$\nu 0p_{1/2} - \nu 0p_{3/2}$ spin-orbit splitting in ^{20}O

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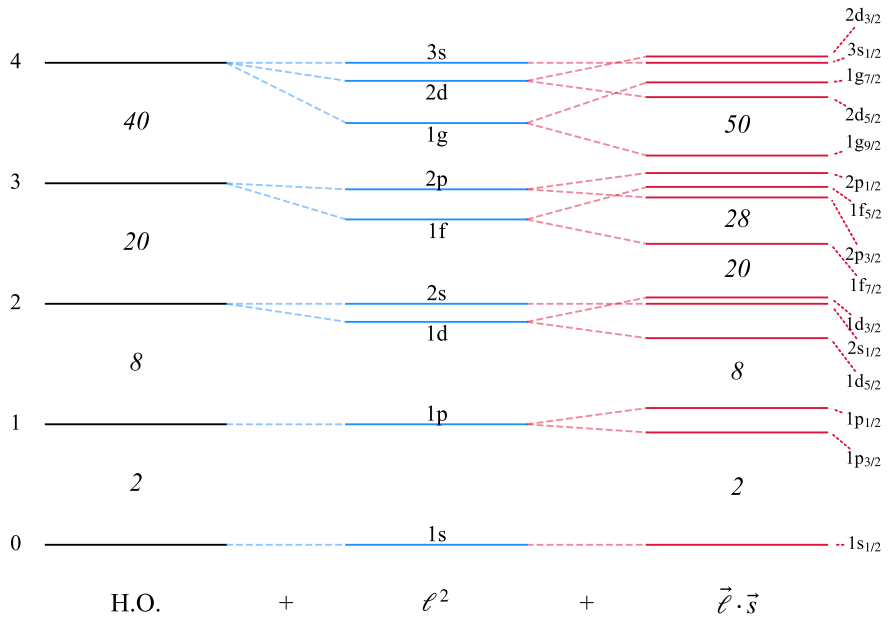
EuNPC 2025 - Caen

A recap on the SO splitting

Introduced by M. Goeppert-Mayer, the SO potential successfully reproduces magic numbers in stable nuclei.



It is mainly a surface effect:

$$V_{SO} = -\frac{1}{\hbar^2} V_{so} (\vec{l} \cdot \vec{s}) \left(\frac{1}{r} \frac{dV}{dr} \right)$$

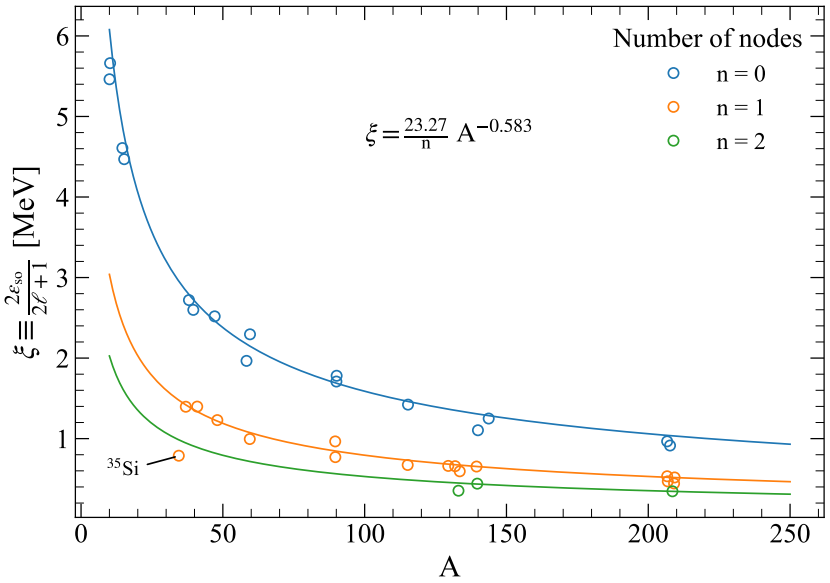
yielding a ℓ-dependent gap:

$$\Delta_{so} = \frac{\hbar^2}{2} (2\ell + 1) \xi$$

$\Rightarrow$ Expected to evolve towards more exotic nuclei, as surface blurs and hence $\xi \sim dV/dr$ changes.

A recap on the SO splitting

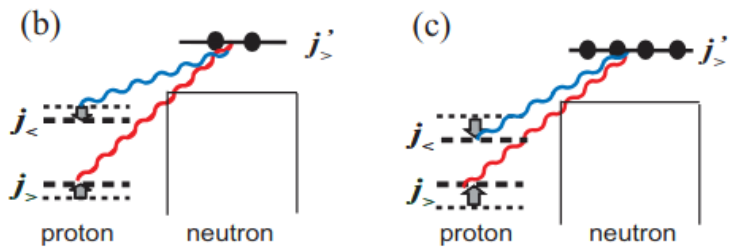
G. Mairle *et al.* (PLB 304 (1993)) found systematic trends easily parametrizable.



Proton-neutron interactions drive **shell evolution**

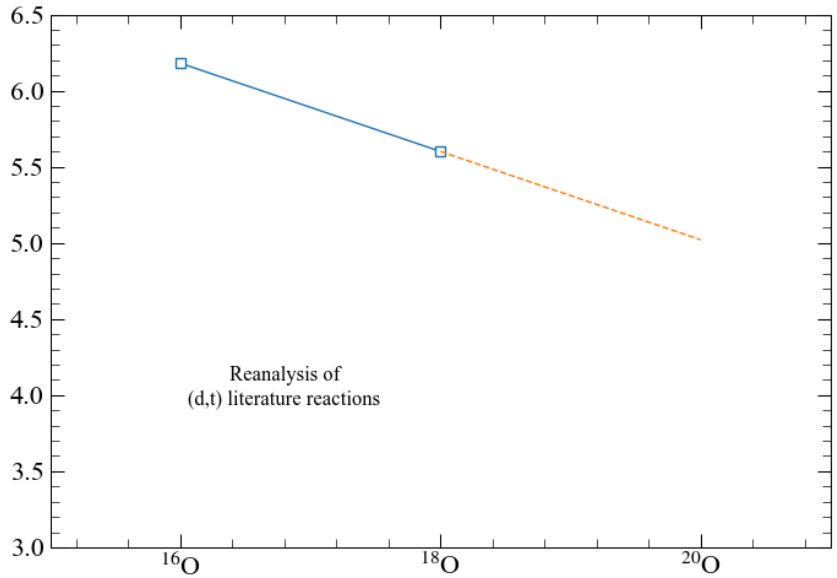
Deviations from the trend are found though:

1. Loosely bound orbitals
2. Nuclear matter deplection (^{35}Si?)
3. Role of **tensor force**



SO gap for $Z = 8$ isotopes

Evolution of the SO gap is plotted below for neutron-rich O isotopes.



Will ^{20}O follow the trend?

Could be determine tensor $\pi\nu$ contribution?

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