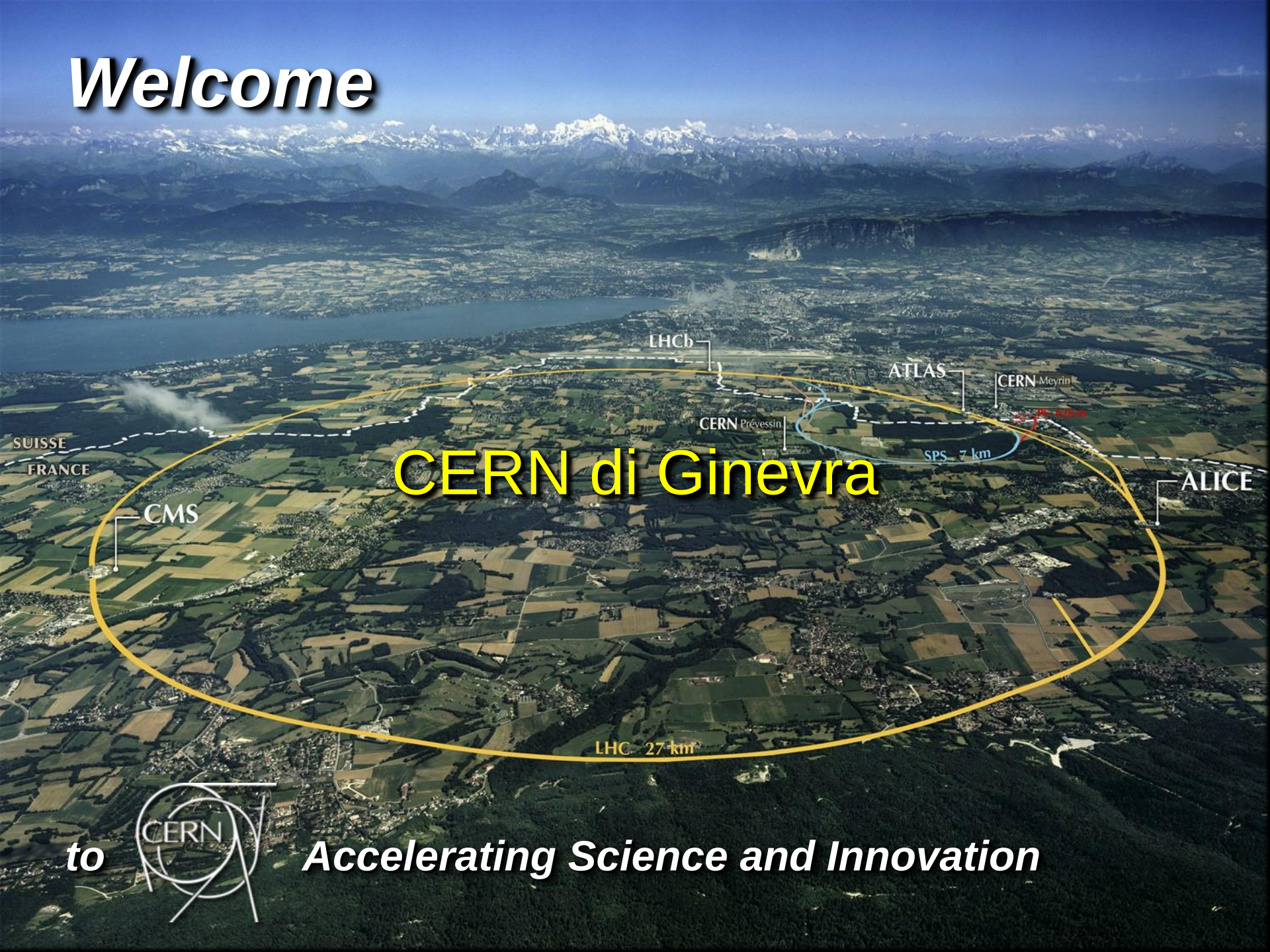
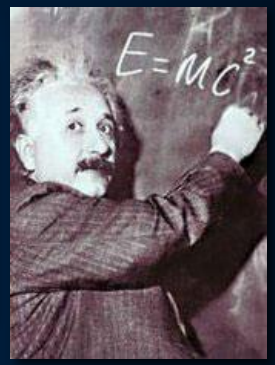
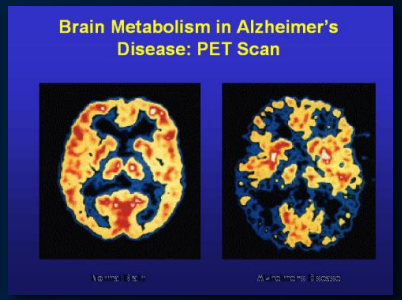

Welcome
LHCb
ATLAS
CERN Meyrin
CERN Prévessin
SPS 7 km
SUISSE
FRANCE
CMS
ALICE
LHC 27 km
CERN di Ginevra
to
CERN
Accelerating Science and Innovation

The Mission of CERN



- **Push back** the frontiers of knowledge

  E.g. the secrets of the Big Bang …what was the matter like within the first moments of the Universe's existence?



- **Develop** new technologies for accelerators and detectors

  Information technology - the Web and the GRID

  Medicine - diagnosis and therapy

- **Train** scientists and engineers of tomorrow

- **Unite** people from different countries and cultures

CERN: founded in 1954: 12 European States
"Science for Peace"
Today: 22 Member States

