Where are we?

CERN as an engine of scientific collaboration;
IdeaSquare as the innovation space at CERN.

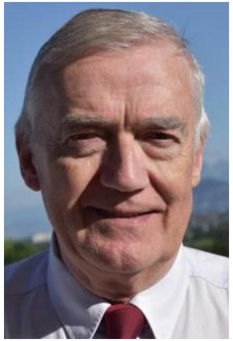
November 4th 2023
Catarina Batista & Ole Werner

[redacted]

The CREW at IdeaSquare

Mirabelle Breidvik
Communications

Catarina Batista
Edu programmes



Robert Cailliau
Resident Provocateur

Laëtitia Pedroso
Events

Roy Pennings
Project Projector

Giulia Gaddi
People watcher

Jimmy Poulaillon
Communications

Pablo Garcia Tello
Wizard of EU

Lauri Valtonen
CIJ

Ole Werner
Edu Programmes

Laura Wirtavuori
Edu programmes

Dina Zimmermann
Prototyping

Who am I to talk to you

Ole Werner

- Galactic Firefighter at CERN IdeaSquare
- BSc Psychology, MSc Behavior Change
- Love to excite people, want to understand your minds

Who am I to talk to you

Catarina Batista

- Mindset Accelerator at CERN IdeaSquare
- BA Organisational Communication, Post-grad Product and Service Innovation, MSc Psychology.
- Passionate about education and humanitarian challenges.
- European nomad, generalist and animal lover.

Photo by Rohan Sachdeva

Safety is first priority.

BUILDING SAFETY B3179

- In all inside areas of Building 3179 **smoking & alcoholic beverages is strictly forbidden.**
- Working is possible 24/7 with CERN access card, **sleeping is prohibited in all CERN buildings.**
- Eating, drinking, coffee breaks are encouraged in the kitchen (and open) area. But not in the Red Bus, please!
- Cameras, **photos,** posting in social media **are highly encouraged :)**


R-A05
R-103
R-102
R-401
R-101
R-201
R-A01
Machineshop
R-B03
Electroshop
R-B08
Light Lab
R-B09
Kitchen
1-D01
3D
Studio
(2nd
floor)
R-E06
Main Area
R-202
Free to use
green
Work under
supervision
yellow
Restricted area
red
red
yellow
blue

WORKSHOP SAFETY B3179

Safety is first priority! In:

- Machineshop 3179-R-A01,
- Electroshop 3179-R-B03,
- 3D Studio 3179-1-D01

working is conducted "under supervision". No eating, please ☺

i.e. When you want to use the workshops:

- Come talk to us (Dina/Ole/Catarina) what would you like to do and we'll figure it out together what is the easiest and fastest way to do it safely.

In case of an emergency

While evacuating, always **go away from the danger!**

Do NOT return to collect your belongings

Walk quickly and calmly to your building's designated **assembly point** or as advised by an Emergency Guide or Fire Brigade personnel

Wait at the assembly point until counted and released by the TSO/DSO or the Fire Brigade.

Give to the Fire Brigade all the information they need! **+41 22 767 44 44**

Things you can avoid for these days

- …climbing on top of the containers or the bus
- ...consuming or storing alcohol inside IdeaSquare
- …entering unauthorised areas
- …walking around without your visitor card and ID
- …not exiting through an authorised gate


Ideas
THINK. DO. COLLABORATE.

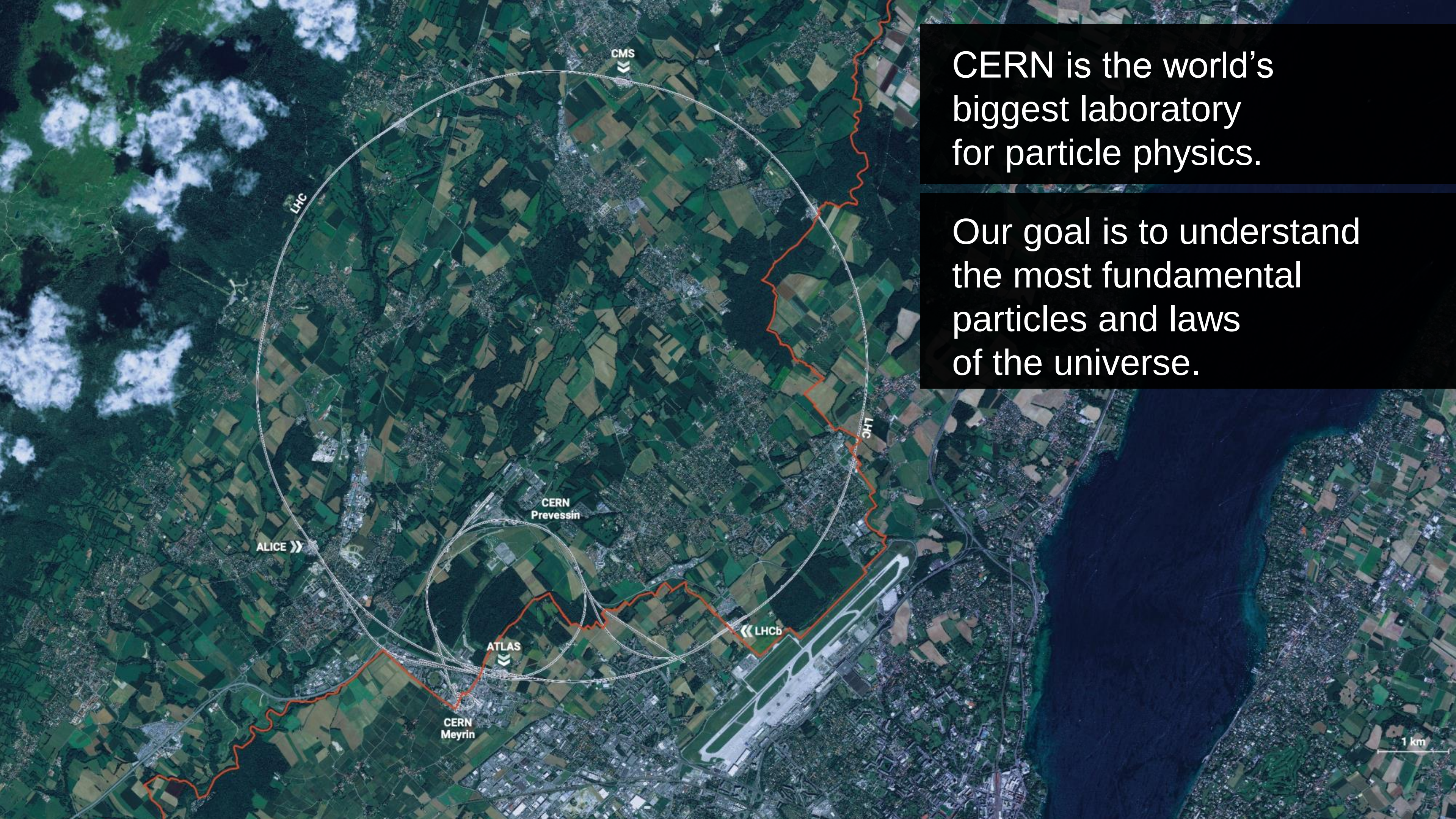
Keeping places tidy

- Please, Please:
  - Bring all coffee cups, plates, dishes to kitchen, and put them inside the dish washer in status “Dirty”.
  - Clean more than you mess, to fight our common enemy called Entropy.
  - Help collaboratively to clean up the space at the end of the day.

Where are we…?

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

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



CERN’s Mission

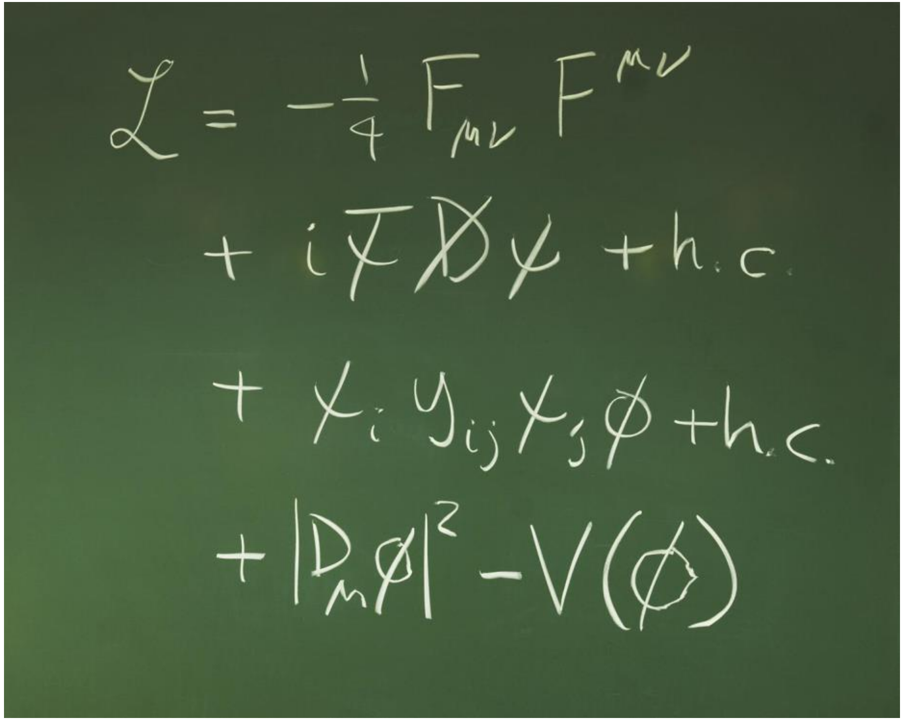


Photo by Claudia Marcelloni

CERN is a peace project, funded in the wake of the second world war that aims to:

