CENTRE DE PHYSIQUE DES PARTICULES DE MARSEILLE

CPPM

UMR7346

A joint CNRS / AMU research lab of excellence

over 160 people strong

**(40 perm. scientists; 35 postdocs and PhD students;
75 engineers, technicians and admin. Staff;
50-60 visiting scientists from all over the world,
over 30 interns, each year)**

At the heart of the Universe and Matter

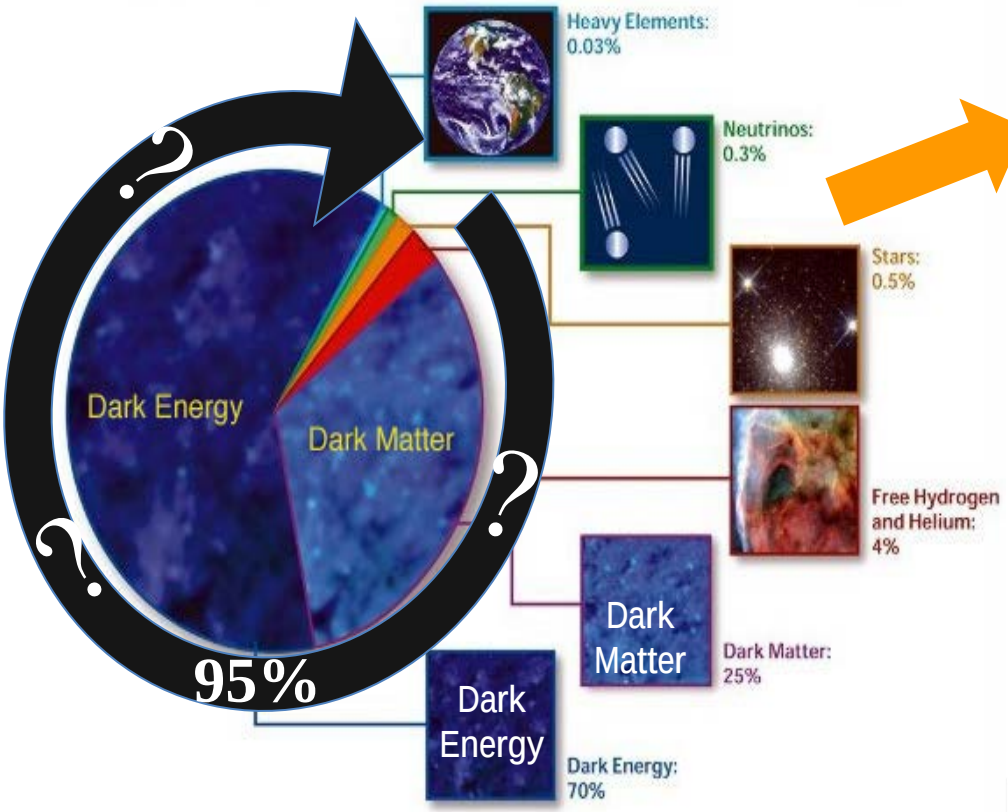
cnrs IN2P3 Les deux infinis

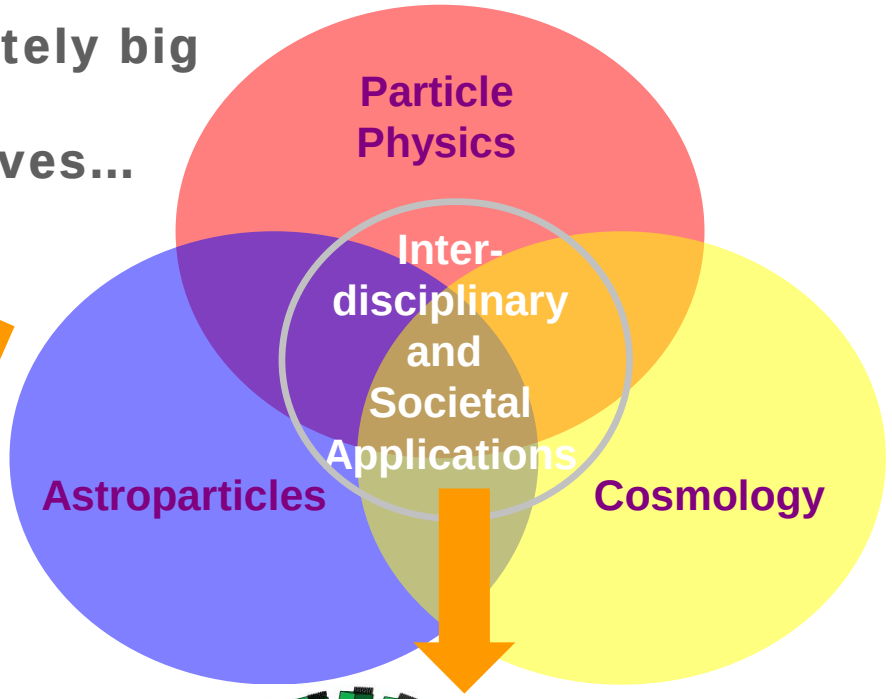
Eric Kajfasz (kajfasz@cppm.in2p3.fr)

