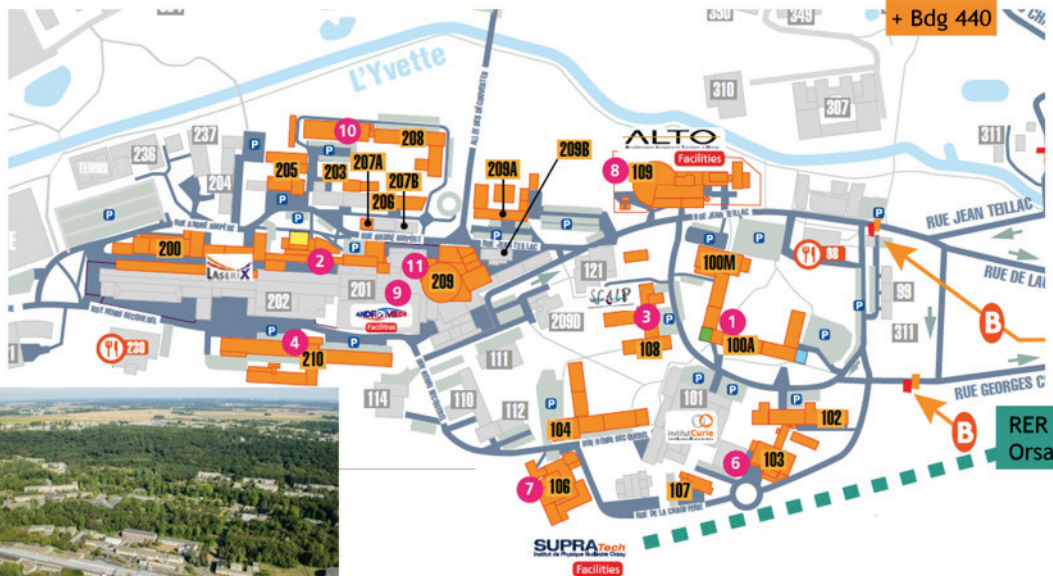


IJCLab

Laboratoire de physique des deux infinis Irène Joliot-Curie

*New Laboratory born in 2020
 from the merger of 5 Orsay laboratories*



www.ijclab.in2p3.fr

730 Collaborators
260 Researchers & Professors
340 Engineers & Technicians

150 People accredited to supervise PhD

140 PhD and Post-docs
50 European and International Research Grants
150 National and Local Research Grants

600/y Articles in international peer-reviewed journals

7 Scientific Poles

1 Engineering Pole

5 Research Platforms

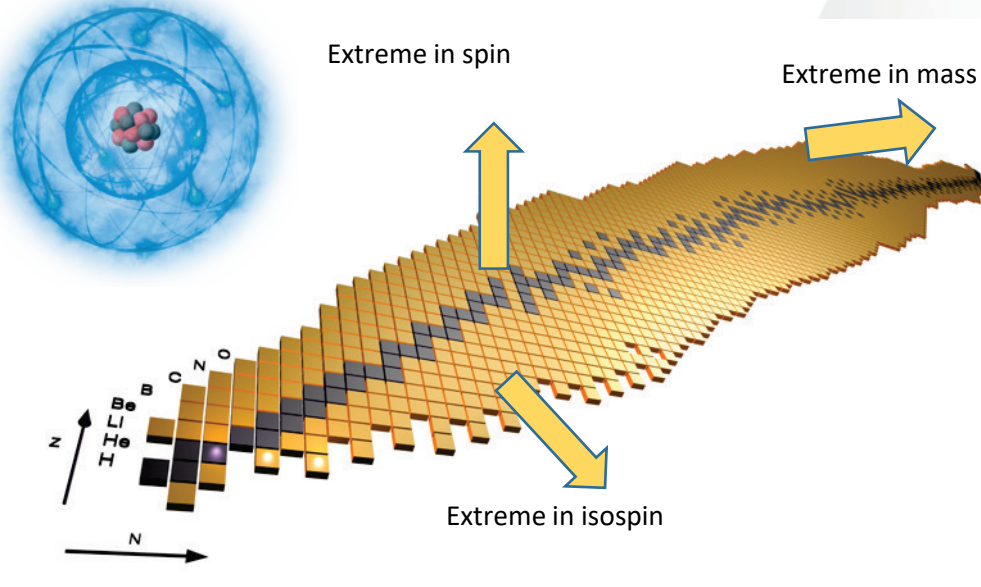
6 Technical Platforms

50000 m² of Buildings

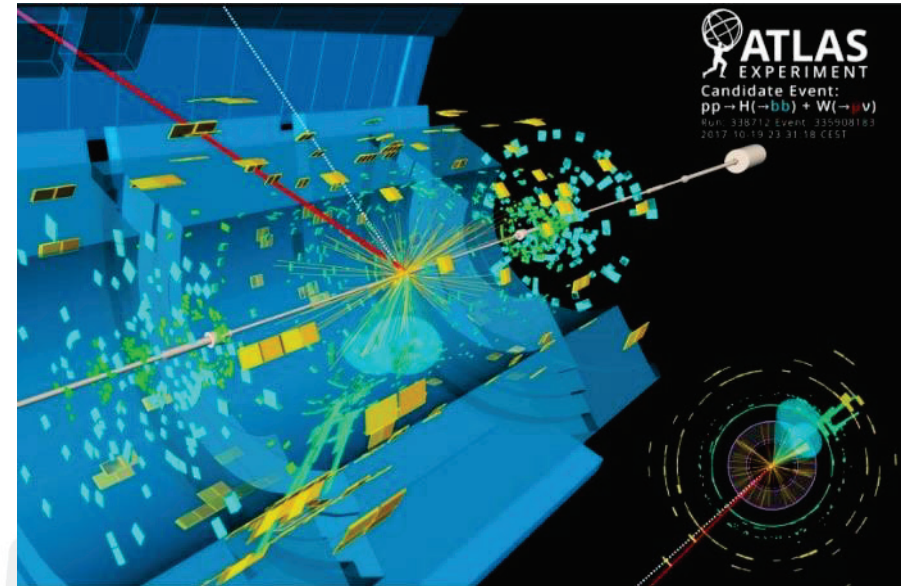


IJCLab in a nutshell (1)

Historically : Probing matter at small distances/high energies



Nuclear Physics



Particle Physics

Understanding the building blocks of matter, their interactions, and how matter properties emerge from them

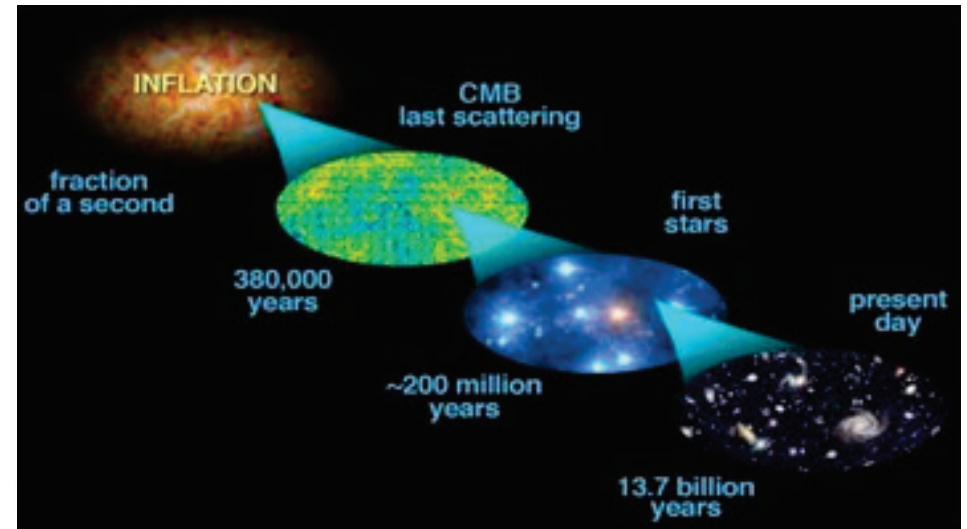


IJCLab in a nutshell (2)

High energies also involved in studying violent phenomena of the Universe
with natural links with high-energy physics



Astrophysical events
(high-energy cosmic rays,
black holes merger,
general relativity...)

