



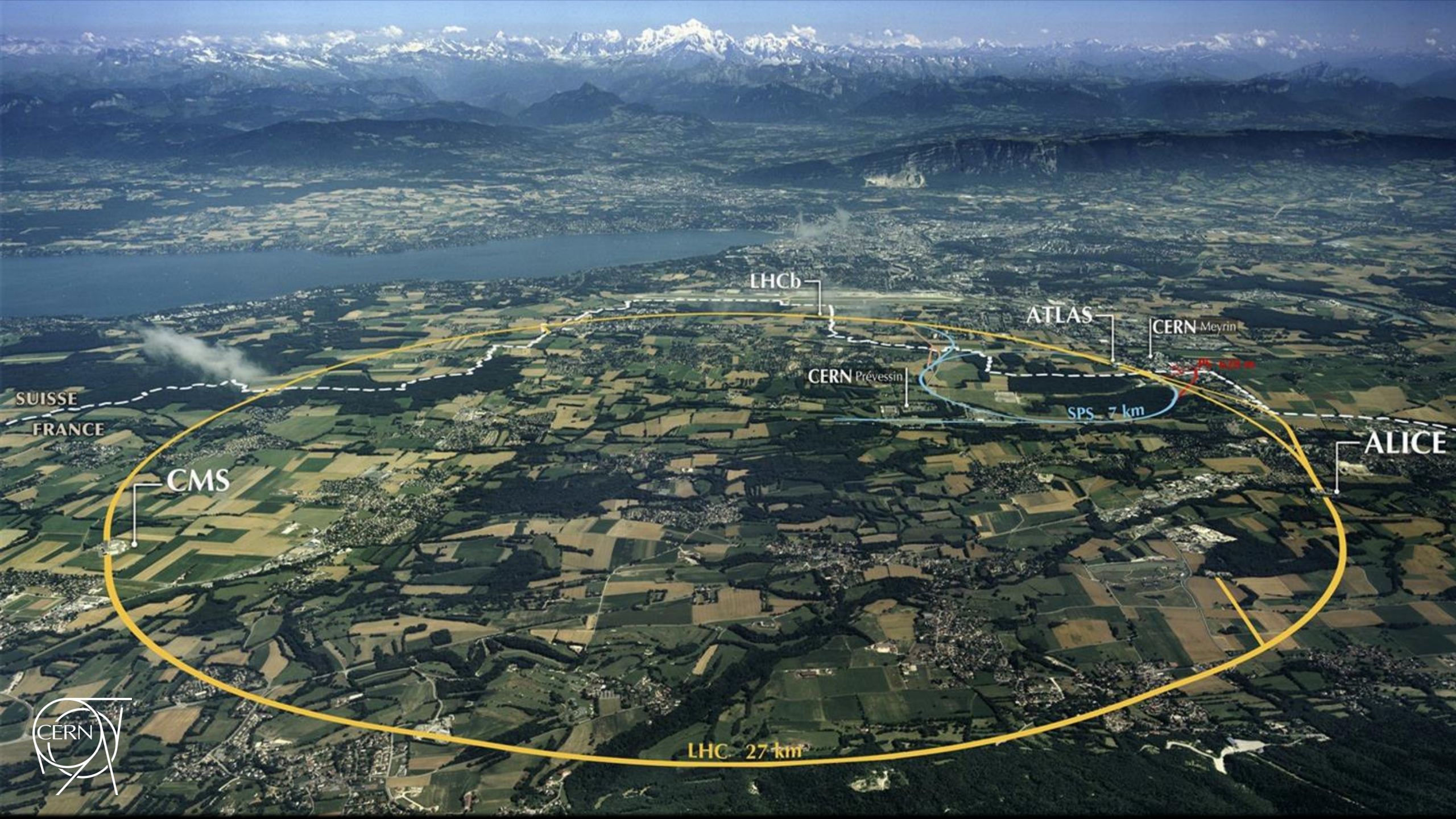
Parallel Worlds: Connecting the Micro and Macro

About Physics, CERN, Innovation and Societal Impact

nandin Innovation Precinct | ANSTO
19 November 2018

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Development and Innovation Unit (CERN IPT-DI)



SUISSE
FRANCE

CMS

LHCb

CERN Prévessin

ATLAS

CERN Meyrin

SPS 7 km

ALICE

LHC 27 km





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?

