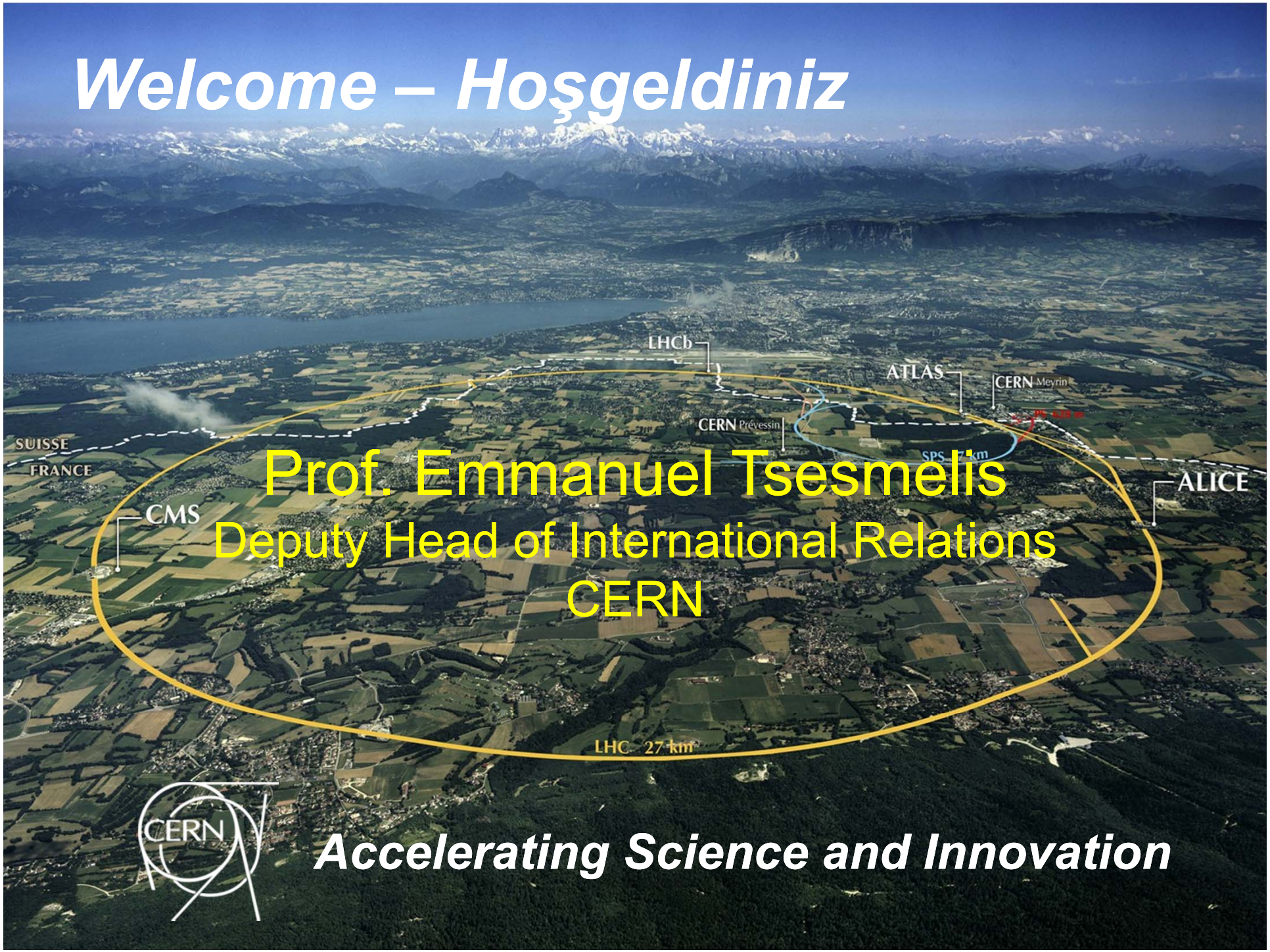
Welcome – Hoşgeldiniz



Prof. Emmanuel Tsesmelis

Deputy Head of International Relations

CERN

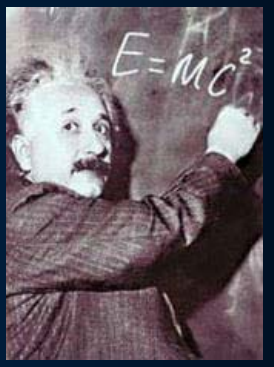
CERN

Accelerating Science and Innovation

The Mission of CERN

- **Push back** the frontiers of knowledge

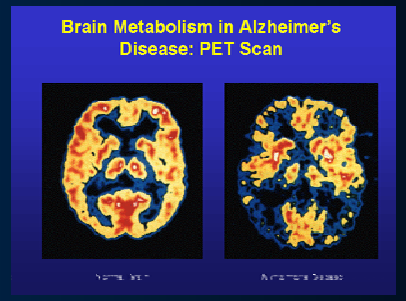
  E.g. the secrets of the Big Bang …what was the matter like within the first moments of the Universe's existence?



