Welcome to CERN

Dr. Sascha Schmeling

European Organization for Particle Physics
Organisation européenne pour la physique des particules

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 – Latvia – 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

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
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

CERN Council

President: U. Bassler
Secretary: CERN DG

- (Associate) Member States: 2 delegates each
- ex-officio members
  - FC Chairperson
  - SPC Chairperson
- different observers on invitation, incl. ECFA Chairperson

Finance Committee

Chairperson: U. Doselli

- (Associate) Member States: 1-3 delegates each
- ex-officio members
  - Council President
  - SPC Chairperson

Scientific Policy Committee

Chairperson: L. Rivkin

- 14 individual members
- ex-officio members
  - ECFA Chairperson
  - Chairpersons of CERN Committees (LHCC, MAC,SPSC, INTC)
- standing invitations
  - CERN DG, Council President, FC Chairperson

Audit Committee

Chairperson: FC Chair

Tripartite Employment Forum

Chairperson: B. Åsman

Pension Fund Governing Board

Chairperson: O. Malmberg

CERN – The Organisation

Council Secretariat
Legal Service

Director General
Fabiola Gianotti

Internal Audit
Health, Safety, and Environment Unit

Finance and Human Resources
Rafael Bello

Research and Computing
Joachim Mnich

Accelerators and Technologoy
Mike Lamont

International Relations
Charlotte Warakaulle

Finance and Administrative Procedures
Florian Sonnemann

Human Resources
James Purvis

Industry, Procurement, and Technology Transfer
Christopher Hartley

Site and Civil Engineering
Mar Capeans

Experimental Physics
Manfred Krammer

Theoretical Physics
Gian Giudice

Information Technologies
Enrica Porcari

Beams
Rhodri Jones

Engineering
Katy Foraz

Systems
Brennan Goddard

Technology
Jose Miguel Jimenez

Education, Communication, and Outreach

Diplomatic and Stakeholder Relations

CERN Organisation 2021-2025 (after 30.06.2021)

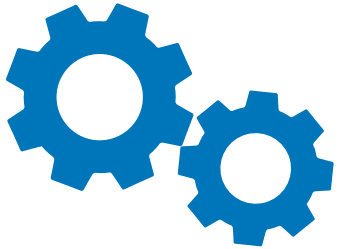
„The Mission“

Fundamental Research

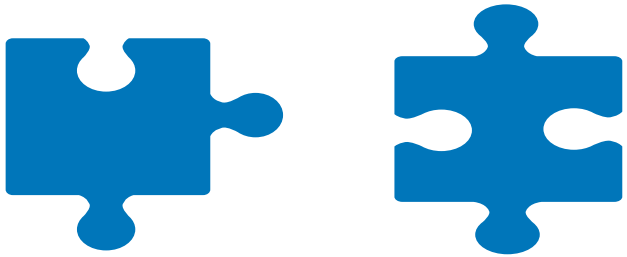
at the frontier of human knowledge

Innovative Technologies

for research

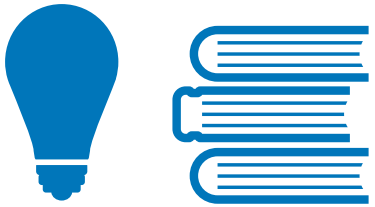


Collaboration



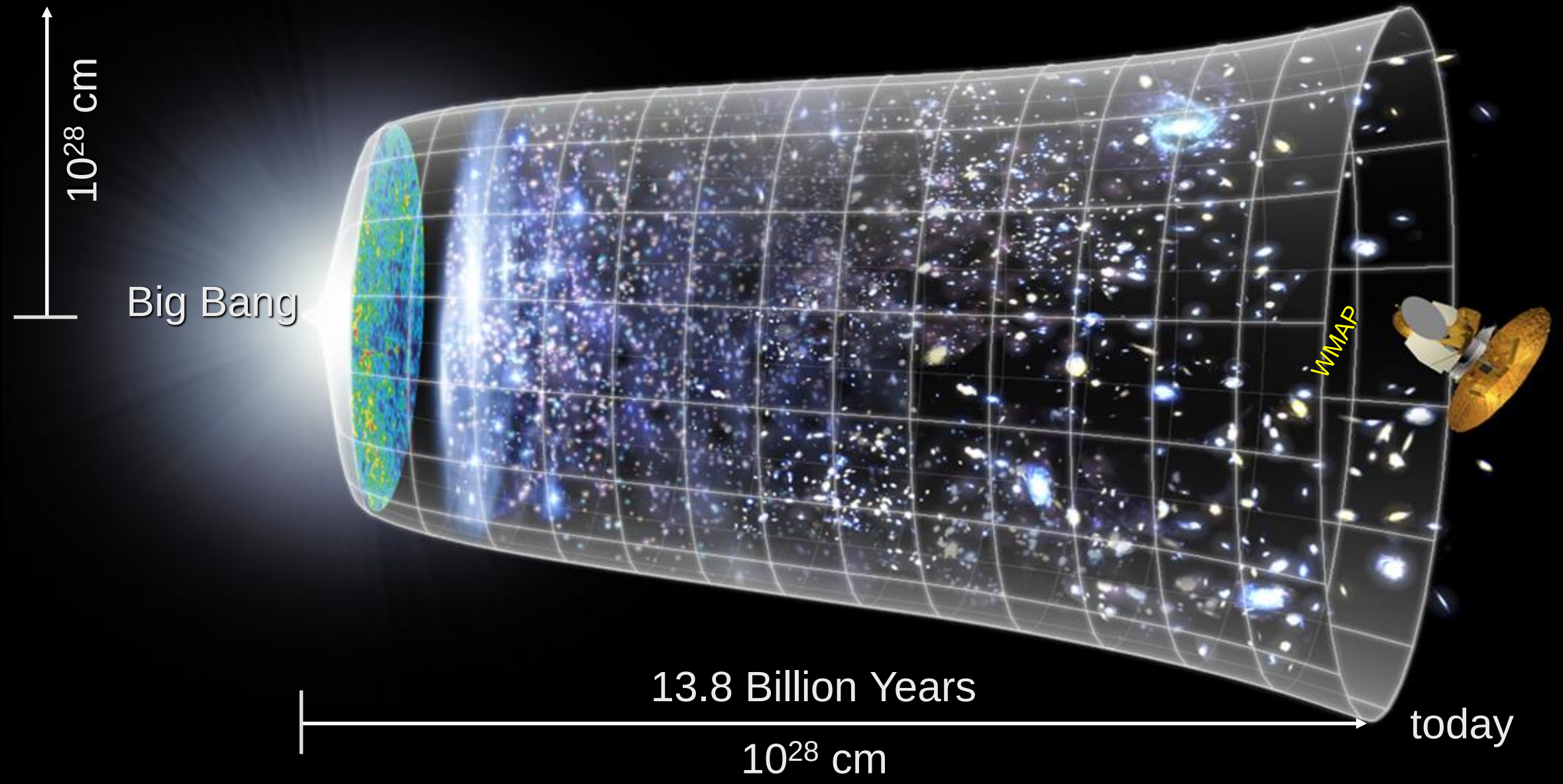
Education & Inspiration

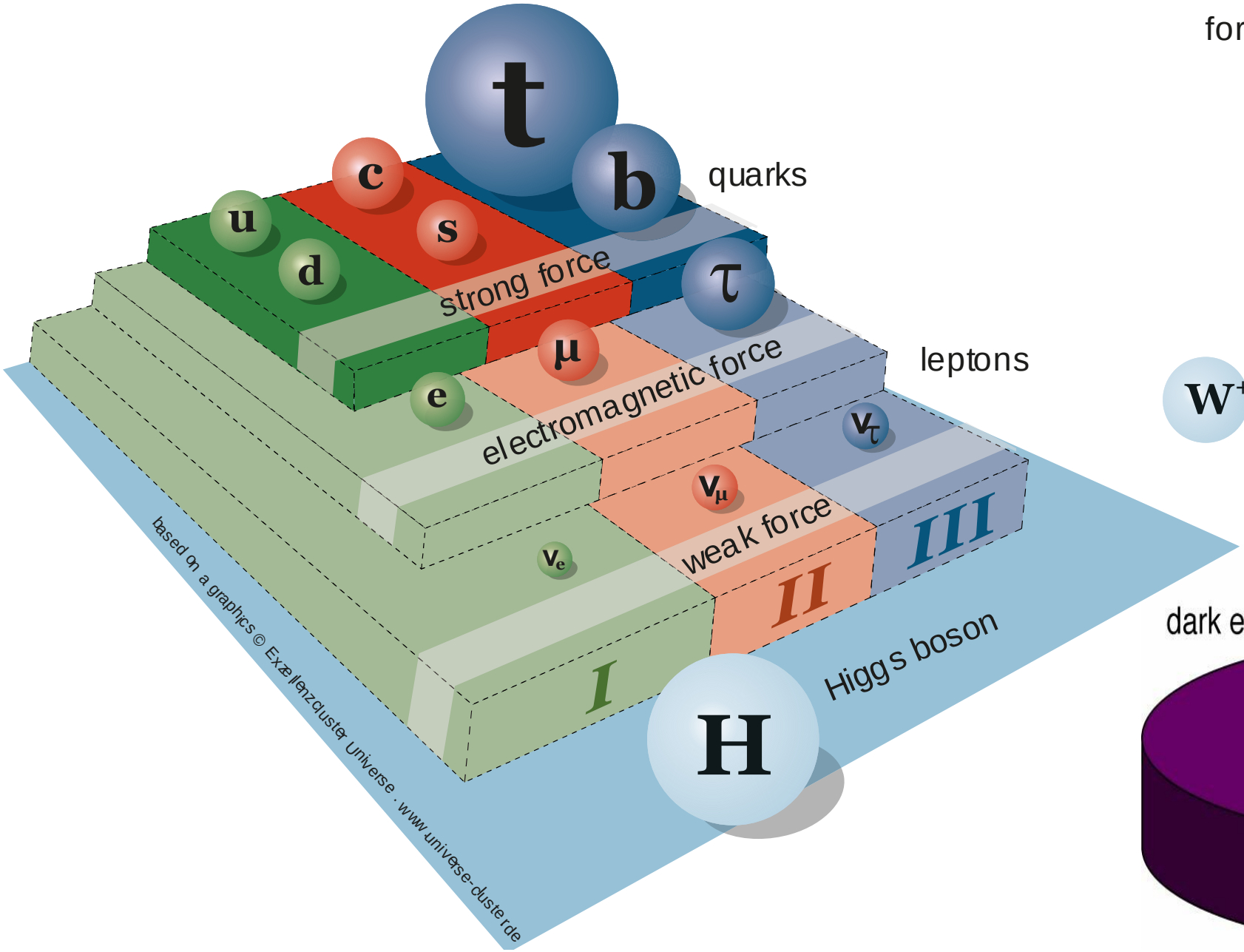
e.g. training of scientist and engineers, but
also educating everyone, from kindergarten to old age



