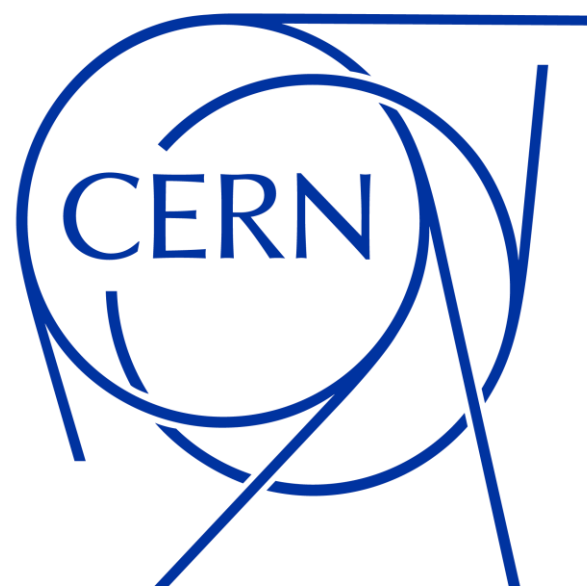




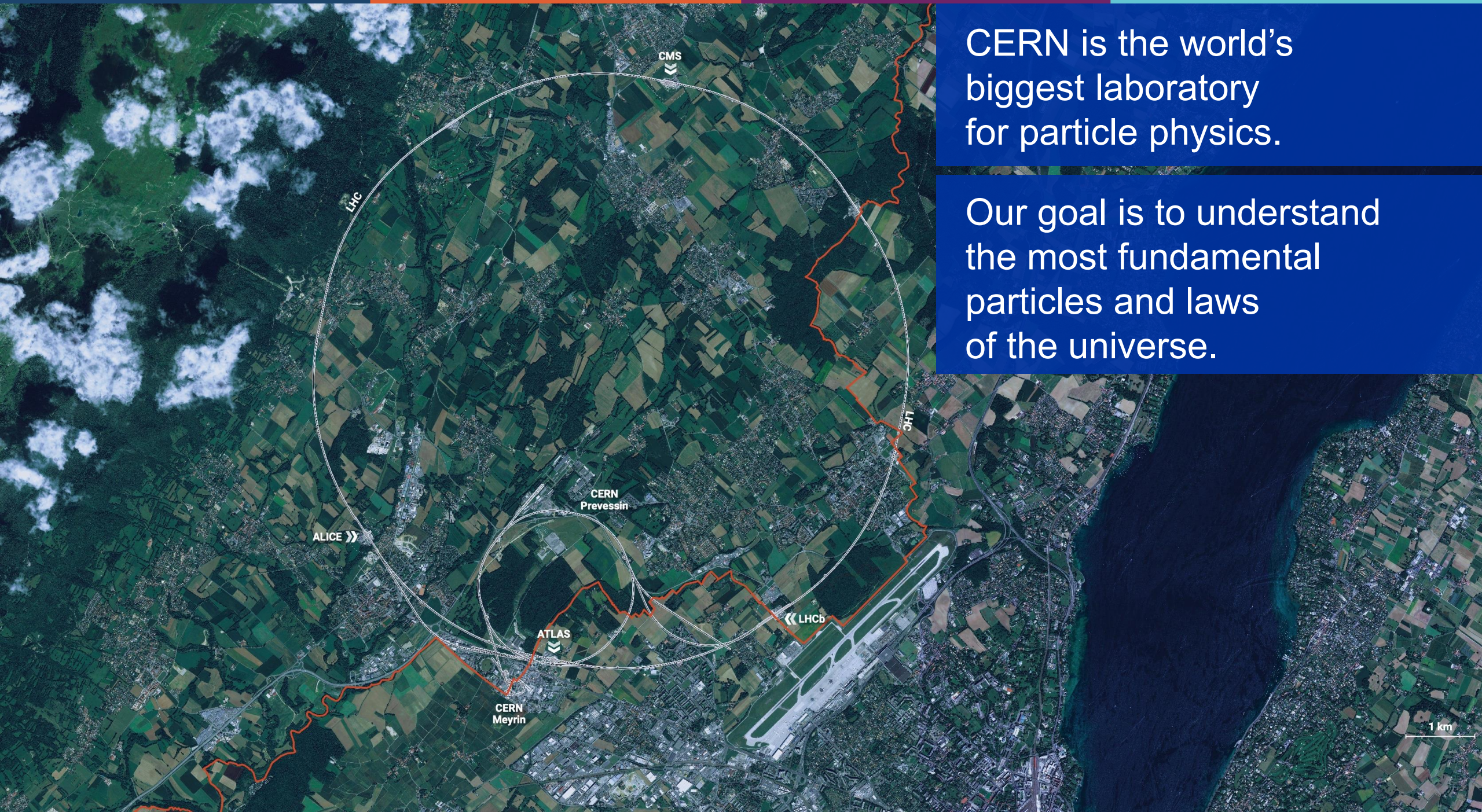


INTRODUCING CERN

PWF Afghanistan: Afghan