

Institut Pluridisciplinaire Hubert Curien



IPHC
Institut Pluridisciplinaire
Hubert CURIEN
STRASBOURG



UNIVERSITÉ DE STRASBOURG

Multi-disciplinarity at IPHC (1)

□ IPHC is supervised by **CNRS** (French National Center for Scientific Research) and **University of Strasbourg**.



□ IPHC is the progeny of one of the earliest Nuclear Laboratory in France:

- **End of WWII**: Institute of Nuclear Research at University of Strasbourg.
- **1956**: creation of the laboratory of Subatomic Research, (CNRS + University of Strasbourg):
 - Several Cockroft & Van de Graaff.
 - 5 departments, of Nuclear Physics, Biology and Chemistry.
- **2006**: IPHC is one of the first French « common laboratory », based on 3 different laboratories: Biology, Chemistry, Physics.



Multi-disciplinarity at IPHC (2)

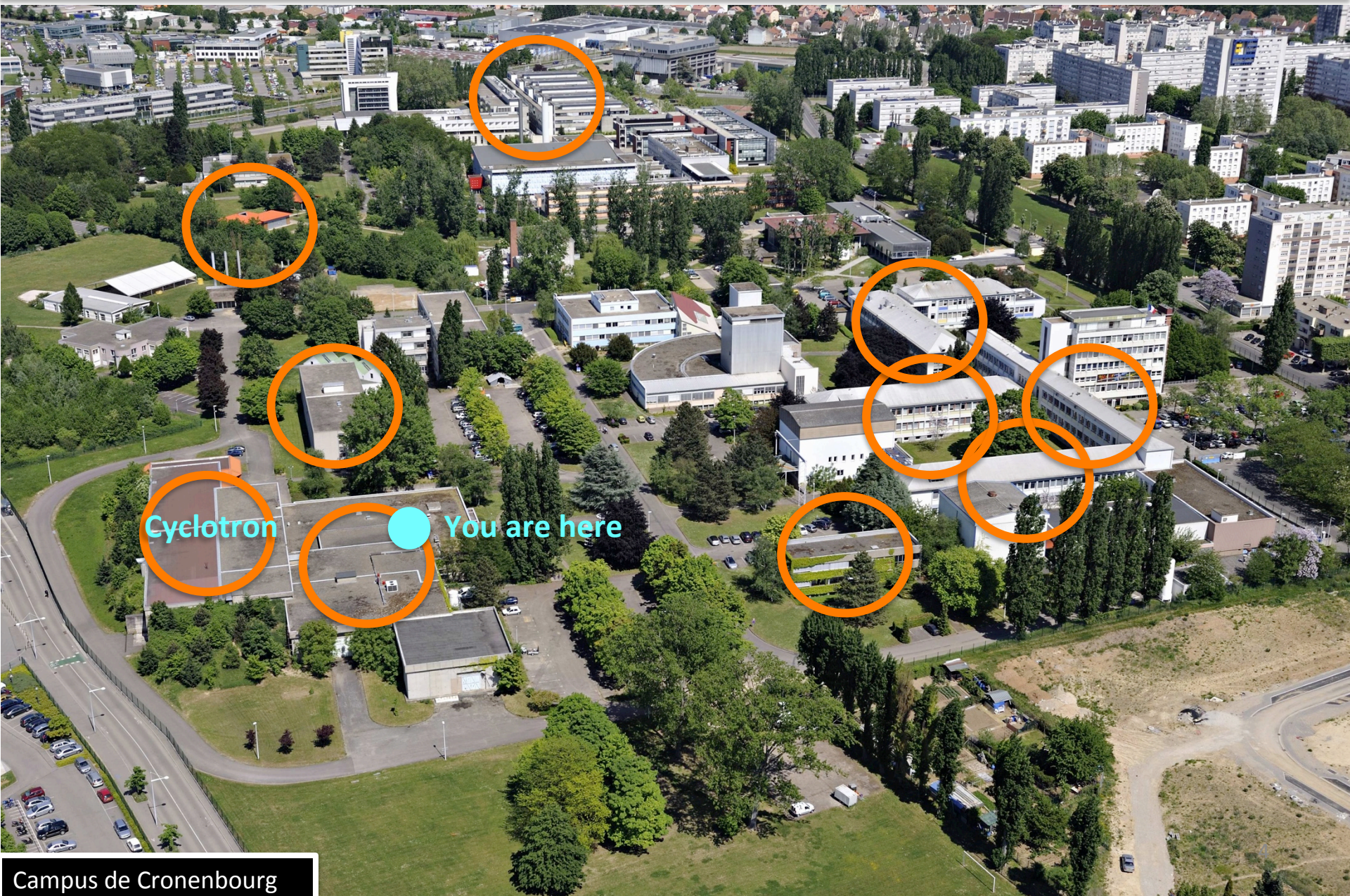


History:

- 2012: building of the **cyclotron** CYRCE.
- 2016: 4 departments, dedicated to defined scientific fields
 - Subatomic Research
 - Analytical Chemistry
 - Ecology, Physiology and Ethology
 - Radiobiology, Hadrontherapy and Molecular Imaging