~ 2300 staff
~ 1530 other paid personnel
~ 12820 scientific users

Budget (2017) ~1000 MCHF

Member States: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom

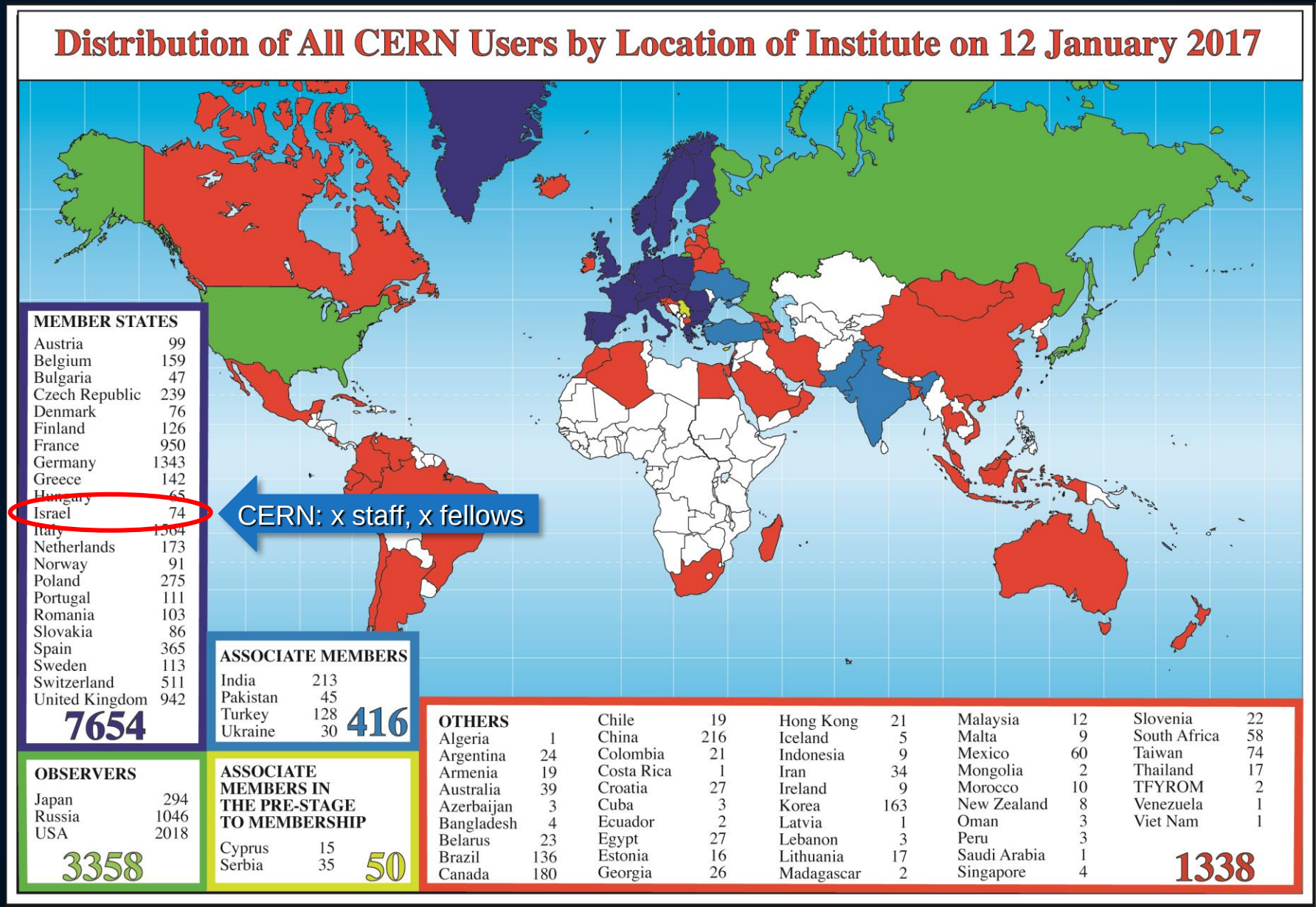
Associate Member States: India, Pakistan, Turkey, Ukraine

Associate Members in the Pre-Stage to Membership: Cyprus, Serbia

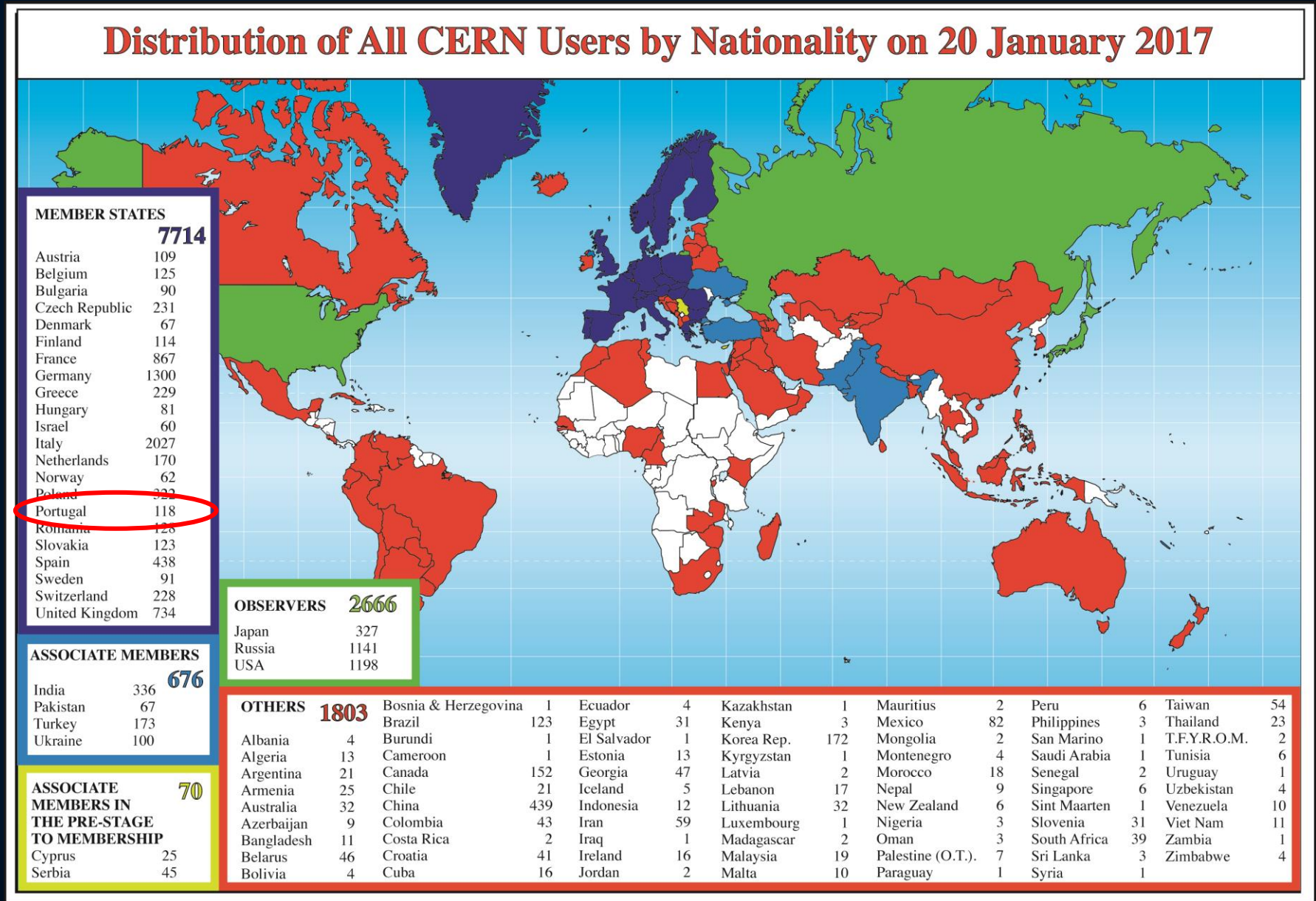
Applications for Membership or Associate Membership: Brazil, Croatia, Lithuania, Russia, Slovenia,

Observers to Council: Japan, Russia, United States of America; European Union, JINR and UNESCO

