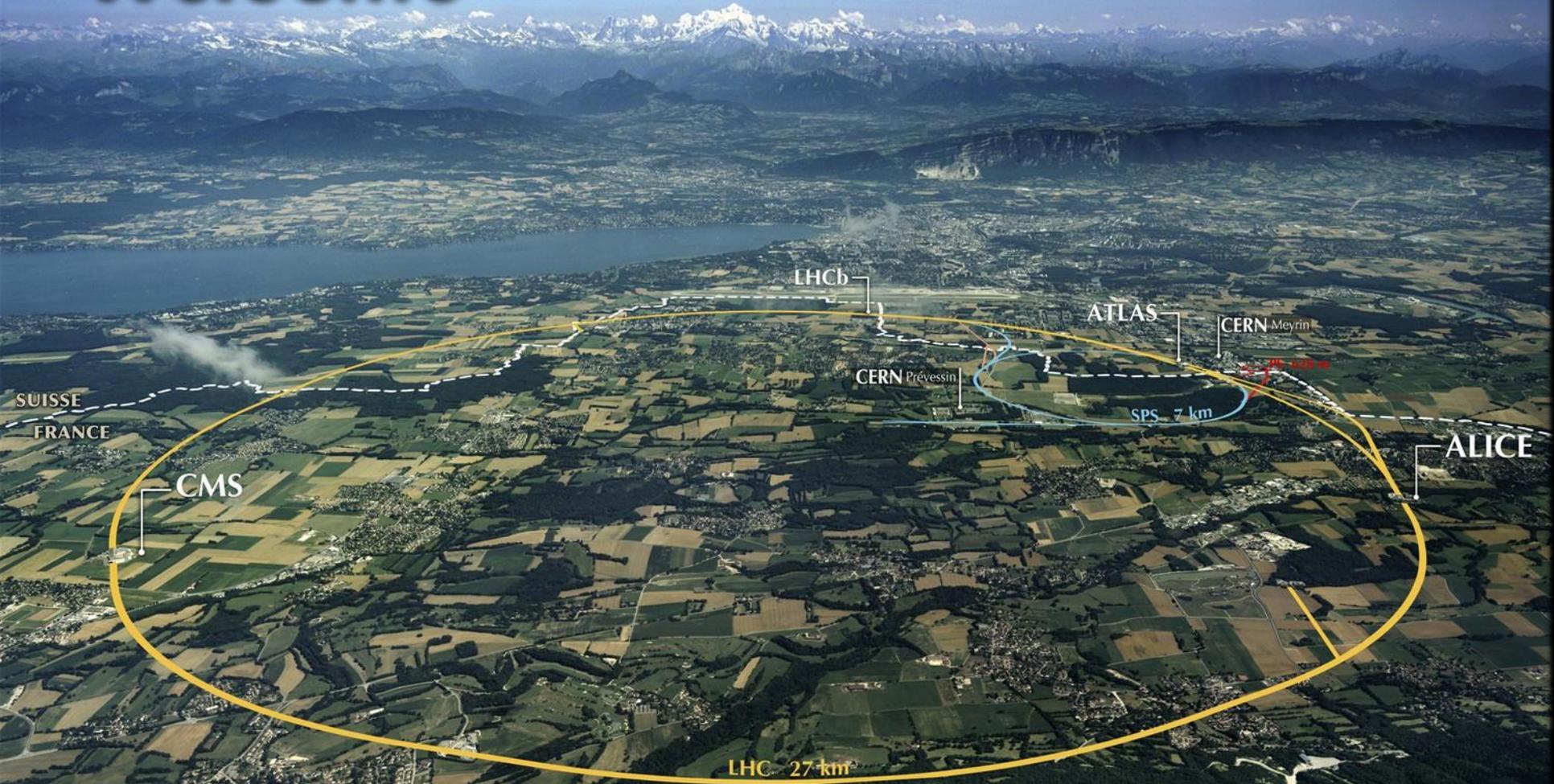
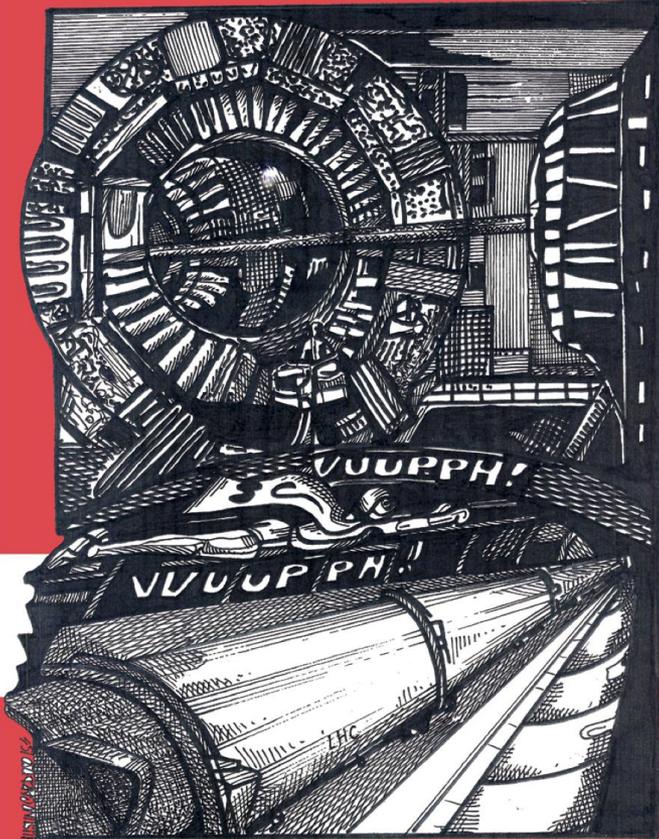