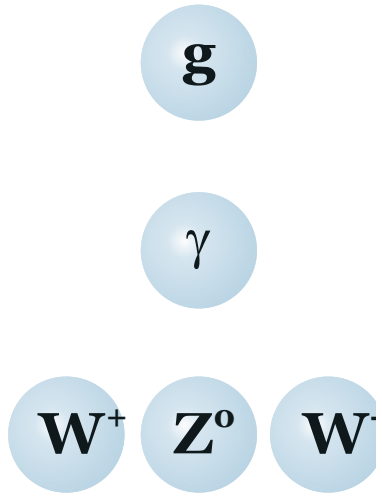
The Scientific Challenge

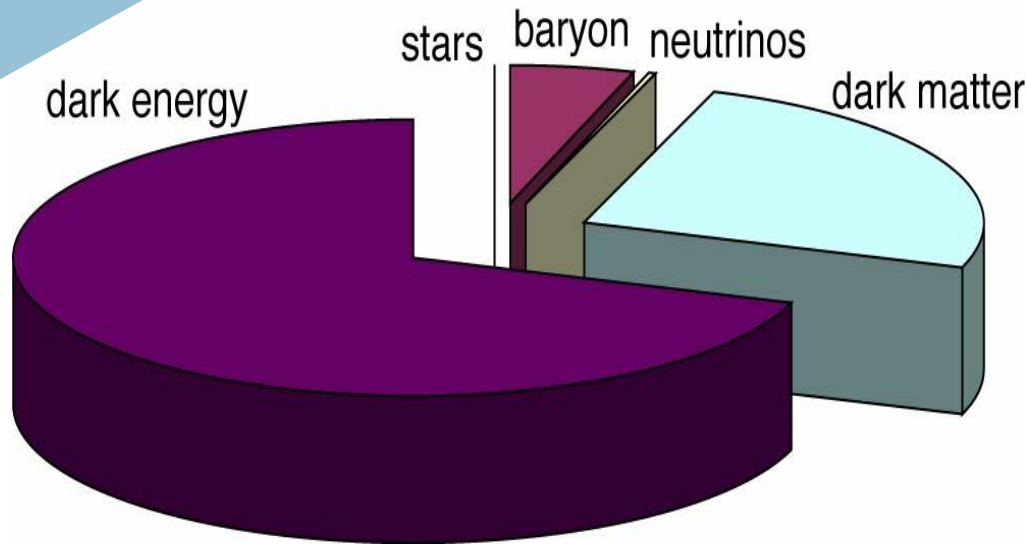
Research on the Development of the Universe