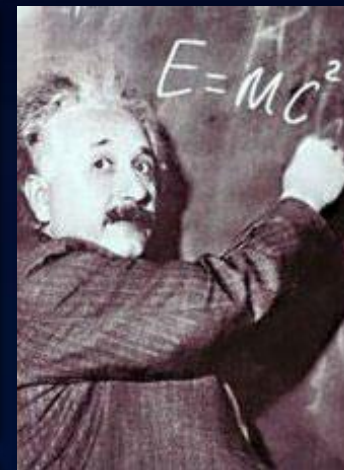
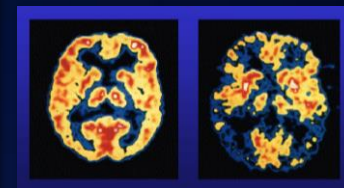
❑ **Develop** new technologies for accelerators and detectors

Information technology - the Web and the GRID

Medicine - diagnosis and therapy

❑ **Train** scientists and engineers of tomorrow

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



CERN

Founded in 1954 | 12 European States
Today there are 22 Member States

Staff	~2500
Other personnel	~1800
Scientific users	~13,000
Budget (2017)	~1100 M Swiss franc

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

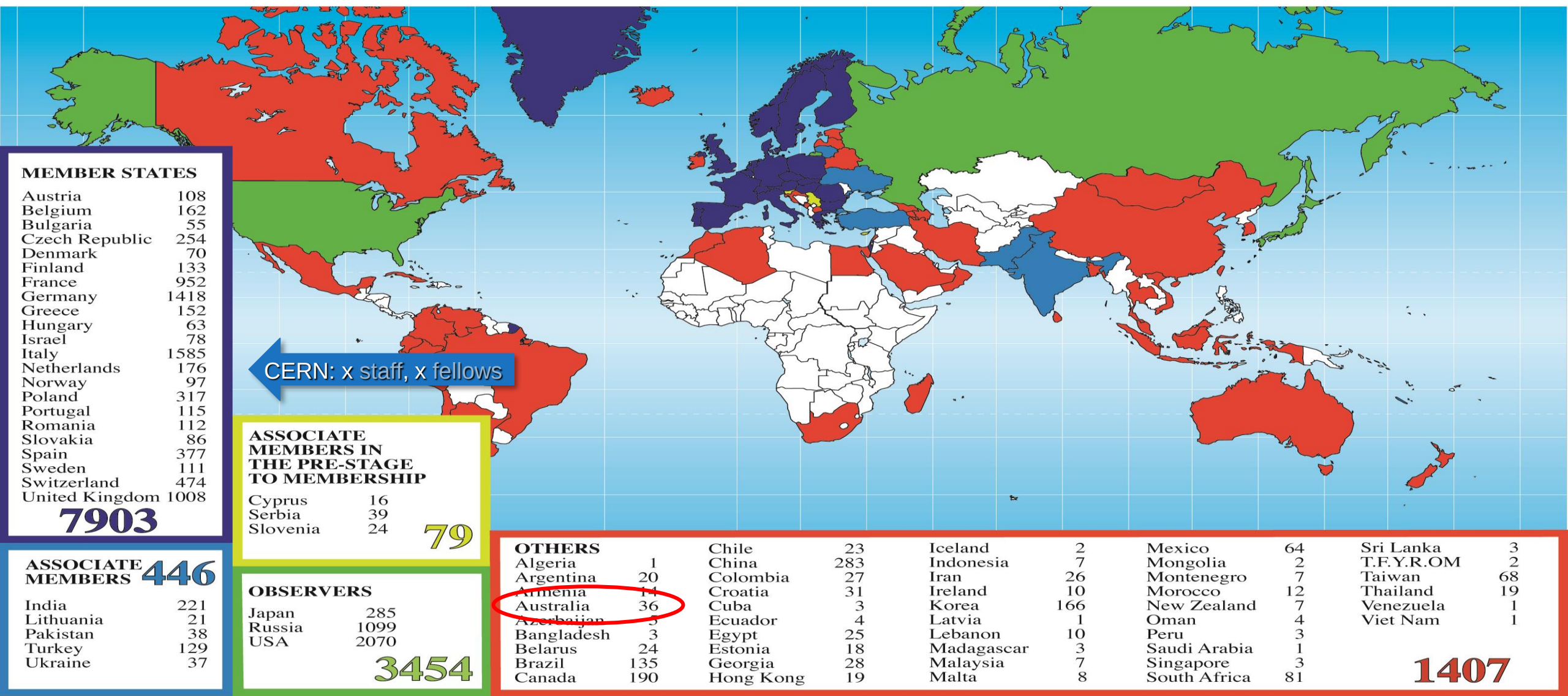
Observers to Council:

