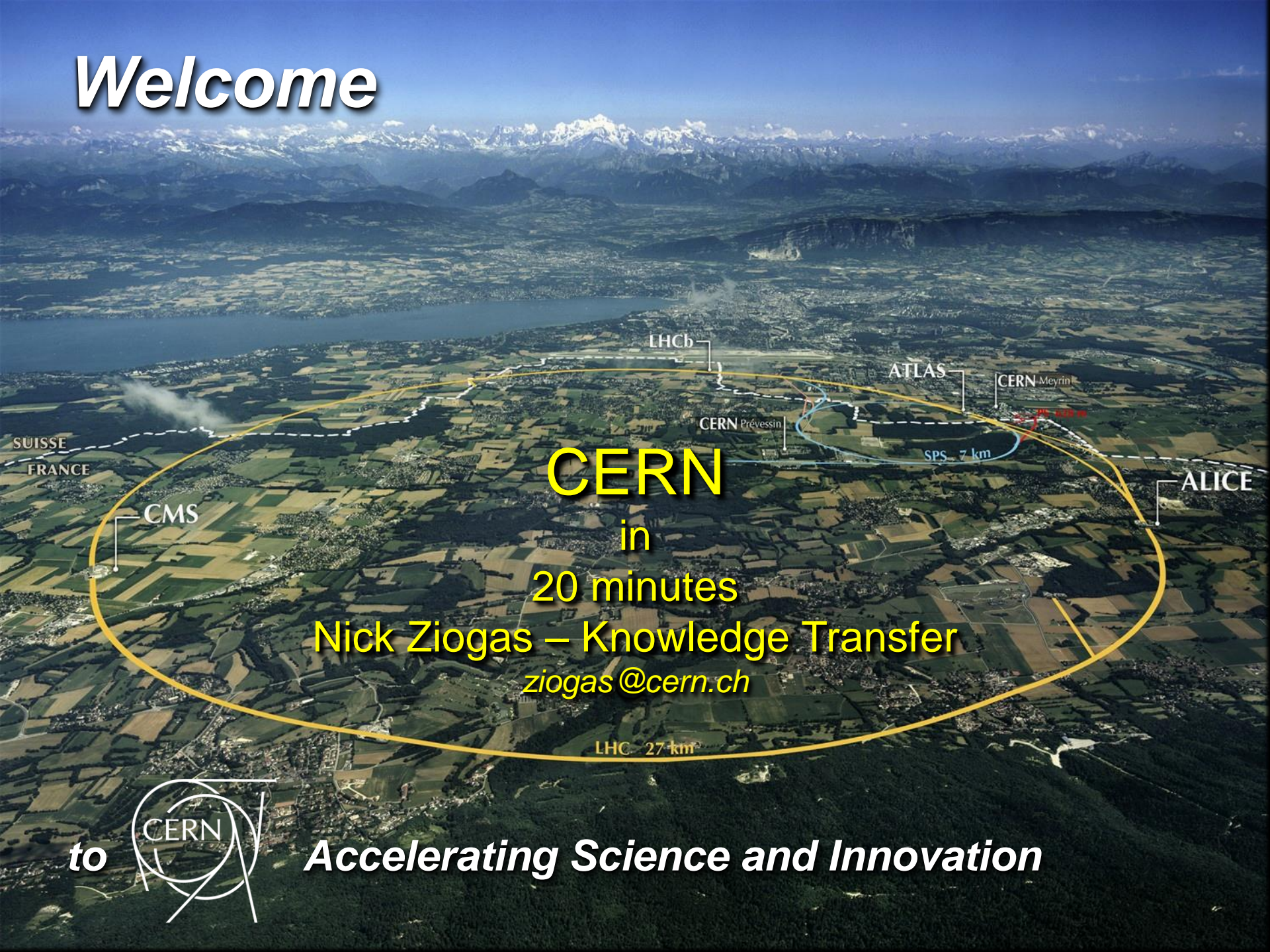


Welcome



CERN

in

20 minutes

Nick Ziogas – Knowledge Transfer

ziogas@cern.ch



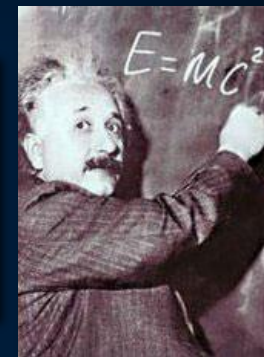
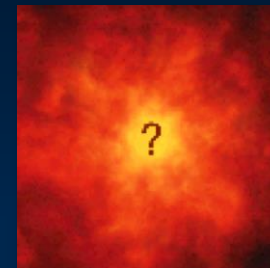
Accelerating Science and Innovation



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?

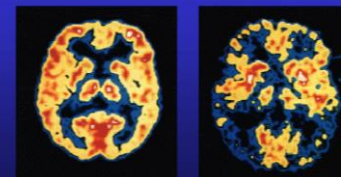


❑ Develop new technologies for accelerators and detectors

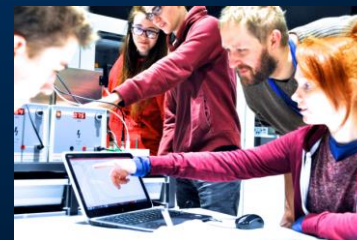
Information technology - the Web and the GRID
Medicine - diagnosis and therapy



Brain Metabolism in Alzheimer's Disease: PET Scan



❑ 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

~ 2500 staff

~ 1800 other paid personnel

~ 13000 scientific users

Budget (2017) ~ 1100 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 Members in the Pre-Stage to Membership: Cyprus, Serbia, Slovenia

Associate Member States: India, Lithuania, Pakistan, Turkey, Ukraine

Applications for Membership or Associate Membership:

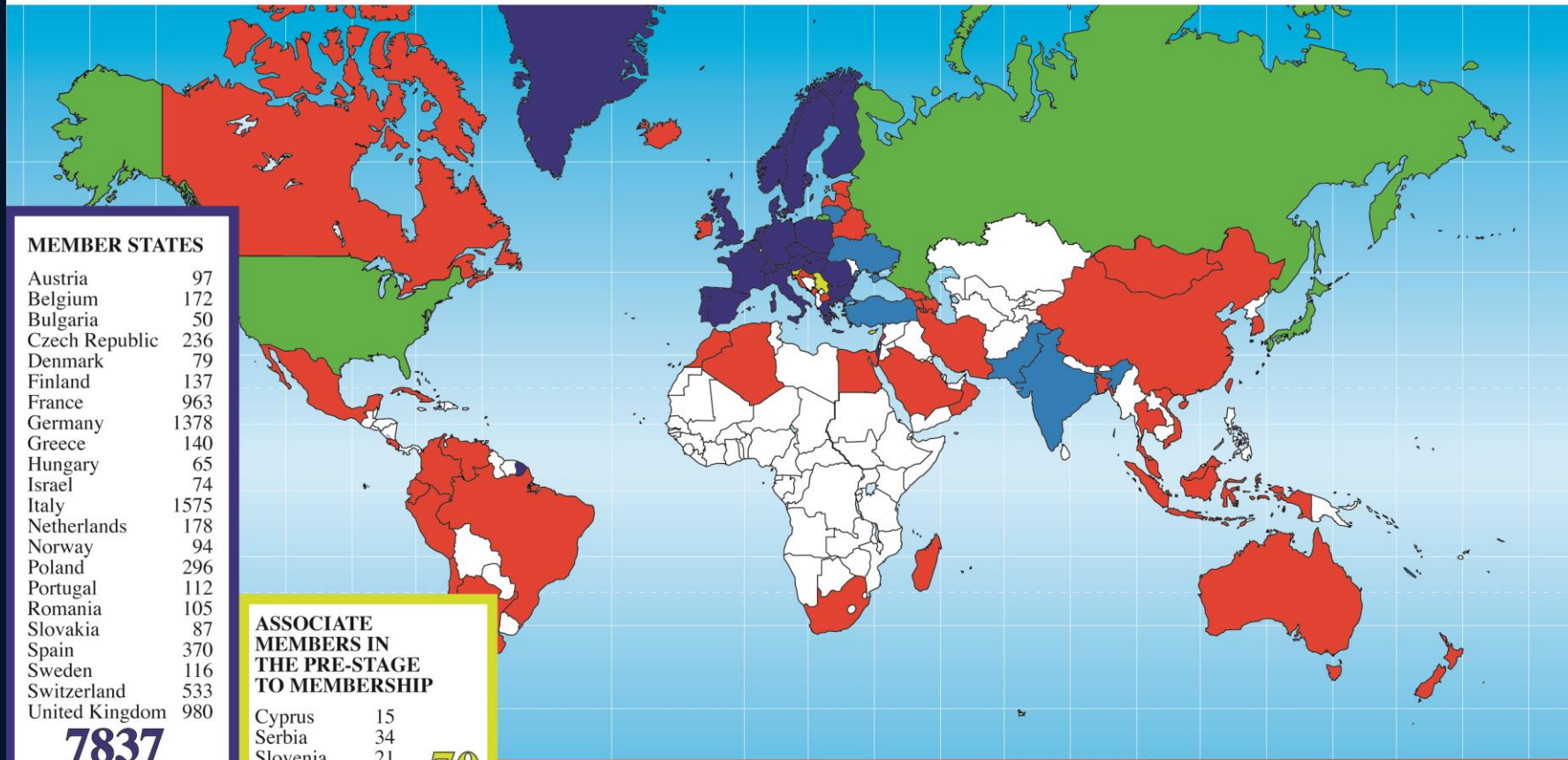
Brazil, Croatia

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



Science is getting more and more global

Distribution of All CERN Users by Location of Institute on 5 July 2017



MEMBER STATES

Austria	97
Belgium	172
Bulgaria	50
Czech Republic	236
Denmark	79
Finland	137
France	963
Germany	1378
Greece	140
Hungary	65
Israel	74
Italy	1575
Netherlands	178
Norway	94
Poland	296
Portugal	112
Romania	105
Slovakia	87
Spain	370
Sweden	116
Switzerland	533
United Kingdom	980

7837

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

Cyprus	15
Serbia	34
Slovenia	21

70

ASSOCIATE MEMBERS 463

India	233
Lithuania	26
Pakistan	36
Turkey	131
Ukraine	37

OBSERVERS

Japan	263
Russia	1068
USA	2152

3483

OTHERS

Algeria	1	Chile	24	Hong Kong	26	Malta	6	South Africa	60
Argentina	23	China	243	Iceland	5	Mexico	68	Taiwan	74
Armenia	19	Colombia	28	Indonesia	7	Mongolia	2	Thailand	19
Australia	37	Costa Rica	1	Iran	28	Montenegro	4	TFYROM	2
Azerbaijan	4	Croatia	27	Ireland	9	Morocco	11	Venezuela	1
Bangladesh	4	Cuba	3	Korea	160	New Zealand	8	Viet Nam	1
Belarus	24	Ecuador	2	Latvia	1	Oman	10		
Brazil	136	Egypt	27	Lebanon	8	Peru	2		
Canada	191	Estonia	19	Madagascar	3	Saudi Arabia	1		
		Georgia	28	Malaysia	8	Singapore	4		