Science is getting more and more global

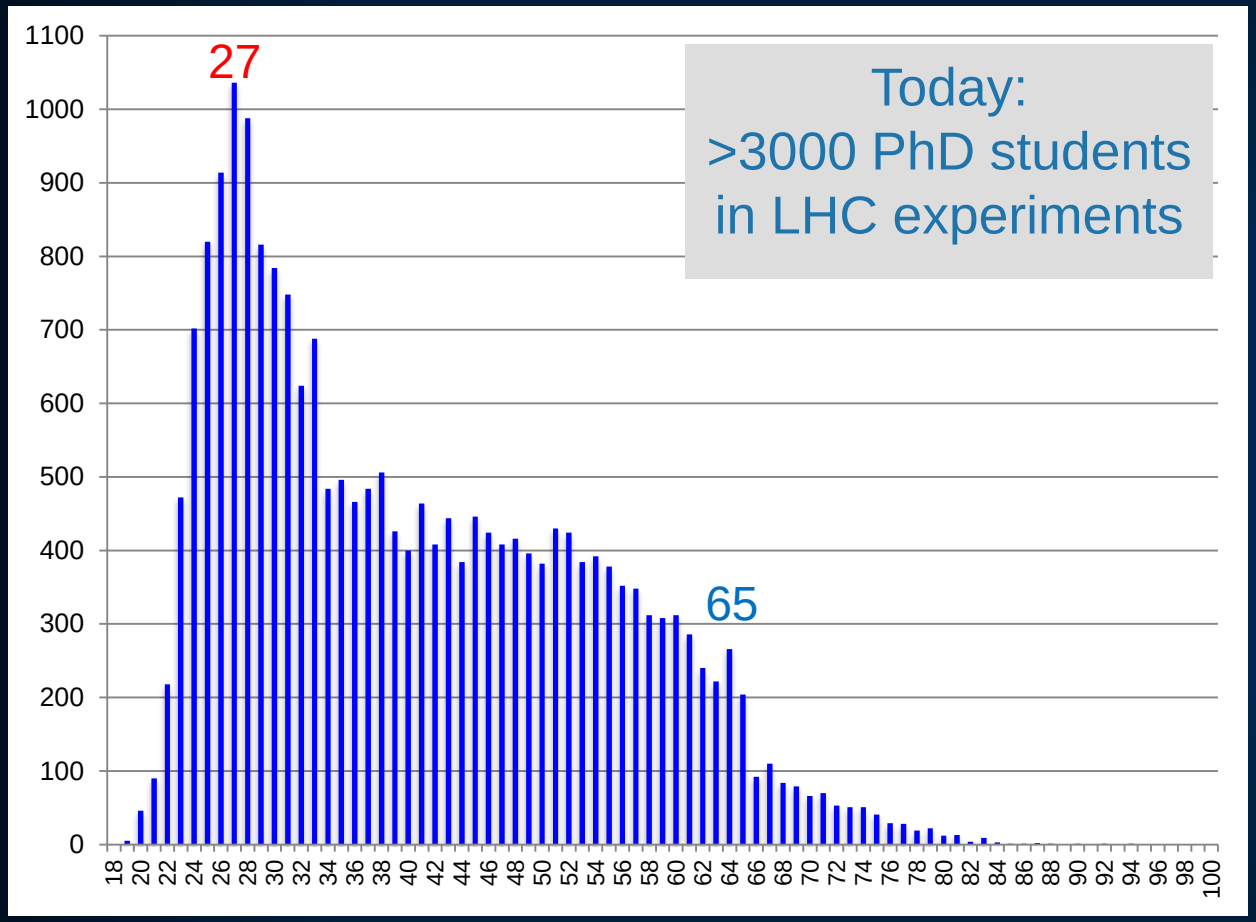


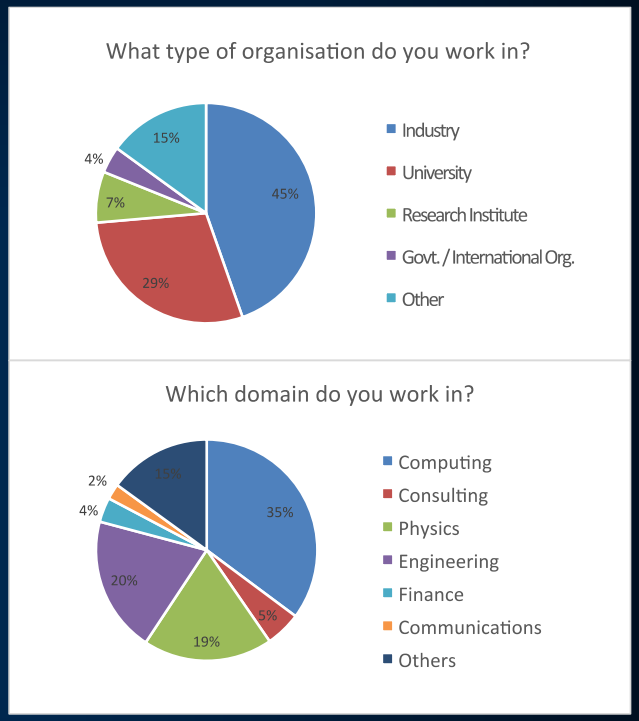
Science is getting more and more global



Age Distribution of Scientists

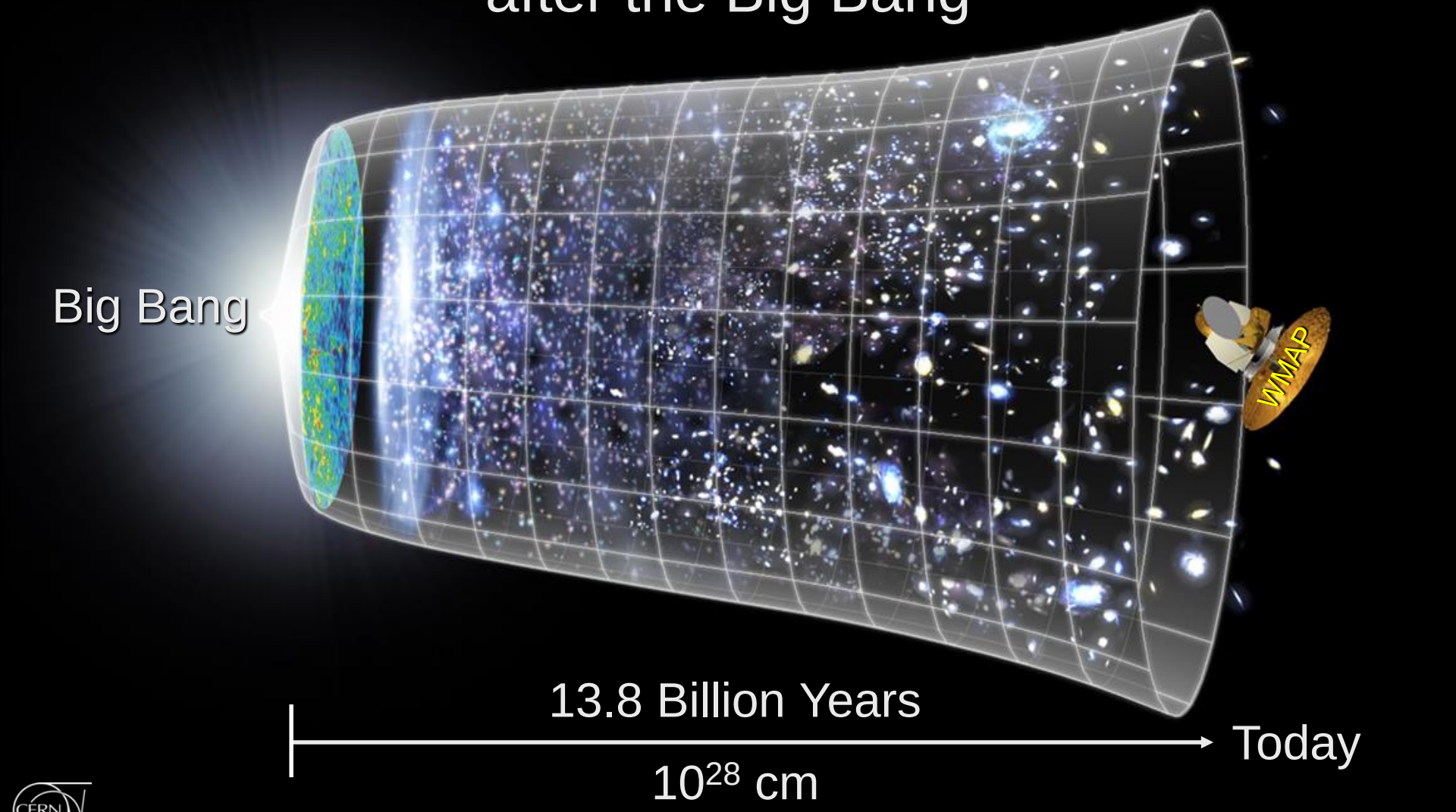
- and where they go afterwards