Physics Student Conference 2025

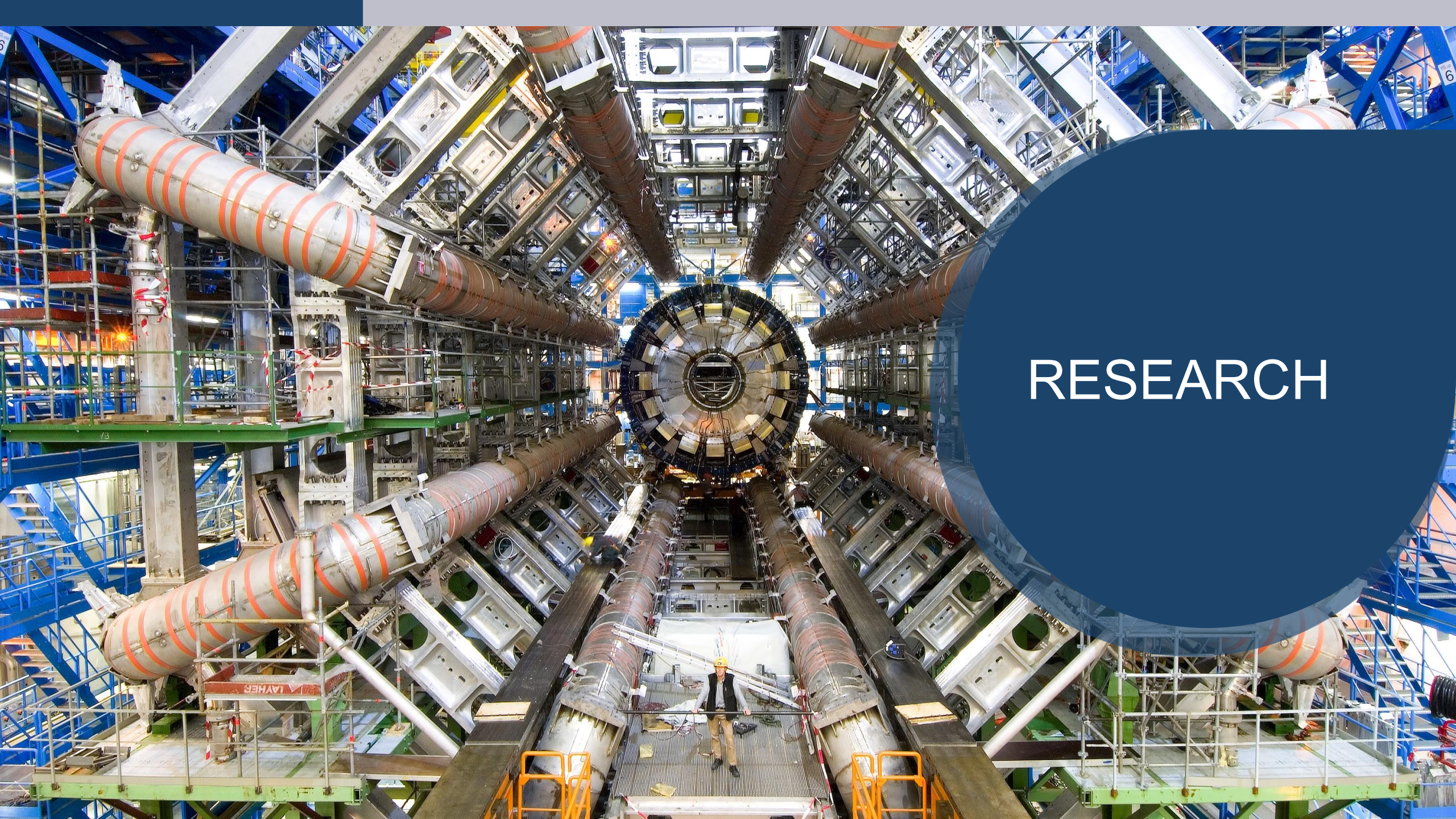
CERN is the world's
biggest laboratory
for particle physics.

