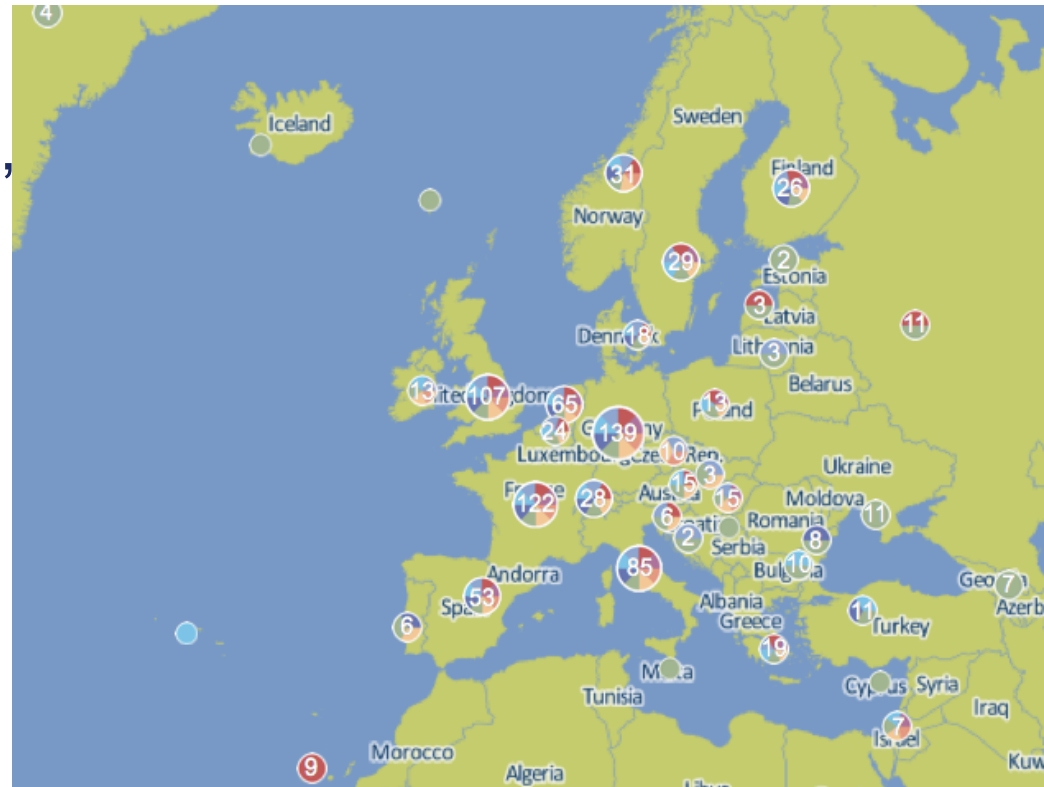
The background is a dark blue, abstract digital space. It features numerous bright blue light trails and streaks that create a sense of motion and depth. In the upper right quadrant, there is a faint, glowing globe or sphere with some internal structure. The overall aesthetic is futuristic and technological.

From Open Science to Open Innovation: Utopia or Necessity?

October 30th 2019
Sergio Bertolucci
University of Bologna

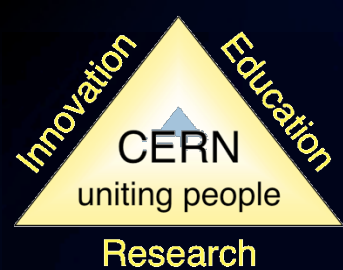
European Research Infrastructures or Research Infrastructures in Europe?

- A rich scenario of Global, European and National RI's, an impressive number of Higher Education Institutes
- A unique landscape
- A great asset for Europe
- Is it used optimally?



From Open Science to Open Innovation

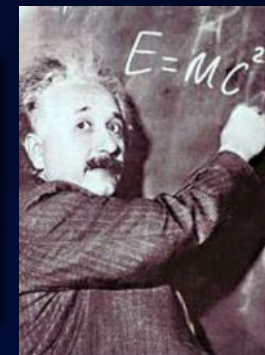
- European RIs have succeeded in establishing the paradigm of **Open Science**, establishing an extended **ecosystem**, where the research communities are fostering a **culture of mutual trust**, balancing **competition and collaboration**.
- Their potential to generate innovation is **largely untapped**, due to the lack of a corresponding **ecosystem at the European scale**, which needs to include the **private sector (industry, investors, entrepreneurs)**.
- The lack of such an eco-system impairs the development of policies of adequate scale, and it is one of the main causes of the **declining competitiveness of Europe in innovation**.



An example: CERN

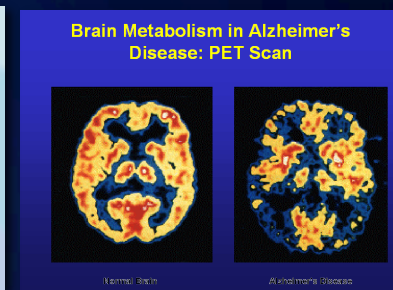
- **Push forward** the frontiers of knowledge

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

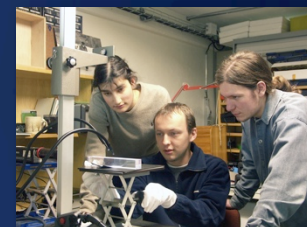


- **Develop** new technologies for accelerators and detectors

Information technology - the Web and the GRID
Medicine - diagnosis and therapy



- **Train** scientists and engineers of tomorrow



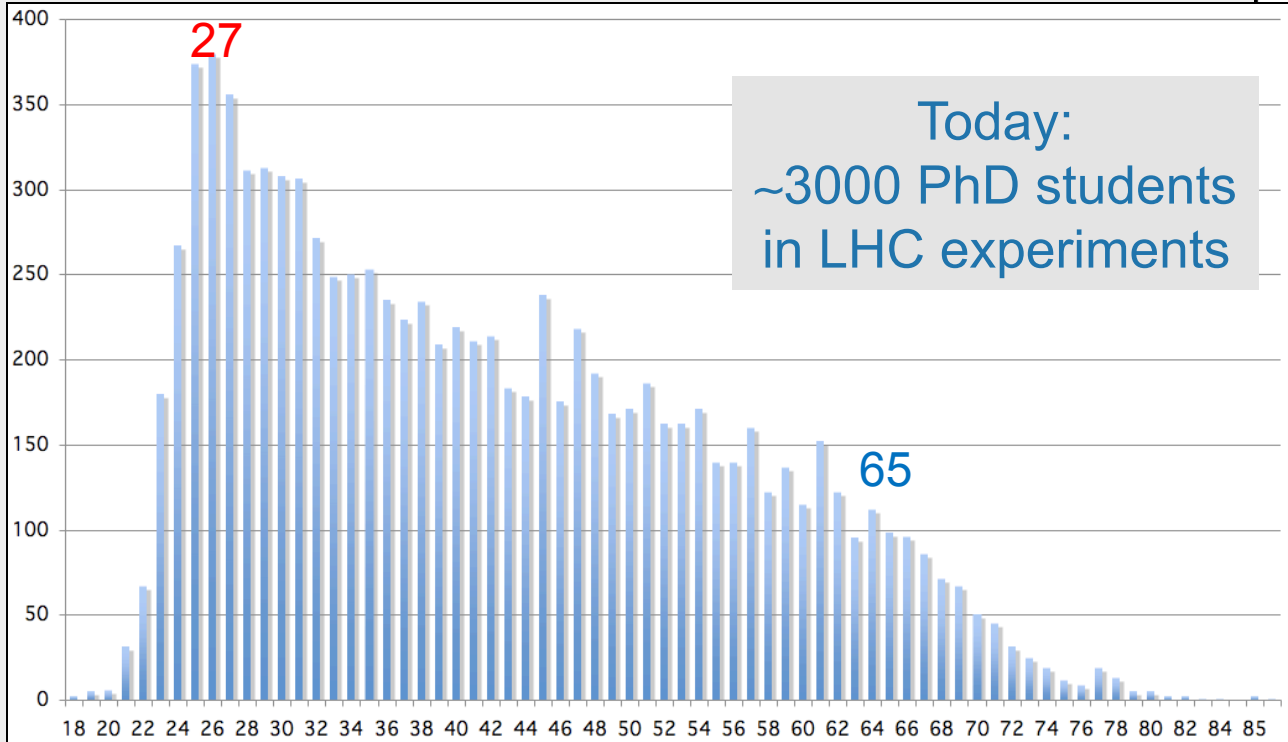
- **Unite** people from different countries and cultures



