Innovation, Society, Markets:
the Power of Leverage of Science in the Process of Innovation

Assemblea Generale 2016 parte pubblica

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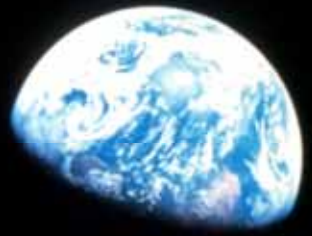
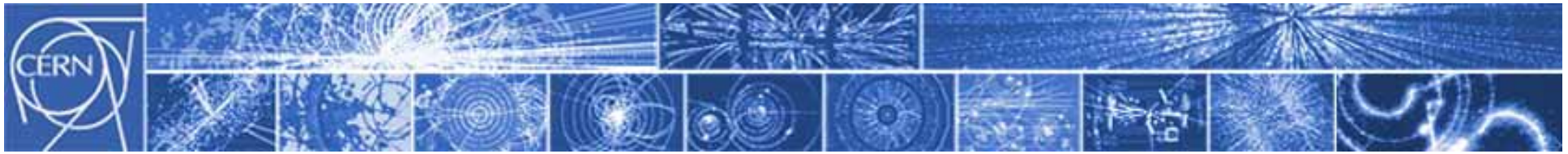
An economy only based on “value for me” is no longer an option for a world facing Societal Challenges at a planetary scale.



Global Sustainability needs an economy based on “value for many”.

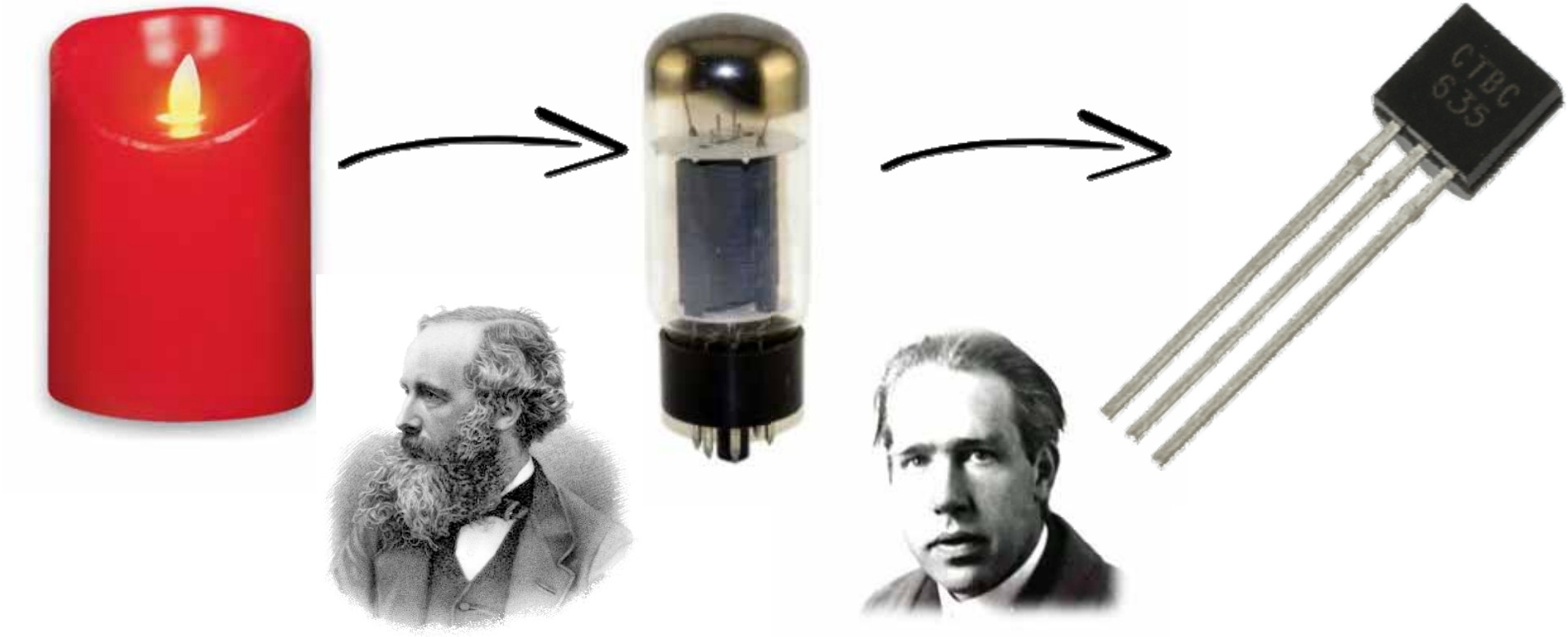

As scientists working on Fundamental Physics, we are constanly reminded by Nature on how little we know.
But there are three things we know:


That Open Science
rewards, motivates and
breaks all barriers
for many.



CERN

That Fundamental Science generates impact and value for many.



That without Fundamental Science is not possible to generate breakthrough paradigms that change industries, economies and humankind.

European Research Infrastructures or Research Infrastructures in Europe?

- A rich scenario of Global, European and National RI's
- A great asset for Europe
- Is it used optimally?

Example CERN: founded in 1954: 12 European States

"Science for Peace"

Today: 21 Member States

~ 2300 staff
~ 1300 other paid personnel
~ 11500 scientific users

Budget (2015) ~1000 MCHF

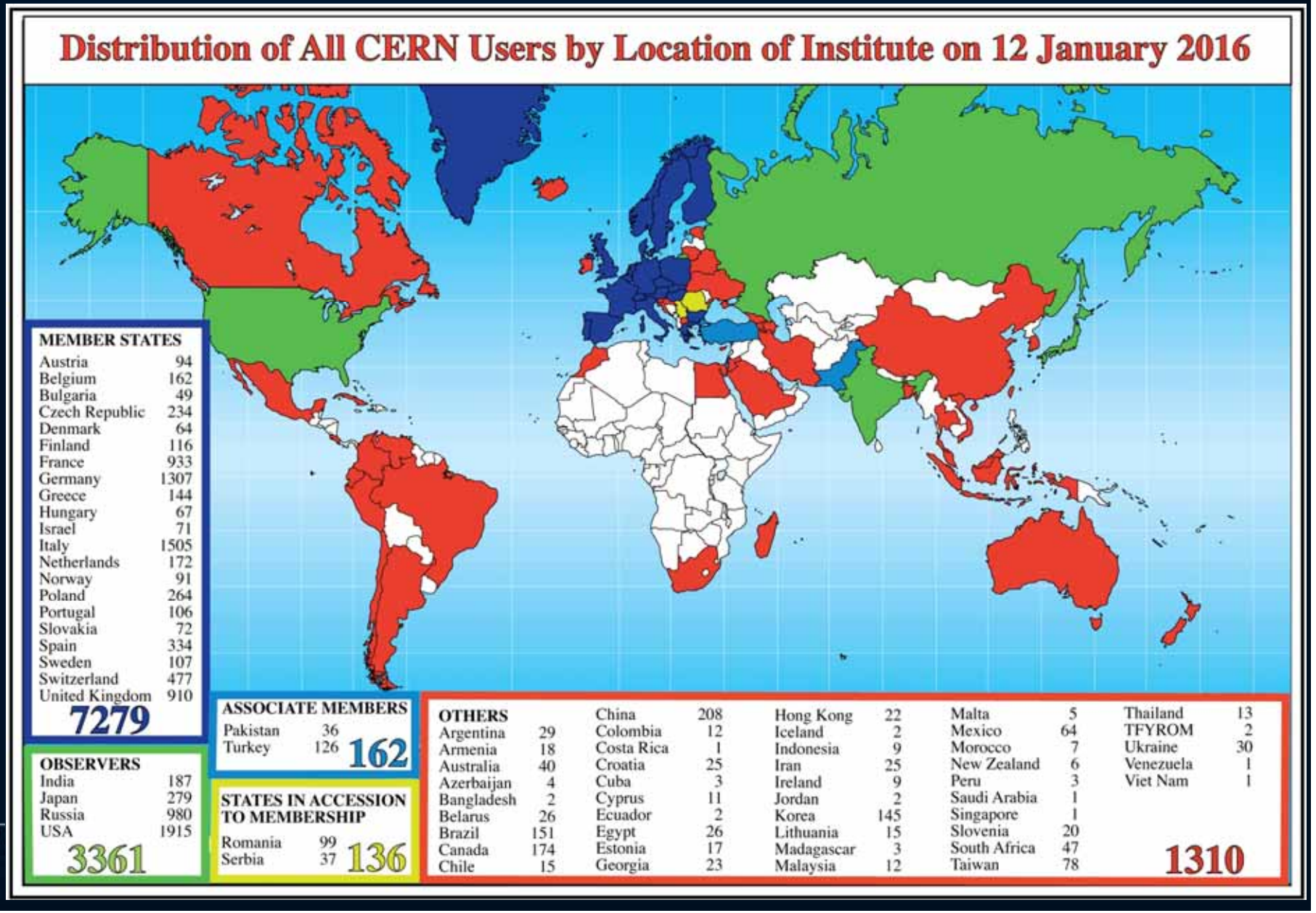
Member States: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland and
United Kingdom