force carriers

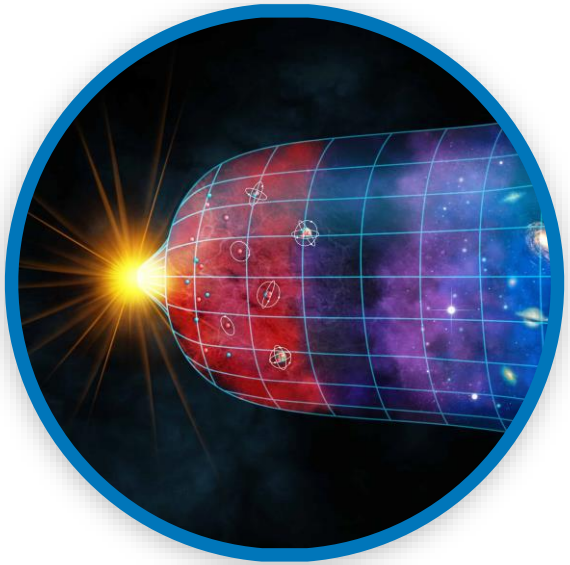




Standard Model

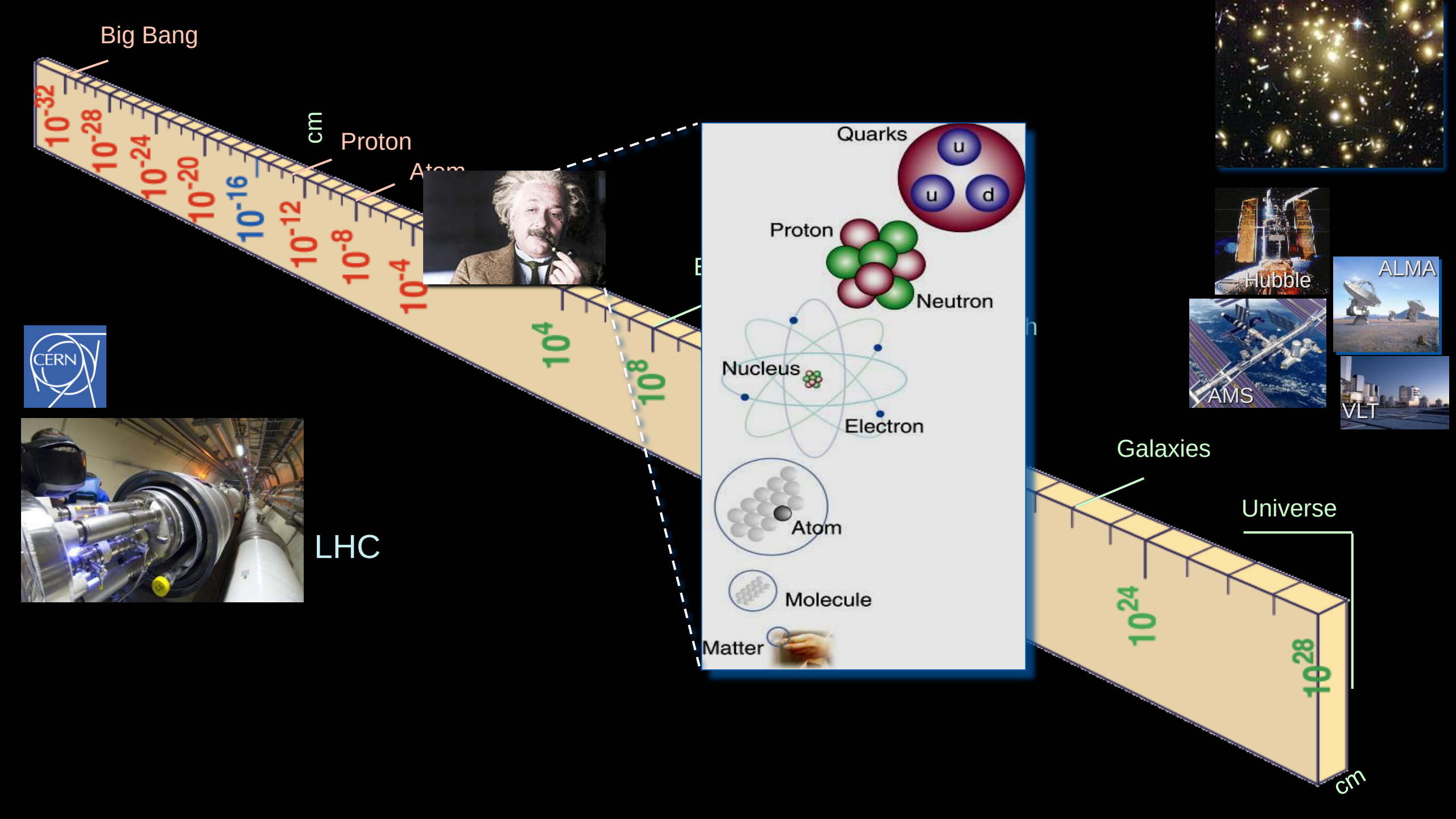
Further Research Questions

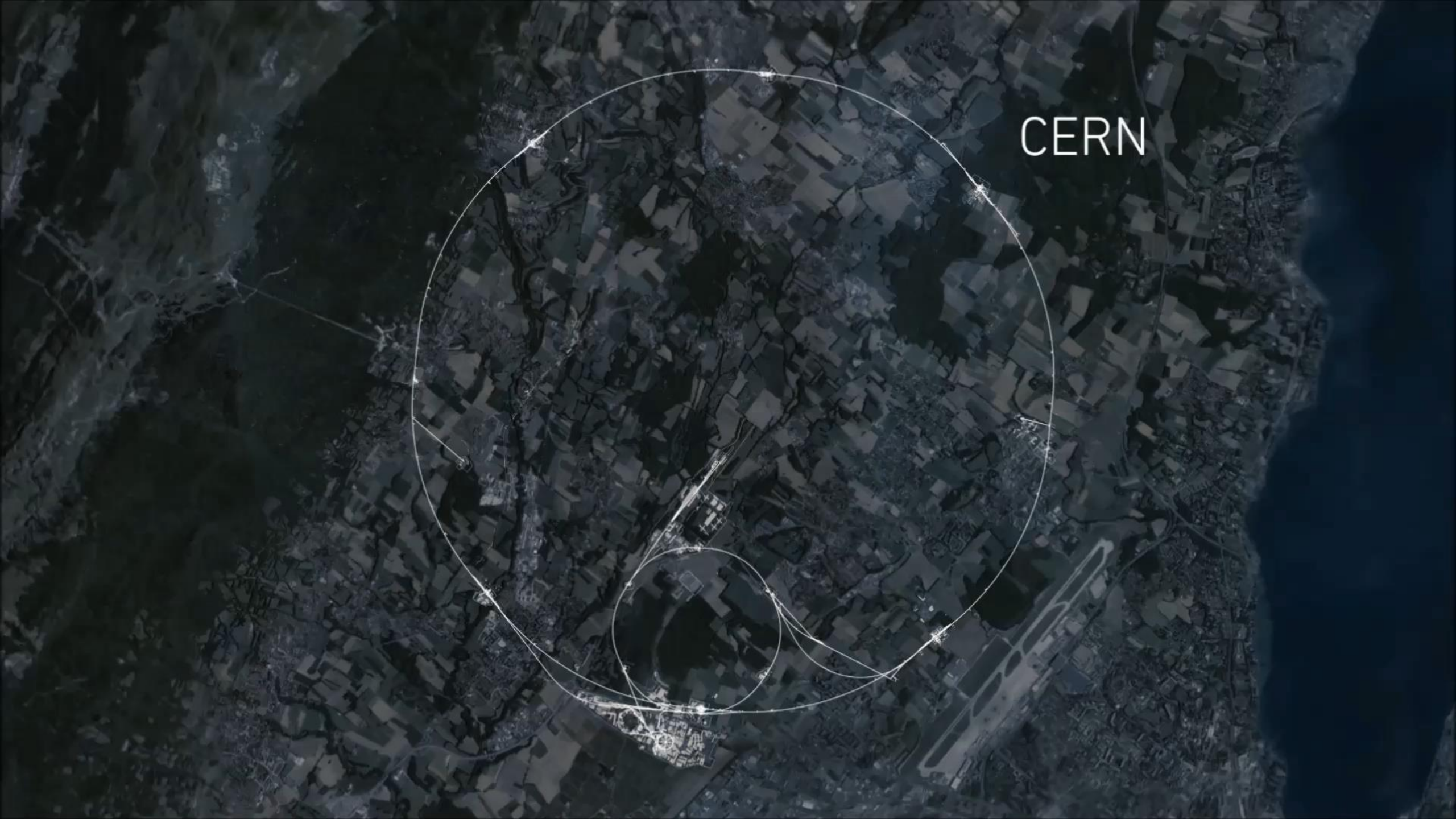
Early Universe



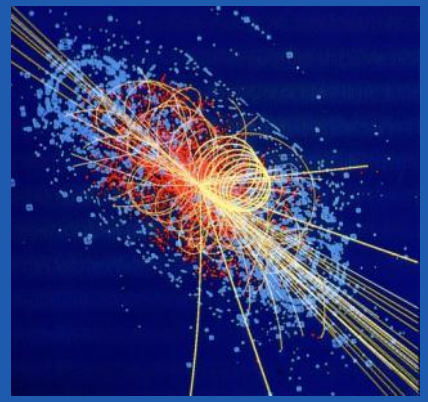
Anti-Matter

Dark Matter


Big Bang
cm
Proton
Atom
10^{-32}
10^{-28}
10^{-24}
10^{-20}
10^{-16}
10^{-12}
10^{-8}
10^{-4}
10^{4}
10^{8}
Quarks
u
u
d
Proton
Neutron
Nucleus
Electron
Atom
Molecule
Matter
Galaxies
Universe
10^{24}
10^{28}
cm
CERN
LHC
Hubble
ALMA
AMS
VLT


CERN

Other Activities

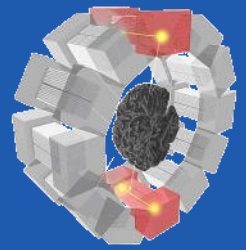


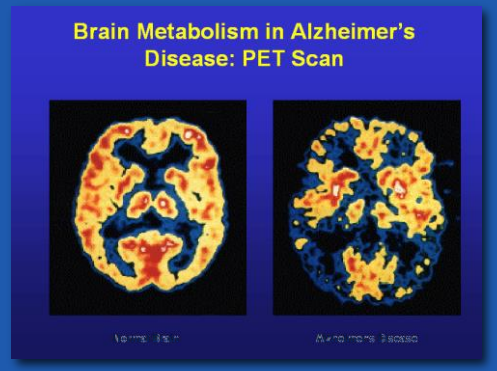
Particle Detection

Imaging

ClearPEM

PET Scanner

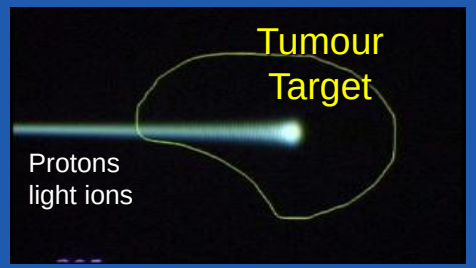


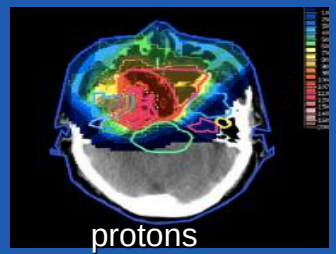


Accelerated Particle Beams

~30’000 accelerators world-wide
~17’000 for medical applications

Hadron Therapy

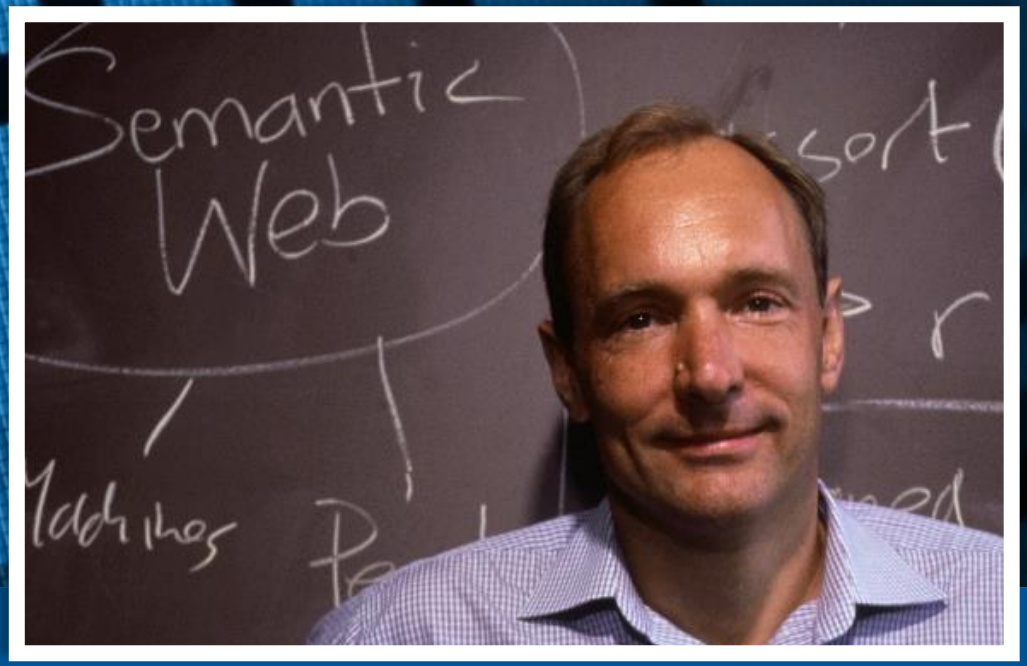




>70’000 patients/a world-wide (30 institutes)
>21’000 patients/a in Europe (9 institutes)