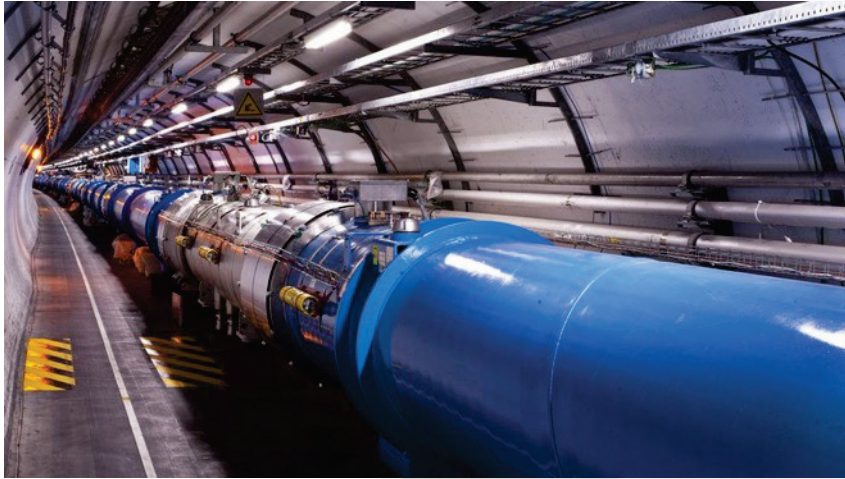


Cosmology
(evolution of the Universe,
inflation, large structures,
dark matter and energy)

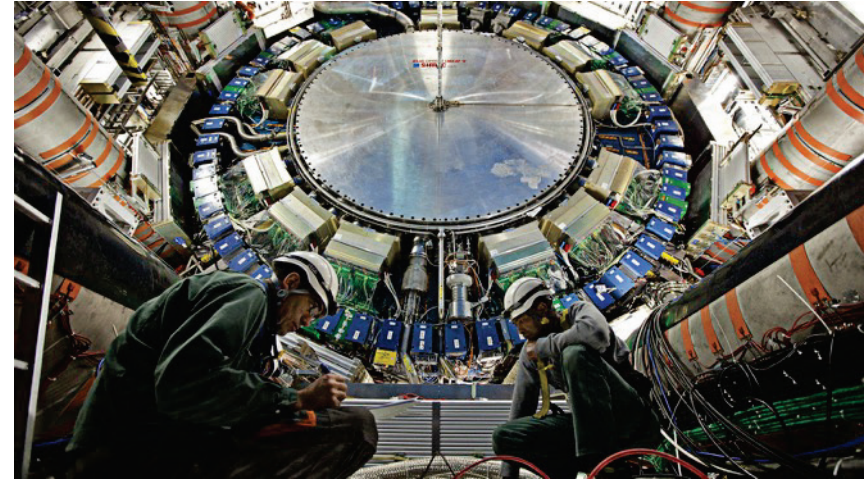


IJCLab in a nutshell (3)

Building tools to perform these investigations



Accelerators



Detectors

Theory : interpreting
and relating results



and suggesting new
tests and ideas

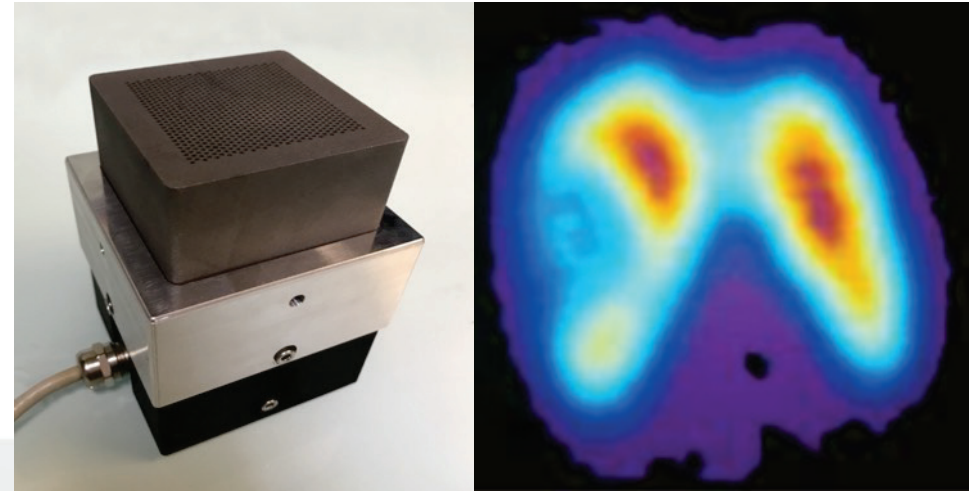


IJCLab in a nutshell (4)

Tools and concepts applied in areas with impact on society



Energy and environment
(nuclear energy,
radiochemistry...)

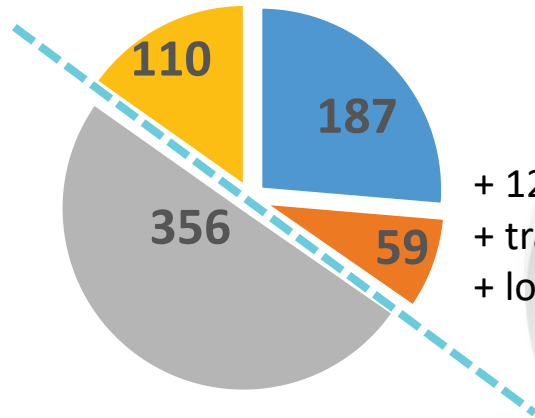


Health physics
(imaging,
therapy by irradiation)



IJCLab Staff Status (including non permanent)

- Researchers CNRS
- Researchers-Teachers
- Engineers + Technicians
- PHD



710 people
+ 120 Internships
+ trainees (« Apprentis »)
+ long-term visitors

All in all ~ 800 people present at the laboratory

CNRS (Centre National de la Recherche Scientifique)

- ~17000 researchers + 16000 technical staff
- 10 institutes among them **IN2P3 (Institut national de physique nucléaire et de physique des particules)**
- IN2P3 composed by ~20 large-scale laboratories
- IJCLab mainly linked to IN2P3 ~1/4 of HR of the IN2P3

Université Paris-Saclay

- 275 laboratories : 9000 researchers, 11000 IT (*University and research organism altogether, comprising CNRS and CEA*)
- 13th Shanghai ranking (Physics : 9th World, 1st Europe)
- 48000 students (with 9000 Master, 4000 PHD)