States in accession to Membership: Romania, Serbia

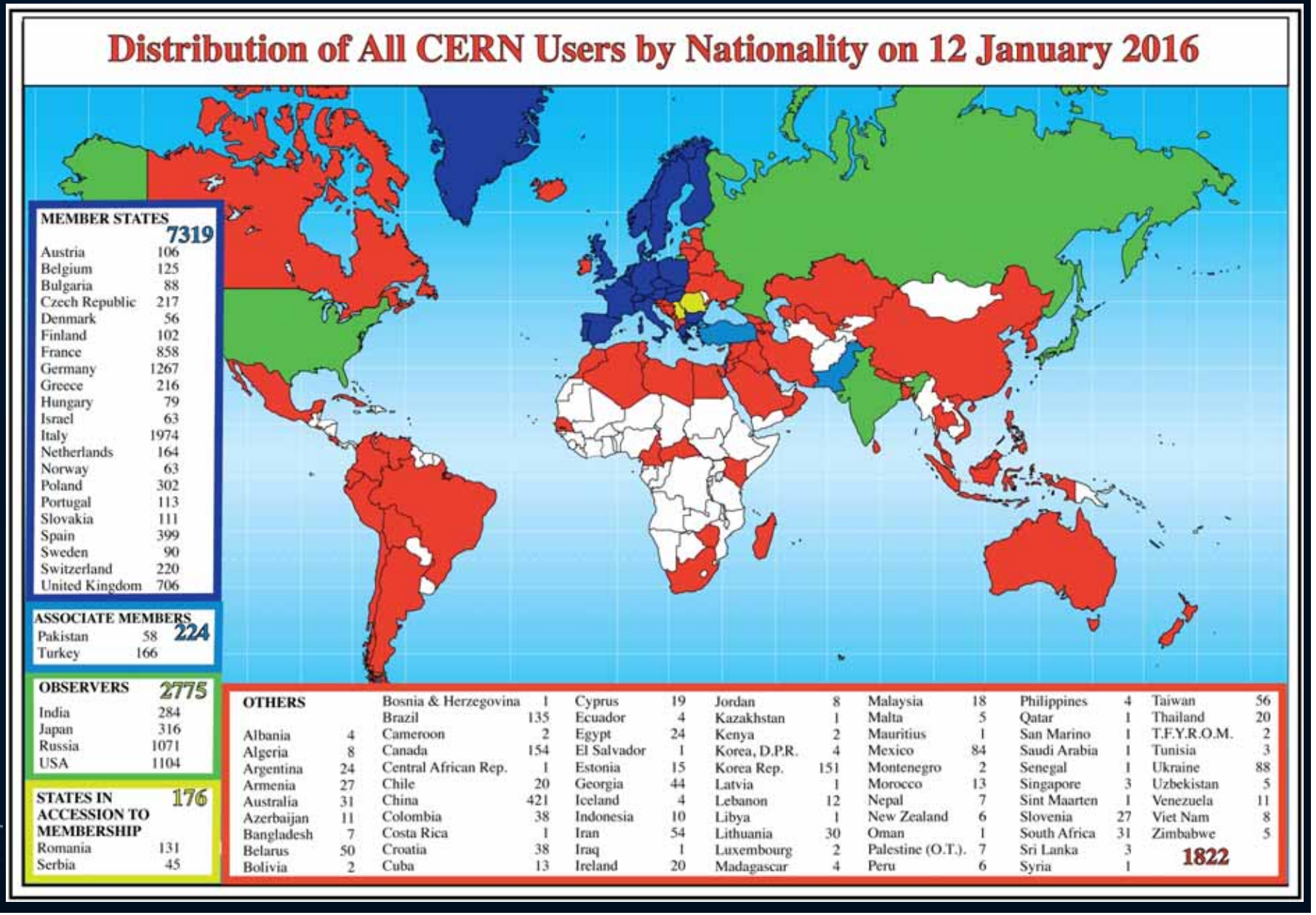
Applications for Membership or Associate Membership:
Brazil, Croatia, Cyprus, Pakistan, Russia, Slovenia, Turkey, Ukraine

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

A global footprint.



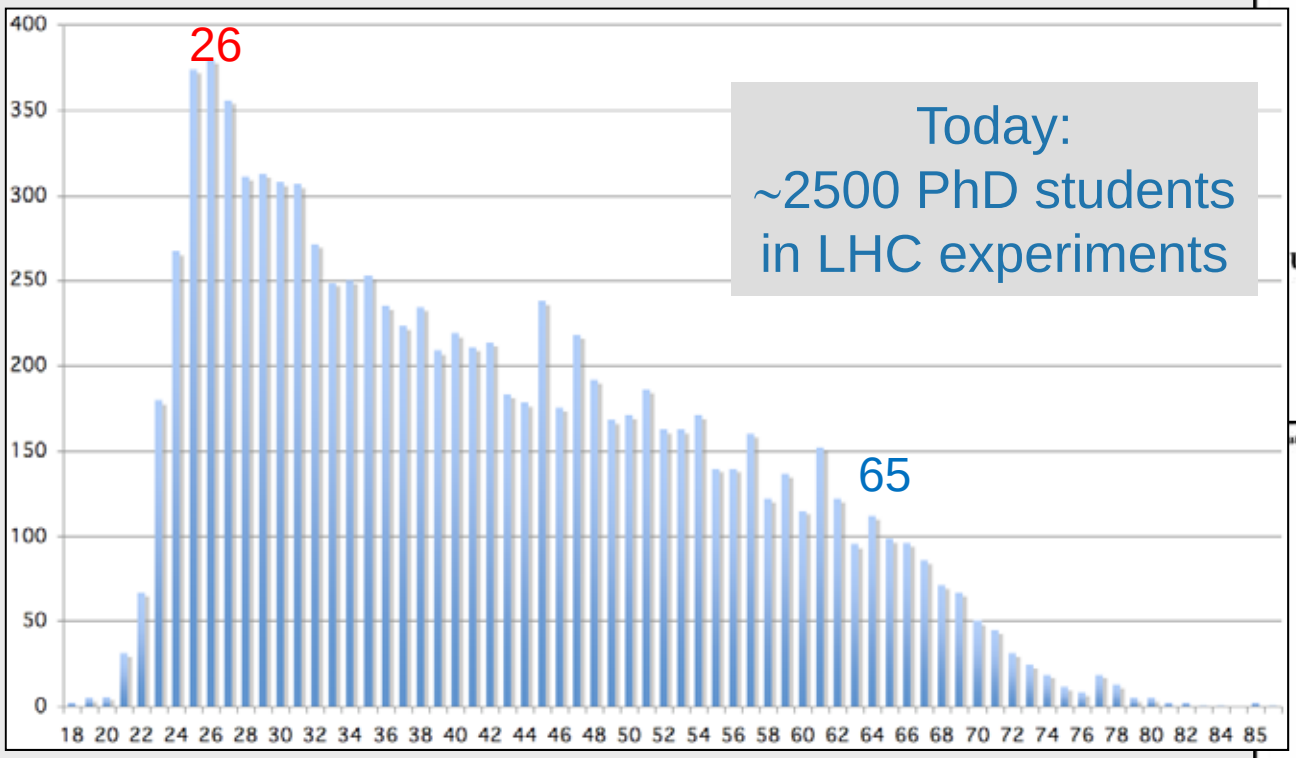
A global footprint.