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



Four pillars underpin CERN's mission

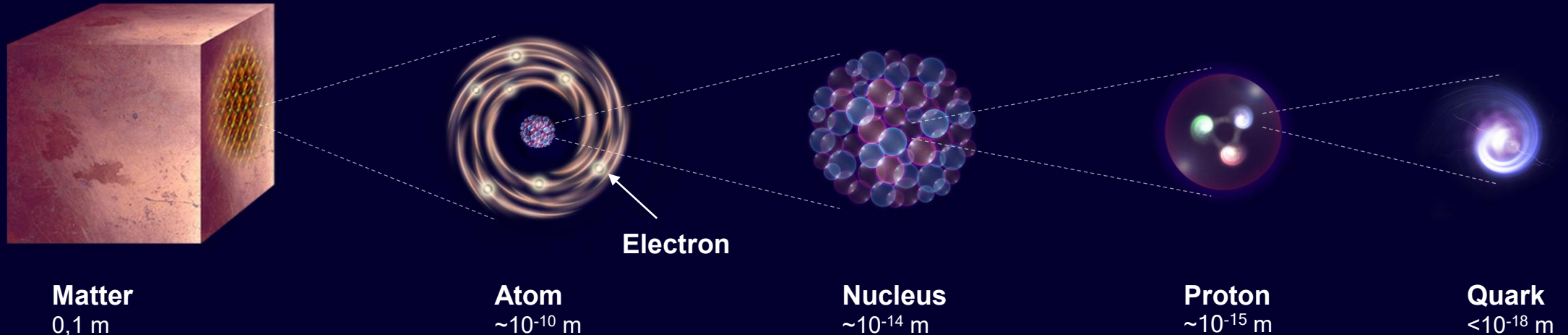


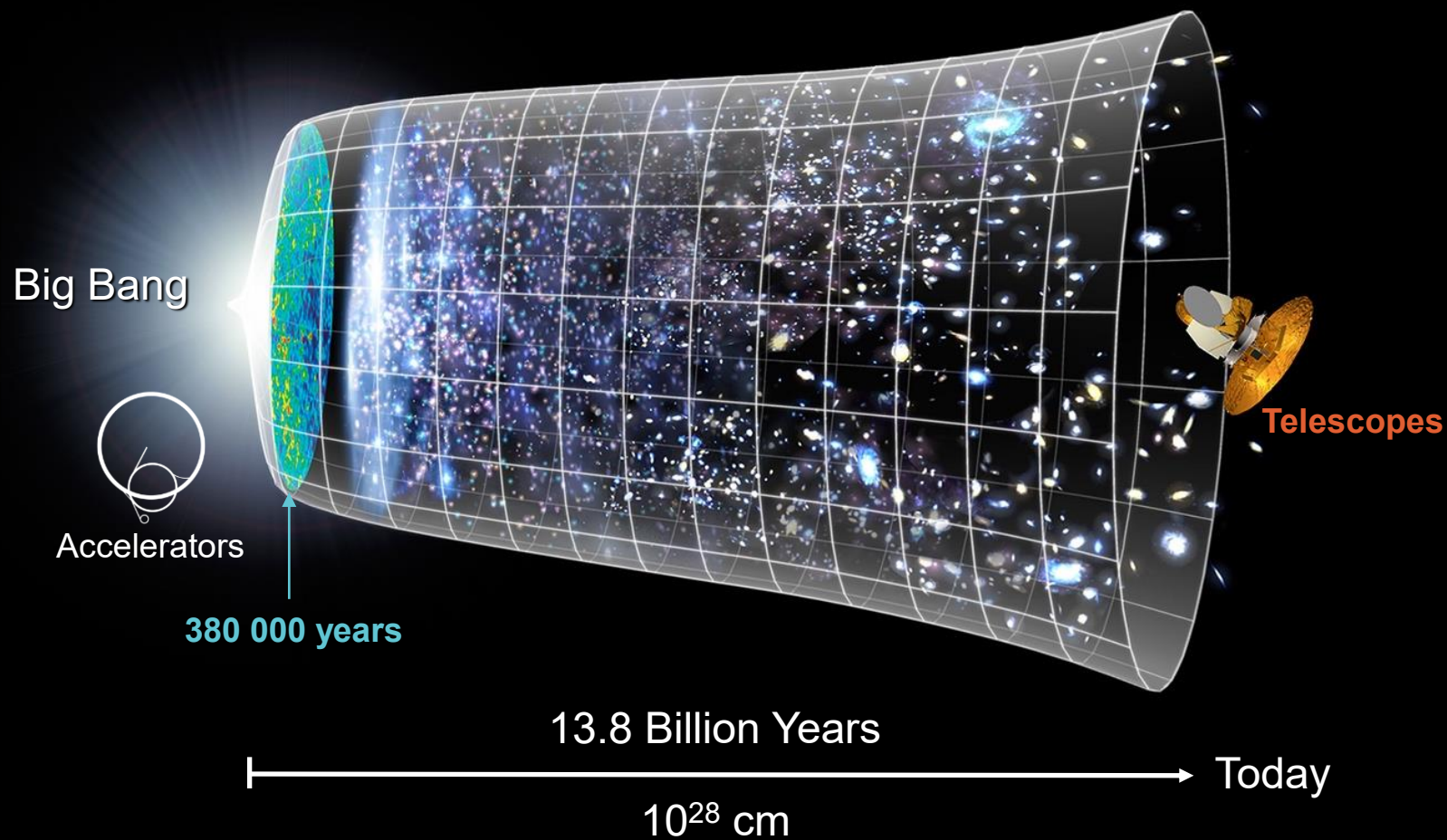


RESEARCH

What is the universe made of?