→ transversal interdisciplinary projects born from this juxtaposition

IPHC in the campus of Cronenbourg

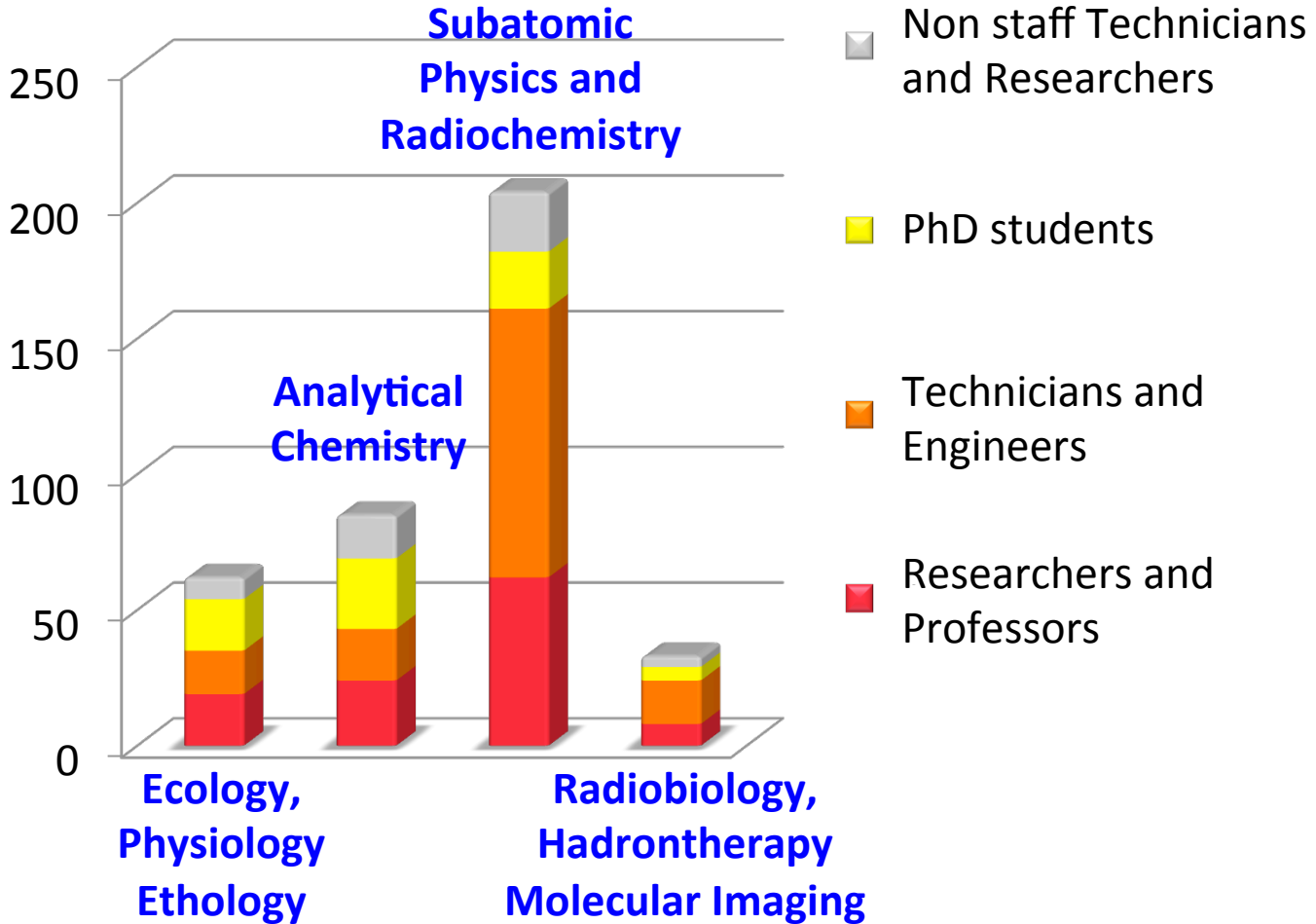


Cyclotron

You are here

Human resources

IPHC: 380 employees (260 staffs)



Institut Pluridisciplinaire Hubert Curien UMR 7178

Assistants de prévention :
E. Schaeffer (coord), Z. Asfari, I. Chery
 Communication : **N. Busser**
 Documentation : **B. Gaillard**
 Qualité : **S. Suzanne-Ochsenbein**
 Valorisation : **J. Schihin**

Directrice : C. Roy
Adjoint : S. Blanc
Assistante : F. Diemer

Instances du Laboratoire
 Conseil de Laboratoire
 Conseil Scientifique
 Cellule de Suivi Technique des Projets
 Commission Paritaire Locale
 Commission locale H&S et Conditions de Travail

MiPHC
 (Mission pour
 l'interdisciplinarité à l'IPHC)

