

GT2

M. Bender

A. Lopez-Martens

D. Verney

Questionnements (resanet.in2p3.fr)

Quelles sont les formes des noyaux et les symétries sous-jacentes aux frontières en spin et en masse

- Qu'apprend-on des études de la coexistence de formes et de la super-déformation ?
- L'hyper-déformation (HD) nucléaire existe-t-elle ?
- Quelle théorie/expérience pour la recherche des noyaux hyper-déformés (HD) ?
- Comment peut-on former de nouveaux noyaux super-lourds ? Quel est l'apport de la structure des noyaux très-lourds ?

Première réunion

But: premier tour d'horizon expérimental & théorique avec des exposés courts et une table ronde

Expérience: A. Lopez-Martens (noyaux lourds)
 J. Wilson (superdéformation)
 A. Korichi (hyperdéformation)
 E. Clément (coexistence de formes)

Théorie: M. Bender (formes et champ moyen)
 J. Dudek (formes exotiques)
 S. Hilaire (Hamiltonien de Bohr)
 B. Bally (GCM)
 F. Nowacki (corrélations dans le SM)

(Programme et exposés sur <https://indico.in2p3.fr/event/18191/>)

Première réunion

9 octobre 2018 @ Caen

- Réunion lors du Ganil Community Meeting pour maximiser la présence et minimiser le nombre de déplacements: ~ 30 personnes (représentatif de la communauté ou concours de circonstances ?)
- 3 orateurs absents
- Exposés intéressants et bonnes discussions
- Format d'exposés courts peut-être mal adapté
- Mauvaise gestion du temps de la part des organisateurs -> pas de « table ronde »

Super heavy nuclei

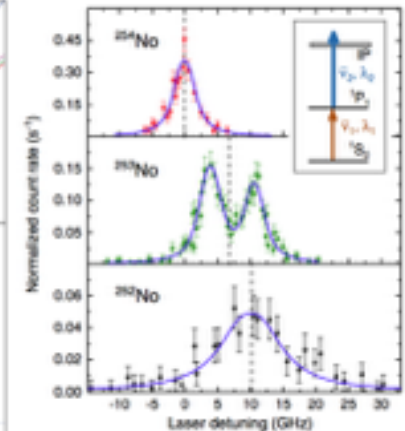
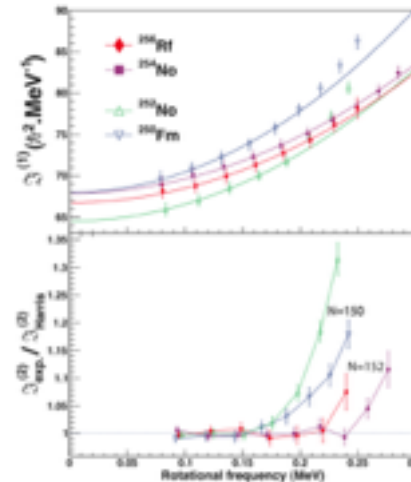
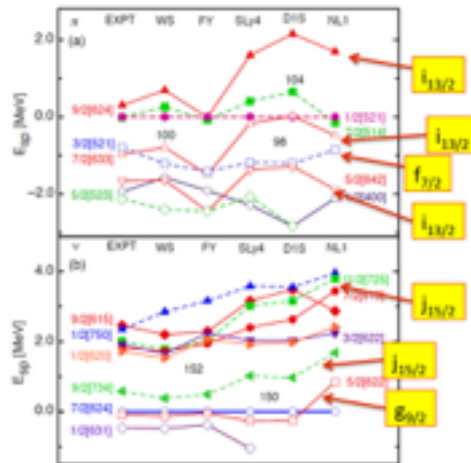
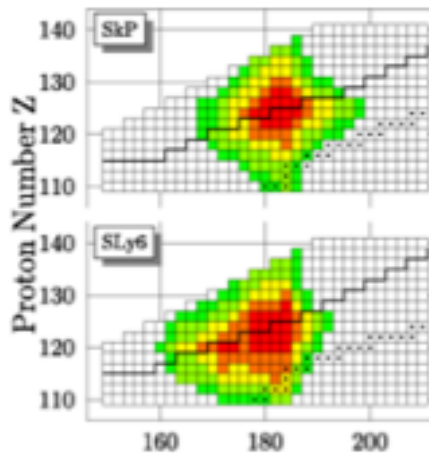
overview of available spectroscopic data

