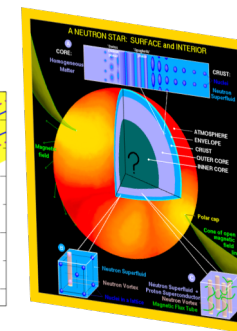
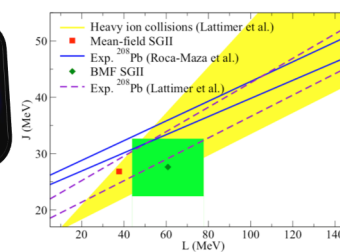
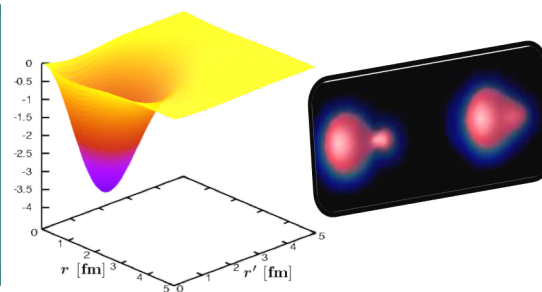
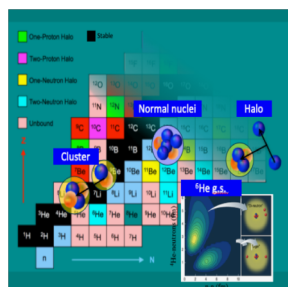
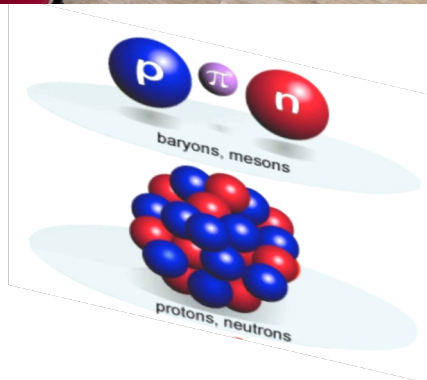


Nuclear Physics Theory team (Theory Pole)





Nuclear Physics Theory Team

- Permanents (9+3)

Pierre Arthuis (CR)

Marcella Grasso* (DR)

Chloë Hebborn (CR)

Guillaume Hupin (CR)

Elias Khan (Pr)

Denis Lacroix (DR)

Paolo Napolitani (CR)

Michael Urban (DR)

Bira van Kolck* (DR)

+ Jaume Carbonell (DR)

+ Emiko Hiyama (long-term visitor)

+ Karim Hasnaoui (IR)

- PhD & Postdocs

AYCHET-CLAISSE Samuel (CEA-Saclay)

BOCQUET Rémi (CEA-DAM)

[CHAMSEDDINE Mohamad](#)

De CORREC Christian (Cifre-Bull)

DIDIER-PICHAT Rodrigue (ED)

[MACGLYNN Patrick](#)

NGUYEN Khoa (CNRS with UBC)

[SINGH Ashutosh](#)

SMITH Andrew (Chateaubriand)

[STELLIN Gianluca](#)

[WU Feng](#)

+ D. Becht, K. Becker, R. Mendes, F. Agert



Topics

- **Nuclear interaction:** Effective Field Theory (EFT) based approaches, fundamental symmetries
- **Nuclear structure:** Ab initio methods, few-body systems, Energy Density Functional (EDF), clustering
- **Nuclear dynamics:** direct and compound reactions, transport, excitations, decays
- **Nuclear astrophysics:** neutrons stars, neutrino oscillations and reactions, evaluation of reaction rates
- **Interdisciplinary research:** open quantum systems, universality, quantum computing, ...
- **Collaboration with experimentalists:** cross section interpretations, experiments, ...

Nuclear interaction & Nuclear structure

- Nuclear effective field theories: excited baryons in Chiral EFT, matching nuclear EFTs to lattice QCD [Bira]
- antinuclear forces and structure [Bira, Guillaume]
- nuclear forces and currents from EFT, new probes in few-body systems [Bira, Guillaume, Pierre]
- halo and cluster states with Halo/Cluster EFT, and Cluster phenomenology [Bira, Chloë, Elias]
- Development of energy density functional model for nuclear structure [Elias, Denis]
- Generator Coordinate Methods and their extensions [Elias, Denis]
- Expansion of ab initio methods over the nuclear chart [Pierre]

Nuclear dynamics

- Towards the modeling of complex reactions with ab-initio methods [Guillaume, Pierre]
- development of microscopic models for heavy-ion collisions beyond mean field in the low (few MeV per nucleon) to intermediate (200 MeV per nucleon) energy range.
Semiclassical approaches (Boltzmann), quantum approaches (TDHF). [Paolo]
- Microscopic quantum transport theories including stochastic methods [Denis]
- Description of low energy nuclear phenomena: collective excitation, fission, ... [Denis, Elias]
- Few-body methods to describe direct reactions used to probe exotic nuclei [Chloë]
- Development of phenomenological and more microscopic optical potentials [Chloë]

Nuclear astrophysics

- Cluster formation in heavy-ion collisions as a function of time and density and links with the nuclear equation of state. [Paolo]
- Application of nuclear models to nuclear astrophysics [Elias]
- Description of neutrons stars [Michael]
- Quantum information in neutrino oscillations [Denis]
- Evaluation of astrophysical reaction rates [Chloë]

Interdisciplinary research, applications and emerging technologies

- Fermi liquids: dissipation, chaos, large-amplitude fluctuations and bifurcations. [Paolo]
- fast heavy-ion-collisions solution for medical applications through deep-learning [Paolo]
- Superfluidity and strongly interacting Fermi gas [Michael, Denis]
- Machine learning and Quantum Machine Learning [Guillaume, Denis]
- Quantum computing applied to many-body systems [Denis, Guillaume]
- Nuclear tests of global symmetries (lepton number, baryon number, etc) [Bira]
- expansion around unitarity for nucleons and atoms [Bira, Guillaume]
- Development of automated expression and code generation for many-body methods [Pierre]

Collaboration with experimentalists

- Interpretation of reactions of astrophysical interest [Chloë with F. Hammache and N. de Sereville]
- Single-particle shell structure and related reactions [Chloë with O. Sorlin, Elias with D. Verney]
- 2 alpha decay experiment [Elias with experimentalists from pôle nucléaire and CEA]
- Contribution in communities and projects on the EoS and the dynamics of exotic nuclei [Paolo, member of FAZIA]
- Nuclear density profiles for neutron-knockout experiments with R3B @ GSI/FAIR [Pierre with T. Aumann & A. Schwenk]
- Nuclear density profiles for scattering off (un)stable isotopes with SCRIT & ESPRI @ RIBF [Pierre with K. Tsukada & J. Zenihiro]

Thematics of the team—Global view and Emergence of new projects