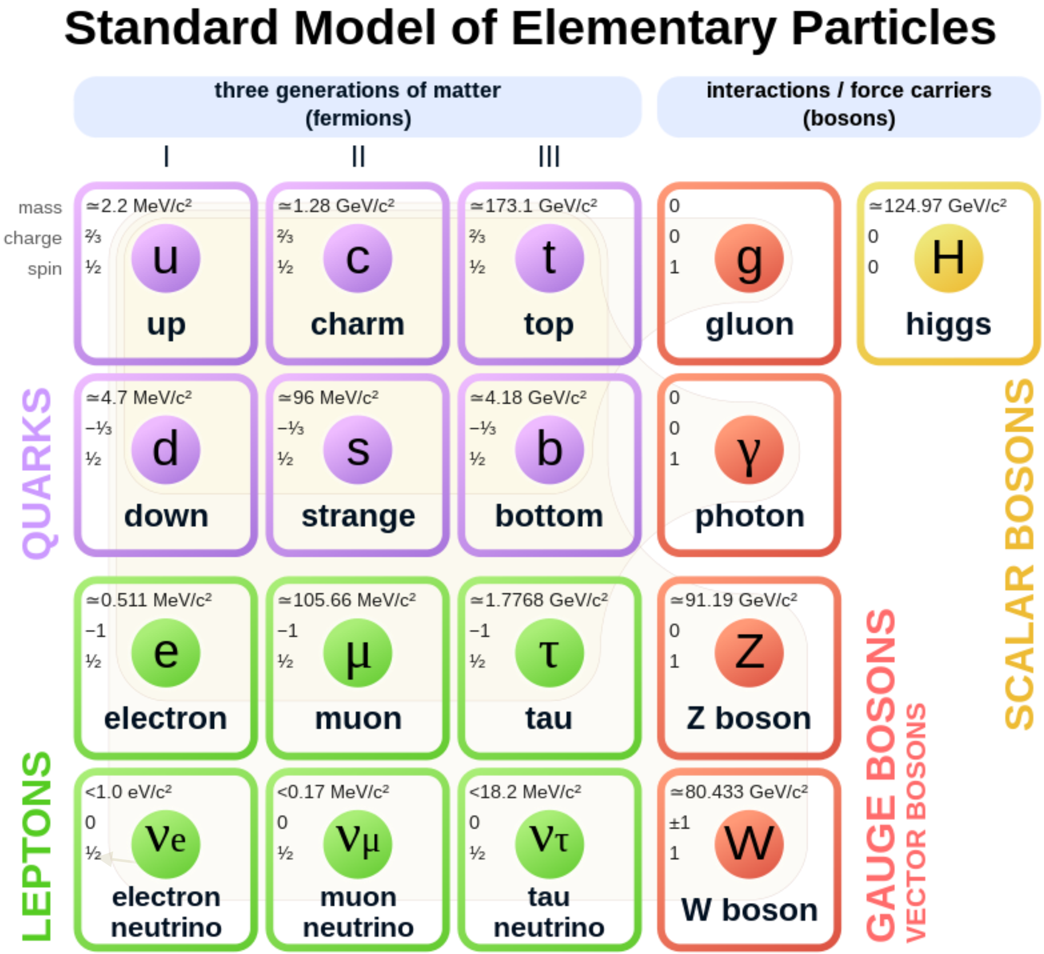
- *Push back the frontiers of knowledge;*
- *Answer questions about the beginning and the nature of the universe;*
- *Unite people from different countries*
- *and cultures;*
- *Train scientists and engineers of tomorrow;*
- *Develop new technologies for accelerators and detectors and other new solutions , such as more effective cancer treatment.*

70

YEARS / ANS **CERN**

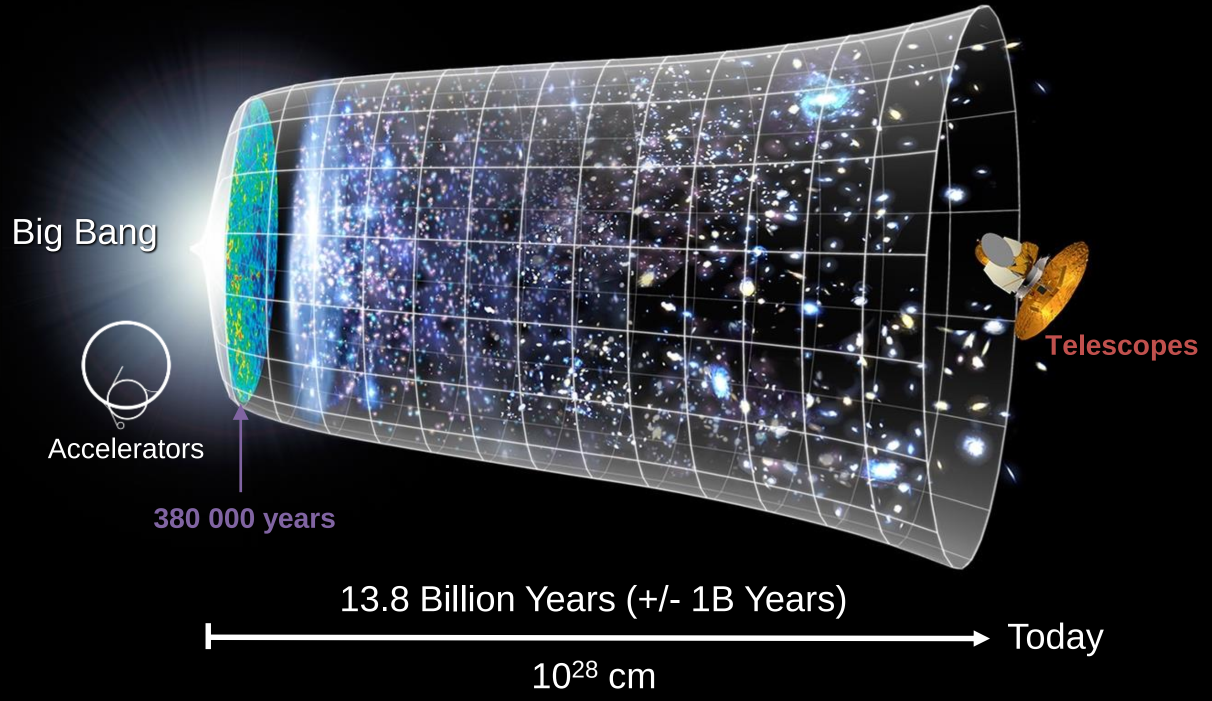
1954 - **2024**

What is the universe made of?



How did the universe begin?

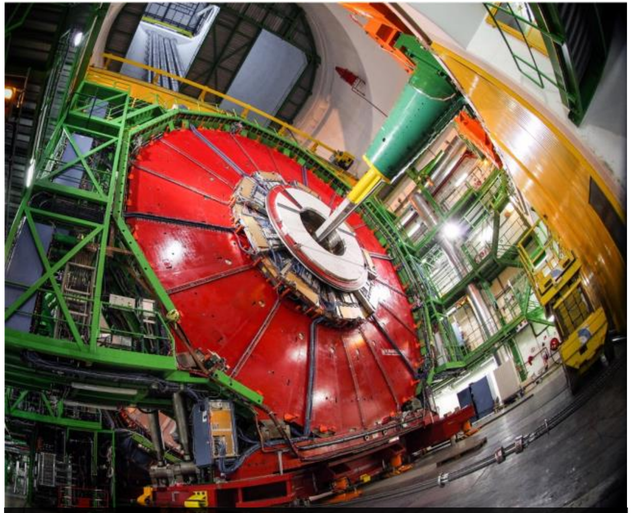
We reproduce the conditions a fraction of a second after the Big Bang, to gain insight into the structure and evolution
of the universe.



