Institut national de physique nucléaire et de physique des particules

Heavy Ion Laboratory, University of Warsaw, November 20 2023

Marcella Grasso

Scientific Director in charge of Nuclear Physics and Applications, IN2P3

IN2P3: a national institute

MISSION: COORDINATING RESEARCH IN THE FIELDS OF NUCLEAR, PARTICLE and ASTROPARTICLE PHYSICS

EXPLORES

the physics of the *two infinities:* from elementary particles to cosmology

COORDINATES

research programs, projects and international collaborations

RUNS and OVERSEES

research laboratories in connection with universities and other finding agencies

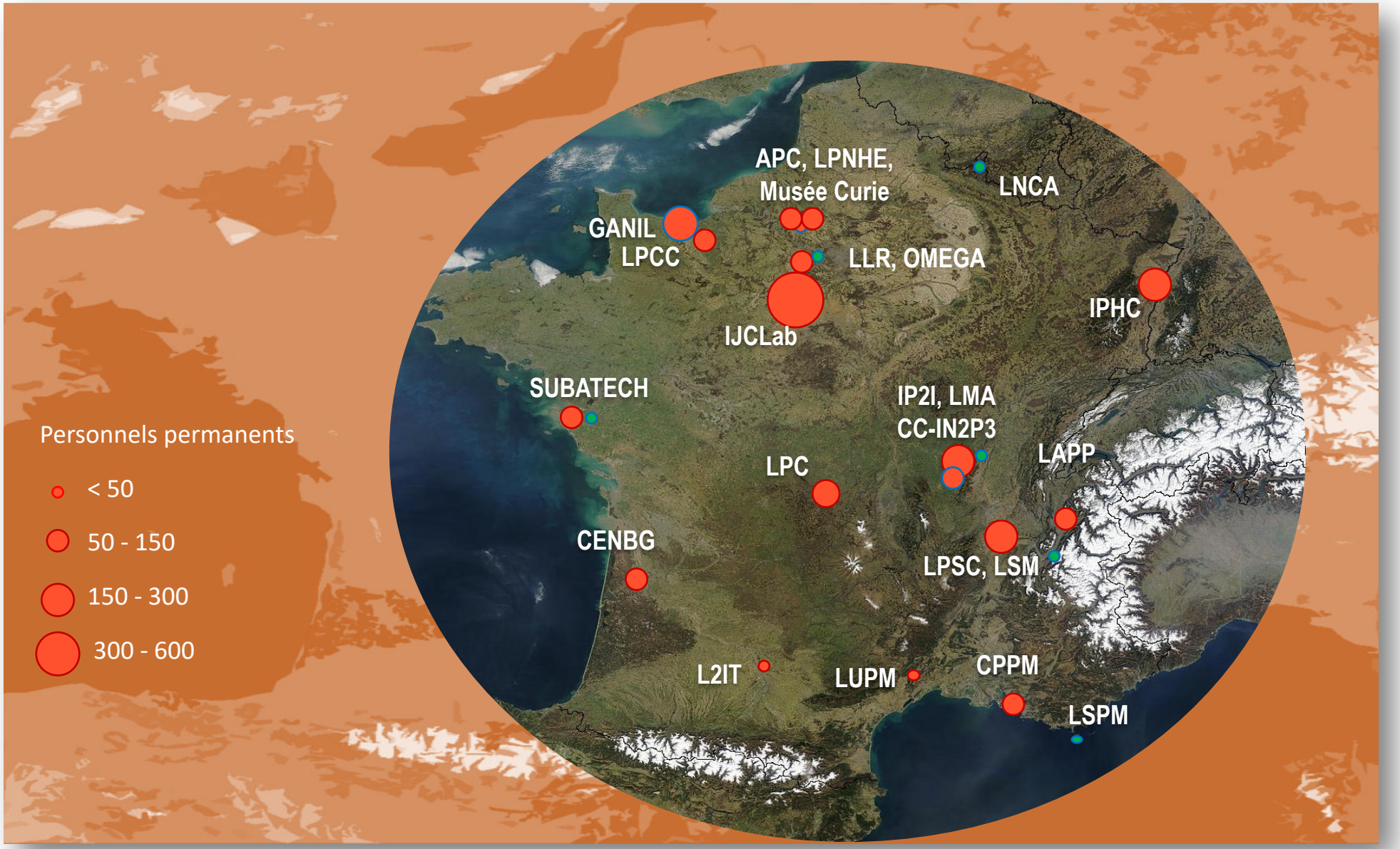
DEVELOPS

technologies, applications of societal interest

PROVIDES expertise, teaching, training

LINKS WITH SOCIETY

IN2P3 today

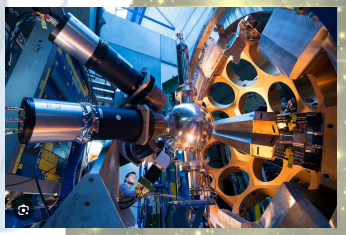

APC, LPNHE,
Musée Curie
LNCA
GANIL
LPCC
LLR, OMEGA
IJCLab
IPHC
SUBATECH
IP2I, LMA
CC-IN2P3
LPC
LAPP
CENBG
LPSC, LSM
L2IT
LUPM
CPPM
LSPM
Personnels permanents
< 50
50 - 150
150 - 300
300 - 600

