
CERN
Accelerating Science and Innovation
Science bridging Cultures and Nations

The role of Science:

– innovate, discover, publish, share

... but bridging cultures and nations?

The role of Science:

– innovate, discover, publish, share

… compete and collaborate

Potsdam Manifesto 2005 (*H-P Dürr et al, VDW*)

Following the spirit of the 1955 Russell – Einstein Manifesto

"*We need to learn to think in a new way*"

"New Action

…….

To ensure global supply worthy of human beings and communities, *com-petition, i.e., cooperative rivalry*, can develop in a fostering and protective way only through innovation and creative productivity, while using the dynamic driving forces of a cooperative-dialogical interaction among the cultures and people of the earth.

……."

The role of Science:

– innovate, discover, publish, share

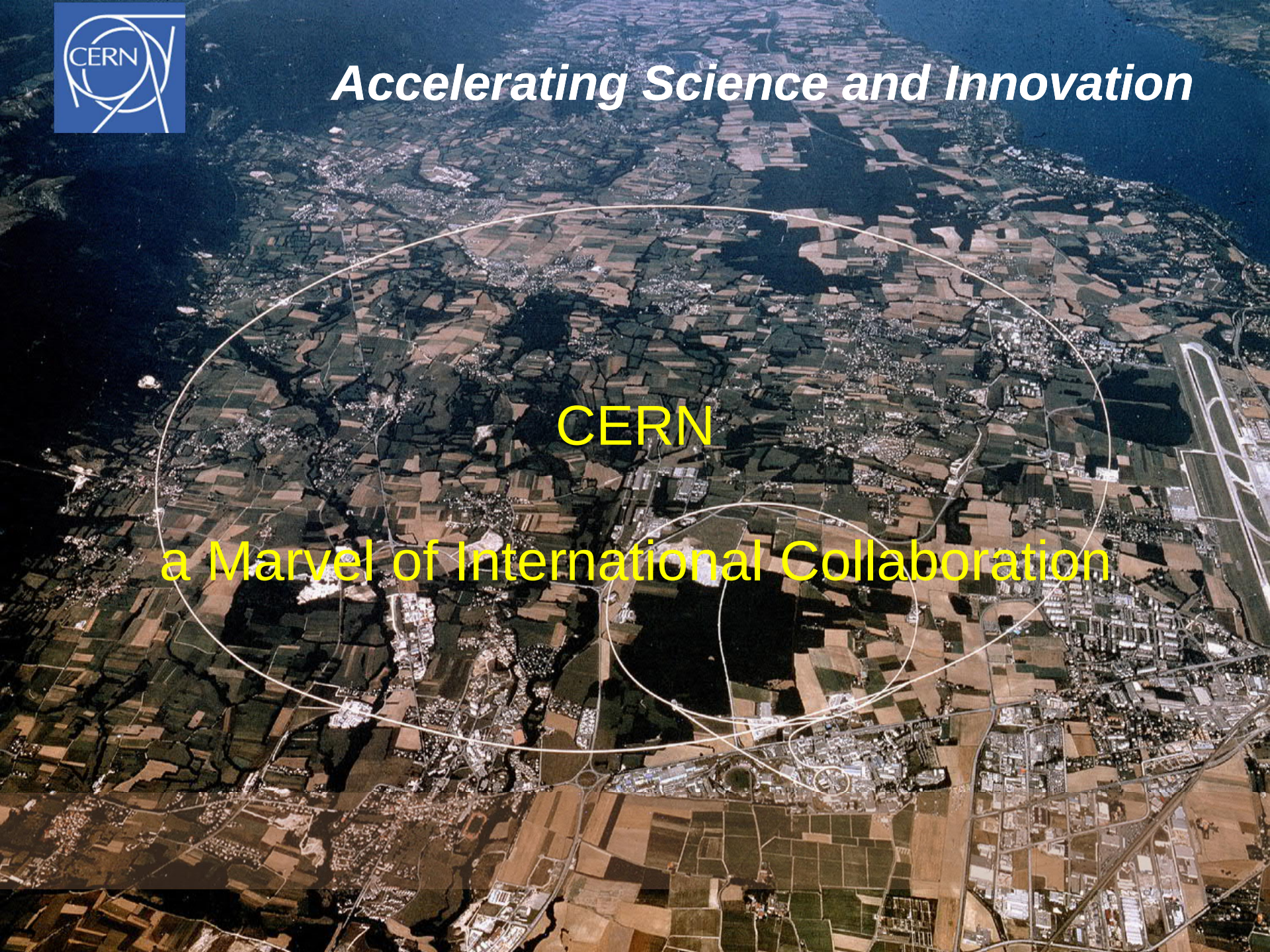
Science is a universal language
allowing to compete and to cooperate peacefully

Cooperation:

International scientific research provides successful modes for peaceful cooperation.

Such research projects show what mankind is able to achieve when working together coherently towards a common goal.

Cooperation needs to comprise developing, emerging and developed countries. We need to exploit all possible synergies. We need to bring the best brains from all regions together for the benefit and sustainability of society.


Accelerating Science and Innovation
CERN
a Marvel of International Collaboration

CERN

Conceived late 1940s – two aims:

- Enable construction of a facility for (then) nuclear and (now) particle physics research beyond the means of individual members
- Foster cooperation between peoples recently in conflict

founded 1954, going beyond national borders
today scientist from all over the world
are coming to CERN

CERN

a European Intergovernmental Organization, globally used

→ an infrastructure belonging to all its member states

→ an example of what Europe and its partners can achieve when they are working together

Key Message

From the very beginning:
Peaceful cooperation at the forefront of science
independent of cultural and national differencies

1954 European Reconstruction
1st Session of CERN Council

1980 The East Meets the West
Visit of delegation from Beijing

Today The LHC brings together > 8000 scientists and some 100 nationalities

Examples of bridges between peoples built by CERN:

- 1st intergovernmental organisation that Germany joined after WW II (on probation!)
- 1st post WW II meetings between German and Israeli physicists at CERN
- Collaboration between CERN & Russia at the height of Cold War kept doors open & established trust, and was model for later USA-Russian collaboration
- In the late 1970s, when China was closed, scientific contacts between Europe and China were pioneered in work at DESY (in Hamburg) and later at CERN - Nobel Laureate Sam Ting from MIT got backing of Deng Xiaoping
- In 1985, when USSR-USA arms negotiations in Geneva were stalled, the US delegation asked the DG to arrange a dinner at CERN for Russian and Americ… …ntific advisors - which facilitated a subsequent breakthrough
- CERN had an open door policy for East Euro… …old war, this allowed them quickly to join CERN (… …European identity) following the fall of the B…

Poland, Czechoslovakia, Hungary joined within 3 years

founded 1954, going beyond national borders
since 2010 going beyond regional borders

Since 2010 CERN membership is going global

New members:

Israel, Romania, Serbia

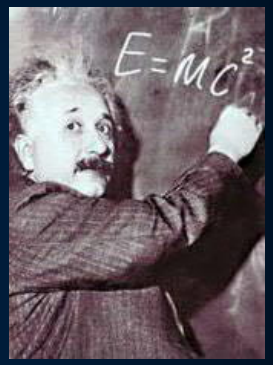
Associate members:

Cyprus, Estonia, Slovenia

Croatia, India, Latvia, Lithuania, Pakistan,Turkey, Ukraine

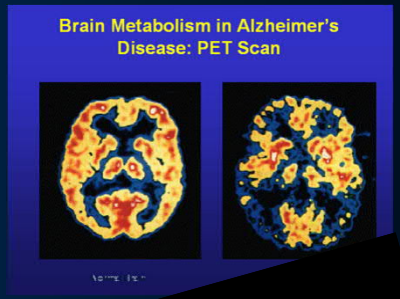
Innovation
Education
CERN
uniting people
Research

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 fr…erent countries and cultures

