

# Maintaining European Leadership in Particle Physics

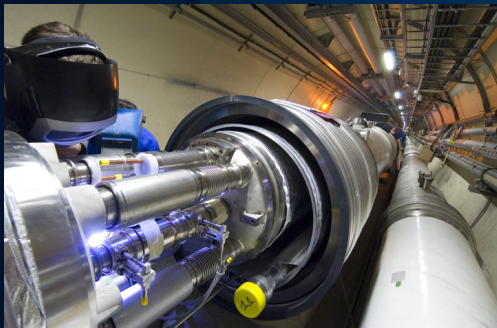
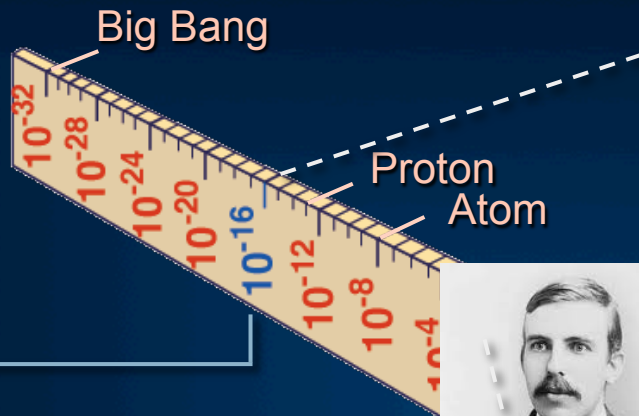


## The European Strategy for Particle Physics

# Particle Physics ...

- Pushes back the frontiers of knowledge:  
e.g. Investigating the first moments of the Universe's existence
- Advances the frontiers of technology
- Trains the scientists and engineers of tomorrow
- Brings nations together through science



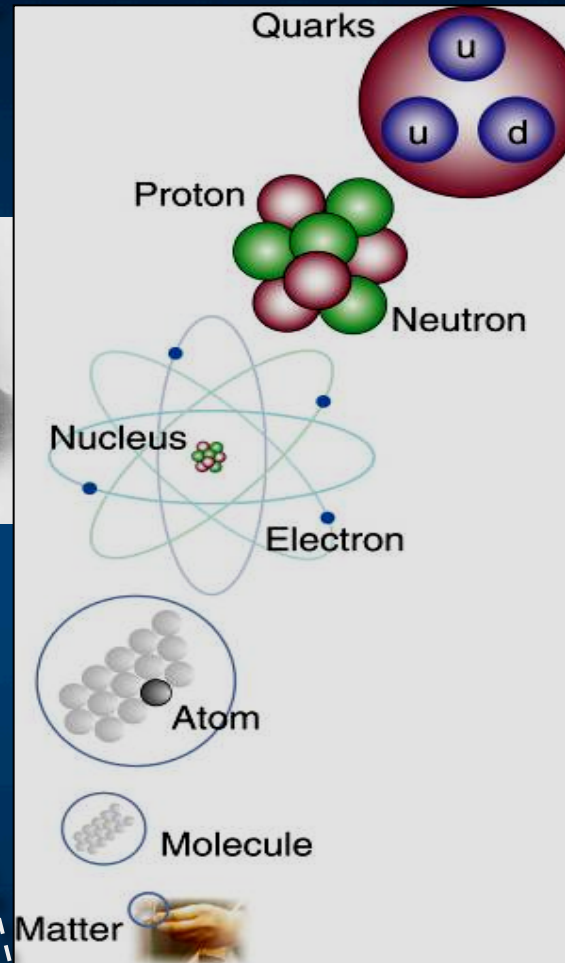


LHC

Super-Microscope

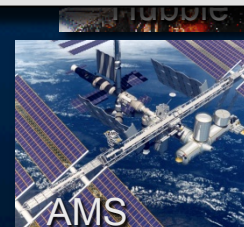
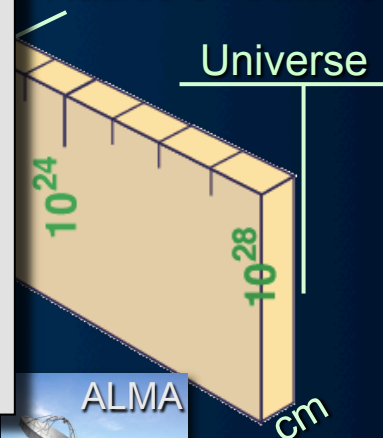