Research Areas

Particles & hadronic physics
Matter's most elementary constituents

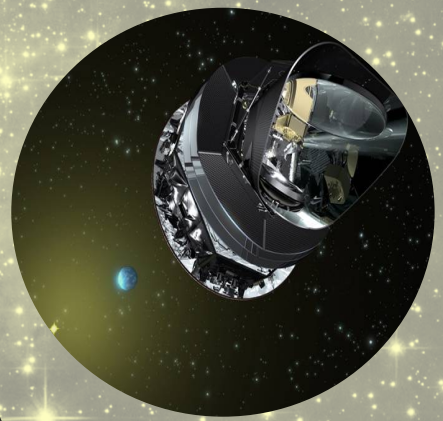
Nuclear physics
Nuclei and nuclear matter, nuclear energy and medical applications

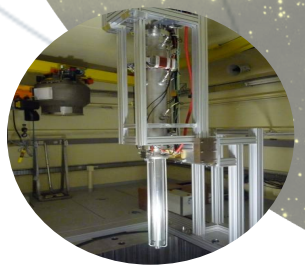
Astroparticle physics and Cosmology
Universe composition and evolution

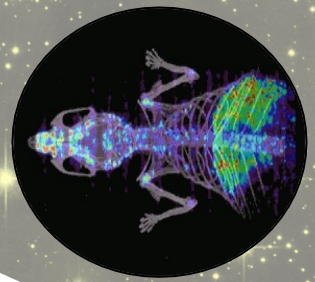


Computing & Data
Data Science and Computing

Accelerators & Technology
R&D







25 laboratories and national platforms
1000 scientists,
1500 engineers, technicians and administrative staff
300 post-doc
400 PhD students

Hadron physics

ALICE

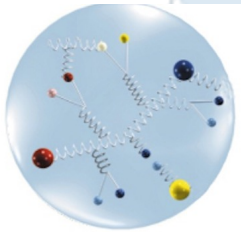
Particle physics

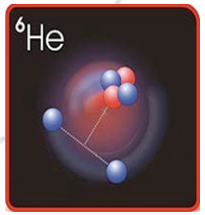
HADES

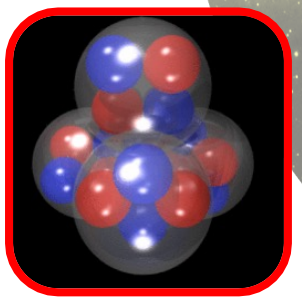
Jefferson Lab, EIC

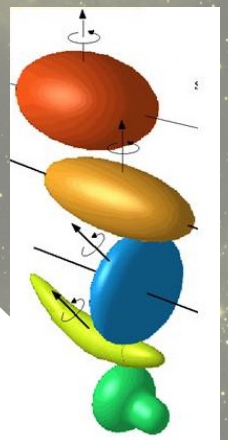
Nuclear physics

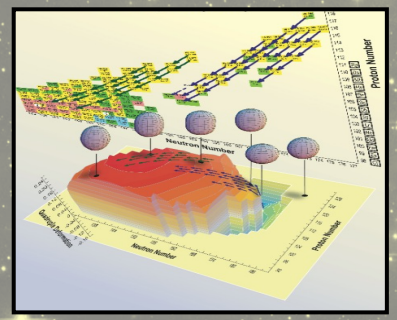
Nucleon structure, nuclei, nuclear matter, nuclear astrophysics, nuclear energy, nuclear developments for environment and health