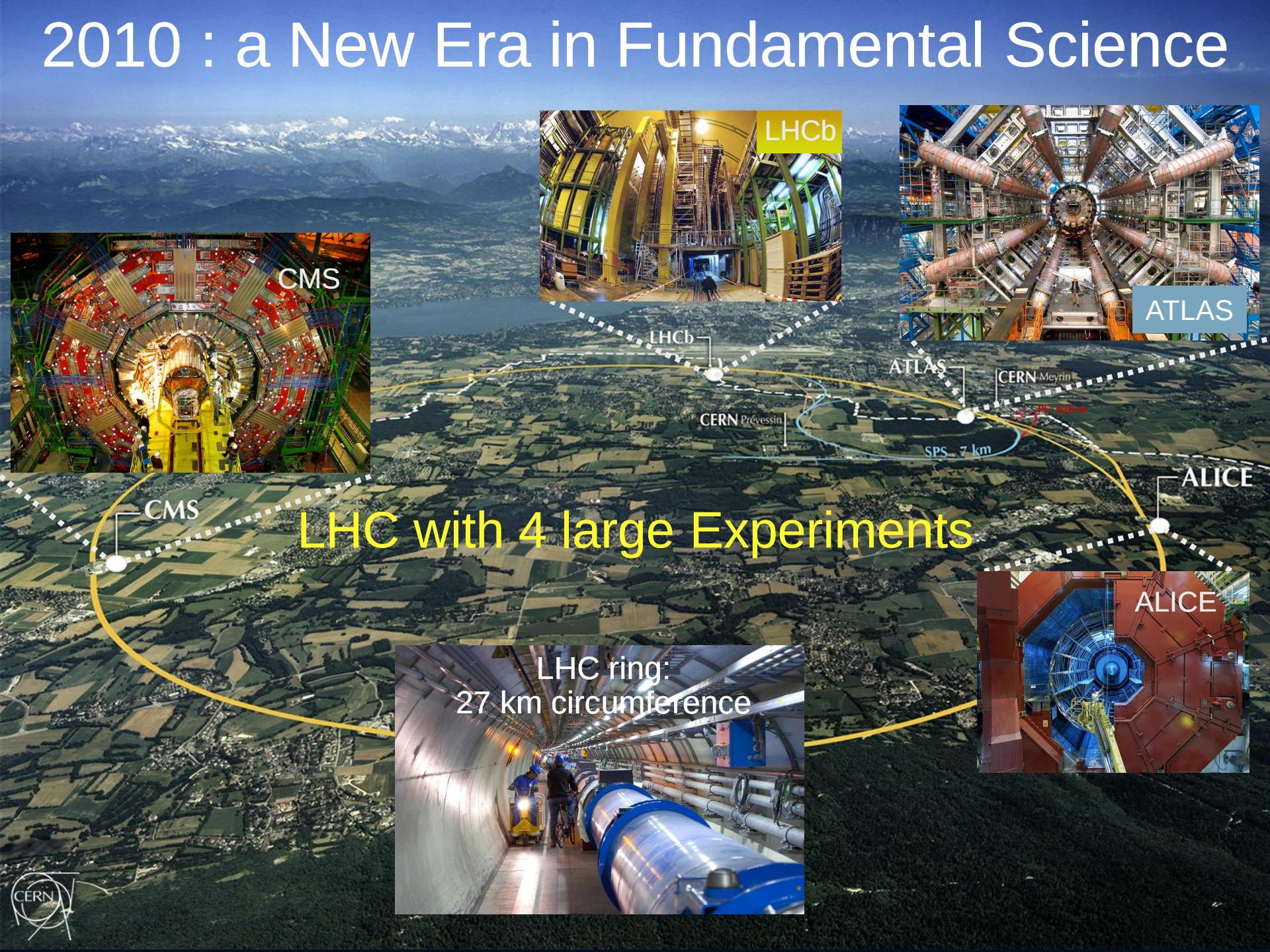
Key: excellent research, trust between people

CERN

starting 1954 …..

Mid 50s: the first accelerator (the Synchrocyclotron) arrives . . .

2010 : a New Era in Fundamental Science



Large Hadron Collider (LHC) Project

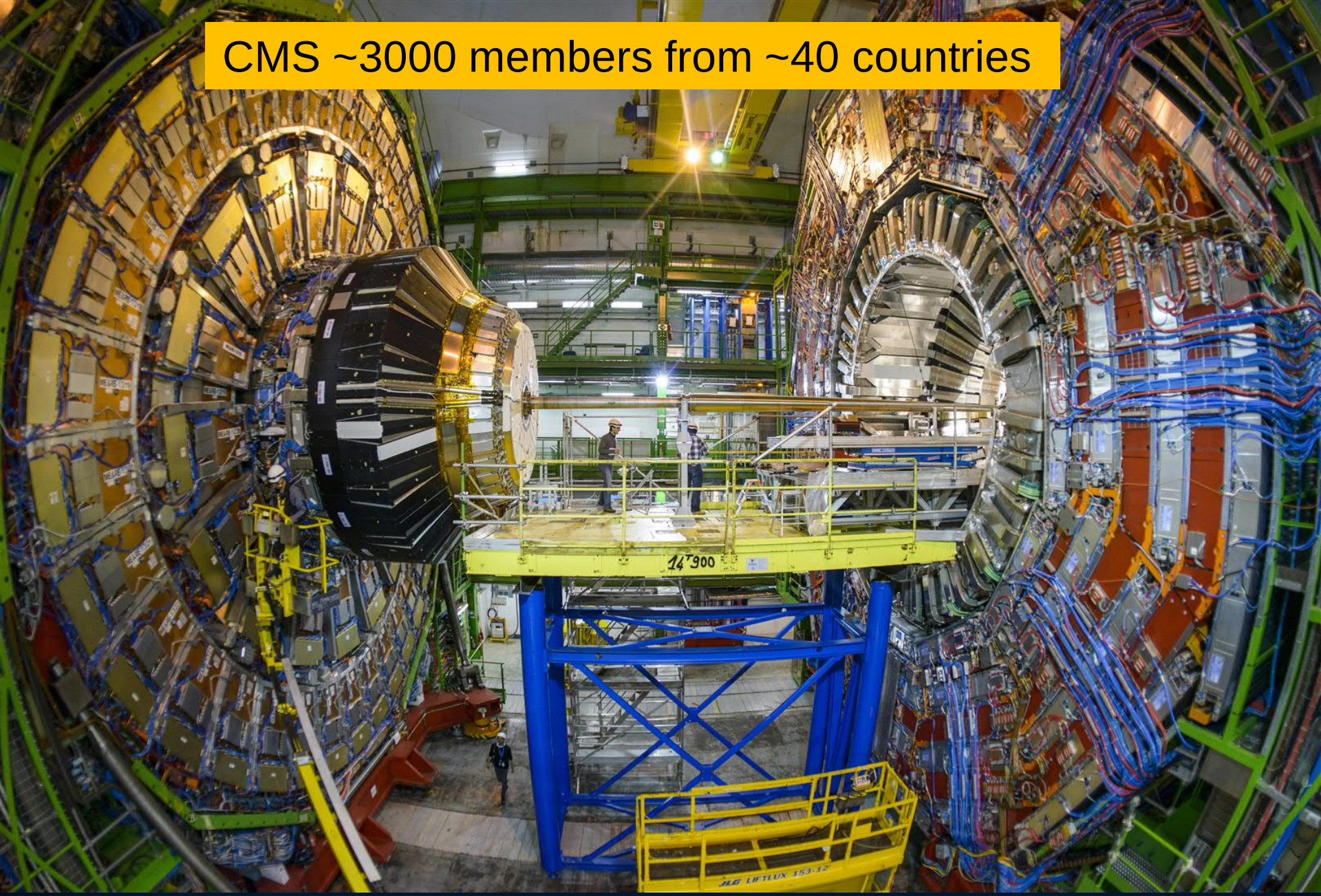
To design, construct and run such a project
many thousands of technicians, engineers and physicists
from **all over the world**,
from **many different disciplines**,

develop new technologies,
develop new engineering concepts,

work together over decades

Prime example of global cooperation

at CERN ***Accelerating Science and Innovation***


CMS ~3000 members from ~40 countries

Sociology

Large International Collaborations

– a place where people learn t

– collaboratio

large international collaborations are a great training ground for academia and private sector for today's challenging global projects and markets, and to learn to appreciate other cultures