Study physics laws of first moments after Big Bang  
increasing Symbiosis between Particle Physics,  
Astrophysics and Cosmology

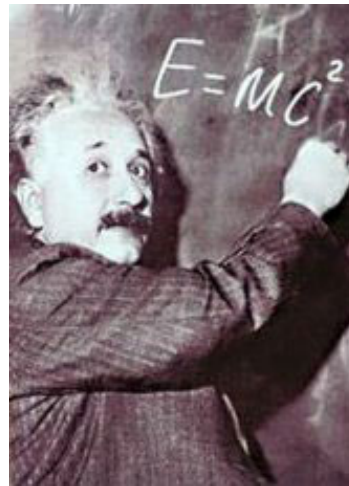


Radius of Galaxies

Universe



To push back the frontiers of knowledge.....  
Seeking answers to questions about the Early Universe:



Newton's unfinished business... what is mass?

Science's little embarrassment... what is 96% of the Universe made of?

Nature's favouritism... why is there no more antimatter?

The secrets of the Big Bang... what was matter like within the first moments of the Universe's life?



To push back the frontiers of knowledge.....

Seeking answers to questions about the Early Universe:

We need.....

Large Infrastructures: Such research goes (far) beyond the  
capability of individual countries

Global Collaboration: We cannot do it alone

Sustainability: long term stable support mandatory

...

We have.....

the EIROs:

European Intergovernmental Research Organizations  
delivering global leadership in their respective fields



# CERN

a European Intergovernmental Organisation, globally used

→ an infrastructure belonging to all member states

→ an example of what Europe can achieve when Europe is working together

→ a world leading infrastructure in Europe:

## YOUR infrastructure



**1954** European Reconstruction  
1<sup>st</sup> Session of CERN Council



**1980** The East Meets the West  
Visit of delegation from Beijing



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

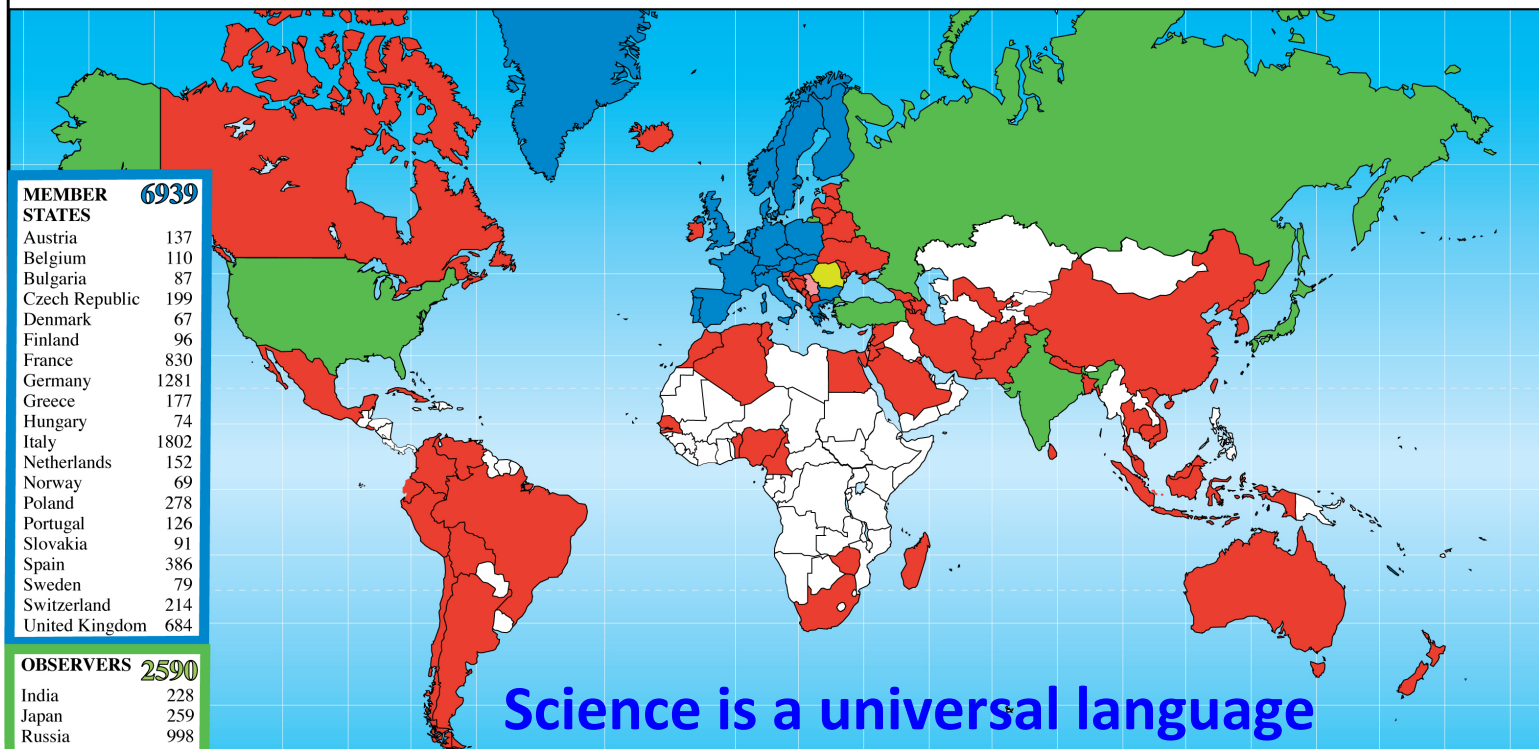


## Global Collaboration

# Breaking the Walls between Cultures and Nations since 1954



## Distribution of All CERN Users by Nationality on 14 January 2013



### MEMBER STATES 6939

Austria	137
Belgium	110
Bulgaria	87
Czech Republic	199
Denmark	67
Finland	96
France	830
Germany	1281
Greece	177
Hungary	74
Italy	1802
Netherlands	152
Norway	69
Poland	278
Portugal	126
Slovakia	91
Spain	386
Sweden	79
Switzerland	214
United Kingdom	684

### OBSERVERS 2590

India	228
Japan	259
Russia	998
Turkey	127
USA	978

### CANDIDATE FOR ACCESSION

Romania	126
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### ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

Israel	60
Serbia	45

### OTHERS

Afghanistan	1	Bolivia	2	Croatia	31	Iran	31	Malaysia	8	Peru	6	Ukraine	57
Albania	3	Bosnia & Herzegovina	2	Cuba	7	Ireland	22	Malta	2	Saudi Arabia	3	Uzbekistan	2
Algeria	12	Brazil	98	Cyprus	13	Jordan	2	Mexico	62	Senegal	1	Venezuela	11
Argentina	16	Cambodia	1	Ecuador	3	Korea, D.P.R.	2	Moldova	1	Singapore	1	Viet Nam	11
Armenia	23	Cameroon	1	Egypt	12	Korea Rep.	117	Montenegro	3	Slovenia	33	Zimbabwe	2
Australia	23	Canada	140	El Salvador	1	Kuwait	1	Morocco	16	South Africa	14		
Azerbaijan	7	Cape Verde	1	Estonia	15	Latvia	1	Nepal	3	Sri Lanka	7		
Bangladesh	6	Chile	10	Georgia	35	Lebanon	10	New Zealand	8	Syria	2		
Belarus	41	China	266	Gibraltar	1	Lithuania	20	Nigeria	1	Thailand	8		
Benin	1	China (Tapei)	47	Iceland	3	Luxembourg	4	Pakistan	40	T.F.Y.R.O.M.	2		
		Colombia	35	Indonesia	1	Madagascar	1	Palestine (O.T.)	5	Tunisia	8		