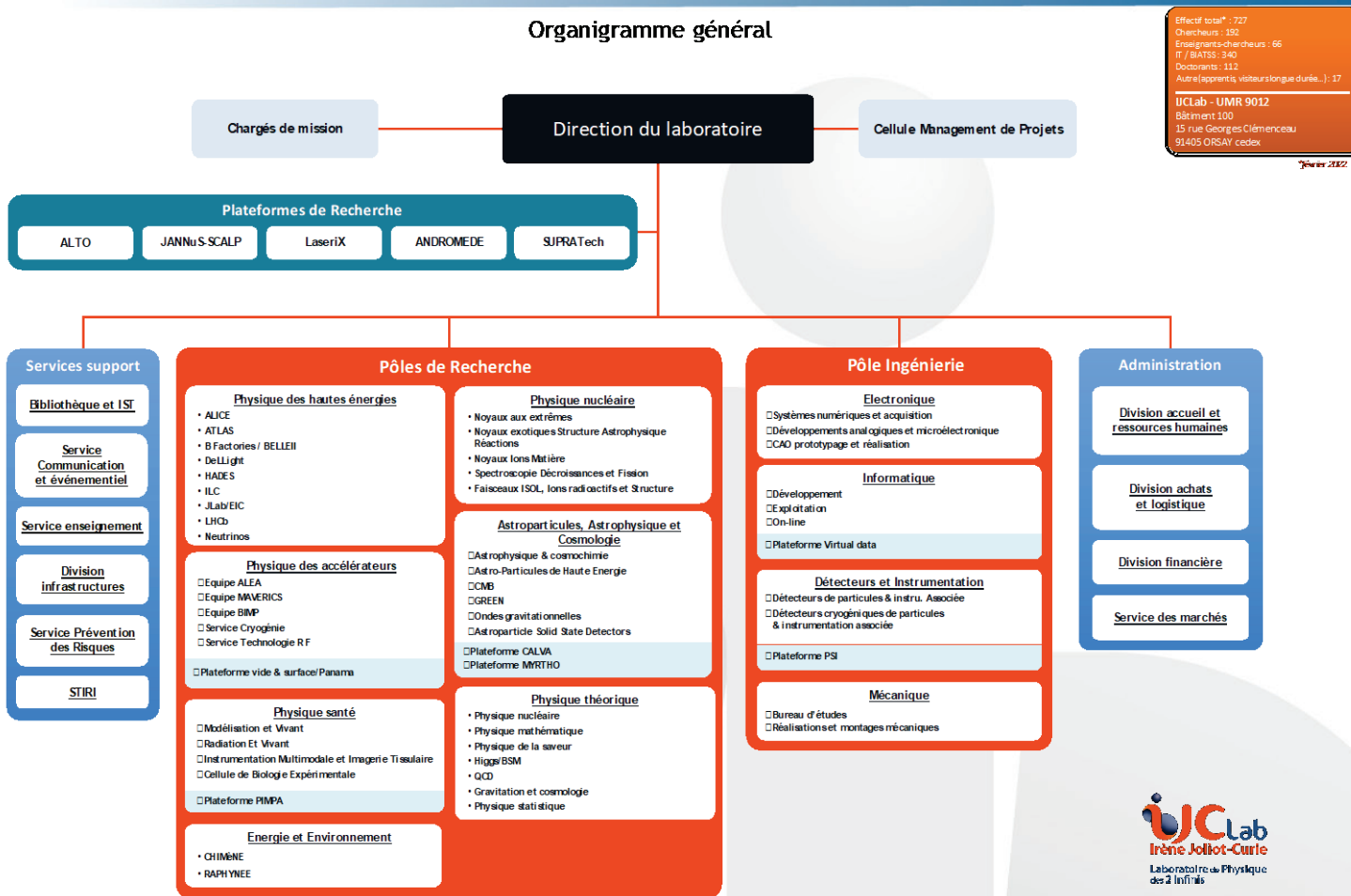
Université Paris Cité

- Specific links with IJCLab in Health Physics



Laboratory organization

Organigramme général



Effectif total : 727
 Chercheurs : 532
 Enseignants-chercheurs : 66
 IT / BIATSS : 340
 Doctorants : 112
 Aute(e)appren(t)s, visiteurs longue durée... : 17

IJCLab - UMR 9012
 Bâtiment 100
 15 rue Georges Clémenceau
 91405 ORSAY cedex

7 février 2022

710 members
 530 staff
 250 researchers
 360 engineers and technicians

7 Research poles
 31 teams
1 Engineering pole
 4 technical departments
 11 services
1 administrative pole
 3 Divisions
 1 Service
8 support services
5 research platforms

3 governing bodies

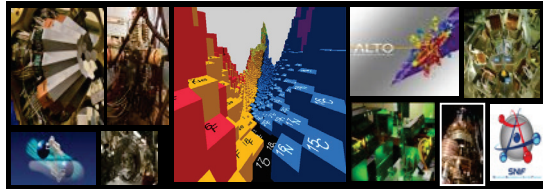
- CNRS (through IN2P3, Institut de Physique Nucléaire et de Physique des Particules)
- U. Paris-Saclay
- U. Paris Cité (Health Physics)





7 Scientific Poles

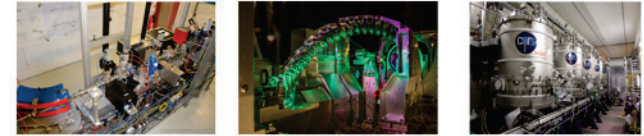
PHYSIQUE NUCLÉAIRE
NUCLEAR PHYSICS ~ 70



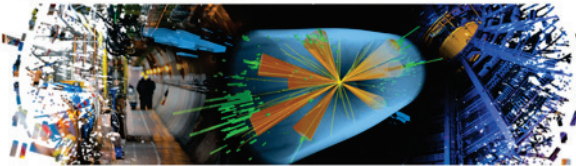
A2C Astroparticles, Astrophysics & Cosmology ~ 60



Accelerator Physics ~ 90



PHE Physique des Hautes Energies ~ 100
High Energy Physics



Theory ~ 80



Energy and Environment ~ 40



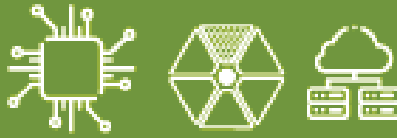
Health Physics ~ 25



~ 110 PhD



1 Engineering Pole



~ 180 members
10 services in 4 tech depts

Mechanics

- Design office
- Mechanical realizations and assemblies



Workshops

- lathes
- milling machines
- 3D printer
- sheet metal work + control

IT and computing

- Development
- Operations
- On-line

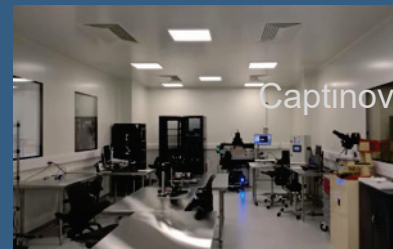


Virtual Data datacenter
51 racks (2000 servers)
up to 600kW

Detectors and Instrumentation

- Particle detectors
- Cryogenic detectors

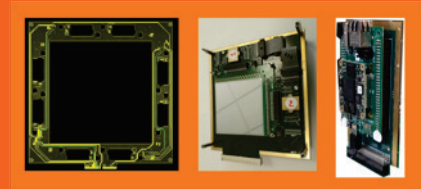
and associated instrumentation



Captinov clean room for detector building and testing

Electronics

- Analog dev. and microelectronics
- Digital systems and acquisition
- CAD prototyping and production