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

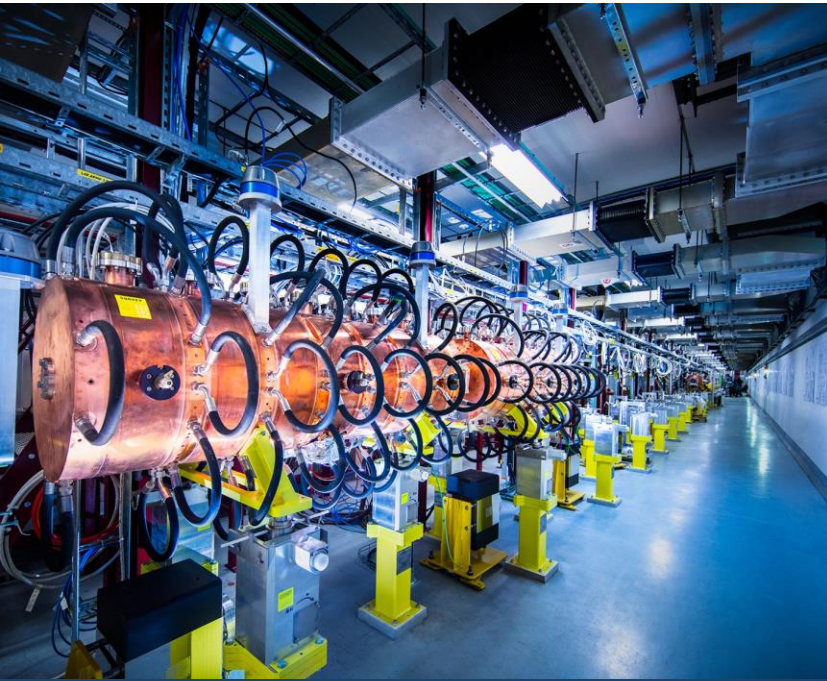




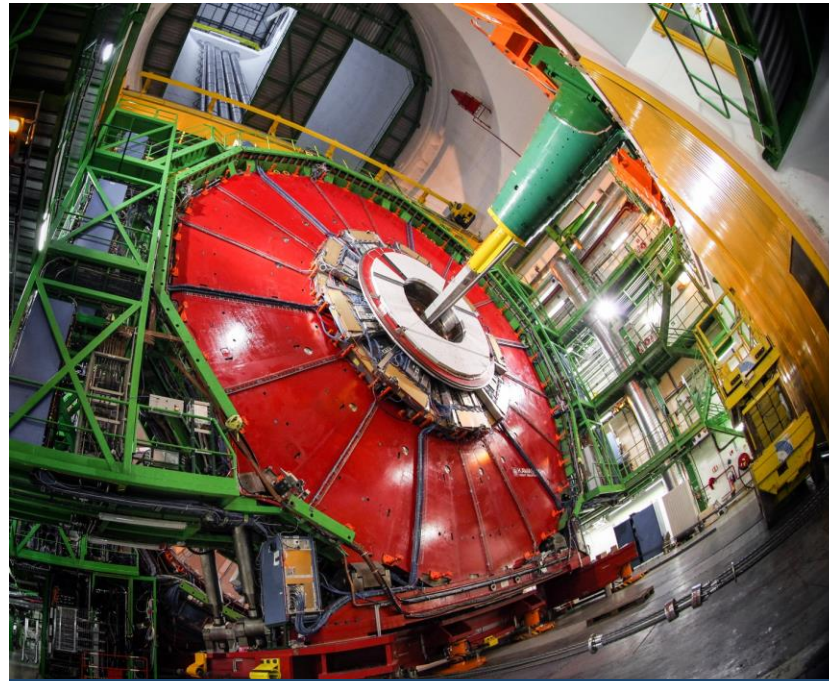
How did the universe begin?

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

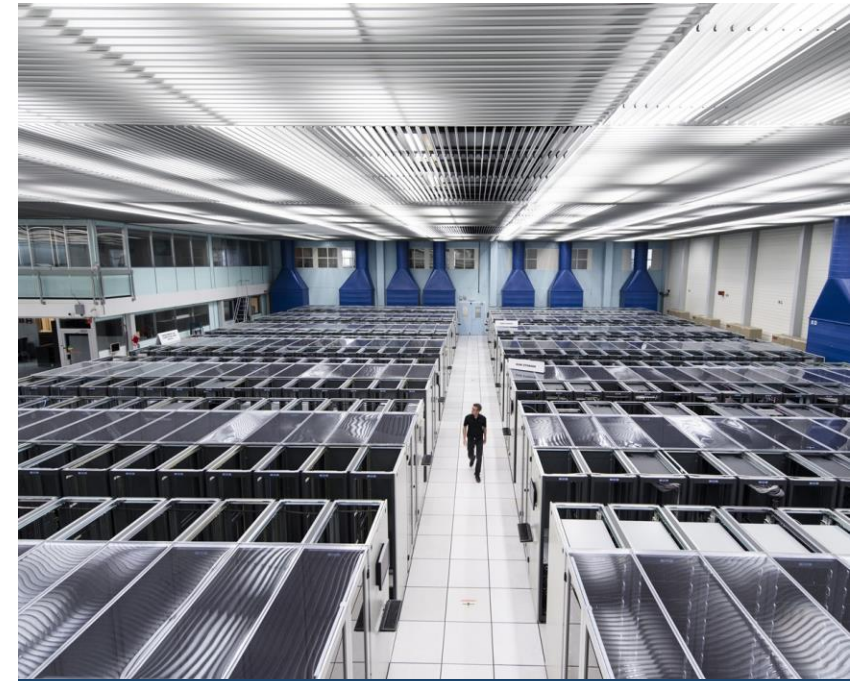
To answer these questions, we develop technologies in three key areas