- **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: 21 Member States

~ 2500 staff
~ 1300 other paid personnel
~ 12100 scientific users

Budget (2015) ~1000 MCHF

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

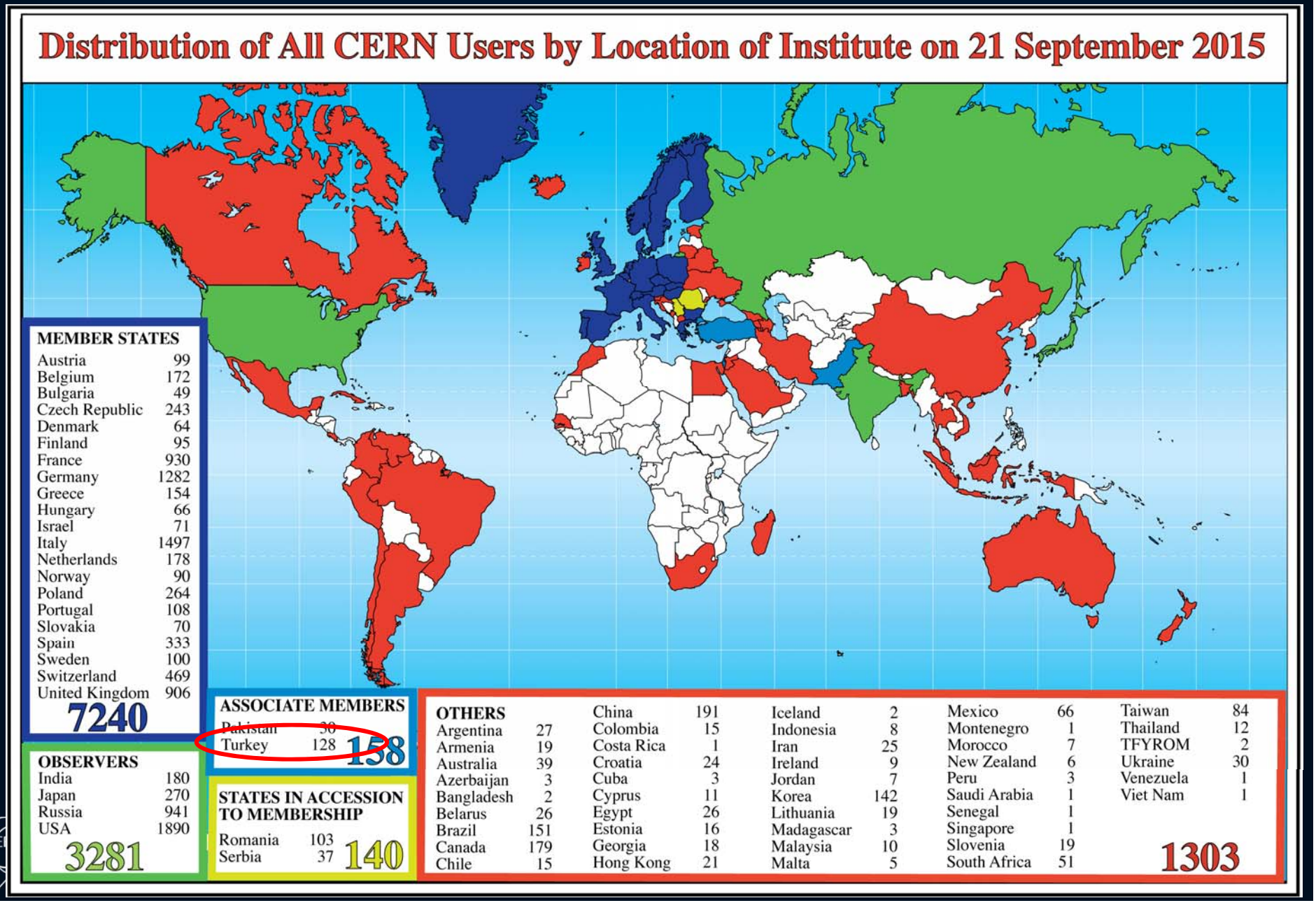
Associate Member States: Pakistan, Turkey

States in accession to Membership: Romania, Serbia

Applications for Membership or Associate Membership:
Azerbaijan, Brazil, Croatia, Cyprus, India Russia, Slovenia, Ukraine