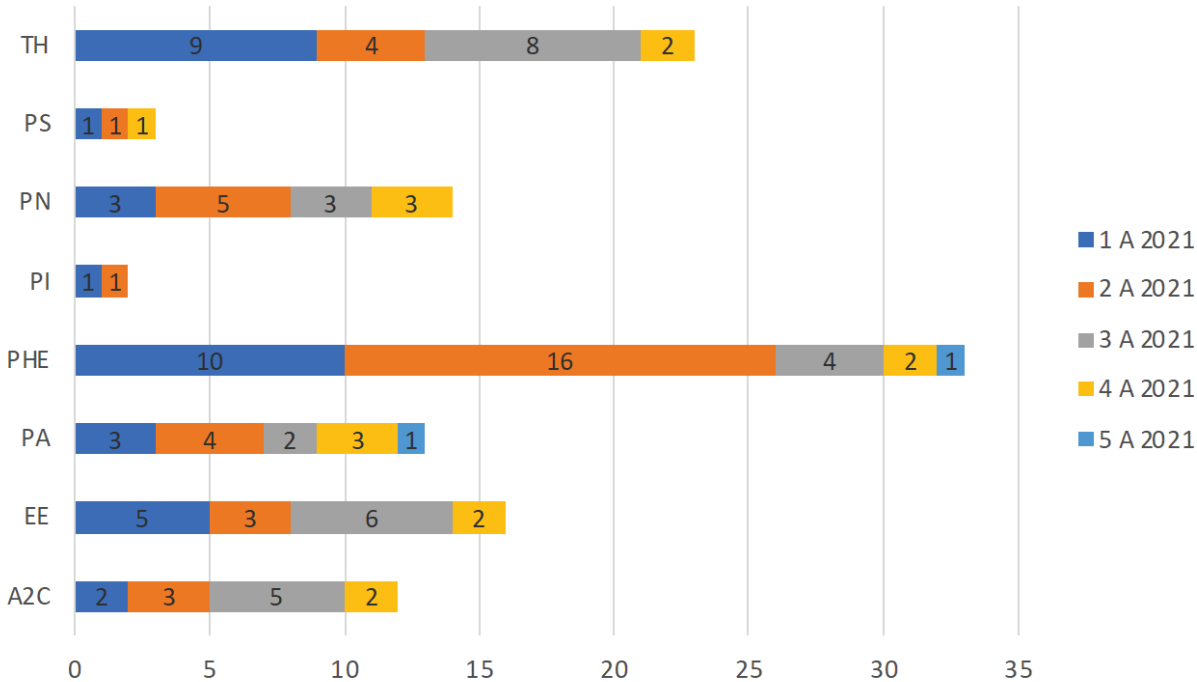


Low noise electronics for Si track sensors



PhD students at the end of 2021

Doctorant par pôle et par année (2022)



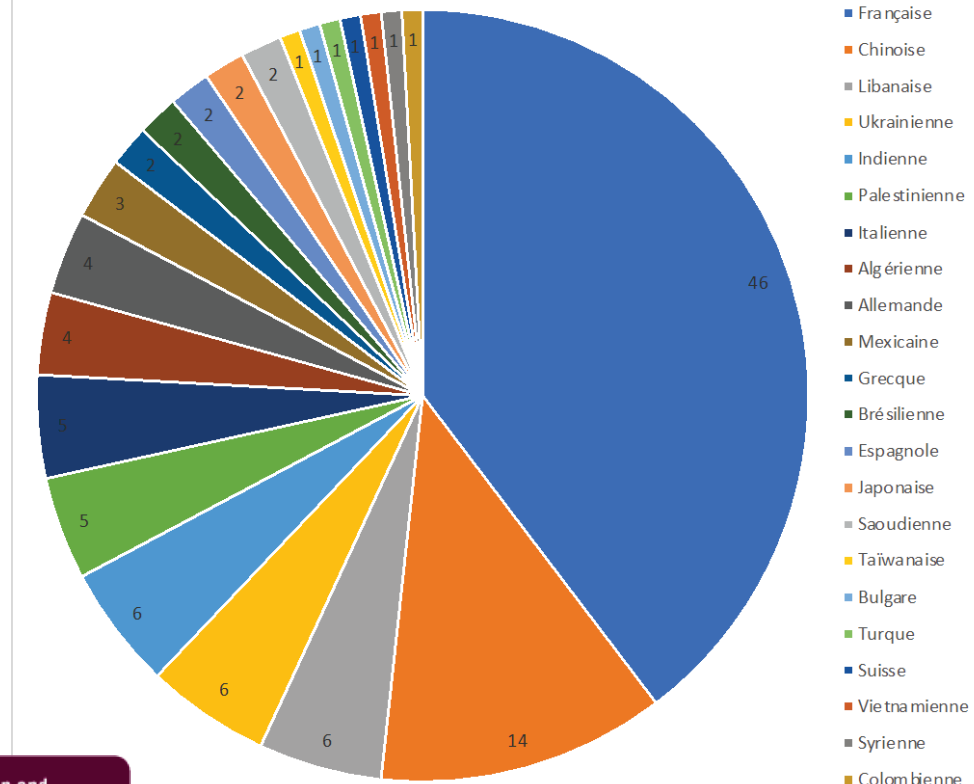
116 PhD @ IJCLab

140
PhD and
Post-docs



50 European and
International
Research Grants
150 National and Local
Research Grants

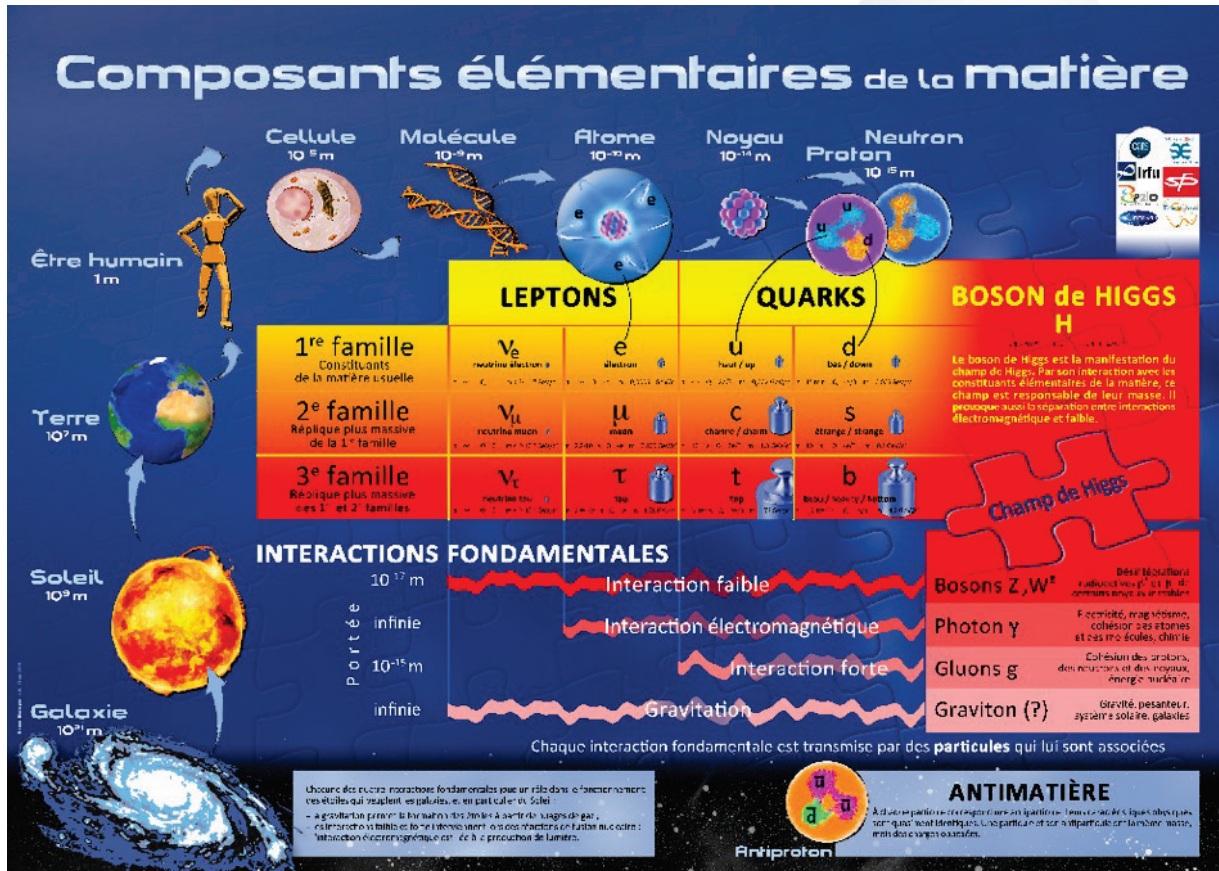
Nationalités doctorants (2022)



22 different citizenships



High-energy physics



- Probing matter at the smallest scale
- Highest energies, creating new particles in collisions (eg LHC@CERN)
- Understanding their properties and interactions