Japan, Russia, United States of America; European Union, JINR and UNESCO

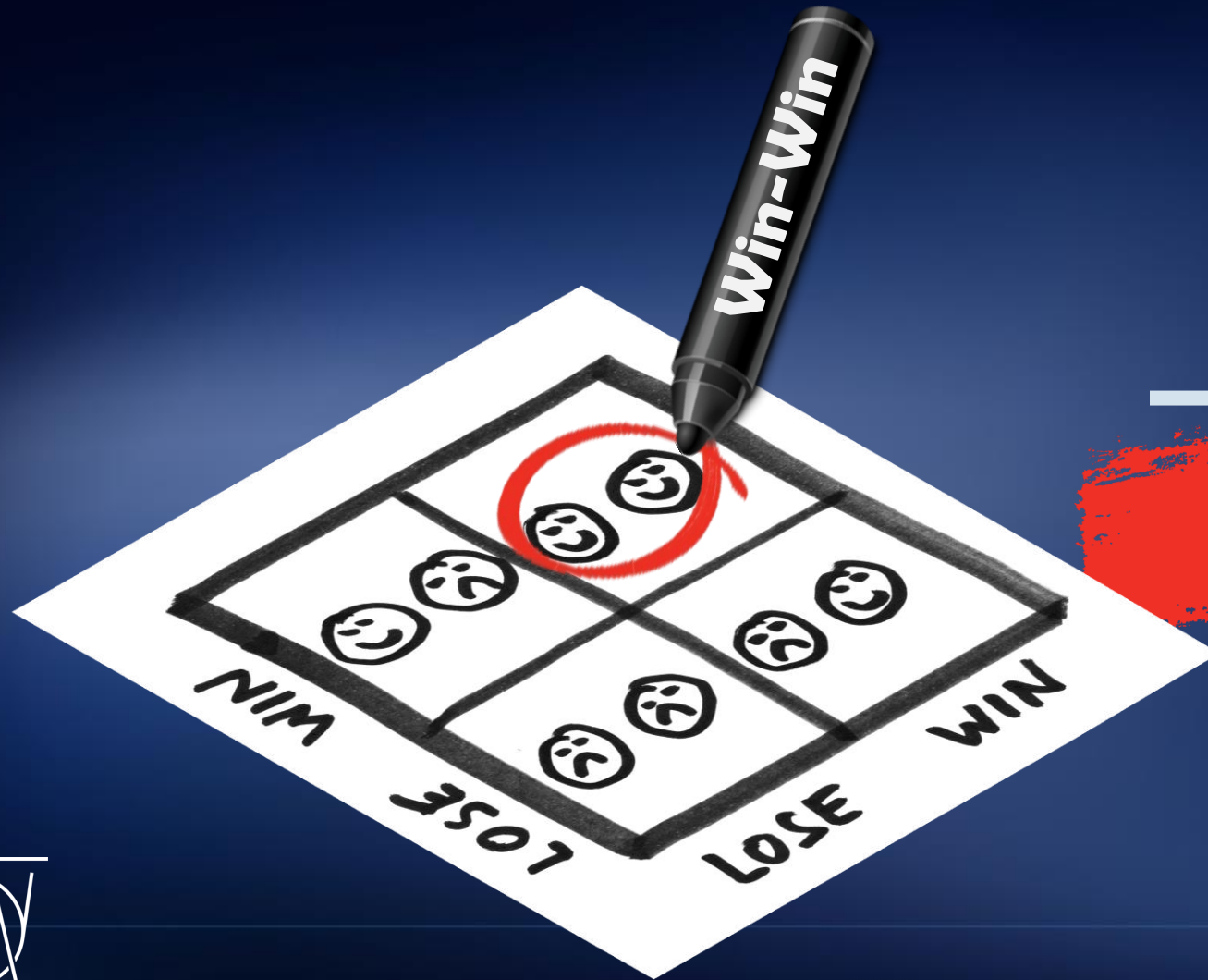


Science is getting more global

Distribution of All CERN Users by Location of Institute on 24 January 2018