1369



Science is getting more and more global

Distribution of All CERN Users by Nationality on 5 July 2017



ASSOCIATE MEMBERS 750	
India	360
Lithuania	40
Pakistan	61
Turkey	179
Ukraine	110

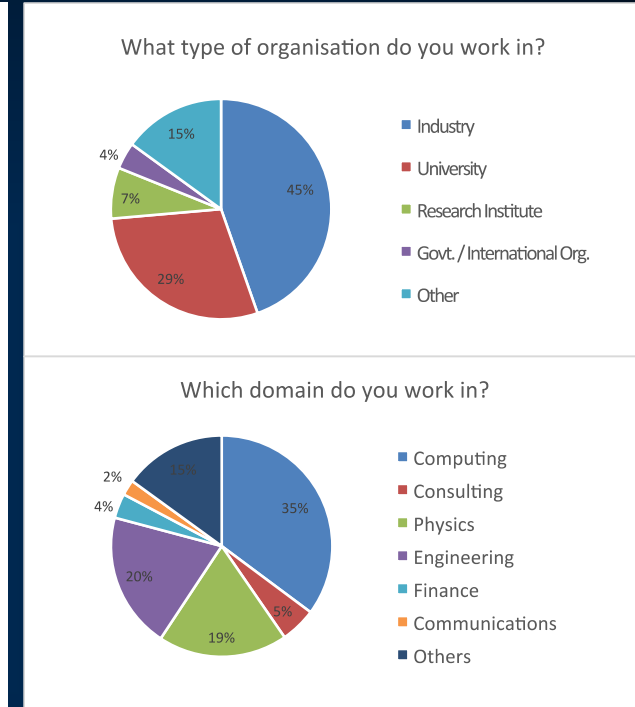
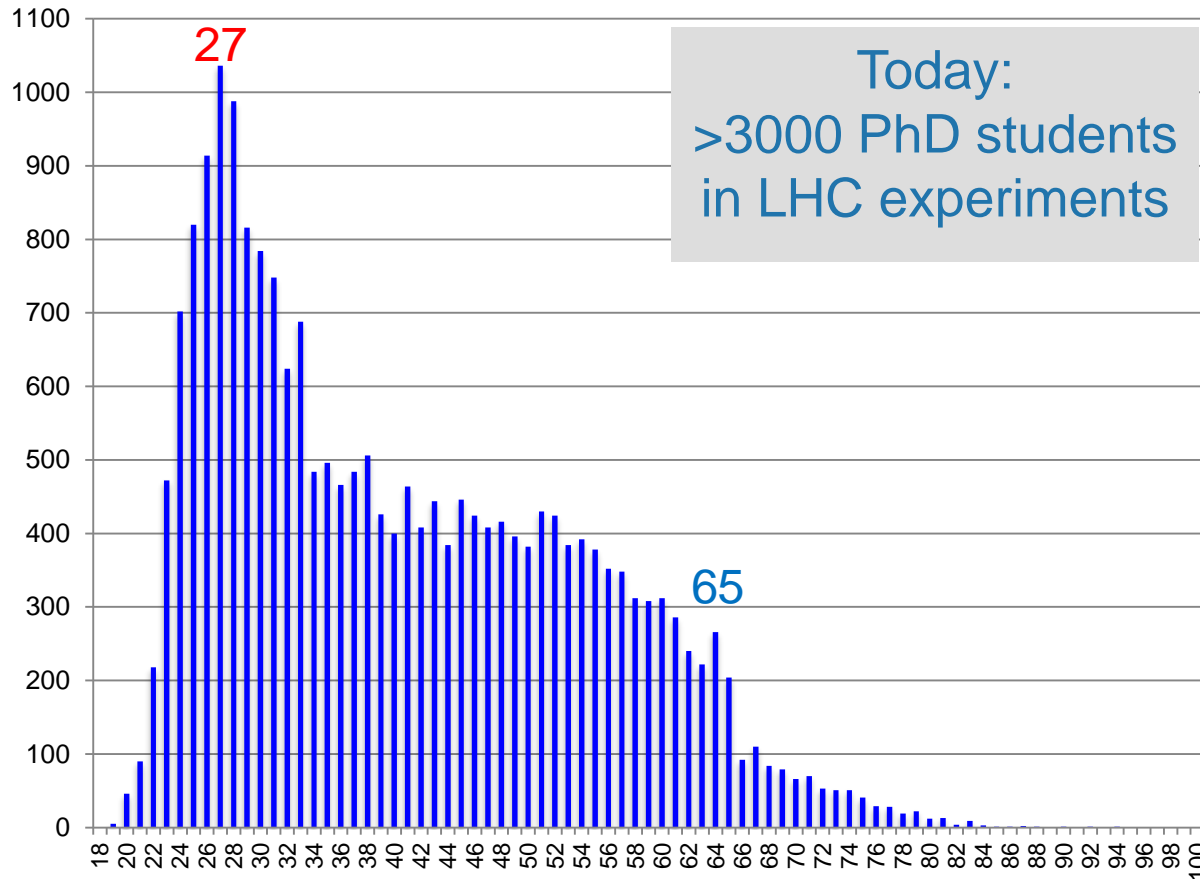
ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP 104	
Cyprus	26
Serbia	47
Slovenia	31

OTHERS 1825	
Albania	3
Algeria	14
Argentina	24
Armenia	25
Australia	30
Azerbaijan	9
Bangladesh	12
Belarus	47
Bolivia	3
Bosnia & Herzegovina	1
Brazil	131
Burundi	1
Cameroon	1
Canada	161
Chile	22
China	482
Colombia	45
Costa Rica	1
Croatia	41
Cuba	15
Ecuador	4
Egypt	33
El Salvador	1
Estonia	17
Georgia	45
Hong Kong	1
Iceland	5
Indonesia	11
Iran	52
Iraq	1
Ireland	17
Jordan	2
Kazakhstan	4
Kenya	3
Korea Rep.	175
Kyrgyzstan	1
Latvia	2
Lebanon	19
Luxembourg	2
Madagascar	3
Malaysia	12
Malta	7
Mauritius	1
Mexico	92
Mongolia	2
Montenegro	7
Morocco	18
Myanmar	1
Nepal	10
New Zealand	6
Nigeria	3
North Korea	1
Oman	9
Palestine (O.T.)	7
Paraguay	2
Peru	6
Philippines	4
Saint Kitts and Nevis	1
San Marino	1
Saudi Arabia	2
Senegal	2
Singapore	6
Saint Maarten	1
South Africa	39
Sri Lanka	4
Syria	2
Taiwan	53
Thailand	24
T.F.Y.R.O.M.	2
Tunisia	5
Uruguay	1
Uzbekistan	3
Venezuela	10
Viet Nam	12
Zambia	1
Zimbabwe	4