# Welcome



to **Accelerating Science and Innovation**



CERN Science bridging cultures

CERN  
*Science bridging cultures*

Edited by Marilena Streit-Bianchi

Geneva  
2018

**Pushing particles near to the speed of light”  
Justino António Cardoso (2015)**



*In memory of **Dr. Karl-Peter Streit**, a physicist who was a member of the **University of Heidelberg** and assistant to Prof. Volker Soergel. He participated in the experiments **WA2, WA42 and WA46**, studying the characteristics of hyperons. In 1983 the collaboration **WA62**, for which he was spokesman, demonstrated the existence of the charmed strange baryon  $\Lambda^+$  (csu) at  $2.46 \text{ GeV}/c^2$  and in 1984 of the charmed doubly strange baryon  $T^0$  (csu) at  $2.74 \text{ GeV}/c^2$ . After working in industry he joined the group of Prof. Allan Clark at the Department of Nuclear and Corpuscular Physics of the **University of Geneva** working on the aspect of radiation hardness of the silicon pixel detector for future upgrades of the **ATLAS** tracker (Insertable B-Layer (IBL) and High Luminosity - LHC (HL-LHC)). He was for many years member of the User Community of CERN.*

**Marilena Streit-Bianchi and Rolf Heuer**

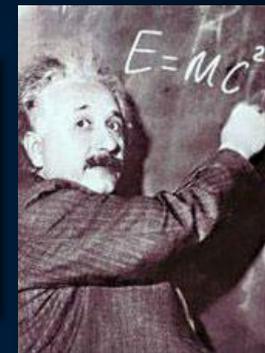




# The Mission of CERN

## ❑ 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?

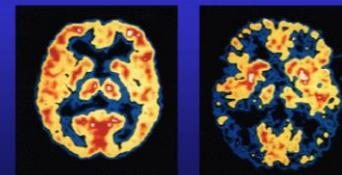