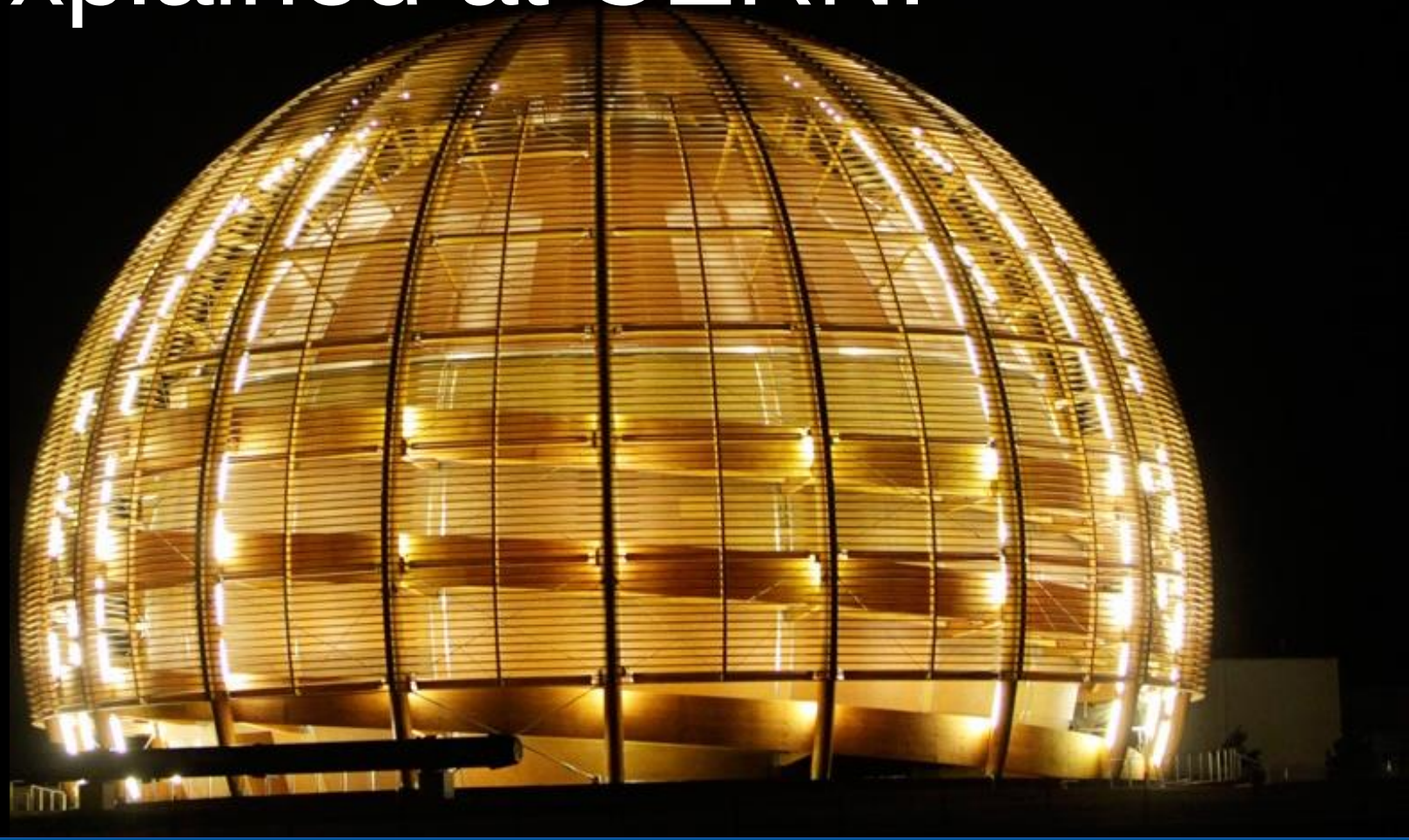
Medical Applications

World Wide Web

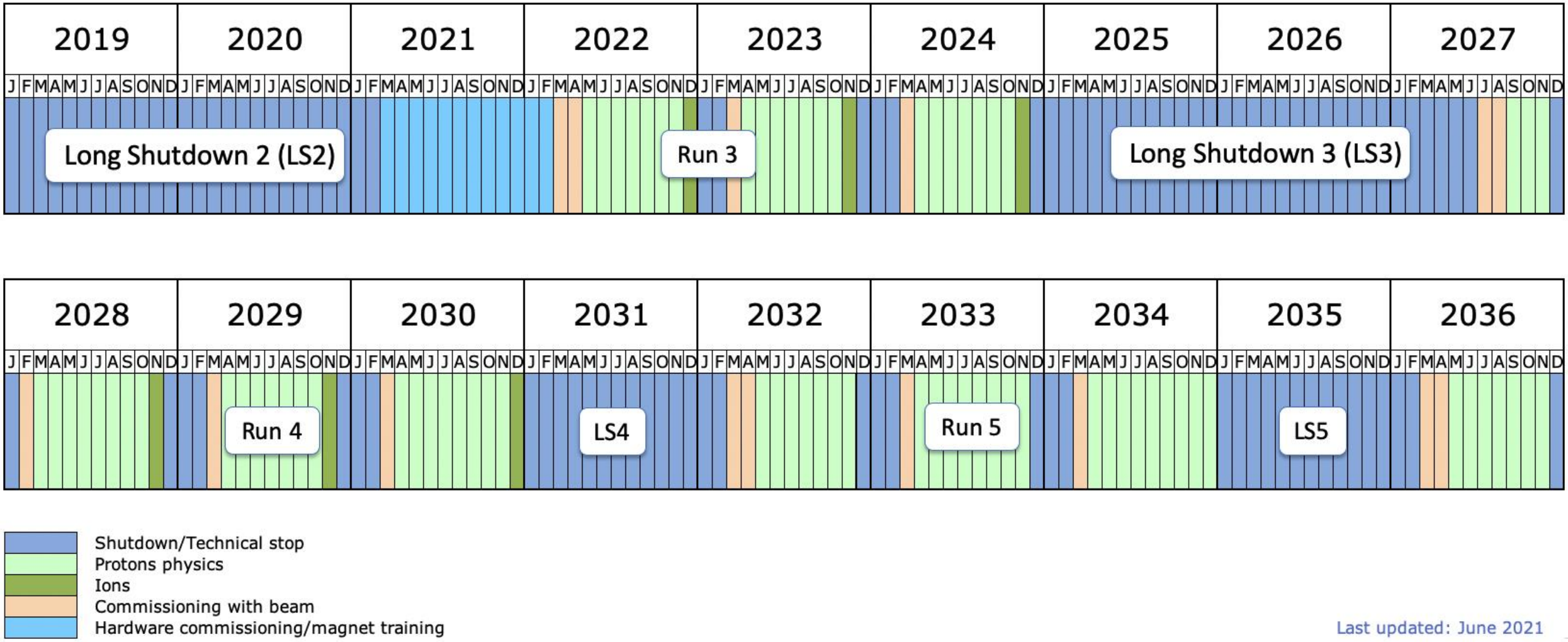


“Magic is not happening at CERN, magic is being explained at CERN.“

Tom Hanks

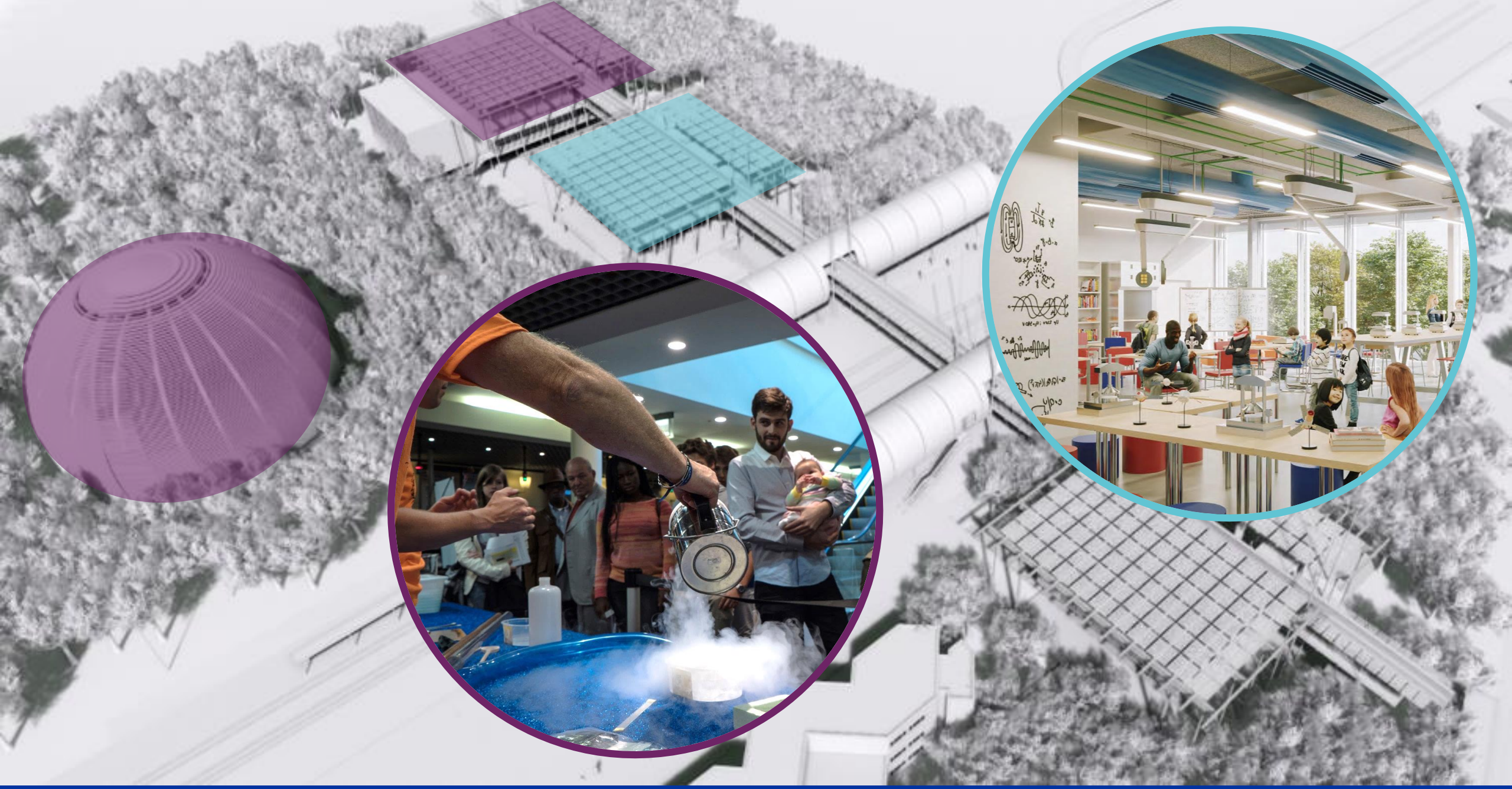


What happens just now?



