CERN: Sixty years of science for peace and development

IPU Committee on Middle East Questions

Second Roundtable on Water: From words to action

Geneva, 6 - 7 July 2017

Session 5: Science models to promote the dialogue and Science for Peace School

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- **Introduction to CERN**
- **CERN's advocacy for science in the international Community**
- **Science and diplomacy; science for peace.**
- **Science for Peace Schools**

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

~ 2300 staff
~ 1400 other paid personnel
~ 12500 scientific users

Budget (2016) ~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

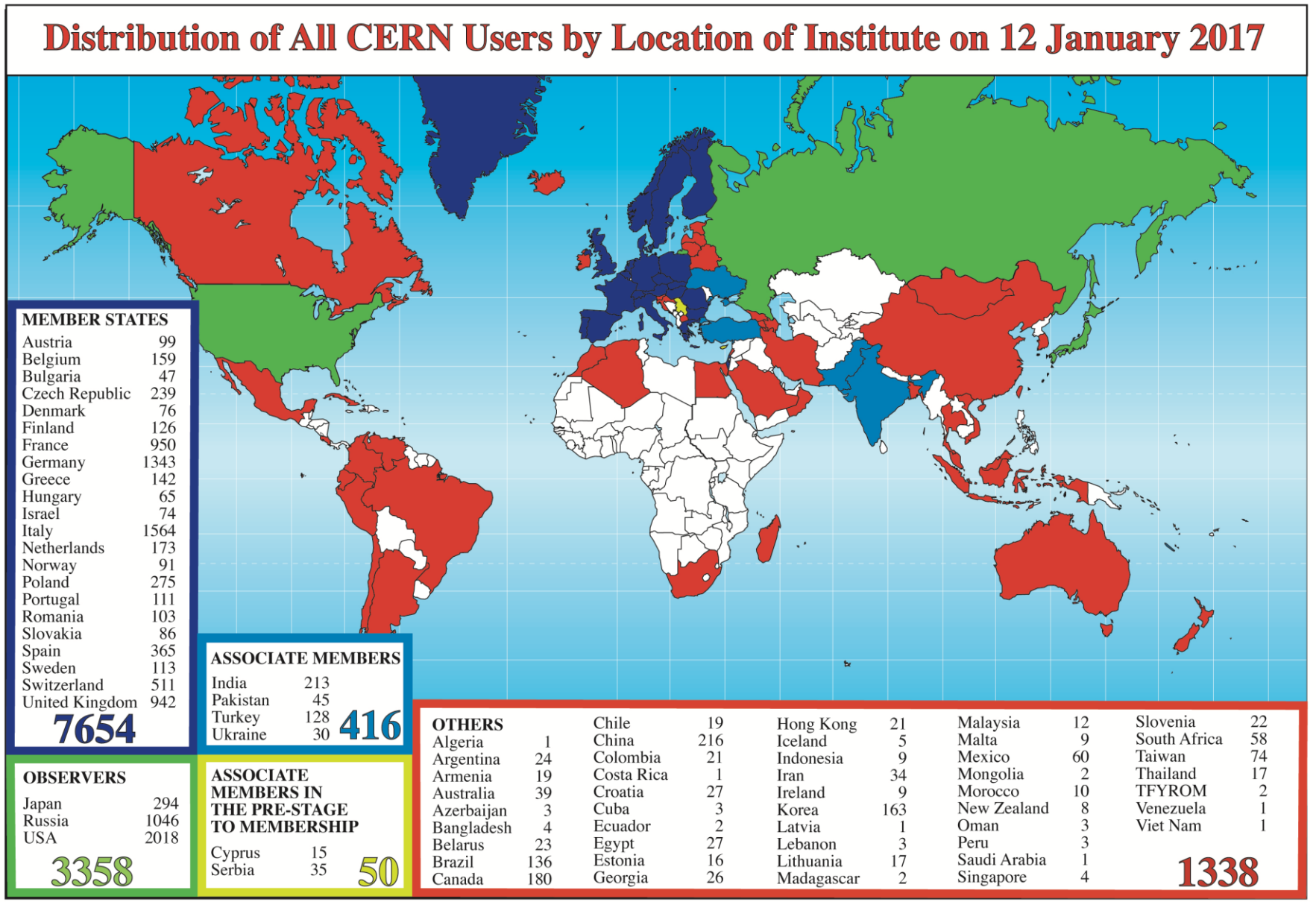
Associate Member States: India, Pakistan, Slovenia, Turkey, Ukraine

States in accession to Membership: Cyprus, Serbia

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

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

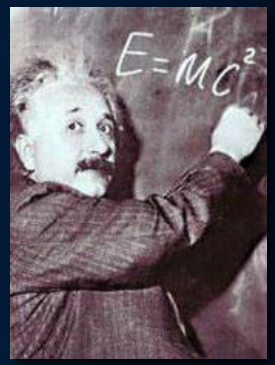
Science is getting more and more global



The Mission of CERN

- **Push back** the frontiers of knowledge

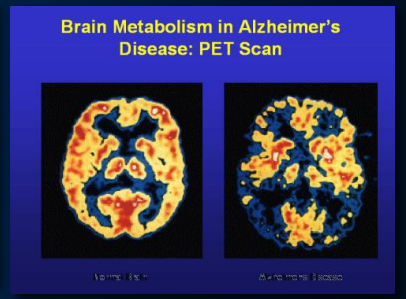
  E.g. the secrets of the Big Bang …what was the matter like within the first moments of the Universe's existence?