importance of combining prompt/decay-spectroscopy information

deficiencies of density functional theories

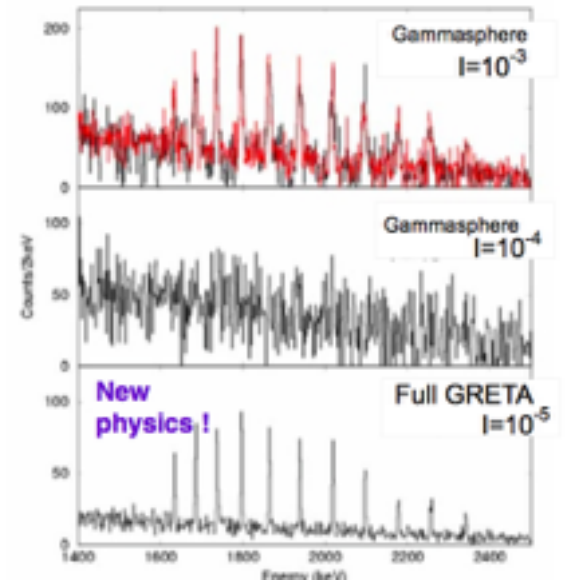
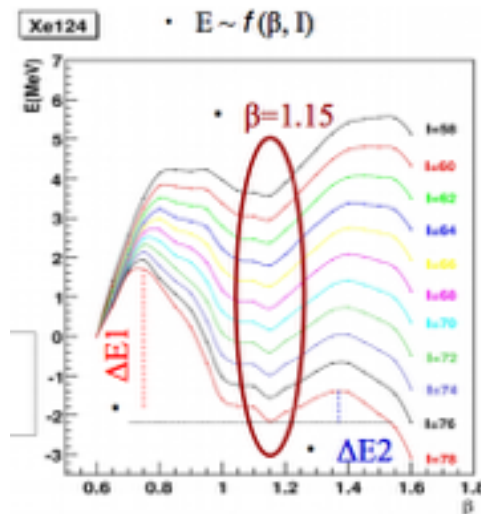
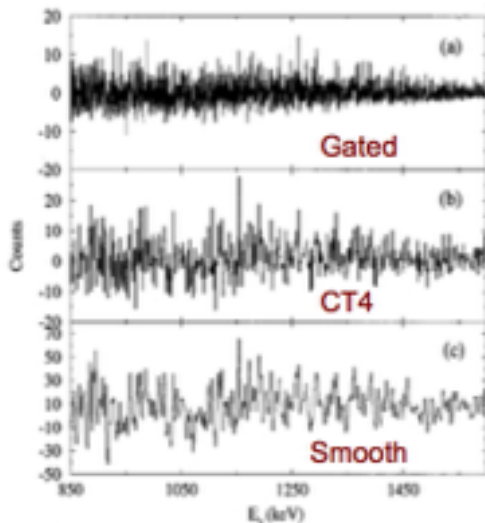
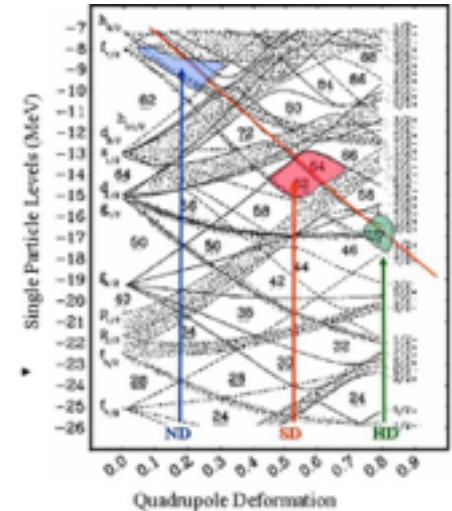
what are the relevant observables to compare to & constrain theory?

impact of correlations?