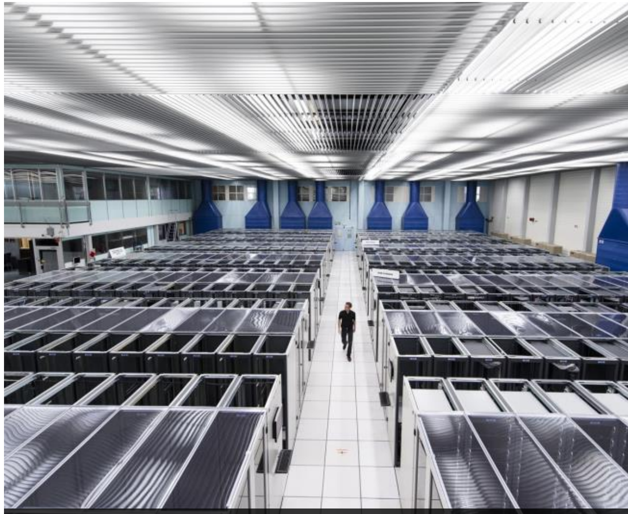
How do we do it?

- We build the largest machines to study the smallest particles in the universe.
- We develop technology to advance the limits of what is possible.

ACCELERATORS

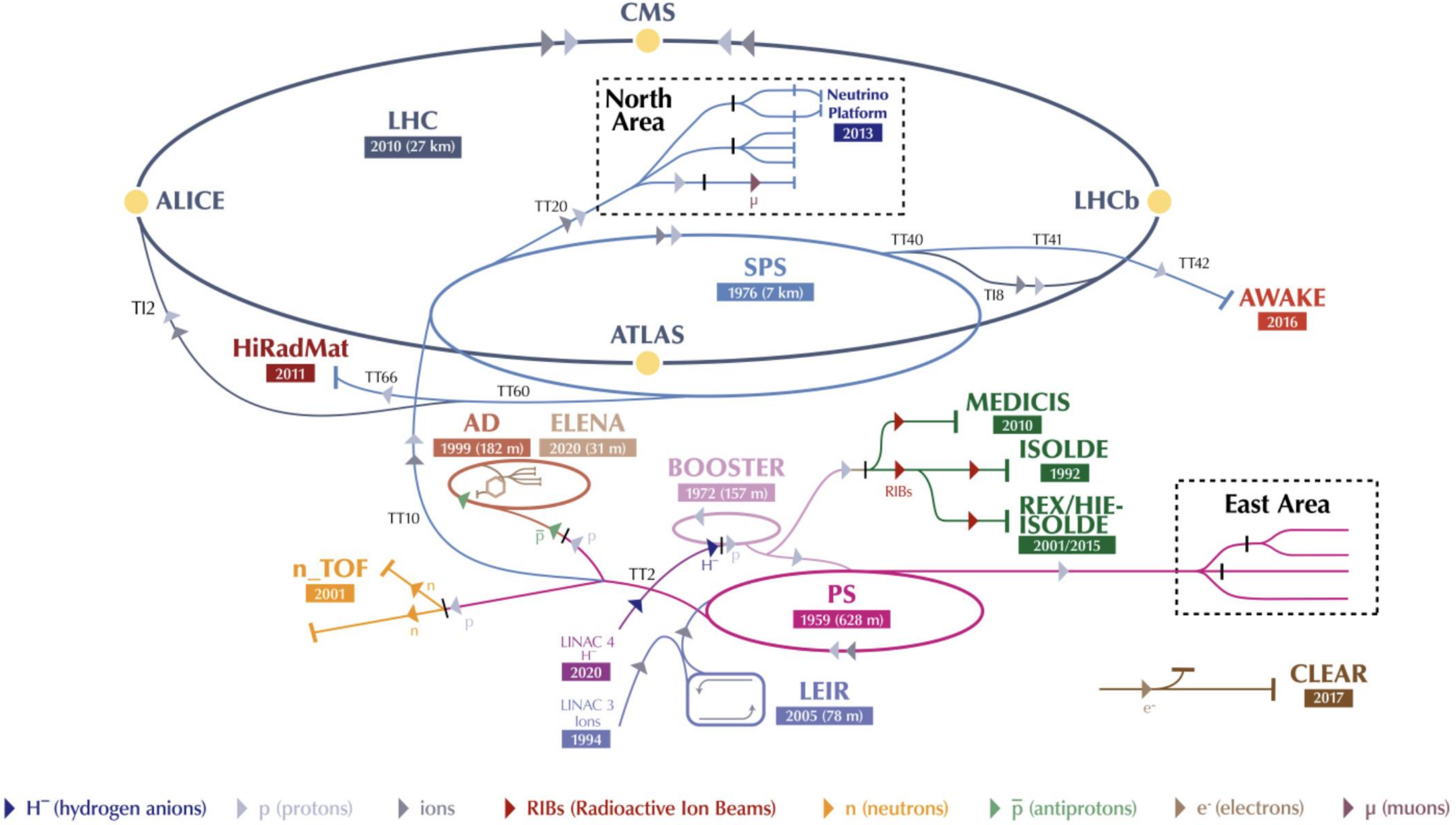


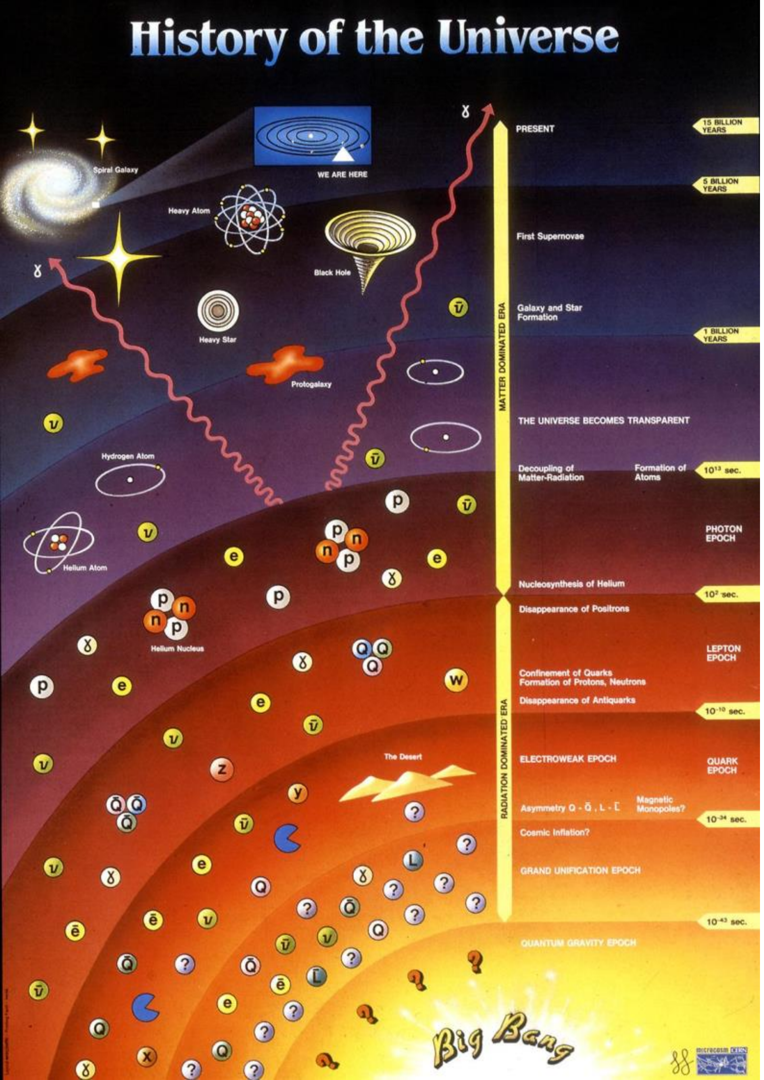
DETECTORS



COMPUTING

CERN's "orchestra" of accelerators





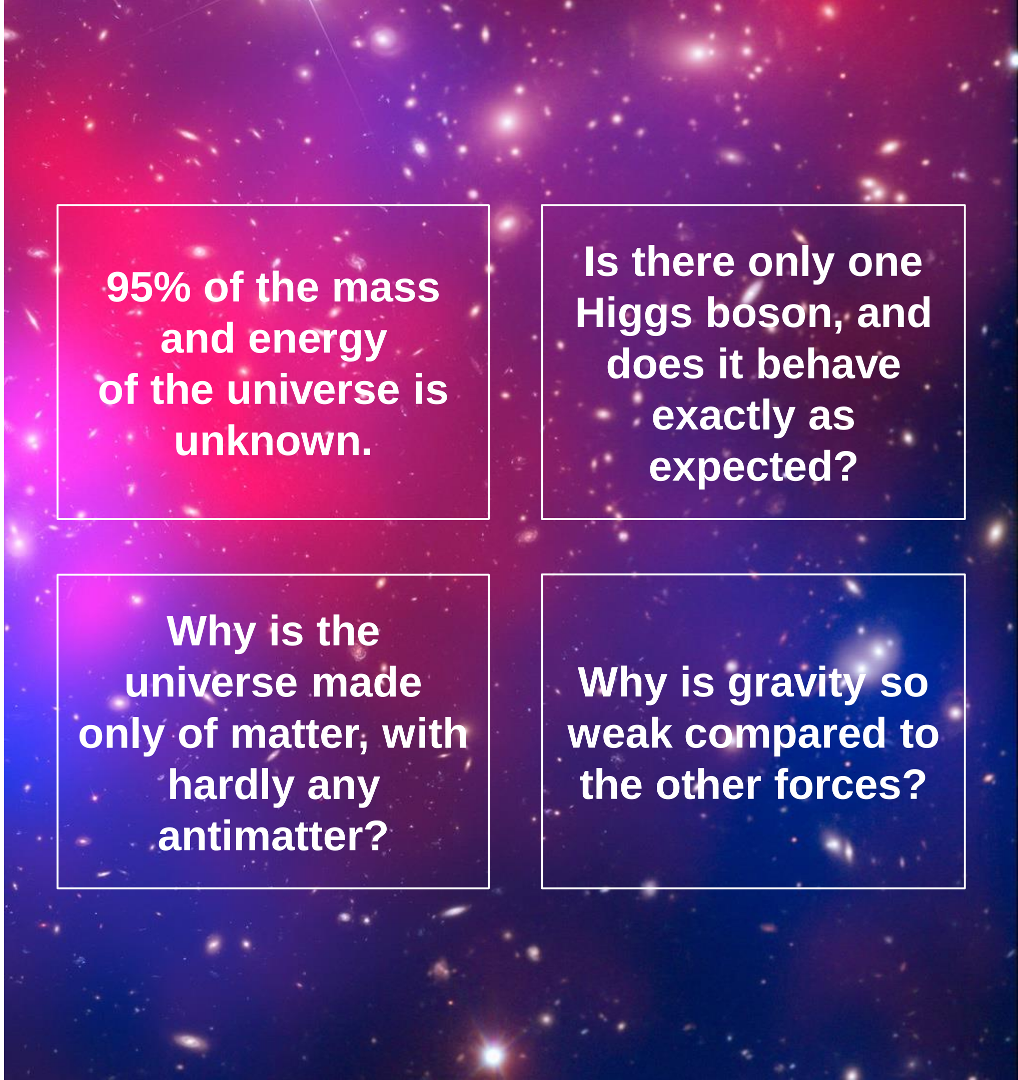
In the LHC, we…

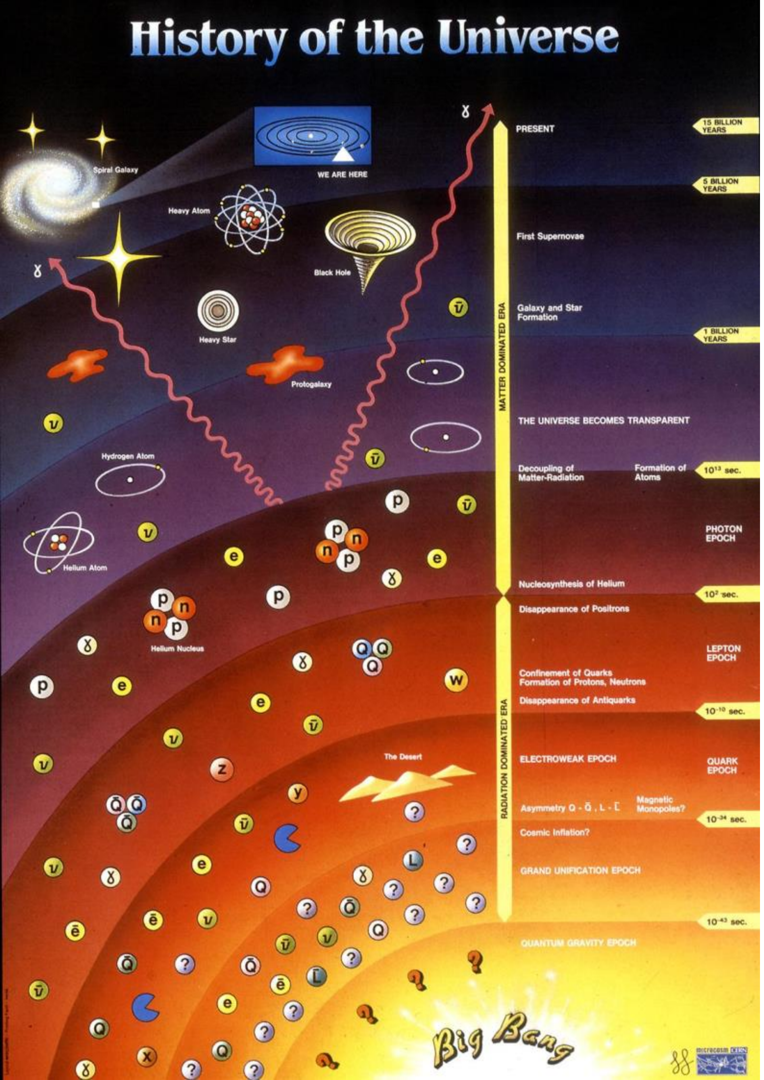
Use **9.593 Magnets**
at an **operating temperature of -271.3°C**
to accelerate **2.808 bunches of $1.2*10^{11}$ Protons** over **26 659 m**

At 99,99999 % of the speed of light
They make 1.245 turns per Second
And collide at 4 Experiments every 25 nanoseconds
(1.6 Billion times/second)

Are we done?
Not quite…

There are many unanswered questions in fundamental physics

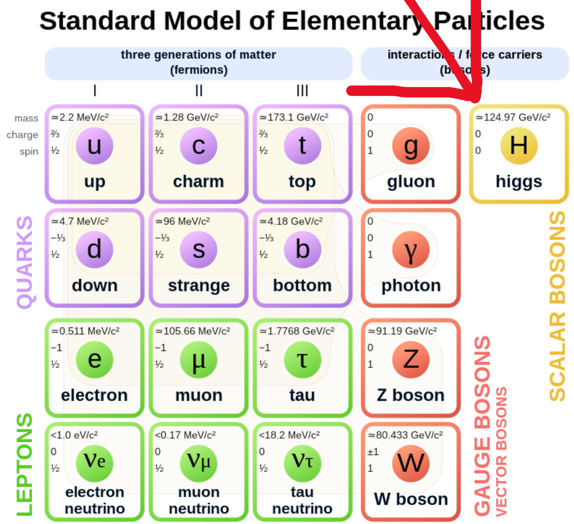




… And we found the HIGGS!

Since the discovery of the Higgs, we can measure "until" 10^{-12}s

(But that's not enough ☹)



Since the discovery of the Higgs, we can measure "until" 10^{-12}s

A laboratory for people around the world

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

Other countries **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
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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

Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC ☆,☆☆

ATLAS Collaboration

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ABSTRACT