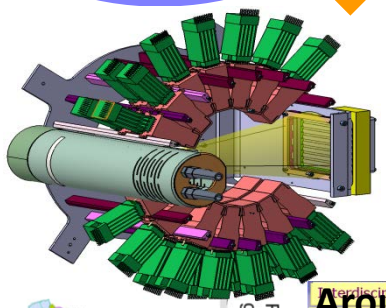
Aix*Marseille université Initiative d'excellence

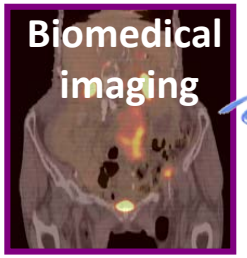
Our missions

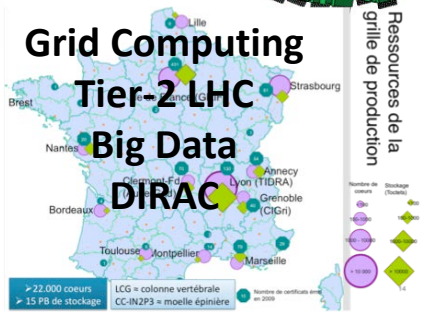
From the infinitely small to the infinitely big
Understand our Universe,
What it is made of and how it evolves…

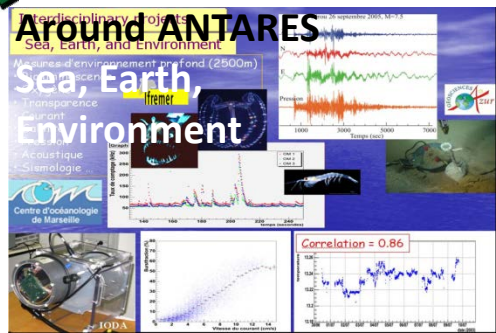




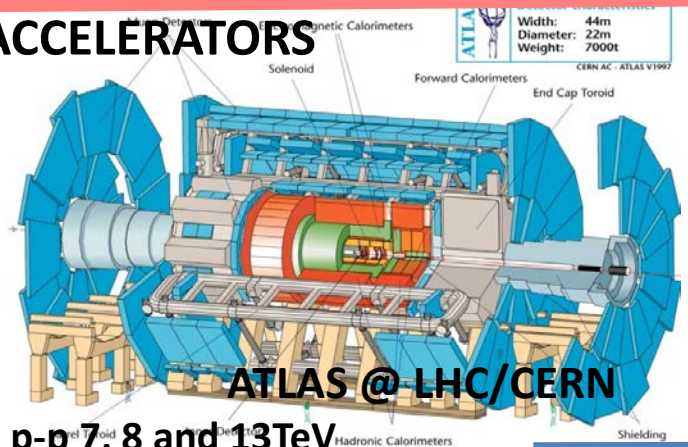








AT ACCELERATORS