## ❑ Develop new technologies for accelerators and detectors

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:**

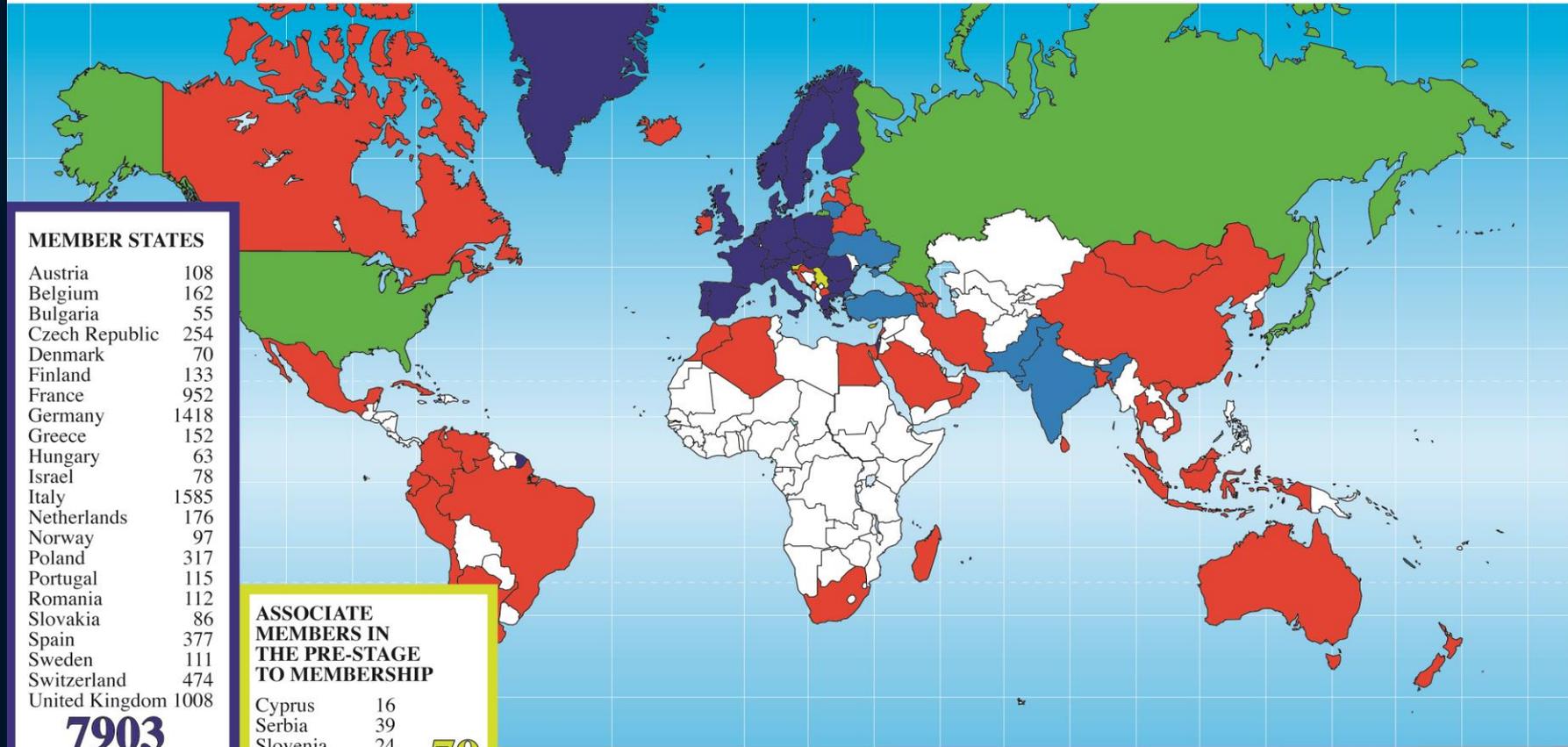
Brazil, Croatia

**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 24 January 2018



### MEMBER STATES

|                |      |
|----------------|------|
| Austria        | 108  |
| Belgium        | 162  |
| Bulgaria       | 55   |
| Czech Republic | 254  |
| Denmark        | 70   |
| Finland        | 133  |
| France         | 952  |
| Germany        | 1418 |
| Greece         | 152  |
| Hungary        | 63   |
| Israel         | 78   |
| Italy          | 1585 |
| Netherlands    | 176  |
| Norway         | 97   |
| Poland         | 317  |
| Portugal       | 115  |
| Romania        | 112  |
| Slovakia       | 86   |
| Spain          | 377  |
| Sweden         | 111  |
| Switzerland    | 474  |
| United Kingdom | 1008 |

**7903**

### ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

|          |    |
|----------|----|
| Cyprus   | 16 |
| Serbia   | 39 |
| Slovenia | 24 |

**79**

### ASSOCIATE MEMBERS 446

|           |     |
|-----------|-----|
| India     | 221 |
| Lithuania | 21  |
| Pakistan  | 38  |
| Turkey    | 129 |
| Ukraine   | 37  |

### OBSERVERS

|        |      |
|--------|------|
| Japan  | 285  |
| Russia | 1099 |
| USA    | 2070 |