LHC Roadmap

https://lhc-commissioning.web.cern.ch/schedule/LHC-long-term.htm



Slide courtesy of Sarah Zöchling

And then?


2020 UPDATE OF THE EUROPEAN STRATEGY
FOR PARTICLE PHYSICS
by the European Strategy Group

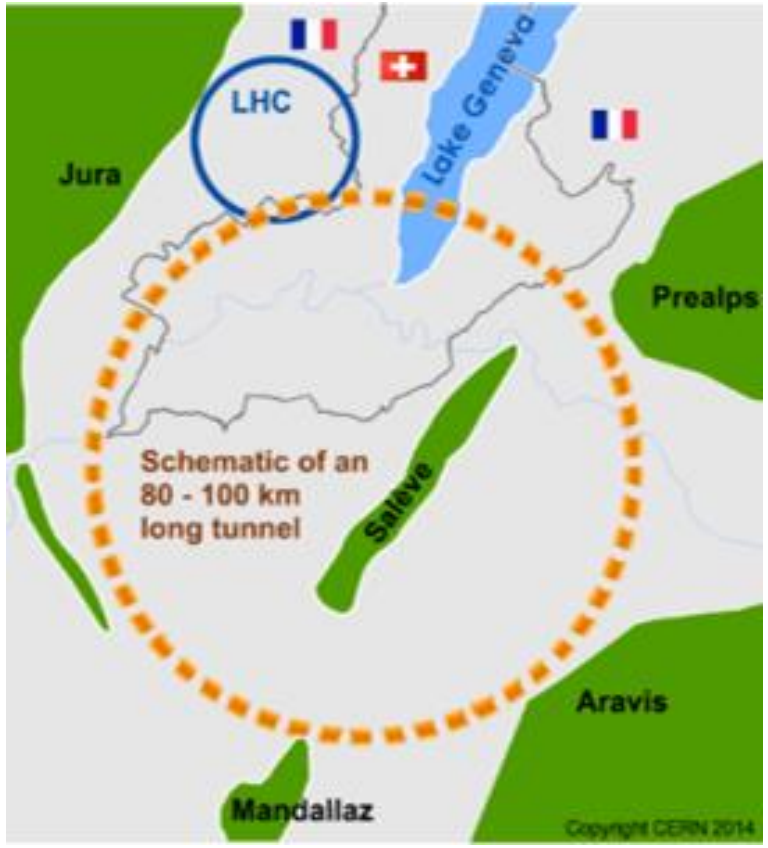
CERN Scientific Priorities for the Future

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

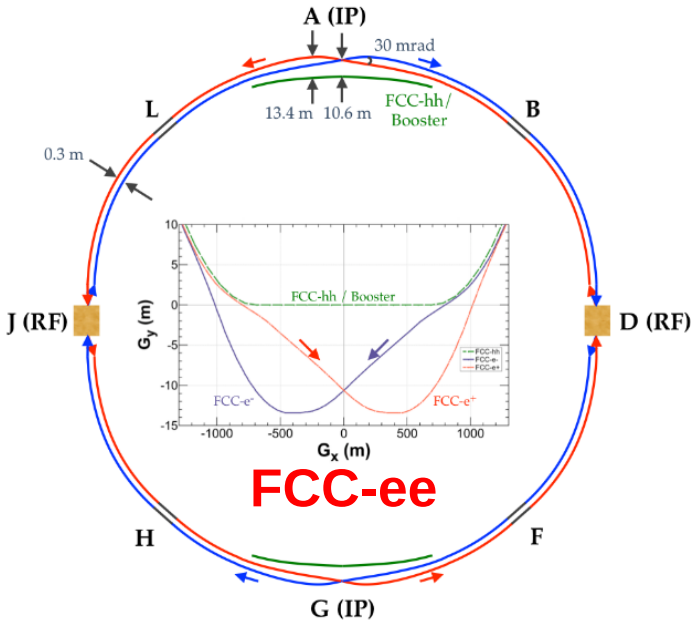
- Fully exploit the LHC & HL-LHC.
- Build a Higgs factory to further understand this unique particle.
- Investigate the technical and financial feasibility of a future energy-frontier 100 km collider at CERN.
- Ramp up relevant R&D.
- Continue supporting other projects around the world.

The FCC Integrated Programme
Inspired by successful LEP – LHC Programmes at CERN

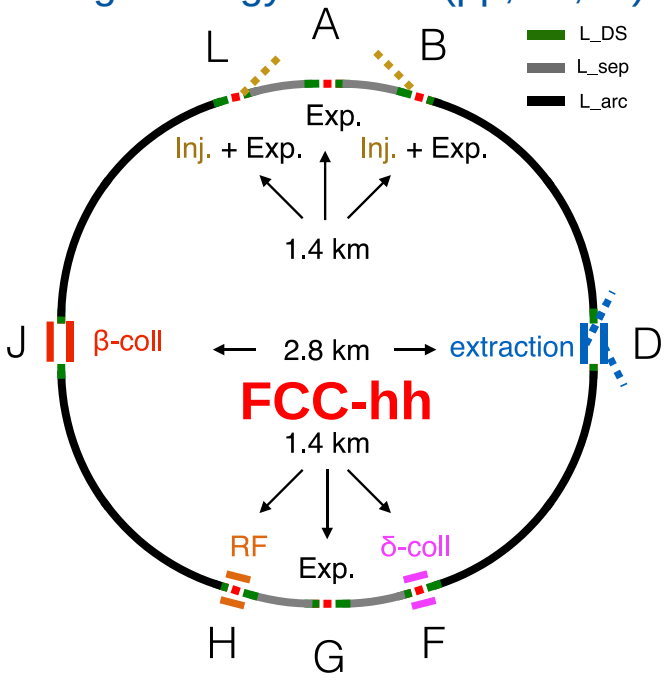
Complementary physics, common civil engineering and technical infrastructures, building on and reusing CERN's existing infrastructure, FCC integrated project allows seamless continuation of HEP after HL-LHC



Phase 1 : FCC-ee
electron – positron Collider
Higgs, Z, W, ttbar Factory at highest lumi



Phase 2 : FCC-hh
proton – proton Collider
High-energy frontier (pp,ion,eh)