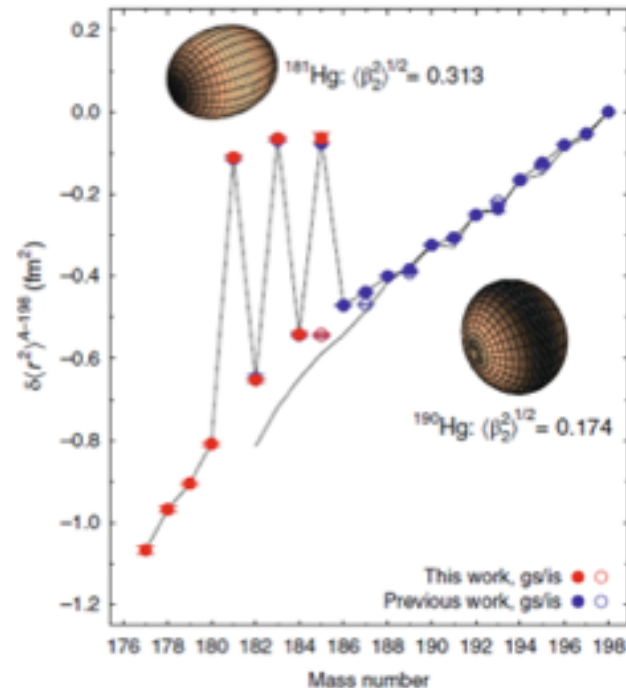
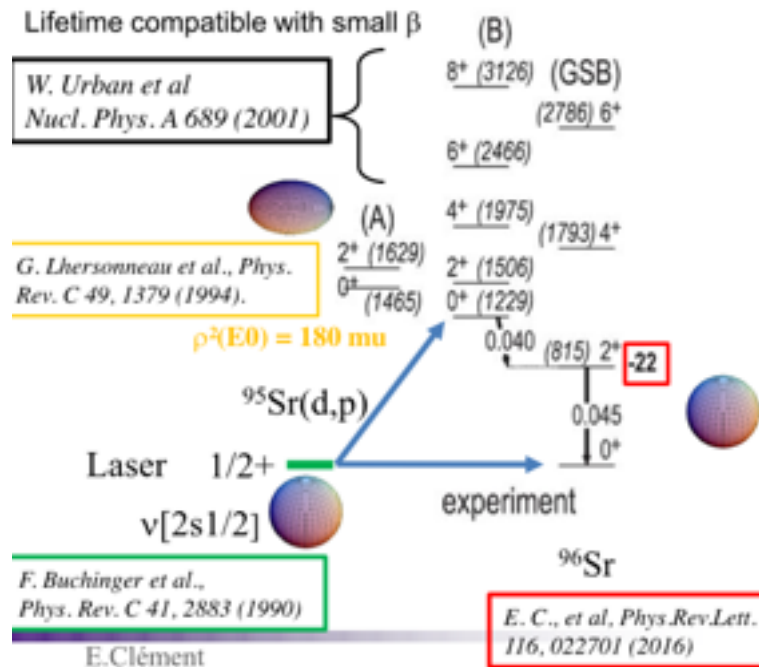
Nuclear hyperdeformation

historical review on experimental searches of
 so far no convincing spectra
 Evidence for HD ridge in $A \sim 120$?
 large variety of theoretical predictions
 prospects with tracking arrays



Shape coexistence & transition

overview of experimental observations in $A=100$ and Hg/Pb regions
 importance of gathering observables from different sources: coulex & transfer reactions, E0 & laser spectroscopy
 New insights into the origin of the phenomenon from (MC) shell model