**3454**

### OTHERS

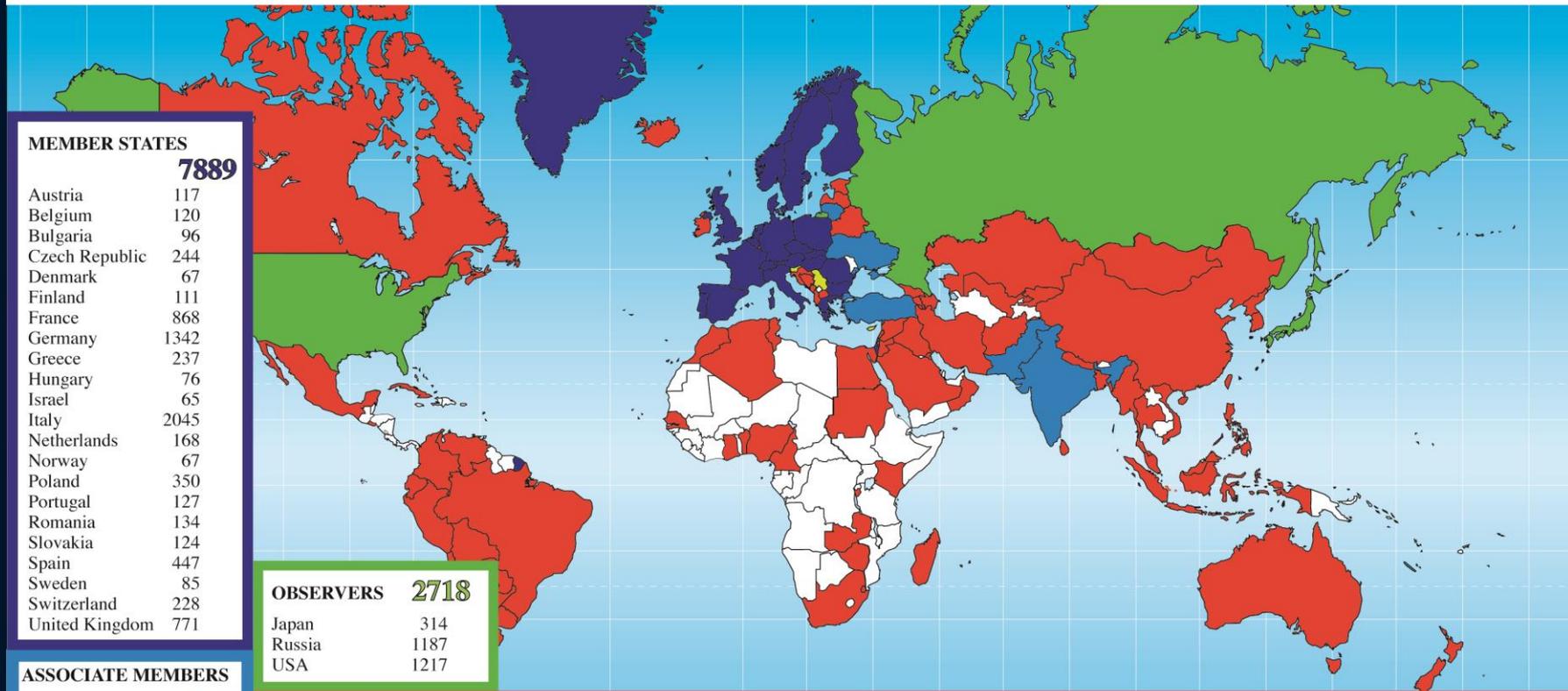
|            |     |           |     |            |     |              |    |            |    |
|------------|-----|-----------|-----|------------|-----|--------------|----|------------|----|
| Algeria    | 1   | Chile     | 23  | Iceland    | 2   | Mexico       | 64 | Sri Lanka  | 3  |
| Argentina  | 20  | China     | 283 | Indonesia  | 7   | Mongolia     | 2  | T.F.Y.R.OM | 2  |
| Armenia    | 14  | Colombia  | 27  | Iran       | 26  | Montenegro   | 7  | Taiwan     | 68 |
| Australia  | 36  | Croatia   | 31  | Ireland    | 10  | Morocco      | 12 | Thailand   | 19 |
| Azerbaijan | 5   | Cuba      | 3   | Korea      | 166 | New Zealand  | 7  | Venezuela  | 1  |
| Bangladesh | 3   | Ecuador   | 4   | Latvia     | 1   | Oman         | 4  | Viet Nam   | 1  |
| Belarus    | 24  | Egypt     | 25  | Lebanon    | 10  | Peru         | 3  |            |    |
| Brazil     | 135 | Estonia   | 18  | Madagascar | 3   | Saudi Arabia | 1  |            |    |
| Canada     | 190 | Georgia   | 28  | Malaysia   | 7   | Singapore    | 3  |            |    |
|            |     | Hong Kong | 19  | Malta      | 8   | South Africa | 81 |            |    |