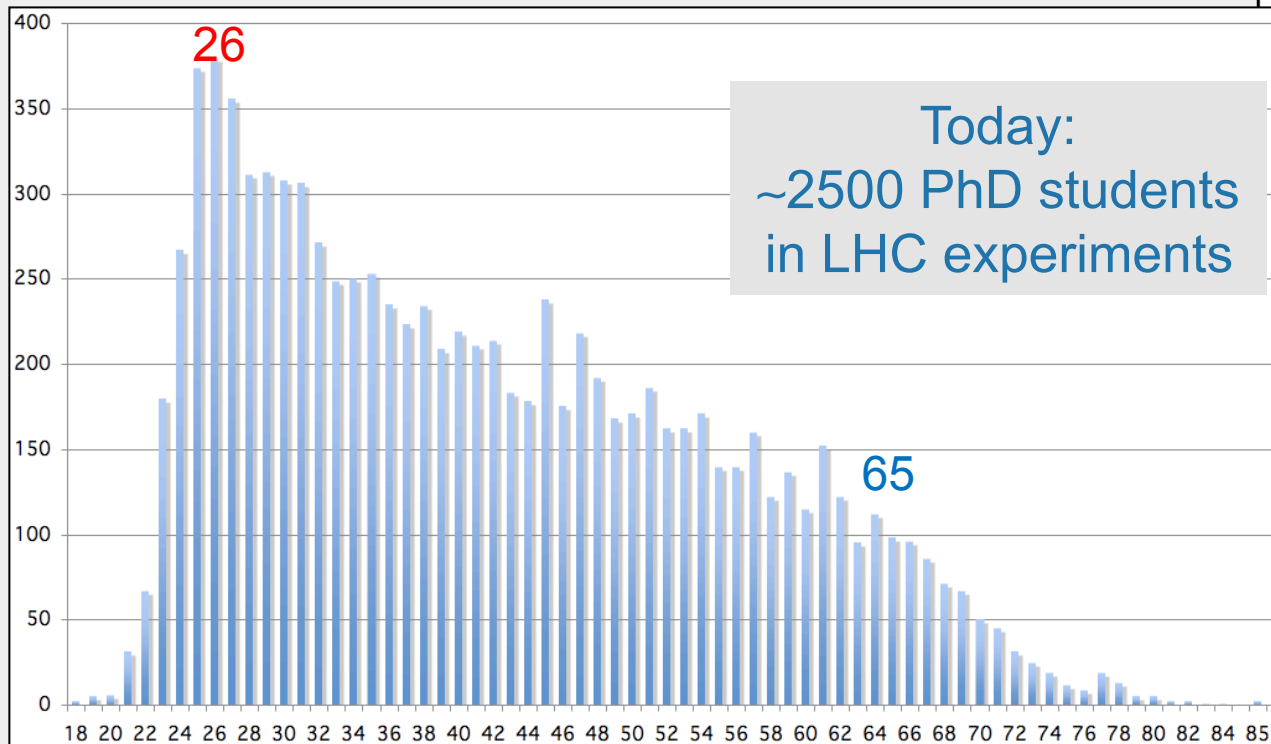
1386



# Age Distribution of Scientists

- and where they go afterwards

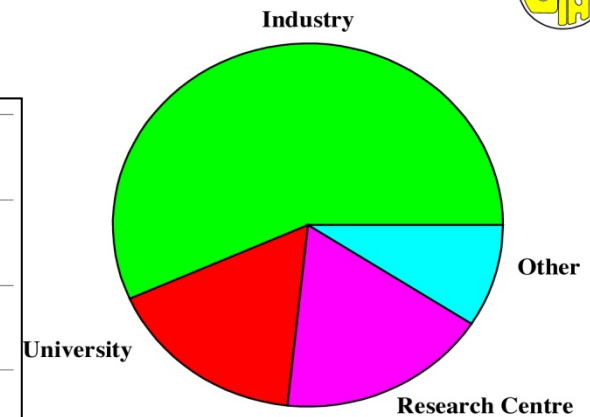
Survey in March 2009



They do not all stay: where do they go?