The first measurements from proton–proton collisions recorded with the ATLAS detector at the are presented. Data were collected in December 2009 using a minimum-bias trigger during colli at a centre-of-mass energy of 900 GeV. The charged-particle multiplicity, its dependence on trans momentum and pseudorapidity, and the relationship between mean transverse momentum and cha particle multiplicity are measured for events with at least one charged particle in the kinematic $|\eta| < 2.5$ and $p_T > 500$ MeV. The measurements are compared to Monte Carlo models of proton–p collisions and to results from other experiments at the same centre-of-mass energy. The charged-pa multiplicity per event and unit of pseudorapidity at $\eta = 0$ is measured to be 1.333 ± 0.003(sta 0.040(syst.), which is 5–15% higher than the Monte Carlo models predict.

1. Introduction

Inclusive charged-particle distributions have been measured in pp and $p\bar{p}$ collisions at a range of different centre- 13]. Many of these measurements have been used to constrain phenomenological models of soft-hadronic interac properties at higher centre-of-mass energies. Most of the previous charged-particle multiplicity measurements were data with a double-arm coincidence trigger, thus removing large fractions of diffractive events. The data were then remove the remaining single-diffractive component. This selection is referred to as non-single-diffractive (NSD). In so as inelastic non-diffractive, the residual double-diffractive component was also subtracted. The selection of NSD or ine charged-particle spectra involves model-dependent corrections for the diffractive components and for effects of the events with no charged particles within the acceptance of the detector. The measurement presented in this Letter in strategy, which uses a single-arm trigger overlapping with the acceptance of the tracking volume. Results are pr inelastic distributions, with minimal model-dependence, by requiring one charged particle within the acceptance of t