king, planning at general level

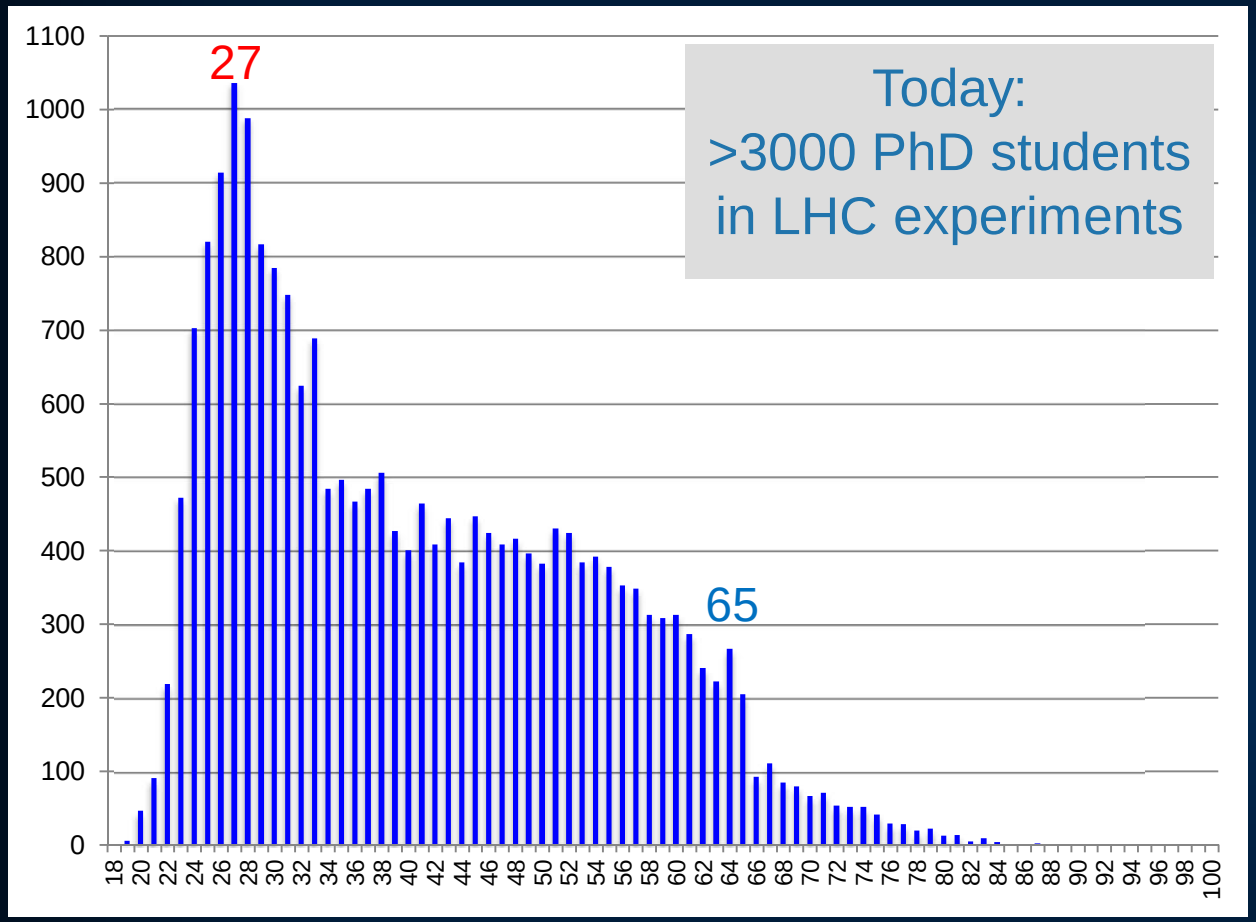
on sharing: role of computing in internationalization and communication

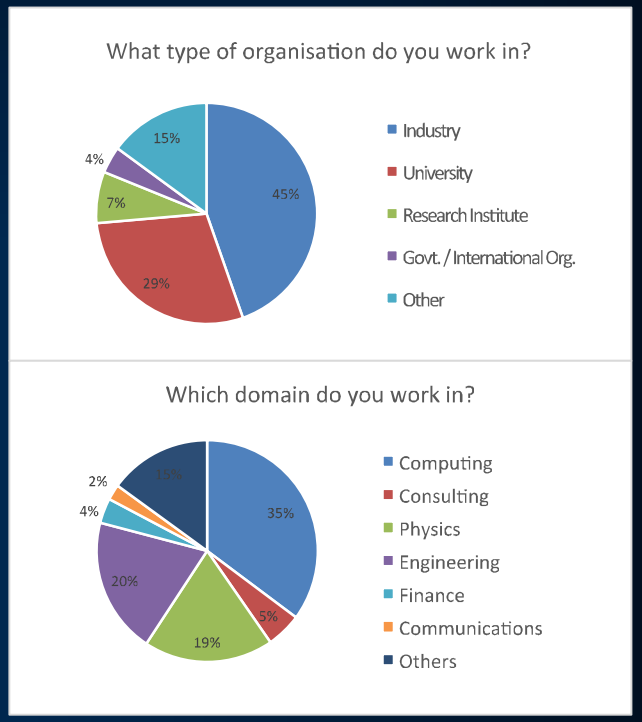
– experience can be used by individuals and in other fields

→ management through 'common goals'

→ management by 'convincing partners'

Age Distribution of Scientists
- and where they go afterwards



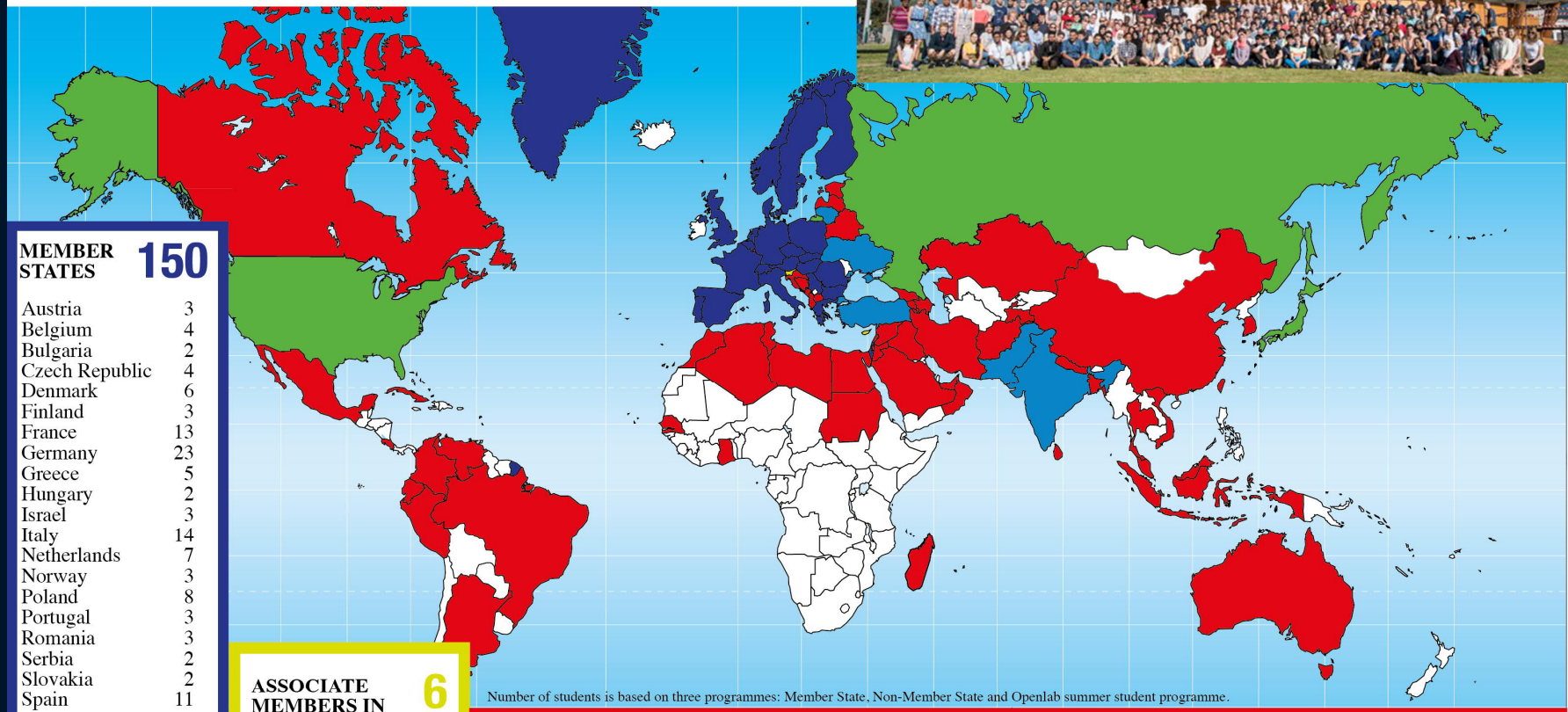


They do not all stay: where do they go?

spreading the spirit of CERN

Summer Students 2019

Summer Studen



Number of students is based on three programmes: Member State, Non-Member State and Openlab summer student programme.