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

  Information technology - the Web and the GRID

  Medicine - diagnosis and therapy

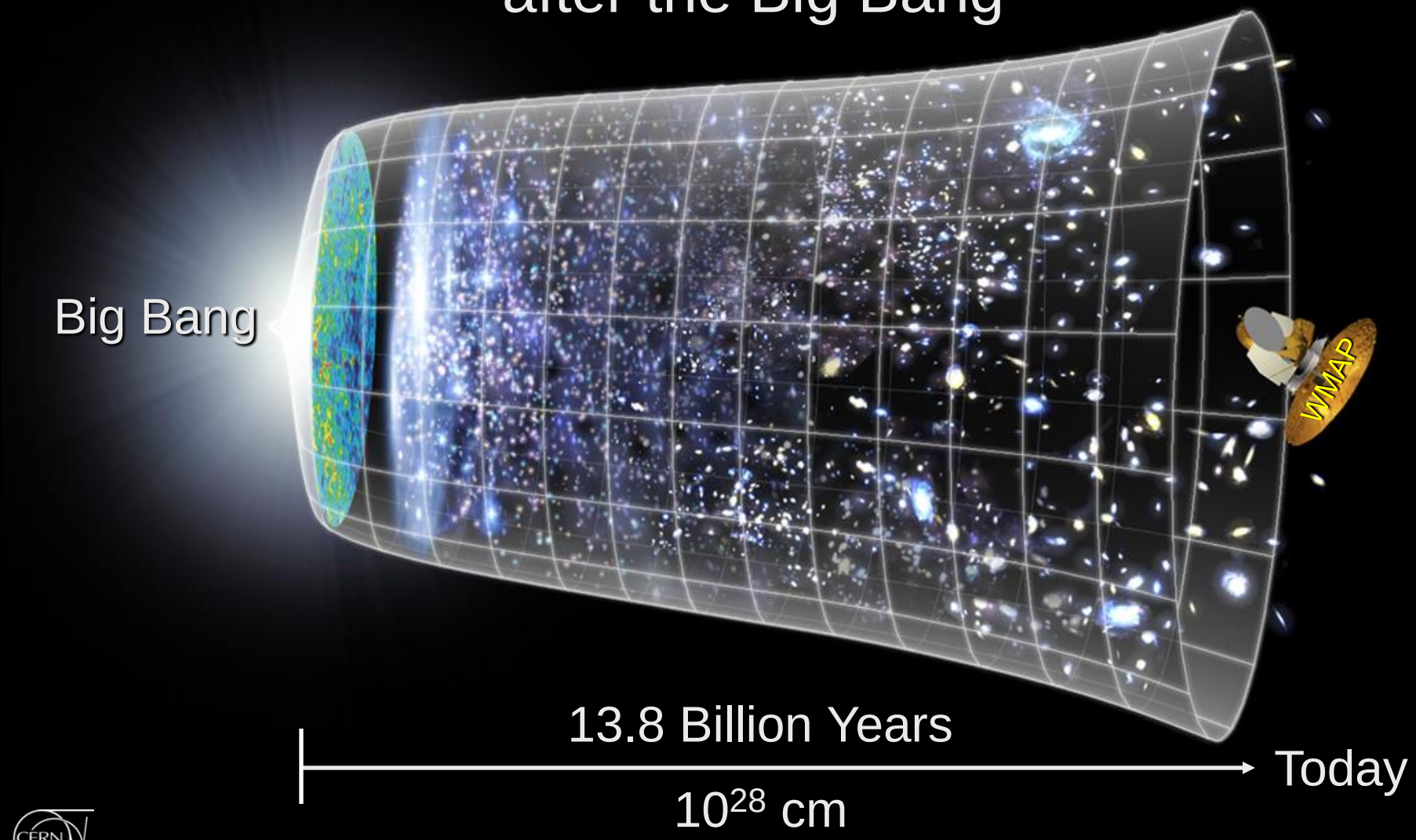


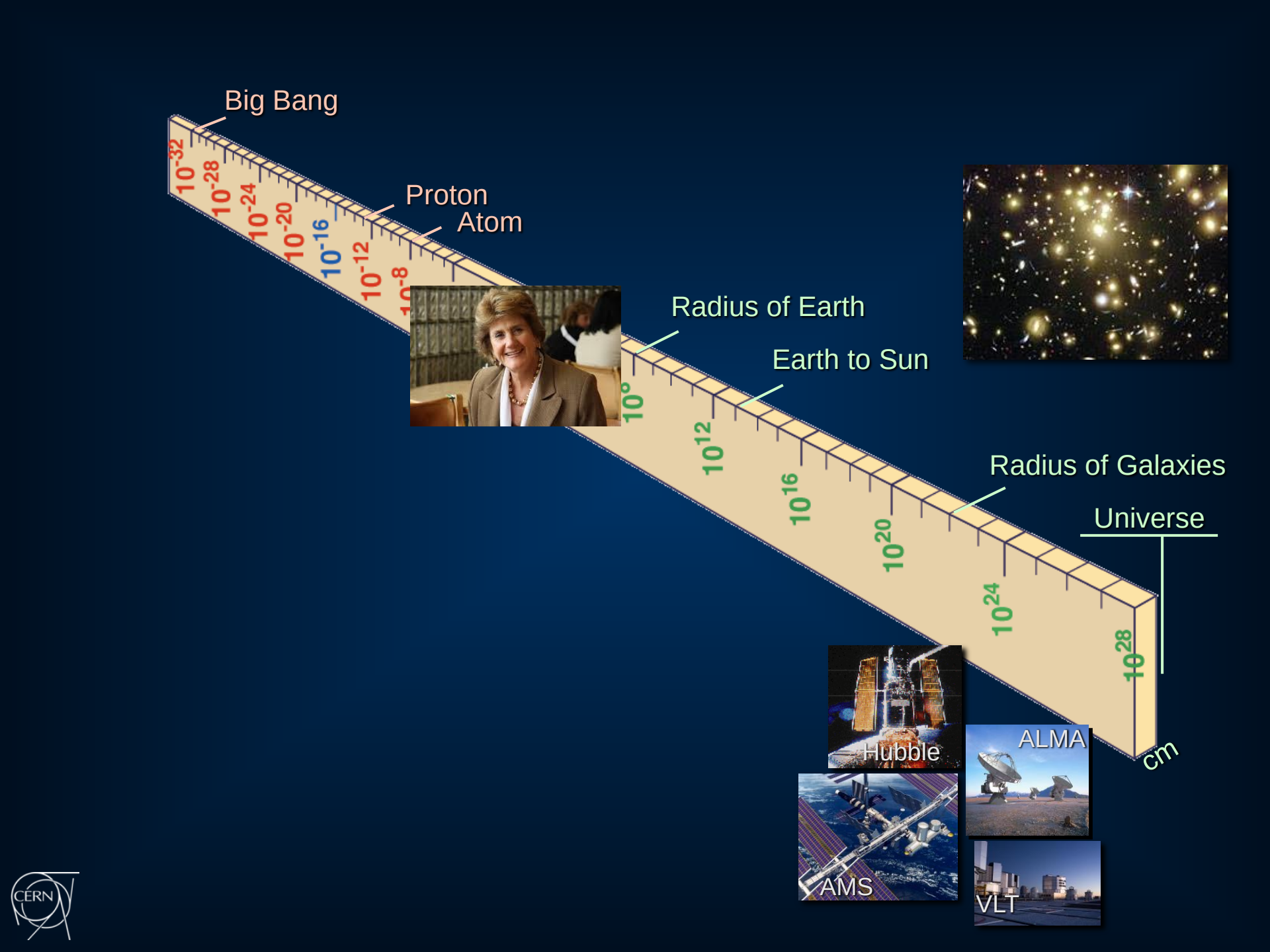
- **Train** scientists and engineers of tomorrow