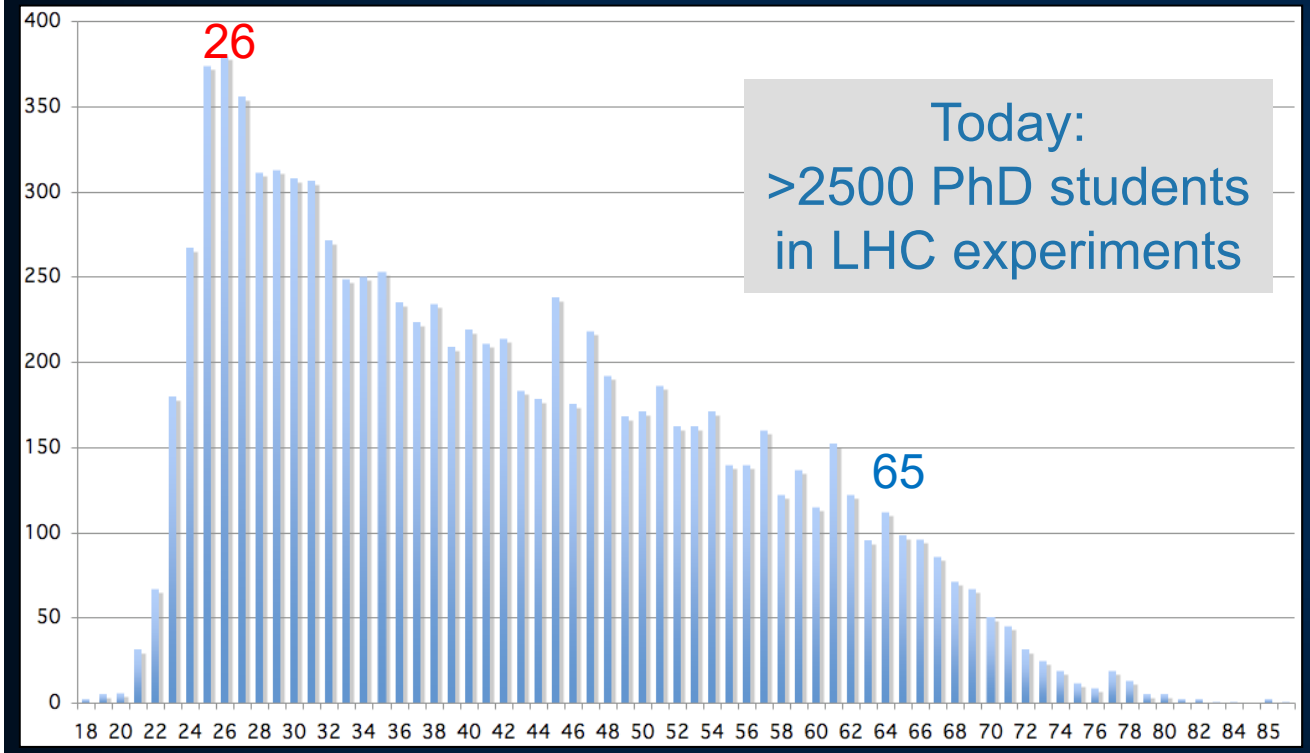
Observers to Council: India, Japan, Russia, United States of America; European Union, JINR and UNESCO

