

Why nuclear physics?

- Still a lot to learn about nuclear physics – little is known about “exotic” nuclei that lie away from stability – involved in supernova reactions.
- The behaviour of the nucleus is of great theoretical interest; a quantum system of ~ 100 particles puts the nucleus on the threshold between quantum and macroscopic phenomena.
- The nucleus can be used as a laboratory for fundamental physics, to study two fundamental forces: the Strong interaction, and the Weak interaction (β –decay properties, and parity violation).
- Nuclear techniques have many applications:
 - o Medicine – PET (Positron Emission Tomography), MRI (Magnetic Resonance Imaging), X-Rays, ...
 - o Condensed matter – radioactive probes at crystal lattice sites.
 - o Astrophysics – nucleosynthesis
 - o General uses – Smoke detectors, thickness monitors, fission and fusion energy

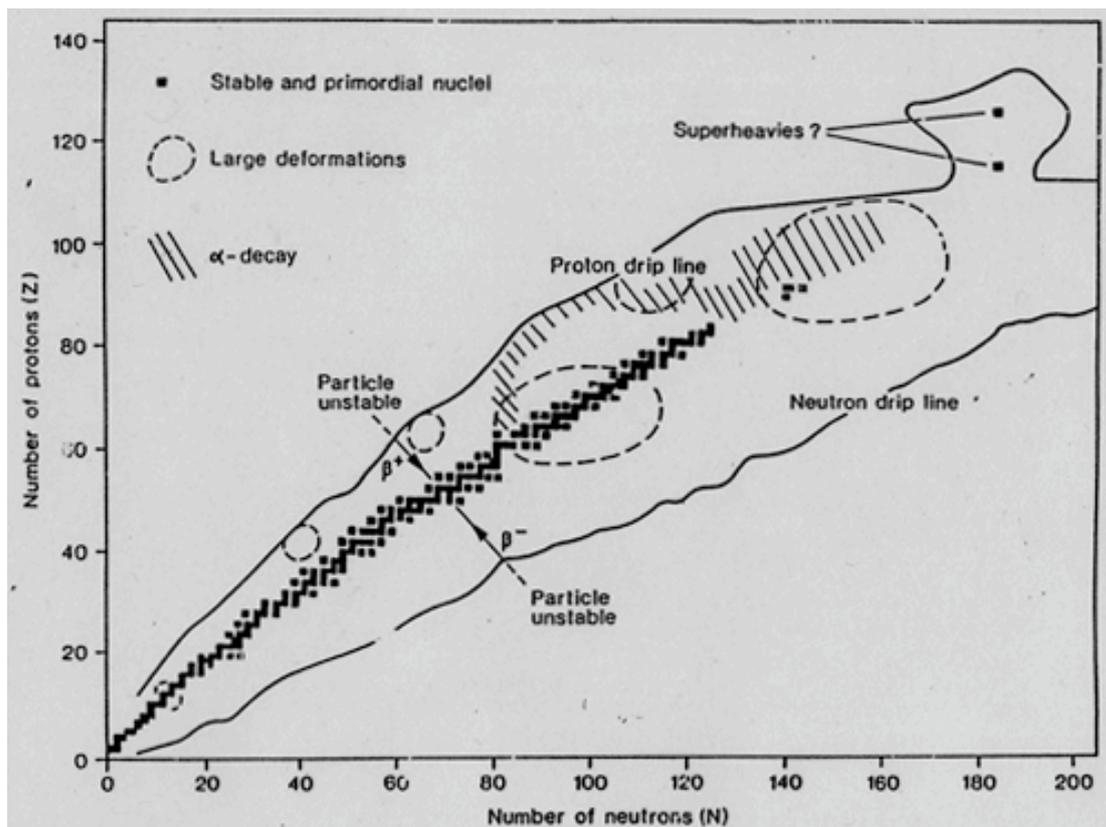


Fig. 15.1 The figure shows the β stable nuclei (small black squares) in the (N, Z) plane. The upper and the lower full lines give limits for nuclear instabilities for, respectively, proton and neutron decay. Regions of large deformations are given by the dashed lines.