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

Our Scientific Challenge:

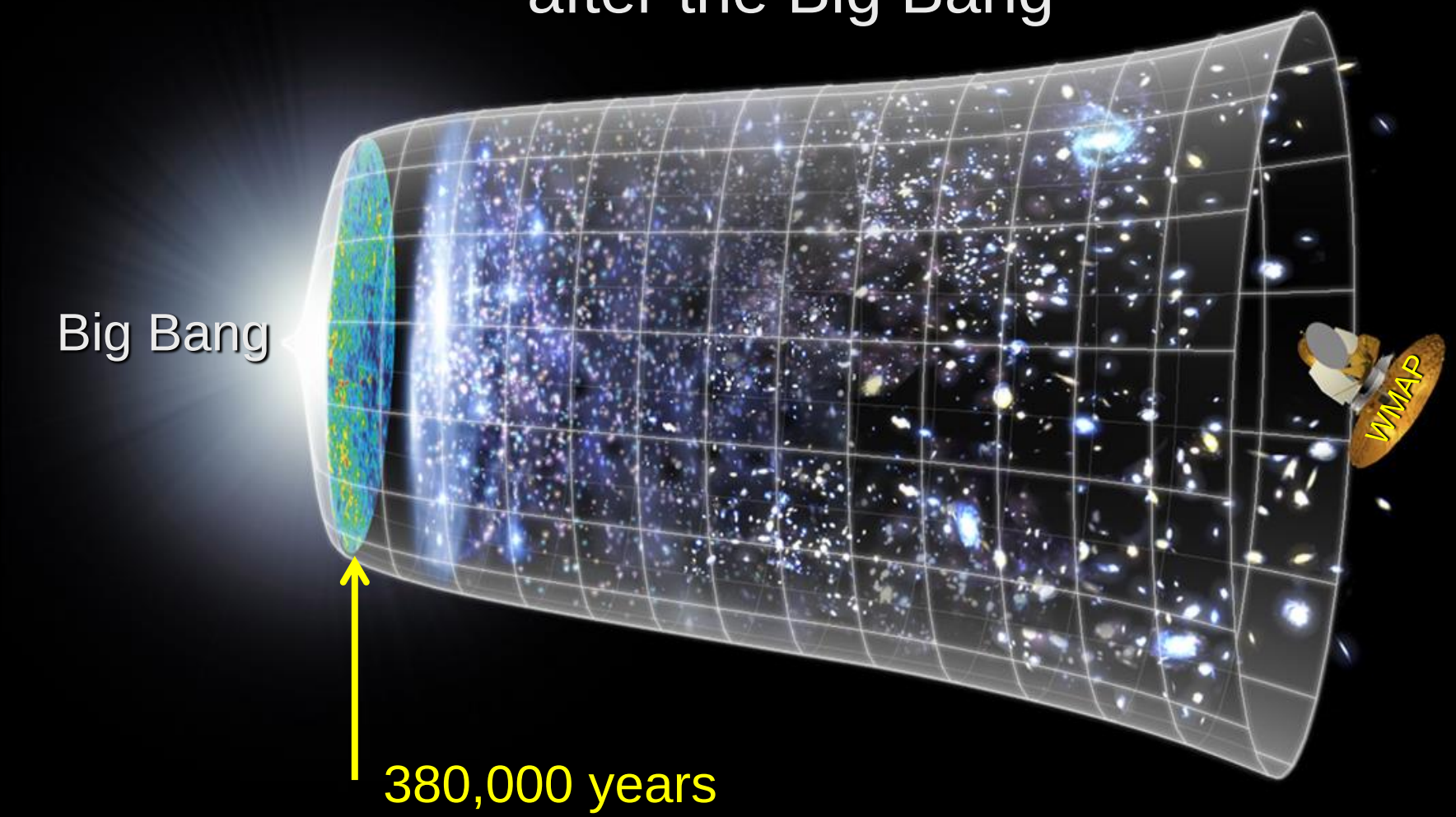
to understand the very first moments of our Universe after the Big Bang