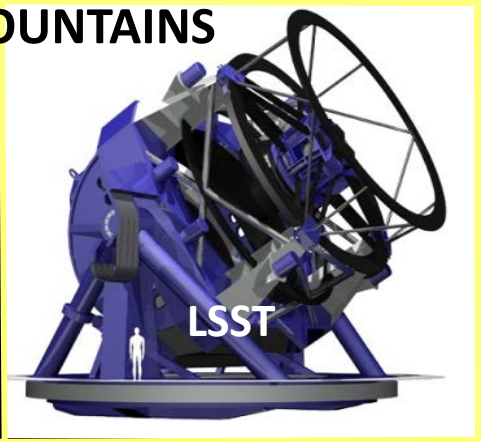


ATLAS @ LHC/CERN

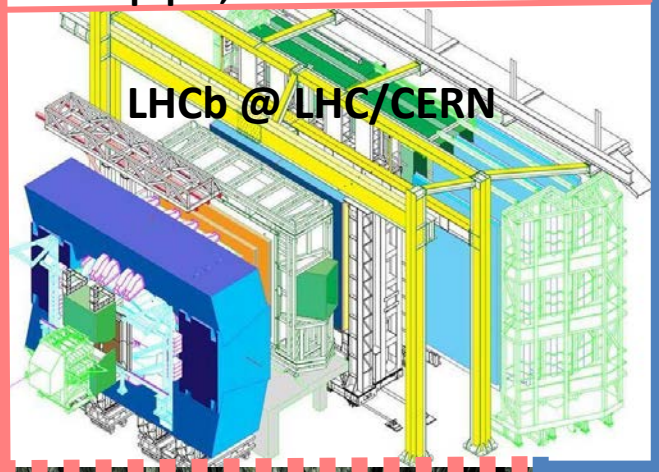
p-p 7, 8 and 13TeV

ON TOP OF MOUNTAINS

SNLS/SNFactory
BOSS/eBOSS
DESI



LSST



LHCb @ LHC/CERN

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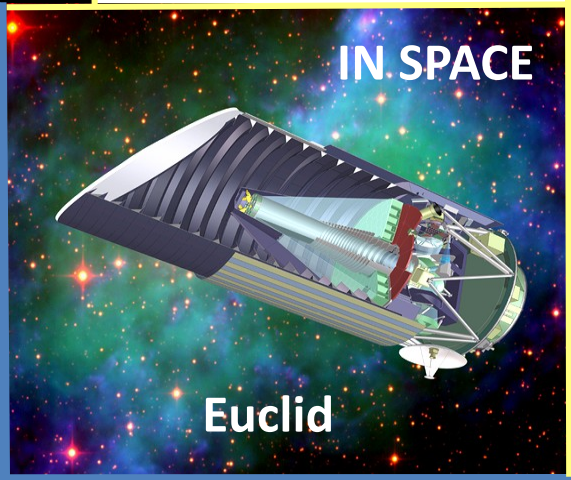
International Scientific Collaborations all over the Planet

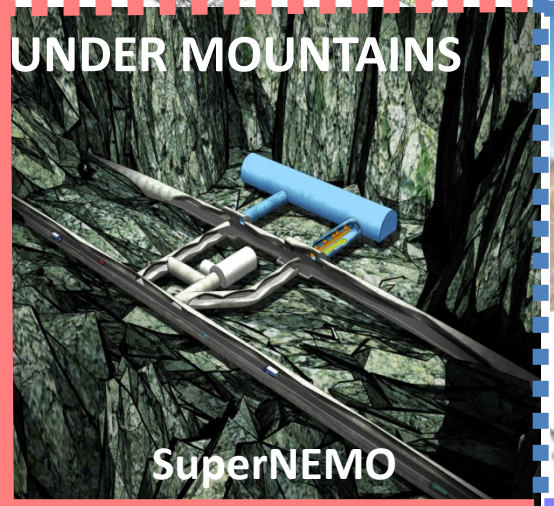
...