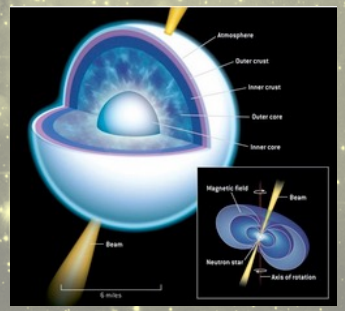






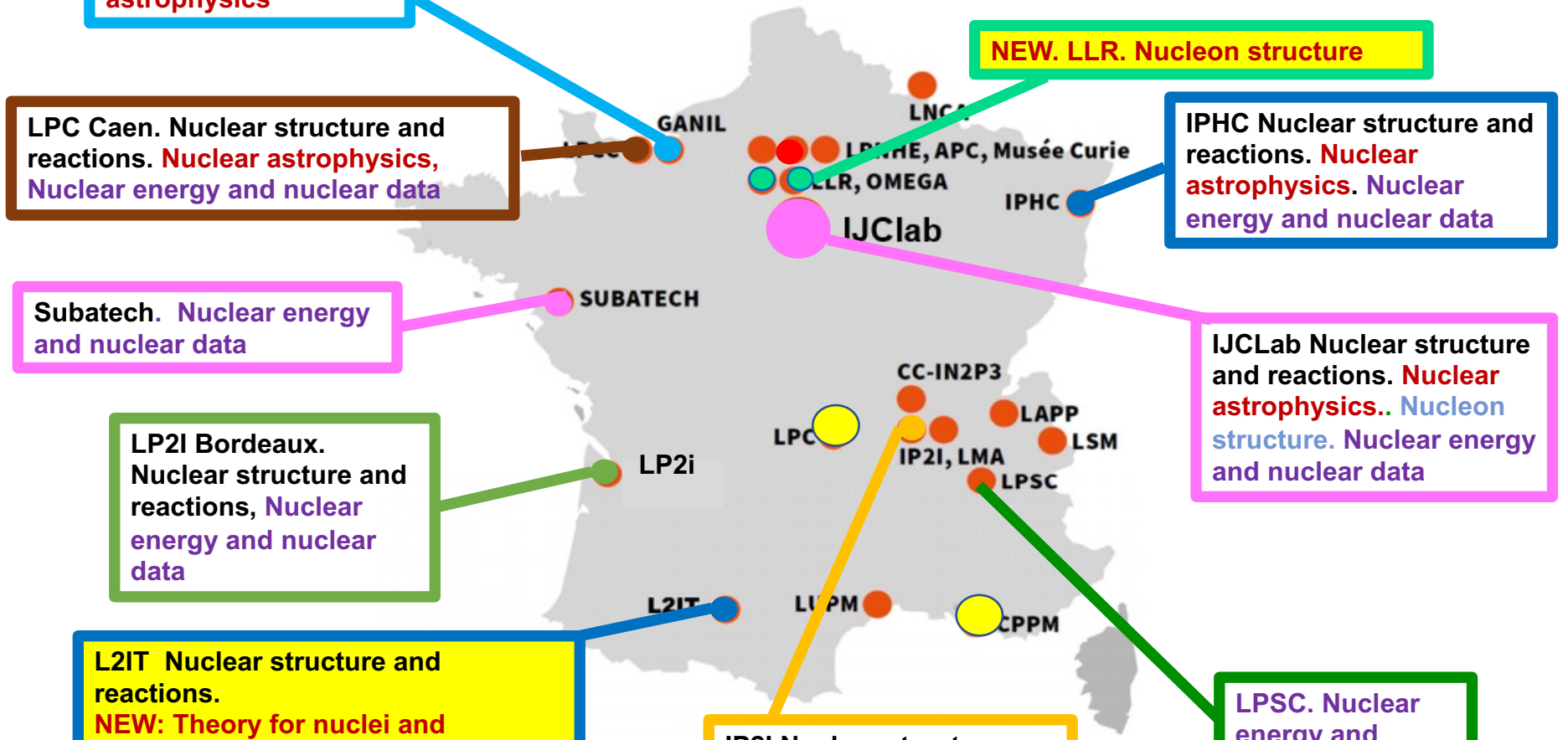






France: teams involved in experimental and theoretical nuclear physics in 11 IN2P3 laboratories (+ studies of interest for environment and medical applications)