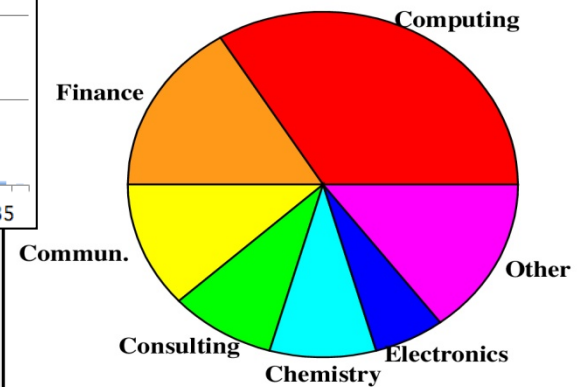


Status of 1998 (120 PhD's total)



## Whereabouts of PhD's

Status of 1998 (68 PhD's total)



## Whereabouts of PhD's in Industry



# the Large Hadron Collider (LHC)

- Largest scientific instrument ever built, 27km of circumference

- >10 000 people involved in its design, construction, exploitation

- Collides protons to reproduce conditions at the birth of the Universe...

...40 million times a second

at



***Accelerating Science and Innovation***

SUISSE  
FRANCE

CMS

CERN Preessin

ATLAS

CERN Meyrin

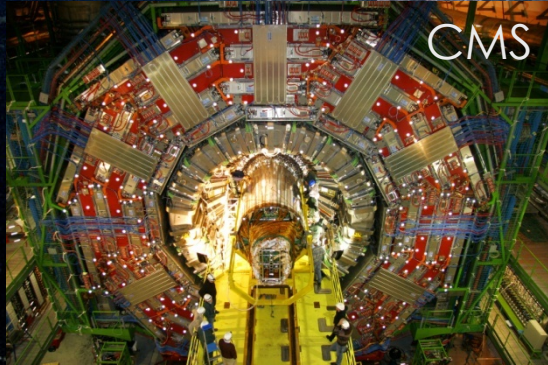
SPS 7 km

ALICE

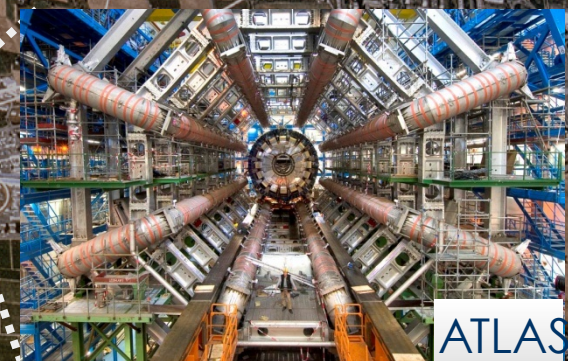
LHC 27 km



# 2010: A New Era in Fundamental Science



Exploration of a new energy frontier  
Proton-proton and Heavy Ion collisions







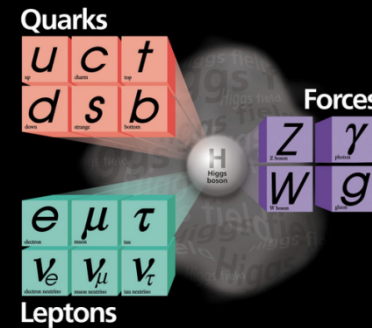
A historical day : 4<sup>th</sup> July 2012



Have we found the **Higgs particle** that is 'responsible' for **giving mass** to all particles?