Age Distribution of Scientists

- and where they go afterwards

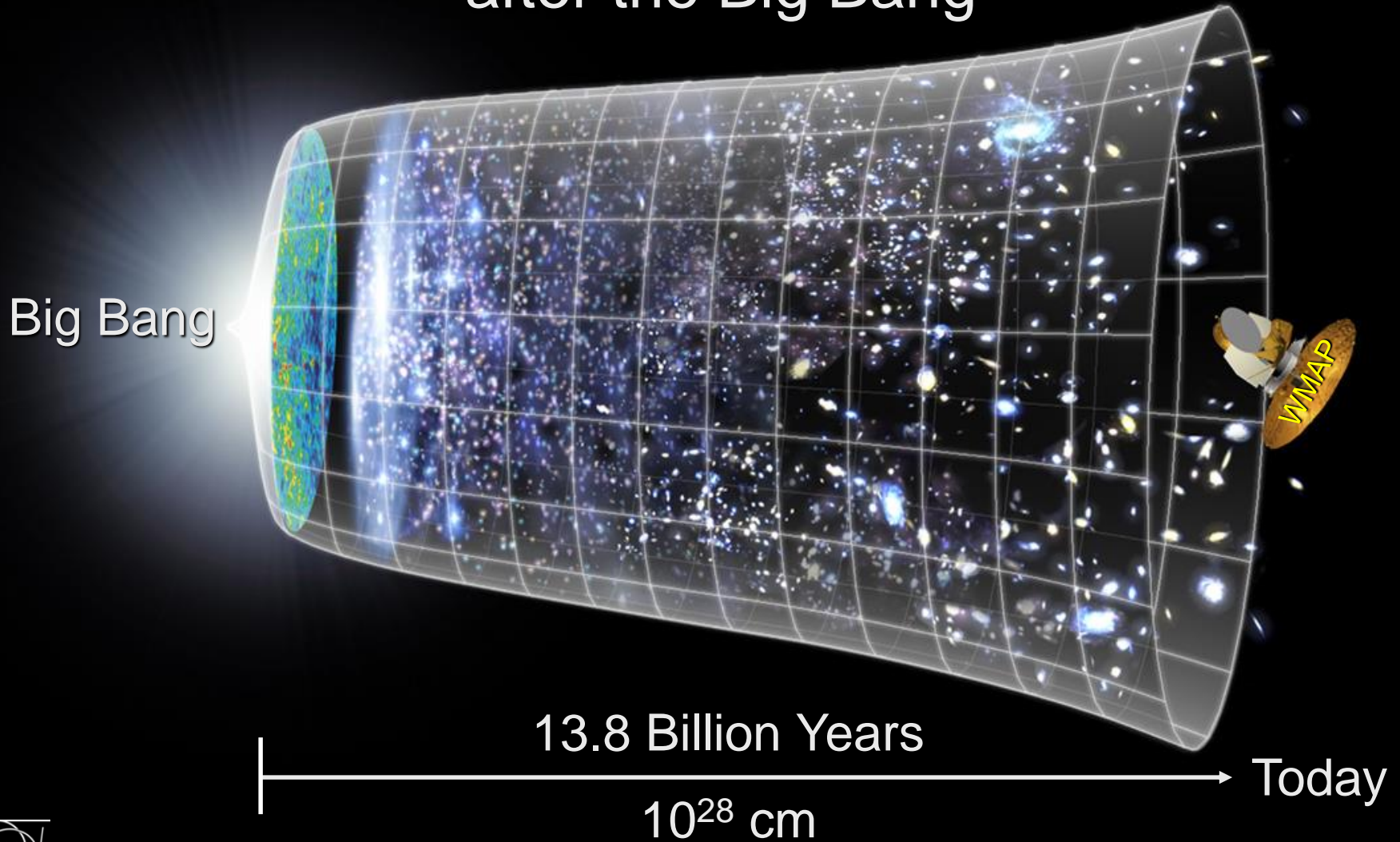


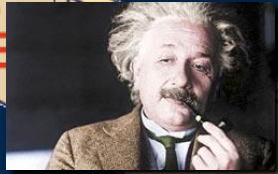
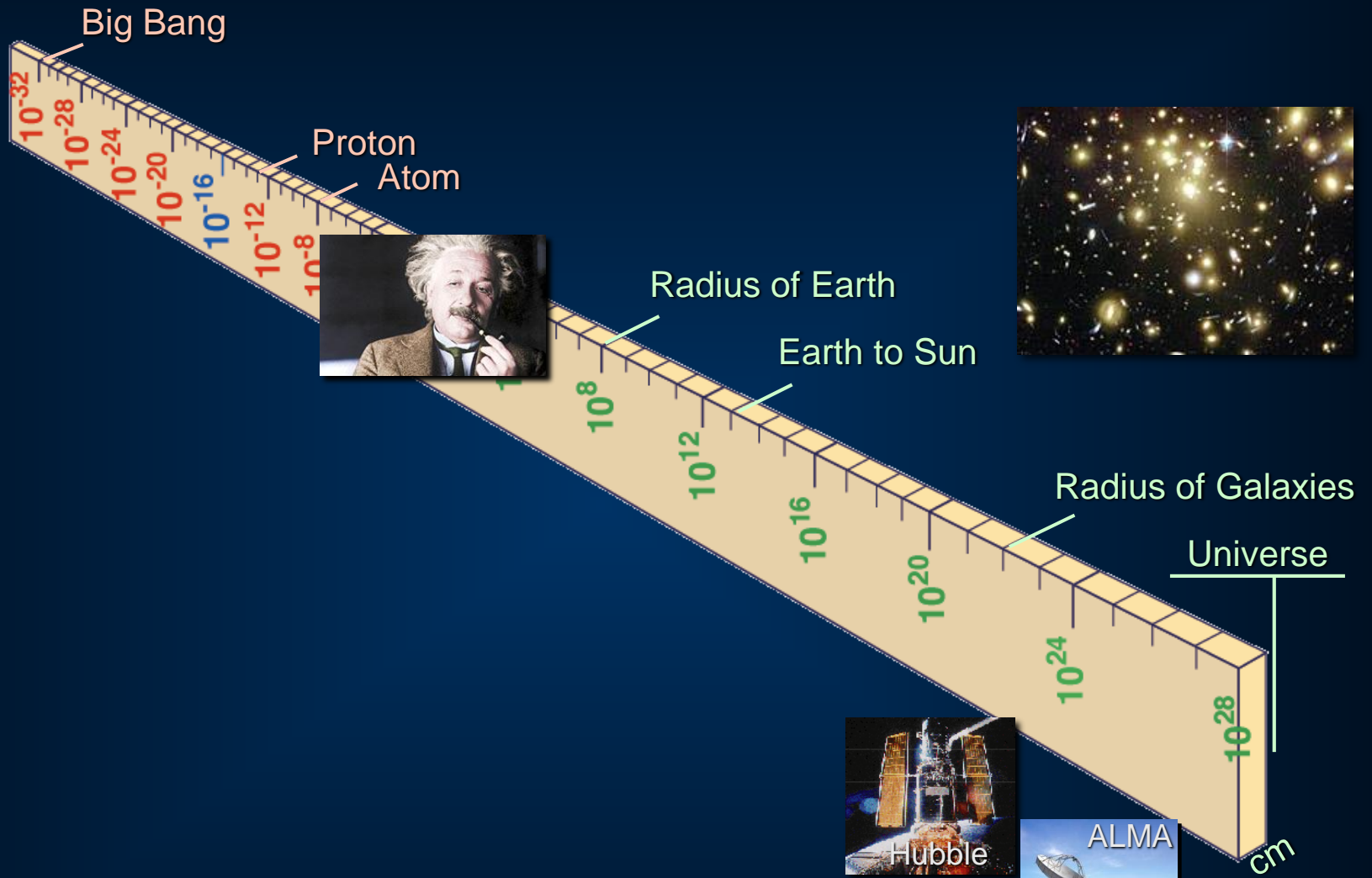
They do not all stay: where do they go?