IN SPACE



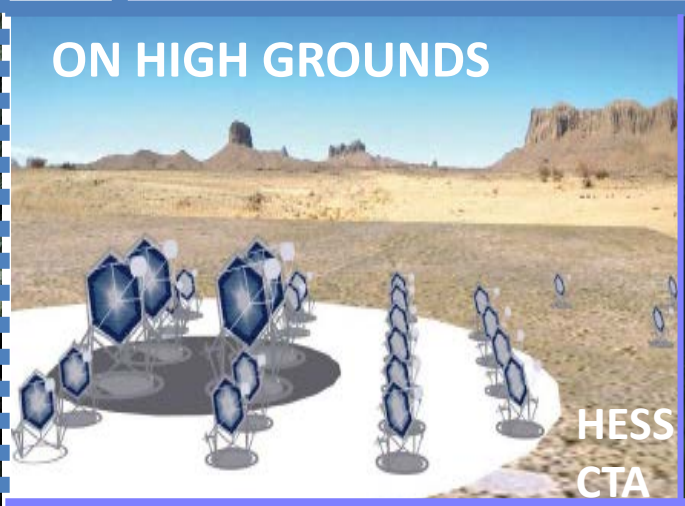
Euclid

UNDER MOUNTAINS



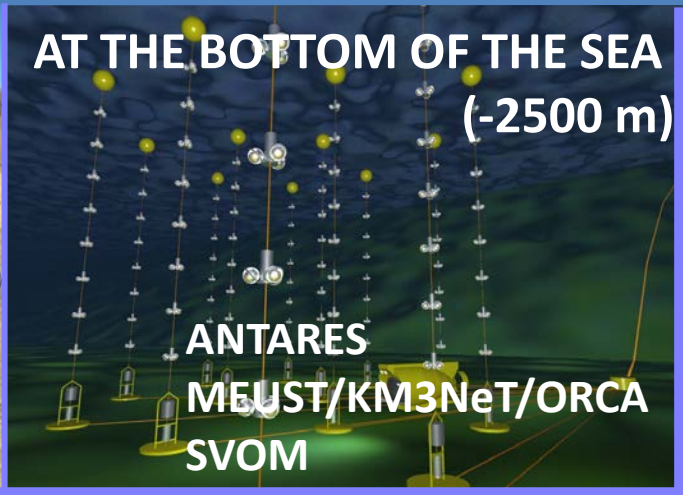
SuperNEMO

ON HIGH GROUNDS



HESS
CTA

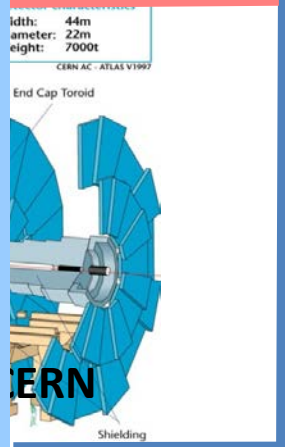
AT THE BOTTOM OF THE SEA (-2500 m)



ANTARES
MEUST/KM3NeT/ORCA
SVOM

Precision measurement of the SM
Discovery and study of the Higgs boson
CP violation - Search for New Physics

ATLAS *Pixel detectors* (current, IBL, upgrades)
e/γ calorimeter (endcaps, operations, ID and performance)
Trigger and filtering (HLT, Lar trigger upgrade)
LHCb *trigger/DAQ* (current L0 Trigger and 40 MHz readout)



Characterize Dark Energy Cosmological parameters multi-probe approach
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LSST Camera Filter Changer System & "Ground" Segment
EUCLID Near-IR Spectro- and Photo-meter focal plane & Ground Segment

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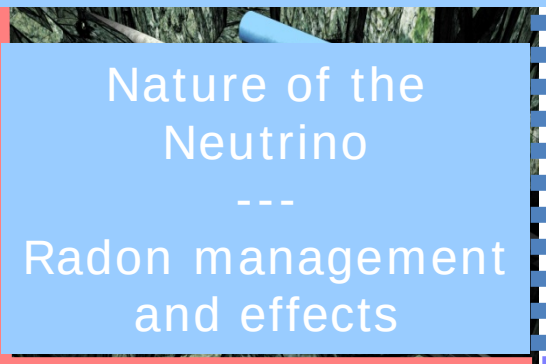
CPPM

International Scientific Collaborations all over the Planet

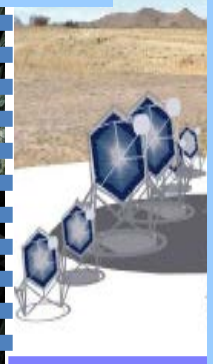
Neutrino and Gamma Astronomy
Sources of CR acceleration
Indirect detection of Dark Matter multi-messenger approach
Neutrino mass hierarchy (ORCA)

CTA NectarCAM DAQ
KM3NeT infrastructure and line integration
SVOM ground segment (Follow-up telescope)