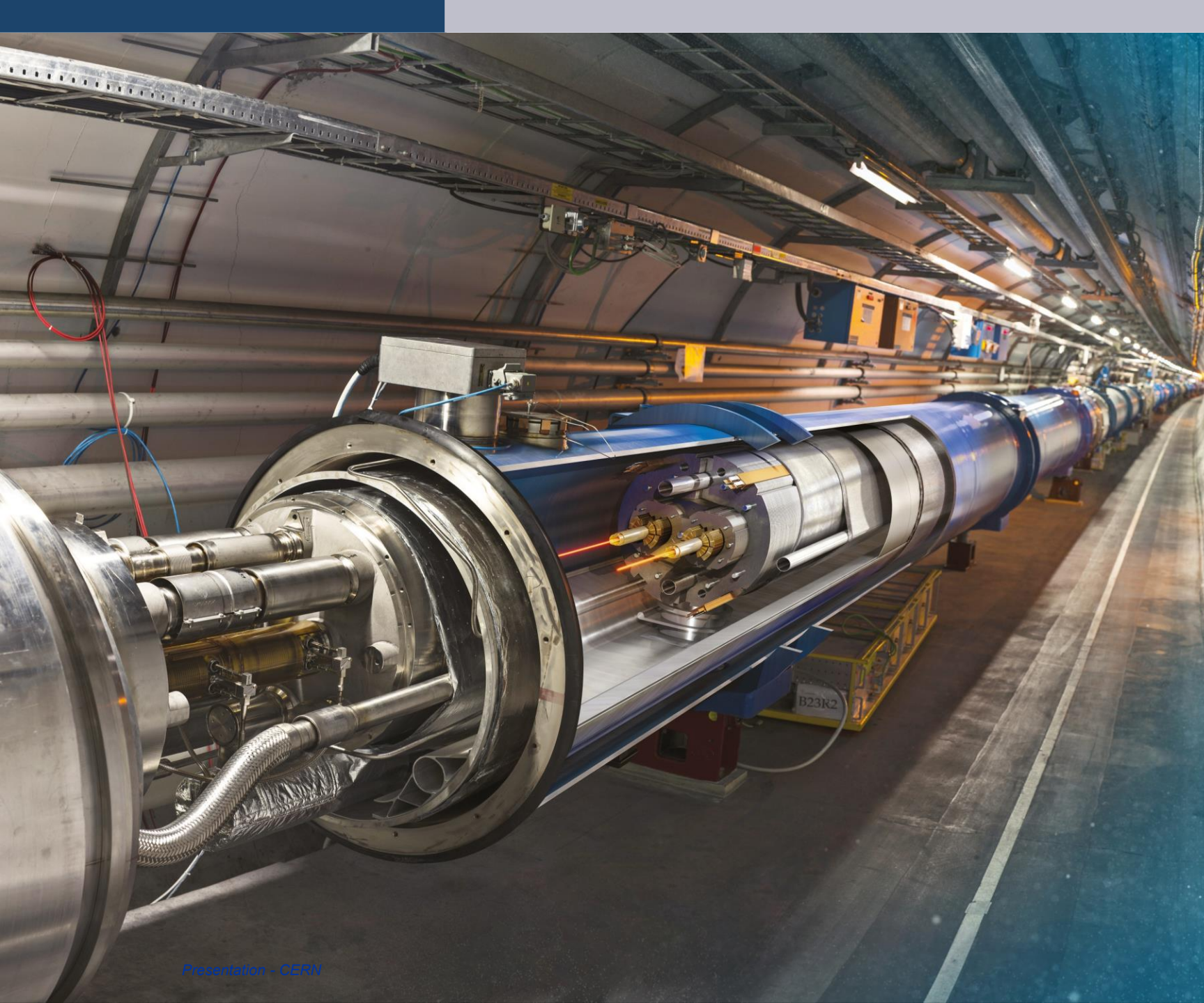
ACCELERATORS



DETECTORS



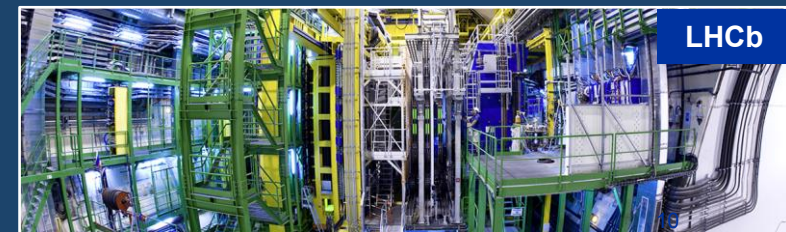