Ecologie Physiologie Ethologie

Responsable : F. Criscuolo

Administration : **C. Gallone**

Eq. scientifiques *Eq. techniques*

Ecophysiologie et changements environnementaux
J-P. Robin

Métrologie et Instrument. en Biologie et Environnement
F. Crenner

Ecophysiologie évolutive
C. Schradin

Supports techniques

- Biologie Moléculaire

S. Zahn

- Spectro. isotopique

I. Chery, A. Zahariev

- Génétique

écologique

H. Gachot

- Animalerie

A. Hranitzky

Station Guyane

D. Chevallier

Recherches Subatomiques

Responsable : I. Ripp-Baudot

Administration : **N. Reinbold**

Eq. scientifiques *Eq. techniques*

Théorie **H. Molière**

Du big bang aux particules

ALICE **C. Kuhn**

CMS **D. Bloch**

Neutrinos **M. Dracos**

PICSEL **M. Winter**

Du noyau aux étoiles

L. Stuttgé

Noyaux exotiques

Noyaux superlourds

Clusters et

nucléosynthèse

Energie, environnement et dosimétrie

Données Nucléaires pour les

Réacteurs **P. Dessagne**

Radiochimie **R. Barillon**

DeSIs **Z. El Bitar**

Systèmes de Mesure et d'Acquisition
L. Charles

Micro-électronique
C. Hu-Guo

Micro-technique
M. Imhoff

Instrumentation des Accélérateurs
E. Bouquerel

RaMsEs*
A. Sellam

Sciences Analytiques

Responsable : L. Sabatier

Administration : **C. Gallone**

Eq. scientifiques *Plateformes*

Spectrométrie de Masse BioOrganique#
S. Cianférani

Chimie Analytique des Molécules BioActives
E. Marchioni

Reconnaissance et Procédés de Séparation Moléculaire
B. Ernst

Ingénierie Moléculaire Appliquée à l'Analyse
L. Charbonnière

Analyse inorganique
A. Boos

Protéomique IBISA#
C. Schaeffer

Infrastructure protéomique nationale ProFI#
C. Carapito

Radiobiologie Hadronthérapie

Imagerie Moléculaire

Responsable : M. Rousseau

Administration : **F. Hamel**

Eq. scientifiques *Plateformes*

Radiobiologie
XXX

CYRCé/PRECy
M. Pellicoli

Hadronthérapie
C. Finck

AMISSA
L. Thomas

Imagerie Moléculaire
F. Boisson

Animalerie
B. Jessel

--- } Création de l'équipe pour le prochain quinquennal 2018-2023

Pôle Administratif commun : J. Schihin

Ressources Humaines : **R. Sommer**

Logistique : **D. Kissenberger**

Pôle Technique commun : L. Gross

Service informatique : **J-M. Gallone**

Service Mécanique : **M. Krauth**

Service de Radioprotection : **D. Oster**

Plateforme commune

Grille/Cloud : **C. Carapito, J. Pansanel, Y. Patois**

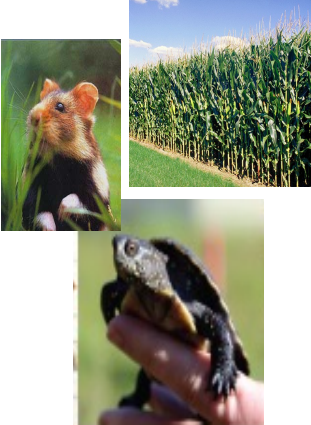
Ecology, Physiology and Ethology

FOUR TEAMS GATHERING **60 SCIENTISTS**
WORLDWIDE RECOGNIZED IN ECOPHYSIOLOGY...



Behavioral Ecophysiology
Coevolution of
sociality & fitness

**Environmental
Management**
Understanding animal
adaptation to promote
regional biodiversity



... STUDYING EVOLUTIONARY ORIGIN &
PLASTICITY OF ANIMAL ADAPTATIONS...



**Adaptation of Marine
Vertebrates**
Population dynamics
under
global changes

Adaptation to Gravity
Impact on health
from inactivity
of animals & humans

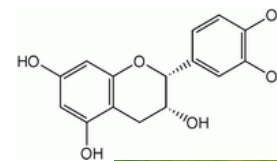


...TO BETTER UNDERSTAND **THE FUTURE OF ANIMAL
BIODIVERSITY** AND ITS STATUS IN MODERN SOCIETY .

Analytical Chemistry

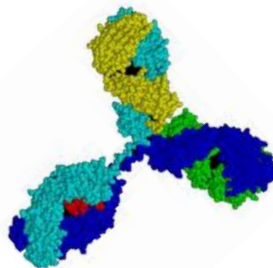
Study of molecule structure and properties

- Synthesis of new molecules
- Characterisation of new complex molecules
- Study of interactions between molecules



Macrobiomolecules (proteins)

Development of new methods to characterise biomolecules e.g., with proteomics



Food analysis through its chemical components

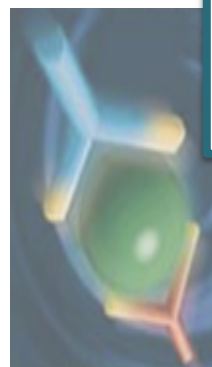
Search for components possibly inducing human pathologies.

Physical chemistry and separative sciences

Study of ion complexation. New separation supports.