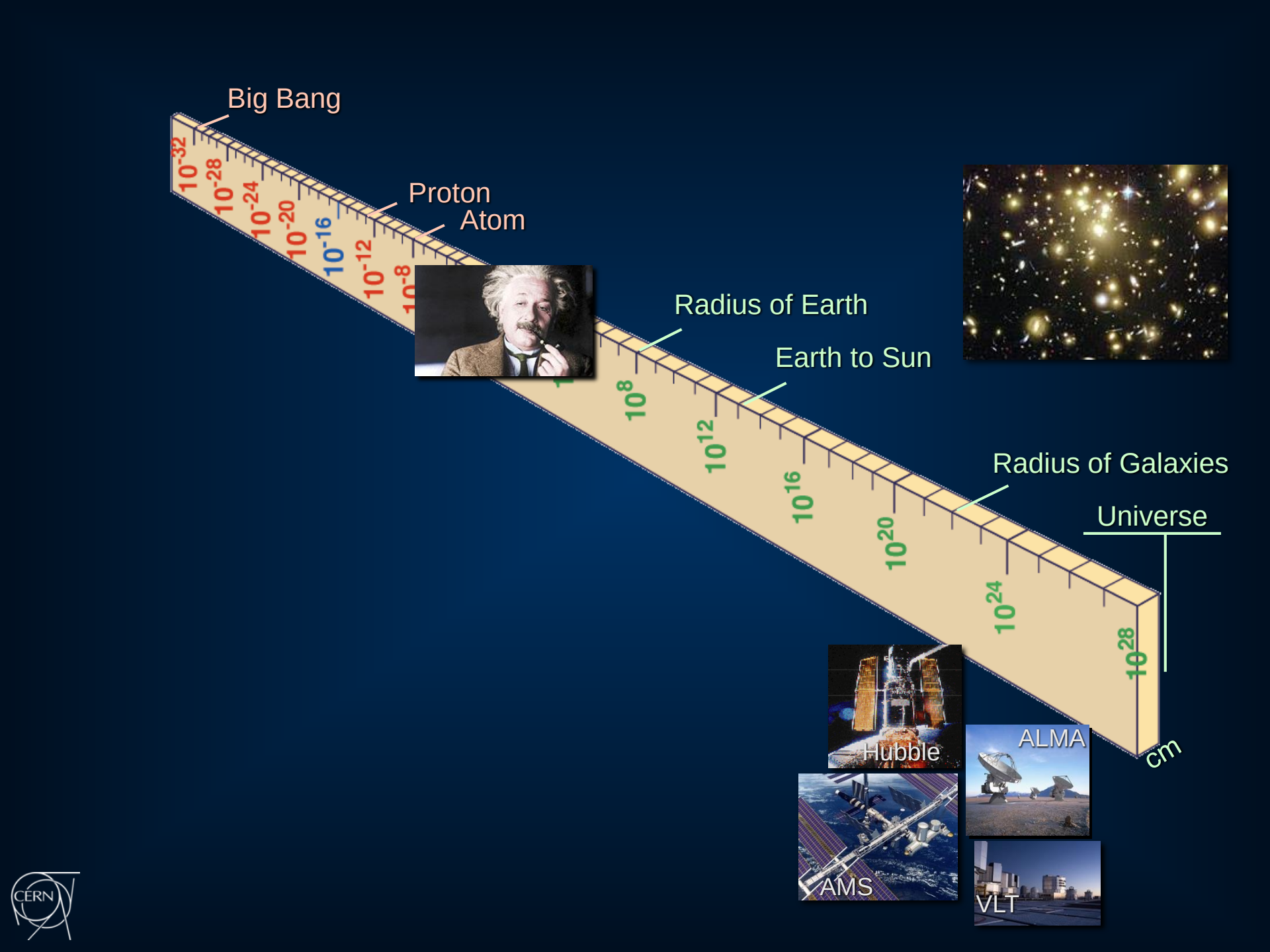




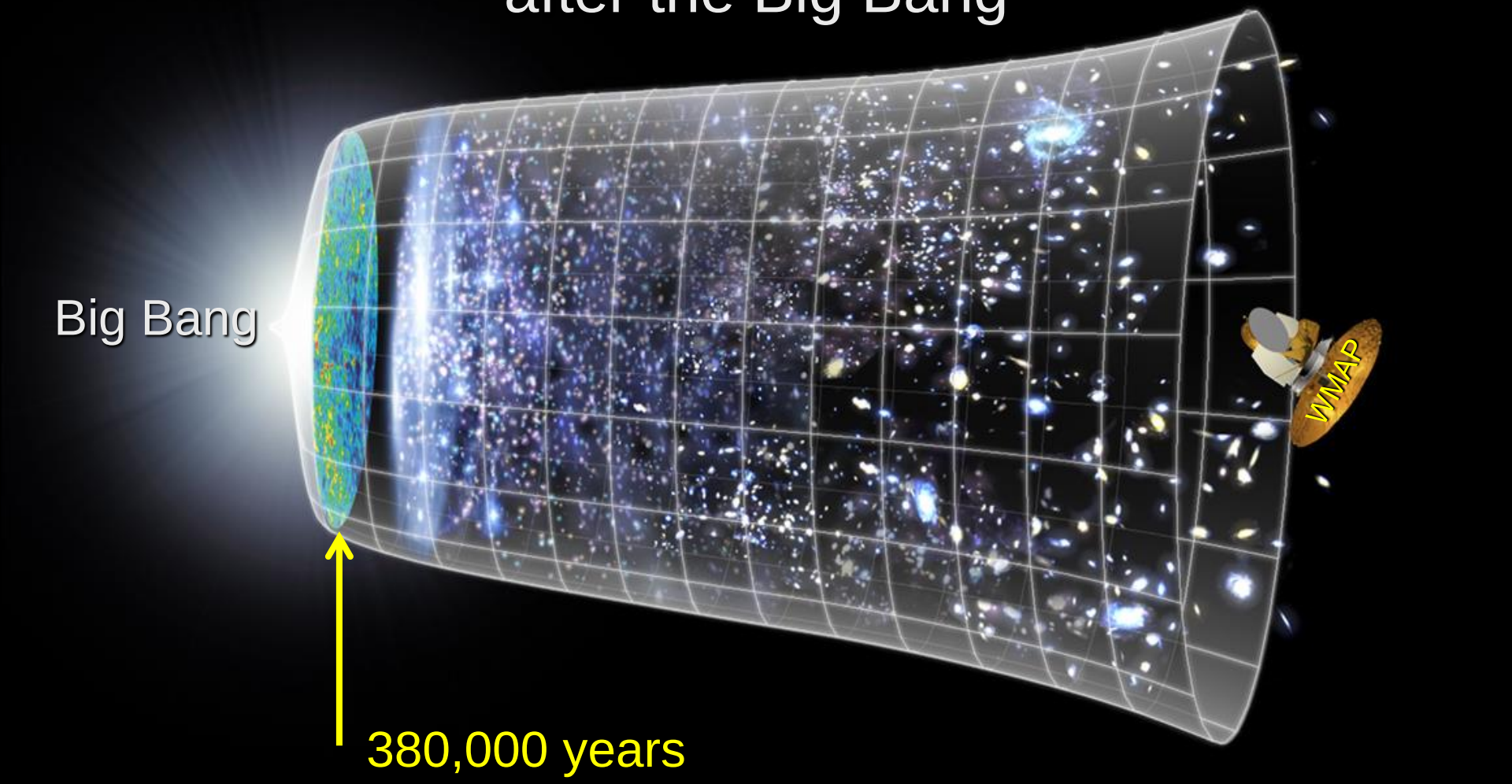
They do not all stay: where do they go?

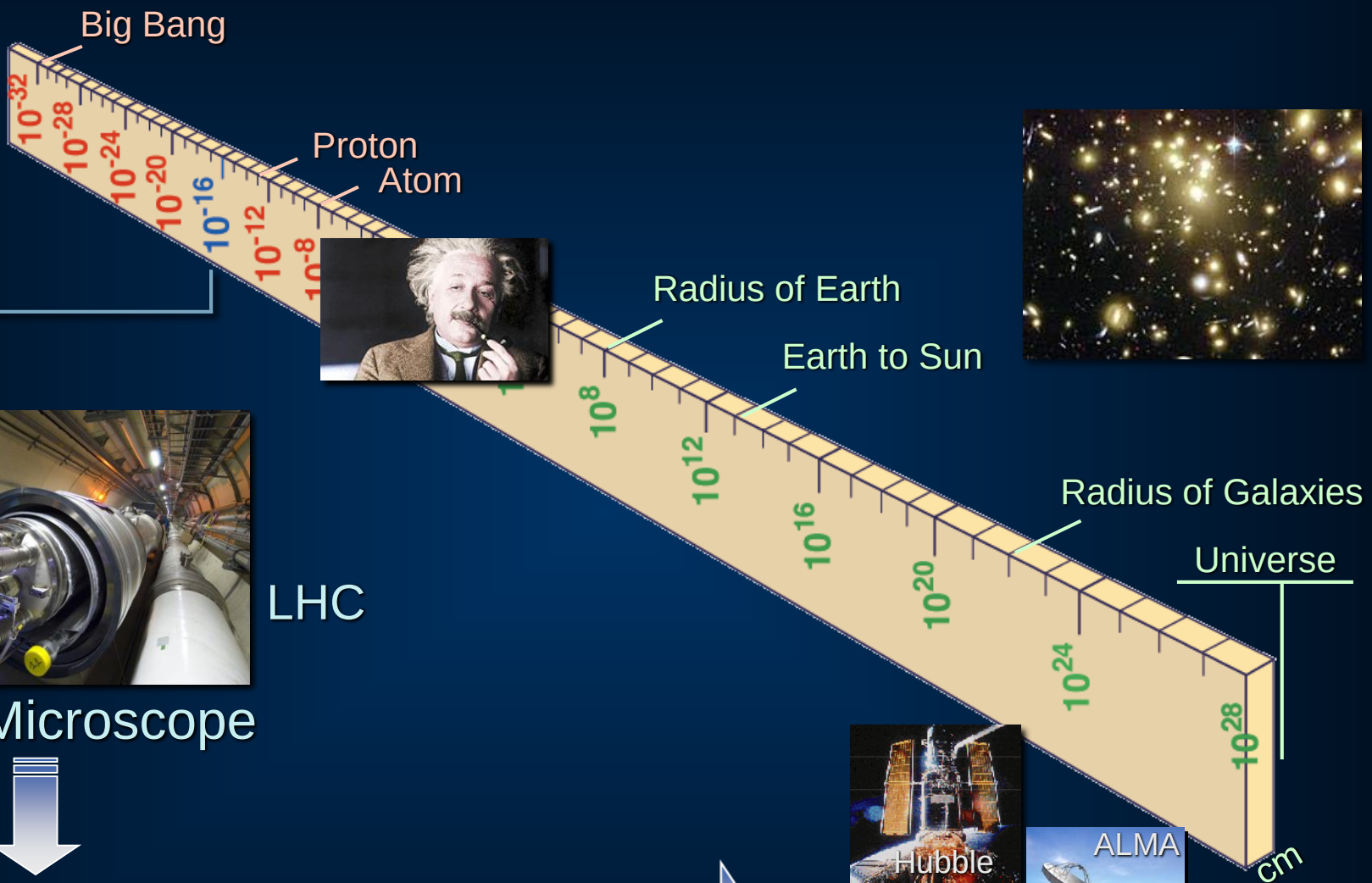
Next Scientific Challenge:
to understand the very first moments of our Universe after the Big Bang




Big Bang
Proton
Atom
Radius of Earth
Earth to Sun
Radius of Galaxies
Universe
10^{-32}
10^{-28}
10^{-24}
10^{-20}
10^{-16}
10^{-12}
10^{-8}
10^{8}
10^{12}
10^{16}
10^{20}
10^{24}
10^{28}
cm
Hubble
ALMA
AMS
VLT
CERN

Next Scientific Challenge:
to understand the very first moments of our Universe after the Big Bang