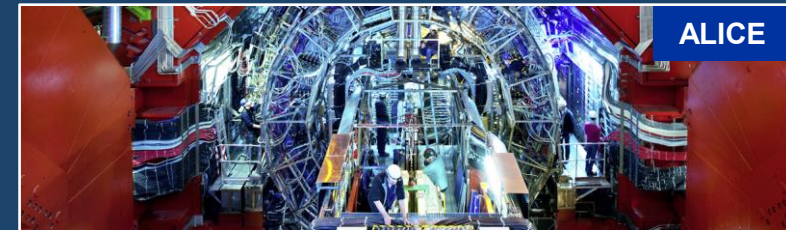
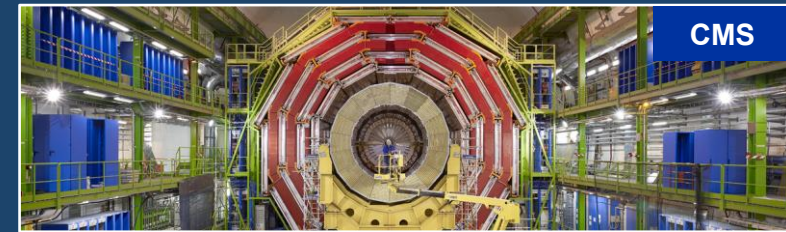
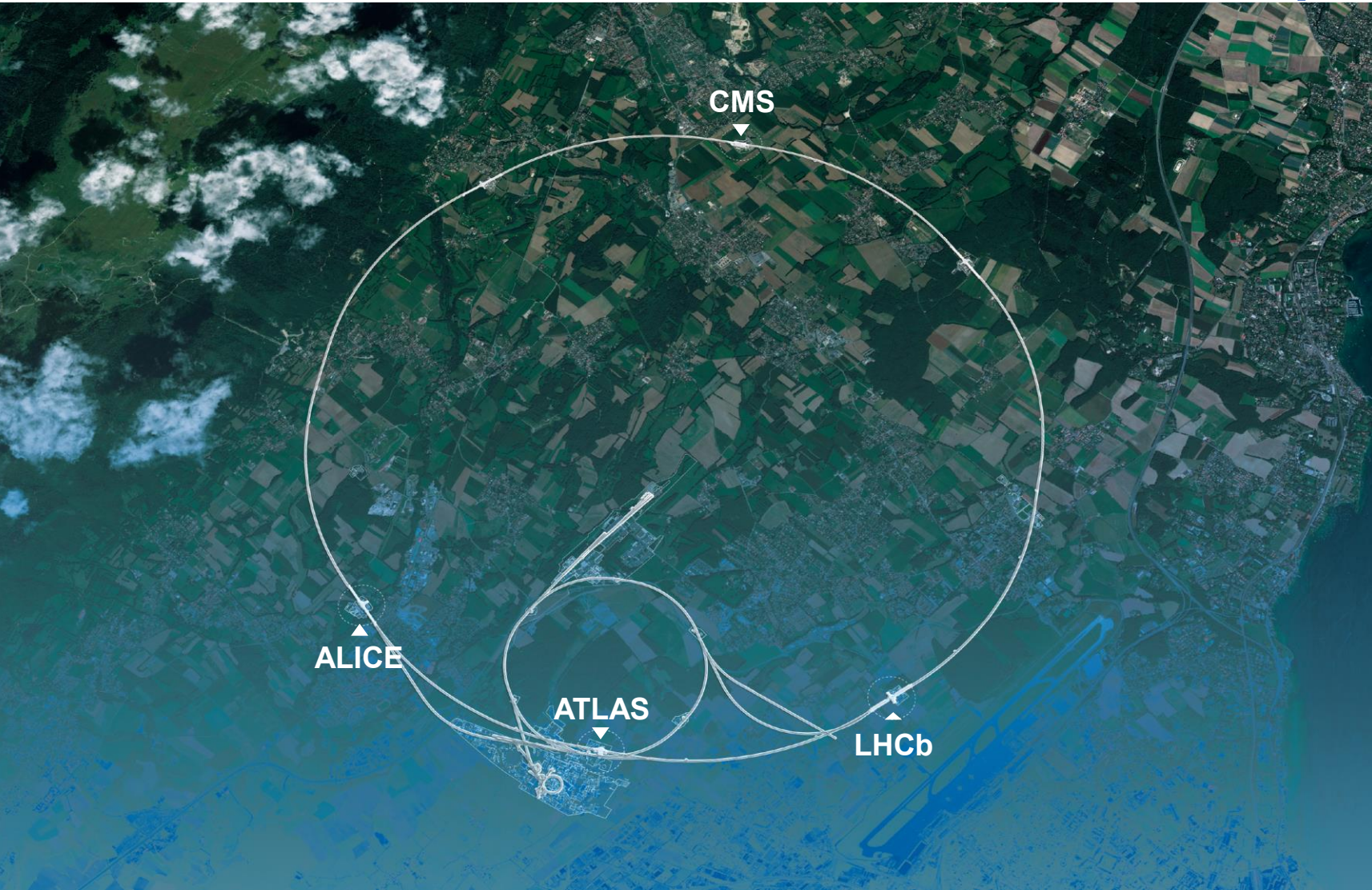
COMPUTING