Science is getting more and more global

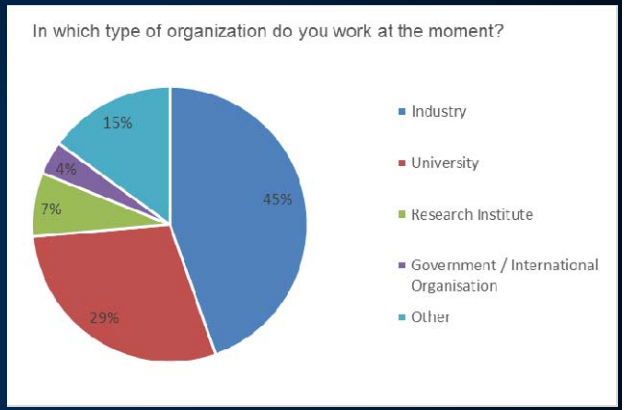


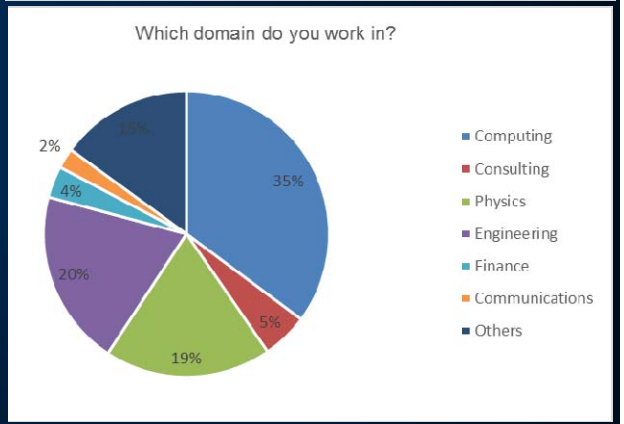
Age Distribution of Scientists

- and where they go afterwards



Today:
>2500 PhD students
in LHC experiments

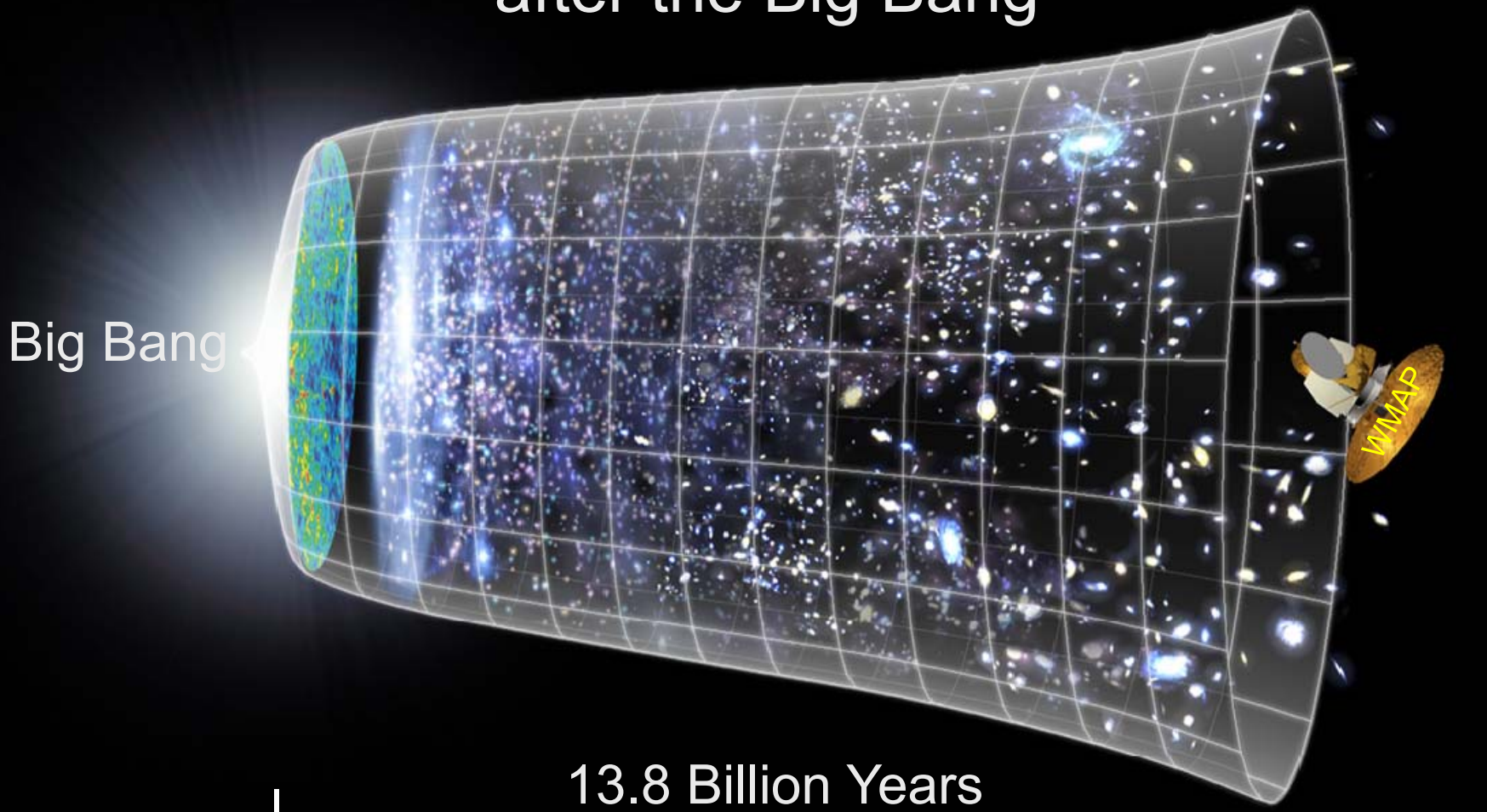


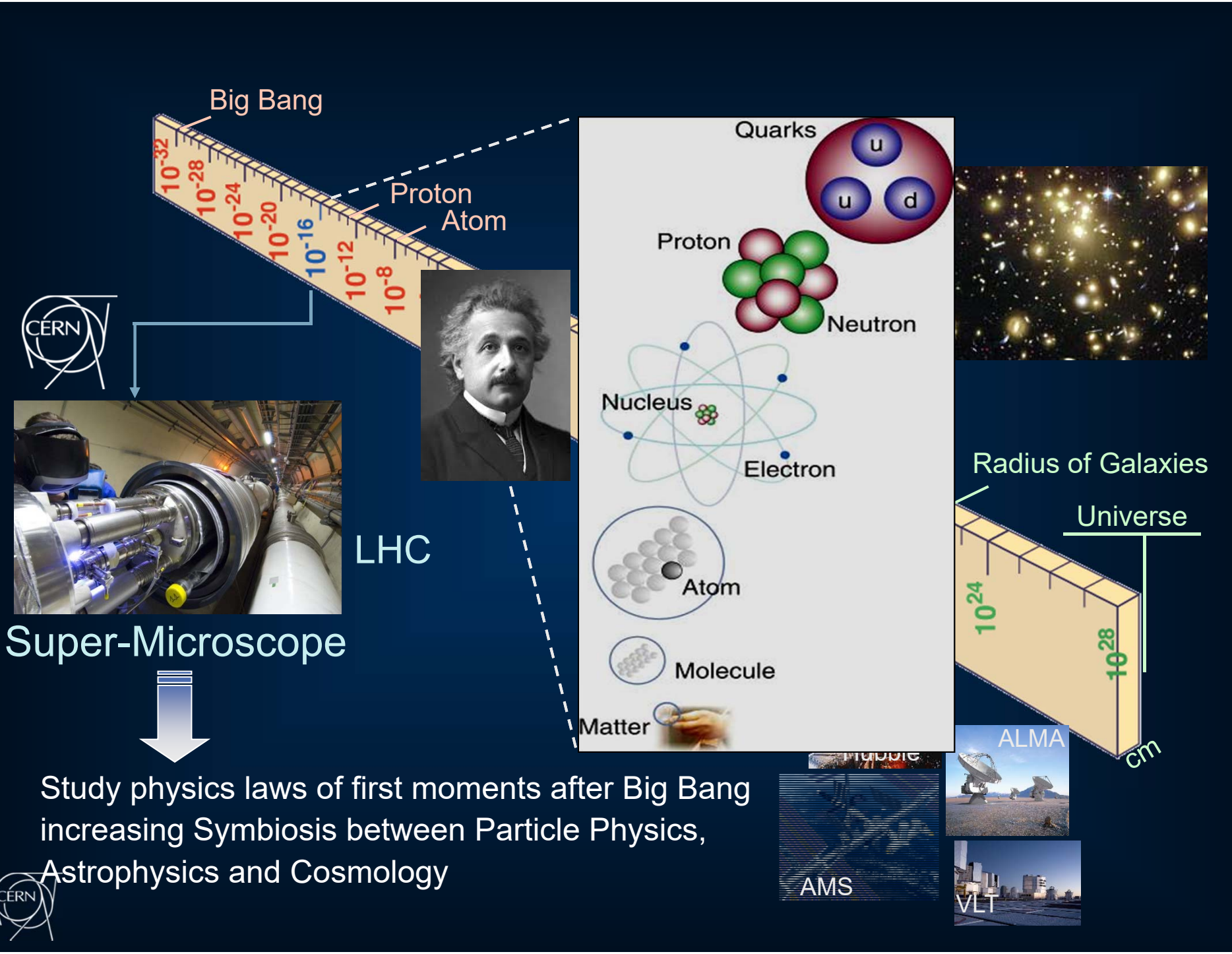


They do not all stay: where do they go?

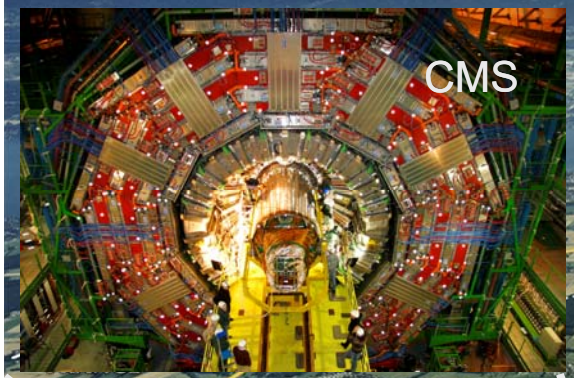
Next Scientific Challenge:

to understand the very first moments of our Universe after the Big Bang




Big Bang
Proton
Atom
10^{-32}
10^{-28}
10^{-24}
10^{-20}
10^{-16}
10^{-12}
10^{-8}
CERN
LHC
Super-Microscope
Quarks
u
u
d
Proton
Neutron
Nucleus
Electron
Atom
Molecule
Matter
Radius of Galaxies
Universe
10^{24}
10^{28}
cm
ALMA
AMS
VLT
Study physics laws of first moments after Big Bang