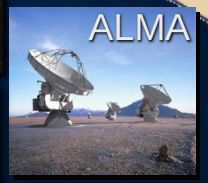
CERN

LHC

Super-Microscope

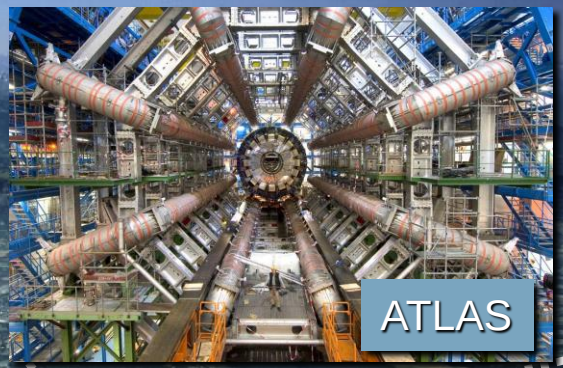
Reproducing conditions

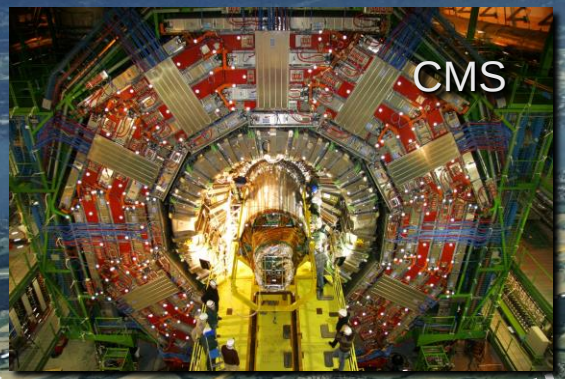
Looking back



CERN

2010: a New Era in Fundamental Science





Exploration of a new energy frontier
in p-p and Pb-Pb collisions

CERN

Discovery 2012, Nobel Prize in Physics 2013

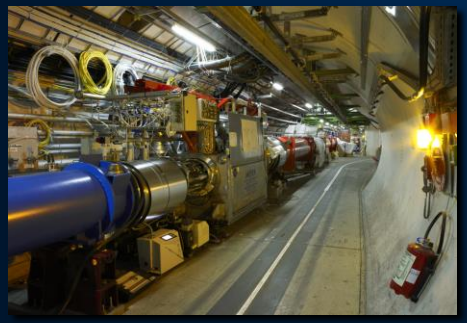
The Nobel Prize in Physics 2013 was awarded jointly to François Englert and Peter W. Higgs *"for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider".*

Innovation
Education
CERN
uniting people
Research

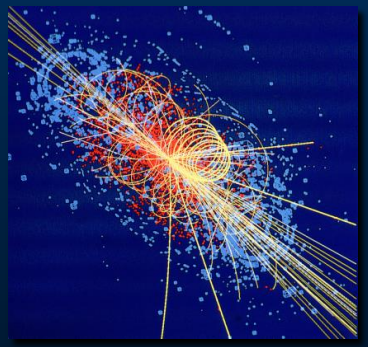
CERN: Particle Physics and Innovation

- Interfacing between fundamental science and key technological developments

- CERN Technologies and Innovation



Accelerating particle beams

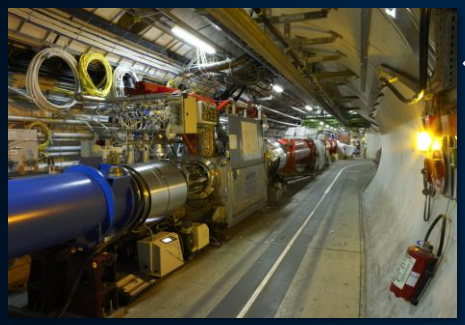


Detecting particles

Large-scale computing (Grid)

CERN

Examples of applications: medical imaging, cancer therapy, solar panels, materials science, airport scanners, cargo screening, food sterilization, nuclear waste transmutation, analysis of historical relics, etc. etc. …not to mention the WEB …

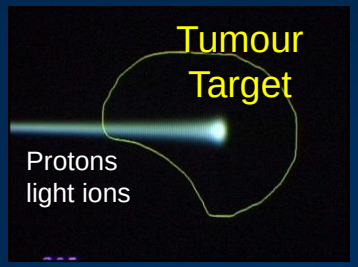


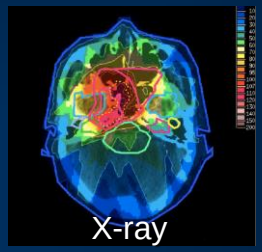
Accelerating particle beams

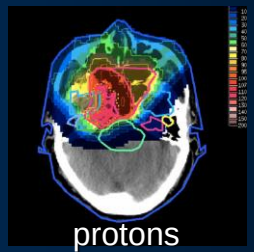
~30’000 accelerators worldwide

~17’000 used for medicine

Hadron Therapy



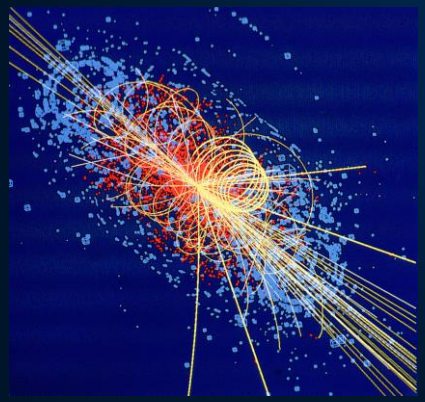




Leadership in Ion Beam Therapy now in Europe and Japan

>100’000 patients treated worldwide (45 facilities)

>50’000 patients treated in Europe (14 facilities – 1 in Krakow, Poland)

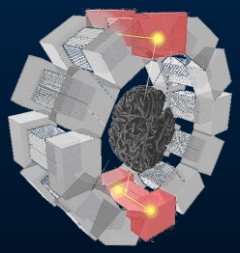


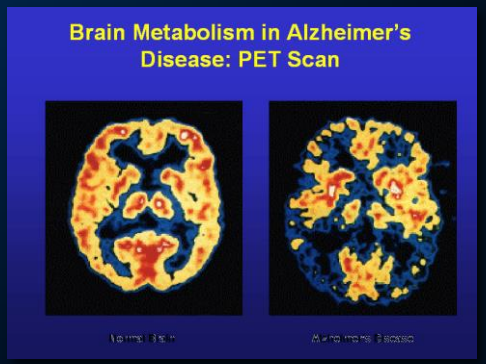
Detecting particles

Imaging

Clinical trial in Portugal, France and Italy for new breast imaging system (ClearPEM)