2020 - 2040 | 2040 - 2055 | 2060 - 2090

Education at CERN

International Relations Sector
Secteur Relations Internationales

Education @ CERN – Today

CERN Education Programme for Teachers and Students

1 staff
1 admin
1 tech

Teacher Programmes
1 staff
1 doct

S'Cool LAB
1 fellow
1 doct
1 technician

Competitions
½ fellow

Internships
½ fellow

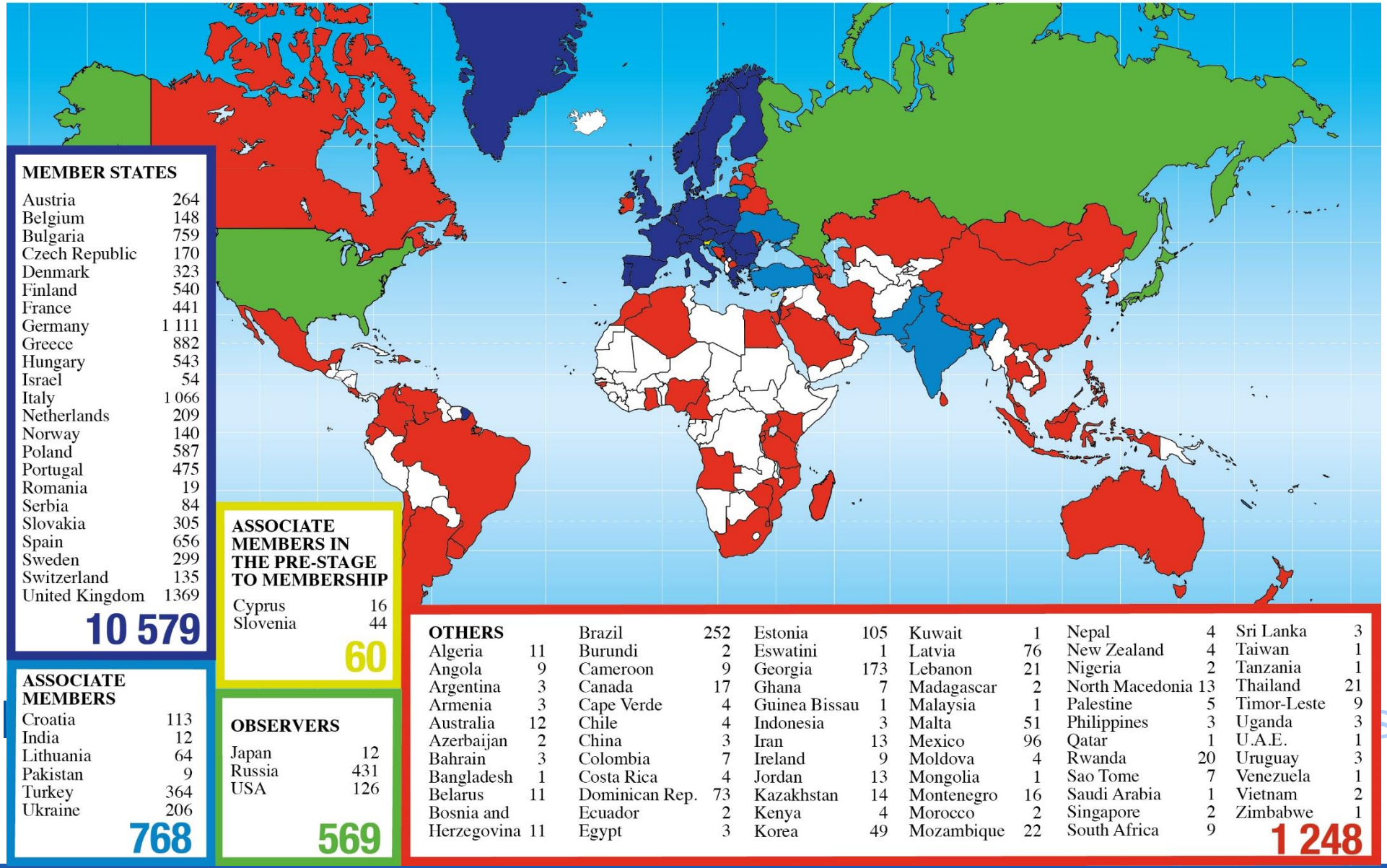
Publications

Collaboration 1 user

Physics Education Research 3 doct

1 staff
1 fellow

Teacher Programme Participants 1998 - 2019 (Total: 13 224)



MEMBER STATES

Austria	264
Belgium	148
Bulgaria	759
Czech Republic	170
Denmark	323
Finland	540
France	441
Germany	1 111
Greece	882
Hungary	543
Israel	54
Italy	1 066
Netherlands	209
Norway	140
Poland	587
Portugal	475
Romania	19
Serbia	84
Slovakia	305
Spain	656
Sweden	299
Switzerland	135
United Kingdom	1369

10 579

ASSOCIATE MEMBERS

Croatia	113
India	12
Lithuania	64
Pakistan	9
Turkey	364
Ukraine	206

768

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

Cyprus	16
Slovenia	44

60

OBSERVERS

Japan	12
Russia	431
USA	126

569

OTHERS

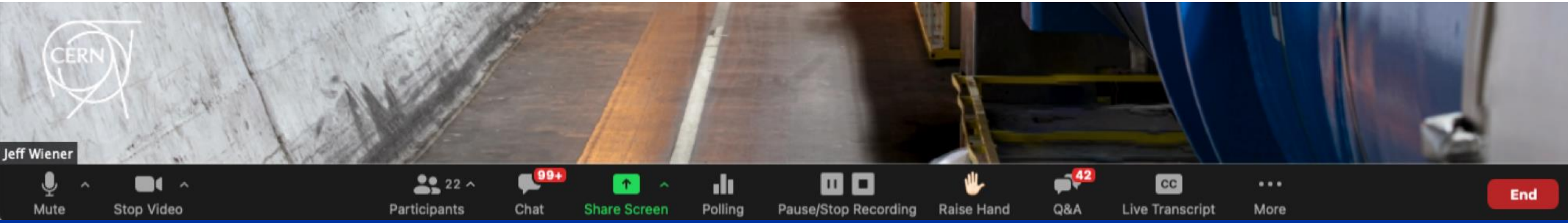
Algeria	11	Brazil	252	Estonia	105	Kuwait	1	Nepal	4	Sri Lanka	3
Angola	9	Burundi	2	Eswatini	1	Latvia	76	New Zealand	4	Taiwan	1
Argentina	3	Cameroon	9	Georgia	173	Lebanon	21	Nigeria	2	Tanzania	1
Armenia	3	Canada	17	Ghana	7	Madagascar	2	North Macedonia	13	Thailand	21
Australia	12	Cape Verde	4	Guinea Bissau	1	Malaysia	1	Palestine	5	Timor-Leste	9
Azerbaijan	2	Chile	4	Indonesia	3	Malta	51	Philippines	3	Uganda	3
Bahrain	3	China	3	Iran	13	Mexico	96	Qatar	1	U.A.E.	1
Bangladesh	1	Colombia	7	Ireland	9	Moldova	4	Rwanda	20	Uruguay	3
Belarus	11	Costa Rica	4	Jordan	13	Mongolia	1	Sao Tome	7	Venezuela	1
Bosnia and Herzegovina	11	Dominican Rep.	73	Kazakhstan	14	Montenegro	16	Saudi Arabia	1	Vietnam	2
		Ecuador	2	Kenya	4	Morocco	2	Singapore	2	Zimbabwe	1
		Egypt	3	Korea	49	Mozambique	22	South Africa	9		

1 248

Teacher Programmes

ONLINE Teacher Programmes

More than a dozen programmes, different formats, more than 2000 teachers, 80 countries



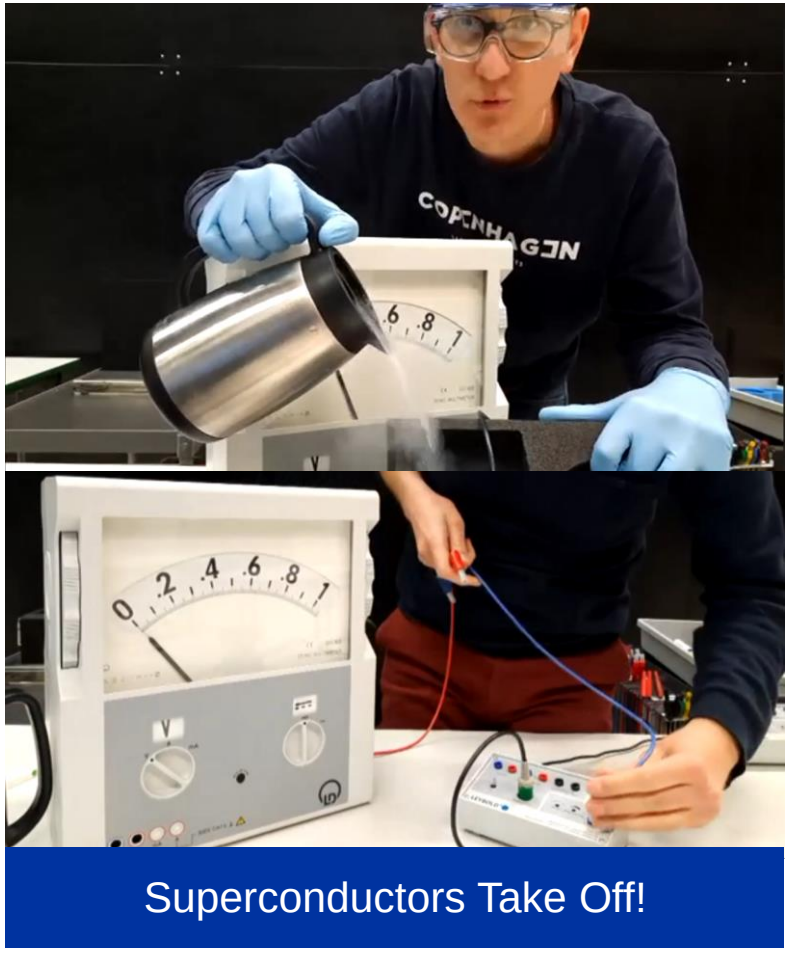

S'Cool LAB
Welcome
There is always a way to do it better... find it!
If you can't explain it simply, you don't understand it well enc

Virtual Science Shows

The pandemic as great opportunity

- **Live interactive demonstrations of scientific phenomena**
- **Links to CERN research**
- **Questions and answers**
- **Various languages**

It's Just a Phase!



Superconductors Take Off!