Standard Model of Particle physics

- Tested and challenged for decades
- Latest addition : Higgs boson 2012



Better understanding
of the SM

Challenging the
SM

Strong interaction

Weak & electromagnetic interactions

QGP & hadronic physics

(W,Z,H,t) physics

Flavour physics

Neutrinos physics

Beyond SM

QED in intense
em field

ALICE, HADES, Jlab, LHCb

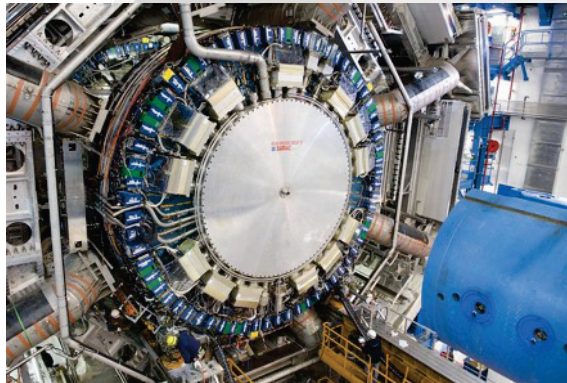
ATLAS, ILC

Belle2, LHCb

DOUBLE-CHOOZ
JUNO, DUNE

ATLAS, Solid,
(Super)NEMO

DeLLight



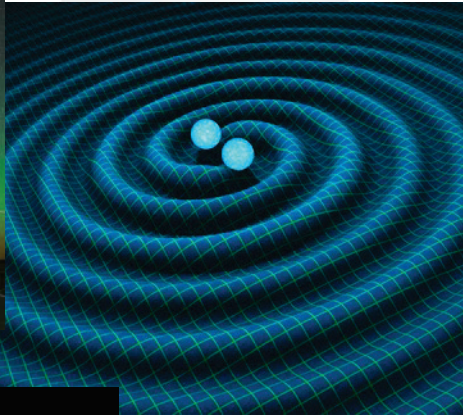
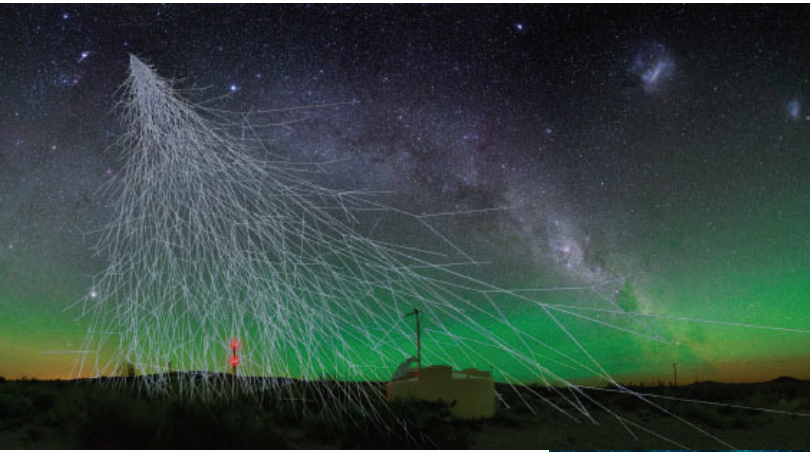
Challenging
the SM

direct searches

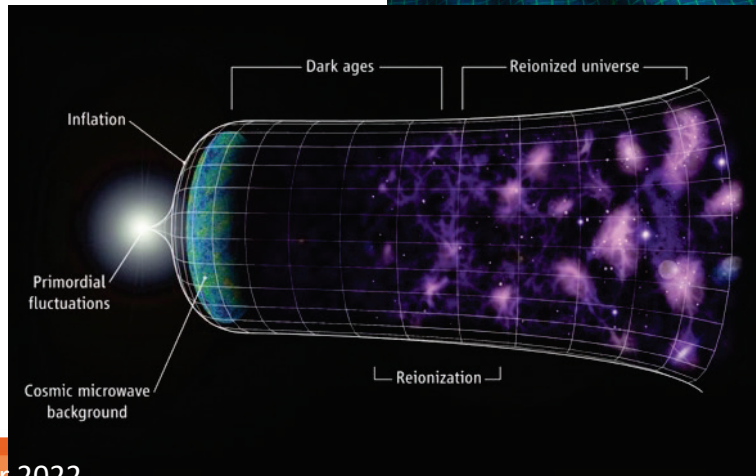
precise measurements



Astroparticles, astrophysics and cosmology



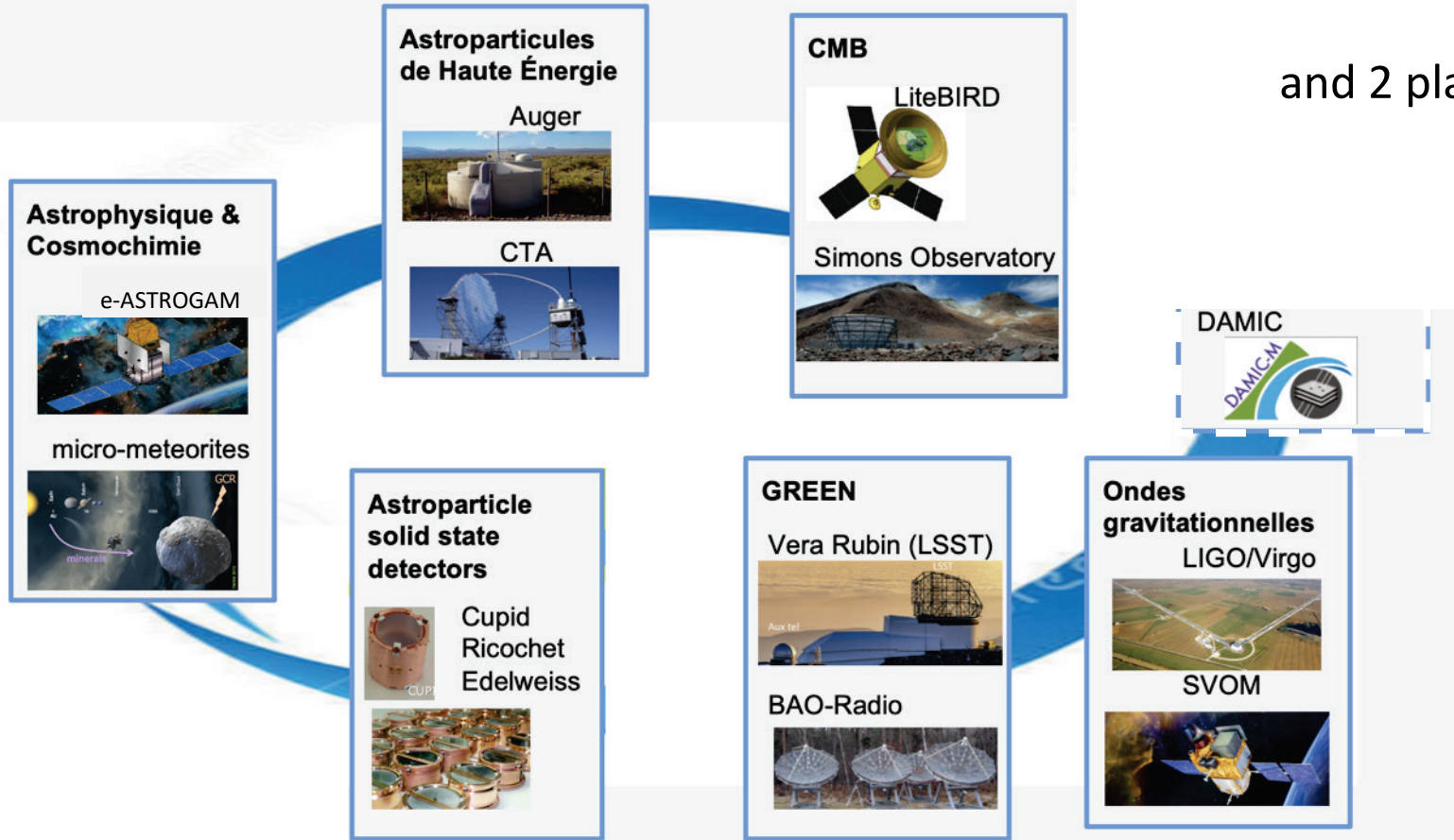
- Violent phenomena in the universe (neutron stars, black holes, AGN...)
- High-energy cosmic rays
- Evolution of the universe (Big bang, large-scale structures)
- Role of dark matter, dark energy
- Multi-messenger astronomy (gravitational waves, astroparticles...)