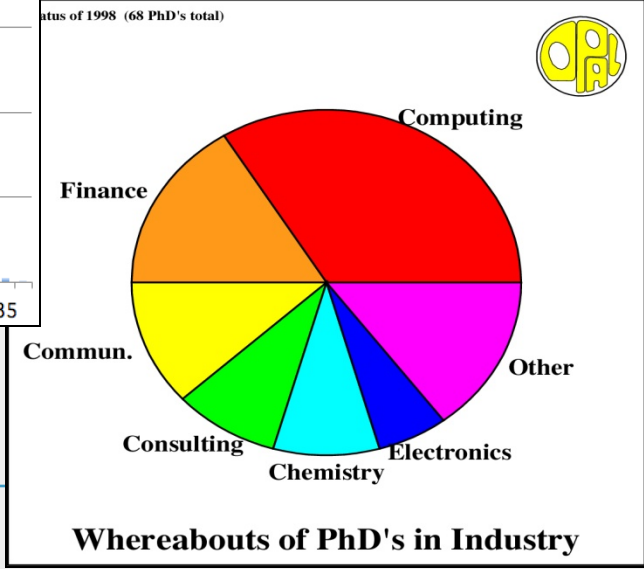
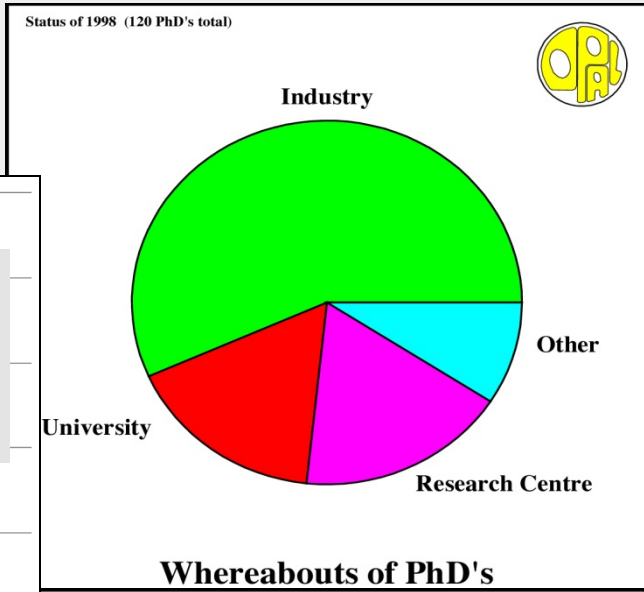


Age Distribution of Scientists

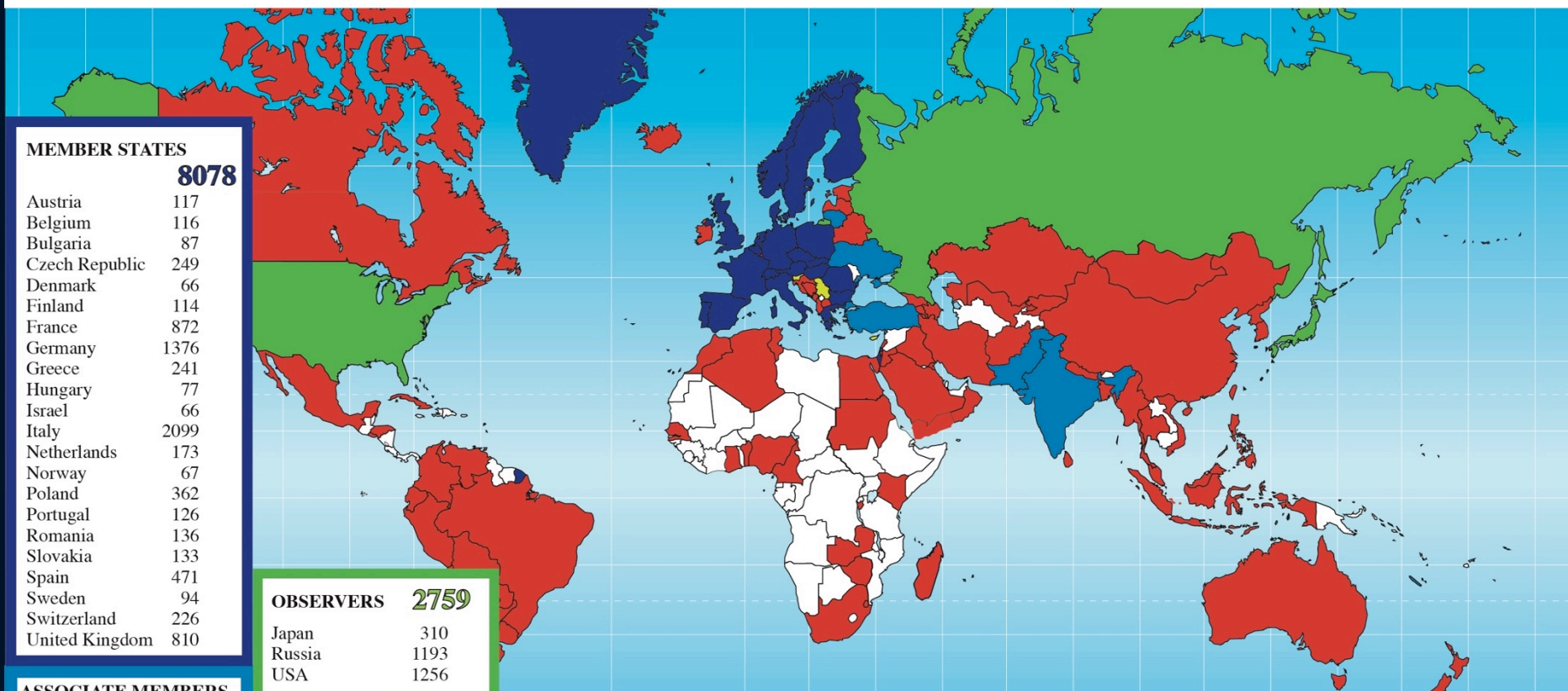
- and where they go afterwards



They do not all stay: where do they go?



Distribution of All CERN Users by Nationality on 21 September 2018



MEMBER STATES

8078

Austria	117
Belgium	116
Bulgaria	87
Czech Republic	249
Denmark	66
Finland	114
France	872
Germany	1376
Greece	241
Hungary	77
Israel	66
Italy	2099
Netherlands	173
Norway	67
Poland	362
Portugal	126
Romania	136
Slovakia	133
Spain	471
Sweden	94
Switzerland	226
United Kingdom	810