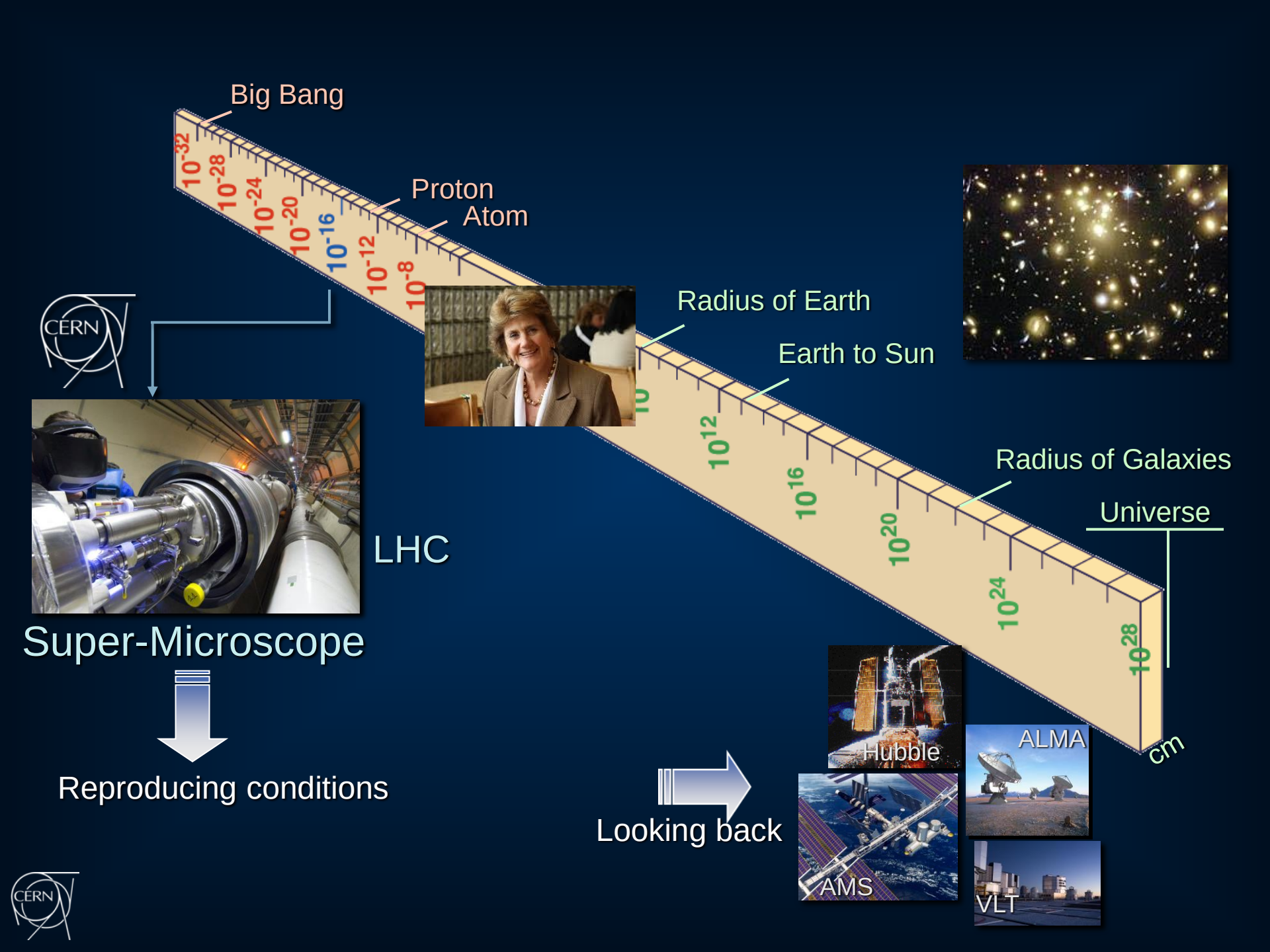



Big Bang
Proton
Atom
Radius of Earth
Earth to Sun
Radius of Galaxies
Universe
10^{-32}
10^{-28}
10^{-24}
10^{-20}
10^{-16}
10^{-12}
10^{-8}
10^{0}
10^{12}
10^{16}
10^{20}
10^{24}
10^{28}
cm
Hubble
ALMA
AMS
VLT
CERN

Our 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
cm
LHC
Super-Microscope
Reproducing conditions
Looking back
Hubble
ALMA
AMS
VLT


CMS
LHCb
ALICE
ATLAS

$-D \nabla n = \vec{J}_{diff}$ Fick's law — current (density): $\frac{\text{number}}{\text{Area time}}$

$j_{diff} = (-e)(-D \nabla n)$ El. current — $\frac{\text{charge}}{\text{Area time}}$

$\vec{E} = -\nabla \Phi$

$v_{drift} = (-e\vec{E}) \tau$ relaxation time

$\vec{j} = (n \cdot e)(v_{drift})$

$\vec{v}_{drift} = \mu \cdot \vec{E}$

$\vec{j}_{drift} = ne\mu\vec{E}$

$eD \nabla n + n \cdot e\mu \vec{E} = 0$

$\nabla \vec{n} \rightarrow \left(\frac{dn}{dx}, 0, 0\right)$

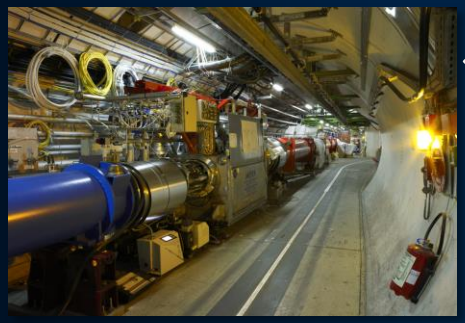
$\frac{1}{n}\frac{dn}{dx} = -\frac{\mu}{D}\left(-\frac{d}{dx}\Phi\right)$

$\ln n \Big|_a^b = \frac{\mu}{D}\left[\phi(b) - \phi(a)\right]$

$$E = m\,c^2$$

Medical Application as an Example of Particle Physics Spin-off

Combining Physics, ICT, Biology and Medicine to fight cancer

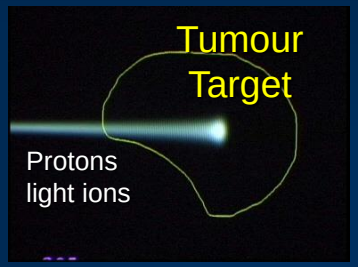


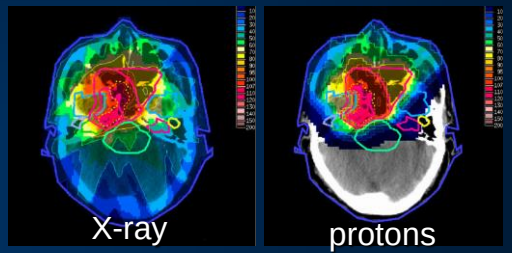
Accelerating particle beams

~30’000 accelerators worldwide

~17’000 used for medicine

Hadron Therapy

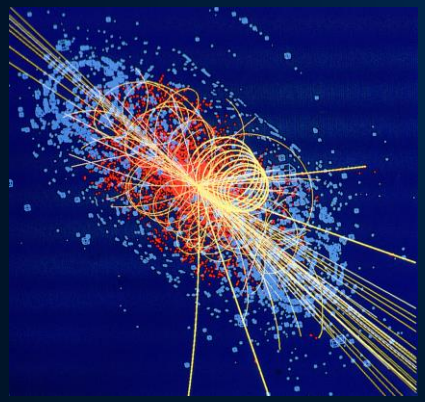




Leadership in Ion Beam Therapy now in Europe and Japan

>100’000 patients treated worldwide (45 facilities)