Co-Innovation: Compete to Share



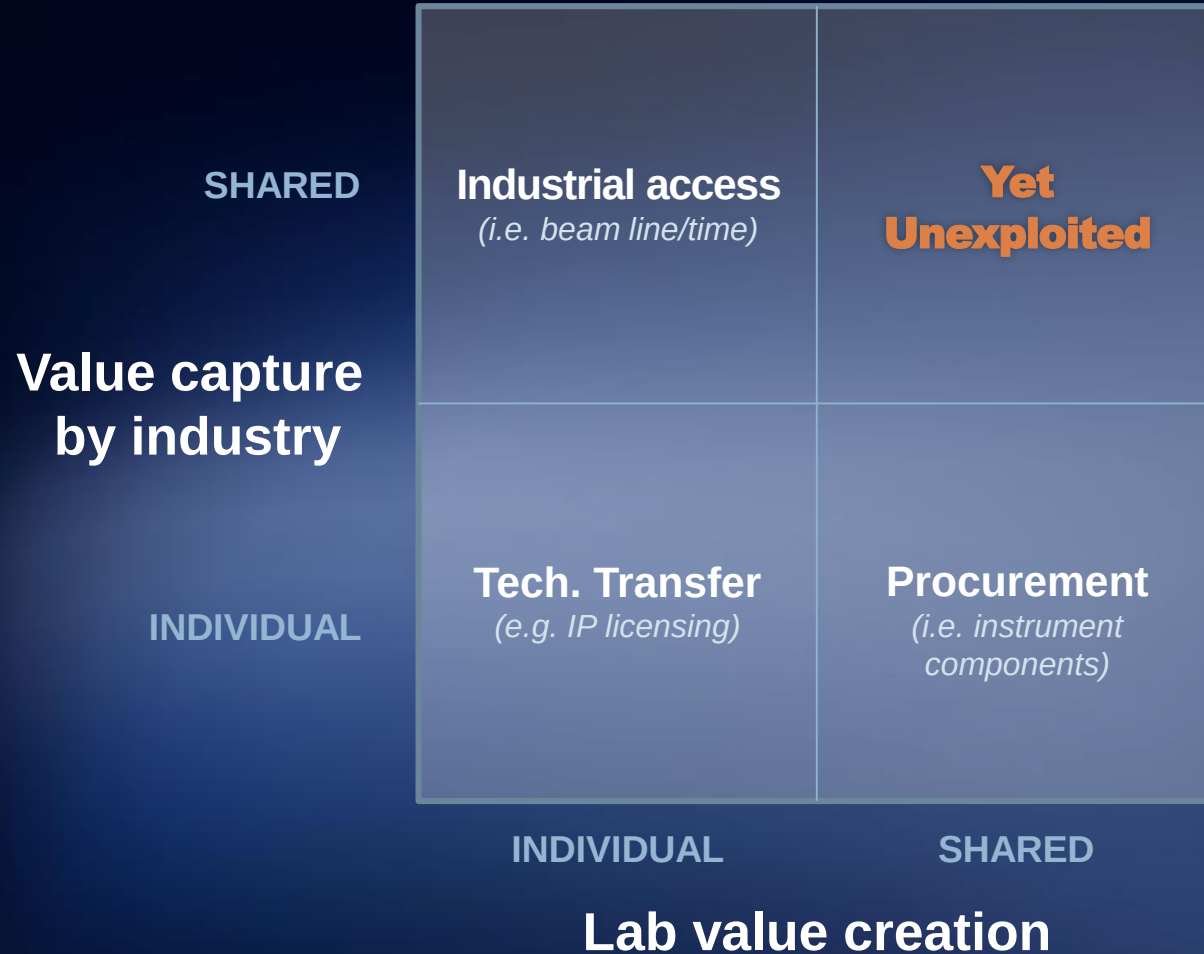
Cooperation
+
Competition

Co-Innovation

Can Science and Society-Driven Cycles Coexist?



Yes, by creating shared value opportunities



Shared value opportunities...

