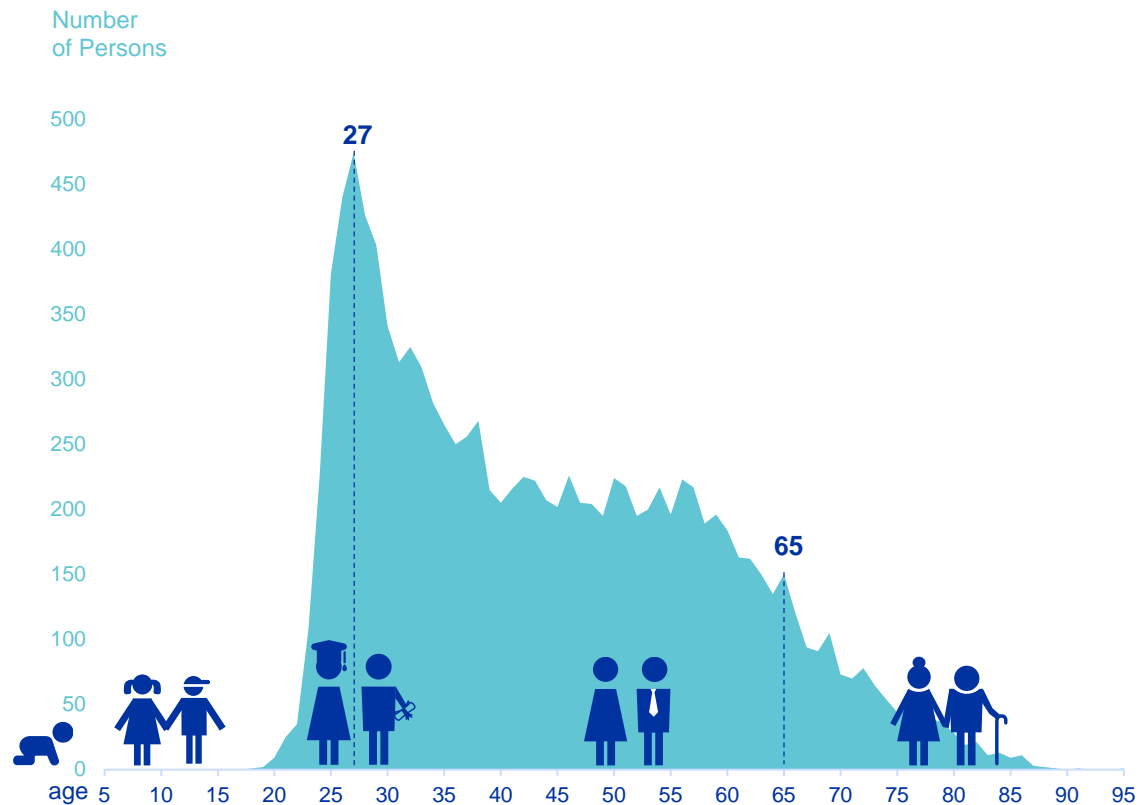


~800 fellows in research and applied physics, engineering and computing.

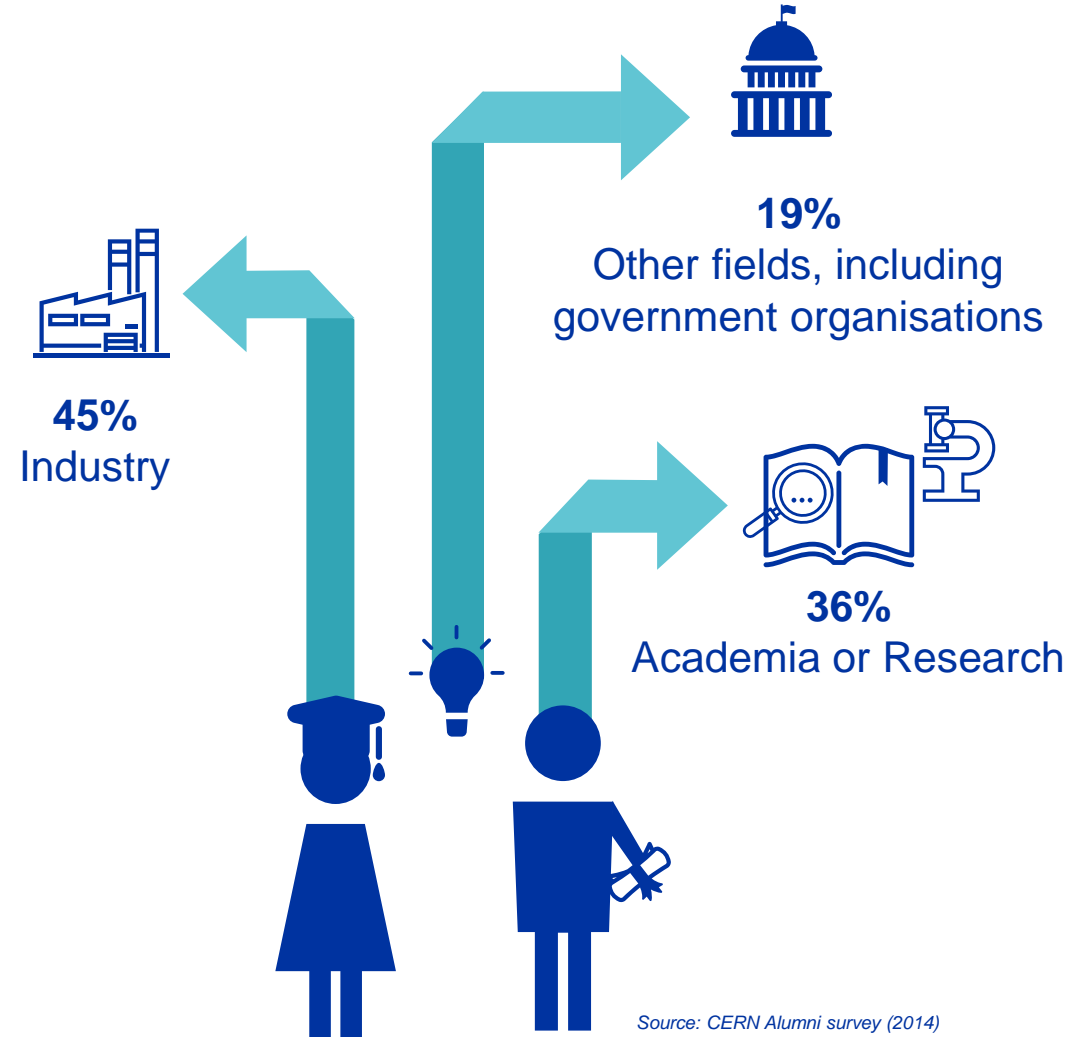
~200 Technical and Doctoral Students in applied physics, engineering and computing.

CERN organises schools for undergraduates and postgraduates, in all regions.

CERN opens a world of career opportunities



Age Distribution of Scientists working at CERN



PhD and Technical students leaving CERN



There are many unanswered questions
in fundamental physics

**CERN will continue to play a crucial role
in the journey of exploration**