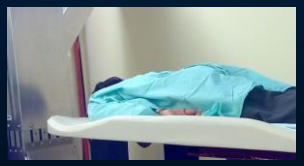
>50’000 patients treated in Europe (14 facilities)



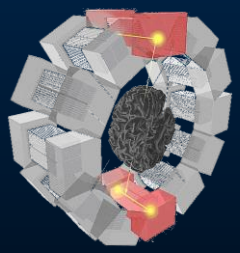
Detecting particles

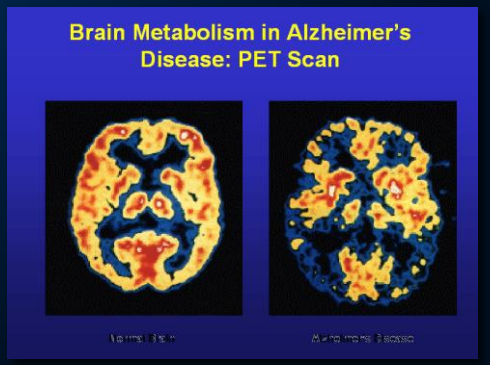
Imaging

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



PET Scanner





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

Summer Students 2015

Summer Students 2015

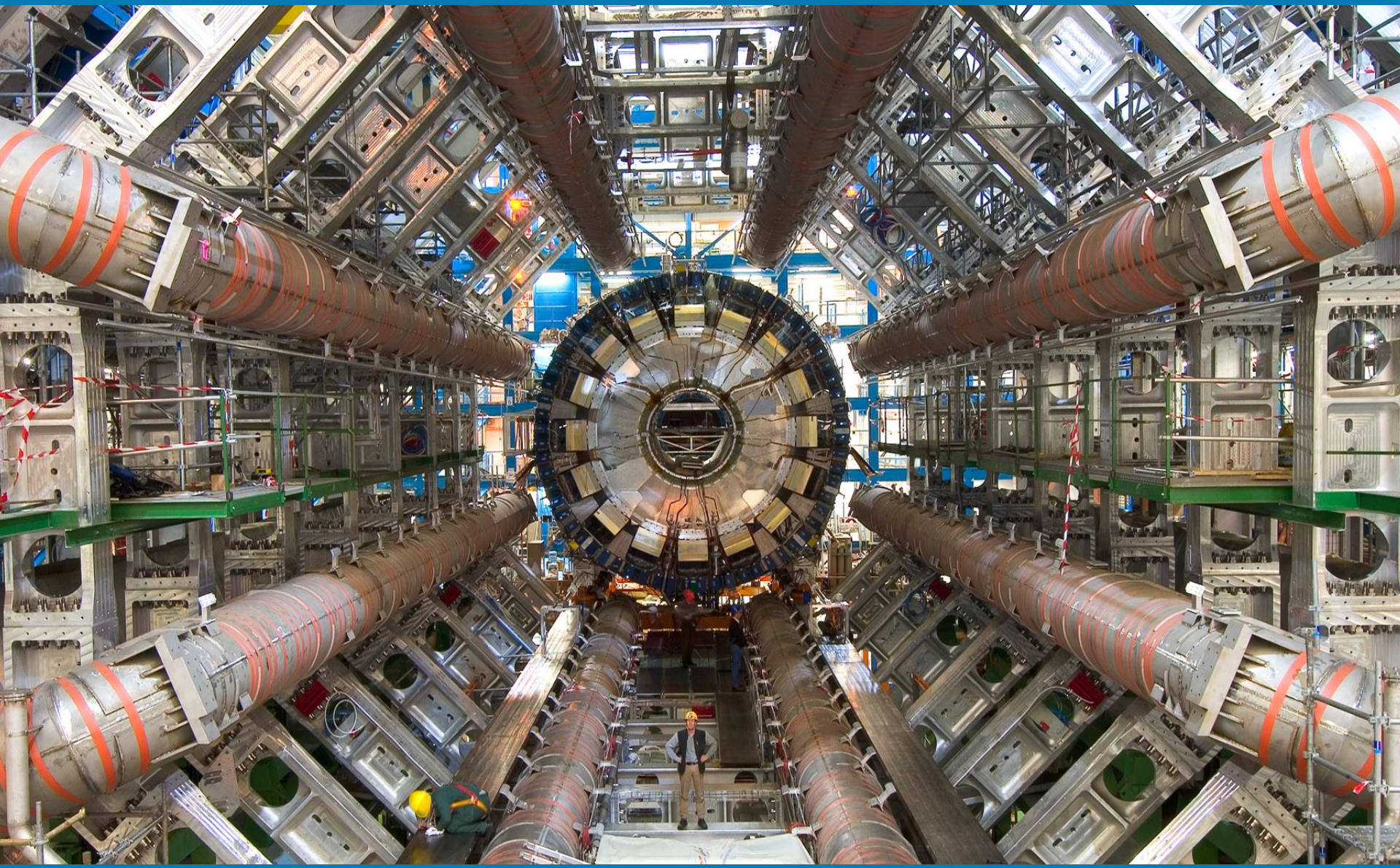
MEMBER STATES	148
Austria	4
Belgium	4
Bulgaria	4
Czech Republic	6
Denmark	5
Finland	5
France	15
Germany	23
Greece	10
Hungary	3
Israel	3
Italy	14
Netherlands	9
Norway	3
Poland	7
Portugal	3
Slovakia	3
Spain	14
Sweden	4
Switzerland	1
United Kingdom	8

OBSERVERS	44
India	13
Japan	4
Russia	9
USA	18

ASSOCIATE MEMBERS	15
Pakistan	8
Turkey	7

CANDIDATES FOR ACCESSION	9
Romania	6
Serbia	3

OTHERS		Brunei	2	Egypt	2	Kazakhstan	1	Nepal	1	South Africa	2
Albania	2	Burundi	1	Estonia	2	Korea	1	Nigeria	1	Sri Lanka	1
Algeria	4	Canada	3	Georgia	1	Latvia	1	Oman	1	Sudan	1
Argentina	3	China	12	Ghana	1	Lebanon	3	Palestine	1	Thailand	3
Armenia	1	Colombia	1	Gibraltar	1	Lithuania	2	Peru	1	T.F.Y.R.O.M.	3
Azerbaijan	1	Costa Rica	2	Indonesia	1	Malaysia	3	Philippines	1	Ukraine	1
Bangladesh	1	Croatia	2	Iran	2	Malta	4	Puerto Rico	1	Venezuela	1
Belarus	1	Cuba	1	Iraq	1	Mexico	1	Qatar	1		
Bosnia	1	Cyprus	1	Ireland	1	Mongolia	2	Singapore	2		
Brazil	2	Ecuador	1	Jordan	1	Montenegro	1	Slovenia	1		105




CYPRUS
CAPE VERDE

The birth of CERN

- **The CERN "parents"**

A group of farsighted **scientists**, **politicians**, **diplomats**.