increasing Symbiosis between Particle Physics,
Astrophysics and Cosmology
CERN

2010: a New Era in Fundamental Science



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

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".*

CERN

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)

Medical Application as an Example of Particle Physics Spin-off

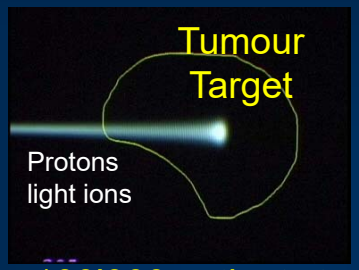
Combining Physics, ICT, Biology and Medicine to fight cancer

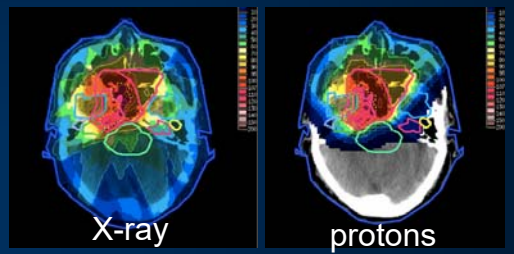
Accelerating particle beams

~30'000 accelerators worldwide

~17'000 used for medicine

Hadron Therapy

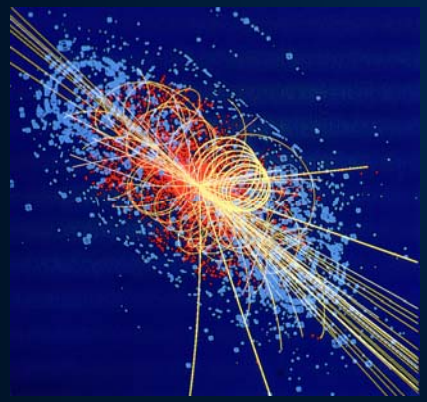




Leadership in Ion Beam Therapy now in Europe and Japan

>100'000 patients treated worldwide (45 facilities)

>50'000 patients treated in Europe (14 facilities)