OBSERVERS 2759

Japan	310
Russia	1193
USA	1256

ASSOCIATE MEMBERS

771

India	385
Lithuania	43
Pakistan	68
Turkey	160
Ukraine	115

OTHERS 1962

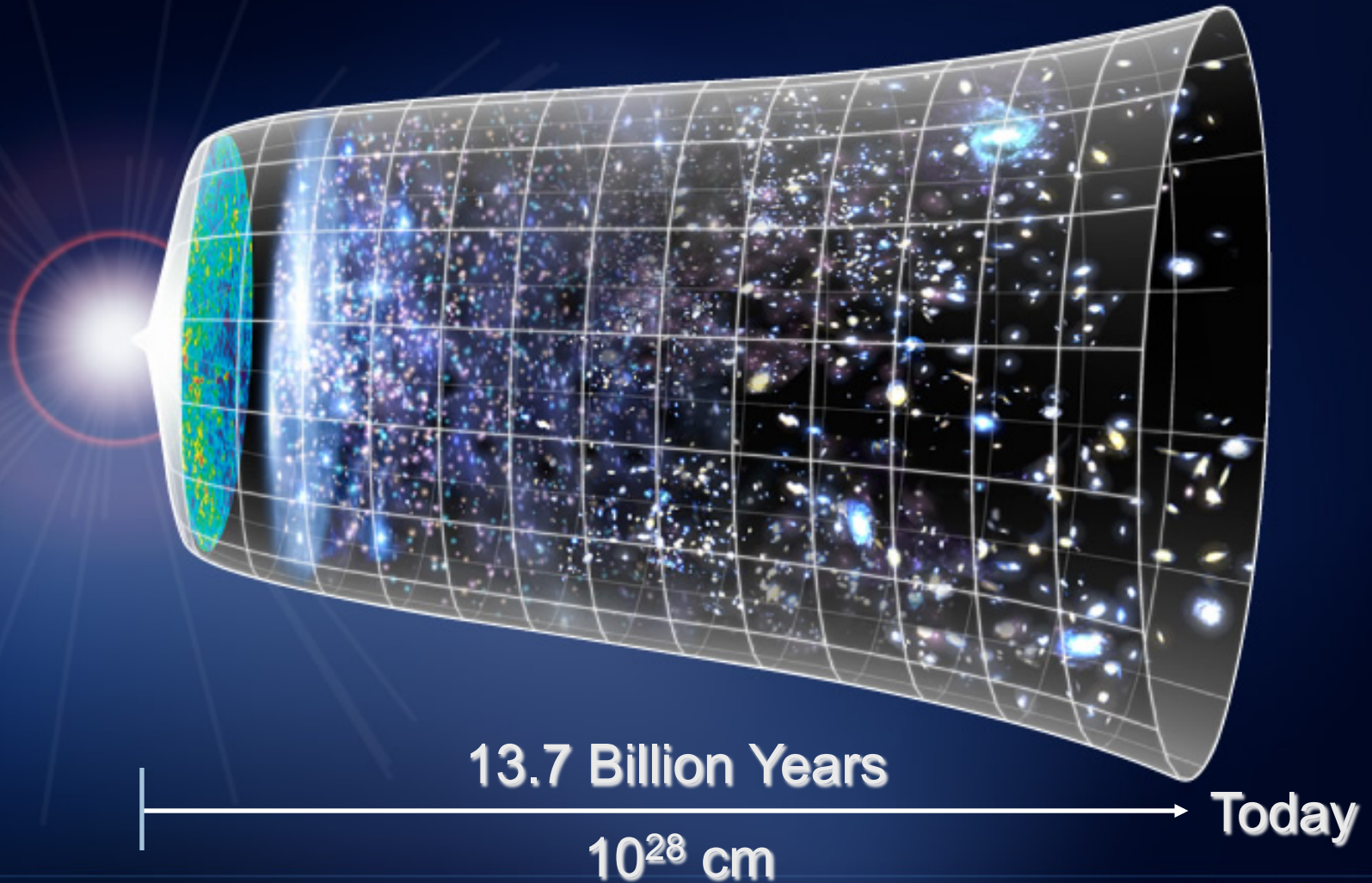
Afghanistan	1	Bosnia & Herzegovina	2	El Salvador	1	Kazakhstan	8	Montenegro	12	Saint Kitts and Nevis	1	T.F.Y.R.O.M.	2
Albania	3	Brazil	135	Estonia	15	Kenya	1	Morocco	24	San Marino	1	Tunisia	5
Algeria	15	Burundi	1	Georgia	46	Korea Rep.	184	Myanmar	2	Saudi Arabia	2	Uruguay	1
Argentina	27	Cameroon	1	Ghana	1	Kyrgyzstan	1	Nepal	9	Senegal	1	Uzbekistan	3
Armenia	21	Canada	174	Hong Kong	1	Latvia	3	New Zealand	5	Singapore	5	Venezuela	11
Australia	34	Chile	21	Honduras	1	Lebanon	25	Nigeria	2	South Africa	49	Viet Nam	9
Azerbaijan	9	China	559	Iceland	4	Luxembourg	3	North Korea	3	Sri Lanka	12	Yemen	1
Bangladesh	9	Colombia	45	Indonesia	10	Madagascar	3	Oman	3	Sudan	2	Zambia	1
Belarus	49	Croatia	41	Iran	53	Malaysia	16	Palestine	8	Swaziland	1	Zimbabwe	2
Benin	1	Cuba	16	Iraq	1	Malta	8	Paraguay	1	Taiwan	53		
Bolivia	4	Ecuador	6	Ireland	16	Mexico	86	Peru	7	Thailand	28		
		Egypt	28	Jordan	2	Mongolia	2	Philippines	3				

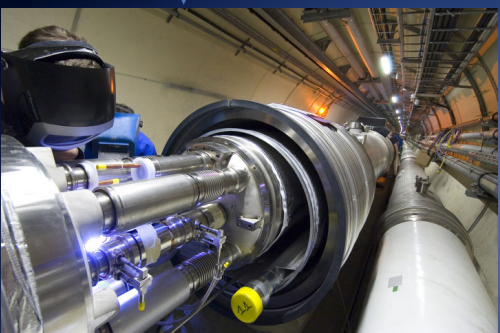
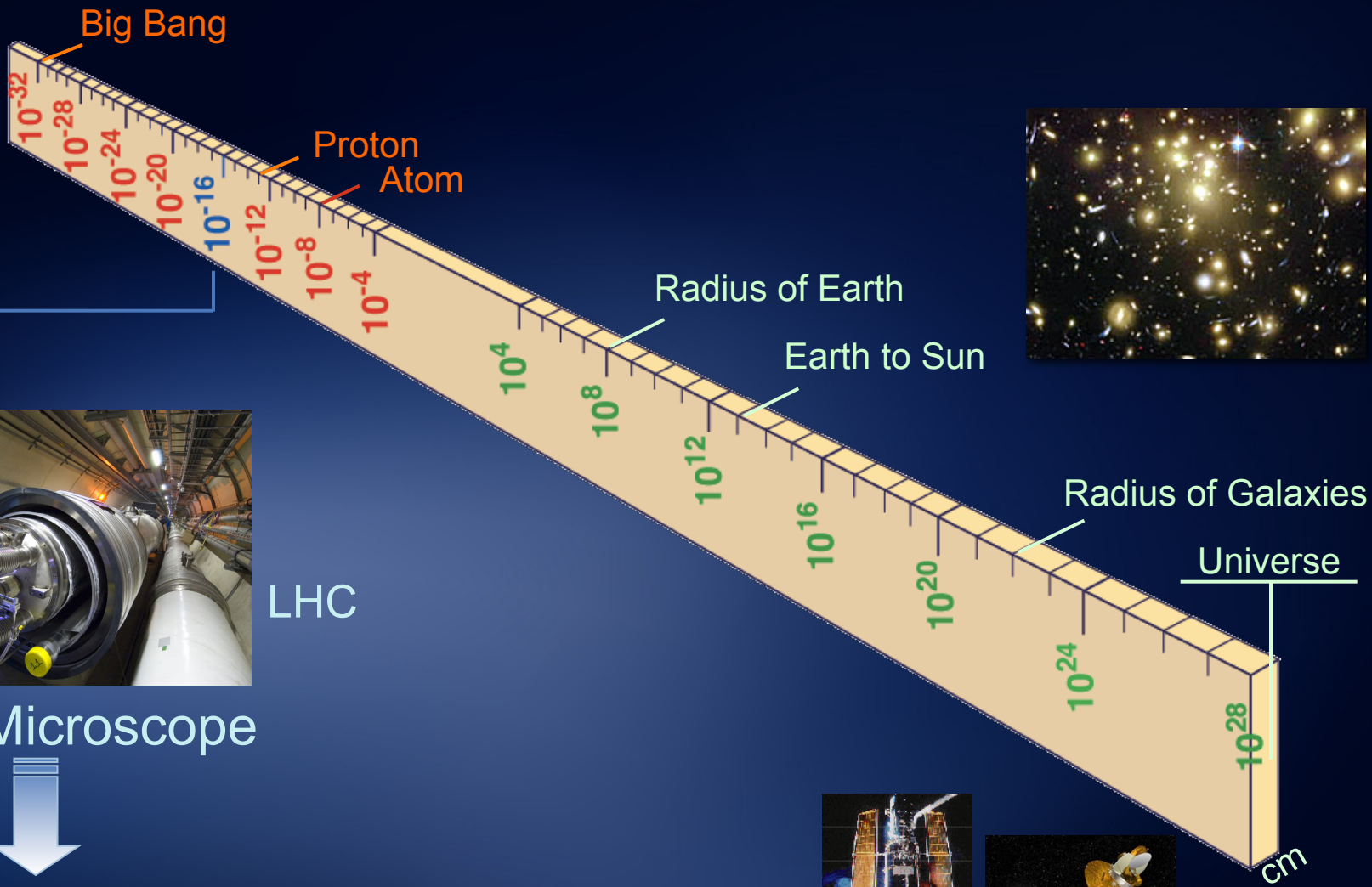
ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