Nature of the Neutrino

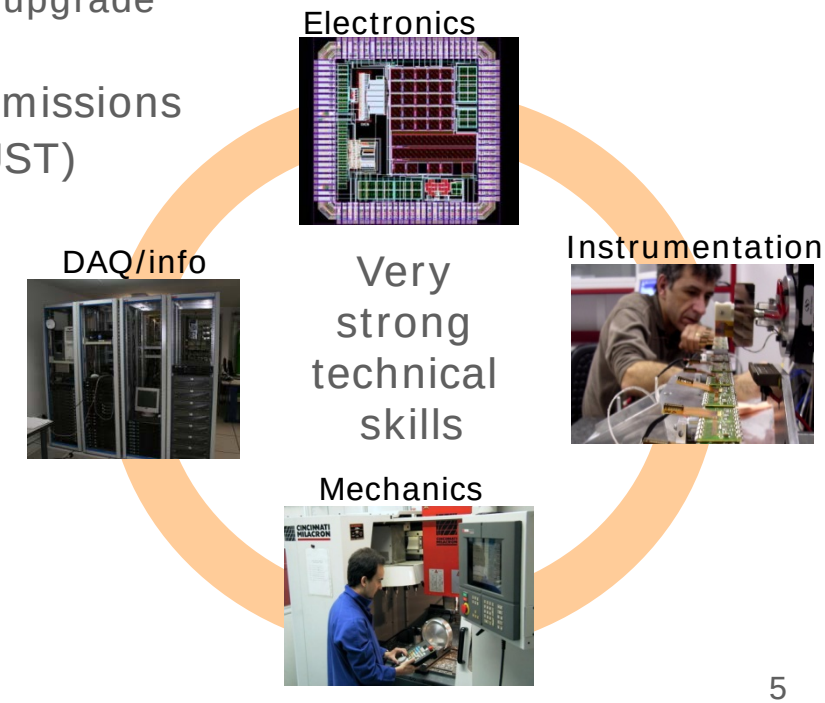
Radon management and effects



Top-notch techn(olog)ical skills for top-notch science

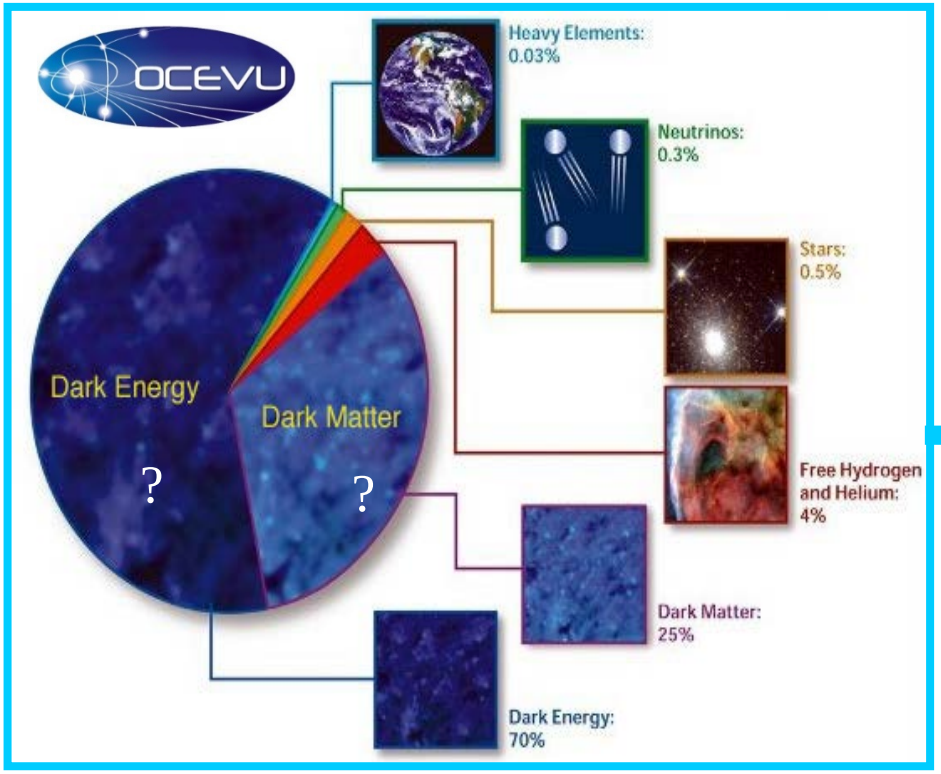
- Recognized technical skills and leadership
  - Micro-electronics (planar and 3D; radiation hardness)
    - Pixels detectors for particle physics (ATLAS)
    - Transfer to:
      - X-Ray imaging (imXgam) => ***4 patents and startup company*** imXPAD silicon and CdTe (FP7 Calypso)
      - ... but also robotized avionics (silicon fly retina – FP7 Curvace)
  - Fast acquisition (FPGA based) and fiber optics transmission (LHCb)