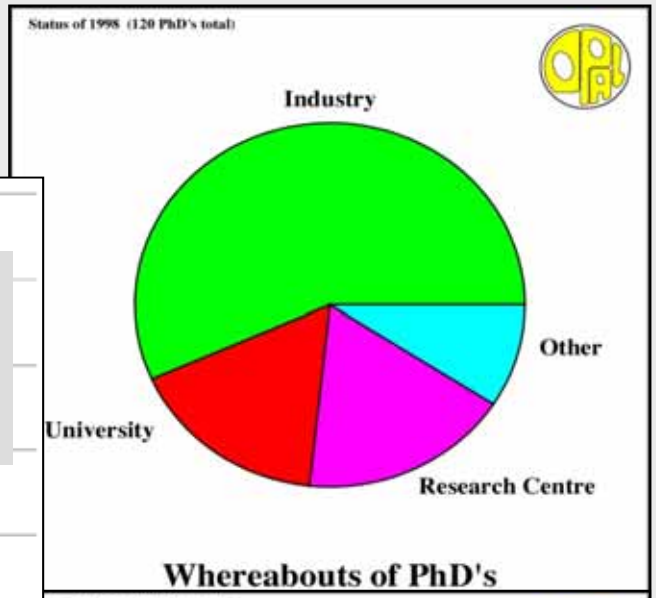
Age Distribution of Scientists

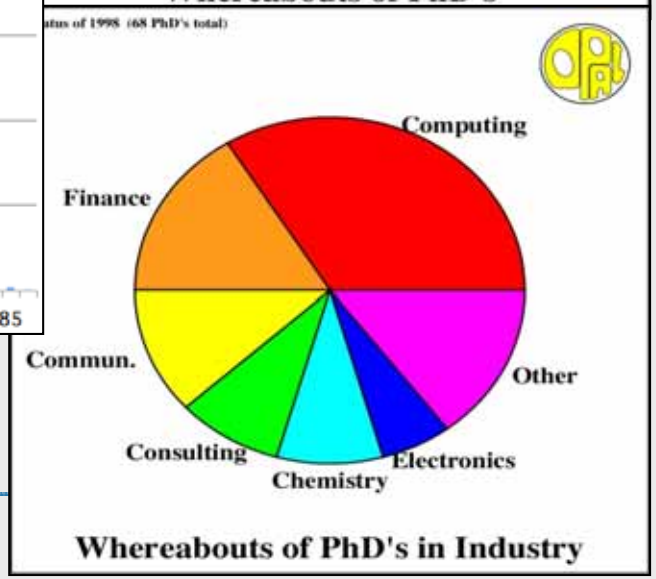
- and where they go afterwards

Survey in March 2009



Today:
~2500 PhD students
in LHC experiments





They do not all stay: where do they go?

How Do We Manage This?

Contrary to popular belief, our community is rather elementary:

- It has simple rules, honed by centuries of practice
- It shares a common vision and a common set of values
- It is based on collaboration AND competition

Science is intrinsically **not democratic** (can't decide who is right by vote!) and therefore it has to be performed with the most democratic tools:

- Freedom of expression
- Peer reviewing
- Independency from political orientation, religion, social status, etc…

A peculiar ant colony, probably worth of a closer look


C
D

The scientists

Despite the usual cinematographic representation, in general we DO NOT

- Wear white lab coats
- Live in ivory towers
- Find a revolutionary result every second day (scientist=genius)

We are a pragmatic community capable to address in a very material way grand and (apparently) immaterial questions, knowing that for every answer we might find, we will open more and unpredicted questions.

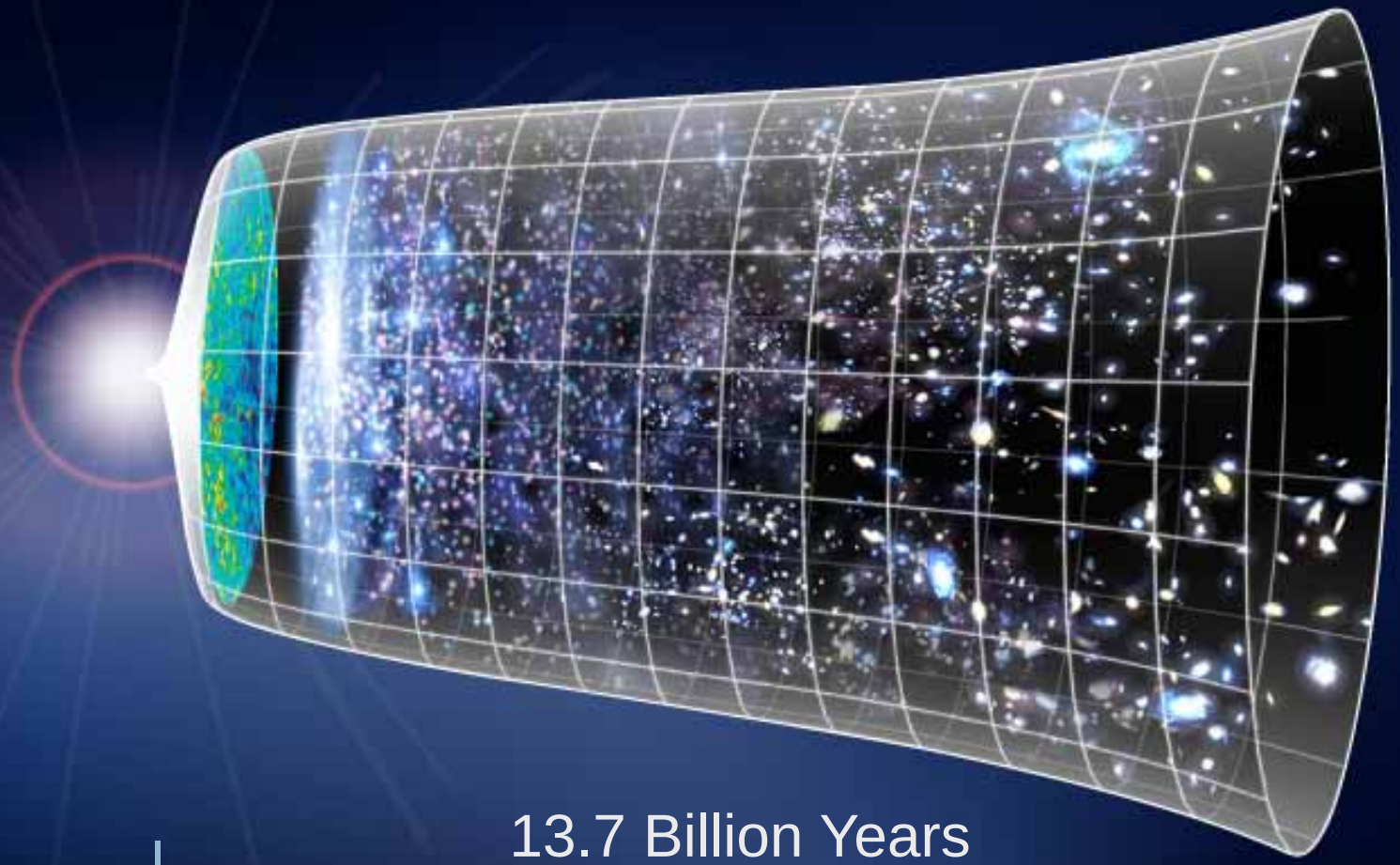
(we definitely prefer to be Ministers of Doubt than Kings of Truth: ubi dubium, ibi libertas)