Links and close collaboration with CEA and laboratories from other CNRS institutes



GANIL. Nuclear structure and reactions. Nuclear astrophysics

LPC Caen. Nuclear structure and reactions. Nuclear astrophysics, Nuclear energy and nuclear data

Subatech. Nuclear energy and nuclear data

LP2I Bordeaux. Nuclear structure and reactions, Nuclear energy and nuclear data

L2IT Nuclear structure and reactions.
NEW: Theory for nuclei and nucleosynthesis.
Recent tenure track position

NEW. LLR. Nucleon structure

IPHC Nuclear structure and reactions. Nuclear astrophysics. Nuclear energy and nuclear data

IJCLab Nuclear structure and reactions. Nuclear astrophysics.. Nucleon structure. Nuclear energy and nuclear data

IP2I Nuclear structure and reactions. Nuclear astrophysics

LPSC. Nuclear energy and nuclear data

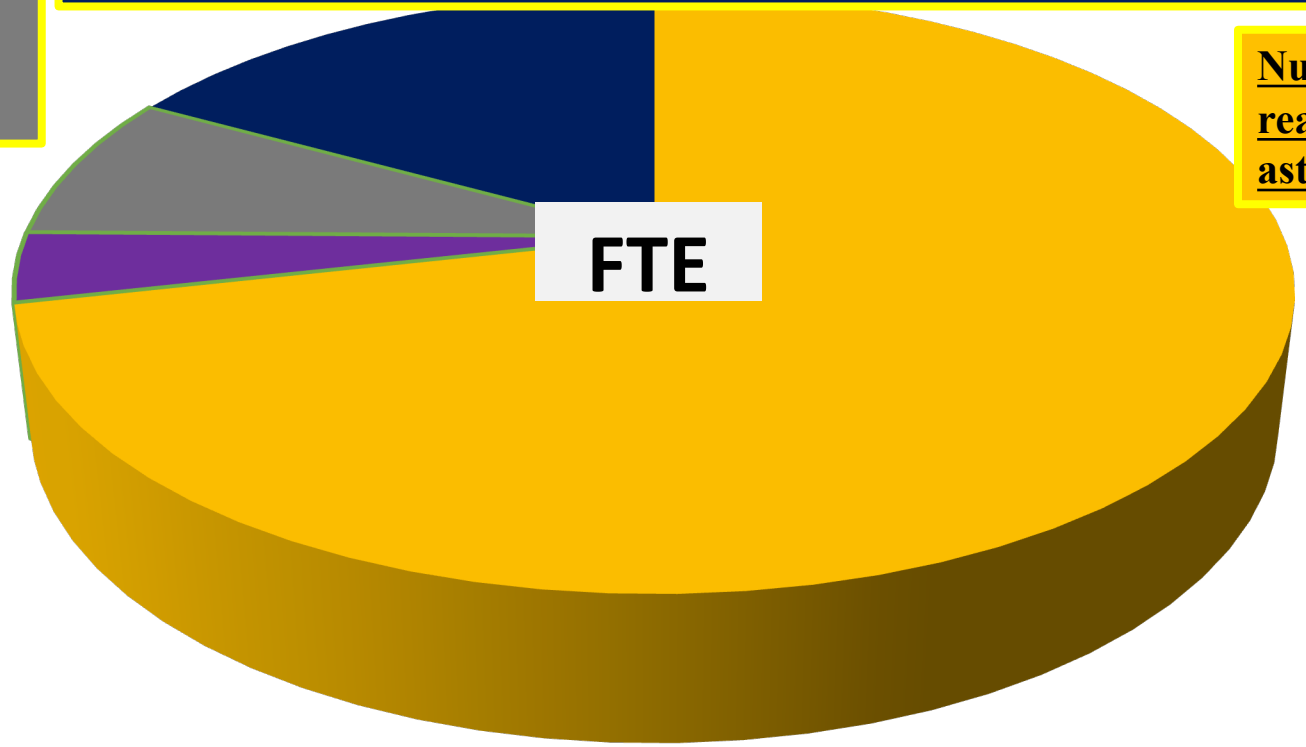
About 300 physicists and 300 engineers and technicians, in 13 IN2P3 laboratories (nuclear physics, nuclear astrophysics, nucleon structure, activities on nuclear energy, environment and techniques for medical applications)