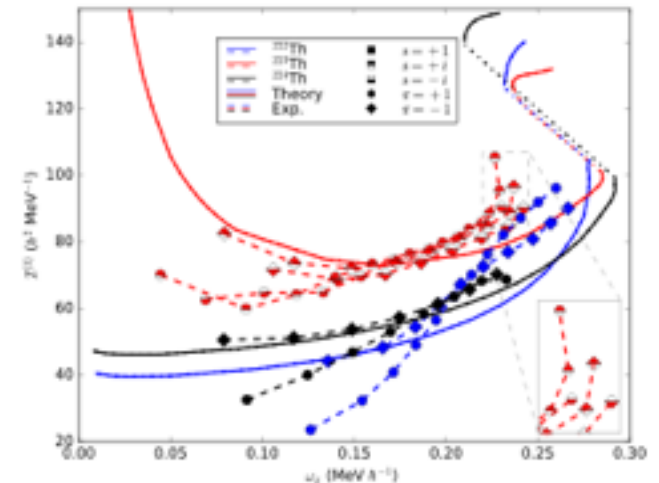
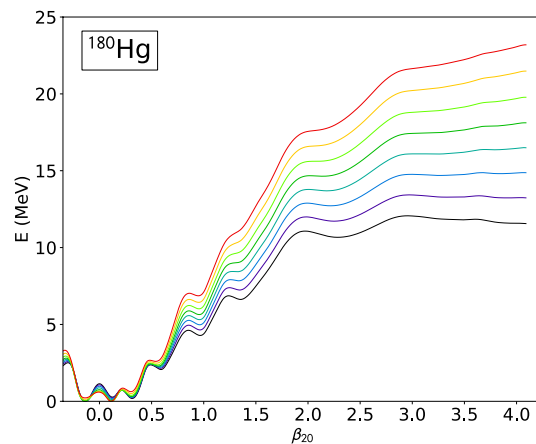
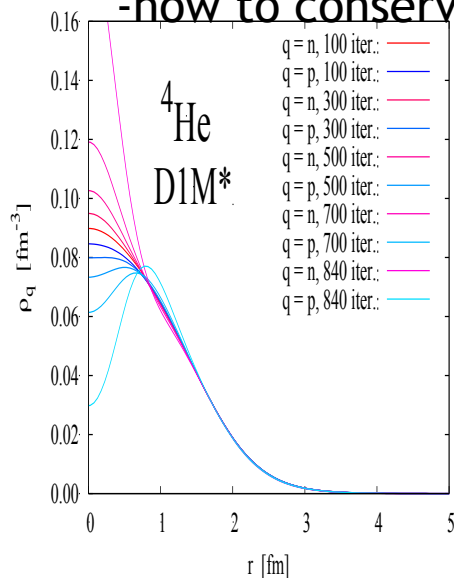


Mean field description of deformed states of very heavy nuclei

overview of current developments:

- fit protocols (new constraints on shell structure, surface energy, response properties, ... and quantification of model errors)
- extended forms of the effective interactions to improve predictive power and to avoid technical problems
- technical implementation (symmetry-unrestricted calculations for exotic shapes)

-how to conserve the know how?