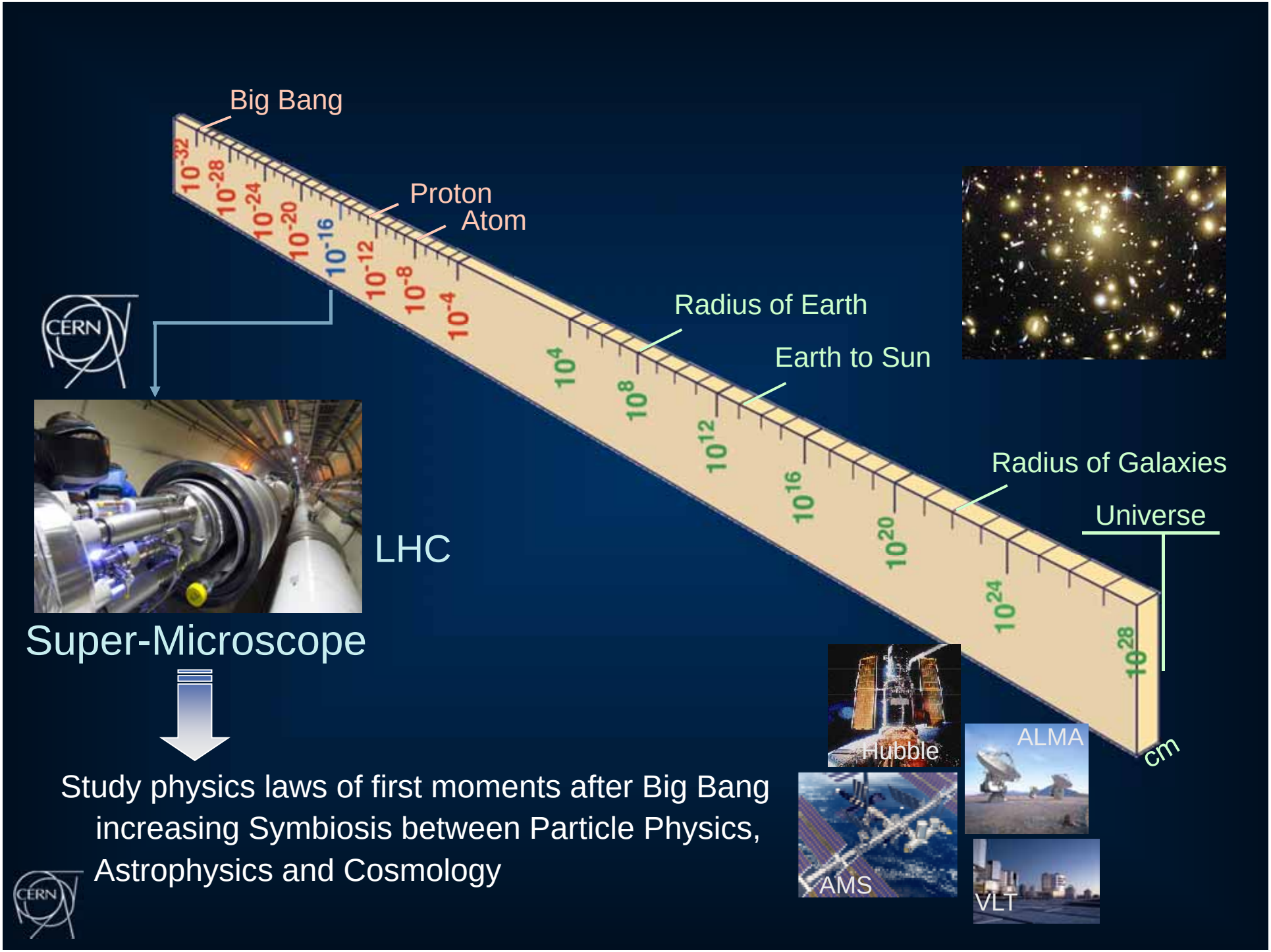
How can you manage such a community?

Need individualized, enabling structures within supporting infrastructure to:

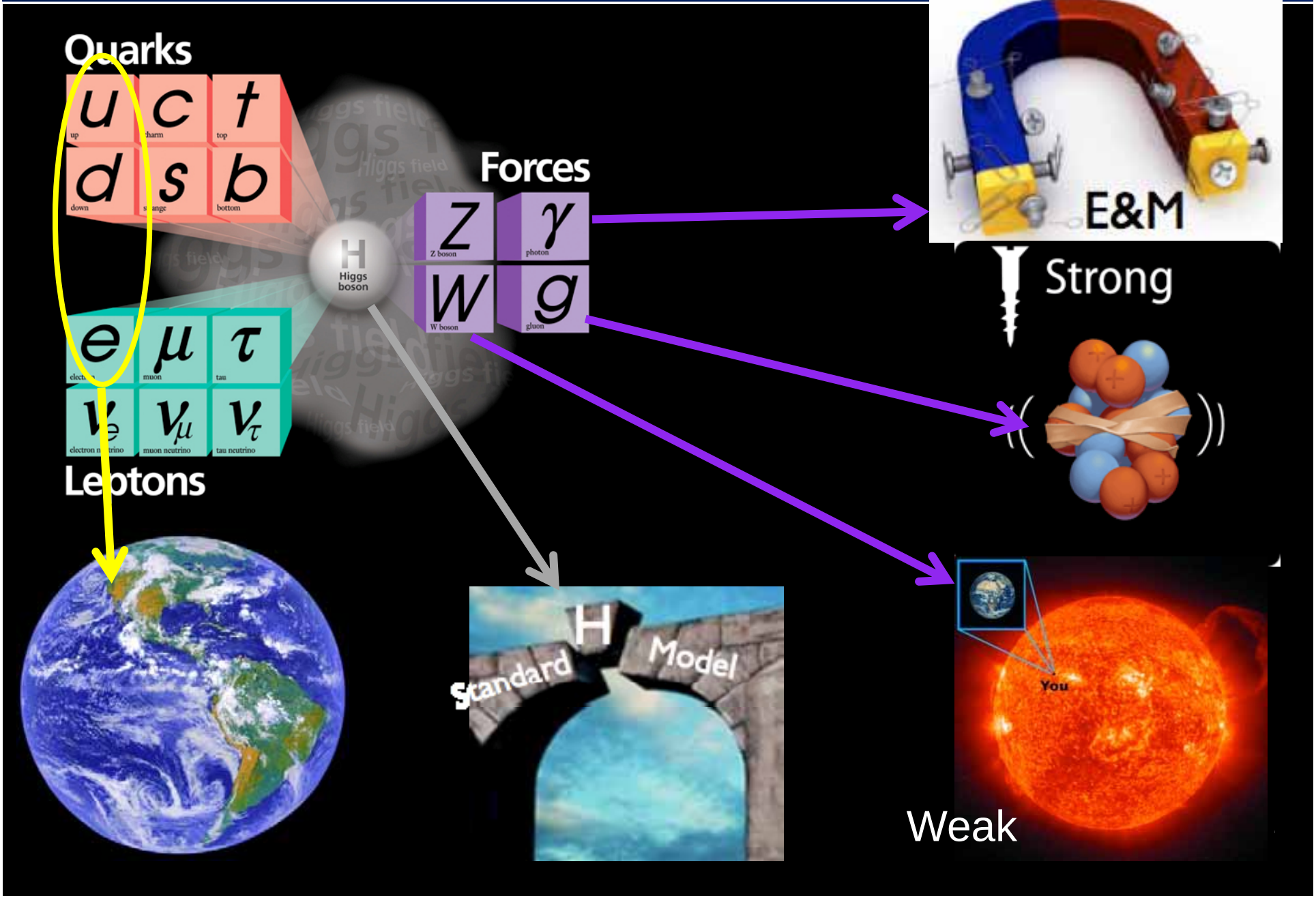
- Allow everybody to keep his/her 5% of dream (i.e. the own original contribution to the advancement of Science), while operating in a very large symphony orchestra.
- Encourage the emergence of gifted performers/soloists
- Foster a leadership based on credibility and consensus more than on authority

Our challenge: to understand the first moments of our Universe




Big Bang
Proton
Atom
Radius of Earth
Earth to Sun
Radius of Galaxies
Universe
cm
LHC
Super-Microscope
Hubble
ALMA
AMS
VLT
Study physics laws of first moments after Big Bang
increasing Symbiosis between Particle Physics,
Astrophysics and Cosmology