Connection with particle physics,
but also probing general relativity
and astrophysical questions

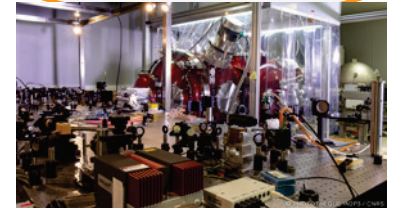


Astroparticles, astrophysics and cosmology



and 2 platforms:

CALVA/Exsqueez

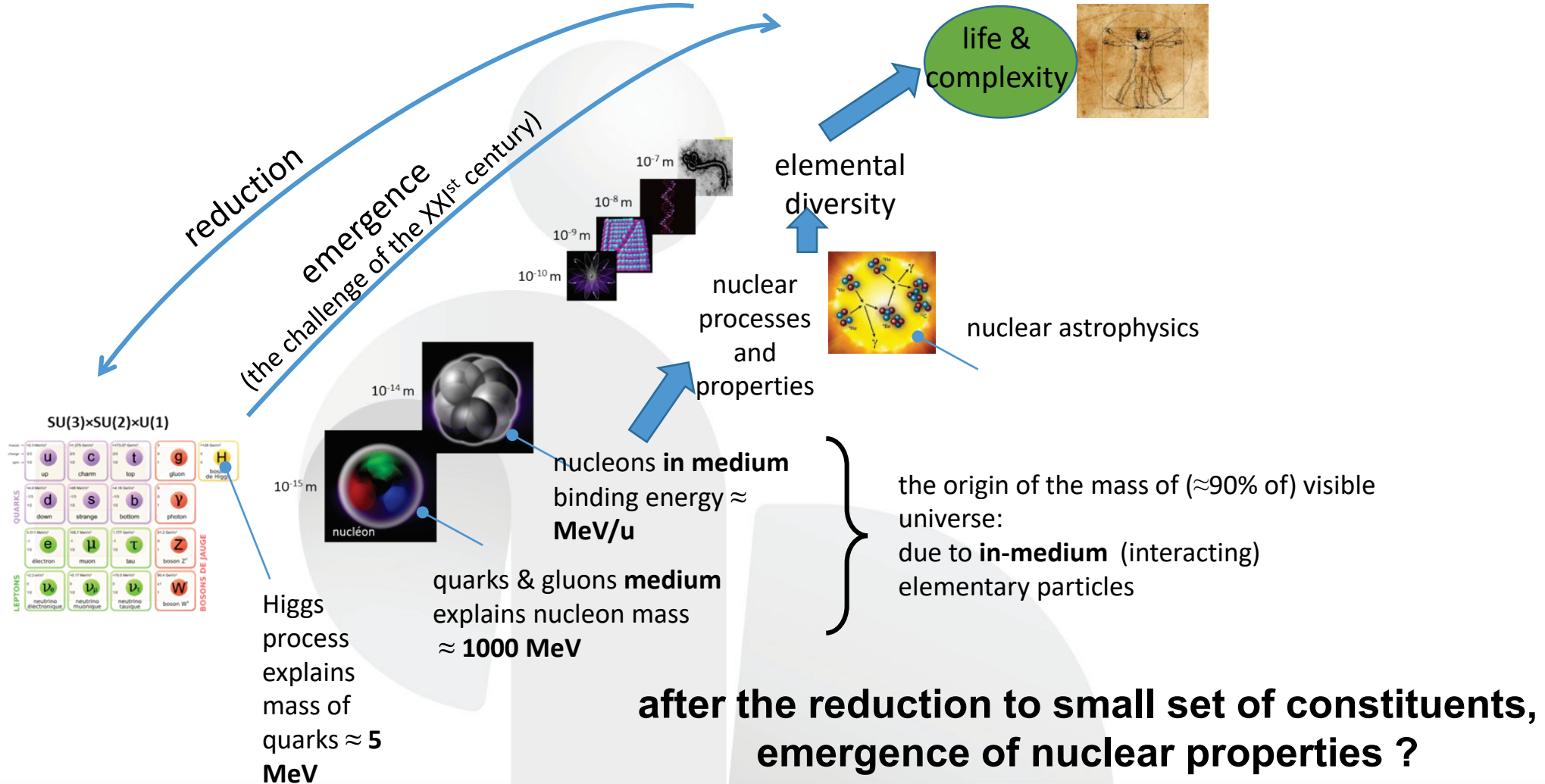


MYRTHO





Nuclear Physics





Nuclear Physics

a community of spectroscopists and builders

the discovery frontier (synthesis of new nuclei)

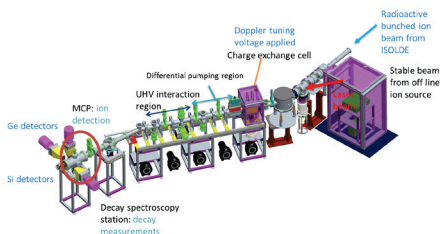
the precision frontier (network of observables)

with many experiments, locally (ALTO), nationally (GANIL) and internationally

Nuclear Spectroscopy : Orsay field of excellence

laser spectroscopy

- ISOLDE/CERN : CRIS, COLLAPS
- ALTO : LINO
- SPIRAL2/S3-LEB



mass spectroscopy

- ISOLDE/CERN : ISOLTRAP
- TRIUMF/ISAC (Canada) : TITAN
- ALTO : MLL-Trap
- SPIRAL2/S3-LEB & DESIR



particle and missing/invariant-mass spectroscopy

- GANIL : MUGAST, LISE, INDRA/FAZIA
- RIKEN (Japan)
- LNS (Italy): CHIMERA



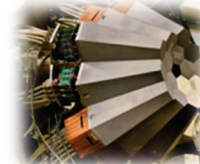
delayed/recoil spectroscopy

- ALTO : BEDO, TETRA, POLAREX
- GANIL : LISE
- JINR Dubna: GABRIELA
- SPIRAL2/S3: SIRIUS



prompt γ -spectroscopy

- ALTO : MINORCA, Nu-Ball
- GANIL : AGATA
- OUPS: lifetime measurements
- JYFL (Finland) : JUROGAM2, RITU
- ANL (USA) : GAMMASPHERE
- ILL : EXILL, FIPPS

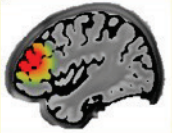




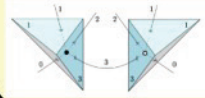
Theory

THEORY
is everywhere!

7.



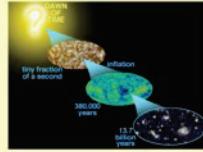
1.



1. **Mathematical physics**
2. **Cosmology & gravitation**
3. **Higgs sector & physics beyond the Standard Model (BSM)**
4. **Quantum chromodynamics (QCD) and flavour physics**
5. **Nuclear physics**
6. **Statistical physics**
7. **Interface physics - life sciences**

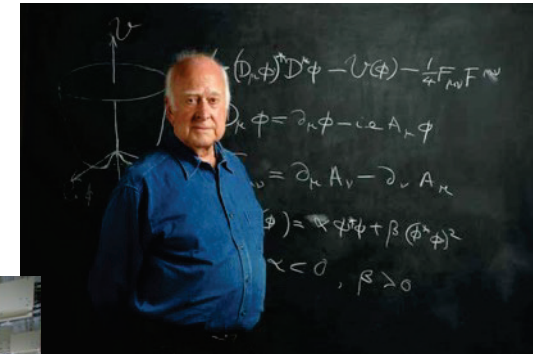
Quantum gravity

2.



Dark matter

Pen, paper,
blackboard?
Yes but...