Health and environment:
- Nuclear techniques for medical applications (radioisotopes for medical applications, dosimetry, hadrontherapy)
-Radioisotopes in the environment (nuclear waste treatment and natural radioactivity)

Nuclear energy (nuclear data, MSR, sub-critical reactors, scenarios for nuclear energy, studies of materials under extreme conditions)

Nuclear structure, reactions and nuclear astrophysics

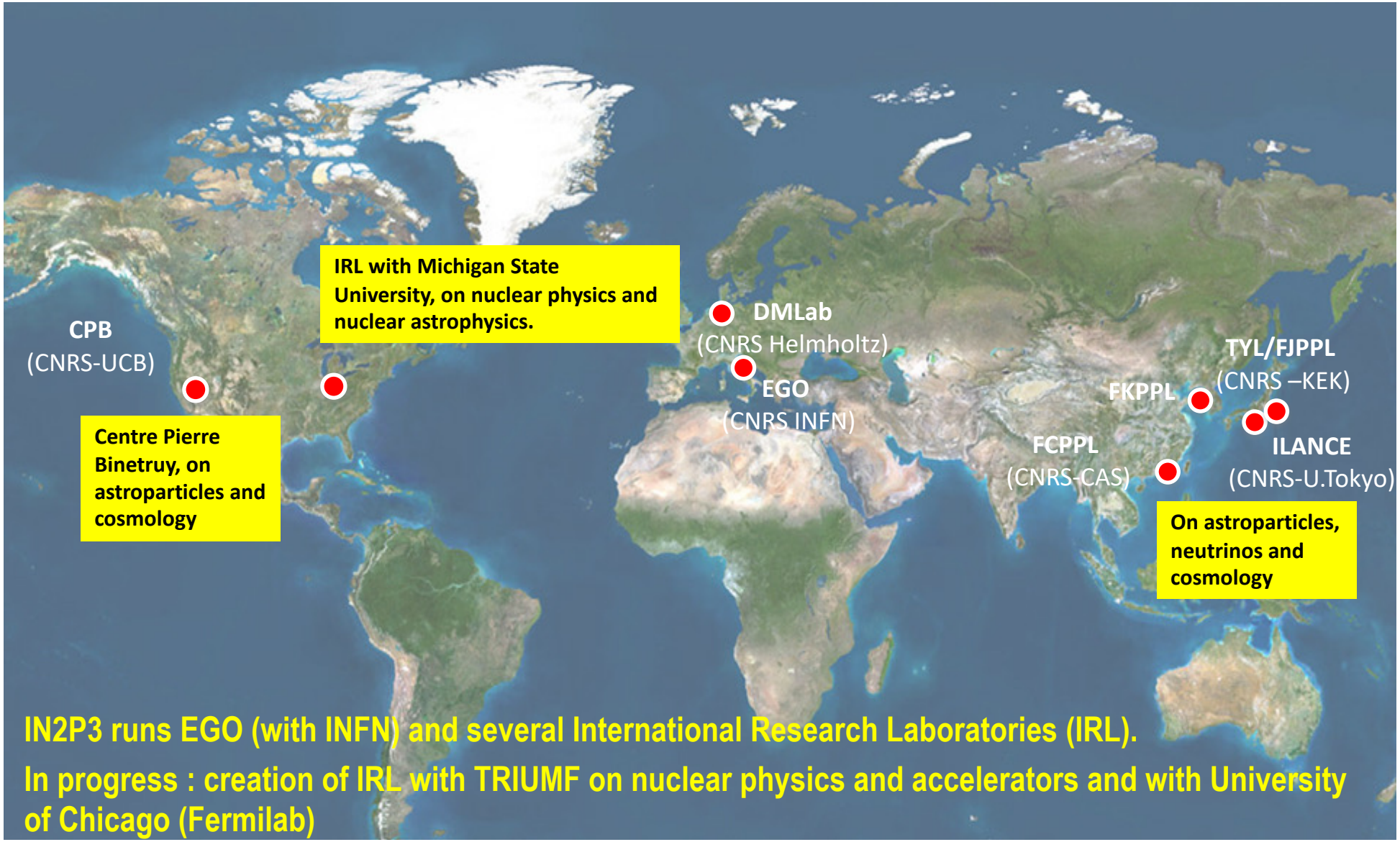
Structure of the nucleon



Several networks and international collaborations: for example, EUROLABS (transnational access), ARIEL (transnational access to neutron facilities), ISOLDE collaboration, FAIR members, several bilateral agreements …

Examples of ongoing bilateral agreements

- 1974 : bilateral agreement with COPIN (Poland) and then JINR (Russie) (presently suspended), and GSI (Germany)
- Funding of visitors, with approval of a mixed committee
- Originally around nuclear physics and now open to other fields


IRL with Michigan State University, on nuclear physics and nuclear astrophysics.
CPB
(CNRS-UCB)
Centre Pierre Binetruy, on astroparticles and cosmology
DMLab
(CNRS Helmholtz)
EGO
(CNRS INFN)
FKPPL
TYL/FJPPL
(CNRS –KEK)
ILANCE
(CNRS-U.Tokyo)
FCPPL
(CNRS-CAS)
On astroparticles, neutrinos and cosmology
IN2P3 runs EGO (with INFN) and several International Research Laboratories (IRL).
In progress : creation of IRL with TRIUMF on nuclear physics and accelerators and with University of Chicago (Fermilab)

International Research Laboratory NPA with Michigan State University

SAVE THE DATE