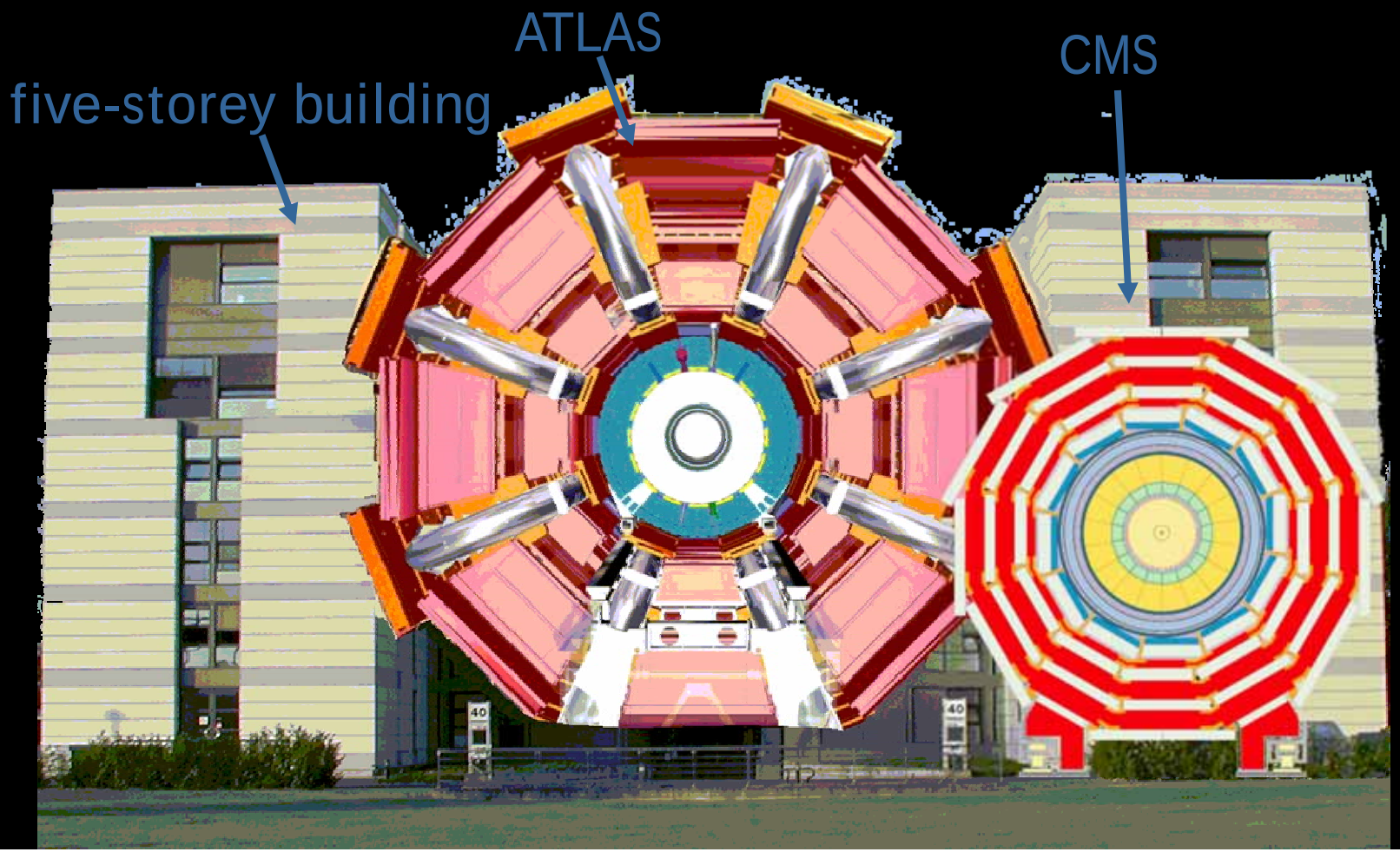
The Standard Model



LHC: a New Era in Fundamental Science

Since March 2010 exploration of a new energy frontier
in p-p and Pb-Pb collisions

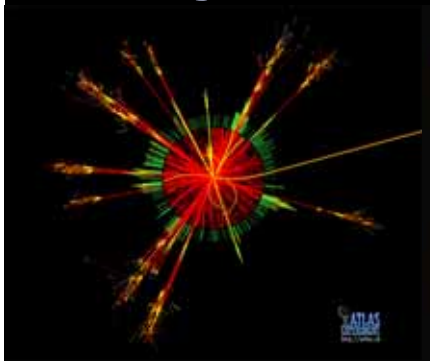
The LHC experiments:
about 100 million "sensors" each
[think your 6MP digital camera…
…taking 40 million pictures a second]

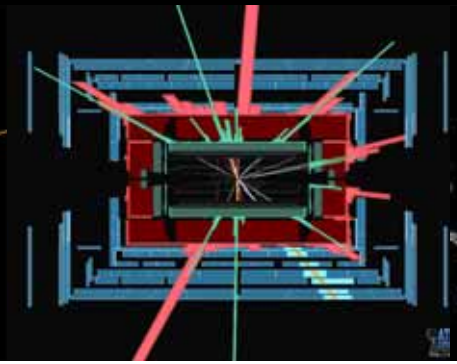


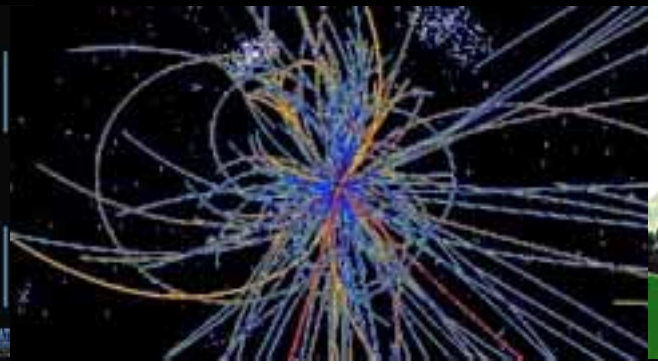
The LHC data

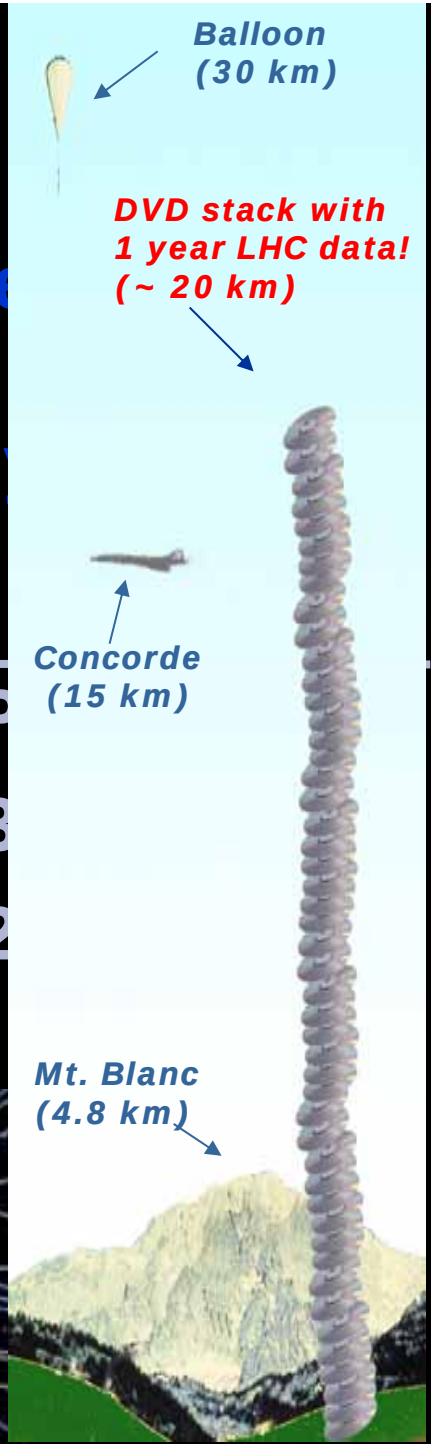
- 40 million events (pictures) per second
- Select (on the fly) the ~500 interesting e
  second to write on tape
- "Reconstruct" data and convert for anal
  "physics data" [→ the grid…]