... more and more
computers (analytic
computation, simulations,
data analysis...)

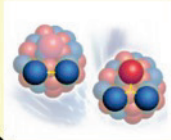


Cellular transport

6.



5.



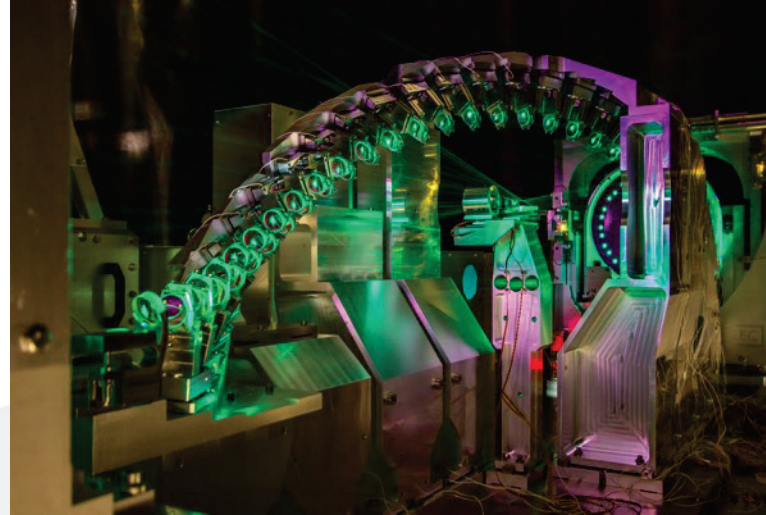
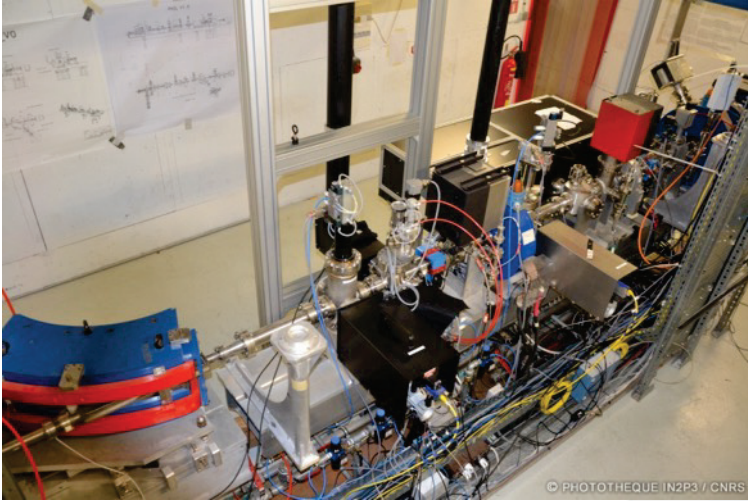
QCD

4.



3.





Weighing in on a **European/global scale**
by making a major contribution to the design and construction of **large machines**
(LHC, GANIL, ESS, Myrrha, PipII...)

Research Themes

- New materials for accelerators
- Supraconducting RF

- Laser-plasma acceleration
- Beam Instrumentation



Health Physics

Develop an integrated project mainly in oncology (from biological foundations to therapy)
at the heart of a laboratory with strong scientific and technical potential

Multimodal imaging
(preclinical and clinical)

Modeling
(statistical physics, animal models)

Radiotherapy
(radiobiology, radiotherapy, vector th.)

Biology
(from fundamental to experimental)

Collaborations

Upstream

R&D IN2P3, IJCLab poles
*(engineering, nuclear, theory,
accelerator), IRSN, Soleil, industry*

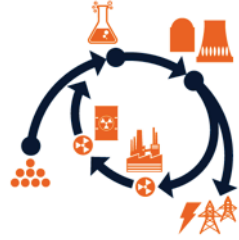


Downstream

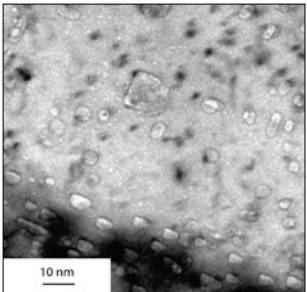
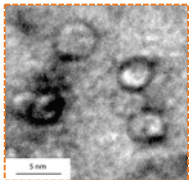
APHP, CPO, Inst. Curie,
NeuroPSI



Major societal issues in relation to nuclear energy & environment with an emphasis put on an academic approach : understanding the physics and chemistry



- Analytical chemistry in complex environment for nuclear energy; Materials and irradiation; Radionuclides in the environment
- Chemistry of actinides; Nuclear Data; Nuclear Systems and scenarios



Scientific activities

- Actinide chemistry in aqueous and non-aqueous solvents
- Innovative nuclear systems and associated scenarios
- Nuclear data; actinide targets
- Fuels, molten salts, transmutation and immobilization matrices
- Materials and irradiation

Facilities within the Lab

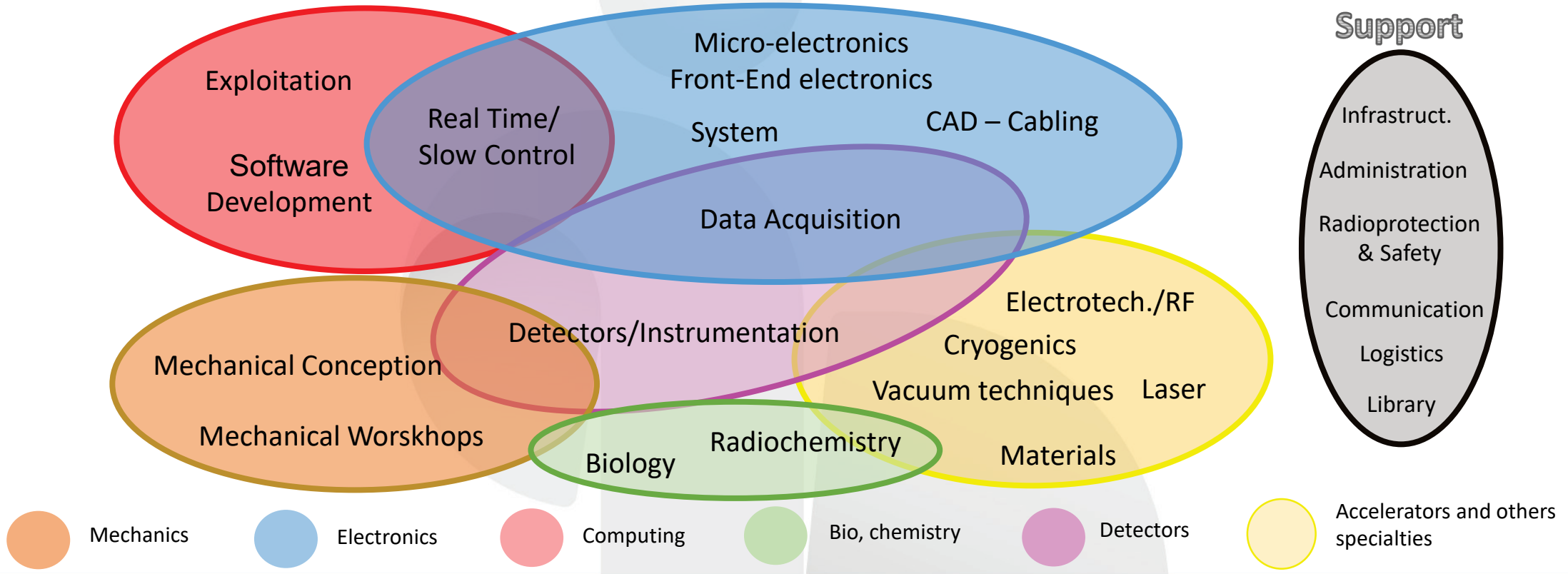
- Analysis and characterization in radiochemistry (buildings 100 and 107)
- Ion implantation, irradiation, and analysis at JANNUS/SCALP platform
- *In situ* dual ion beam transmission electron microscope at JANNUS/SCALP