This Letter reports on a measurement of primary charged particles with a momentum component transverse to $p_T >$ 500 MeV and in the pseudorapidity range $|\eta| < 2.5$. Primary charged particles are defined as charged particles $\tau > 0.3 \times 10^{-10}$ s directly produced in pp interactions or from subsequent decays of particles with a shorter lifetime tracks reconstructed in the ATLAS inner detector were corrected to obtain the particle-level distributions:

$$\frac{1}{N_{ev}} \cdot \frac{dN_{ch}}{d\eta}, \quad \frac{1}{N_{ev}} \cdot \frac{1}{2\pi p_T} \cdot \frac{d^2 N_{ch}}{d\eta\, dp_T}, \quad \frac{1}{N_{ev}} \cdot \frac{dN_{ev}}{dn_{ch}} \quad \text{and} \quad \langle p_T \rangle \text{ vs. } n_{ch},$$

where N_{ev} is the number of events with at least one charged particle inside the selected kinematic range, N_{ch} is charged particles, n_{ch} is the number of charged particles in an event and $\langle p_T \rangle$ is the average p_T for a given number

ATLAS Collaboration

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[92] Massachusetts Institute of Tec
[93] University of Montreal, Group
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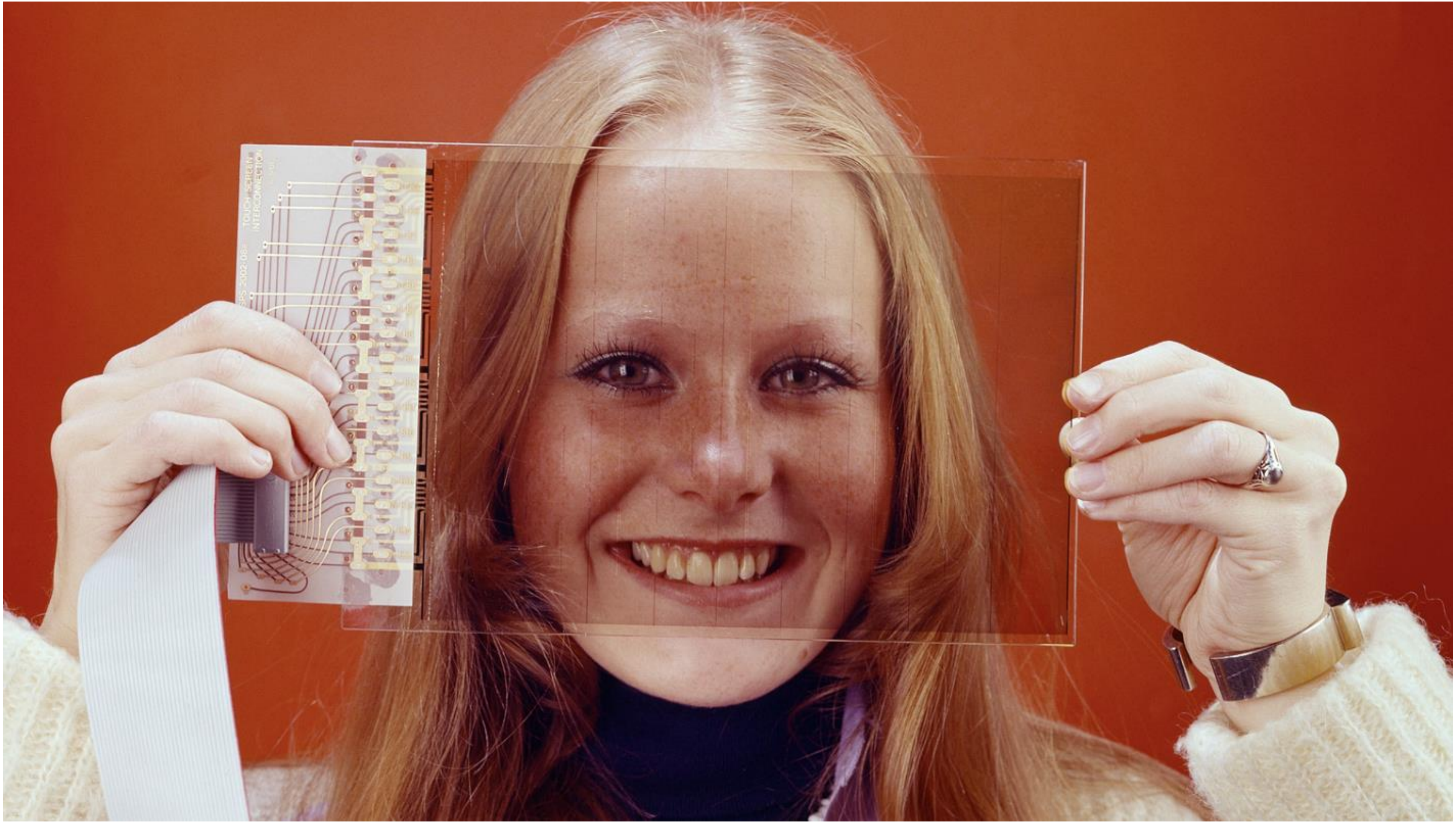
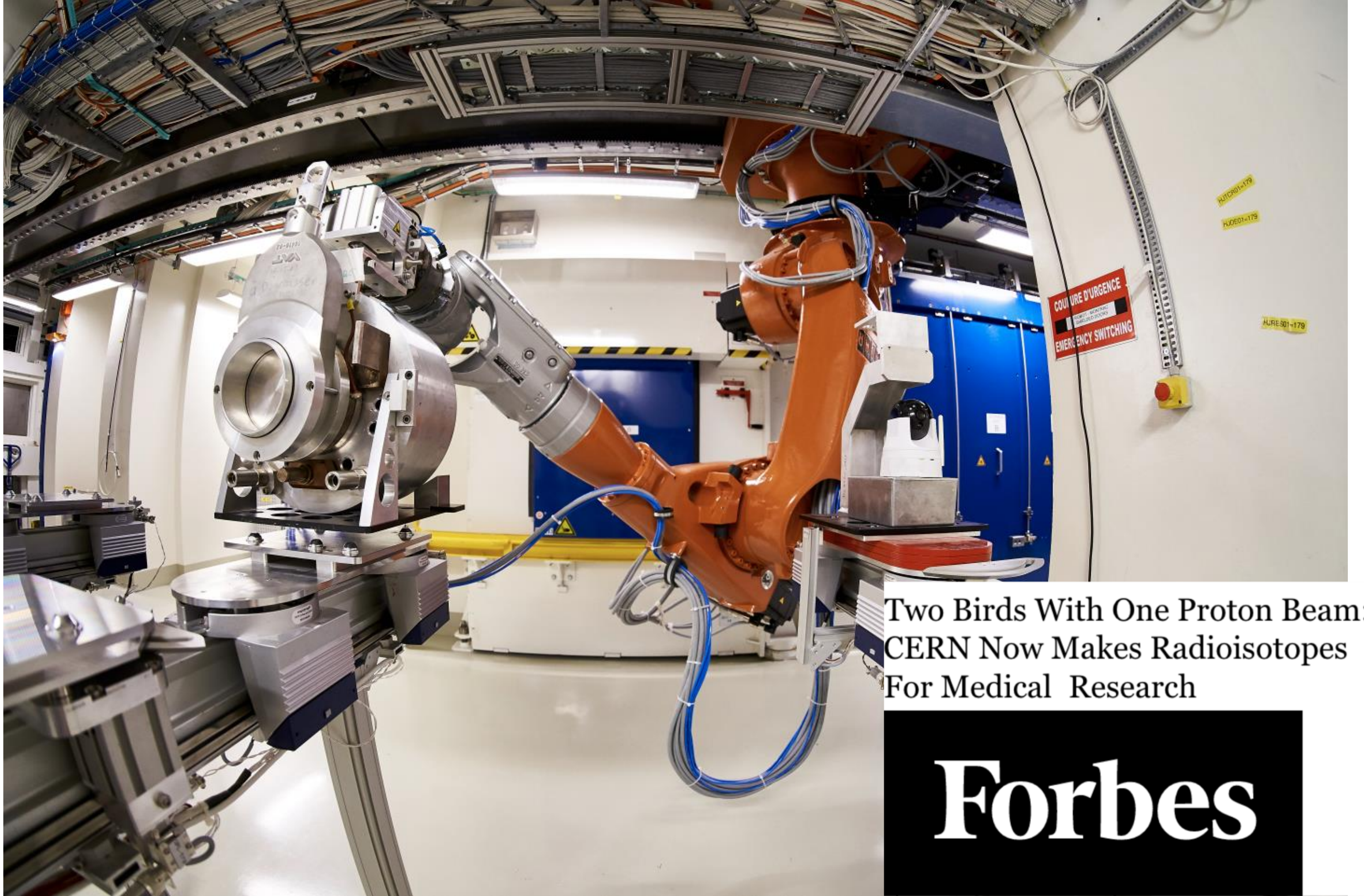
CERN
World Wide Web Initiative
About the Laboratory
EIZO


TOUCH SCREEN
INTERCONNECTION



Two Birds With One Proton Beam: CERN Now Makes Radioisotopes For Medical Research