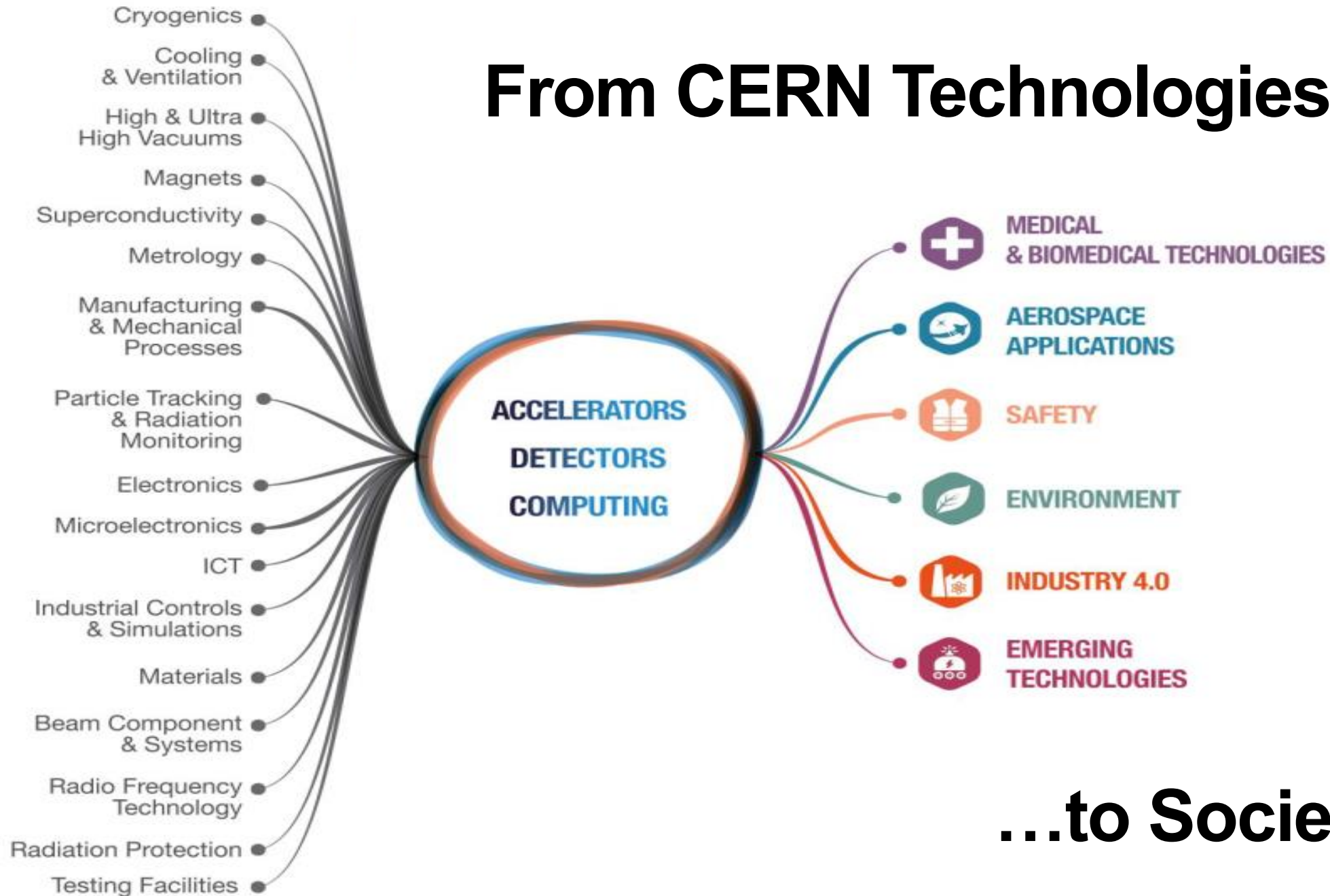
...but what does it mean?

- Create economic and social value while respecting Research Labs fundamental scientific mission.
- Fully exploit the synergies between national and international Research Labs.
- Enhance existing (local) industrial collaborations and foster new (global) ones.

It is about creating an Innovation Ecosystem...



From CERN Technologies...



...to Society

CERN-MEDICIS First medical isotopes produced

Forbes

Two Birds With One Proton Beam: CERN Now Makes Radioisotopes For Medical Research