Next Scientific Challenge:

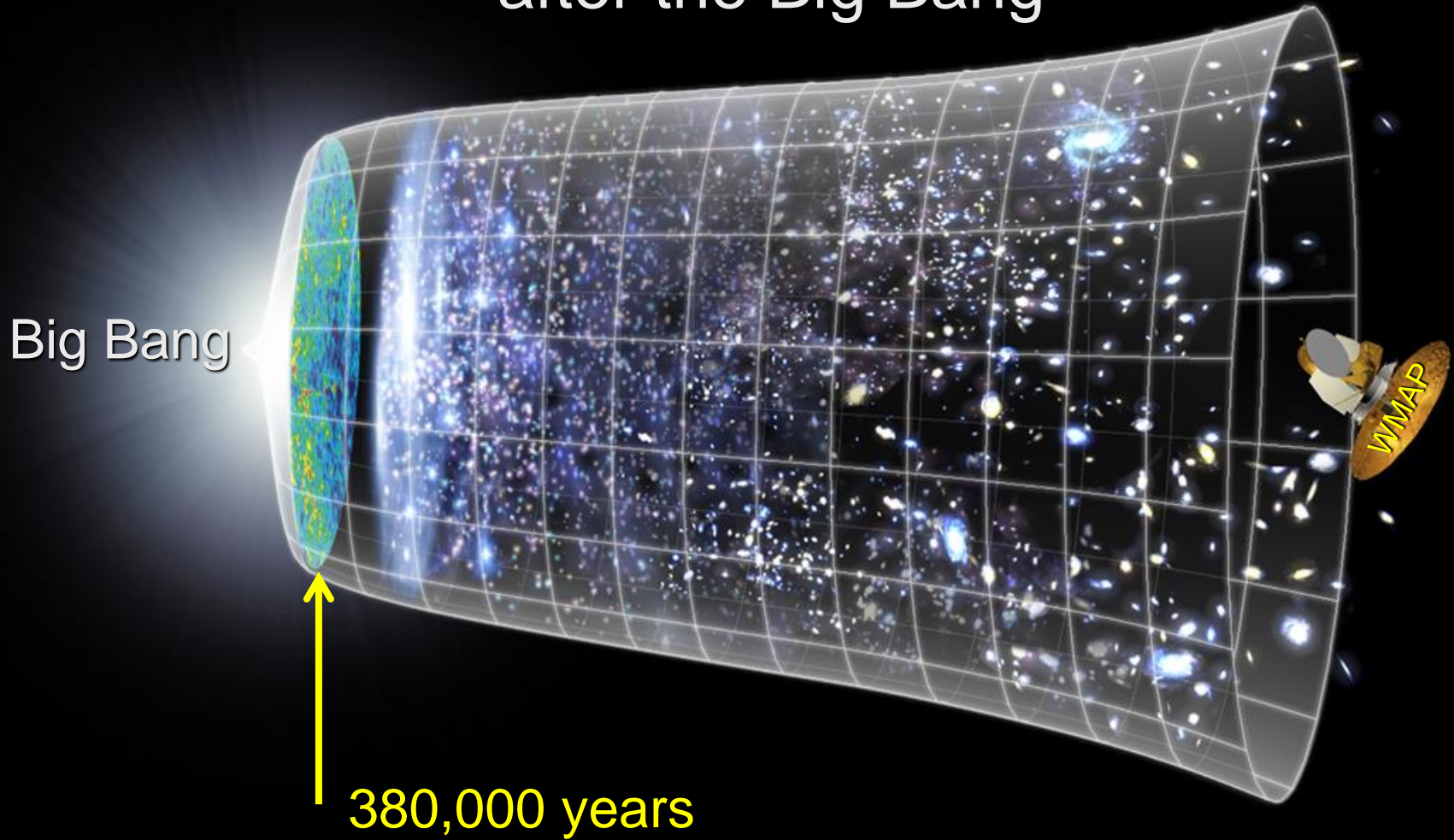
to understand the very first moments of our Universe
after the Big Bang

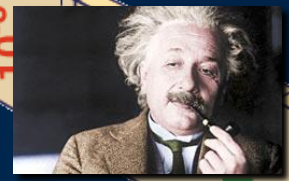
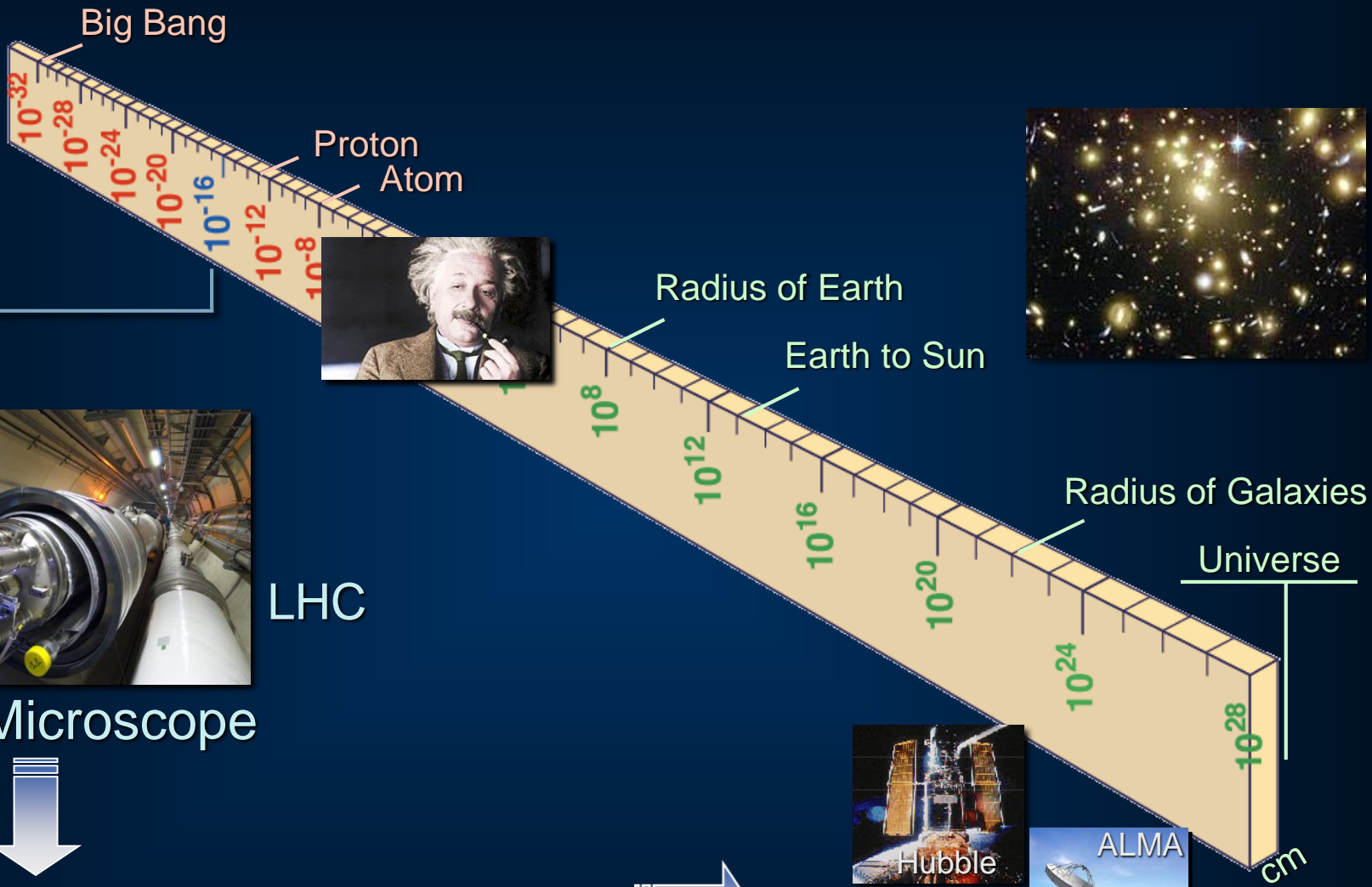




Next Scientific Challenge:

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





LHC

Super-Microscope



Reproducing conditions



Looking back



Hubble



ALMA



AMS



VLT



2010: a New Era in Fundamental Science



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"*.