- **CERN's main objectives**

. Resume the dialogue after World War II among former belligerent European Countries, and beyond.

. Carry out **excellent** scientific programmes.

The first 60 years of CERN

- **The CERN Convention (signed in 1953)**

"The Organization shall have no concern with work for military requirements and the results of its experimental and theoretical work shall be published or otherwise made generally available"

- **30 years later …**

"I hope that the scientists at CERN will remember that they have other duties than exploring further into particle physics. They represent the combination of centuries of investigation and study... to show the power of human spirit. So I appeal to them not to consider themselves as technicians ...but... as guardians of this flame of European unity so that Europe can help preserve the peace of the world. " *Prof. I. Rabi, US (celebrations for 30th anniversary of CERN, 1984)*

CERN in a nutshell

- **Accelerators and infrastructures**

  . Under the financial & technical responsibility of the Organization.

- **Experimental collaborations**

  . Hundreds (thousands) researchers from Member States and non-Member States.

  . Autonomously organized, including finance; placed under DG's authority. Top-down and bottom-up approach.

- **The scientific programme**

  . Decided by Council on proposal by the Scientific Policy Committee

CERN Scientific Policy Committee
(2014)

Chair
NAKADA Tatsuya EPFL,CH

Ex-officio members
ELSEN Eckhard Chairman, LHCC, DE
BLAUM Klaus Chairman, INTC, DE
KRAMMER Manfred Chairman, ECFA, AT
VALLEE Claude Chairman, SPSC, FR

Also present
HEUER Rolf-Dieter Director-General
ZALEWSKA Agnieszka President of the Council
JAMIESON Charlotte Chairman of Finance Committee

Members
DIEMOZ Marcella INFN, Roma ELLIS Richard Keith Fermilab, USA GAVELA Belen UAM, Spain HARRISON Michael LBNL, USA HUYSE Mark KUL, BE
LE DIBERDER François LAL Orsay
MURAYAMA Hitoshi FR IPMU Tokyo; LBNL
REDLICH Krzysztof Wroclaw Univ, PL
RIVKIN Leonid EPFL/PSI, CH
RODRIGO Teresa IFCA, ES
ROE Natalie LBNL, USA
RUBAKOV Valéry INR, RU
SPIERING Christian DESY, DE
TOKUSHUKU Katsuo KEK, JP
WARK David Imperial College, UK
WYATT Terry Univ. of Manchester, UK

The world of science

. Inclusive by its nature.

. Individuals are evaluated by peers based on concrete results.

. Results evaluated by the international community; scientific method.

. **Excellence** is required.

. Results are achieved only if all participants share the **same objective**.

. Excellence

. Trust

Science at CERN; the CERN model

. A simple but strong Convention, excluding military applications.

. Researchers from everywhere, including from non-Member States.

. International experimental collaborations, where CERN is minority.

. Open access philosophy, in all fields.

. Inclusion: no barriers of nationality, age, religion, gender etc …

. Collaboration and competition : "**Co-opetition**".

. **Stay away from politics**.

Science for peace and development

CERN is actively engaged to promoting:

. The role of science for the sustainable development of society : knowledge; technology and innovation; education.

. Science as enabler for dialogue and peace.


NIGERIA
MONGOLIA
EUROPEAN ORGANIZATION
FOR NUCLEAR RESEARCH
INTERNATIONAL UNION FOR
CONSERVATION OF

Observer status at the UN, Dec 2012

CERN (and science) for Peace

In the recent years CERN organized:

- Various initiatives like conferences, workshops, with other partners (Governments, Academies, other international organizations).

- Event with the UN in Geneva on the CERN model for global public goods, including science for peace *(Geneva, Nov. 2015)*.

- Event on "Science for Peace and Development" at the UN Headquarters in New York *(New York, Oct. 2014)*.

"CERN: Sixty years of Science for Peace and Development" - United Nations, New York, Oct. 2014

Science and diplomacy

. "Science diplomacy": what does it means ?

. **Diplomacy for science**: CERN would have probably not existed and not developed as it did without diplomats. **And without Parliaments !**

. **Science for diplomacy**: science (STI) and education (STEM) can help policy makers**, including Parliaments**, to take sound decisions for the benefit of society, and can offers models of cooperation.

Science and diplomacy *(cont.)*

Two basic statements:

Science (STI) and (STEM) education are important elements for the sustainable, peaceful, development of society.