Chemical synthesis, coordination chemistry

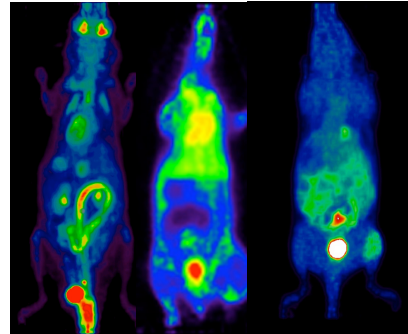
New complex molecules



Radiobiology, Hadrontherapy, Molecular Imaging

From cell to therapy:

- Molecular imaging
- Hadrontherapy
- Radiobiology



Pre-clinic technical set around plateforms :

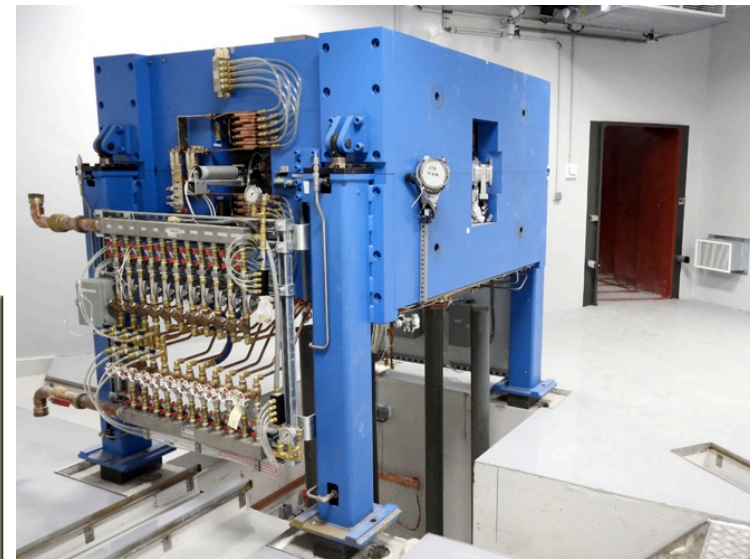
- CYRCé : production of radiotracers
- PRECy : radiobiology at Cyrcé
- AMISSA : multimodal imaging of small animals
- Animal house and biology labs



Physicists, chemists, biologists, clinicians grouped within a same departement

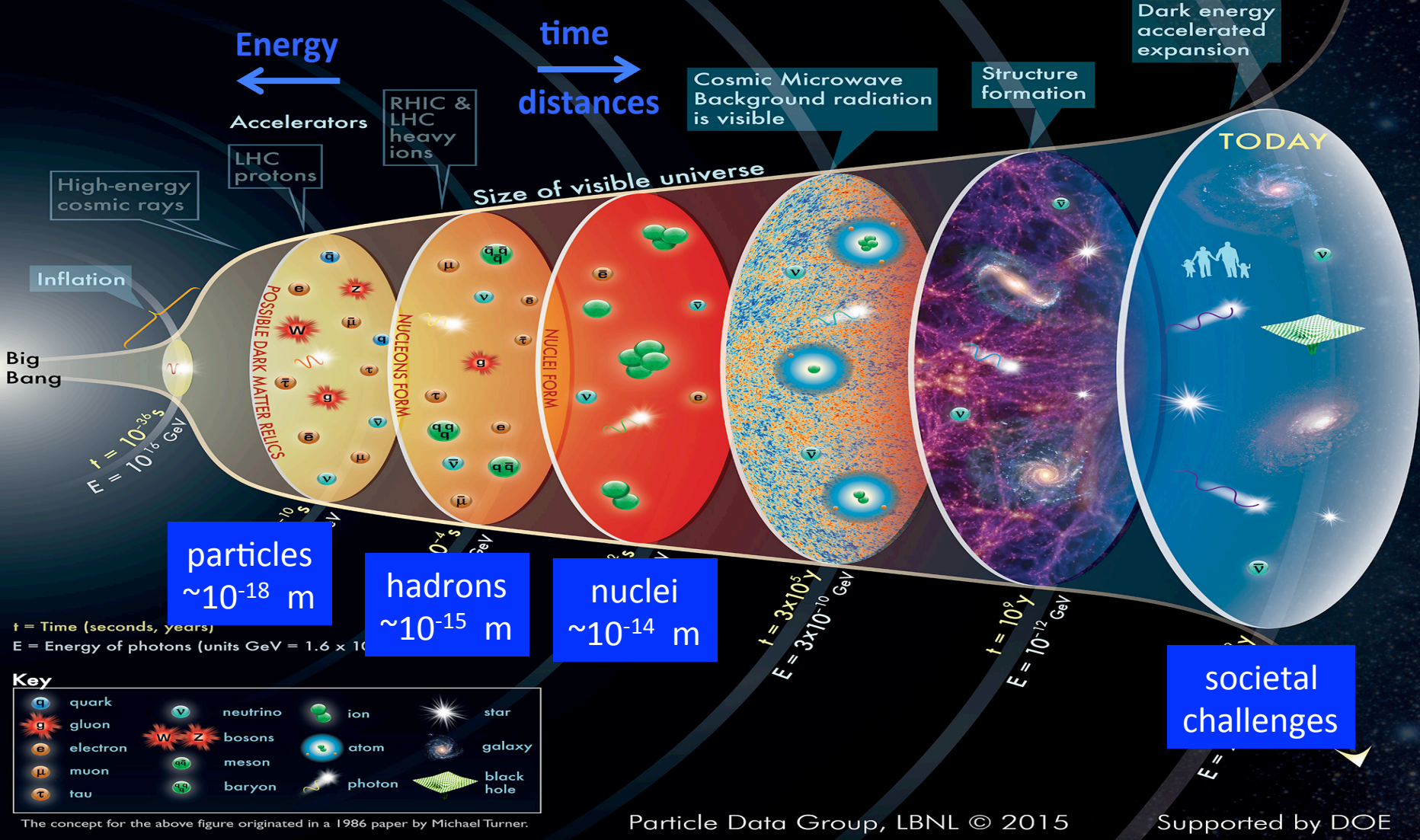
Cyclotron TR24 (ACSI)