**1407**



# Science is getting more and more global

## Distribution of All CERN Users by Nationality on 24 January 2018



### MEMBER STATES

**7889**

|                |      |
|----------------|------|
| Austria        | 117  |
| Belgium        | 120  |
| Bulgaria       | 96   |
| Czech Republic | 244  |
| Denmark        | 67   |
| Finland        | 111  |
| France         | 868  |
| Germany        | 1342 |
| Greece         | 237  |
| Hungary        | 76   |
| Israel         | 65   |
| Italy          | 2045 |
| Netherlands    | 168  |
| Norway         | 67   |
| Poland         | 350  |
| Portugal       | 127  |
| Romania        | 134  |
| Slovakia       | 124  |
| Spain          | 447  |
| Sweden         | 85   |
| Switzerland    | 228  |
| United Kingdom | 771  |

### OBSERVERS

**2718**

|        |      |
|--------|------|
| Japan  | 314  |
| Russia | 1187 |
| USA    | 1217 |

### ASSOCIATE MEMBERS

|           |     |            |
|-----------|-----|------------|
| India     | 357 | <b>745</b> |
| Lithuania | 35  |            |
| Pakistan  | 65  |            |
| Turkey    | 173 |            |
| Ukraine   | 115 |            |

### ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

**118**

|          |    |
|----------|----|
| Cyprus   | 26 |
| Serbia   | 57 |
| Slovenia | 35 |