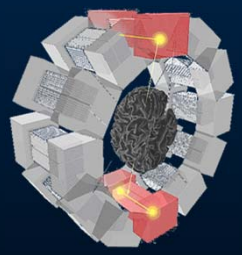


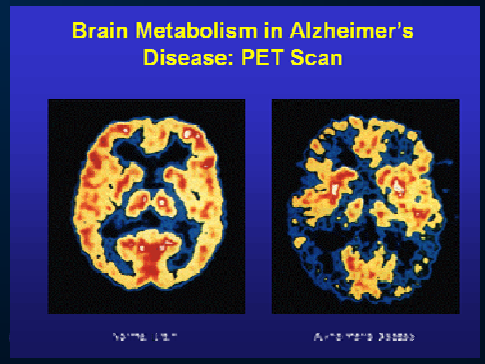
Detecting particles

Imaging

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

PET Scanner



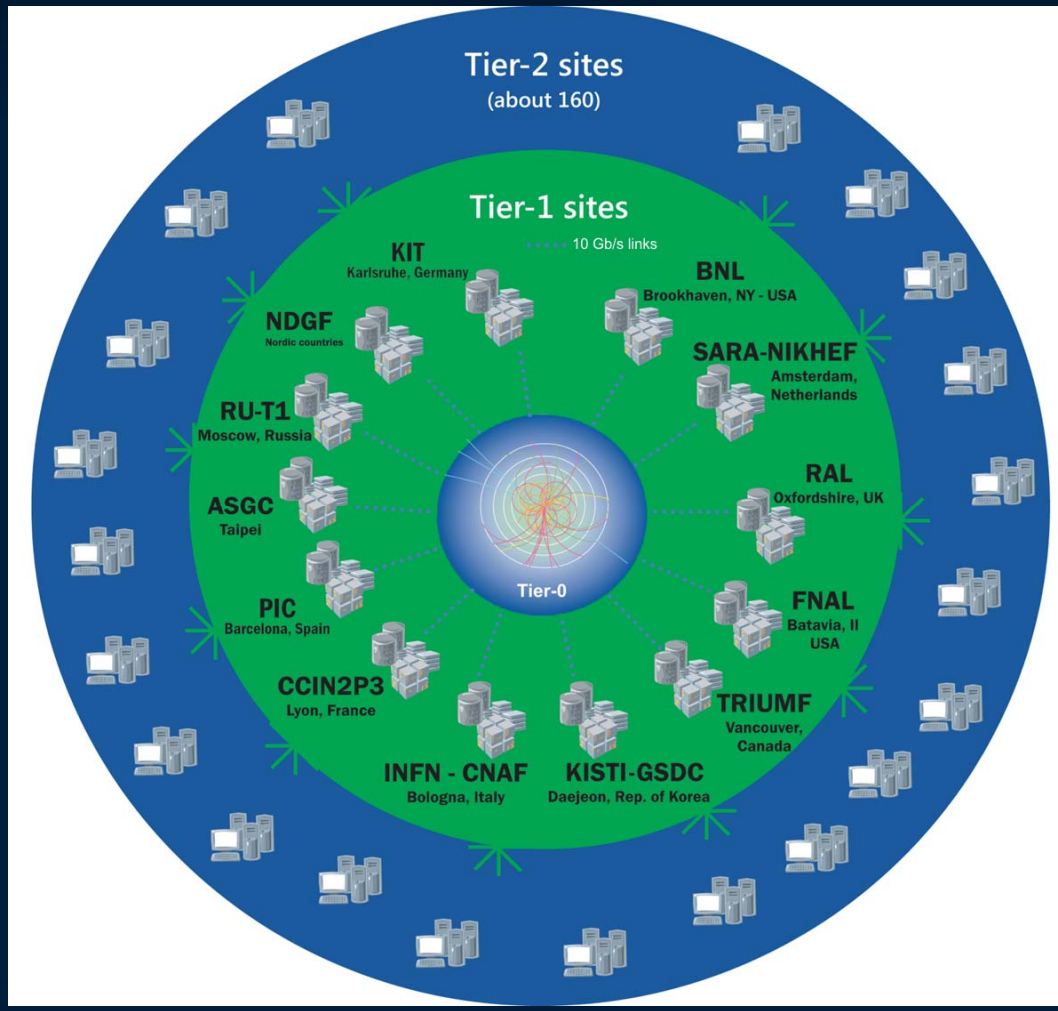


The Worldwide LHC Computing Grid

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

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

Tier-2: Simulation, end-user analysis



Nearly 170 sites, 40 countries

~350'000 cores