for the inauguration of the
CNRS – Michigan State University
Nuclear Physics and Astrophysics
International Research Laboratory
at the Facility for Rare Isotope Beams,
a U.S. Department of Energy Office of Science user facility,
supporting the mission of the Office of Nuclear Physics

The morning of
Tuesday, 18 July 2023
at the Facility for Rare Isotope Beams
at Michigan State University
East Lansing, Michigan, USA

NPA (Nuclear Physics and Nuclear Astrophysics), September 2023

Inauguration Ceremony on July 18, 2023

Recent 'Prospective' exercise at IN2P3

December 2022: document with the French roadmap for Nuclear, Particle and Astroparticle physics, and associated technical developments and applications

Science and projects at GANIL in the next decade and beyond

GANIL
March 2023 - 40 years from the first beam

Before 2030

Neutrons for Science (NFS) started to work in 2021 (first exp).
Neutrons produced from protons and deuterons accelerated from the LINAC: mainly fission, but also low-energy excitations, …

Commissioning of the Super Separator Spectrometer (S3) planned in 2025:
nuclei with very low cross sections, such as superheavy elements or neutron deficient nuclei close to the limit of stability

DESIR in 2027
unique opportunities in terms of selection of exotic nuclei and/or beam purity.
masses, laser spectroscopy, beta-decay spectroscopy, … building construction starts in 2023.
First stone ceremony on November 10, 2023

NEWGAIN, Injector 2: A/Q =3-7 Increasing beam intensities of heavy (A > 40) and very heavy (Xe, Pb, U) nuclei