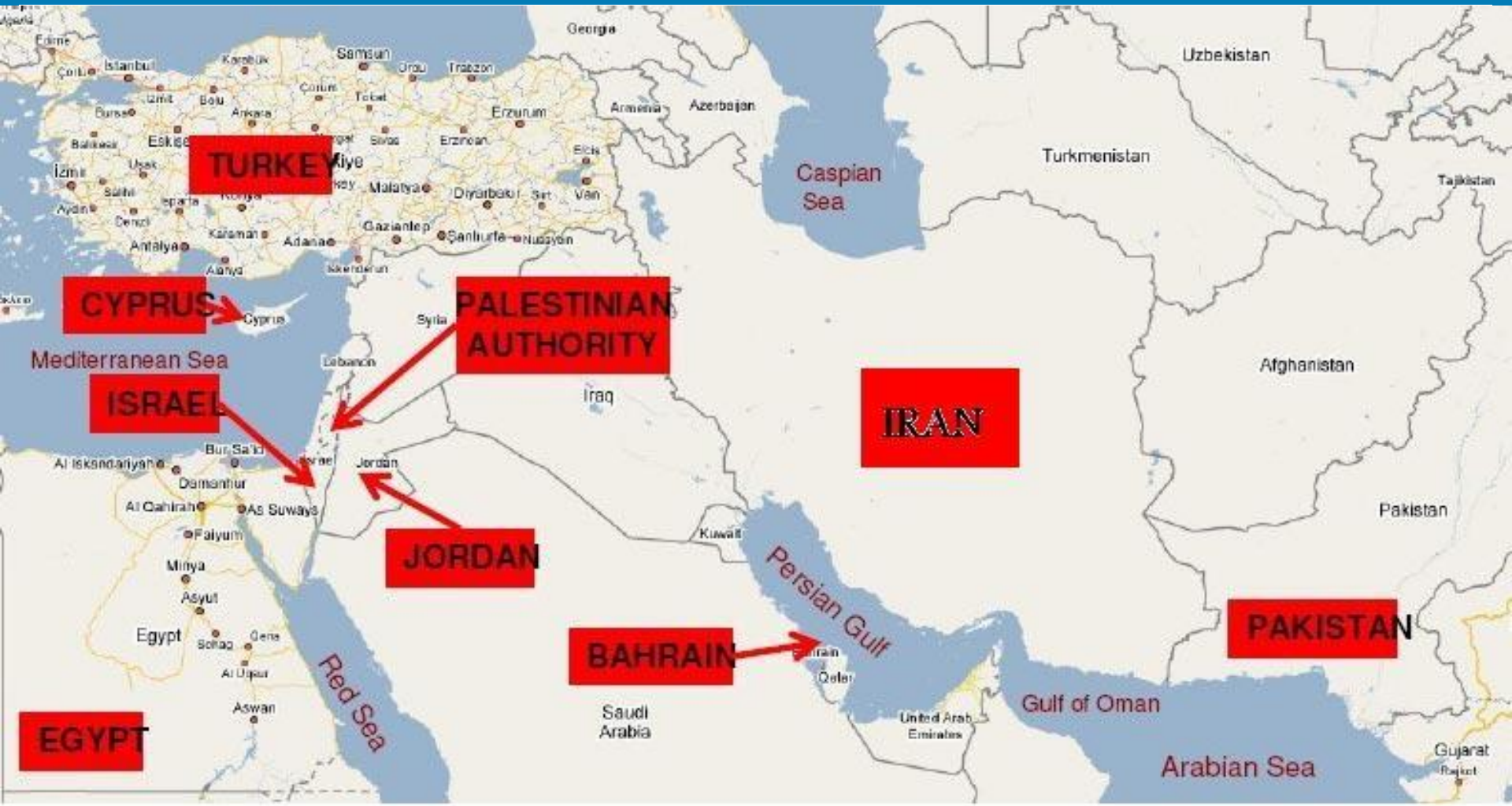
Cooperation models developed by the world of science can help fostering the dialogue and contributing to peace.

Should these statements be agreed beyond the world of science, and in particular by Parliaments:

Parliaments can increase the effectiveness of their action as policy makers, and also help connecting the world of science with the other policy makers.

SESAME - Synchrotron-light for Experimental Science and Applications in the Middle East

Amman, Jordan



SESAME Members

Teacher Training Schools

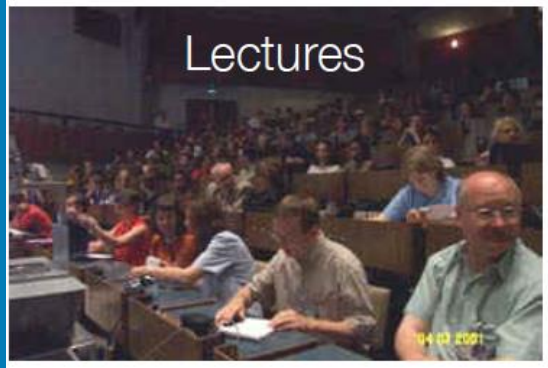
. Target: high school teachers.

. Goal: stimulate vocation of young people, in particular females, to invest in scientific university studies.

. Modules originally developed for Member States teachers, progressively extended also to teachers from non-Member States.

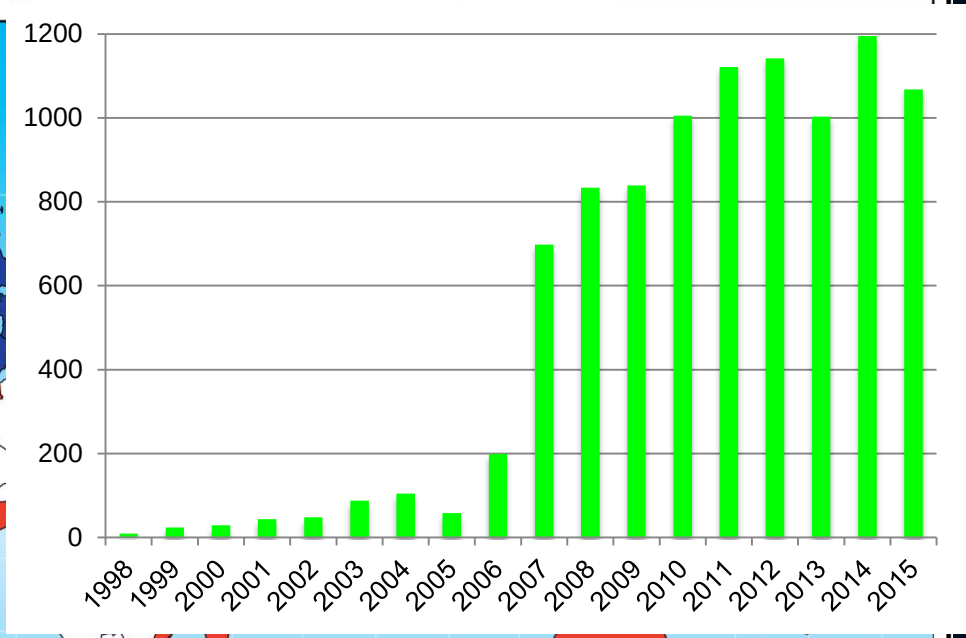
. Particular attention to specific regions, i.e. Africa with UNESCO.