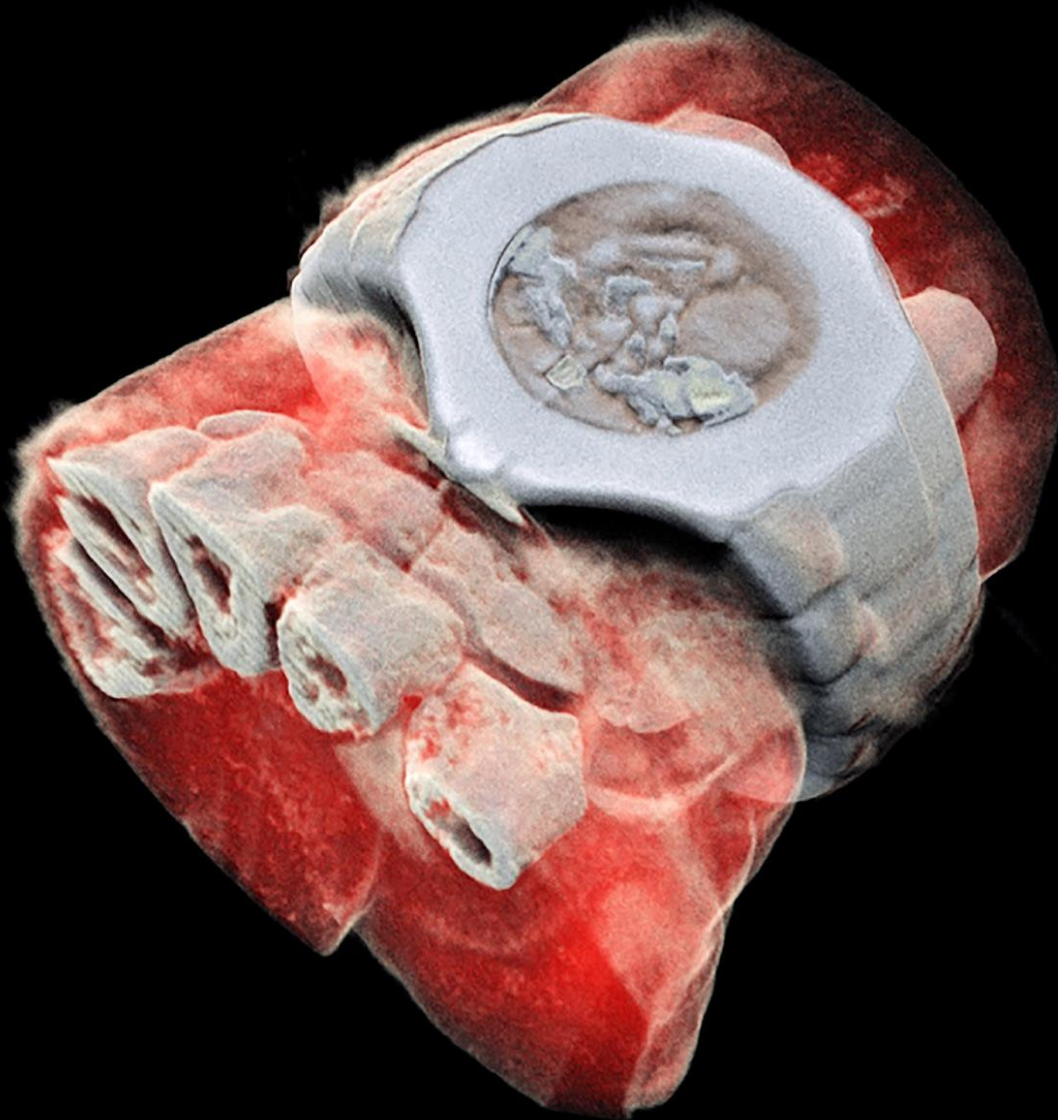
The CERN-MEDICIS facility in Geneva, Switzerland has produced radioisotopes for medical research for the first time. This is the first step in the MEDICIS facility's plans to make a large number of rare and unconventional radioisotopes that will advance medical research in cancer diagnosis and therapy.

This raises an intriguing question: why has a major research facility renowned for its endeavors in fundamental physics venturing into medical research? It actually makes a lot of sense when you take a closer look at the facility. The proton beam used in the

Courtesy of R. Strom CERN KT Group



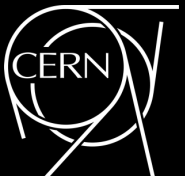
Spectral imaging – Medipix chip



The New York Times

3-D Color X-Rays Could Help Spot Deadly Disease Without Surgery

A new medical scanner, derived from technology used by particle physics researchers at CERN, “is like the upgrade from black-and-white film to color,” one of its developers said.