MEMBER STATES 150

Austria	3
Belgium	4
Bulgaria	2
Czech Republic	4
Denmark	6
Finland	3
France	13
Germany	23
Greece	5
Hungary	2
Israel	3
Italy	14
Netherlands	7
Norway	3
Poland	8
Portugal	3
Romania	3
Serbia	2
Slovakia	2
Spain	11
Sweden	7
Switzerland	5
United Kingdom	17

ASSOCIATE MEMBERS 24

India	13
Lithuania	2
Pakistan	4
Turkey	3
Ukraine	2

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP 6

Cyprus	4
Slovenia	2

OBSERVERS 34

Japan	4
Russia	10
USA	20

OTHERS

Afghanistan	1	Bolivia	1	Egypt	4	Kuwait	1	Nepal	1	Tajikistan	1
Albania	1	Bosnia & Herzegovina	1	Estonia	2	Latvia	1	North Macedonia	1	Thailand	4
Algeria	4	Brazil	4	Georgia	1	Lebanon	3	Oman	1	Tunisia	2
Argentina	1	Canada	6	Ghana	1	Libya	1	Palestine	2	U.A.E.	1
Armenia	1	Chile	1	Hong Kong	2	Madagascar	1	Peru	1	Venezuela	1
Australia	1	China	10	Indonesia	1	Malaysia	3	Saudi Arabia	1	Viet Nam	1
Azerbaijan	2	Colombia	1	Iran	2	Malta	3	Singapore	2	Yemen	1
Bahrain	2	Costa Rica	4	Iraq	1	Mauritius	1	Sri Lanka	4		
Bangladesh	2	Croatia	4	Jordan	1	Mexico	1	Sudan	1		
Belarus	1	Cuba	2	Kazakhstan	3	Moldova	1	Syrian Arab Republic	1		
		Ecuador	3	Korea	2	Montenegro	4				
				Kosovo	1	Morocco	1	Taiwan	1		

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There are also other aspects:

better use of technologies

One of the detector parts used over a million World War II brass shell casements from the Russian Navy in making some of its components

Potsdam Manifesto 2005

"New Action

…….

To ensure global supply worthy of human beings and communities, *com-petition, i.e., cooperative rivalry*, can develop in a fostering and protective way only through innovation and creative productivity, while using the dynamic driving forces of a cooperative-dialogical interaction among the cultures and people of the earth.

Dialogue and exchange must and can be installed in all layers of life, particularly in the institutional and spatial overlaps between cultures, and must constantly dynamically adapt. In this way, *tension and conflicts can be dynamically absorbed, balanced, and diverted into moving discourse*.

……."

CERN is a small but beautiful example of this spirit

But CERN is not alone,

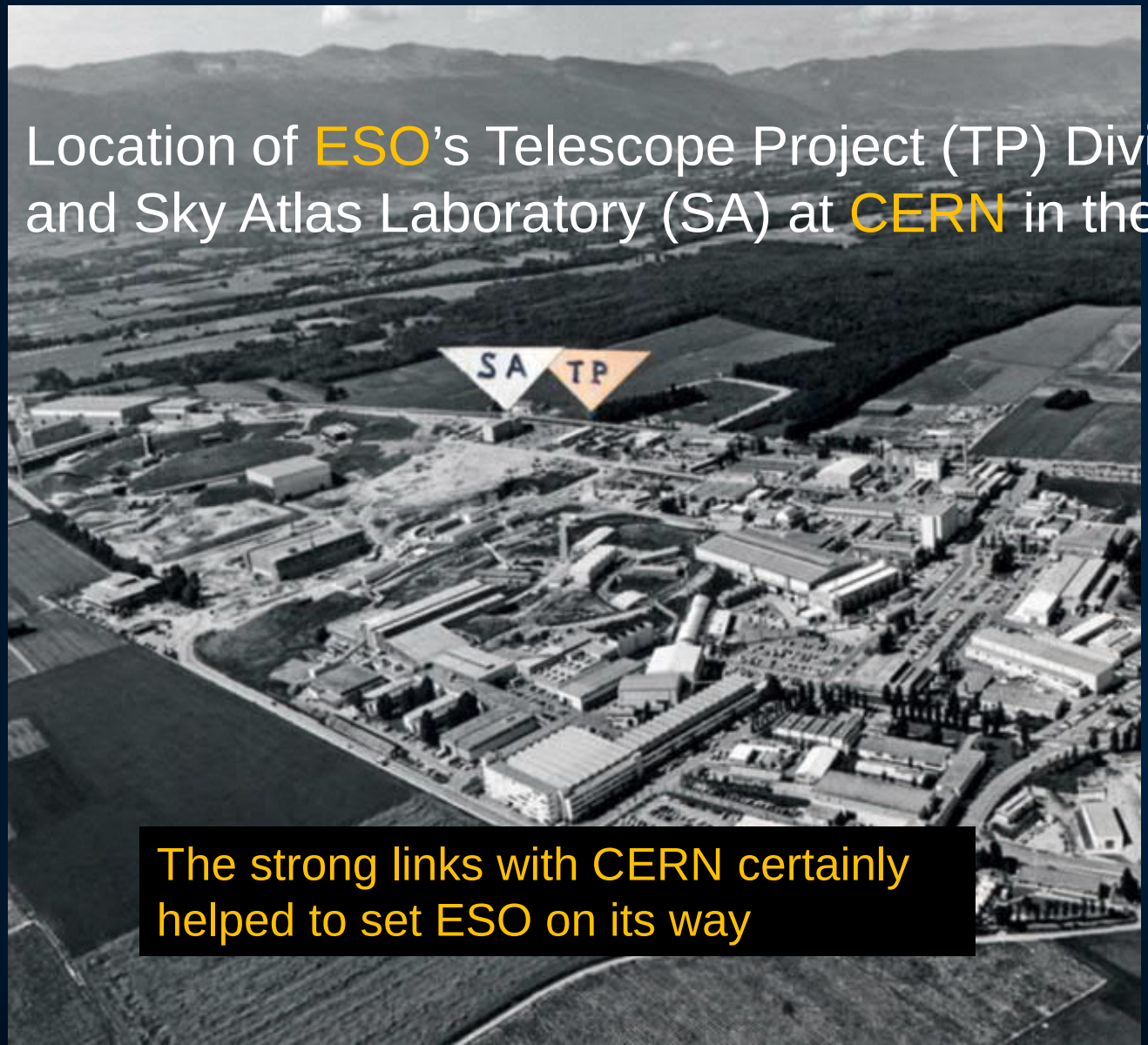
there are several ‘off-springs’……

ESO

One of ESO's original aims was to allow the Member States to work together to build and operate advanced astronomical facilities that were beyond the capabilities of any individual country.
Convention signed 1962 by 5 founding members, today there are 16 members

Charles Fehrenbach, the director of the Haute Provence Observatory, who was involved with ESO for many of the early years, stated 1981 in ESO's journal, *The Messenger* :
"There is no doubt in my mind that it was the installation in Geneva which saved our organization."

ESO



Location of ESO's Telescope Project (TP) Division and Sky Atlas Laboratory (SA) at CERN in the 1970s.

The strong links with CERN certainly helped to set ESO on its way

EMBL

The European Molecular Biology Laboratory was the idea of prominent scientists, with the goal to create a CERN-like supranational research centre to redress the balance in the strongly US-dominated field of molecular biology.