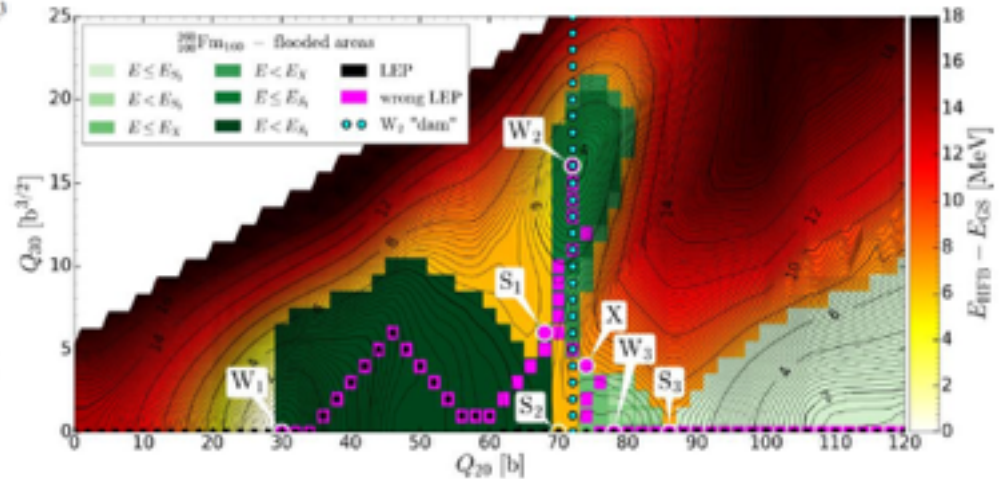
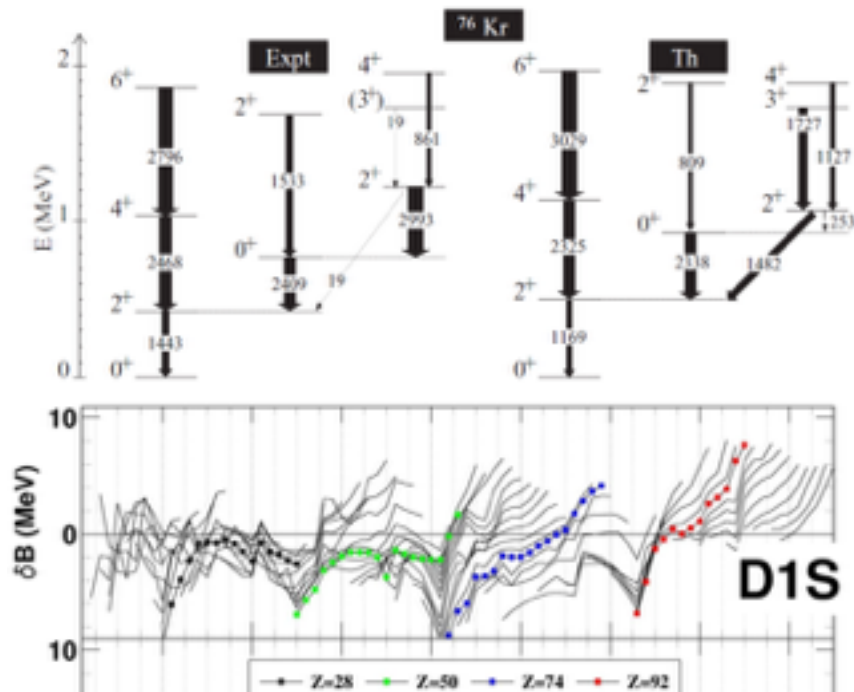


Mean-field and beyond-mean-field approaches using the Gogny force

overview of the 5DCH approach to provide coherent microscopic inputs to reaction models

examples of results for masses, spectroscopy, level densities, fission paths ...

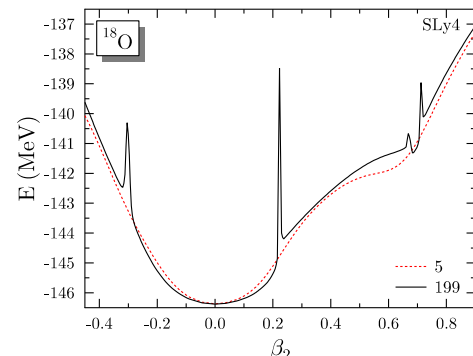
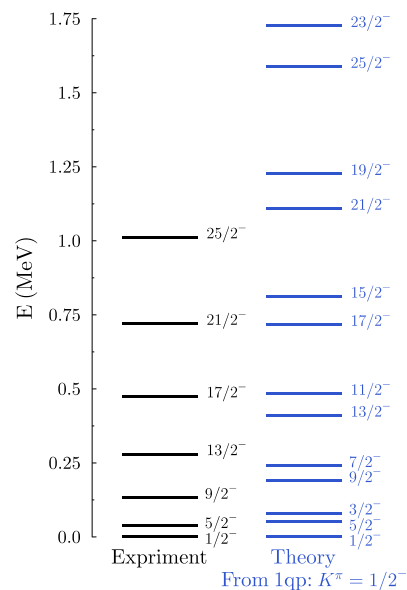
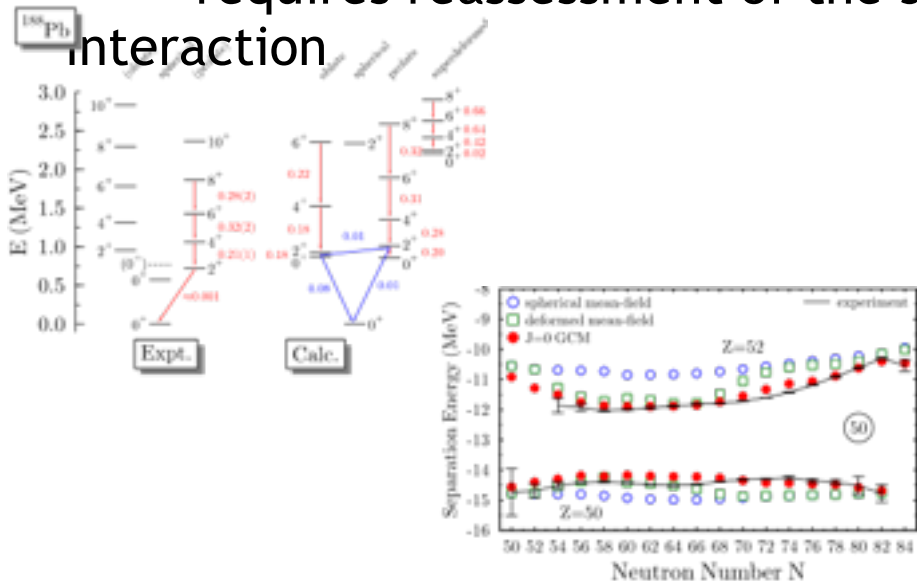
how to conserve the know-how and go further ?