X-ray eyes for cultural heritage – Medipix chip



From the LHC to space – Timepix chip



CERN controls middleware software for worldwide factory automation

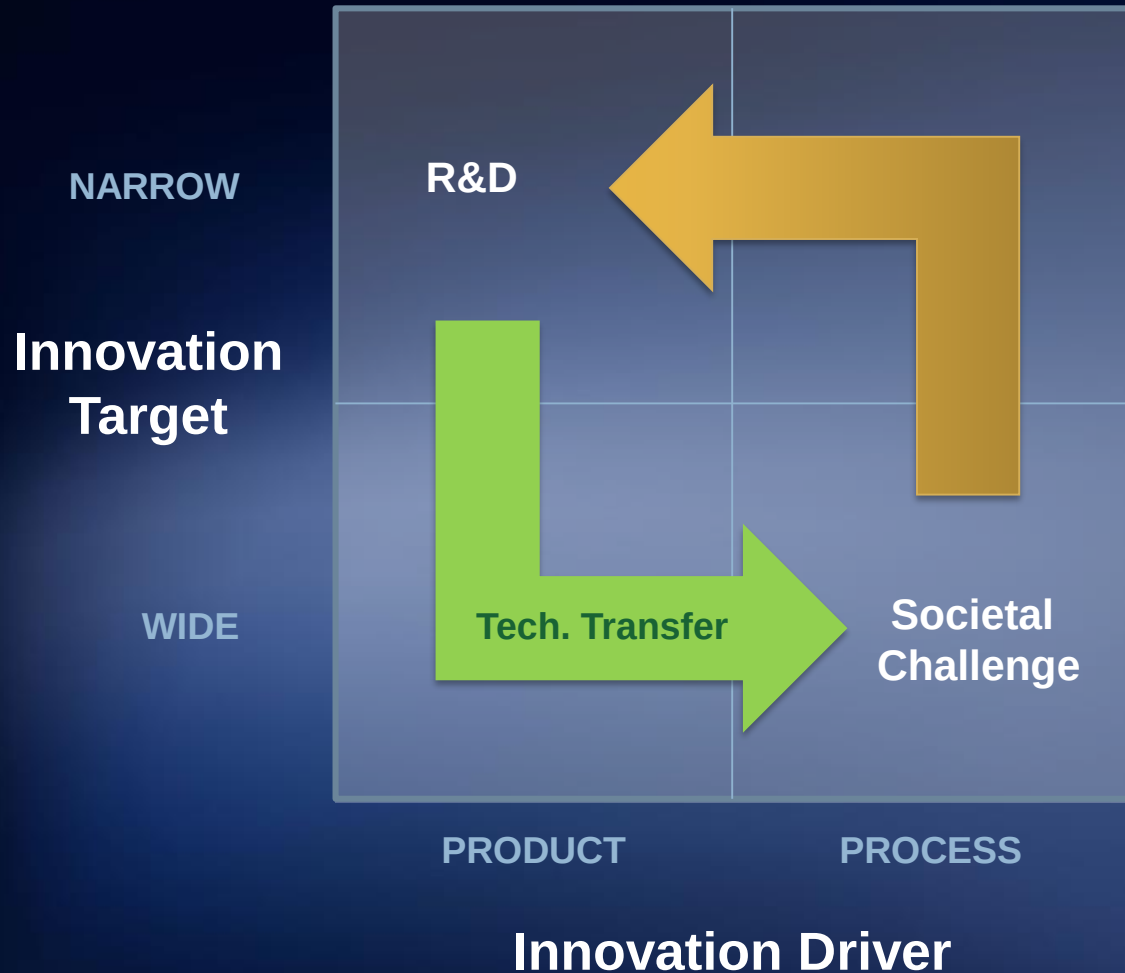


Machine learning to improve vaccine production





IdeaSquare@CERN: Testing in practice for OS-OI



IdeaSquare Approach

Publicly funded R&D detection and imaging projects - co-innovation with industry; applying open innovation principles.



Feeding Societal Challenges back to R&D, industrial and business value – using Design Thinking methodology and MSc interdisciplinary student teams.



More than 500 MSc students since 2014 and 50% rate of demonstrated interest in entrepreneurship.

Experimenting at IdeaSquare

- Dedicated location at CERN that hosts and facilitates detector R&D-related activities and facilitates cross-disciplinary MSc-level student projects focusing on societal challenges.
- IdeaSquare provides technical support facilities (“innovation in the making”)
  - Rapid prototyping (within 7 meters, 7 seconds)
  - Mechanical, electronics labs, cleanroom for advanced assemblies
- The R&D projects include e.g. semiconductor sensors, THz-electronics and augmented reality technologies
- The MSc-student projects are part of Design Thinking-inspired Challenge Based Innovation Program (CBI)
  - MSc students from six countries, teams from product design, business management and engineering students
  - Society-driven challenges (not physics!)
- Results are published in a new, dedicated on-line journal CIJ
  - <http://cij-ei.web.cern.ch/CIJ-EI/>

Strong student involvement from Swinburne, Inspired by Design Thinking

(Re)defining the problem

Understanding project goals
What are we solving?

Technology review

Technology specifications, need assessment
What (CERN) technologies can we use to fulfill the needs?