Forbes

IdeaSquare
The innovation space at CERN

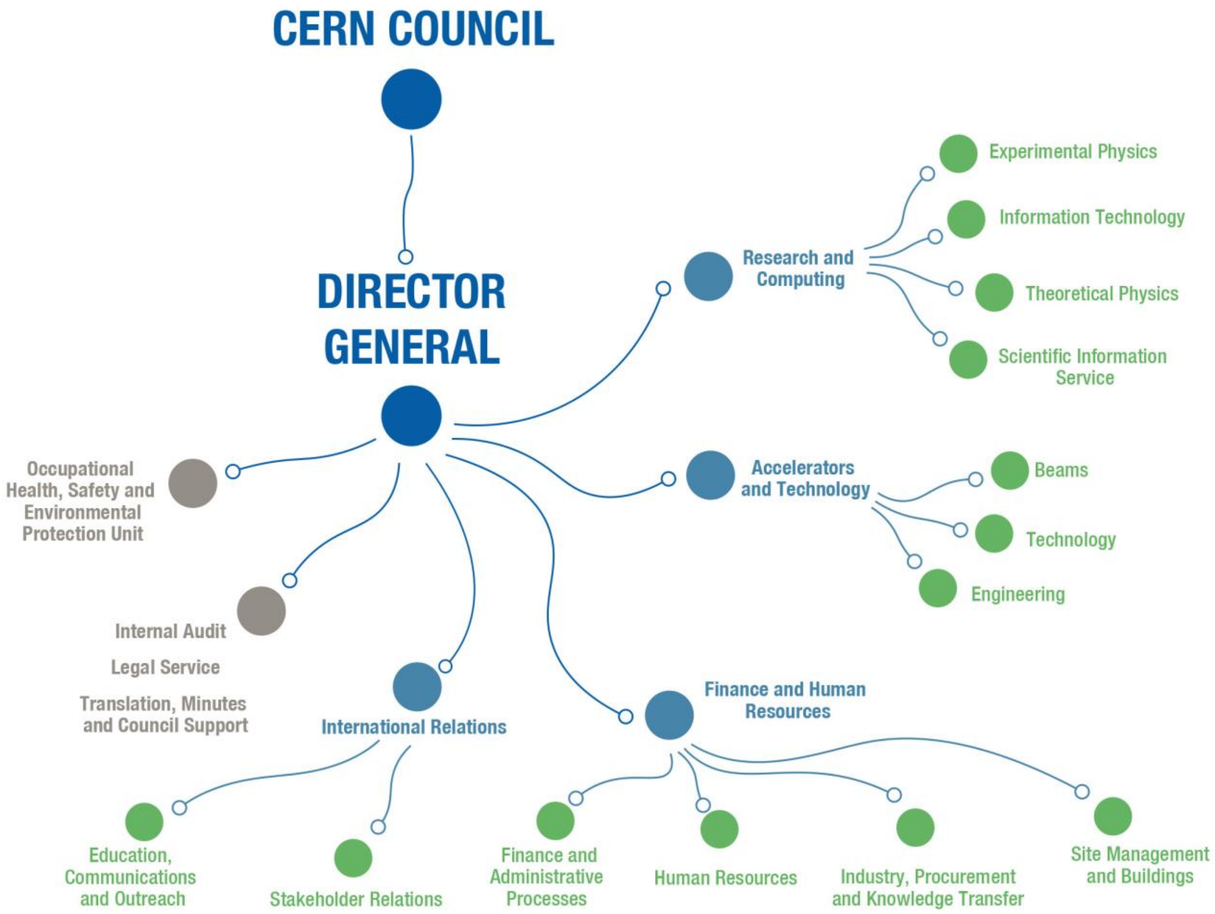
IdeaSquare

Why and How?

Who are we?

- IdeaSquare part of CERN’s Industry, Procurement and Knowledge Transfer Department

- unique position to **bridge** (and examine relationships between) **fundamental science** and other sectors of **society**



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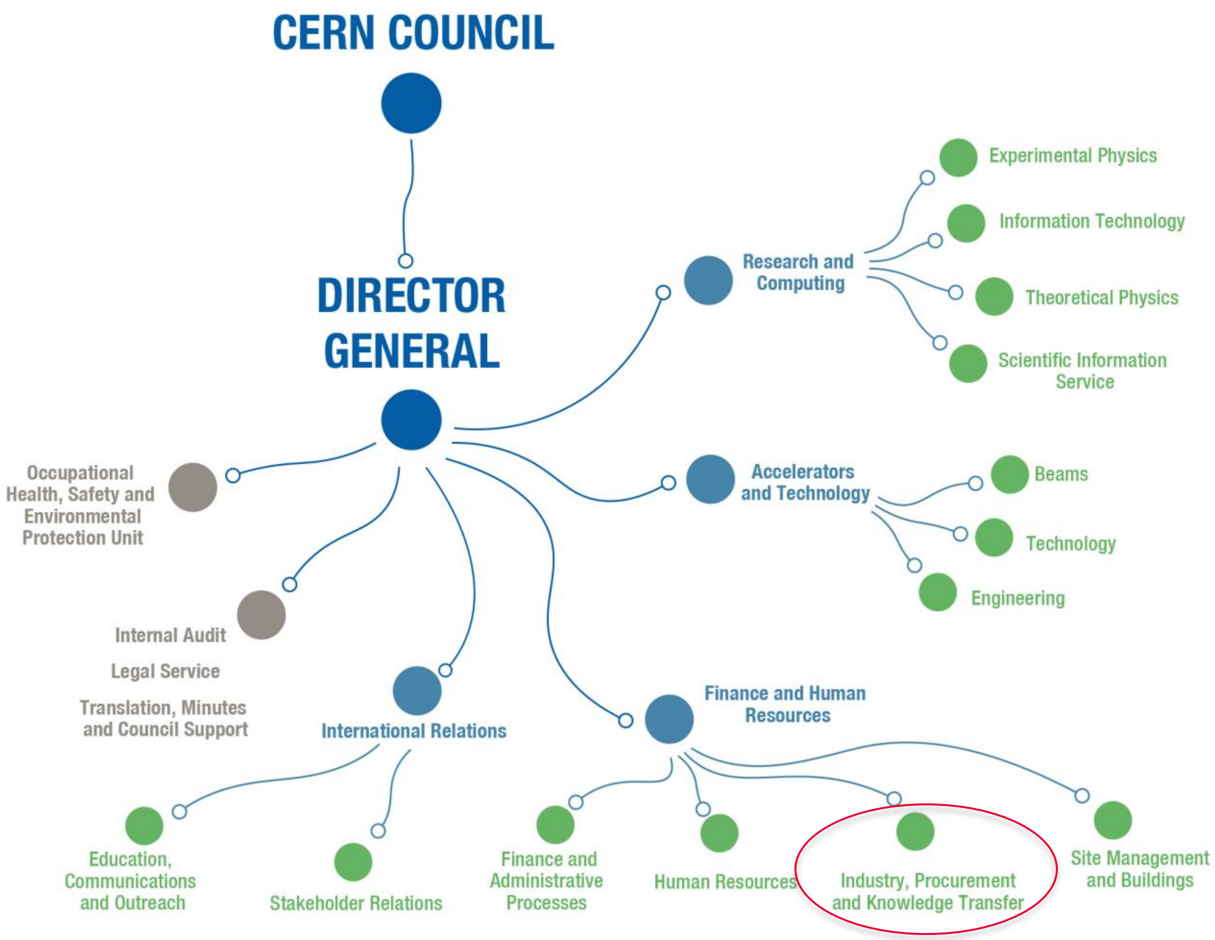
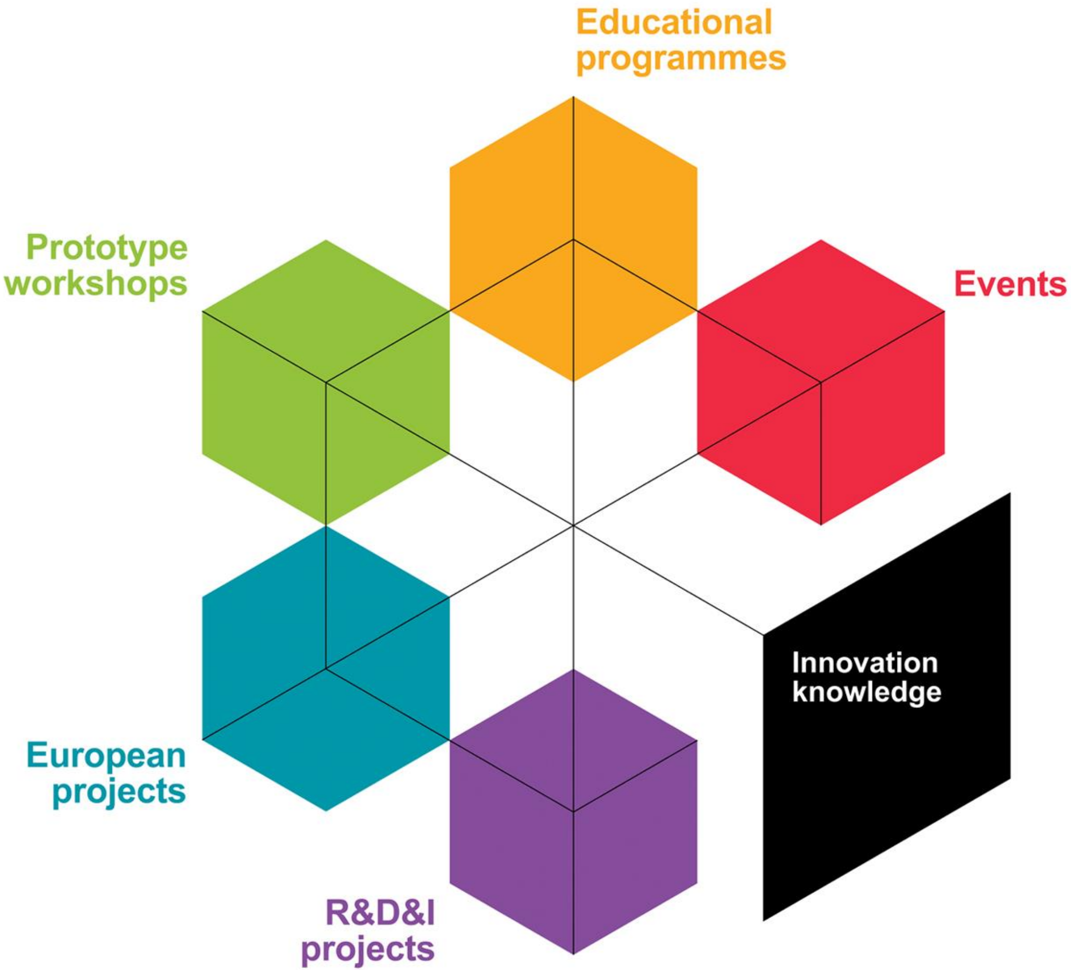