500 PB of storage

> 2 million jobs/day

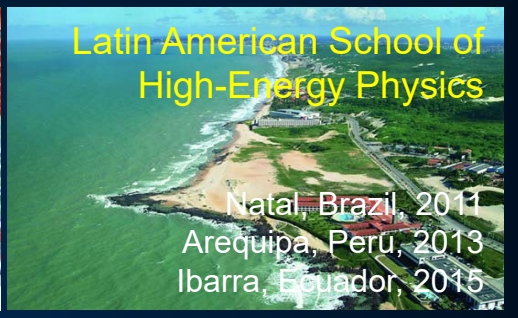
10-100 Gb links

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

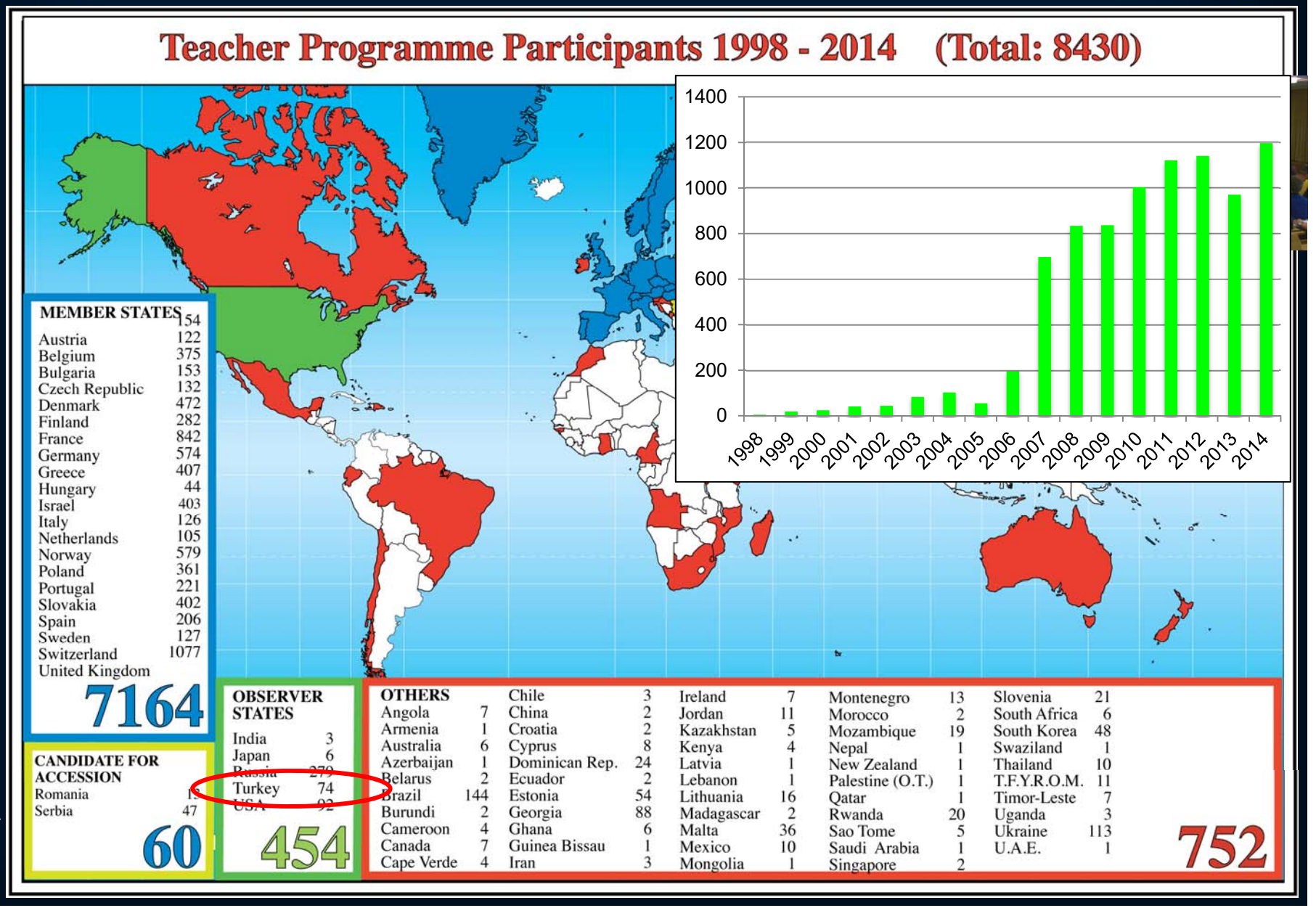


Young Researchers
CERN School of High Energy Physics
CERN School of Computing
CERN Accelerator School

Physics Students
Summer Students Programme

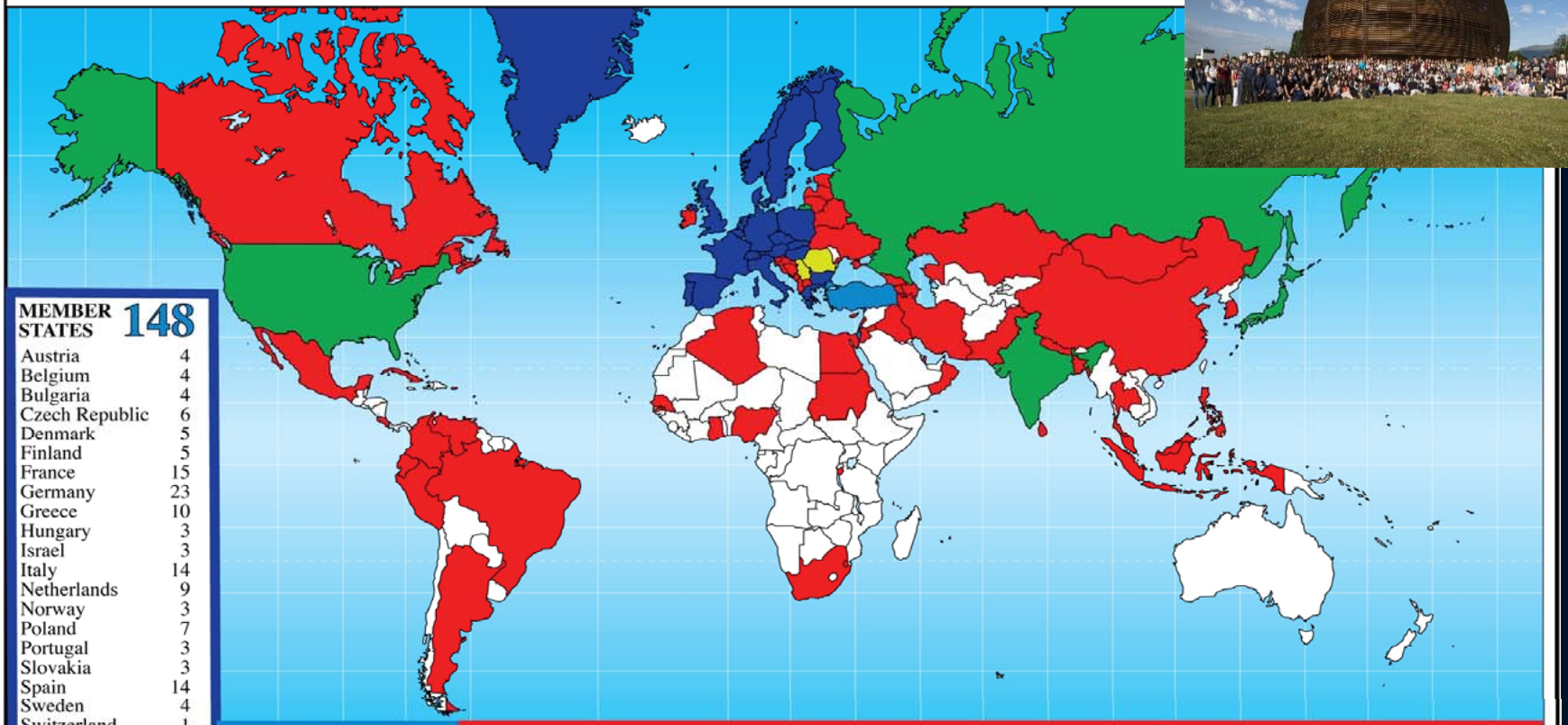
CERN Teacher Schools
International and National Programmes