Beyond-mean-field approaches with symmetry-restored GCM (not given talk)

ongoing developments:

- mean-field-based calculation of spectroscopic observables and ground-state correlations through projection and shape mixing
- computationally expensive, but applicable across the chart of nuclei
- benchmarking of frequently used simpler approximations
- requires reassessment of the strategy to construct the

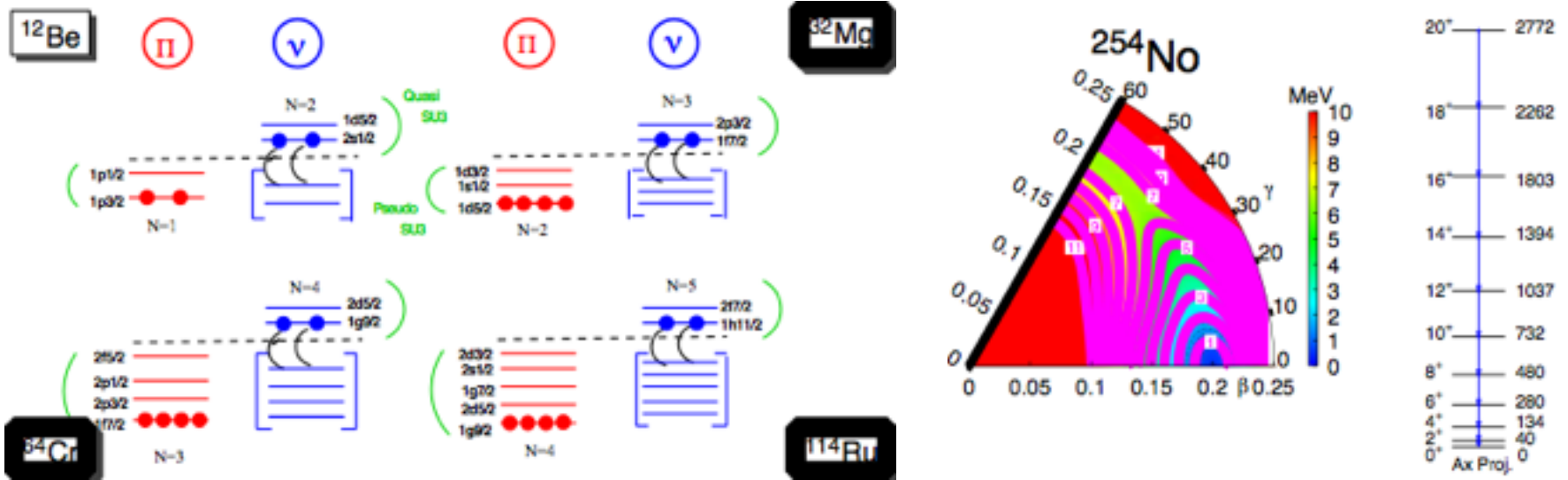


Correlations & collectivity within the shell model

nuclear structure as the result of the interplay between the monopole Hamiltonian and correlations (shell evolution, islands of inversion, ...)