- Proton energy: 16 ro 24 MeV
- Current: 300 μ A
- 2 extracted beams



Subatomic Research

HISTORY OF THE UNIVERSE



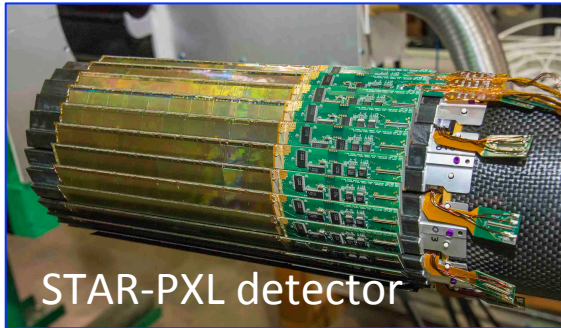
Particle and Heavy Ion Physics at IPHC



- ❑ **ALICE:** upgrade of the Si tracker, heavy flavour production.
- ❑ **CMS:** upgrade of the Si tracker, Higgs and top properties, susy searches.
- ❑ **Neutrinos:** Double Chooz, JUNO (Top Tracker), Antares and KM3NeT.
- ❑ **PICSEL:** ILC, Belle II, CMOS sensor and vertex detector R&D.
- ❑ **High energy theory:** scalar potential, supergravity.