112

Cyprus	23
Serbia	58
Slovenia	31

Next challenge: to understand the first moments of our Universe



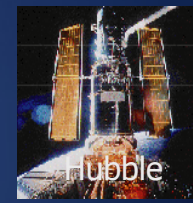


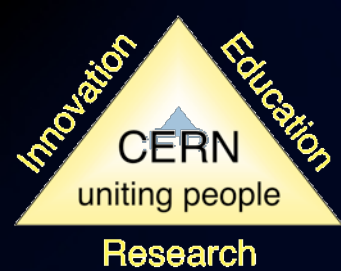
LHC

Super-Microscope



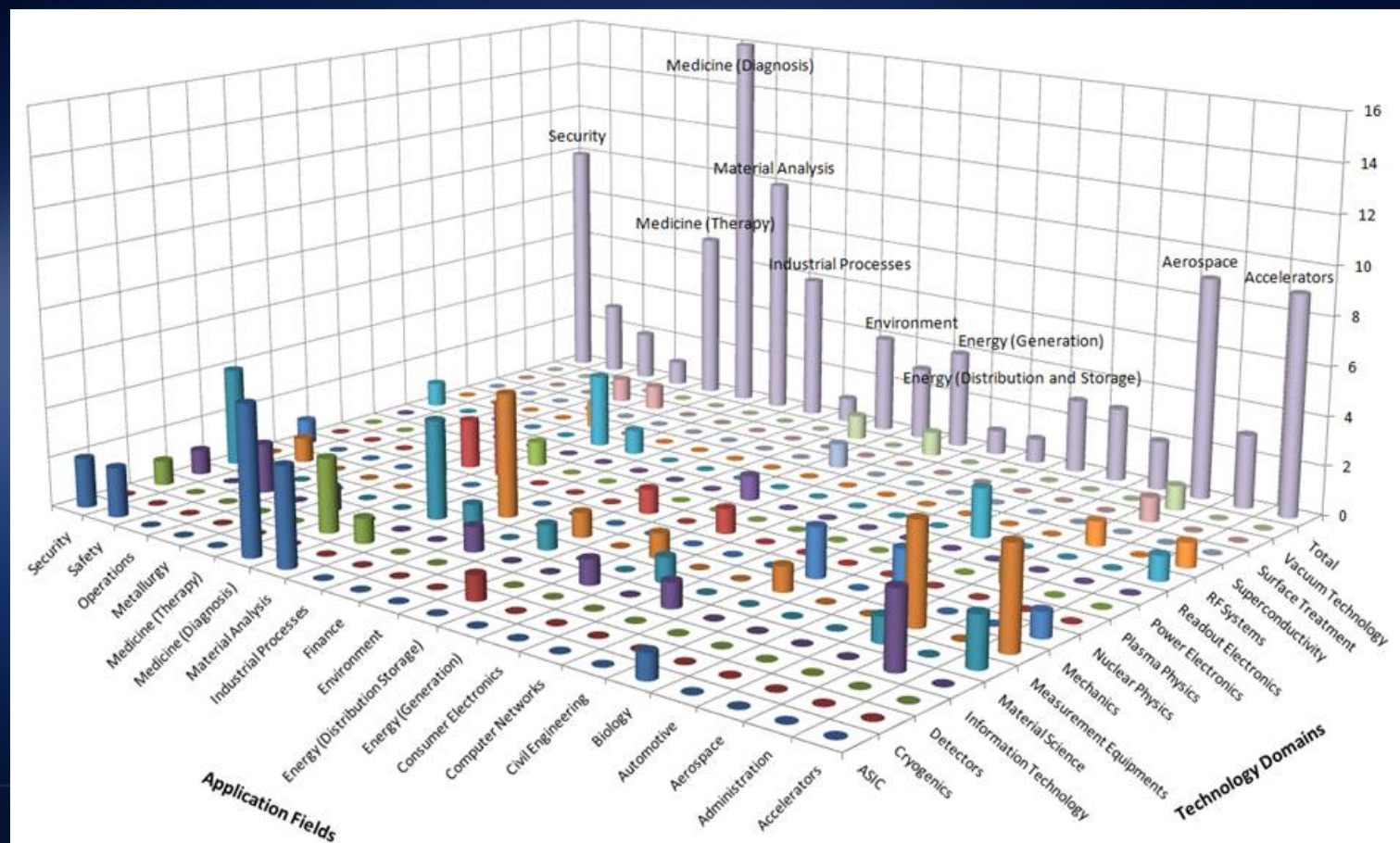
Study physics laws of first moments after Big Bang
 increasing Symbiosis between Particle Physics,
 Astrophysics and Cosmology





Only abstract speculations???

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



A peculiar ant colony, probably worth of a closer look



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...

The scientists/engineers

Despite the usual movie 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 and integrated 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

From Open Science to Open Innovation

Use the lesson learned from the **Open Science** environment to translate the **theoretical models of Open Innovation** (e.g. Henry Chesbrough “*Open Innovation: The New Imperative for Creating and Profiting from Technology.*” HBS Press. 2003. [ISBN 978-1422102831](#)) into the European specific environment, **proposing realistic models** of Open Access and IPR protection, fit to follow innovation from the early stage of Technical Readiness Level (TRL) all the way to market.

This is a fundamental point for the **creation of trust** necessary to the establishment of a **European innovation ecosystem**.

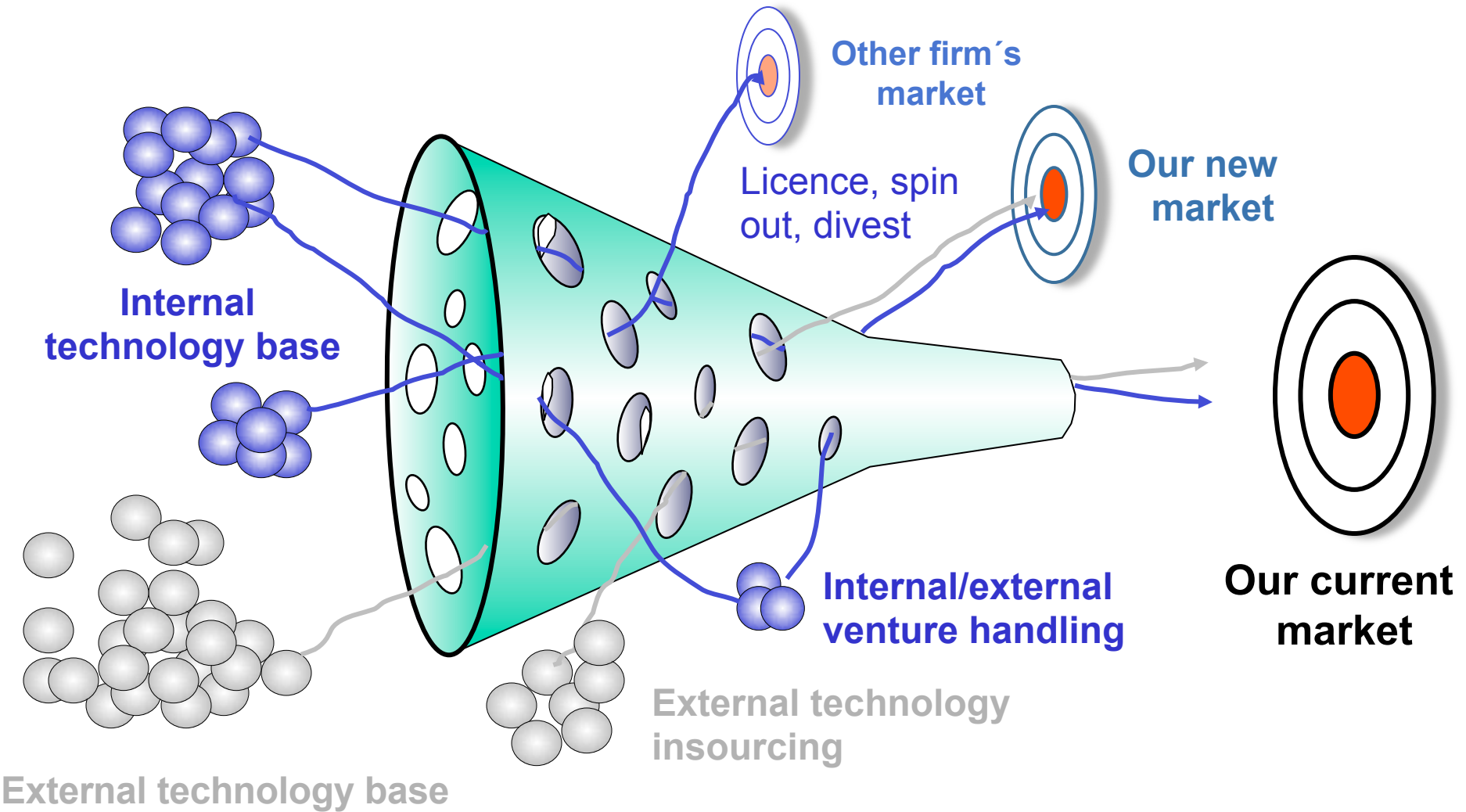
What is Open Innovation?

“ Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.”

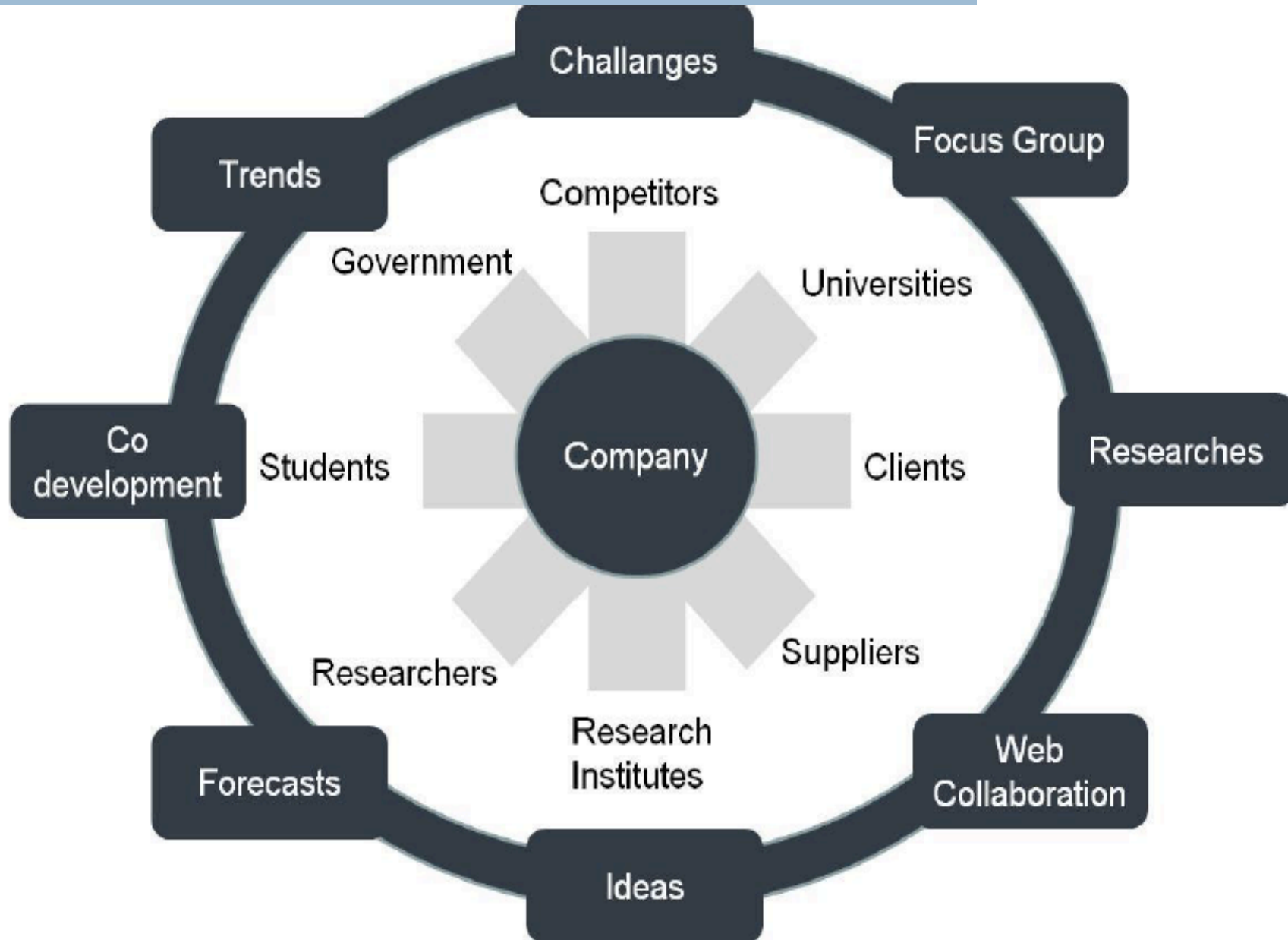
Henry Chesbrough, 2003



Open innovation



Collaboration and Competition



The ATTRACT initiative



EMBL



ESADE
Universitat Ramon Llull



www.attract-eu.org

ATTRACT

A program for a dedicated, interdisciplinary program within H2020 and beyond 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)*

It involves 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

Built on a consortium of ERIs & industrial partners interested and specialized in sensor and imaging technology

The consortium is mandated by EU in the framework of H2020 to:

- *Organize open calls*
- *Monitor and peer review their execution*
- *Promote a strong training program on innovation*
- *Develop evaluation tools for quantitative impact assessment*

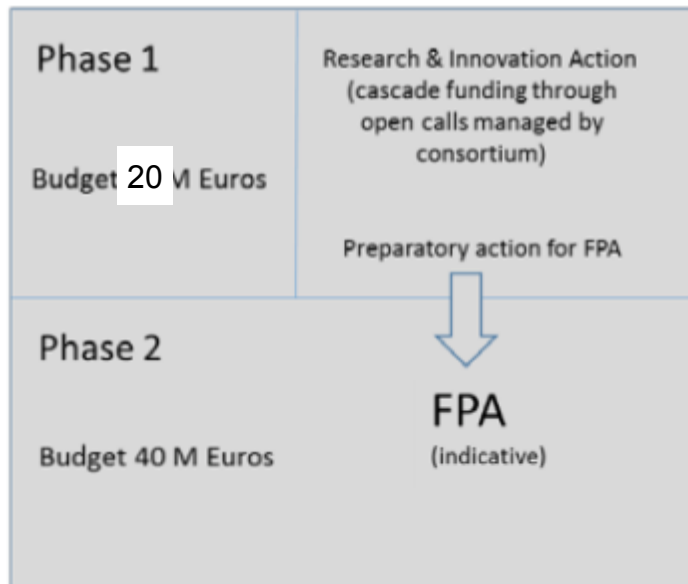
ATTRACT: A New Innovation Ecosystem

A pan-European ecosystem of opportunities:

- ❑ For serving the RIs and their R&D communities in their mission, while...
 - ❑ ... better extracting industrial and societal value out of fundamental science and ...
 - ❑ ... stimulating the talent of young professionals.
-

ATTRACT : an evolutionary approach

“Mini” ATTRACT



“Maxi” ATTRACT



FPA : EU Framework Partnership Agreements

“Mini” ATTRACT : 2 phases

Selected and financed ~170 potential breakthrough proposals for a quick potential evaluation via an open call:

- feasibility demonstrators
 - at least one SME and one ERI involved
- DONE**
- Select and finance ~10 of the best Phase 1 selected projects:
 - 3-4 years of execution
 - monitor performances
 - Re-launch another cycle

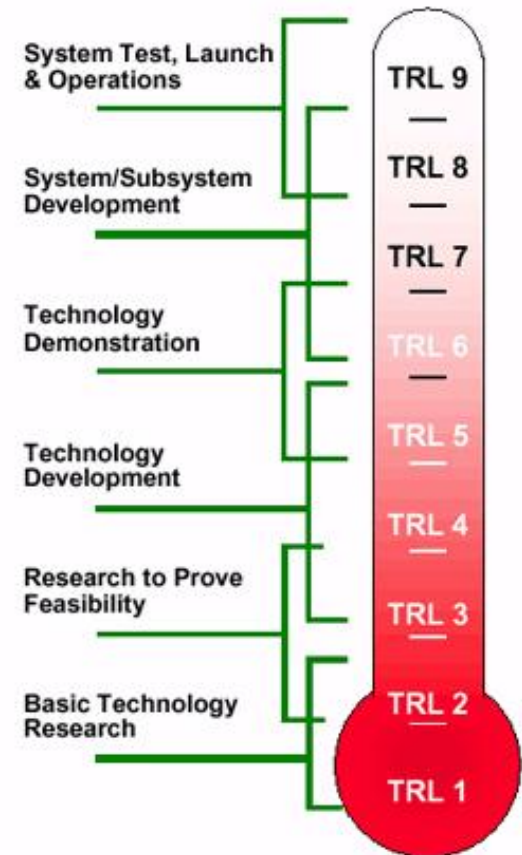
“Mini-ATTRACT” phases 1 and 2: targeted results

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).