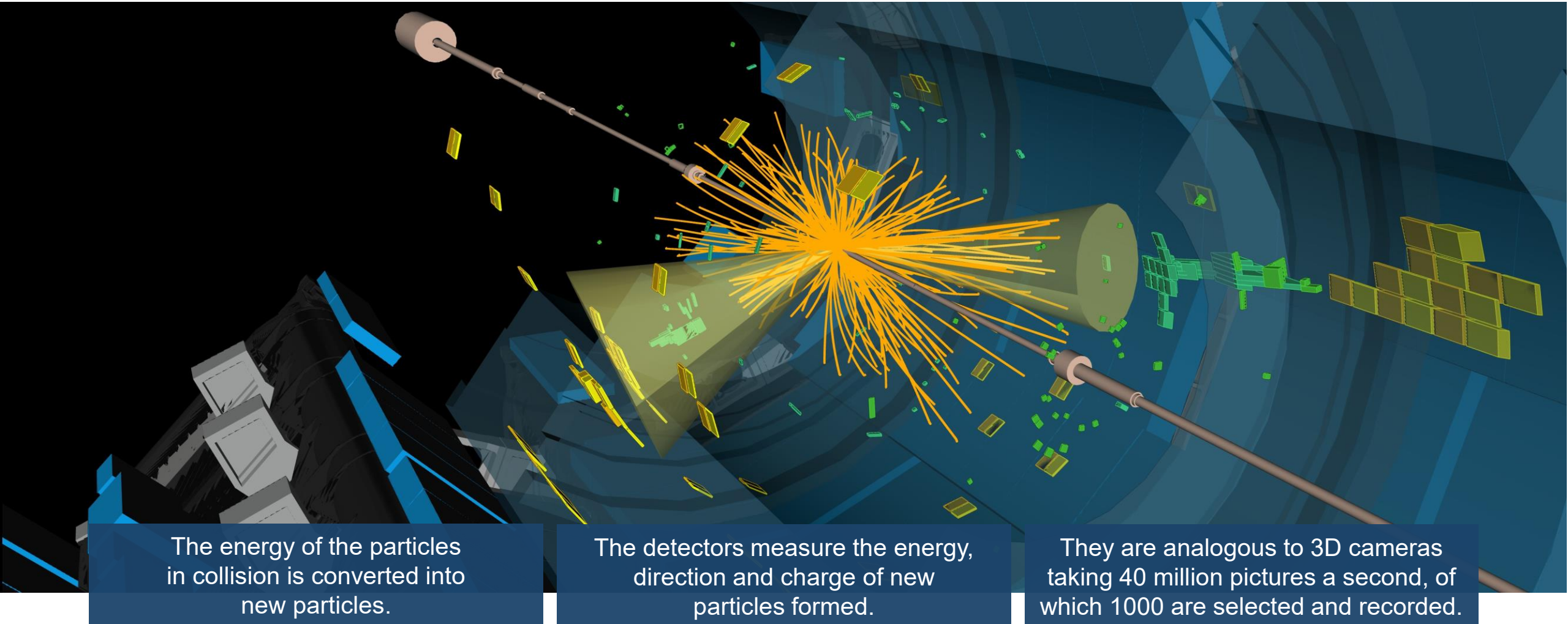
Large Hadron Collider (LHC)

- 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 produces more than 1 billion particle collisions per second



The Worldwide LHC Computing Grid (WLCG)



- Stores, distributes, processes and analyses LHC experiments' data.
- 1.4 million processing cores in 170 data centres and more than 40 countries.
- 1500 Petabytes of CERN data stored world-wide.

EXPERIMENTS SELECTION

- ALICE
- CMS
- ATLAS
- LHCb

TIERS SELECTION

- TIER 0
- TIER 1
- TIER 2
- TIER 3



A low-angle photograph of several flagpoles against a clear blue sky. The flagpoles are arranged in a diagonal line from the bottom left towards the top right. Various national flags are flying from the poles, including the Spanish flag, the Greek flag, the Italian flag, the German flag, the Polish flag, the Danish flag, and the Finnish flag. A large, semi-transparent orange circle is overlaid on the left side of the image, containing the word "COLLABORATION" in white, uppercase letters. The sun is visible in the sky, creating a bright glow.

COLLABORATION

Science for peace

CERN was founded in 1954 with 12 European Member States



25 Member States

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

10 Associate Member States

Brazil – Croatia – Cyprus – India – Ireland – Latvia
Lithuania – Pakistan – Türkiye – Ukraine

4 Observers

Japan – USA – European Union – UNESCO

Data as of 31 December 2024

Employees:

2704 staff

1181 graduates and fellows

Associates:

12 406 users, **1401** others

~ 50 Cooperation Agreements

Albania – Algeria – Argentina – Armenia – Australia – Azerbaijan – Bahrain – Bangladesh – Bolivia – Bosnia and Herzegovina
Canada – Chile – Colombia – Costa Rica – Cuba – Ecuador – Egypt – Georgia – Ghana – Honduras – Hong Kong – Iceland
Indonesia – Iran – JINR – Jordan – Kazakhstan – Kuwait – Lebanon – Madagascar – Malaysia – Malta – Mexico – Mongolia
Montenegro – Morocco – Mozambique – Nepal – New Zealand – North Macedonia – Oman – Palestine – Paraguay
People's Republic of China – Peru – Philippines – Qatar – Republic of Korea – Rwanda – Saudi Arabia – Singapore
South Africa – Sri Lanka – Taiwan – Thailand – Tunisia – United Arab Emirates – Uruguay – Uzbekistan – Vietnam



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 education and training programmes

1181 graduates
(including Research Fellows)

3 000 PhD students

300 Undergraduate students in
Summer programmes



> 15 000 teachers participating in dedicated
programmes, since 1998

2746 teams with more than 20 000 students in
Beamline for Schools (BL4S) competition programme,
since 2014

CERN's education and training opportunities for Afghanistan



Non-Member State Summer Student Programme

3 Afghan students participated since 2019

Non-Member State Doctoral Student Programme

Initiative funded by the CERN & Society Foundation



Beamline for Schools

1 Afghan team participated in 2025

CERN Teacher Programmes

Training in Physics for High-School Teachers



CERN's education and training opportunities for Afghanistan – more information here