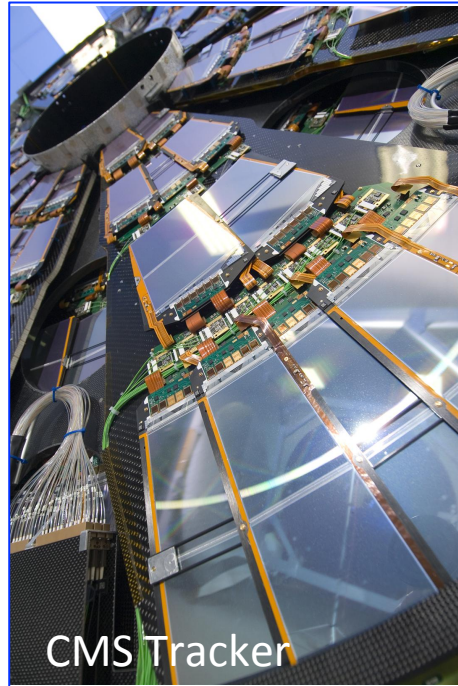
ALICE



STAR-PXL detector



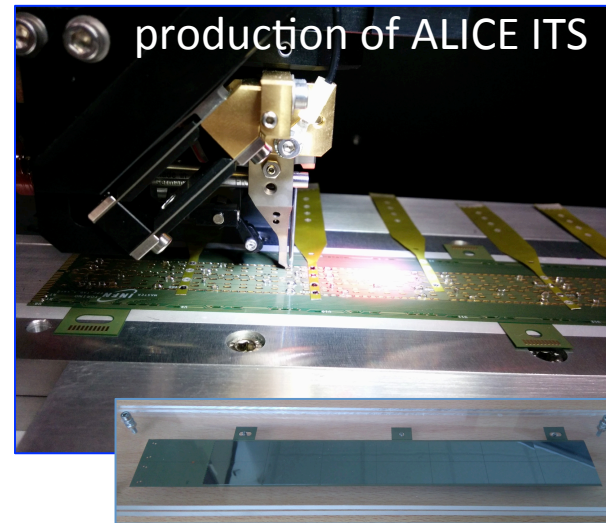
Top Tracker JUNO



CMS Tracker



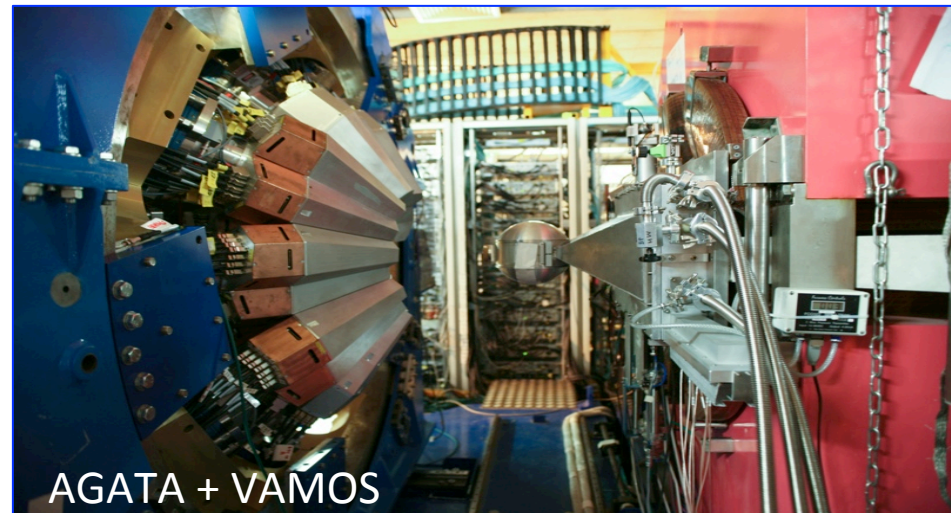
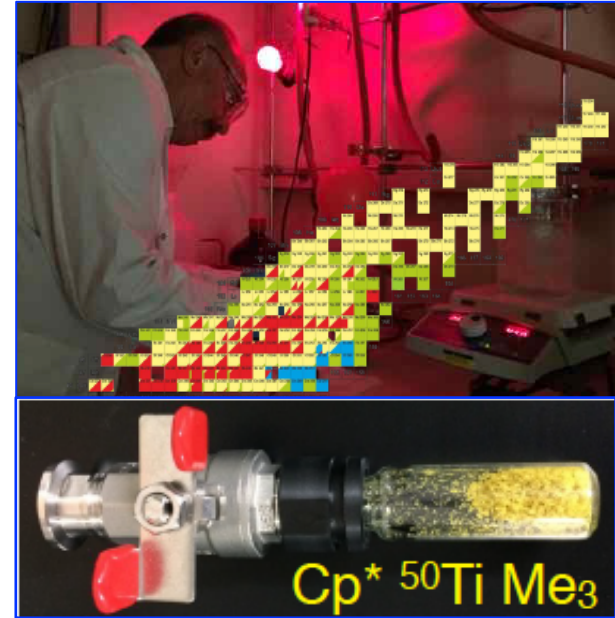
DOM ORCA



production of ALICE ITS

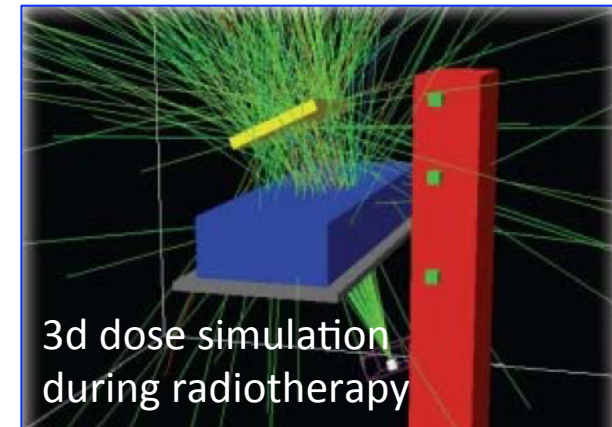
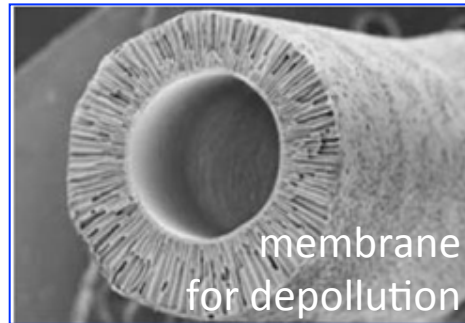
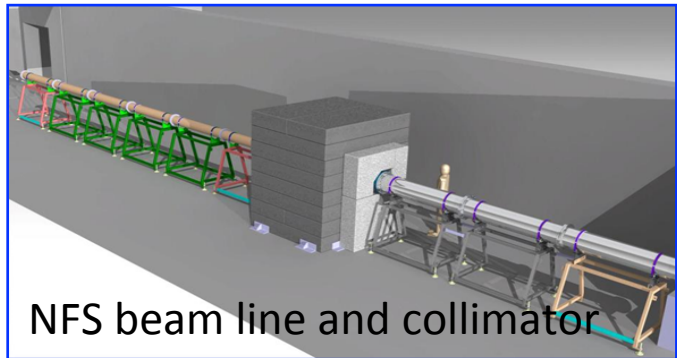
Nuclear Physics at IPHC

- ❑ **Exotic nuclei:** AGATA (SPIRAL2, SPES).
- ❑ **Superheavy nuclei:** MIVOC beams (SHE factory, GARIS II, ...).
- ❑ **Stellar nucleosynthesis:** STELLA (ALTO, Andromede, ...).
- ❑ **Low energy theory:** shell model and ab initio calculations, support to experiments (SuperNEMO, GBAR, SPIRAL2, FAIR, ...).



