Nuclear structure data, within a microscopic approach, for low-energy fission

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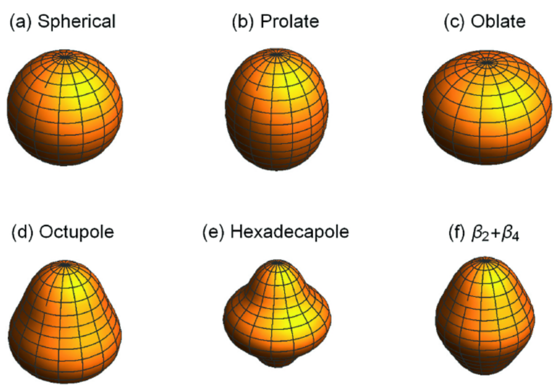
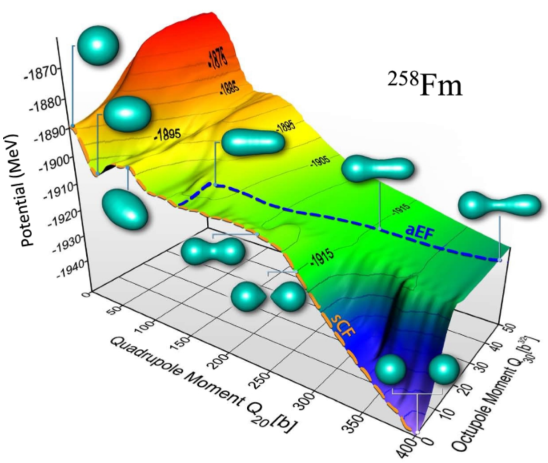
In the framework of my thesis, I am very much interested in a theoretical description of the structure of atomic nuclei with, as applications, the computation of physical quantities of interest for nuclear fission studies. Since nuclei are quantum objects, the problem we deal with is an interacting N-body quantum problem. Unfortunately, due to the complexity of the problem, an exact analytical or numerical solution can not be found.
In order to simplify a bit our problem, we change our point of view and consider that the nucleons of the nucleus don't interact with each other anymore, but interact instead with a one-body average potential, generated by all the nucleons, this is the so-called mean-field approach. For some technical reasons, it turns out that nucleons of same nature (we say isospin), meaning neutrons and protons separately, form pairs and the mean-field approach we use is more complex and quite different of the one presented above (Bogoliubov independent quasi-particles model).
One interesting characteristic of nuclei is their deformation, which can be viewed as a combination of "elementary" deformations (quadrupolar, octupolar, hexadecapolar, ...), see Fig. 1a. In fact, we can compute the potential energy associated with the deformation of the nucleus and draw what we call potential energy surfaces (PES), meaning a manifold embedded in a multidimensional space whose coordinates are the "elementary" deformations introduced previously, see Fig. 1b. Then, among the interesting physical quantities I mentionned, there are the global and local minima of the PES, or the fission pathway (least-energy pathway that leads to fission).



(a) Illustration of "elementary" deformations of the nucleus. Source : Kota, V.K.B. (2020). *SU(3) Symmetry in Atomic Nuclei*. Springer, Singapore. https ://doi.org/10.1007/978-981-15-3603-8_1



(b) Example of PES and fission paths in ^{258}Fm. Source : Sadhukhan, J. Microscopic theory for nuclear fission dynamics. AAPPS Bull. 32, 14 (2022). https ://doi.org/10.1007/s43673-022-00042-7