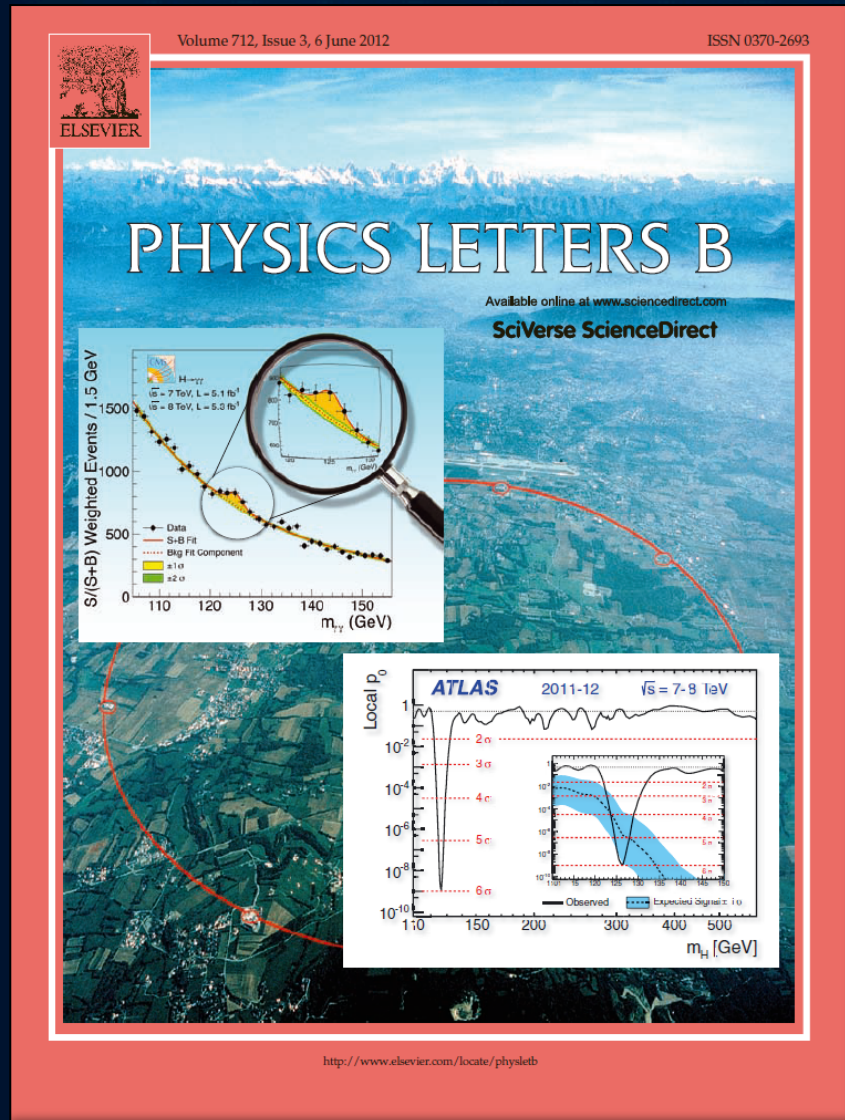
Global Implications for the future

R-D Heuer





# The highlight of a remarkable year 2012





## Why do we need a strategy now ?

The leading role of Europe in particle physics relies heavily on the underlying organisational model:

CERN as a world-leading laboratory,  
strong community of particle physicists in universities and national institutes,  
true spirit of international collaboration.

To keep the lead, long-term planning is mandatory as the time span of large-scale scientific projects extends over several economic and political cycles.

With the first results and discoveries at the LHC it is now the right time for the update of the European strategy.



# The European strategy for particle physics

- is built on excellence in research in Europe,
- provides opportunities for research globally,
- provides direct benefits to society,
- fosters the network between CERN, universities, national laboratories and institutes in Europe,
- fosters the network between Europe and the other regions in the world:

Particle Physics –

the most global example of science in the world



**... Global Effort**  
**... Global Success**  
**but...**  
**with a European Flavour**



**... European Flavour**  
**means in particular**  
**continuous stable support**