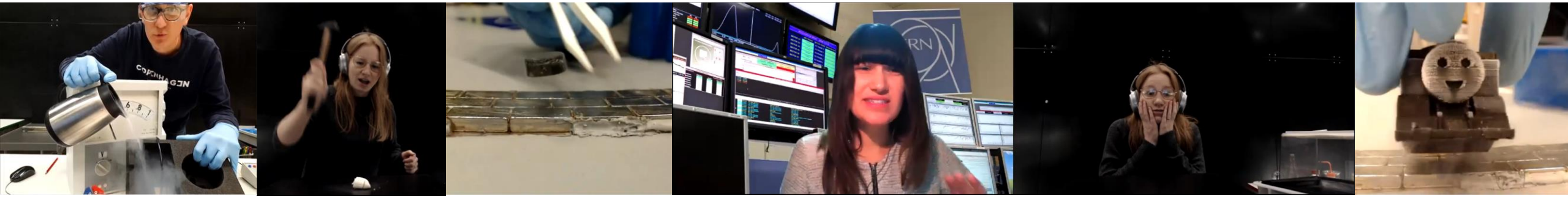
Virtual Science Shows

Participation overview

Since October 2020 we performed **>>50 shows.**

Our shows “travelled” to **>20 different countries.**

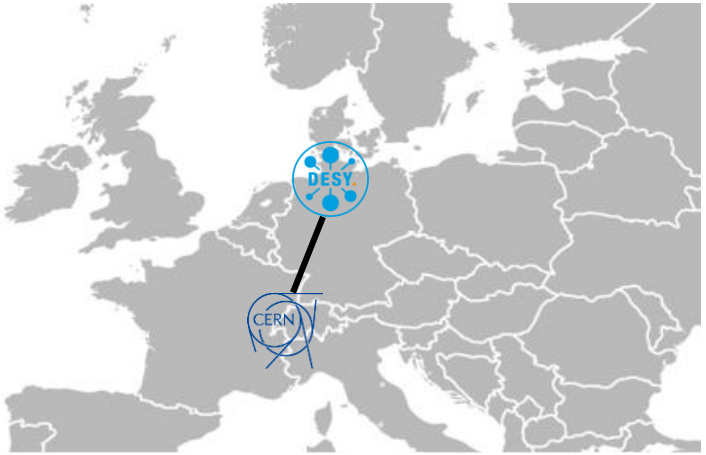
We reached more than 2500 students between ages 12 and 19!

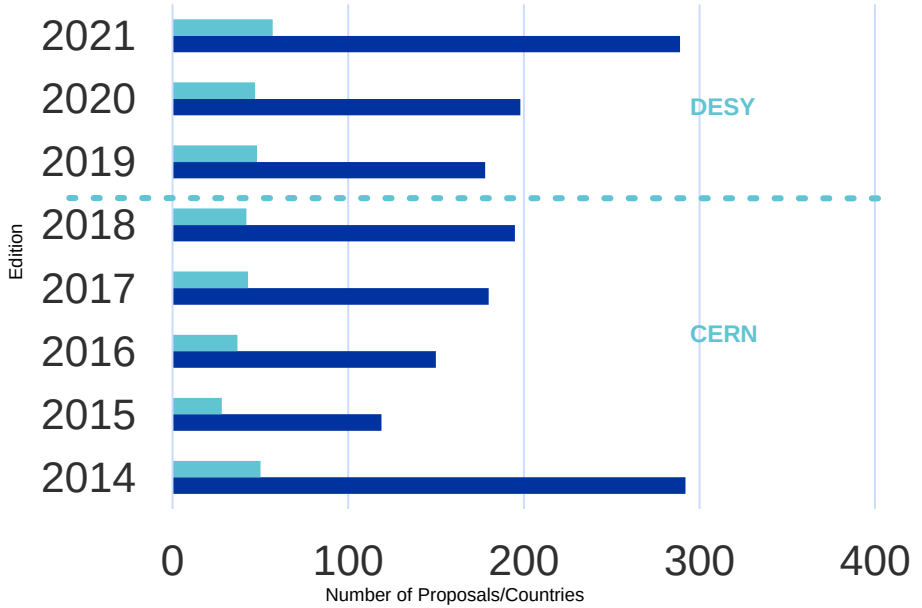


International Relations Sector
Secteur Relations Internationales

Beamline for Schools

- Competition for High-School Student Teams
- Normally at CERN's PS, 2019-21 at DESY
- Participation 2021
  - 298 proposals
- 2022
  - back at CERN for the finals of the competition



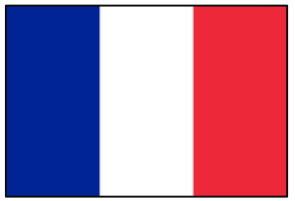


beamline for schools
cern.ch/bl4s
powered by CERN & DESY

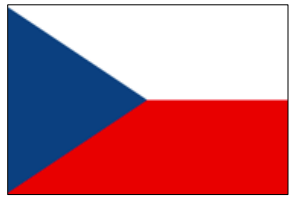
International Relations Sector
Secteur Relations Internationales

High-School Students Internship Programme

2017


2018



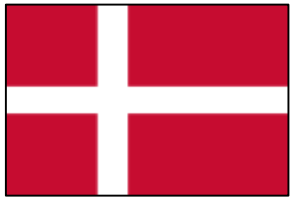


2019






2021


2022


European Strategy for Particle Physics
Update 2020

Chapter

Environmental and Societal Impact

Particle physics, with its fundamental questions and technological innovations, attracts bright young minds.

Their education and training are crucial for the needs of the field and of society at large.

Public engagement, education and communication in particle physics should continue to be recognised as important components of the scientific activity and receive adequate support.

The particle physics community should work with educators and relevant authorities to explore the adoption of basic knowledge of elementary particles and their interactions in the regular school curriculum.

Deliberations

CERN has thriving teachers and students programmes, which are also capable of generating valuable data that should be made available to the education research community.

Vocational education in the fields relevant for CERN should also be encouraged. It is important to be inclusive for all students, and initiatives to address under-represented groups should be supported.

The Science Gateway, under construction at CERN, will offer a golden opportunity to reinforce particle physics public engagement and education, which should be made to radiate across the whole of Europe.

International Relations Sector
Secteur Relations Internationales

Physics Education Research

The basis of all our programmes

Evaluation of CER

Anja Kranjc Horvat

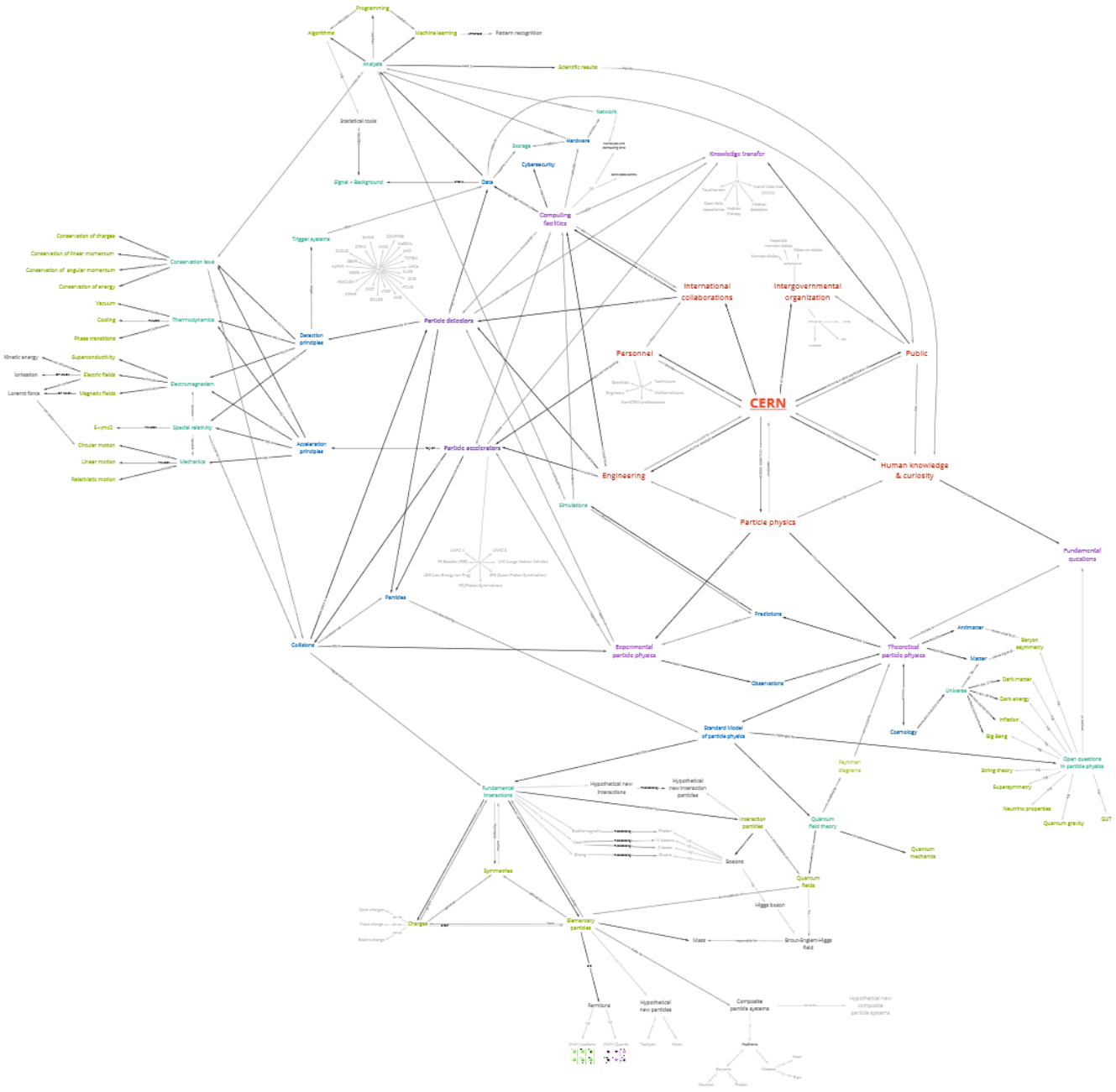
Link to CERN

Evaluation of CERN's Tea
overview of concepts in tl
***physics"* to ...**

- inform and improve C
- create a valuable teac

Paper: Kranjc Horvat, A., Wiener, J., S
Learning goals of professional devel
institutions: A Delphi study with differe
Teacher Education.