PET Scanner



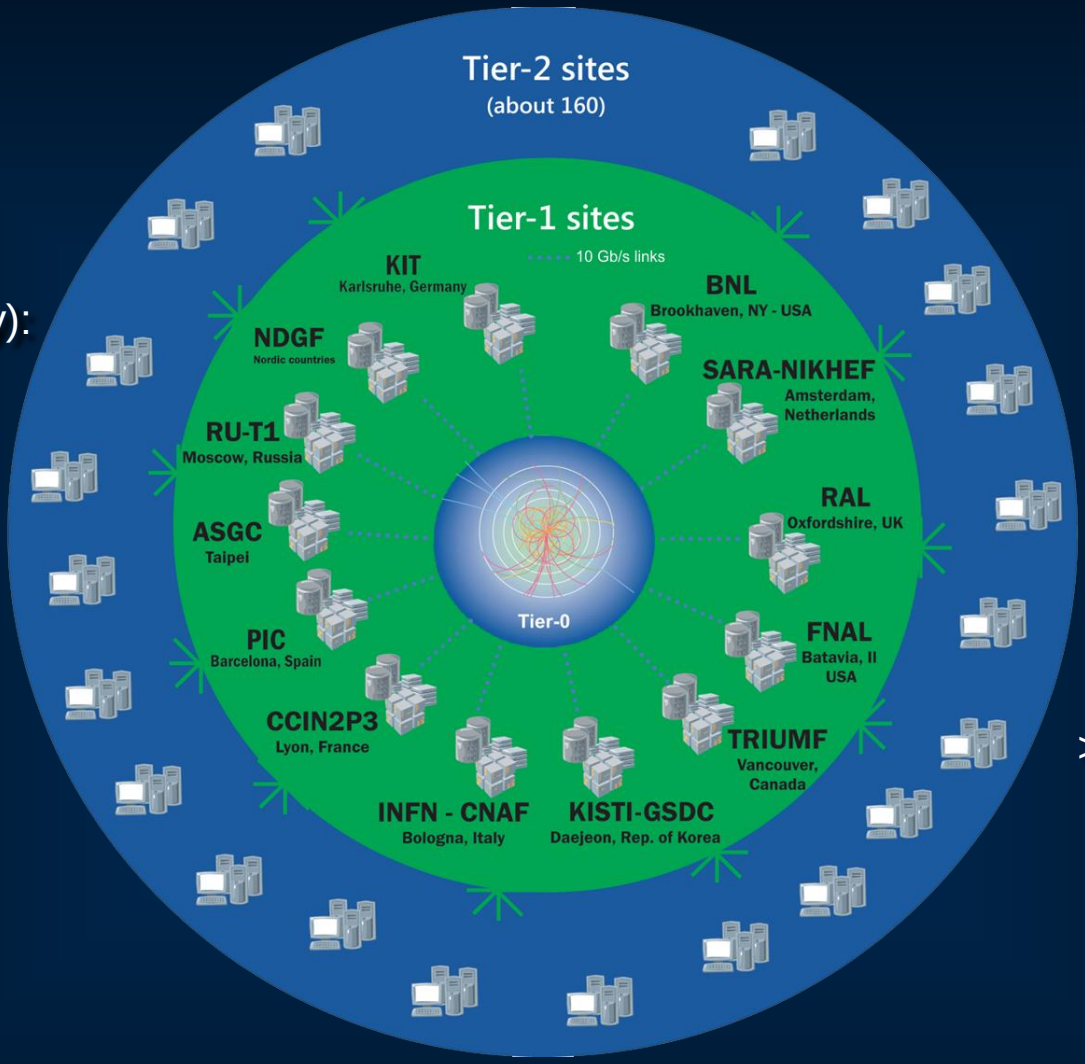


The Worldwide LHC Computing Grid

Tier-0
(CERN and Hungary):
data recording,
reconstruction and
distribution

Tier-1: permanent
storage, re-
processing,
analysis

Tier-2: Simulation,
end-user analysis



~170 sites,
40 countries

~500k CPU cores

500 PB of storage

> 2 million jobs/day

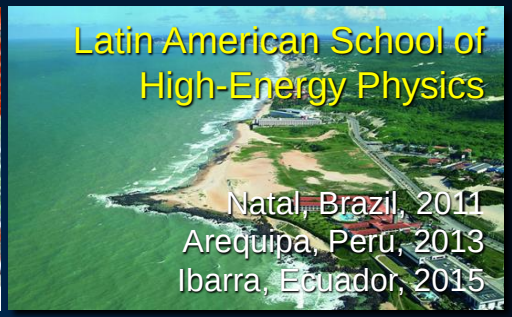
10-100 Gb links

WLCG:
An International collaboration to distribute and analyse LHC data

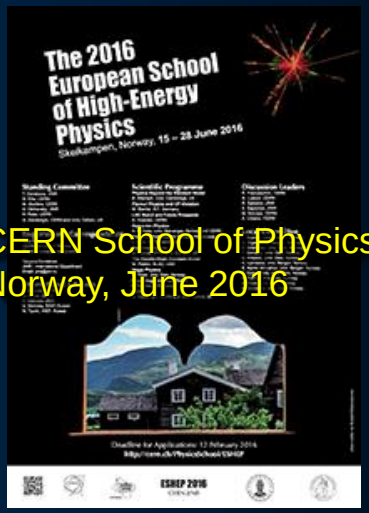
Integrates computer centres worldwide that provide computing and storage resource into a single infrastructure accessible by all LHC physicists

CERN Education Activities

Scientists at CERN
Academic Training Programme



Young Researchers
CERN School of High Energy Physics
CERN School of Computing
CERN Accelerator School



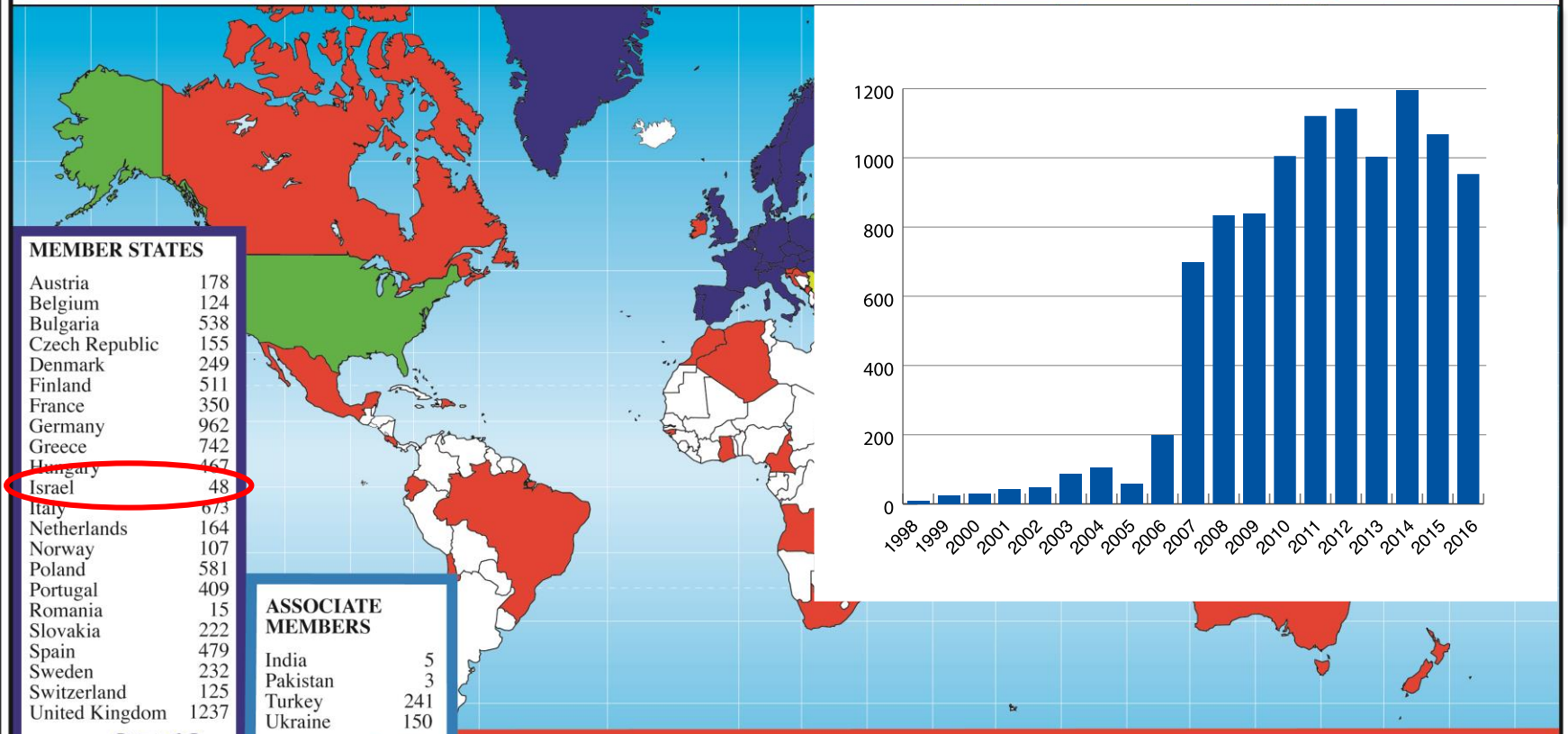
CERN School of Physics
Norway, June 2016