CERN Teacher Programmes



CERN Teacher Programme

Teacher Programme Participants 1998 - 2015 (Total: 9509)



MEMBER STATES

Austria	177
Belgium	123
Bulgaria	455
Czech Republic	154
Denmark	199
Finland	498
France	314
Germany	902
Greece	671
Hungary	446
Israel	47
Italy	551
Netherlands	143
Norway	106
Poland	580
Portugal	386
Slovakia	222
Spain	441
Sweden	216
Switzerland	124
United Kingdom	1161

7916

ASSOCIATE MEMBERS 163

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Serbia	68

82

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India	4
Japan	7
Russia	336
USA	97

444

OTHERS

Angola	7	Cape Verde	4	Ghana	6	Malta	36	Sao Tome	6	Uganda	3
Armenia	1	Chile	3	Guinea Bissau	1	Mexico	14	Saudi Arabia	1	Ukraine	117
Australia	6	China	2	Iran	6	Mongolia	1	Singapore	2	U.A.E.	1
Azerbaijan	1	Costa Rica	4	Ireland	8	Montenegro	14	Slovenia	21		
Bahrain	2	Croatia	23	Jordan	11	Morocco	2	South Africa	7		
Belarus	3	Cyprus	10	Kazakhstan	8	Mozambique	21	South Korea	48		
Brazil	167	Dominican Rep.	45	Kenya	4	Nepal	2	Swaziland	1		
Burundi	2	Ecuador	2	Latvia	1	New Zealand	2	Taiwan	1		
Cameroon	4	Egypt	2	Lebanon	1	Palestine (O.T.)	4	Thailand	12		
Canada	8	Estonia	66	Lithuania	32	Qatar	1	T.F.Y.R.O.M.	12		
		Georgia	104	Madagascar	2	Rwanda	20	Timor-Leste	9		

904

CERN-UNESCO Schools for Teachers from SESAME Member States

. One School for Teachers (and students) from SESAME Member States was held at CERN in September-October 2015.

. Great interest to repeat the experience: discussions are ongoing for further funding.

. Should money become available, 36 teachers/School can be trained.

Science for peace: an exportable model?

. In its 60 years of life CERN, with its model, was a positive example of a worldwide platform for dialogue and peace through science.

. SESAME, based on the same model, is profiling itself as a platform in the Middle East for excellent science as well as for dialogue and peaceful cooperation.

Questions:

. Can these examples be exported to fields other than science?

. Can such models and platforms be used to tackle and solve basic societal needs, like ensuring **water, energy, food** etc ... ?

Some characteristics of science

. Science is by its nature **neutral**.

. Science promotes and requires **trustful** cooperation.

. Science is one of the few real **universal languages**.

Question:

. **Does science bring peace?**

West-Eastern Divan Orchestra

founded by Daniel Barenboim - Edward Said, 1999

Musicians from :

Syria

Turkey

Egypt

Israel

Palestine

Jordan

Lebanon

Spain

Excellence

Sharing the same objective

West-Eastern Divan Orchestra

founded by Daniel Barenboim - Edward Said, 1999

"The West-Eastern Divan Orchestra ….. has been sometimes described in a very flattering way for us as an "orchestra for peace". Let me tell you something: **this is not going to bring peace**. What it can bring is **understanding**, the **patience**, the **courage,** and the **curiosity to listen to the narrative of the other**"

Daniel Barenboim, Ramallah concert, August 2005.

Question:

Does science bring peace?

Question:

Does science bring peace?

My personal answer:

Science itself **cannot bring peace**.

What it can bring is **understanding**, the **patience**, the **courage**, and the **curiosity** to **listen to the narrative of the other**.

Science for Peace School *(1/5)*

. The idea is based on CERN Schools, where international participants spend one or more weeks together, **learning** and **working** on specific topics.

. Not a School just to talk about science and peace. It must be based on concrete goals, to start implement regional strategies for cooperation.

. Main goals:

- **learn** the models that science, technology and innovation can offer to **tackle** and **solve** specific regional/international problems.
- get used to working together for the same objective.
- start **working** on the possible solutions, and prepare the road map for their implementation.

Science for Peace School *(2/5)*

. What

- A one-week School, possibly repeated during the year.
- Possibility to have Schools at different levels (basic; advanced).

. Where

- In the Middle East Region or in Geneva.
- Follow-up in the Middle East Region, including implementation.

. When

- As soon as money is made available.
- Planning: Class 1 in 1st quarter 2018; Class 2 in 2nd quarter 2018.

. Who

- Students/young entrepreneurs from the region: ~ 2 per Country.

Science for Peace School *(3/5)*

. Leader

- IPU

. Partners

- High-innovation companies.
- High-level technology universities.
- Institutes for development and international cooperation agencies.
- CERN, for the scientific and technological support to IPU.

Science for Peace School

(4/5)

. Class 1: experimental Class (water). Main topics:

- Cooperation models offered by the world of science.
- Possible concrete solutions for water in the Region.
- Road map for implementation of the retained solution in the context of the Parliamentary Network on Water.

Invited per Country: one young scientist from the national water Authority, plus a young representative from Administration (e.g. Parliament's Secretariat on water).

. Class 2 and following (other themes). Main topics:

- Cooperation models offered by the world of science.
- Science, technology, innovation: mechanisms to benefit the society.
- Identification of proposed solutions and relevant road map.

Science for Peace School *(5/5)*

Next steps

1. Get the formal support of the Committee on Middle East Questions.
IPU Assembly of St. Petersburg, October 2017

2. Set up a group of Partners, including those who can help IPU to finance the initiative.

3. Prepare a business plan, including budget for the first **three** Classes.

4. Elaborate in detail the content of the School(s), with priority for School 1.

Some personal reflections (1/2)

Some statements retained from yesterday morning's discussion (free interpretation):

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… We should identify the problems in the region, but also the opportunities for their solution …

… Suspicion permeates a large part of UN activities …

… We are not used to talk to each other, even if we live close to each others. IPU is a good platform to start doing it …

Some personal reflections (2/2)

A "conditio sine qua non":

. Build up mutual trust.

Some personal reflections (2/2)

A "conditio sine qua non":

. **Build up mutual trust.**

For the long term:

. **Define and "plant" seeds that can foster the dialogue in region, also through models taken from the world of science.**

Supporting "Science for Peace" schools can be a good start.

Some personal reflections (2/2)

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. **Build up mutual trust.**

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Supporting "Science for Peace" schools can be a good start.

For the water problem in the region:

. **Fly High!** **Define** and support the **main objectives** - in the interest of the local populations - that all parties have to work for.

THANK YOU FOR YOUR ATTENTION !