    But also for...
    - Hadron therapy (FP7 ENVISION)
    - ATLAS: LAr calorimeter readout and trigger upgrade
    - ALICE: readout upgrade
  - Characterization of IR detectors for space missions
  - Submarine Infrastructures (ANTARES/MEUST)
    - Equipressure systems
    - Submarine connectors
    - ***2 patents; startup company*** POWERSEA ***strong interest from the industry (sustainable energies)***
      FUI with EDF, Comex and Subsea Tech
      FUI with NEXANS, Comex and Subsea Tech
  - Interaction with Competitiveness Clusters
    - OPTITEC, SCS, Mer Méditerranée, Eurobiomed, Pégase



Investissements d'avenir

- **Labex OCEVU**: Origins, Constituents et EVolution of the Universe
  - Coordinated by Aix-Marseille Université (and CPPM); 10 M€ over 8 years (2012-2019)



Partners:
Aix-Marseille Université
Univ. de Montpellier
Univ. Paul Sabatier (Toulouse)
CNRS: IN2P3, INP et INSU

CPPM
CPT
LAM
L2C
LUPM
IRAP

Collaborative projects in:
Research
Education
Transfer to society

Combine and reinforce our strengths in:
Cosmology, (Astro-)Particles Physics
Observation, Experimentation, and Theory

- **France Life Imaging** (FLI) selected in the call « Infrastructures in Biology and Health » :
  Spectral & photon counting CT for small animals
- Projects of **A*MIDEX** : M2 P3TMA « Académie d'Excellence », prototype of an X-Ray camera for diagnostics in fusion plasma in Tokamaks, « Académie d'Excellence – Collège Doctoral » - shared PhD student w/ Barcelona
- **Future of OCEVU** : project **IΦU - Institute for the Physics of the Universe**
  strong support from the A*MIDEX, OCEVU Steering Committee and Saul Perlmutter (Chair)
  (CPPM, CPT, LAM) – Research, Education (Graduate School) and Transfer – Funding PIA-3 and A*MIDEX

Resolutely open to the world…

Cooperations (with agreements between universities):

- Algeria
- China
- Columbia
- Czech Republic
- Hungary
- India
- Italy
- Lebanon
- Morocco
- Romania
- Russia
- Spain
- USA
- …

Over half of our PhD students and postdocs are foreigners

Currently 7 PhD co-directions with foreign universities (2 China, 1 Columbia, 1 Italy, 2 Romania, 1 Spain)

LIA FCPPL

France-China Particle Physics Lab

An ''outside the walls'' laboratory
of about 200 Chinese and French collaborators
A network of which CPPM is the administrative headquarters

CPPM Collaborative Projects with:

IHEP, Beijing, 中国科学院高能物理研究所 - 北京

Tsinghua Univ., Beijing - 清华大学 - 北京

USTC, Hefei 中国科学技术大学 - 合肥

Shandong University, Jinan - 山东大学 - 济南

Education and Outreach

Education: strong involvement (faculty staff, researchers, engineers) at the LMD of AMU and engineering schools
Managerial responsibilities (Doctoral School, Licences, Masters 1 et 2)

Scientific communication and outreach:
Publications, seminars,
Conferences and schools…
Activity reports
Articles and press releases,
Conferences in high-schools, Master Classes (with CERN)
Exhibitions, various events, Fête de la Science …
Development of didactic tools, …
Conference cycle for the general public

La villette; Modane; OHP; Planetarium in Vaulx en Velin

CENTRE DE PHYSIQUE DES PARTICULES DE MARSEILLE
CPPM
Mystères au coeur de l'Univers et de la matière
Cycle de conférences

Since 2007
Cycle of monthly conferences for the general public
80-100 participants…
and up to over 230!!!

National deployment in High Schools