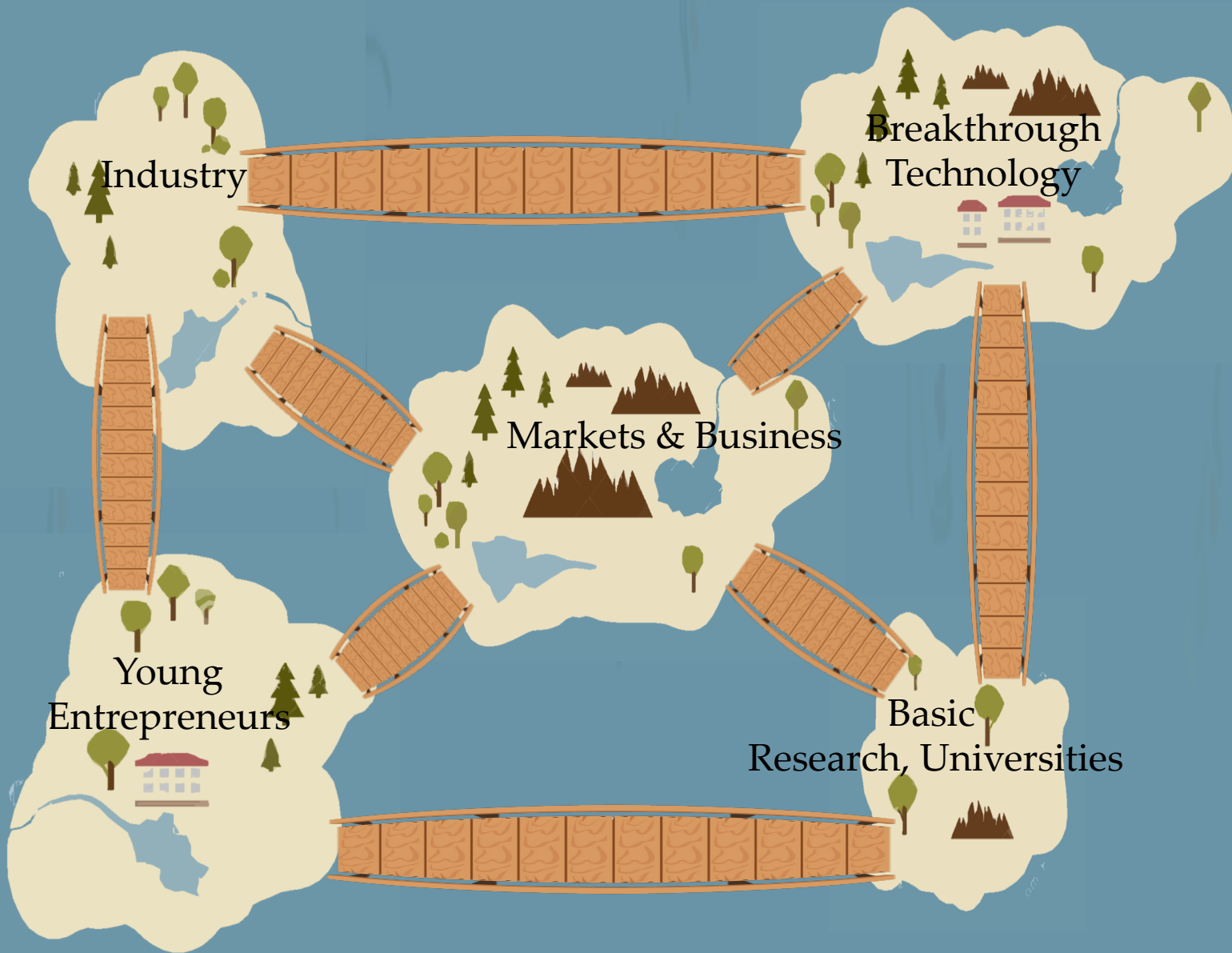


“Mini” ATTRACT phases 1 and 2 represent a new funding instrument that will help Horizon 2020 to deliver innovation.

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

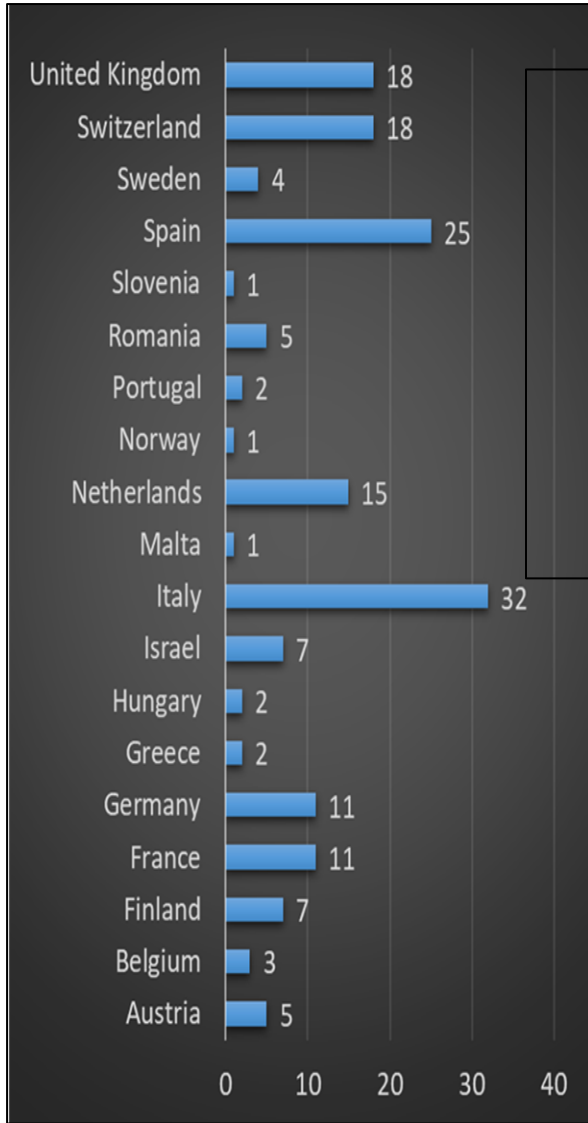
Furthermore, ATTRACT incorporates the fundamental value of co-innovation through collaboration and competition which is essential for exploiting the untapped potential of ERIs-SMEs-Large corporations.

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

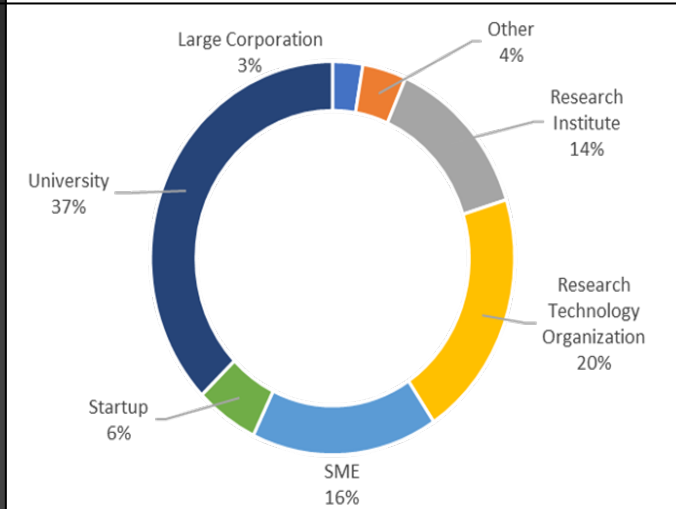


What kind of bridges is ATTRACT building?

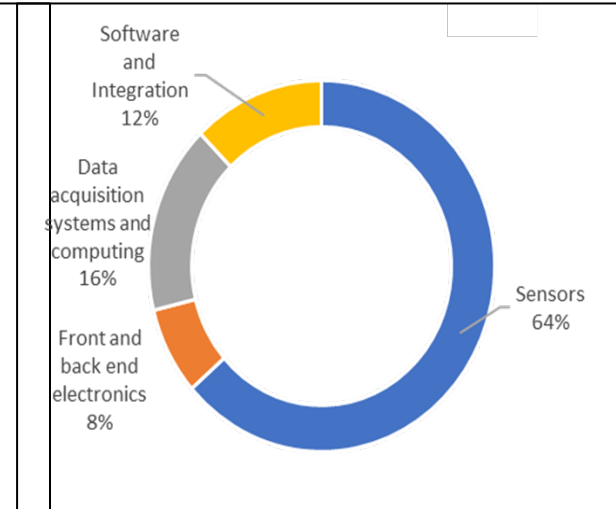
Bridges create cross-connection in the ATTRACT Ecosystem



Country distribution of selected proposals (Coordinator only)



Organization type



Technological domain

- 170 projects will be cross-connected at the end of the ATTRACT phase 1 project.
- 100+ MSc interdisciplinary students will generate new opportunities for social innovation in collaboration with funded projects.