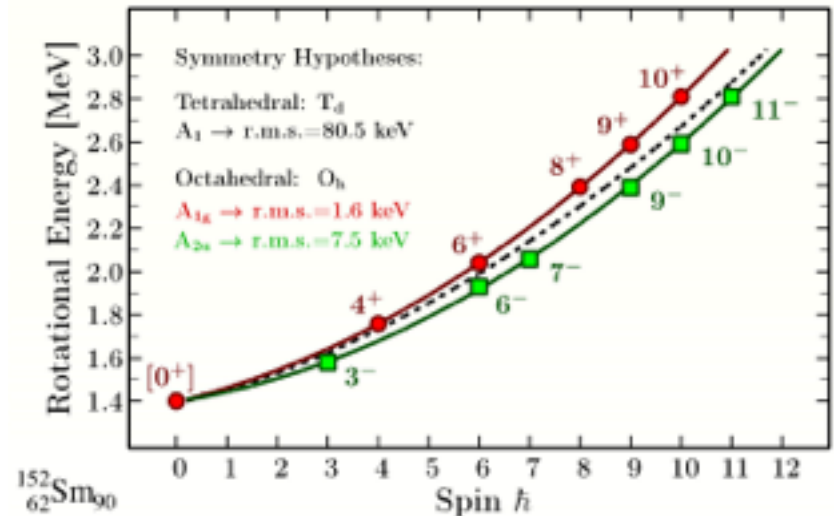
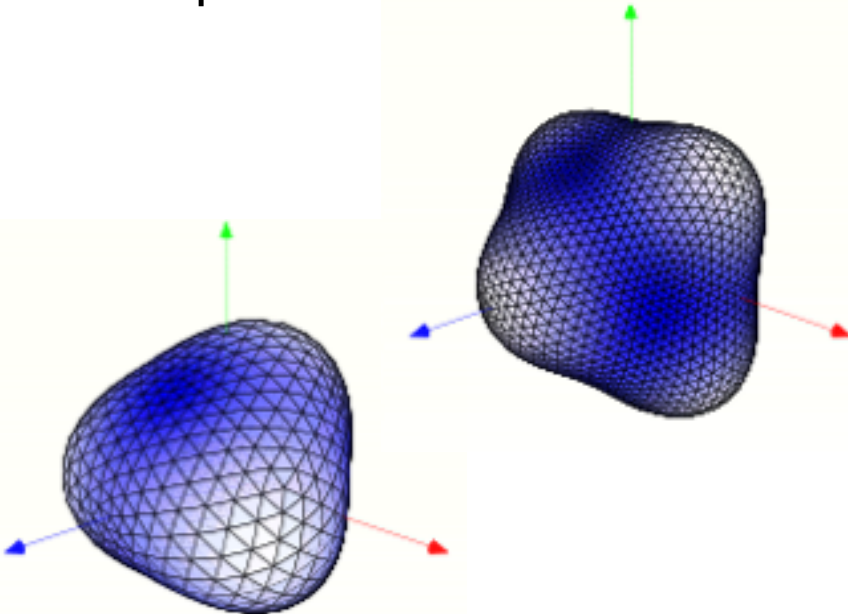
Quadrupole collectivity as a result of large correlation energies and resulting from approximate SU(3)/pseudo-SU(3)/quasi-SU(3) symmetries

possibility to do (beyond-)mean-field calculations within a shell-model



Exotic shapes (not given talk)

- possibility of shapes with exotic symmetries (octahedral, tetrahedral)
 - at low excitation energy
- reassessment of the analysis of shell structure, degeneracies, quantum rotors, ... for arbitrary point-group symmetries
- experimental evidence?



Futur

- Séparation artificielle entre GT1 et GT2: les communautés sont désormais les mêmes et les outils (théoriques/expérimentaux) se rapprochent de plus en plus
- Fusion de GT1 et GT2 ?
- Faible participation au GT2: petite communauté, problème organisationnel, manque de temps, incompréhension de la finalité du GDR...?