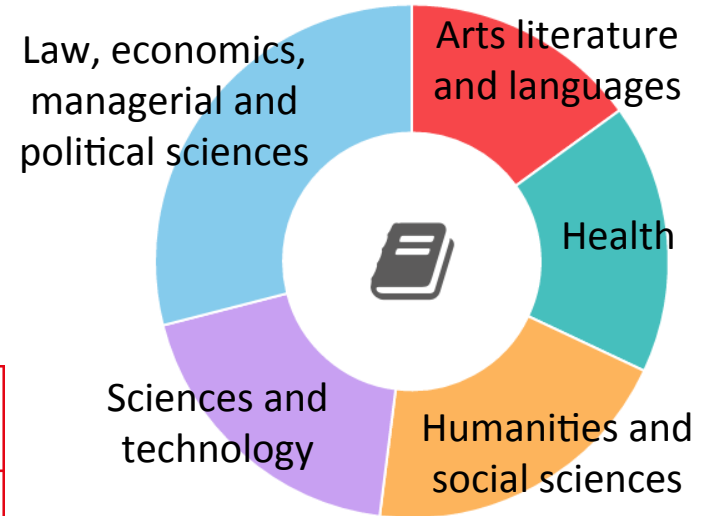
Applications to societal challenges at IPHC

- ❑ **Nuclear data for reactors:** U-Pu and Th-U nuclear fuel cycle optimization (data campaign at JRC-Geel, IFIN-HH-Bucarest, NFS-SPIRAL2).
- ❑ **DESI:** dosimetry and micro-dosimetry, radiation metrology and simulation.
- ❑ **Radiochemistry:** chemical speciation and radiation induced chemical modifications (ground and river pollution, impact on organic matter).



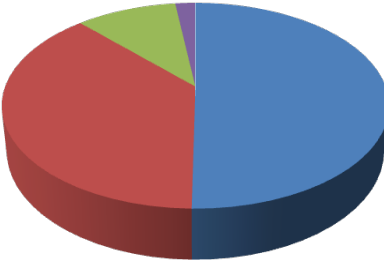
University of Strasbourg

- ❑ Funded in the 16th century.
- ❑ About 50 000 students, 20 % of foreign students.
- ❑ 72 laboratories.
- ❑ 37 faculties.
- ❑ 4 Nobel prizes.



Faculty of Physics and Engineering

- 200 teachers-researchers.
- > 1000 students, including 250 PhD students.