The “ATTRACT Innovation repository”



The ATTRACT Consortium is taking the first steps towards this concept.

- Repository for ATTRACT-funded technologies.
- Loose IP governing regulation (i.e. open source regime).
- Recognition and registering priority but no patents; this could be achieved by using a **secure identity proof and blockchain together**.
- Main principle: Whoever takes something...gives something back...
- “Free riders” are detected by the user community; (i.e. by tracking a **publicly blockchain based distributed ledger** registering who uses and who puts something back...)
- ATTRACT funded community have the possibility to further develop “in-house” technologies from the *repository* and protect them (i.e. IP).
- Technologies constantly improved by the ATTRACT funded community.
- **Machine learning** and **data visualization** in combination with the blockchain ledger could be a powerful **innovation forecasting** tool.

ATTRACT Roadmap

2018 (ATTRACT Phase 1)

Initial 20 M Euros EC fund.
Seed funding of 170 breakthrough projects (100 k Euros each).

1

2020 (ATTRACT Phase 2)

Select 6 to 7 projects of ATTRACT Phase 1.
Scale funding with EC Call.

2

2021 (Maxi-ATTRACT)

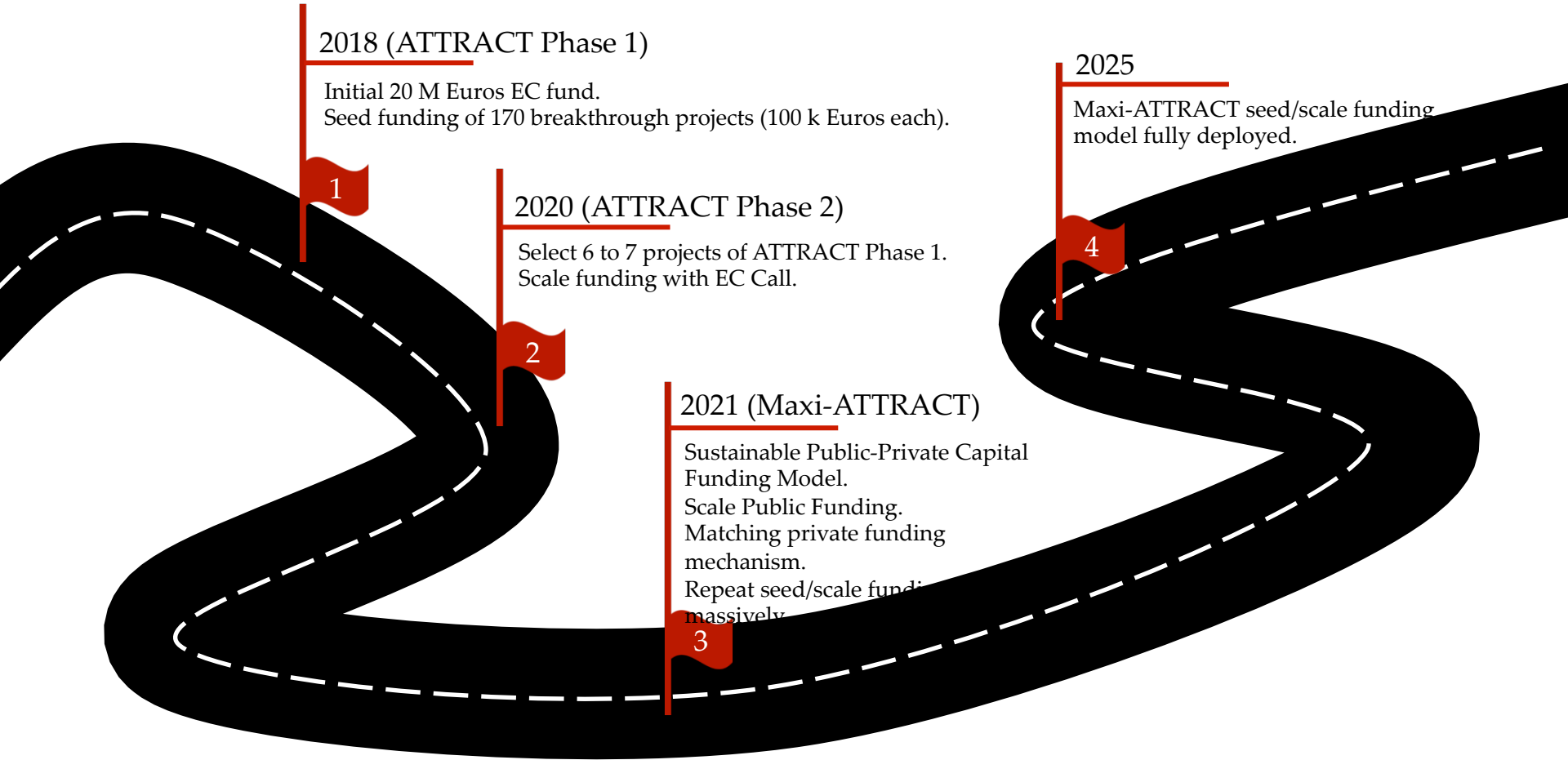
Sustainable Public-Private Capital
Funding Model.
Scale Public Funding.
Matching private funding
mechanism.
Repeat seed/scale fundi
massively.

3

2025

Maxi-ATTRACT seed/scale funding
model fully deployed.

4



THE ITALIAN *INDUSTRIA 4.0* NATIONAL PLAN: GUIDELINES & MEASURES

Italian Industrial Sector peculiarities



- ✓ Limited number of large industry champions able to lead Italian Manufacturing transformation
- ✓ Deeply based on SMEs
- ✓ Key role of universities and research centers in development/ innovation
- ✓ Strong cultural traits of finished products

Government Measures



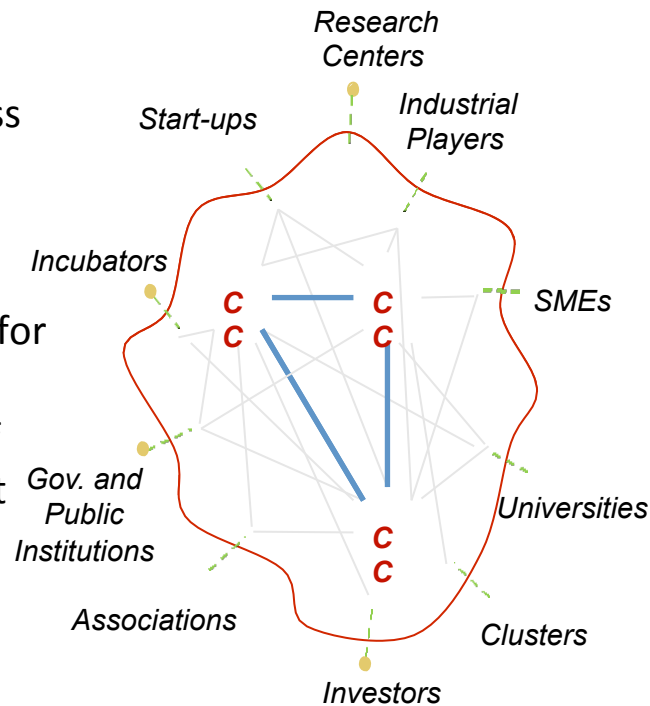
- ✓ Skills on I 4.0:
 - ✓ Specific school programs
 - ✓ Academic & research paths
 - ✓ Competence Centers & DIH
- ✓ Innovative investments
 - ✓ Private Investments
 - ✓ Venture capitals
 - ✓ Start-ups
- ✓ Enabling Infrastructures
- ✓ Public Support Instruments

The Italian government earmarked ~ €20 billion for the period of 2017-2020.