### OTHERS

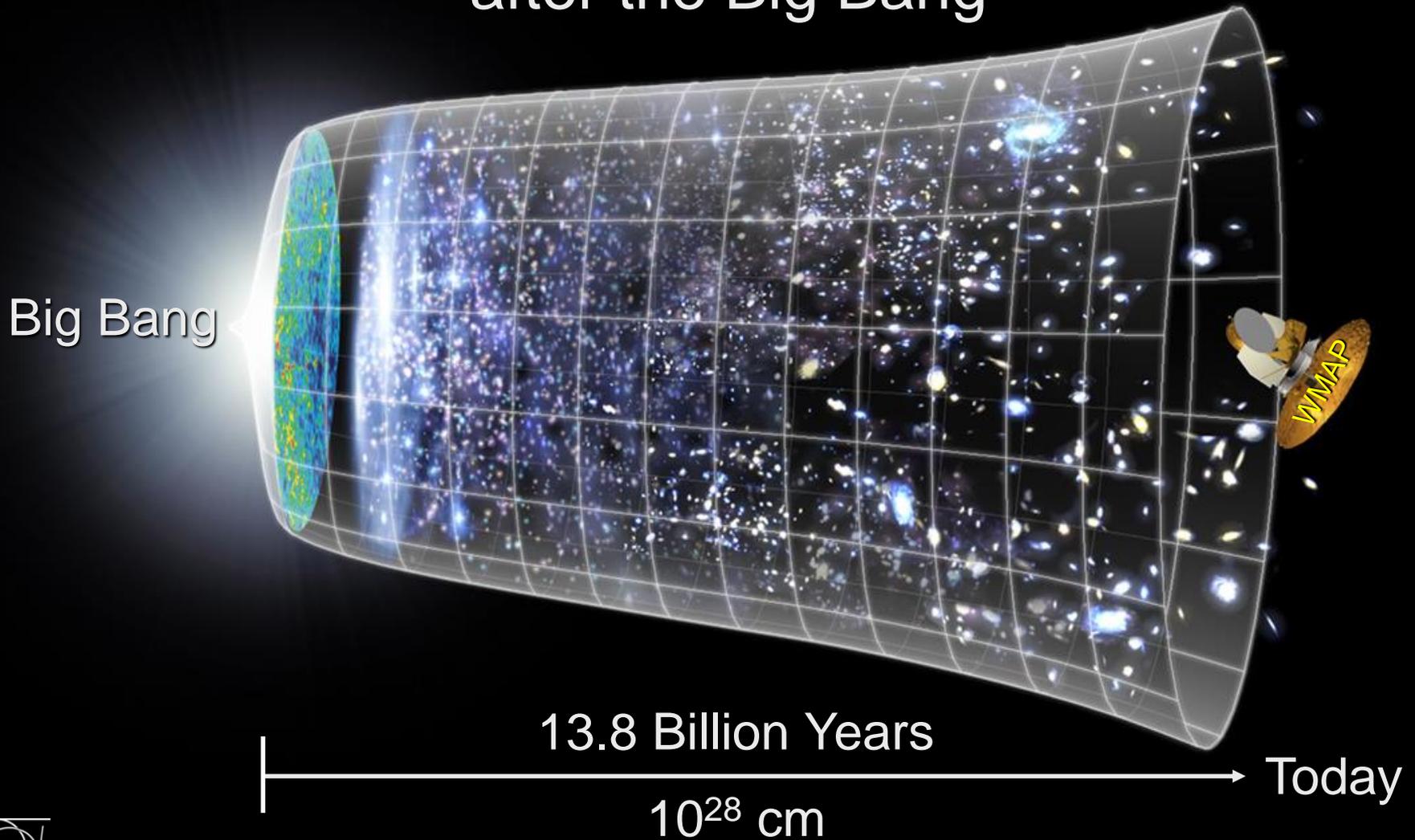
**1872**

|             |    |          |     |           |    |            |     |                  |    |                       |    |              |    |
|-------------|----|----------|-----|-----------|----|------------|-----|------------------|----|-----------------------|----|--------------|----|
| Afghanistan | 1  | Brazil   | 135 | Estonia   | 15 | Kazakhstan | 5   | Mongolia         | 2  | Philippines           | 3  | Thailand     | 22 |
| Albania     | 3  | Burundi  | 1   | Georgia   | 46 | Kenya      | 3   | Montenegro       | 11 | Saint Kitts and Nevis | 1  | T.F.Y.R.O.M. | 2  |
| Algeria     | 14 | Cameroon | 1   | Ghana     | 1  | Korea Rep. | 185 | Morocco          | 20 | Saudi Arabia          | 2  | Tunisia      | 5  |
| Argentina   | 27 | Canada   | 161 | Hong Kong | 1  | Kyrgyzstan | 1   | Myanmar          | 1  | Senegal               | 1  | Uruguay      | 1  |
| Armenia     | 19 | Chile    | 20  | Iceland   | 3  | Lebanon    | 23  | Nepal            | 10 | Singapore             | 4  | Uzbekistan   | 4  |
| Australia   | 31 | China    | 510 | Indonesia | 11 | Luxembourg | 2   | New Zealand      | 5  | Sri Lanka             | 6  | Venezuela    | 10 |
| Azerbaijan  | 10 | Colombia | 45  | Iran      | 51 | Madagascar | 4   | Nigeria          | 3  | South Africa          | 56 | Viet Nam     | 13 |
| Bangladesh  | 11 | Croatia  | 41  | Iraq      | 1  | Malaysia   | 15  | North Korea      | 1  | Sri Lanka             | 6  | Zambia       | 1  |
| Belarus     | 48 | Cuba     | 12  | Ireland   | 16 | Malta      | 9   | Oman             | 3  | Sudan                 | 1  | Zimbabwe     | 2  |
| Benin       | 1  | Ecuador  | 6   | Jordan    | 1  | Mexico     | 82  | Palestine (O.T.) | 7  | Swaziland             | 1  |              |    |
|             |    |          |     |           |    |            |     | Paraguay         | 2  | Syria                 | 1  |              |    |
|             |    |          |     |           |    |            |     | Peru             | 7  | Taiwan                | 51 |              |    |