Prototyping and testing

Building solutions, testing them in reality
How does our solution work?

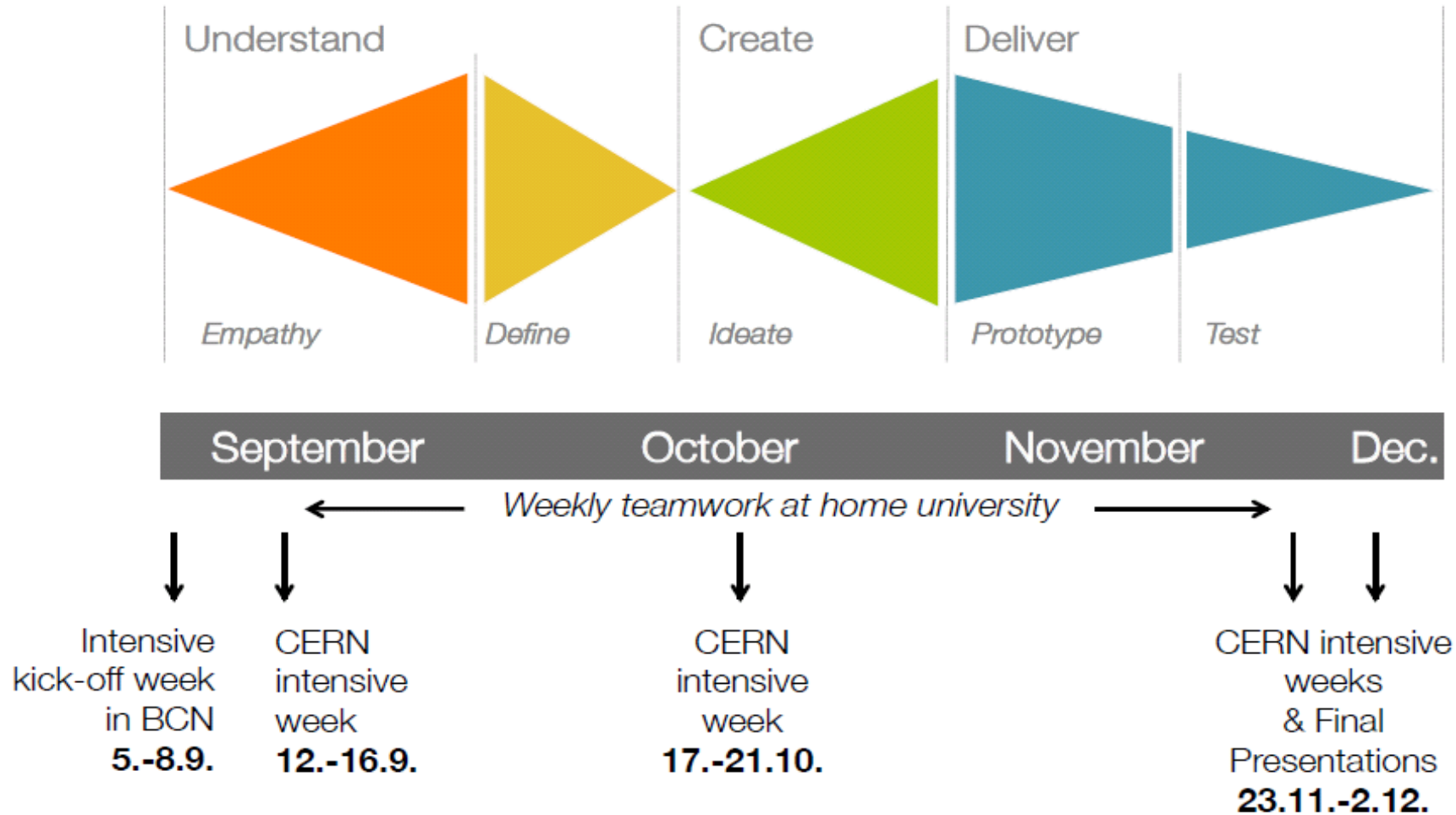
Ideating and selection

Brainstorming, evaluation
How could we solve the problem?

problem space
solution space

Sequence from ideas to innovation

CBI TIME LINE: SEPTEMBER 5TH – DECEMBER 2ND



Helping young autistic children to communicate

IV.
Solution



Preventing hip injury from involuntary fall





**Your fridge is
sending a
message when
food is ripe to
eat for you**

Today our GPS
systems will not
work without
Einstein's special
relativity theory.



Thank you