THE ITALIAN INDUSTRIA 4.0 NATIONAL PLAN: I4.0 COMPETENCE CENTER

MISSION

- I 4.0 training and awareness
- Live demos on new technologies and access to I 4.0 best practices
- Technical advisory on I 4.0 for SMEs
- Launch and acceleration of technological development and innovative projects
- Trial support and "on-site" development of new I4.0 technologies
- Coordination with European CC



FEATURES

- Few and selected national Competence Center
- Strong involvement of leading Italian universities and large private players
- Support to key stakeholders (e.g. research institutions, startups,...)
- Mission-oriented and focused on facilitating I4.0 transformational projects in all domains
- Appropriate legal and managerial skills

THE ITALIAN INDUSTRIA 4.0 NATIONAL PLAN: THE 8 COMPETENCE CENTERS

MADE

4 Universities + 1 Public Body
+ 39 Enterprises

*DEMONSTRATION ISLANDS ON KEY
ENABLING TECHNOLOGIES*

SMACT

7 Universities + 5 Public Bodies
+ 30 Enterprises

SOCIAL MOBILE ANALYTICS CLOUD IOT

CIM 4.0

2 Universities + 26
enterprises

MANUFACTURING 4.0

BI-REX

5 Universities + 7 Public Bodies
+ 45 Enterprises

BIG-DATA and ADDITIVE MANUFACTURING

START4.0

4 Public Bodies + 33 Enterprises

*STRATEGIC INFRASTRUCTURE SECURITY
and OPTIMIZATION*

MediTech

8 Universities + 142 Enterprises
(including 101 SMEs)

*MEDITERRANEAN CC 4 INNOVATION
FOCUSED ON SOCIAL AND
BLOCKCHAIN TECHNOLOGIES*

ARTES4.0

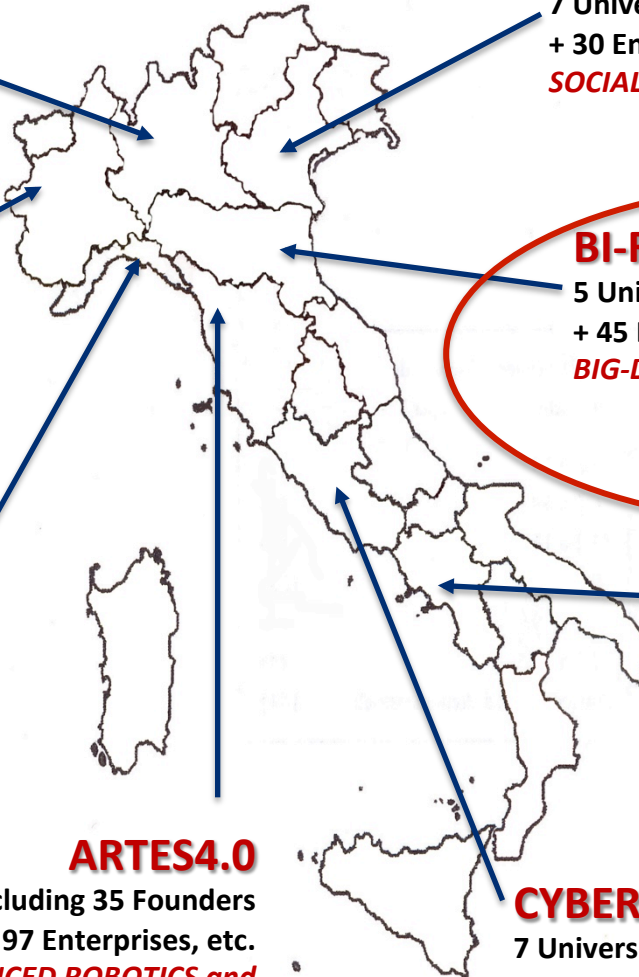
127 members including 35 Founders
13 Research Bodies, 97 Enterprises, etc.

*ADVANCED ROBOTICS and
ENABLING DIGITAL TECHNOLOGIES*

CYBER 4.0

7 Universities + 2 Public Bodies
+ 37 Enterprises

CYBER-SECURITY



Design factories: a tool to facilitate the future

A space for

- Radical collaboration
- Mixing of cultures
- Real world projects
- Unbounded problems
- Human centred perspective



SANTIAGO



HELSINKI



SHANGHAI



MELBOURNE



GENEVA



PORTO



SEOUL



LEEWARDEN



RIGA



PHILADELPHIA



NEW YORK



ANKARA



BOGOTA



VALENCIA



SÃO PAULO



CALI



HAMILTON



WARSAW



BARCELONA



GHENT



KYOTO



MANNHEIM



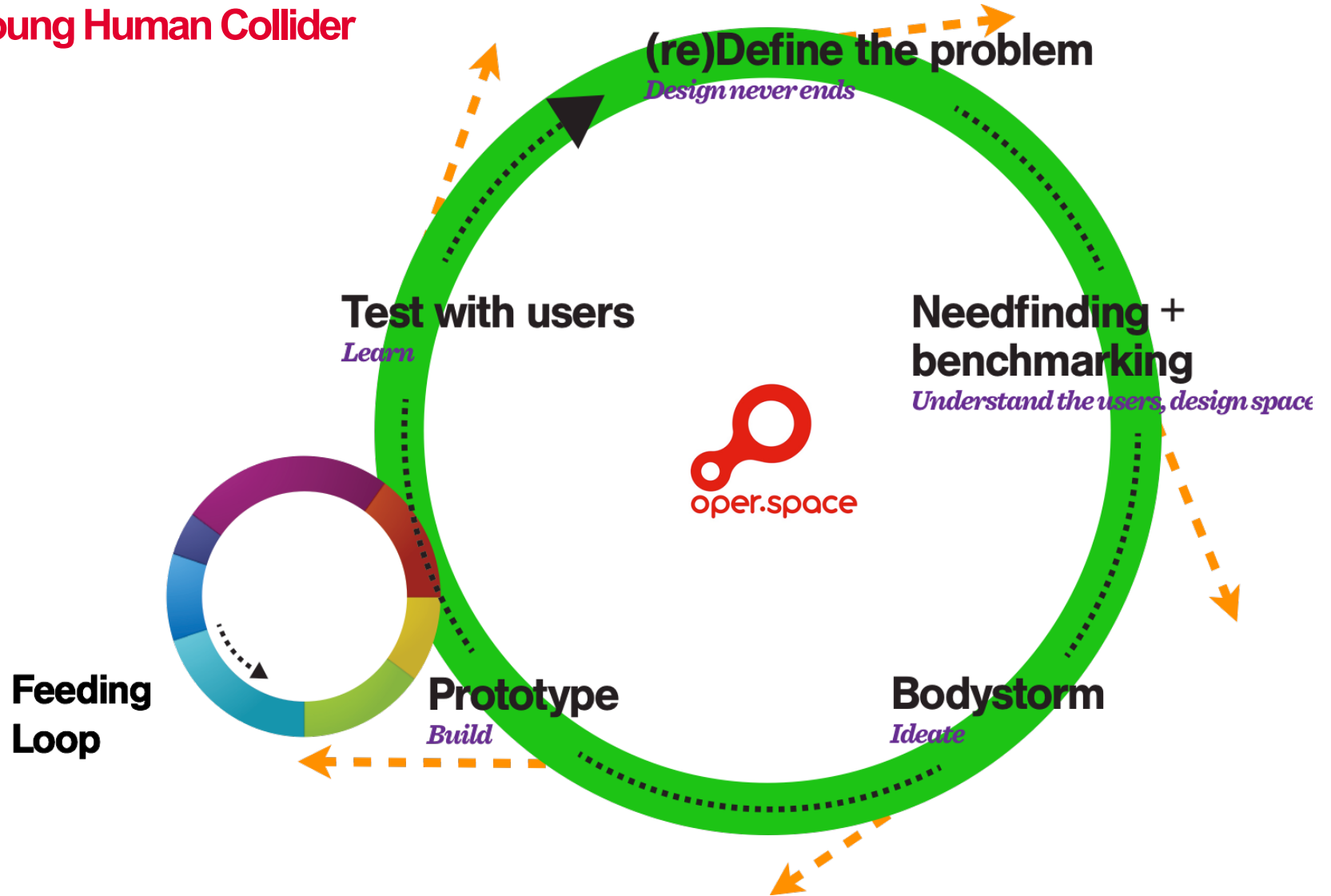
TARTU

..since last month:
BOLOGNA



oper.space

A Young Human Collider



IDEASQUARE at CERN, OPER SPACE in BOLOGNA



To conclude....

- In a globalized world, **knowledge** is the most important asset. **Curiosity and appetite for risk** is its fuel.
- The connection between research, innovation and sustainable progress is inescapable.
- We need to establish an innovation ecosystem at **European scale**.
- European Universities and Research Centers have a central role in it, promoting their **success story in the creation of an ecosystem of trust**.

THANK YOU!