IdeaSquare

The Innovation Space at CERN

- collaborative methodologies
- access to CERN expertise
- cross-connectivity

To ideate solutions for the
future of humankind.



Why IdeaSquare?

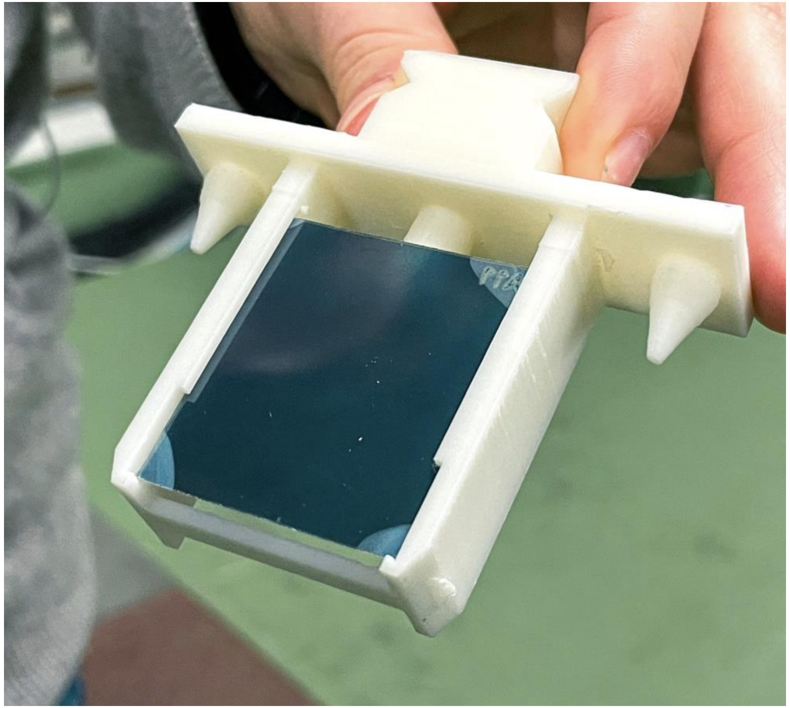
We believe that for **fundamental change** to be made, we need **more than traditional** innovation **methods and mindsets.**

We enable students and innovators to **imagine a future** worth fighting for, and we give them the **tools and confidence** to start building that future.

Prototype workshops

CERN
IdeaS

Fast forward through prototyping



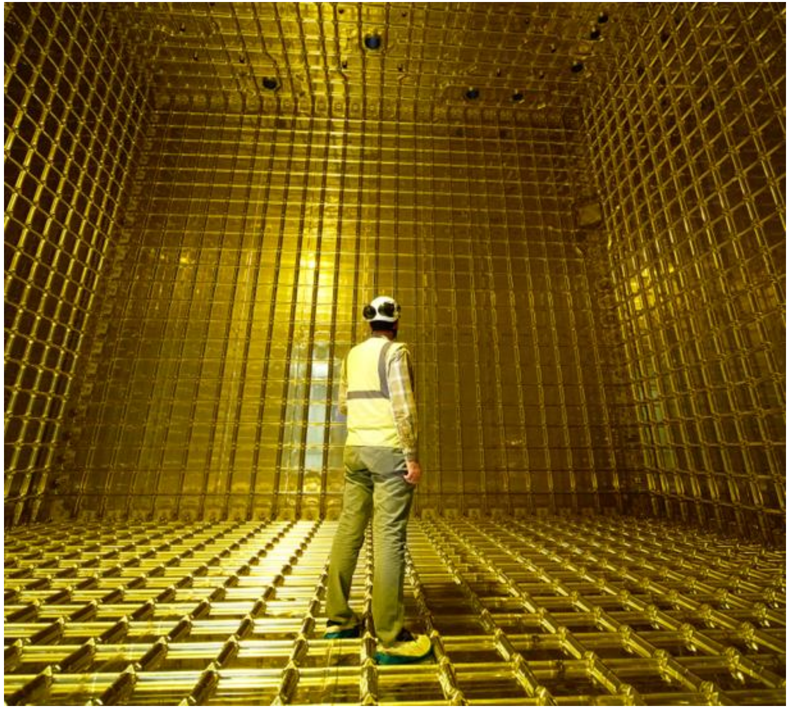
- CLEAR primary focus is on general accelerator R&D and component studies for existing and possible future machines
- Prototyping and validation of accelerator components, and studies of high-gradient acceleration methods.
- Radiation hardness of electronic components for space and high-energy physics;
- Dosimetry for medical applications (cancer therapy).

Ideas

R&D&I projects

Stimulating instrumentation in research

Neutrino Platform



- Neutrino Platform (CENF) fosters fundamental research in the field of Neutrino Accelerator Physics
- CENF supports generic detector, neutrino beams R&D and large detector prototypes or demonstrators. It gives technical, financial and logistics support to approved projects
- Currently includes seven projects, including significant involvement in (Proto) Dune
- CERN & IdeaSquare provides a facility for R&D on future technologies (HW and SW) and partner in several neutrino research programs