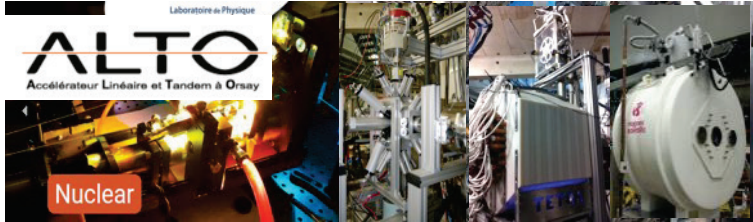


Technical activities

Technical staff with technical skills/expertise essential to design, draw and build instruments

- Engineering pole with 4 Technical Departments
- Accelerator Physics pole with RF and cryogenics services
- Competences in other scientific poles and platforms as well as in support services





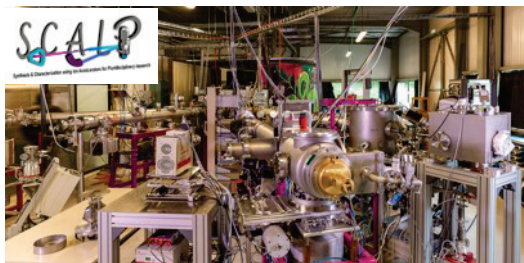
- **15 MV Tandem** (from proton to aggregates)
- **electron linac** -> radioactive beams by photofission

Nuclear, Health physics, Irradiation



Several MeV protons, multicharged atomic ions, gold molecules and nanoparticles

Nuclear/A2C, Health physics, Irradiation



Ion irradiation / implantation and *in situ* characterization techniques (TEM, IBA)

Energy, nuclear materials, Health physics, Irradiation physics and chemistry

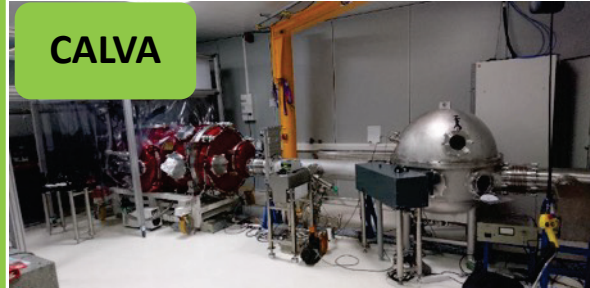
Semiconductor Platform :

Silicon Detector
Characterisation/Production



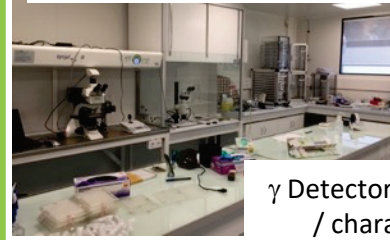
A2C Research themes

CALVA



Cavity locking/Squeezing for VIRGO and ET

Micrometeorite Preparation/analysis



Myrtho

γ Detectors development / characterization

Radiochemistry laboratory Actinides - Bat 107



Platforms for IJCLab projects

Accelerators research themes/technologies

Opening to Materials, atomic physics, detectors



SUPRATECH

R&D on the superconducting cavities (prepare, package, assemble & test of the superconducting RF cavities).



LaseriX

coherent, intense, brief (50fs to 10 ps) sources in near-infrared (800nm) and EUV (30 to 90 eV)



Vide et Surfaces
under construction

VIRTUAL DATA

Advanced computing
resources infrastructure
Grid / Cloud



Health research themes



non linear optical biphotonique imaging

5 Research
Platforms



6 Technical
Platforms





International collaborations

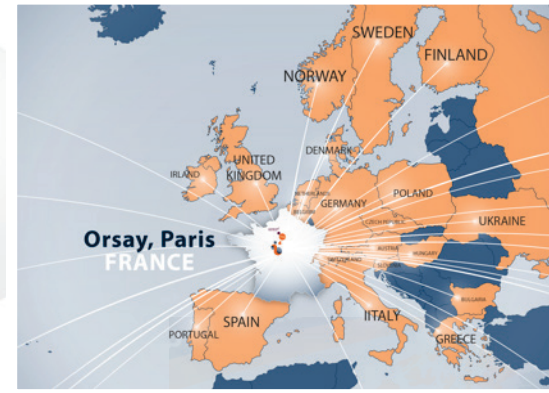
Some major laboratories with facilities or facilities in the world linked to IJCLab

World

Auger-Argentina
LBNL/SLAC-US
Fermilab-US
JLab-US
KEK-Japan
LSST-Chile
Riken-Japan

Europe

SCK-CEN-Belgium
CERN
CTA-Spain
DESY-Germany
Dubna-Russia
EGO/VIRGO-Italy
ESS-Sweden
GANIL-France
GSI-Germany
Jyväskylä -Finland
LNCA-France
LNGS-Italy
LNL-Italy
LSM-France



+ many interactions with French laboratories and industry partnerships



Teaching

Academic, Technical, Platforms

*~60 Researchers-Teachers + ~30 Researches-CNRS are involved in University teaching.
~60 Technical staff teach different skills and specialities (university / Schools..)
Research Installations/ Platforms -> Educational platforms with dedicated lines*

Internships for students

Internships: the gateway for students to discover research

*Internships at different level (from L1 to M2 and international.) :
~110 internships in 2021 corresponding to approximately ~600 months*

Thesis

PhD Training by research and for research

*~110 PhD students in the ensemble of the laboratories (from 30 different nationalities)
Number of technical theses rapidly increasing*

International Schools

Participation and creation of international/national schools

*Participation/creation of international/national schools
School : WISHEPP (Palestine), TESHEP (Ukraine...), QCD, School at L3 level...
IJCLab leads Erasmus+ MIC Colombia / Georgia / Ukraine / Palestine and Erasmus Mundus Lascala*



Our ambition is to elucidate the mysteries of **matter, energy, space, time**, and to understand the constituents of matter, their **interactions** and the origin and the evolution of the **universe**.

We aim at **driving discoveries** on these questions by

- **Contributing to and lead projects at all stages in high-energy physics, nuclear physics, astroparticles and cosmology** (proposal, design, construction, operation, data analysis) with significant **theory** support
- **Playing a major role in the conception, design and construction of current and future accelerators.**
- **Developing and operating research infrastructures and technological platforms** supporting these research areas as well as **original research in health physics and energy**
- **Promoting the development of new technologies** for science for the benefit of society and thus supporting national and European industrial competitiveness
- **Welcoming students trained at IJCLab through and for research** at the heart of a world-class academic environment.



More information

www.ijclab.in2p3.fr

For internships/job opportunities

- Check the website
- Contact directly the poles and research teams

The screenshot shows the IJCLab website homepage. At the top, there is a navigation bar with logos for CNRS, Université Paris-Saclay, and Université de Paris. Below this is a large banner image featuring a 3D cutaway of an accelerator and laboratory equipment, with the word "Accélérateurs" overlaid. A search bar and a "Rechercher" button are visible. A horizontal menu contains various categories: IJCLab, Pôles Scientifiques, Pôle Ingénierie, Plateformes, Enseignement & formations, Grand Public, and Travailler à IJCLab. The "Travailler à IJCLab" dropdown menu is open, showing options for "Stages, Thèses, Post-docs", "Autres offres d'emploi", and "Partenariats avec les entreprises". Below the menu, there are buttons for "Accueil", "Séminaires", and "Publications récentes". The "ACTUALITÉS" section features three featured items: "INGÉNIERIE" with a photo of a person working in a lab, "ASTROPARTICULES, ASTROPHYSIQUE ET COSMOLOGIE" with a photo of a particle detector, and "Rendez-vous ATLAS PAF 2021" with a date of 10-12 mai 2021 at the Domaine de Chalès. A footer note at the bottom of the screenshot says "Open 'https://www.ijclab.in2p3.fr/emploi/stages-theses-post-docs/' in a new tab".