June 9 2023. Minister of Higher Education and Research at GANIL

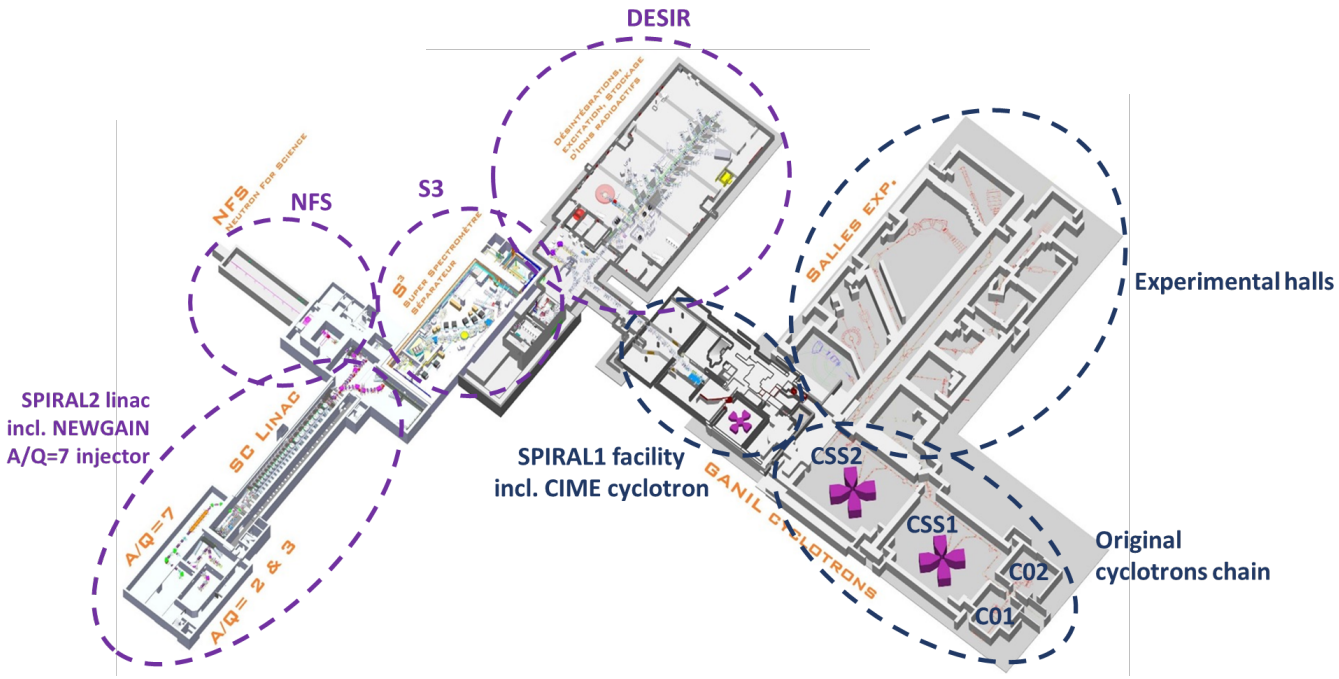
Recently commissioned LINAC

Refurbishment of the cyclotrons – by the end of the decade

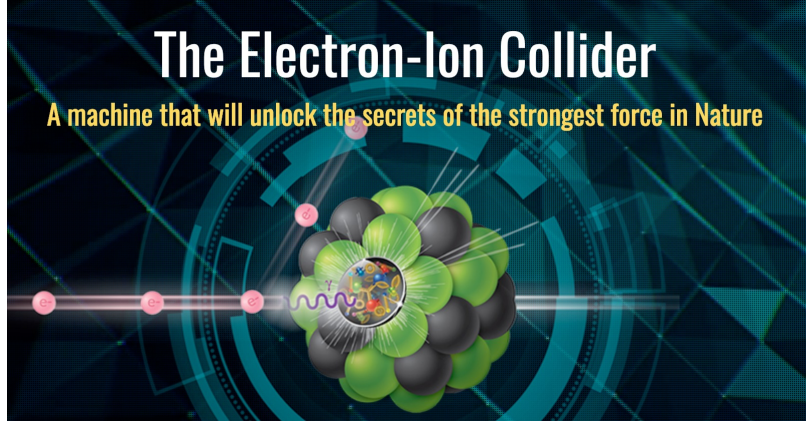
Beyond 2030

International expert committee, chaired by Michel Spiro: vision for the future of GANIL (report provided to CNRS and CEA in December 2021)

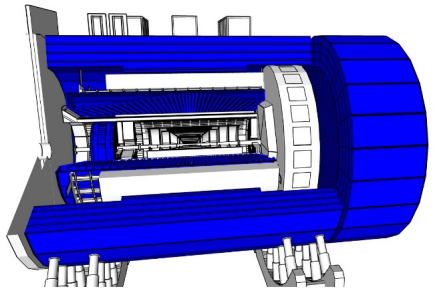
Strategy to be defined based on different recommendations and options suggested by the expert committee: new building for production of neutron-rich exotic nuclei, production of radioisotopes, new reacceleration system -> from Coulomb barrier up to 100 MeV/nucleon, ….