(x4 experiments x15 years)	Per event	P
Raw data	1.6 MB	3
Reconstructed data	1.0 MB	2
Physics data	0.1 MB	



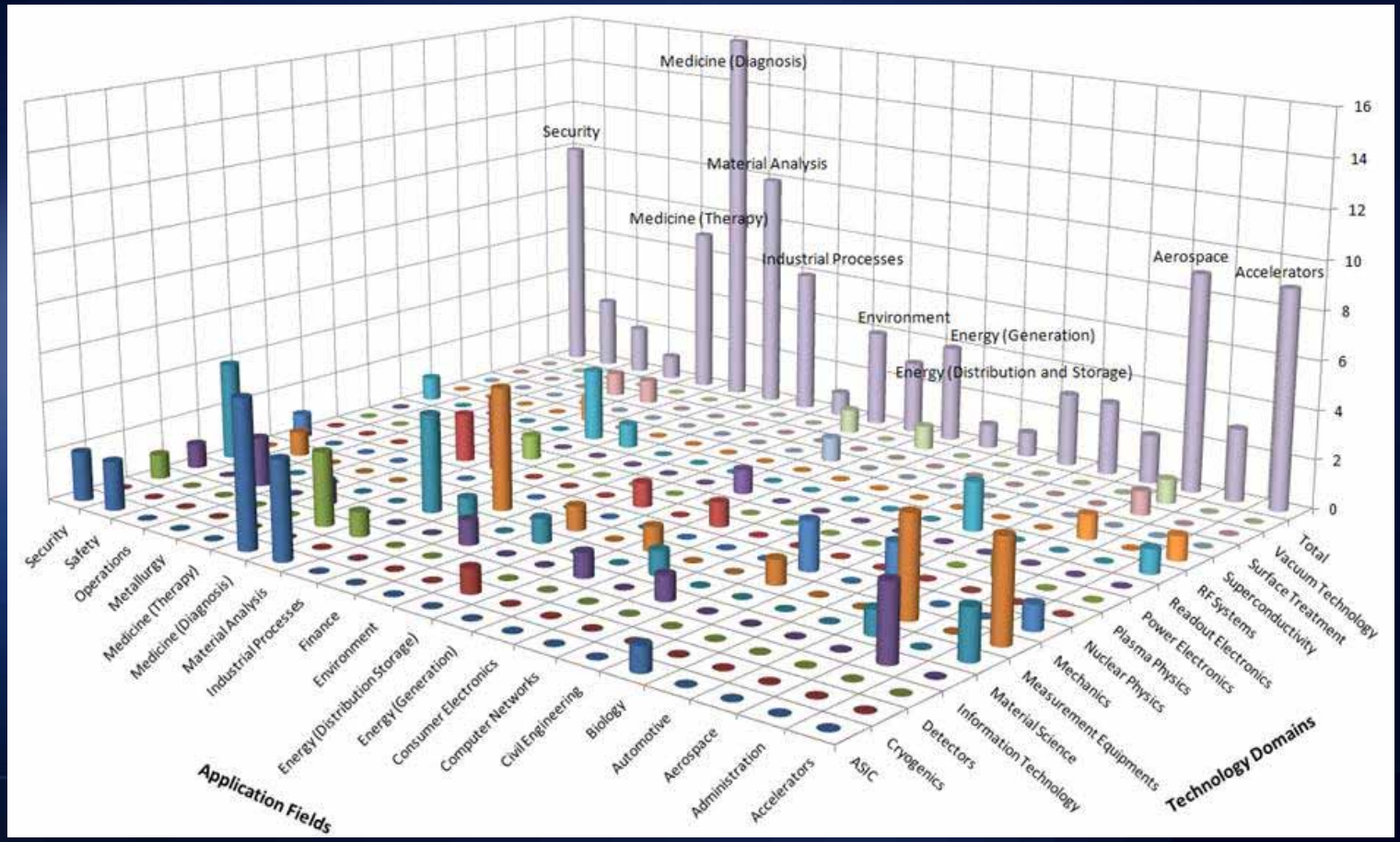


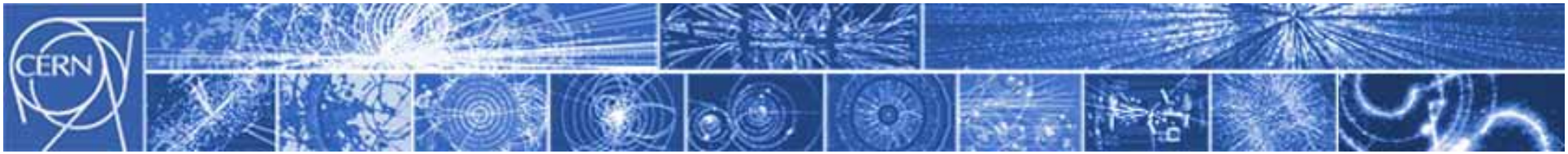




From Open Science to Open Innovation

Cutting edge Research Infrastructures play a key role in a knowledge driven society





Aalto University | CERN | eirma | EMBL | ESADE Universitat Ramon Llull | ESO | ESRF The European Synchrotron | European XFEL | NEUTRONS FOR SCIENCE Institut Laue-Langevin

In Europe, different organizations in dialogue with The European Commission are promoting an initiative to create value for many.

ATTRACT

www.attract-eu.org

ATTRACT

- A proposal for a dedicated, interdisciplinary program within H2020 to co-develop with RIs and industry breakthrough sensor & imaging technologies

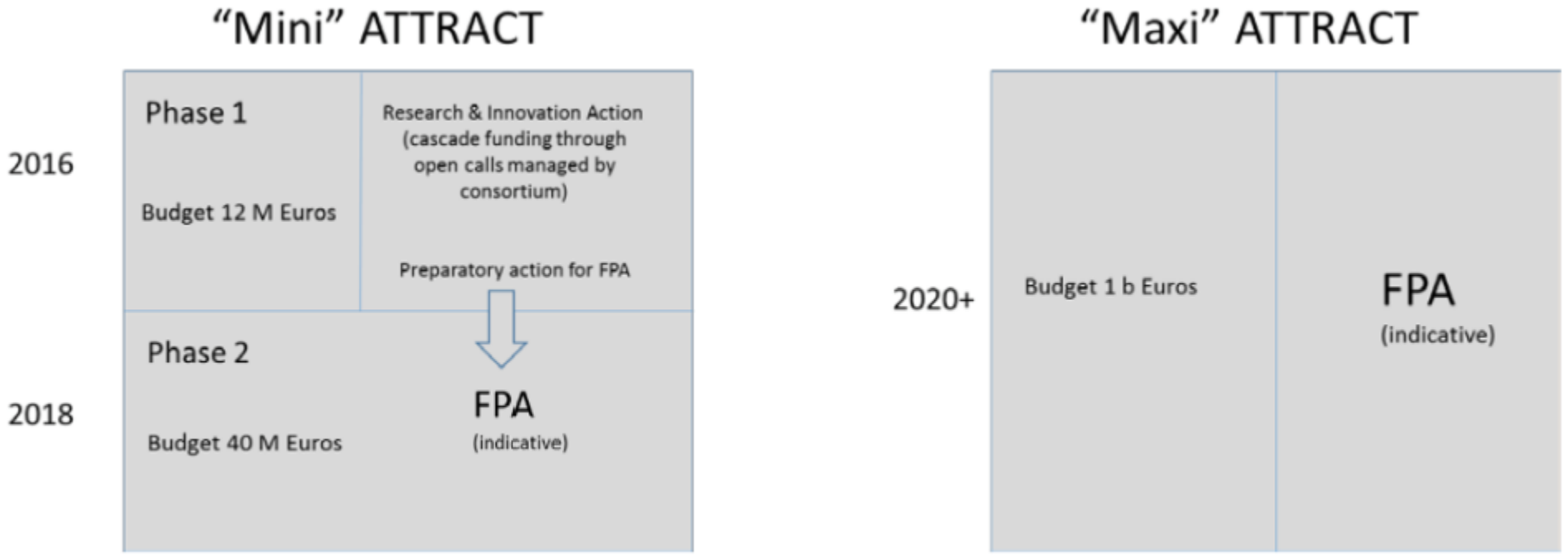
- *The purpose is to address demanding challenges in **both** science and societal needs (e.g. health, sustainable materials and information and communication technologies)*