What would you like high-school students to know about CERN and particle physics?



Fostering i

Sarah Zöchling

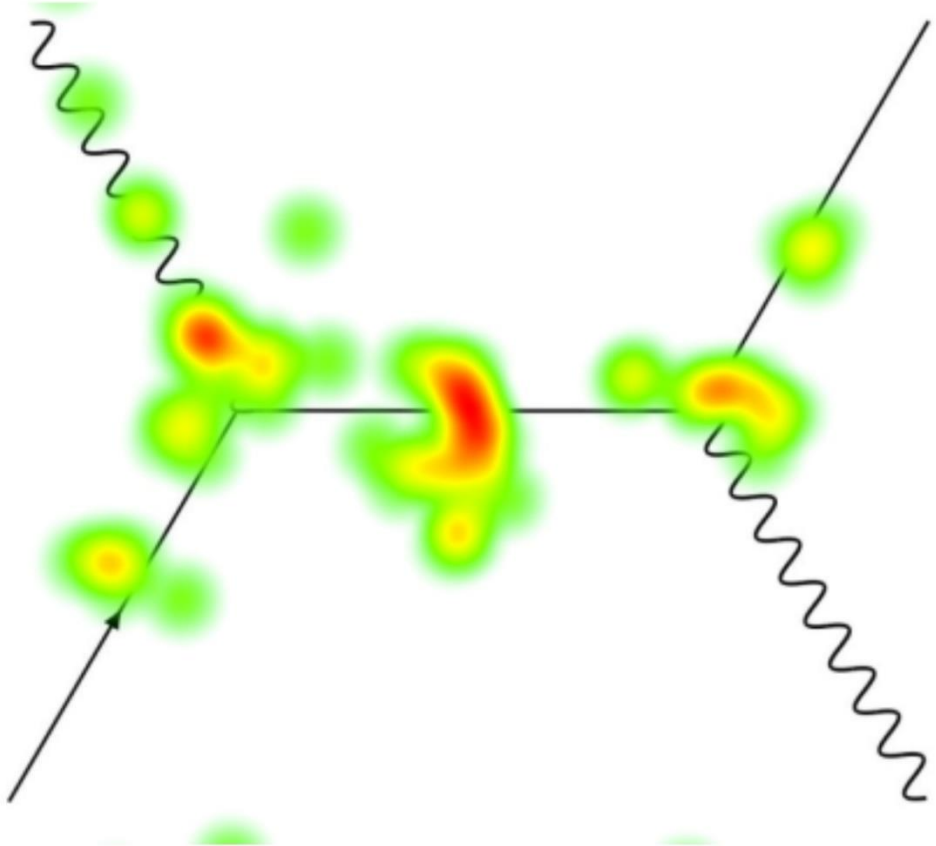
Link to CERN

Development of interest in partic students' interes contexts to …

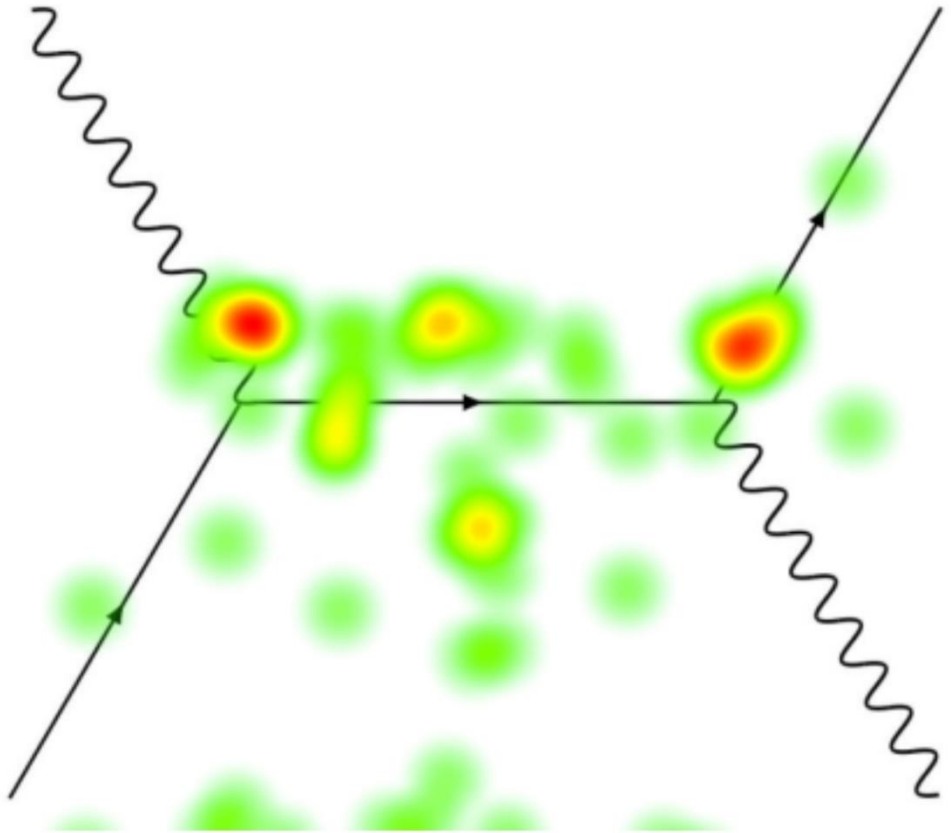
- define interest
- give recommer material

Eye Tracking in PER

Novices



Experts



How many Vertices is the diagram composed of?

How to get to work at CERN?

Recruitment for CERN

Next Application Deadlines

- Fellowship programme
  - *Recent committee on 16 November 2021*
  - Applications until 1 March 2022; committee in May 2022
  - https://cern.ch/fell

- Technical/Doctoral/Administrative student programme
  - *Recent committee on 1 December 2021*
  - Re-opening soon: committee May 2022
  - https://careers.cern/students

- Technician Training Experience (open all year round with 3 selection committees per year):
  - Applications until 30 January, next committee February 2022
  - Continuously open for applications,
  - https://cern.ch/tte

- Summer student programme
  - 2022 programme open: deadline 31 January 2022
  - https://cern.ch/summies

Personnel return and contribution by primary nationality 01.12.2021

Country	Staff members		Fellows		Doctoral students		Technical students		Admin. students		Normalized contribution
	hc	%	hc	%	hc	%	hc	%	hc	%	%
AT	56	2.09	15	1.92	18	7.50	3	1.90			2.15
BE	100	3.74	9	1.15	3	1.25					2.70
BG	14	0.52	2	0.26			2	1.27			0.32
CH	215	8.03	23	2.94	4	1.67	2	1.27	1	4.00	3.83
CY	2	0.07	2	0.26							0.08
CZ	10	0.37	9	1.15	5	2.08	1	0.63	1	4.00	1.02
DE	171	6.39	61	7.79	39	16.25	10	6.33	1	4.00	20.34
DK	17	0.64	3	0.38			1	0.63			1.75
EE											0.09
ES	169	6.32	88	11.24	16	6.67	14	8.86	4	16.00	7.20
FI	31	1.16	8	1.02	1	0.42	3	1.90			1.31
FR	979	36.58	92	11.75	13	5.42	5	3.16	2	8.00	13.56
GB	196	7.32	48	6.13	7	2.92	6	3.80	2	8.00	14.49
GR	57	2.13	50	6.39	13	5.42	23	14.56	2	8.00	1.02
HR	1	0.04	6	0.77	3	1.25			1	4.00	0.08
HU	17	0.64	10	1.28	2	0.83	2	1.27			0.67
IL			2	0.26							1.87
IN	5	0.19	29	3.70	1	0.42	8	5.06	1	4.00	1.35
IT	324	12.11	106	13.54	68	28.33	25	15.82	4	16.00	10.21
LT	2	0.07	9	1.15							0.08
LV					3	1.25					0.04
NL	62	2.32	5	0.64	5	2.08	5	3.16			4.54
NO	18	0.67	14	1.79	3	1.25	9	5.70			2.24
PK	2	0.07	3	0.38	4	1.67			1	4.00	0.16
PL	86	3.21	52	6.64	9	3.75	24	15.19	2	8.00	2.76
PT	60	2.24	38	4.85	5	2.08	3	1.90			1.08
RO	23	0.86	17	2.17	1	0.42	3	1.90	2	8.00	1.13
RS	6	0.22	11	1.40	2	0.83	1	0.63			0.24
SE	25	0.93	8	1.02	1	0.42	2	1.27			2.52

Personnel Return : above 150% | between 81% and 150% | between 51% and 80% | below or equal to 50%

careers.cern

Your Questions