# Scientific Challenge:

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

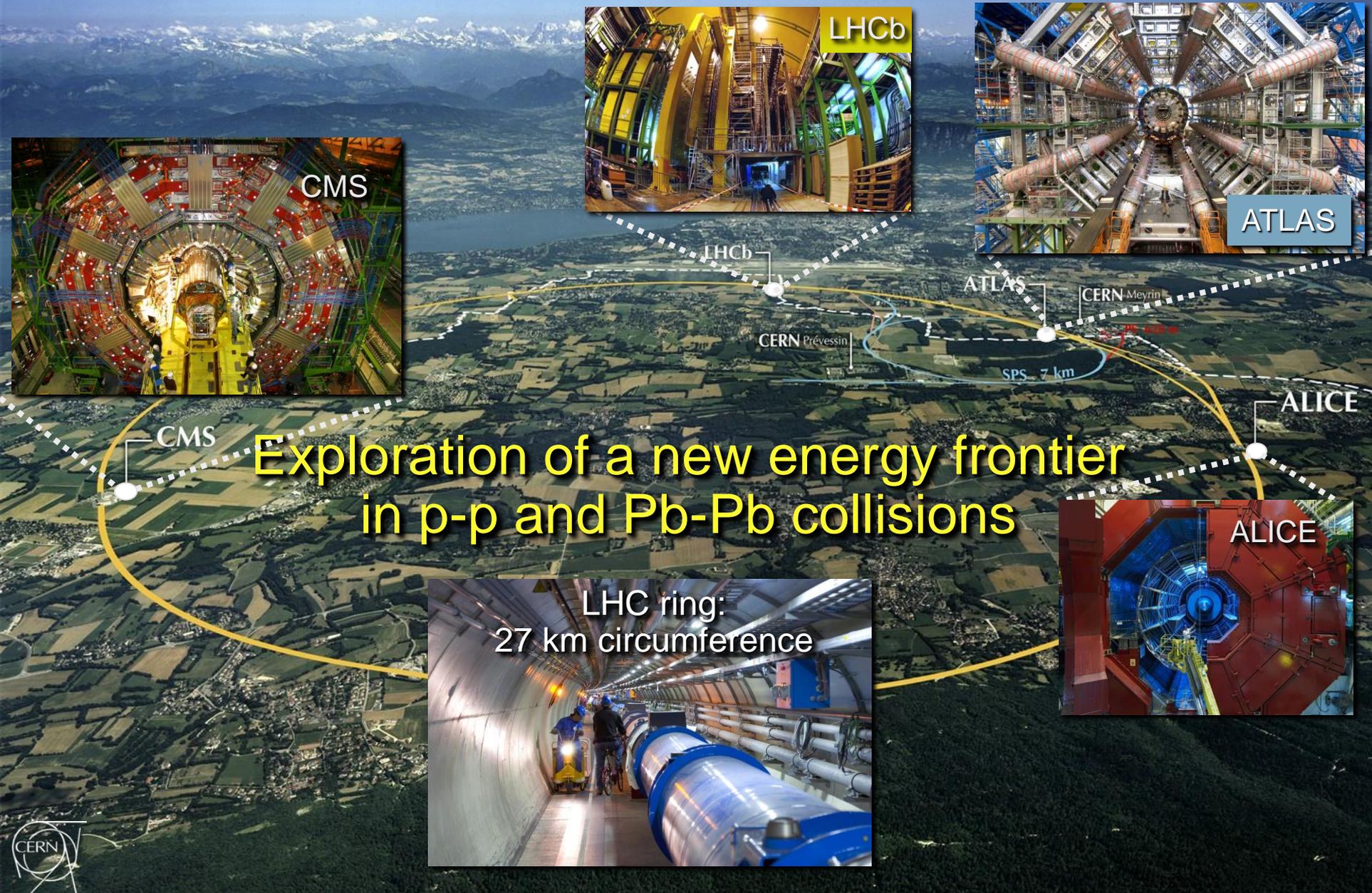




- *The evolution of our Universe, leading to life on Earth, has taken billions of years. LHC physicists are studying what happened in the  $10^{-12}$  seconds after the Big Bang. Hydrogen and helium atoms were produced about 380,000 years after.*

**"The evolution of our Universe"  
Justino António Cardoso 2015**

# 2010: a New Era in Fundamental Science



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

LHC ring:  
27 km circumference



# Mozambique and CERN



Following a visit to CERN by the Mozambican President in 2009, an agreement has been established with the Minister of Science and Technology and the Universidade Eduardo Mondlane, with a view to facilitating training opportunities for Mozambican students and teachers. Mozambican high-school teachers were trained at CERN in 2009 and 2010.



15 June 2009 - President of the Republic of Mozambique A. Guebuza visiting CMS experimental area



26 February 2018 - President of the Republic of Mozambique Mr Filipe Nyusia visiting ATLAS experimental area



# Isidor Rabi at 30<sup>th</sup> Anniversary of CERN (21 September 1984)

*'I hope that the scientists at CERN will remember that they have other duties than exploring further into particle physics.*

*....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'.*

Rabi made also some remarks indicating that he considered his involvement in the foundation of CERN as a certain compensation for his contributions to designing the atomic bomb.



Rabi, Aubert (CH), Merrison, Juan Carlos I, Schopper, Curien (F), Brooks (UK)



Thank You!



*Accelerating Science and Innovation*