CERN Teacher Programme



Summer Students 2015

Summer Students 2015



MEMBER STATES 148

Austria	4
Belgium	4
Bulgaria	4
Czech Republic	6
Denmark	5
Finland	5
France	15
Germany	23
Greece	10
Hungary	3
Israel	3
Italy	14
Netherlands	9
Norway	3
Poland	7
Portugal	3
Slovakia	3
Spain	14
Sweden	4
Switzerland	1
United Kingdom	8

OBSERVERS 44

India	13
Japan	4
Russia	9
USA	18

ASSOCIATE MEMBER

Turkey	7

CANDIDATES FOR ACCESSION

Romania	6
Serbia	3
	9

OTHERS

Albania	2	Brunei	2	Egypt	2	Kazakhstan	1	Nepal	1	Slovenia	1
Algeria	4	Burundi	1	Estonia	2	Korea, South	1	Nigeria	1	South Africa	2
Argentina	3	Canada	3	Georgia	1	Latvia	1	Oman	1	Sri Lanka	1
Armenia	1	China	12	Ghana	1	Lebanon	3	Pakistan	8	Sudan	1
Azerbaijan	1	Colombia	1	Gibraltar	1	Lithuania	2	Palestine	1	Thailand	3
Bangladesh	1	Costa Rica	2	Indonesia	1	Malaysia	3	Peru	1	T.F.Y.R.O.M.	3
Belarus	1	Croatia	2	Iran	2	Malta	4	Philippines	1	Ukraine	1
Bosnia	1	Cuba	1	Iraq	1	Mexico	1	Puerto Rico	1	Venezuela	1
Brazil	2	Cyprus	1	Ireland	1	Mongolia	2	Qatar	1		
		Ecuador	1	Jordan	1	Montenegro	1	Singapore	2		

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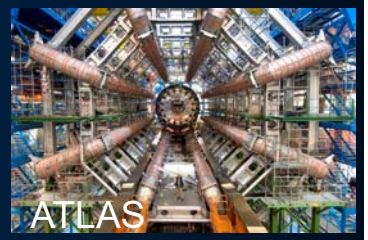
Turkey and CERN

- Turkey had Observer Status at CERN since 1961
- International Cooperation Agreement signed in 2008
- Application to join CERN made in 2009
- Turkey became an Associate Member State on 6 May 2015

Involvements of Turkish Physicists in CERN Programme

- Participation in experiments at CERN:
  - LHC: ATLAS, CMS, ALICE
  - non-LHC: involvements in OPERA, ISOLDE, CAST
- Collaboration in advanced accelerator R&D for CLIC and FCC.



Turkey and CERN

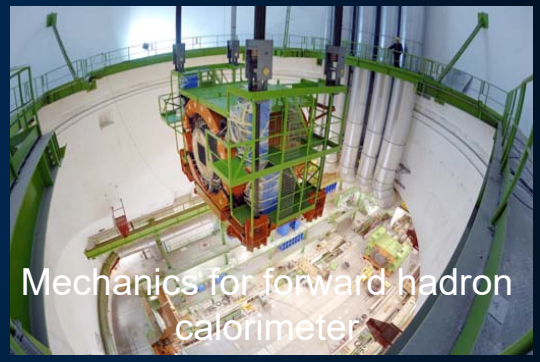
Strong involvement in the LHC experiments ATLAS and CMS

ATLAS
2 Institutions
Ankara University[1]
Bogazici University[2]


Contribution to the Inner Detector (TRT)

Innovative technologies developed

CMS
4 Institutes
Cukurova University, Adana
Middle-East Technical Univ., Ankara
Bogazici Univerity, Istanbul
Istanbul Technıcal Unı., Istanbul


Mechanics for forward hadron calorimeter

[1] includes also physicists from Dumlupinar University, Gazi University, TOBB University of Economy and Technology, TAEA Ankara
[2] includes also physicists from Dogus University Istanbul, Gaziantep University, Istanbul Technical Univ.


LHCb
ATLAS
CERN Meyrin
CERN Prévessin
SPS 7 km
SUISSE
FRANCE
CMS
ALICE
LHC 27 km
Thank You!
Teşekkürler !
CERN
Accelerating Science and Innovation