Founded 1974

Today located at six sites, 27 members

EMBL

Similar to CERN:

In 2003, realising the increasingly global nature of big scientific challenges and the need for international cooperation in research, EMBL introduced the Associate Membership Scheme, making it possible for non-European countries to access all EMBL programmes and services.

The latest “off-spring”

CERN

Conceived late 1940s – two aims:

- Enable construction of a facility for (then) nuclear and (now) particle physics research beyond the means of individual members
- Foster cooperation between peoples recently in conflict

SESAME

Conceived late 1990s – two aims:

- Enable construction of a facility for a broad range of scientific research beyond the means of individual members
- Foster cooperation between peoples

How to achieve the broad range of scientific research……

- Synchrotron-light sources allow research in many areas, e.g. biology, physics, chemistry, archaeology, medicine, material science, environmental science, arts,……. they are ideal facilities for building scientific capacity

- International collaboration is the obvious way for countries with relatively small scientific communities and/or limited science budgets to build a synchrotron-light source

- Synchrotron-light sources are user facilities: scientists will typically go there two or three times a year for a few days to carry out experiments, in collaboration with scientists from other institutions/countries

SESAME is located in Allan, NW of Amman, the capital of Jordan

another Marvel of International Collaboration

United Nations
Educational, Scientific and
Cultural Organization

- SESAME is a cooperative venture by scientists and governments of the region set up on the model of CERN (European Organization for Nuclear Research) although it has very different scientific aims.
- It was developed under the auspices of UNESCO (United Nations Educational, Scientific and Cultural Organization) following the formal approval given for this by the Organization's Executive Board (164th session, May 2002).

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

Aims:

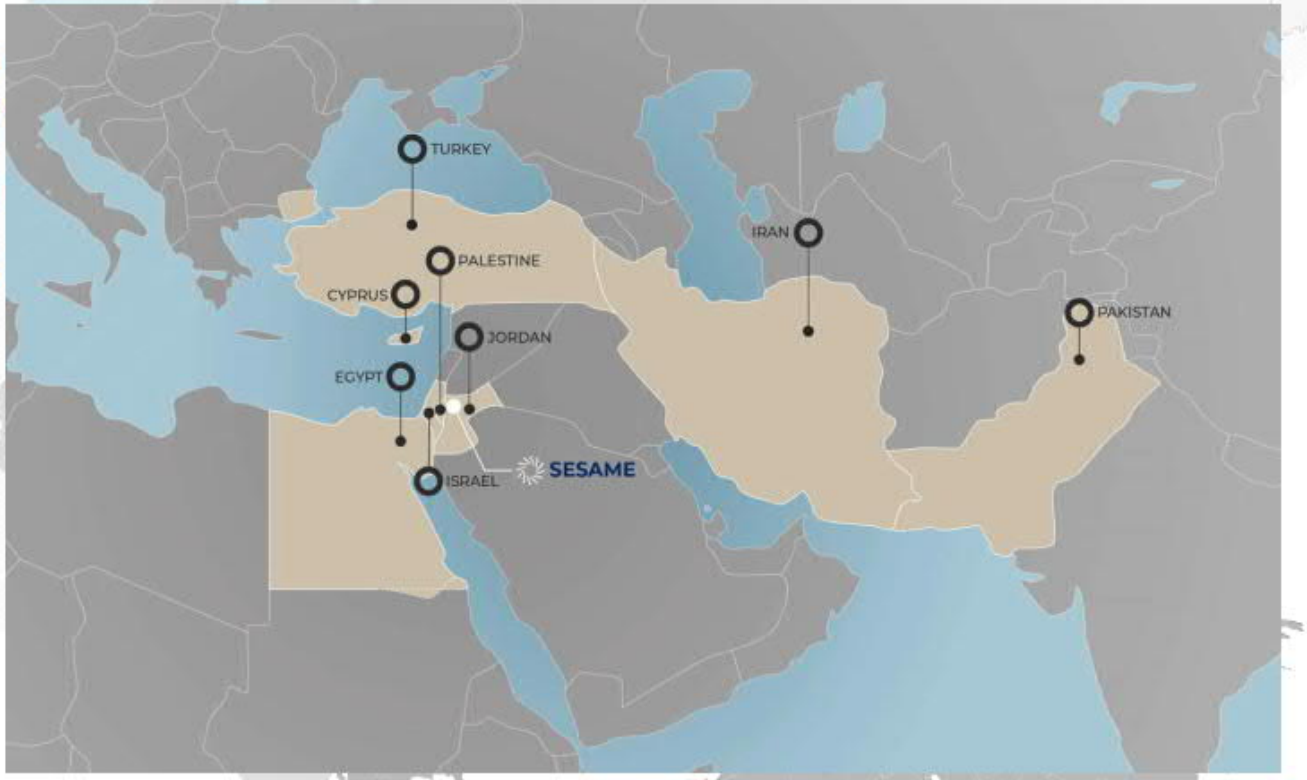
1) promote scientific and technical excellence in the Middle East and beyond (and in particular to enable and achieve the return of scientists and engineers from the region)

2) build scientific and cultural bridges between different societies in the Middle East and beyond

There are some 60 light sources in the world - SESAME is the first in the Middle East

Inauguration 2017

SESAME is composed of **Members** and Observers



Cyprus
Egypt
Iran
Israel
Jordan
Palestine
Pakistan
Turkey

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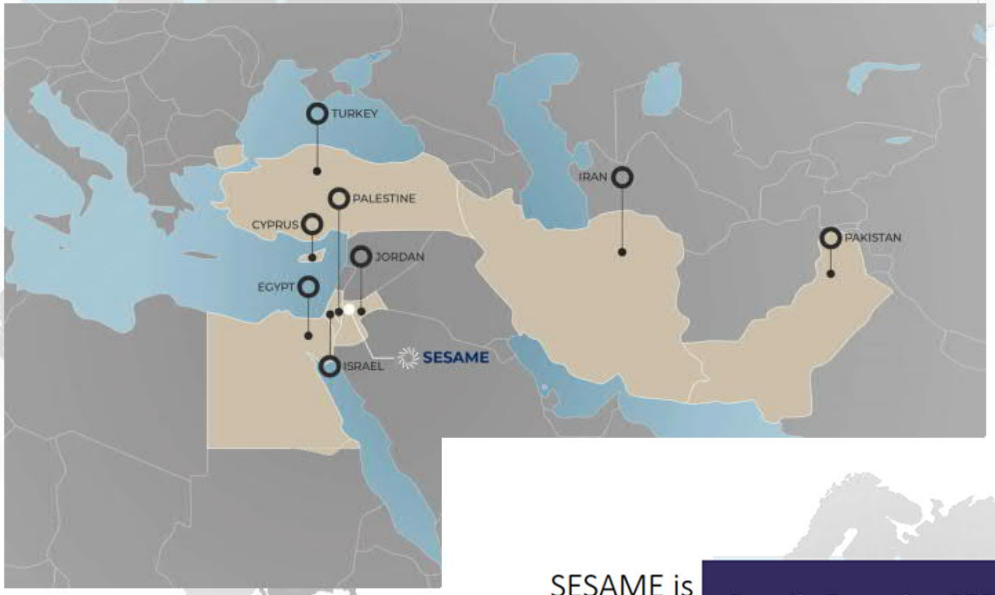
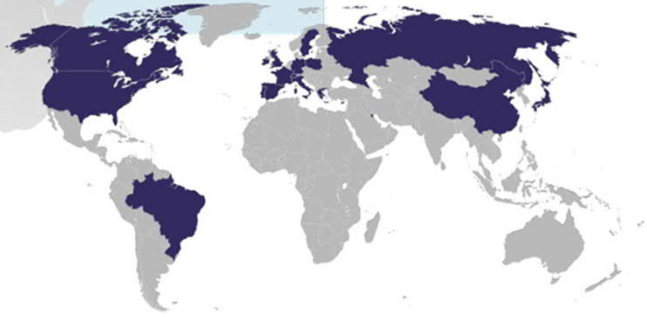


Cyprus
Egypt
Iran
Israel
Jordan
Palestine
Pakistan
Turkey

SESAME is composed of Members and **Observers**

Brazil, Canada, CERN, China, the European Union, France, Germany, Greece, Italy, Iran, Japan, Kuwait, Portugal, Russian Federation, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America.

