

The Nucleus

Physics

What holds it together, and why it has a size limit.

Forces and geometry inside the nucleus.

The two forces

Strong force — attractive, range about 3 fm

Acts between all nucleons equally

Electrostatic repulsion between protons

Long range, grows with proton number

Consequences

Attraction reaches neighbours only

Repulsion is felt across the whole nucleus

Heavy nuclei need extra neutrons to dilute it

$R = r_0 A^{1/3}$ — density is roughly constant

No element above $Z = 82$ (lead) has a stable isotope. Beyond that, repulsion always wins eventually.