- Is involving the detector R&D community from many fields including e.g. biology, physics, astronomy, space exploration, nuclear engineering, medical sensing and imaging, related computing (ICT) and others

ATTRACT main idea

- Build up a consortium of ERIs & industrial partners interested and specialized in sensor and imaging technology
- The consortium proposes to be mandated by EU in the framework of H2020 (initially) to:
  - *Define funding programs*
  - *Organize open calls*
  - *Monitor and peer review their execution*
  - *Manage and administrate their execution*

ATTRACT : 2 phases approach



FPA : EU Framework Partnership Agreements

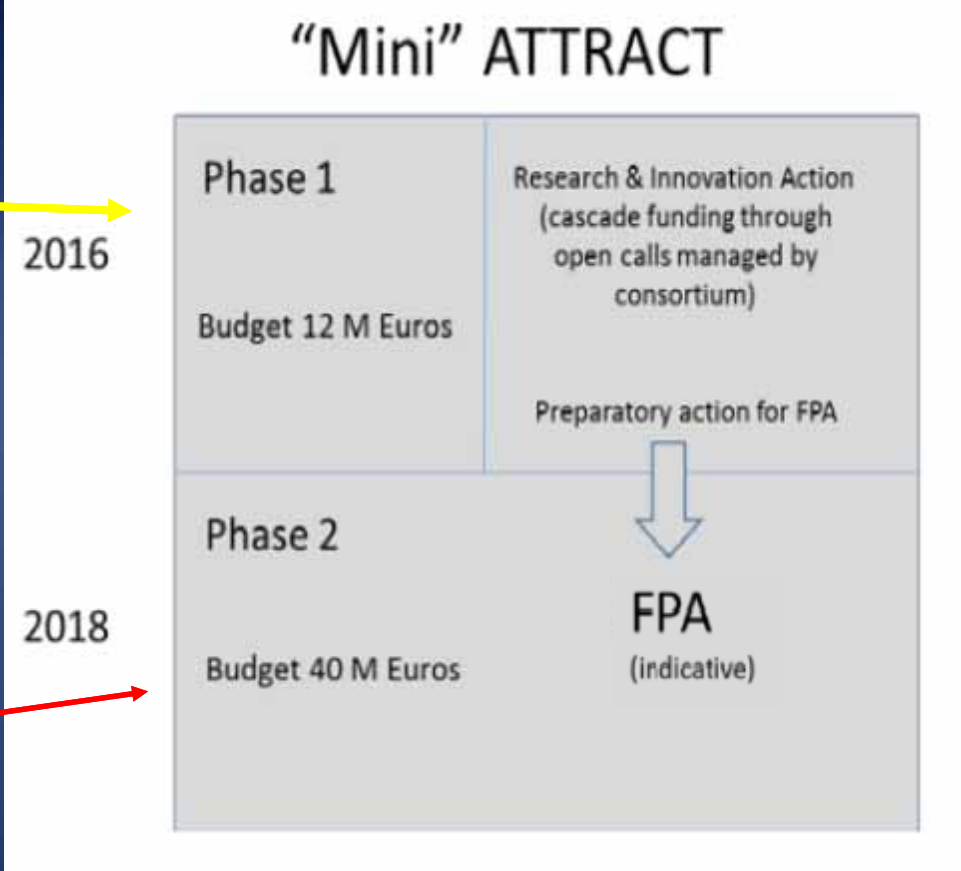
“Mini” ATTRACT : 2 phases approach

Select and finance ~200 potential breaking through proposals for a quick potential evaluation via an open call:

- feasibility demonstrators
- at least one SME and one ERI involved

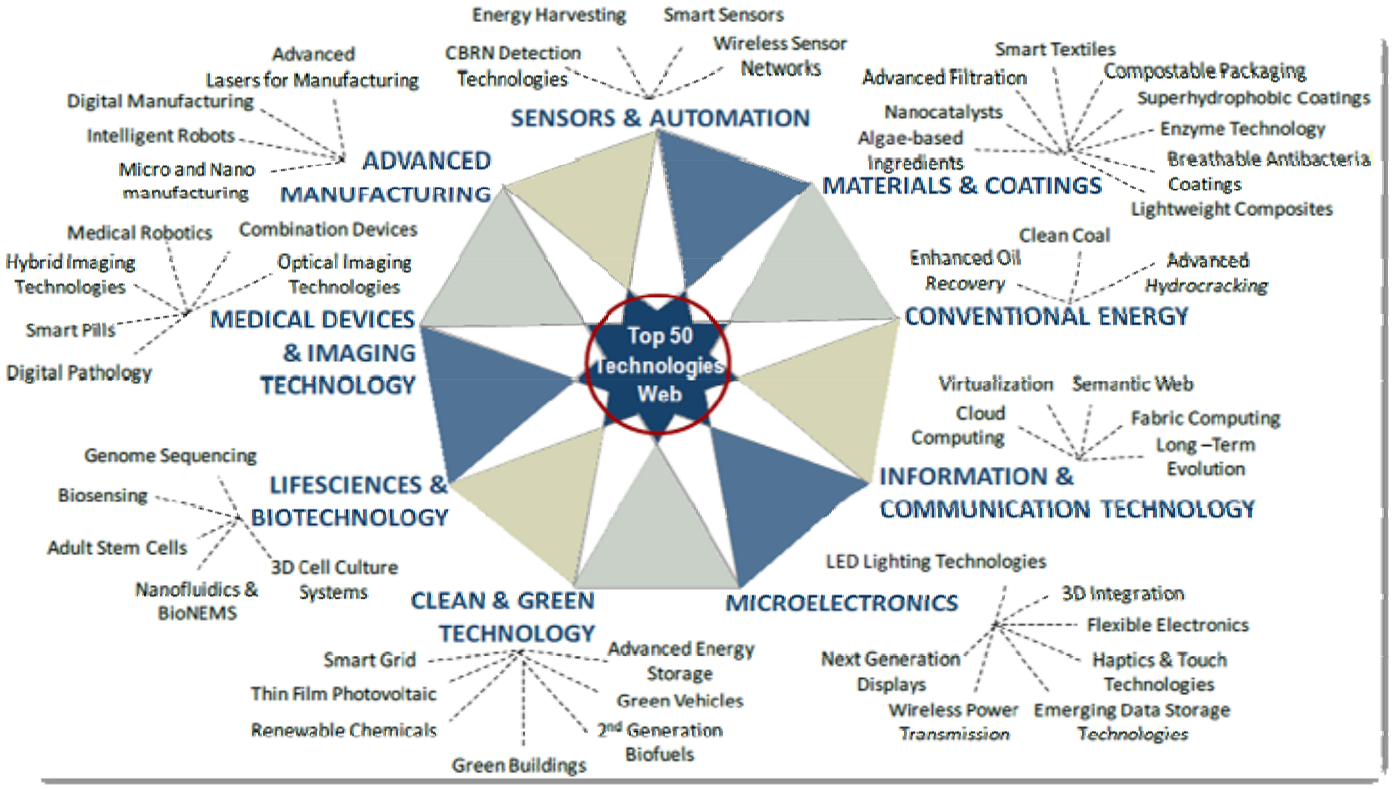
Select and finance ~10 of the best Phase 1 selected projects:

- 3-4 years of execution
- monitor performance
- define an optimal model for “maxi” ATTRACT



ATTRACT Focus: Detection and Imaging Technologies
WHY?

- …are and will be fundamental for ourselves and our society.
- …are at the core of industrial competitiveness.
- …translate into direct economic and wealth value.