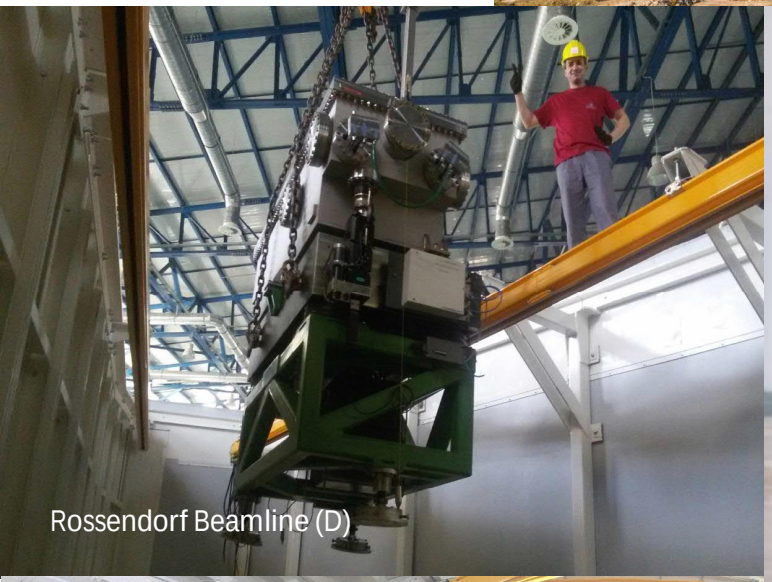


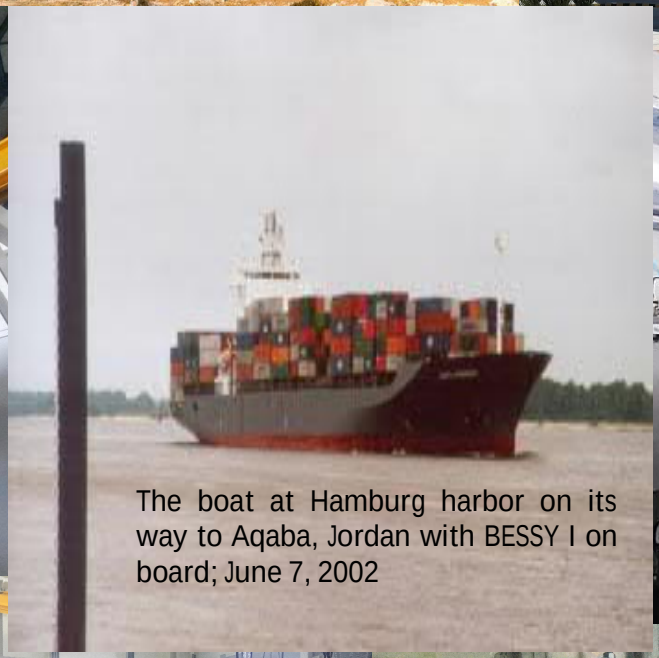
International Cooperation as example of Peaceful Cooperation

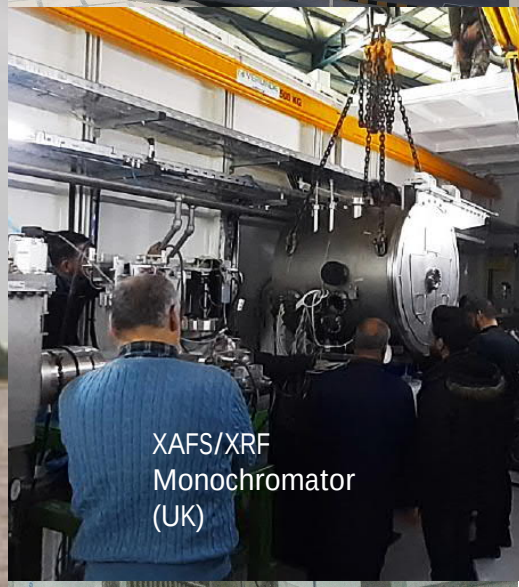
SESAME

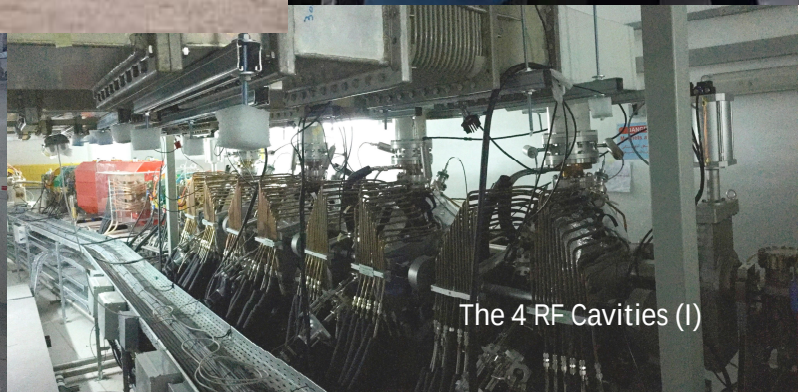
SESAME received much support from non-members.

Examples are…

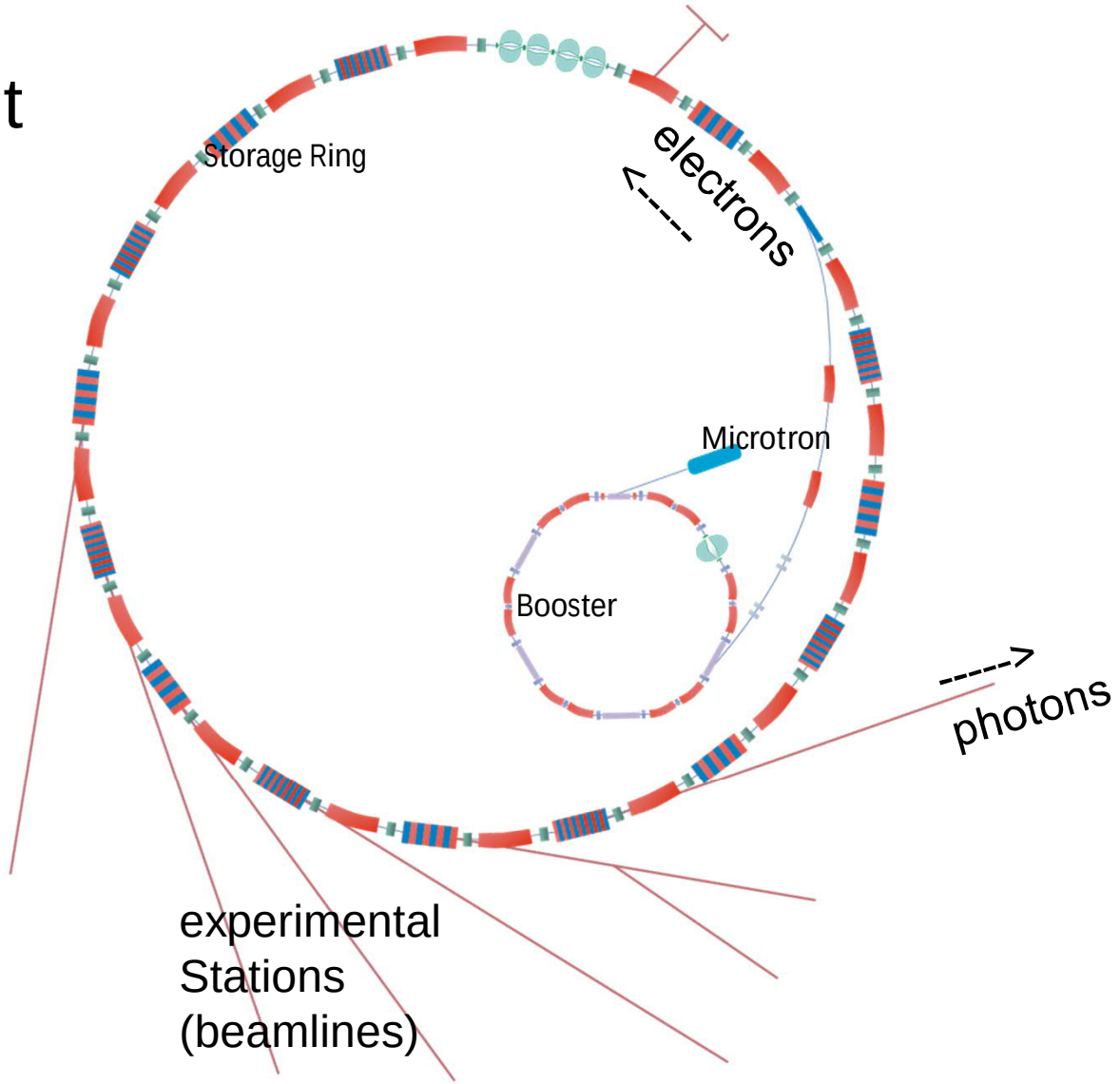








SESAME layout



Three Beamlines in Operation

Number of proposals received for the IR (2018-2021), XAFS-XRF (2018-2021) and MS (2020-2021) beamlines:

Belgium	1
Colombia	1
Cyprus	18
Egypt	75
France	1
Germany	2
Iran	56
Israel	8
Italy	6
Jordan	38
Kenya	3
Malaysia	1
Malta	1
Mexico	1
Pakistan	47
Palestine	12
Qatar	3
South Africa	1
Sweden	1
Turkey	45
United Arab Emirates	2
United Kingdom	1
TOTAL	326

Oversubscribed by factor 2

Three Beamlines under Construction

BEATS – BEAmline for Tomoghraphy at SESAME (2022)

HESEB – Helmholtz-SESAME Beamline (2022)

TXPES – Turkish X-ray PhotoEmission Spectroscopy Beamline (2023)

Examples for
Potential research topics at the different beamlines

- Identification of disease in food crops
- Identification and degradation products from paintings and painted objects
- Aging of microplastics in the environment
- Change in protein structures associated with diseases

- Characterization of lithium-ion and sodium-ion batteries
- Studies of metal contaminants in the environment
- Food security and impacts of various micronutrients on crop development
- Non-destructive analysis of paints of historical art
- Examination of archaeological metals

- Non-destructive studies of archaeological materials
- Agricultural soil management for climate change mitigation
- CO_2 capture and storage
- Hydrogen embrittlement in pipelines

SESAME is actively promoting research in the region and beyond

وزارة التعليم العالي والبحث العلمي

SESAME-PGSB Workshop

⇨ Online-Workshop on 16th November 2021 — 10^{00} to 13^{00} (EET) resp. 9^{00} to 12^{00} (CET)

Program

1) Welcome (5') – H.E. Mahmoud Abu Mois, Minister of Higher Education and Scientific Research, Palestine
2) Goal of the Workshop (5') – Frank Lehner (DESY)
3) The Palestinian-German Science Bridge PGSB (20') – Ghaleb Natour / Caitlin Morgan (PGSB/FZJ)
4) Introduction to SESAME (10') – Andrea Lausi (Scientific Director at SESAME)
5) Highlights from a Science Project at SESAME / case study from Palestine (15') – Rezq Basheer-Salimia (NUVTE) / Kirsi Lorentz (Cyl) / Messaoud Harfouche (SESAME)
6) The SESAME Beamlines (5x 10')
   - Opportunities at IR – Gihan Kamel (SESAME)
   - Opportunities at XAFS/XRF – Messaoud Harfouche (SESAME)
   - Opportunities at MS – Mahmoud Abdellatief (SESAME)
   - Opportunities at BEATS – Gianluca Iori (SESAME)
   - Opportunities at HESEB – Mustafa Genisel / Wolfgang Eberhardt (SESAME/DESY)
7) Virtual Coffee Break (5')
8) Overview of the user community in Palestine and activities (15') – Rezq Basheer-Salimia (Chairman & General Coordinator Palestine National Committee of SESAME, President of Nablus University for Vocational and Technical Education)
9) Discussions on how to improve access to SESAME and promote cooperation projects for Palestine users (everyone is warmly invited to take part in this discussion)

Please register following this link.

HESEB Helmholtz-SESAME Soft X-Ray Beamline for SESAME

BEATS

2019: thanks to EU support, SESAME became the World's FIRST large accelerator complex to be fully powered by renewable energy, and signed the UN's Climate Neutral Now pledge

SESAME story is a special situation in history where a single facility received so much support from sister organizations and observer countries over an extended period.

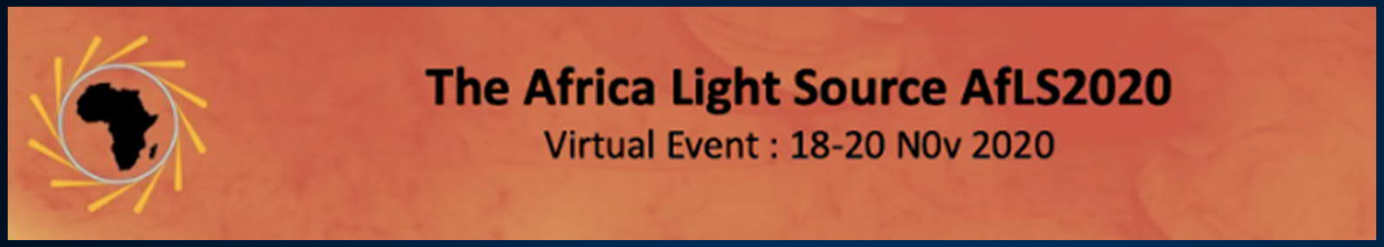
High level cooperation ensures scientific output, high visibility and productivity.

Since its inception SESAME receives much support from many different sources

Now SESAME tries to help other projects

African Light Source (AfLS) Foundation

November 15, 2020 SESAME was the first light source to sign an MoU with AfLS. The MoU was announced at the AfLS2020 Virtual Event.



SESAME IR beamline principal scientist, Gihan Kamel, is a member of the AfLS Board of Trustees, a member of the AfLS Steering Executive Committee, and the deputy chair of the AfLS Strategy Committee. In addition, she is a co-convener of the Light Sources Group of the African Strategy for Fundamental and Applied Physics (ASFAP).

SESAME Scientific Director, Andrea Lausi, is a member of the Steering Committee of the LAAAMP project, partnering with IUPAP and IUCr to enhance Light Sources and crystallographic sciences in Africa, the Americas, Asia, Middle East and the Pacific.

Together with The Cyprus Institute and the IAEA, and with AfLS representatives from the University of Johannesburg, LAAAMP and ESRF, SESAME is organising a School on Synchrotron Light Sources and their Applications, to be hosted online by ICTP in December 2021.

And another off-spring from CERN and SESAME

SEE ST

South East European
International Institute
for Sustainable Technologies

10 members from South East Europe

The South East European International Institute for Sustainable Technologies (SEEIIST)