Physics Students
Summer Students Programme

CERN Teacher Schools
International and National Programmes

CERN Teacher Programme

Teacher Programme Participants 1998 - 2016 (Total: 10462)



MEMBER STATES

Austria	178
Belgium	124
Bulgaria	538
Czech Republic	155
Denmark	249
Finland	511
France	350
Germany	962
Greece	742
Hungary	467
Israel	48
Italy	673
Netherlands	164
Norway	107
Poland	581
Portugal	409
Romania	15
Slovakia	222
Spain	479
Sweden	232
Switzerland	125
United Kingdom	1237

8568

ASSOCIATE MEMBERS

India	5
Pakistan	3
Turkey	241
Ukraine	150

399

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

Cyprus	10
Serbia	68

78

OBSERVERS

Japan	8
Russia	379
USA	102

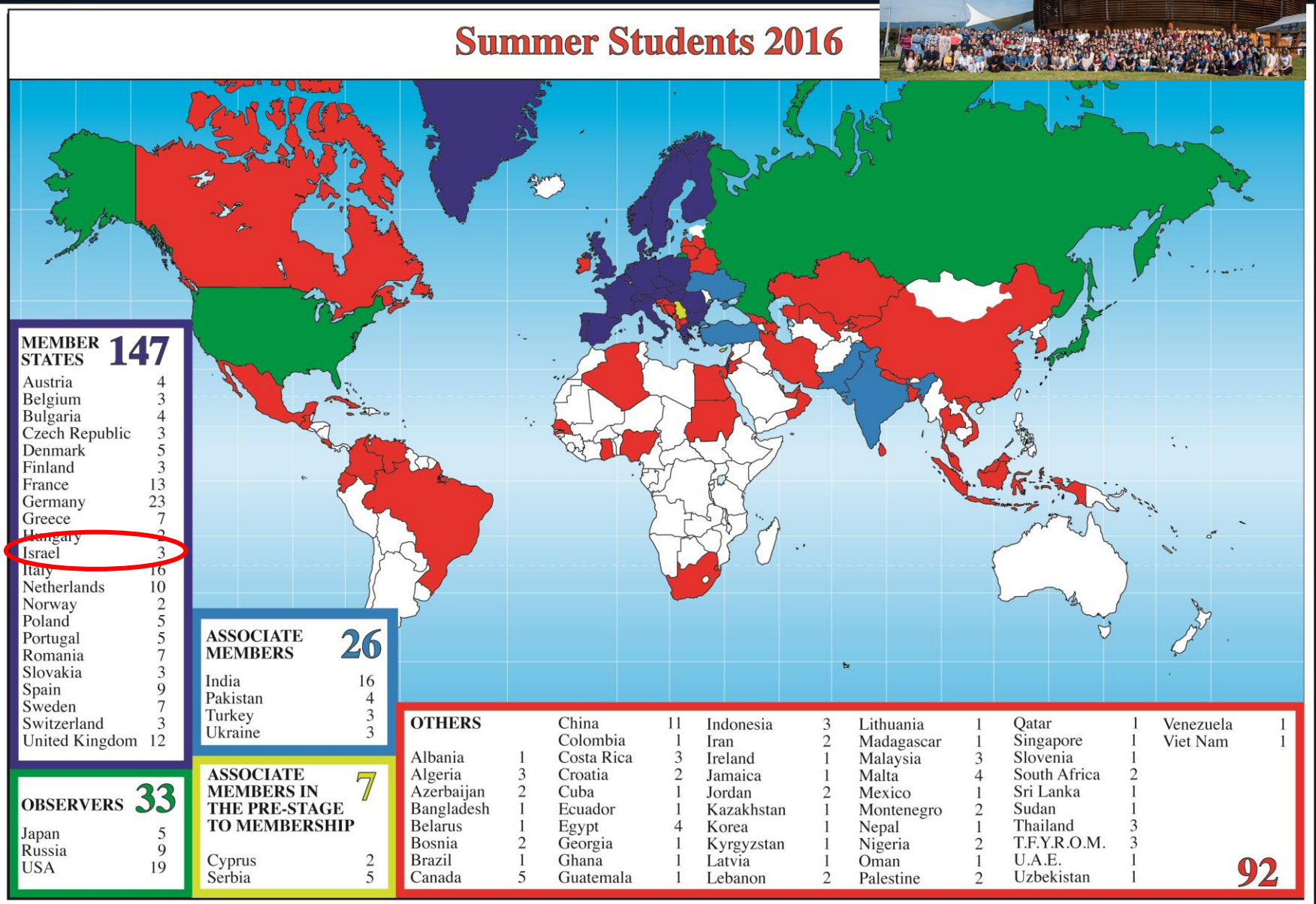
489

OTHERS

Algeria	8	Canada	9	Ghana	6	Malta	36	Sao Tome	7	Uganda	3
Angola	7	Cape Verde	4	Guinea Bissau	1	Mexico	27	Saudi Arabia	1	U.A.E.	1
Armenia	1	Chile	3	Iran	7	Mongolia	1	Singapore	2		
Australia	7	China	2	Ireland	8	Montenegro	15	Slovenia	21		
Azerbaijan	1	Costa Rica	4	Jordan	12	Morocco	2	South Africa	8		
Bahrain	2	Croatia	23	Kazakhstan	8	Mozambique	22	South Korea	48		
Belarus	3	Dominican Rep.	71	Kenya	4	Nepal	2	Swaziland	1		
Brazil	187	Ecuador	2	Latvia	25	New Zealand	2	Taiwan	1		
Burundi	2	Egypt	2	Lebanon	1	Palestine (O.T.)	4	Thailand	14		
Cameroon	5	Estonia	79	Lithuania	51	Qatar	1	T.F.Y.R.O.M.	12		
		Georgia	121	Madagascar	2	Rwanda	20	Timor-Leste	9		

928

Summer Students 2016

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