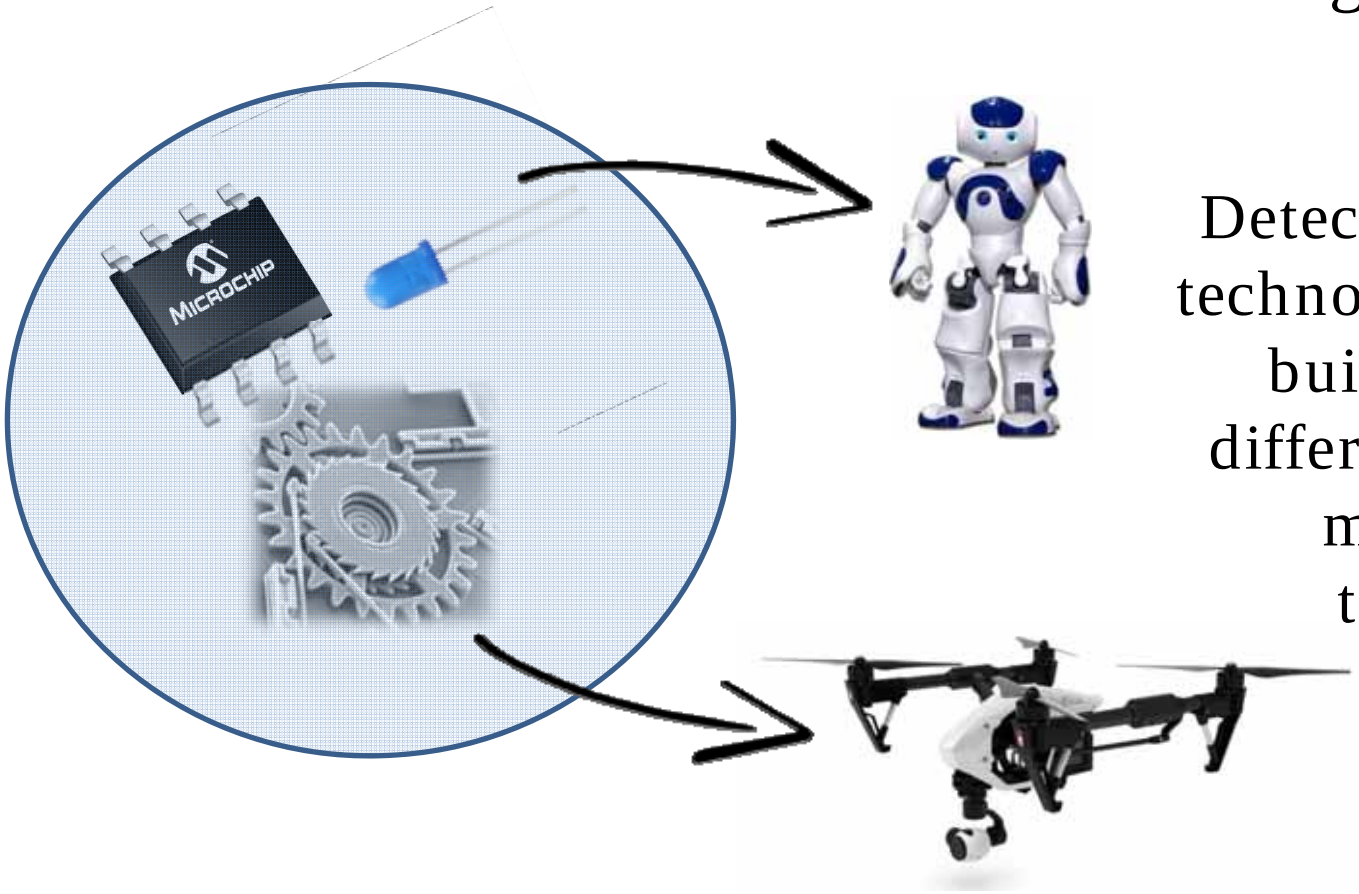
Source: Frost & Sullivan, Megatrends in Technology Convergence

Co-Innovation: a “value for many" proposition

A simple way to understand it:

We all make the best fishing gear and then each one decides what to fish…

Co-Innovation: combinatorial technology evolution



Detection and imaging technologies become the building blocks of different and evolving more complex technologies.

W. Brian Arthur, *The Nature of Technology: What it is and How it Evolves*, Free Press, Simon & Schuster, August 2009.

The ’16-’17 H2020 Work Program

The EC-RTD has published its H2020 Work Programme for 2016 – 2017.
http://ec.europa.eu/rearch/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-infrastructures_en.pdf

It includes a call:
“Future Detection and Imaging Technologies” (INFRAINNOV-1-2017), which is up to 20 M Euros and with a deadline on 29/03/2017.

The description of this call is very much in line with the description and plans of ATTRACT (see the ATTRACT “White Paper” on the web site www.attract-eu.org).

ATTRACT

From Open Science to Open Innovation: balancing collaboration and competition

- **ATTRACT is poised to connect Open Science to Open Innovation .**
- **It proposes a new *co-innovation* paradigm between Industry, Business, Investors, Innovation Specialists and European Research Infrastructures.**
- ***Co-innovation* seeks a strong and open cooperation from the beginning of the innovation value chain on identified breakthrough and win-win technology and business opportunities.**

"Mini" ATTRACT phases 1 and 2 represent a new funding instrument that will help Horizon 2020 to deliver innovation.

They are designed to streamline the value chain from the development of technologies towards their market application.

Furthermore, ATTRACT incorporates the fundamental value of co-innovation through collaboration and competition which is essential for exploiting the untapped potential of ERIs-SMEs-Large corporations.

Public funding is used for ramping-up the ATTRACT initiative, thereby generating trust between ERIs-SMEs and large firms.

ATTRACT

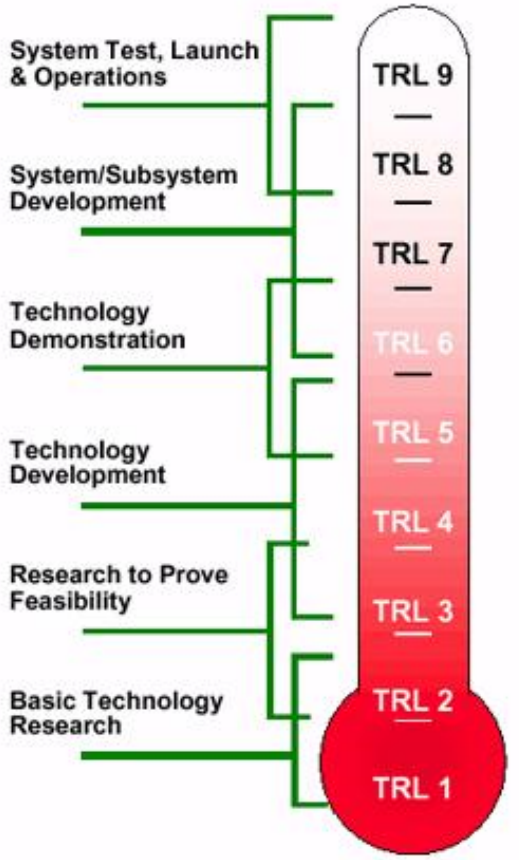
“Mini-ATTRACT” phases 1 and 2: targeted results

Phase 1

- A wide scope of technologies with breakthrough potential (TRL 2 to 4).
- Selection process based on industrial scalability and social added value.

Phase 2

- Scalability of phase 1-selected technologies towards industrial deployment (TRL 5 to 9).
- Construction and establishment of a self-sustained initiative (“Maxi” ATTRACT).



How to measure impact?

Is this “all there is”?

Some organizations start to question the GDP as an indicator to measure value.

New interesting propositions are on the table.

In ATTRACT we want to investigate possible links to apply those indicators.

http://www.oecdbetterlifeindex.org/

http://www.socialprogressimperative.org/

Final Considerations

- **"Value for many" vs "value for me" is key for global sustainability.**
- **The Open Science spirit and *know-how* embedded in fundamental science communities can greatly contribute to express the combinatorial power of innovation.**
- **Connecting Open Science to Open Innovation is a powerful strategy to create Value for Many.**


Thank you