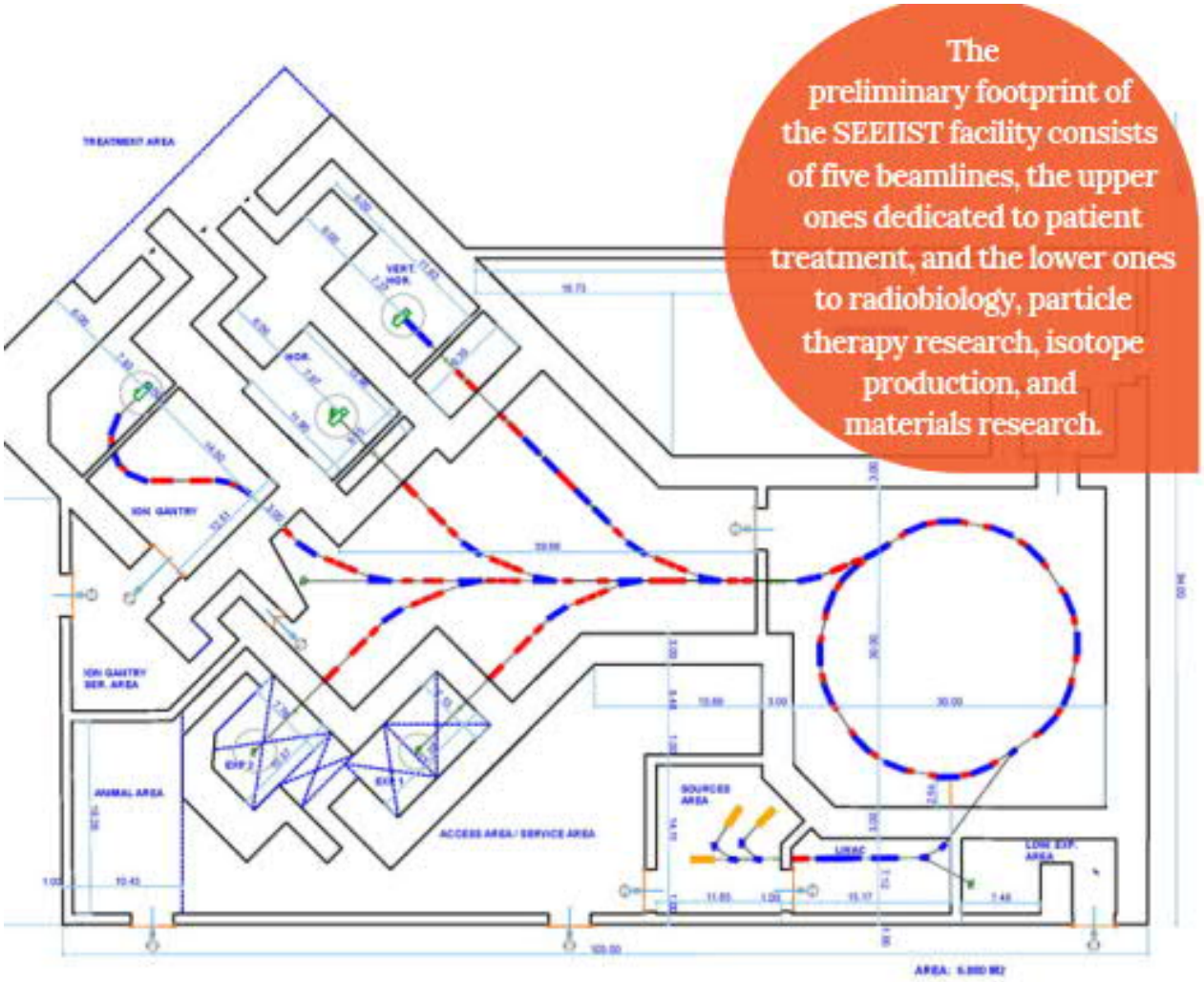
proposed in late 2016 by Prof. Herwig Schopper

it received first official political support by the Government of Montenegro in March 2017.

A **real international cooperation in the SEE region**, gathering scientists, engineers, medical doctors, young people and technicians within the joint research infrastructure with the mission "**Science for Peace**".

The Institute will be a **regional Centre of Excellence** based on the state-of-art sustainable technology which will assure high competitiveness to the rest of Europe.

It will promote the regional collaboration in the fields of science, technology and industry and will represent a **knowledge-based economy project**, as well as a **platform for education and training** for young scientists, researchers, technicians, medical doctors, biologists, biomedicine engineers and others



Combining medical treatment and research

Preparatory phase supported by EU

Preliminary lay-out of SEEIIST

Concept worked out with help from CERN, CNAO, GSI, and other labs

Back to CERN

Connecting 1954 and 2010:

François de Rose

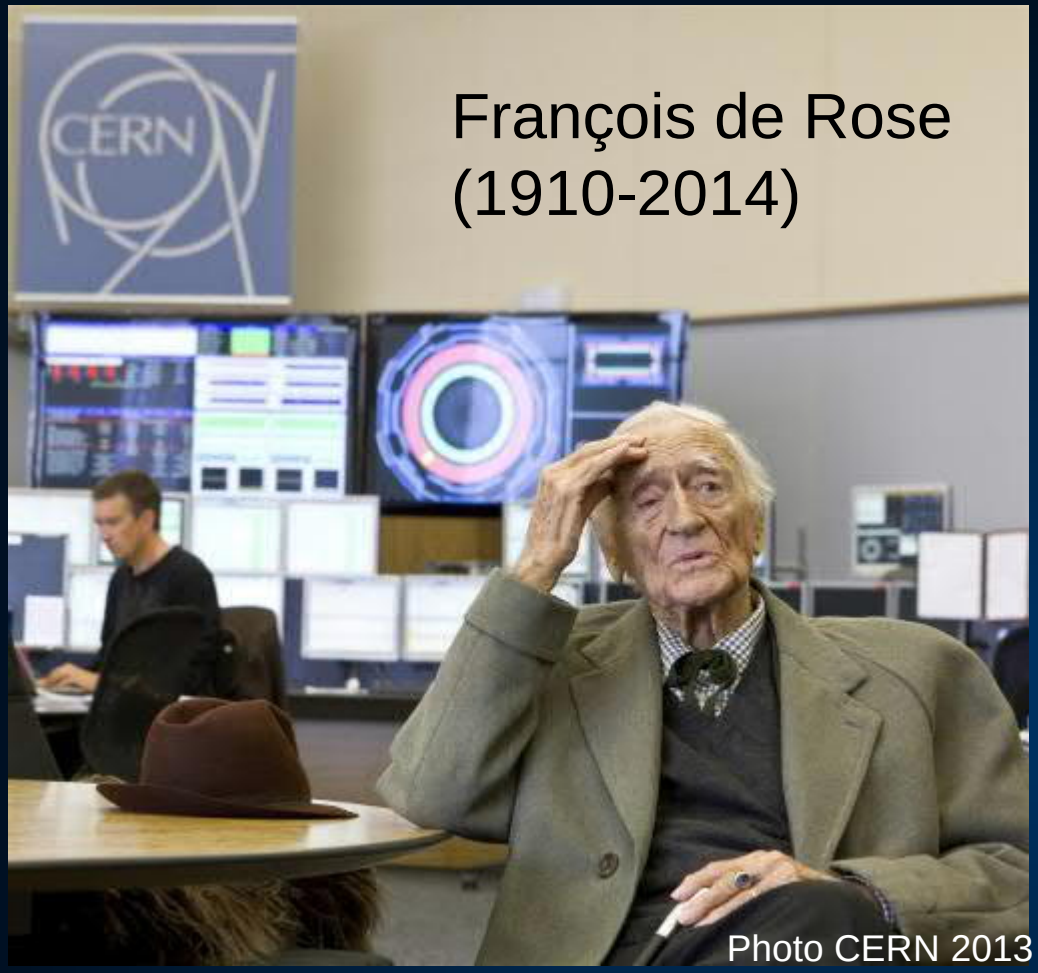
one of CERN's founding fathers

President of the CERN Council from 1957 to 1960

opinion piece about CERN written by François de Rose in 2008.

“CERN is one of the achievements with which I am the most proud to have been associated. I am still very attached to the Organization, not only because of the many friends I've made there but also because it is such a noble cause.”

“CERN was created so that Europeans were not forced to go the United States. Today, Americans are coming to Europe to work on CERN’s machines, something which I don’t think Oppenheimer had anticipated. I find that an extraordinary turnaround.”



François de Rose
(1910-2014)

Photo CERN 2013

His passion for CERN's research endured.
During a visit to CERN in 2010, he promised that he would return when the Higgs boson was discovered, a promise he kept in 2013.

(some) lessons learned

Science bridges Cultures and Nations

Acceptance of diversity is vital

Trust between people is a mandatory ingredient

Scientists can/should/must be ambassadors for peaceful cooperation

CERN, SESAME and others have become key examples for Science Diplomacy……

Last paragraph of the Editorial in The Guardian, 4 March 2015, on CERN/LHC

The search will invoke mini black holes, antimatter, quark-gluon plasma, and extra dimensions of space. The partnership so far has spun off colossal technological and computing rewards, but that is not the point. The point is that Europe is working together in a thrilling intellectual exploration that can have no conceivable commercial or political payoff but could, in some still intangible way, enlighten all humankind. In these otherwise murderous and mean-spirited times, that is something to salute.

The role of international science projects:

– innovate, discover, publish, share

... and bring the world together