CERN: Particle Physics and Innovation

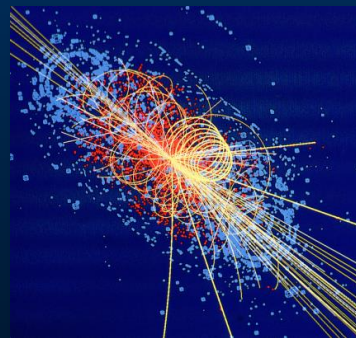
- **Interfacing** between fundamental science and key technological developments



- **CERN Technologies and Innovation**



Accelerating particle beams



Detecting particles



Large-scale computing (Grid)

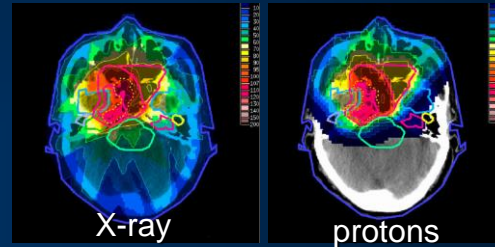
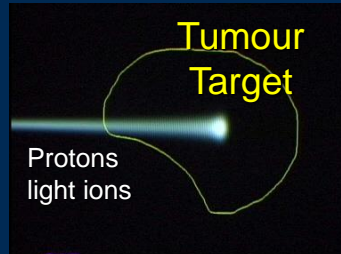
Medical Application as an Example of Particle Physics Spin-off

Combining Physics, ICT, Biology and Medicine to fight cancer



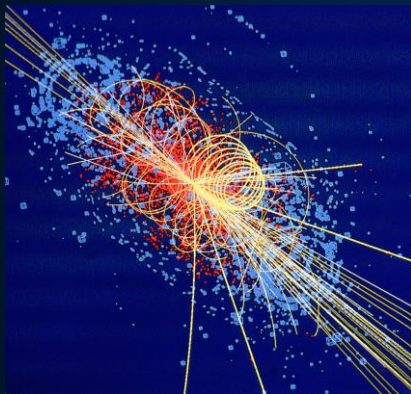
Hadron Therapy

Accelerating particle beams
~30'000 accelerators worldwide
~17'000 used for medicine



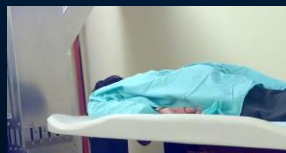
Leadership in Ion Beam Therapy now in Europe and Japan

>100'000 patients treated worldwide (45 facilities)
>50'000 patients treated in Europe (14 facilities)

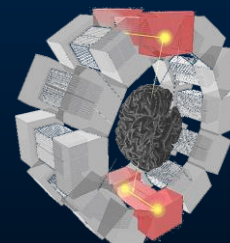


Imaging

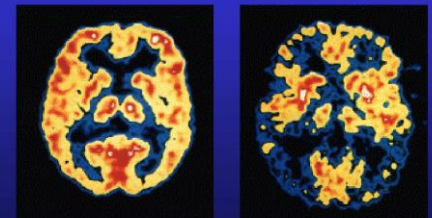
Clinical trial in Portugal, France and Italy for new breast imaging system (ClearPEM)