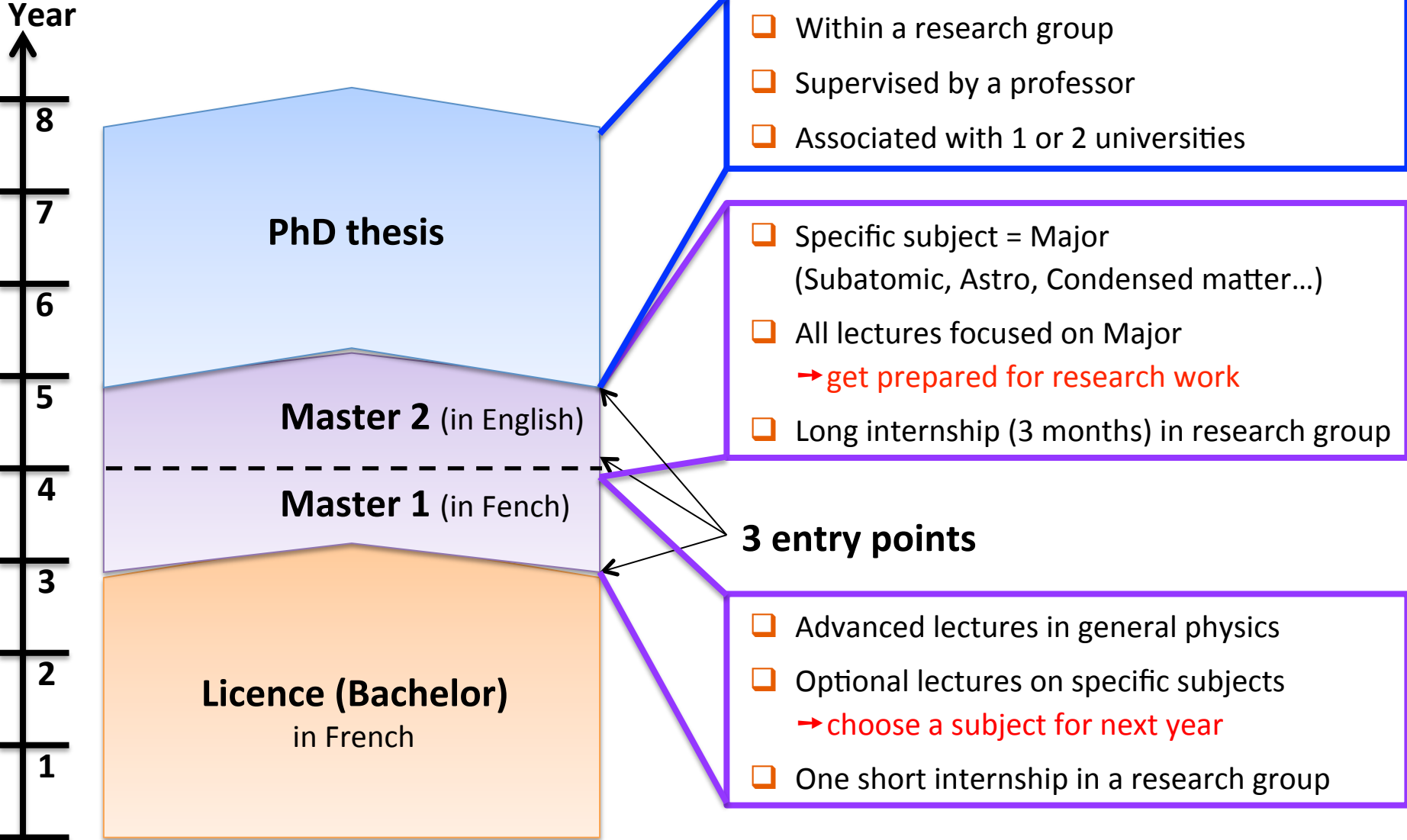


- 50% Master
- 38% Bachelor
- 10% Professional Bachelor
- 2% Erasmus exchange



P&I Faculté de **physique et ingénierie**
Université de Strasbourg

Studies at University in France



Master-2 Subatomic Physics & Astroparticles

Common lectures

- ❑ Subatomic physics (78 h)
 - Quantum Field theory
 - Nuclei & Nucleons Interactions
 - Particle Physics
 - Students' Seminar
- ❑ Detector & Analysis (48 h)
 - Radiation Interaction with Matter
 - Detectors: Physics & systems
 - Data Analysis & Modelization

5 Chosen lectures (100 h) (1 possibly in another M2)

- Theoretical Nuclear Physics
- From Nuclei to Star
- Standard Model theory
- Beyond Standard Model
- Strong interaction at hadron coll.
- General Relativity & Cosmology
- Astroparticle & Observational Cosmology
- Reactors & Applications of Nuclear Physics
- Complements in Quantum Mechanics & Special Relativity

Both **theoretical** & experimental points of view ➔ Knowledge

Master-2 Subatomic Physics & Astroparticles

Learning by practice → Competences

□ 1 month Project

- Solving a « small » problem /computer
 - within a research group @ IPHC
- or
- Performing a real « small » experiment
 - EXcellence by Experiment (EX² diploma)
 - 8 platforms: accelerator, high-tech det.

or

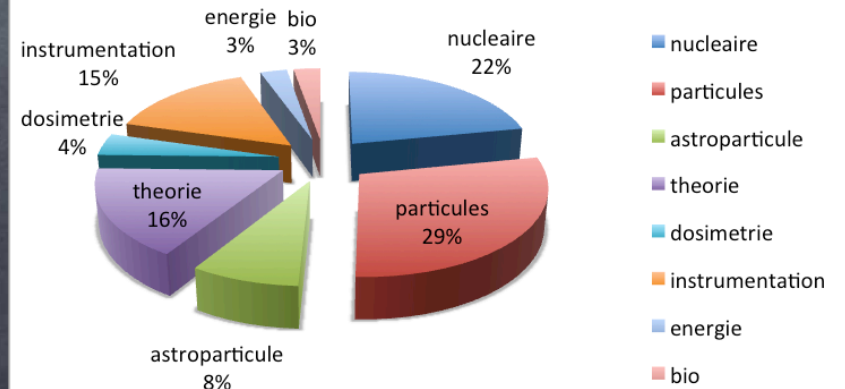
□ 1 month European School in Instrumentation

- Near Geneva
- Small groups
- Advance courses by intern'l experts
- Labs @ CERN

• 4-6 months Internship

- RESEARCH project
- 1st step toward thesis
- 75% France, 25% abroad
 - Major labs (CERN, IHEP, DESY...)
 - CNRS / Université / CEA
 - Private companies (if research)

Thème du stage



Master-2 Subatomic Physics & Astroparticles

www.physique-ingenierie.unistra.fr/psa

- ❑ **Entrance open to any students with ≥ 4 years at universities**
 - Pre-requisites : Quantum Physics, Basic of Subatomic Physics, Special Relativity
 - Introduction to Quantum Field Theory is an asset

- ❑ **About 15 students ... and 20 lecturers**
 - 25% foreigners
 - Success rate $\sim 90\%$

- ❑ **Calendar over the academic year**
 - September to January = lectures + exams
 - January to February = projects + schools & choice of PhD subject
 - March to June = research internship

PhD Thesis @ IPHC

- About 10 new PhD students in Subatomic physics each year
 - Thesis usually starts in October, but not compulsory

- Proposed subjects available around November the previous year
 - Consult : <http://www.iphc.cnrs.fr/-Theses-stages-au-DRS-.html>
 - **Don't wait → connect with us this week!**

- Financial support
 - French “Doctoral contract” for 3 years
 - Application in May
 - Other supports (Chinese Ministry for instance) work fine (even if >3 years)

- Defence
 - Required: at least one paper or Collaboration note published
 - Long manuscript describing all your work → reviewed by 2 referees
 - After referee agreement: oral defence for 45' + 60' open questions
 - Committee of 4 to 8 members, including supervisor(s) and referees