- **CERN Beamline for Schools:** <https://beamlineforschools.cern/>
- **CERN Non-Member State PhD Studentship Scheme:**
<https://cernandsocietyfoundation.cern/projects/cern-non-member-state-phd-studentship-scheme>
- **CERN Summer Student Programme:**
<https://careers.cern/programmes/summer-studentship/>
- **CERN Teacher Programmes:** <https://teachers.cern/>

CERN's education and training opportunities for Afghanistan – online resources

- **International Particle Physics Outreach Group:** <https://ippog-resources-portal.web.cern.ch/>
- **Online particle physics course:** <https://ppc.web.cern.ch/>
- **Virtual visits:** <https://visit.cern/virtual-visit>

There are many unanswered questions in fundamental physics

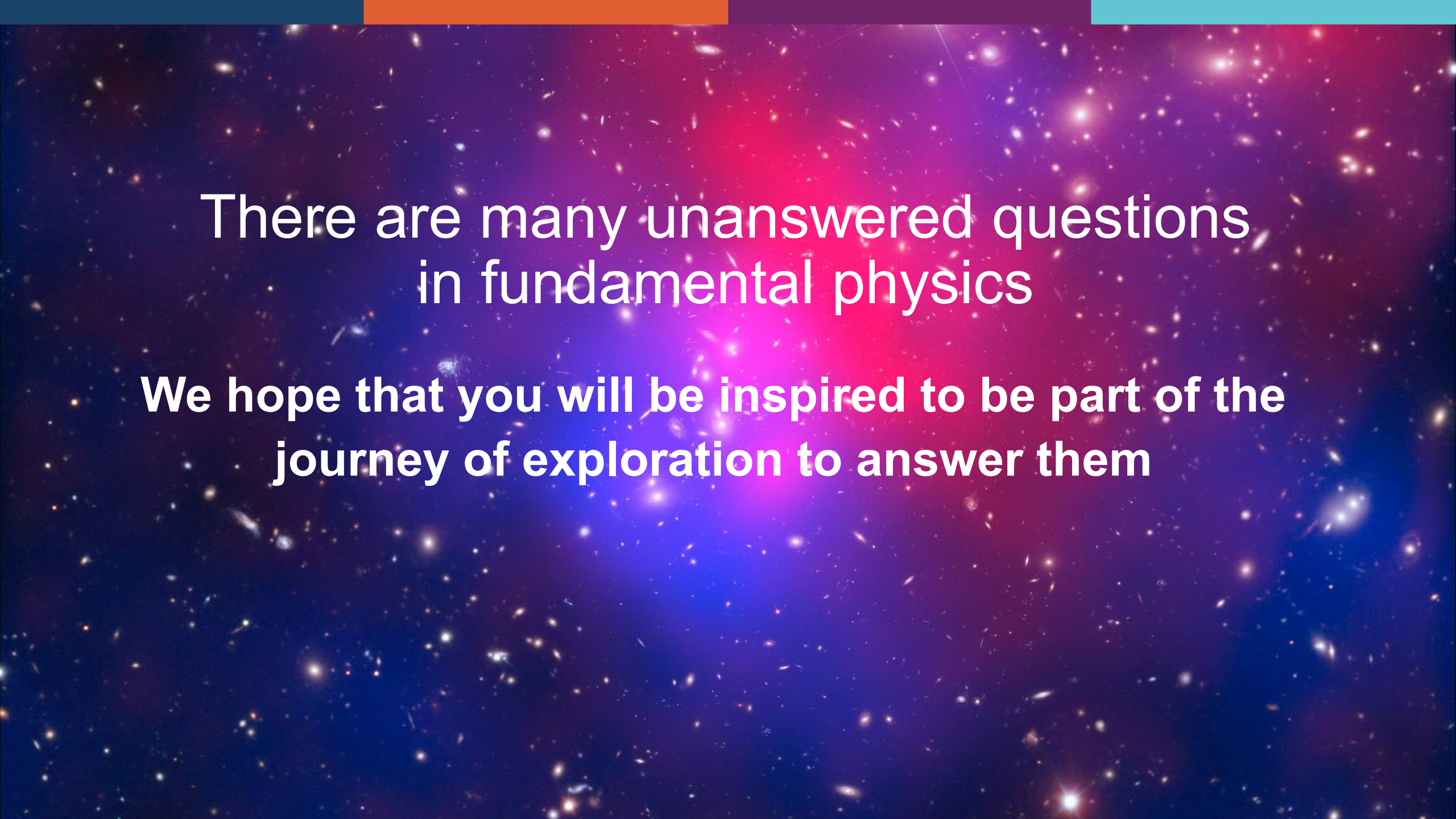
Including

What is the unknown
95% of the mass
and energy
of the universe?

Does the Higgs boson
interact with dark
matter?

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

Why is gravity so weak
compared to the other
forces?

The background of the slide is a deep space image featuring a dense field of galaxies and stars. A prominent, bright, multi-colored nebula or light source is centered in the upper half, radiating a mix of red, orange, and yellow light. The surrounding space is dark blue and black, filled with numerous smaller, distant galaxies and star clusters. At the very top of the image, there are three horizontal bars of color: a dark blue bar on the left, an orange bar in the middle, and a light blue bar on the right.

There are many unanswered questions
in fundamental physics

**We hope that you will be inspired to be part of the
journey of exploration to answer them**