PET Scanner



Brain Metabolism in Alzheimer's Disease: PET Scan



Normal Brain

Alzheimer's Disease

Detecting particles

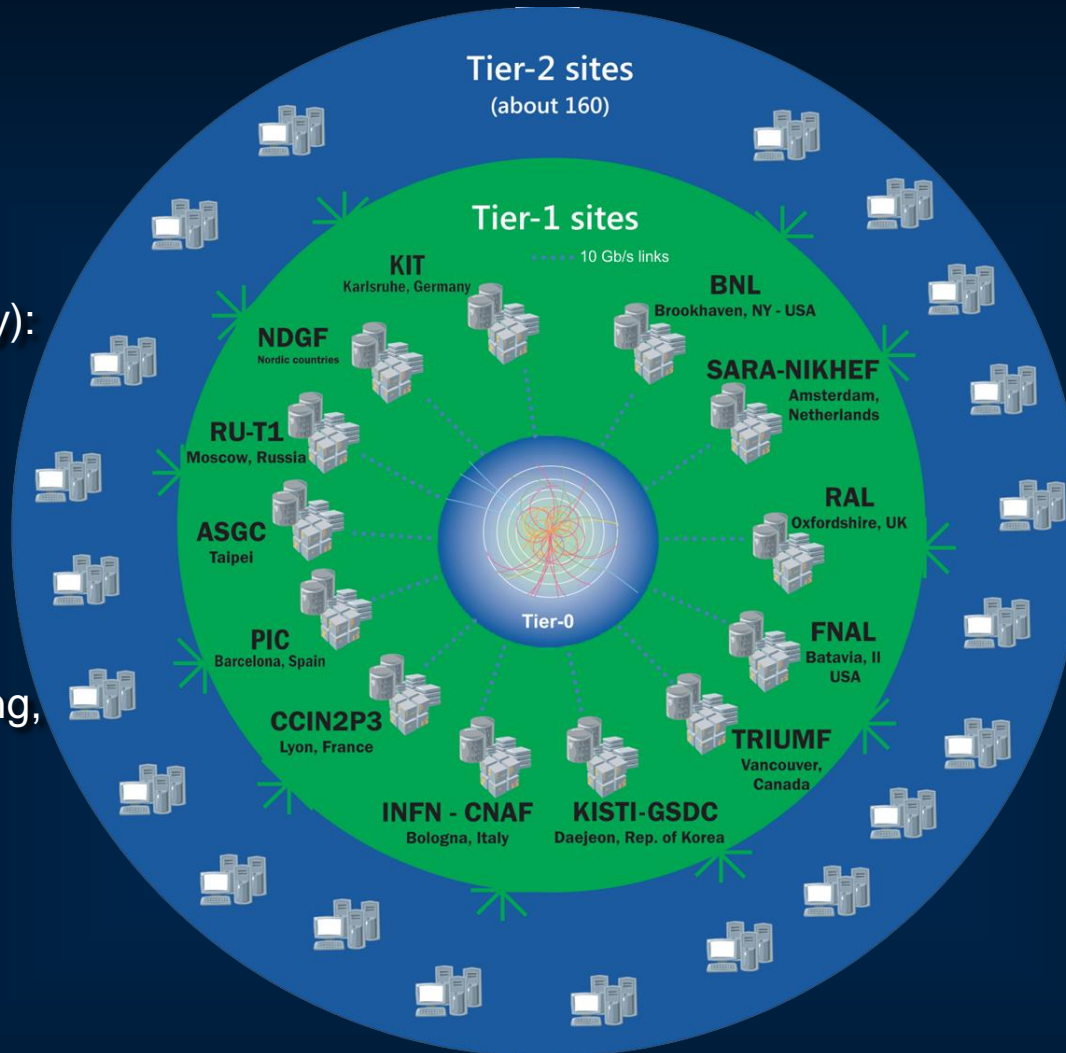


The Worldwide LHC Computing Grid

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

Tier-1: permanent
storage, reprocessing,
analysis

Tier-2: simulation,
end-user analysis



>170 sites in,
42 countries

750k CPU cores

800 PB of storage

> 2 million jobs/day

35 GB/s global
transfers

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

Asia-Europe-Pacific
School of High-Energy
Physics

Fukuoka, Japan, 2012
Puri, India, 2014
China, 2016

Latin American School of
High-Energy Physics

Arequipa, Peru, 2013
Ibarra, Ecuador, 2015
San Juan del Rio, Mexico, 2017



Young Researchers

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

The 2016
European School
of High-Energy
Physics

Skauvammen, Norway, 15 - 28 June 2016

CERN School of Physics
Norway, June 2016

Undergraduates

Summer Students
Programme

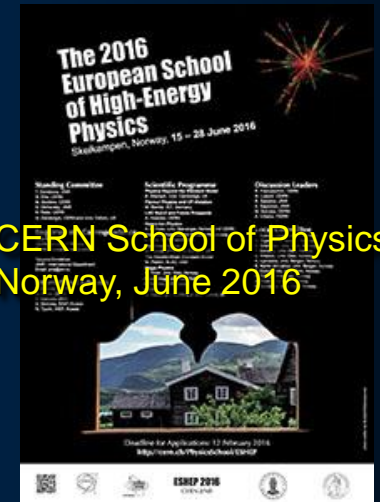


CERN Teacher Schools

International and National
Programmes

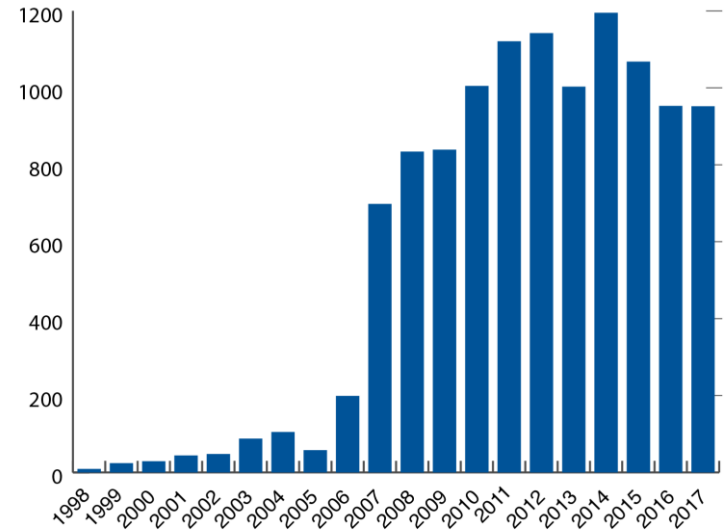
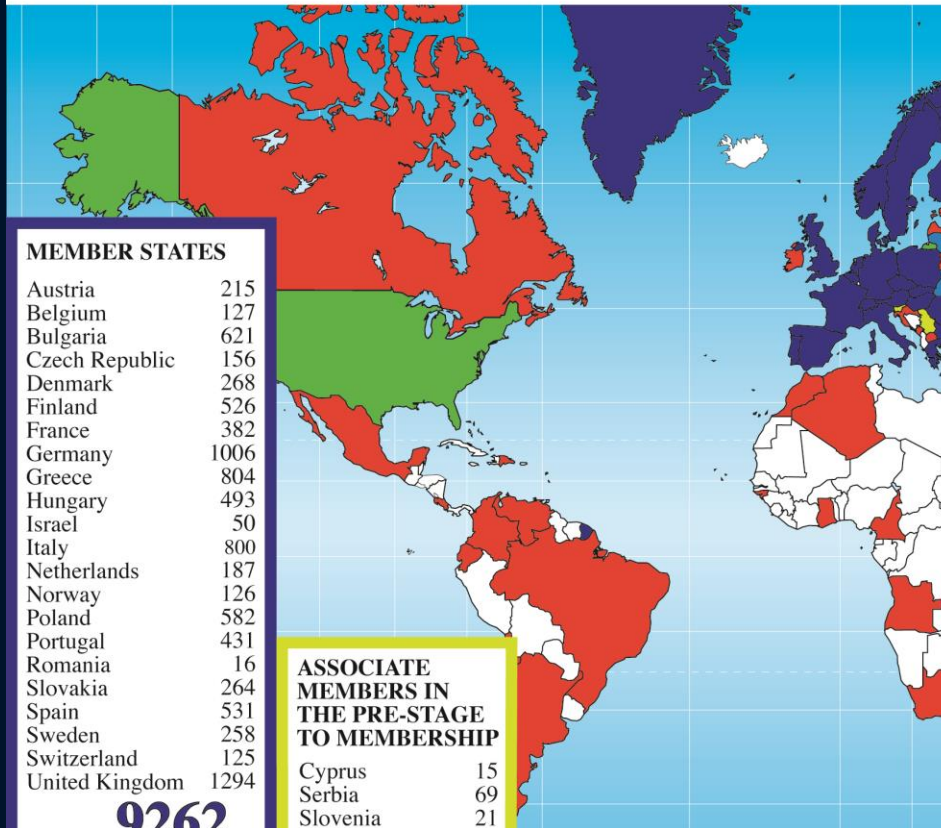
Public visitors

120 thousand per year



CERN Teacher Programme

Teacher Programme Participants 1998 - 2017 (Total: 11414)



MEMBER STATES

Austria	215
Belgium	127
Bulgaria	621
Czech Republic	156
Denmark	268
Finland	526
France	382
Germany	1006
Greece	804
Hungary	493
Israel	50
Italy	800
Netherlands	187
Norway	126
Poland	582
Portugal	431
Romania	16
Slovakia	264
Spain	531
Sweden	258
Switzerland	125
United Kingdom	1294