On this basis, GANIL direction asked Hanna Franberg and Stéphane Grevy to prepare a document where a few possible scenarios are identified, with:
-the description of the physics cases associated with each step
-a budget estimation



Construction 2023-2033. Detector ready in 2030



IN2P3 is involved in the project

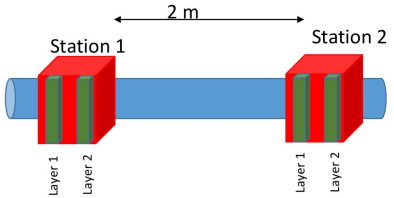
- **Advisory Committee and RRB**
- **First meeting RRB, April 3 and 4 2023, Stony Brook, with visit of BNL**
- **Also interest in the accelerator part: being defined with engineers at IJCLab (followed by Arnaud Lucotte)**
- **Our commitment is being defined by the end of the year**

backward endcap high-resolution electromagnetic calorimeter

-- IN2P3 participating in the calorimetry generic R&D program on scintillating materials since 2015

-- IN2P3 R&T project for the development of calorimeter readout

-> EIC-CALO R&D



roman pots, detectors placed at about 30 m from interaction point (recoil protons and ions)

-- IN2P3 leading the readout ASIC developement

-> EICROC R&D

Hadron physics

ALICE

Particle physics

HADES,
Jefferson Lab, EIC

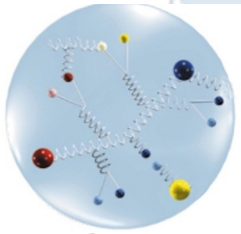
Astroparticle physics and Cosmology

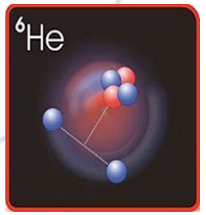
Universe composition and evolution

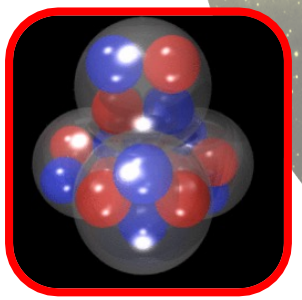
Nuclear physics

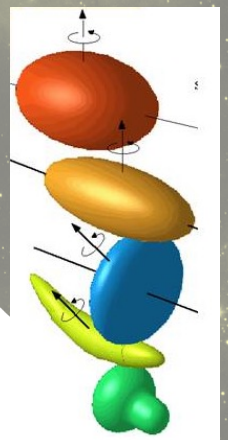
Nucleon structure, nuclei, nuclear matter, nuclear astrophysics, nuclear energy, nuclear developments for environment and health

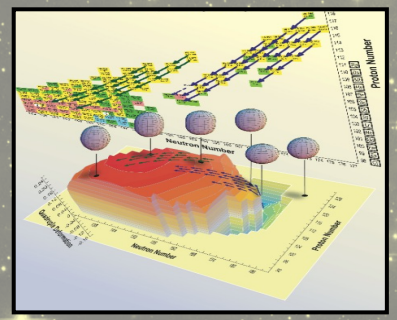
NEW : double beta decay in the nuclear physics domain - about 20 physicists

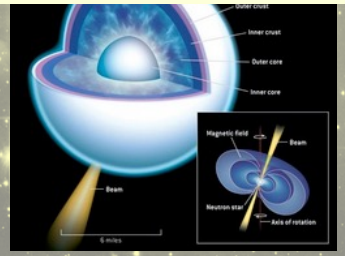












In 2023, 18 ongoing projects, 360 days attributed for Polish scientists in France

For 2024 : 19 projects,

8 hadronic and particle physics

1 astroparticles and cosmology

10 nuclear physics

Thank you!

- Heavy Ion Laboratory direction for your hospitality

- The organizing committee : Adam Maj and Christelle Schmitt

Michał Ciemala, Michalina Komorowska, Jolanta Matuszczak, Mateusz Pęgier HIL UW

Institut national de physique nucléaire et de physique des particules

Thank you for your attention