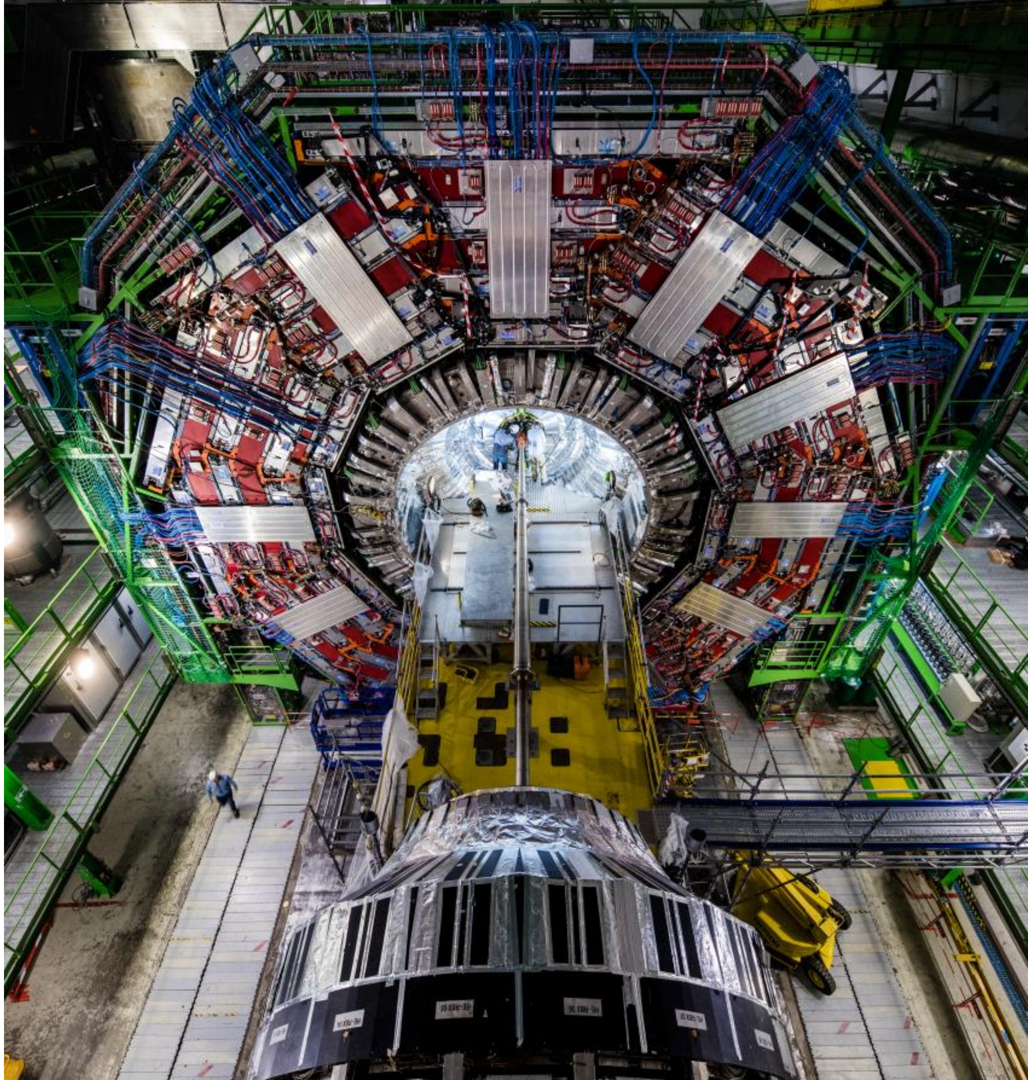
Educational programmes

Training and experimenting with the innovators of the future

Business as usual is not in our DNA, but we also don't want any "magic"…

- Ideas should be disruptive, without:

- Breaking the laws of physics;
- Causing more harm than good.



Our specialties

- **Order of magnitude thinking (+ estimations!)**

  - Ideas should be disruptive enough to generate excitement

  - While also having a substantial basis behind - “Do the math”

- **Systemic and Exponential thinking**

  - Going for exponential ideas

  - Thinking in planetary levels

  - Nothing is so great that there is nothing bad: what are the implications of your solution?

A place where people have the licence to dream!

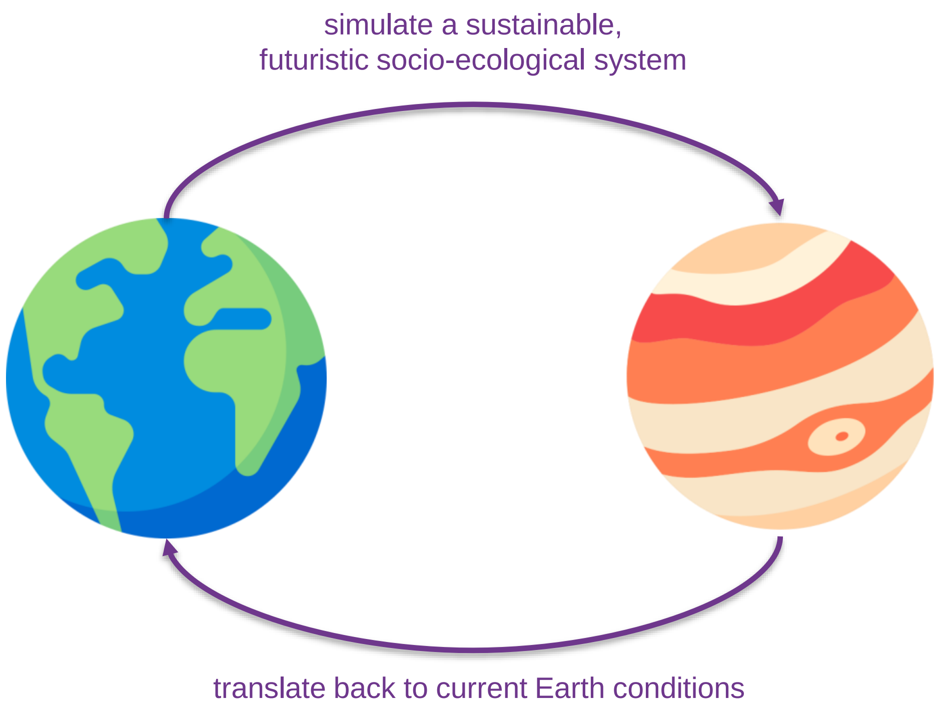

We can understand the roots of today’s problems by looking at the past, so maybe we can understand solutions for these problems by exploring possible futures.

Filling the gaps and pushing boundaries

- **Systems-thinking approach** to design and simulate a first settlement on an exoplanet.

- Showcasing scientific methods can be used to **address complex societal challenges.**

- Reference point for **assessing** the potential **societal impact.**

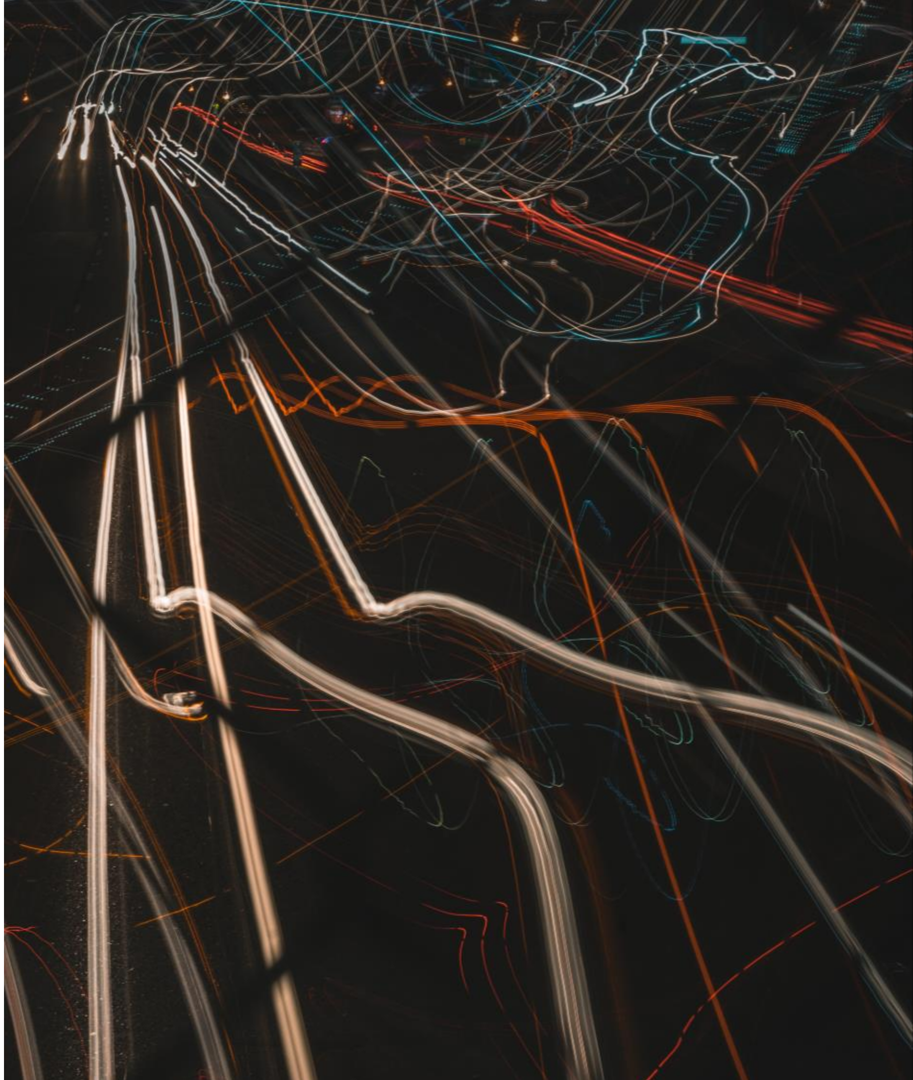



Exploring different ways to **drive transformative innovation, equipping students with a toolbox and mindsets to tackle seemingly impossible challenges.**

Overarching objectives

- Non-incremental (non-linear), **breakthrough innovation thinking**;
- **Visionary, scientific** and positive approach;
- Test-bed for **new ideas and methodologies** (towards a full-fledged version by 2025/26).

Photo by Skye Studios on Unsplash



By the end of this week you will be able to…

- **Question worldviews, assumptions and the status quo.**
- **Tackle complex challenges** and building hypothesis under high levels of **uncertainty.**
- **Identify key variables of a complex problem and** ponder **trade-offs** within a system.
- Make ideas tangible through **prototyping.**
- Apply creative thinking to **imagine alternative futures** and create new solutions.
- **Elaborate quantitative and qualitative assumptions,** considering improvements in orders of magnitude.
- **Work independently,** using the necessary tools and resources available.
- Collaborate in **multidisciplinary teams**, while navigating conflict and **ambiguity.**

Join our Alumni group!

Contact us!
#CERNIdeaSquare
ideasquare.cern