9262

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

Cyprus	15
Serbia	69
Slovenia	21

105

ASSOCIATE MEMBERS

India	7
Lithuania	53
Pakistan	4
Turkey	282
Ukraine	155

501

OBSERVERS

Japan	10
Russia	387
USA	108

505

OTHERS

Algeria	9	Cameroon	7	Estonia	80	Lebanon	20	New Zealand	2	Thailand	16
Angola	7	Canada	11	Georgia	138	Macedonia	13	Palestine (O.T.)	4	Timor-Leste	9
Argentina	1	Cape Verde	4	Ghana	6	Madagascar	2	Qatar	1	Uganda	3
Armenia	3	Chile	3	Guinea Bissau	1	Malta	37	Rwanda	20	U.A.E.	1
Australia	9	China	2	Indonesia	1	Mexico	64	Sao Tome	7	Venezuela	1
Azerbaijan	2	Colombia	2	Iran	9	Moldova	4	Saudi Arabia	1		
Bahrain	2	Costa Rica	4	Ireland	9	Mongolia	1	Singapore	2		
Belarus	4	Croatia	53	Jordan	12	Montenegro	15	South Africa	8		
Brazil	209	Dominican Rep.	72	Kazakhstan	13	Morocco	2	South Korea	49		
Burundi	2	Ecuador	2	Kenya	4	Mozambique	22	Swaziland	1		
		Egypt	2	Latvia	49	Nepal	3	Taiwan	1		

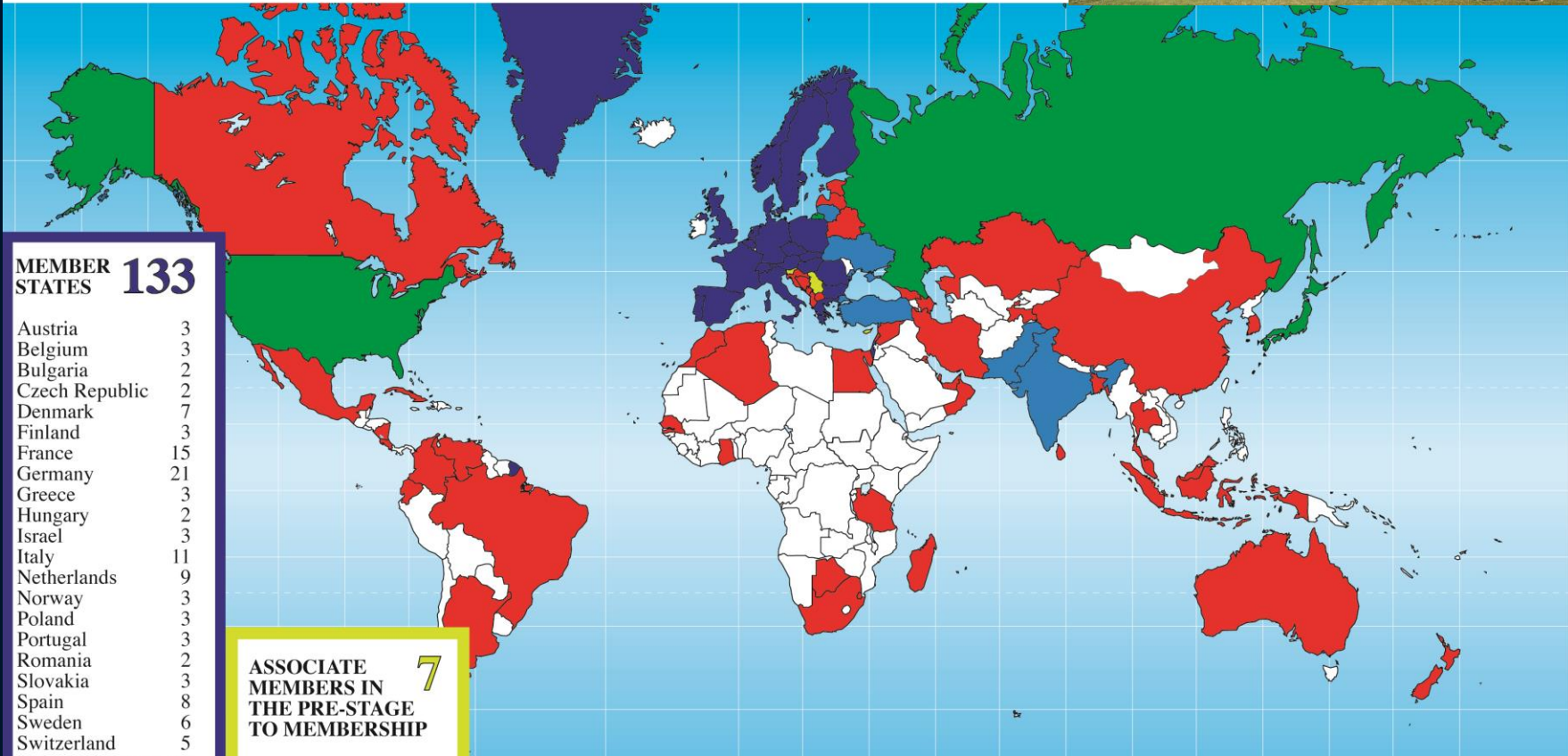
1041



Summer Students 2017



Summer Students 2017



MEMBER STATES 133

Austria	3
Belgium	3
Bulgaria	2
Czech Republic	2
Denmark	7
Finland	3
France	15
Germany	21
Greece	3
Hungary	2
Israel	3
Italy	11
Netherlands	9
Norway	3
Poland	3
Portugal	3
Romania	2
Slovakia	3
Spain	8
Sweden	6
Switzerland	5
United Kingdom	16

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP 7

Cyprus	4
Serbia	2
Slovenia	1

ASSOCIATE MEMBERS 18

India	3
Lithuania	7
Pakistan	2
Turkey	4
Ukraine	2

OBSERVERS 38

Japan	4
Russia	8
USA	26

OTHERS

Albania	1	Bosnia	1	Ecuador	1	Korea	2	New Zeland	1	Tadjikistan	1
Algeria	1	Botswana	1	Egypt	3	Kuwait	1	Nicaragua	1	Tanzania	1
Argentina	1	Brazil	2	Estonia	5	Latvia	2	Oman	1	Thailand	4
Austarlia	1	Canada	5	Georgia	1	Lebanon	3	Palestine	2	T.F.Y.R.O.M.	1
Azerbaijan	1	China	6	Ghana	1	Malaysia	4	Qatar	2	U.A.E.	2
Bangladesh	1	Colombia	1	Hong Kong	3	Malta	3	Singapore	2	Venezuela	1
Belarus	1	Costa Rica	3	Indonesia	2	Mexico	1	Syria	2		
		Croatia	2	Iran	3	Montenegro	2	South Africa	2		
		Cuba	1	Kazakhstan	2	Marocco	1	Sri Lanka	4		





Thank You!



Accelerating Science and Innovation



Thank You!



Accelerating Science and Innovation