Opening a new view to the structure of nuclei

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Abstract

The density distribution and the size of nuclei were studied in details for stable nuclei and "common rules" were established. Those are;

- A nucleus has a spherical or near spherical shape.
- The radius of a nucleus is proportional to $A^{1/3}$, where A is the mass number of the nucleus.
- The surface of a nucleus is diffused and this diffuseness is almost the same for all nuclei.
- The distribution of protons and neutrons in a nucleus is similar.

A new experimental method of Radioactive Ion Beam (RIB) invented in the mid-80th has enabled to determine radii of unstable nuclei. From experiments with RIB, surprisingly, it was found that the "common rules" were all broken and found that the "common rules" are only valid for stable nuclei. Then it was found that the understanding of nuclear structure, when it is expanded to unstable nuclei, has to be revised not only the density distribution but also other building blocks of nuclear structures such as shell structures.

Such developments originated by the use of RIB and new structures of nuclei will be presented.