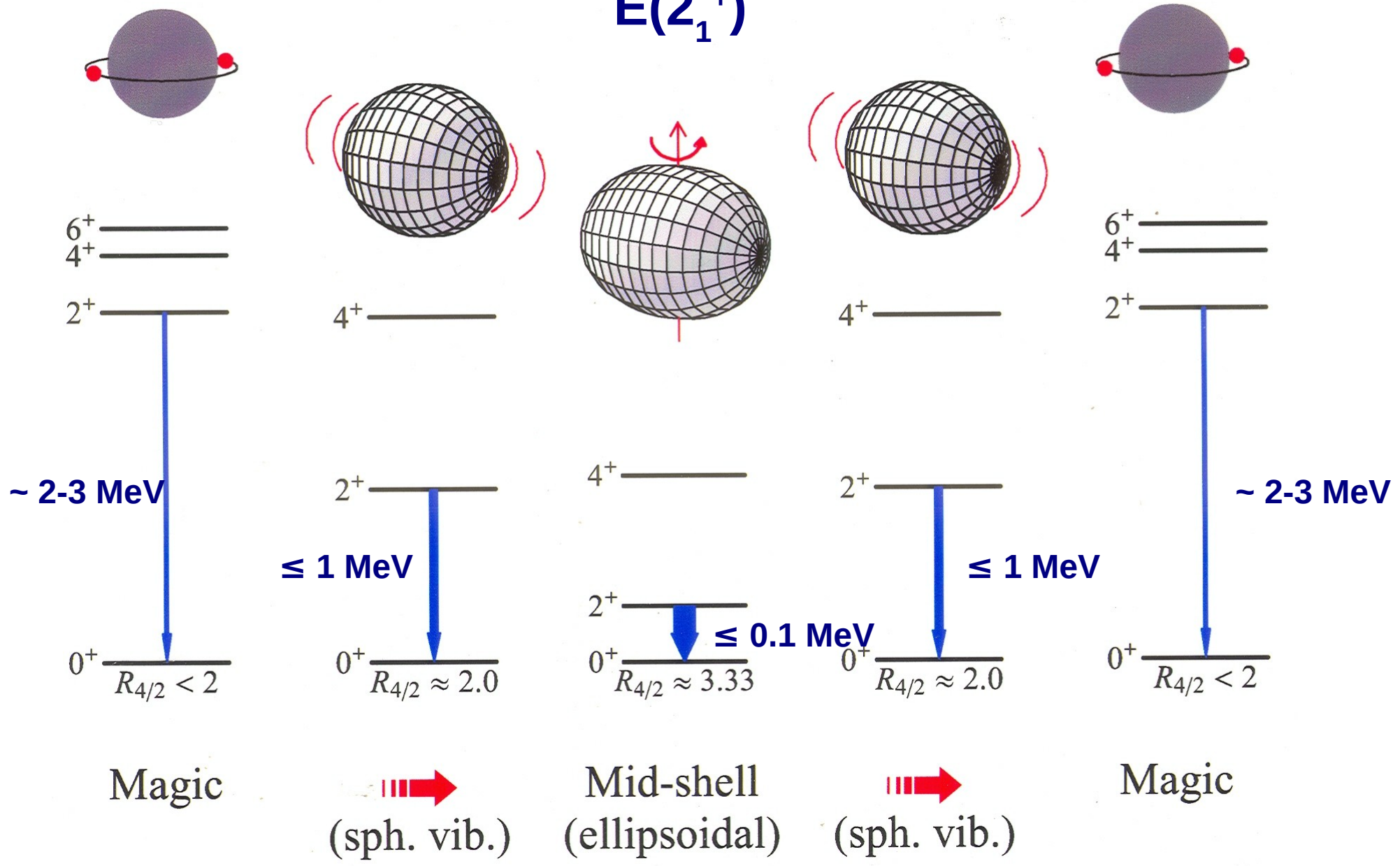


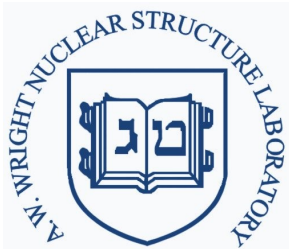
Role of the $d_{5/2}$ sub-shell in the Evolution of Ge and Se Isotopes

- **Aims:**
 - Clarify 2_1^+ energies at and near N=56, Se and Ge
 - Evolution of SPE's, especially $vd_{5/2}$ and $vg_{7/2}$ with Z
 - Where possible, extract $R_{4/2} = E(4_1^+) / E(2_1^+)$

Evolution of nuclear structure

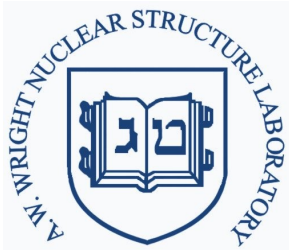
$E(2_1^+)$





$E(2_1^+)$ Systematics $A \sim 90$

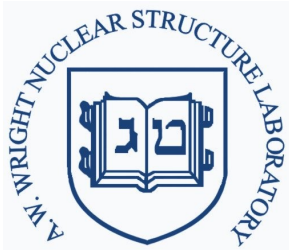
Zr	2186	934	919	1750	1223
Sr	1836	832	814	837	815
Kr	1565	775	707	769	665
Se	1455	704	886	?	?
Ge	1348	624	?	?	?
N	50	52	54	56	58



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Well-known $d_{5/2}$ sub-shell
at $N=52$: Zr – chain
→ large gap $d_{5/2} - g_{7/2}$

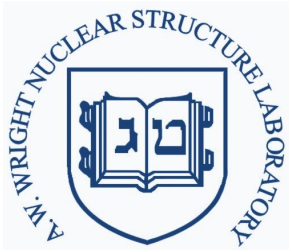


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in Sr/Kr – chains
→ $d_{5/2} - g_{7/2}$ gap vanishing



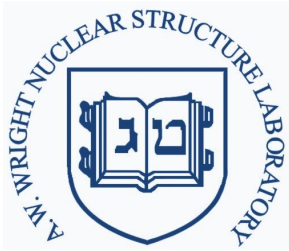
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 If correct, gives rise to a Pronounced sub-shell at $N=56$ (or $Z=34$?)



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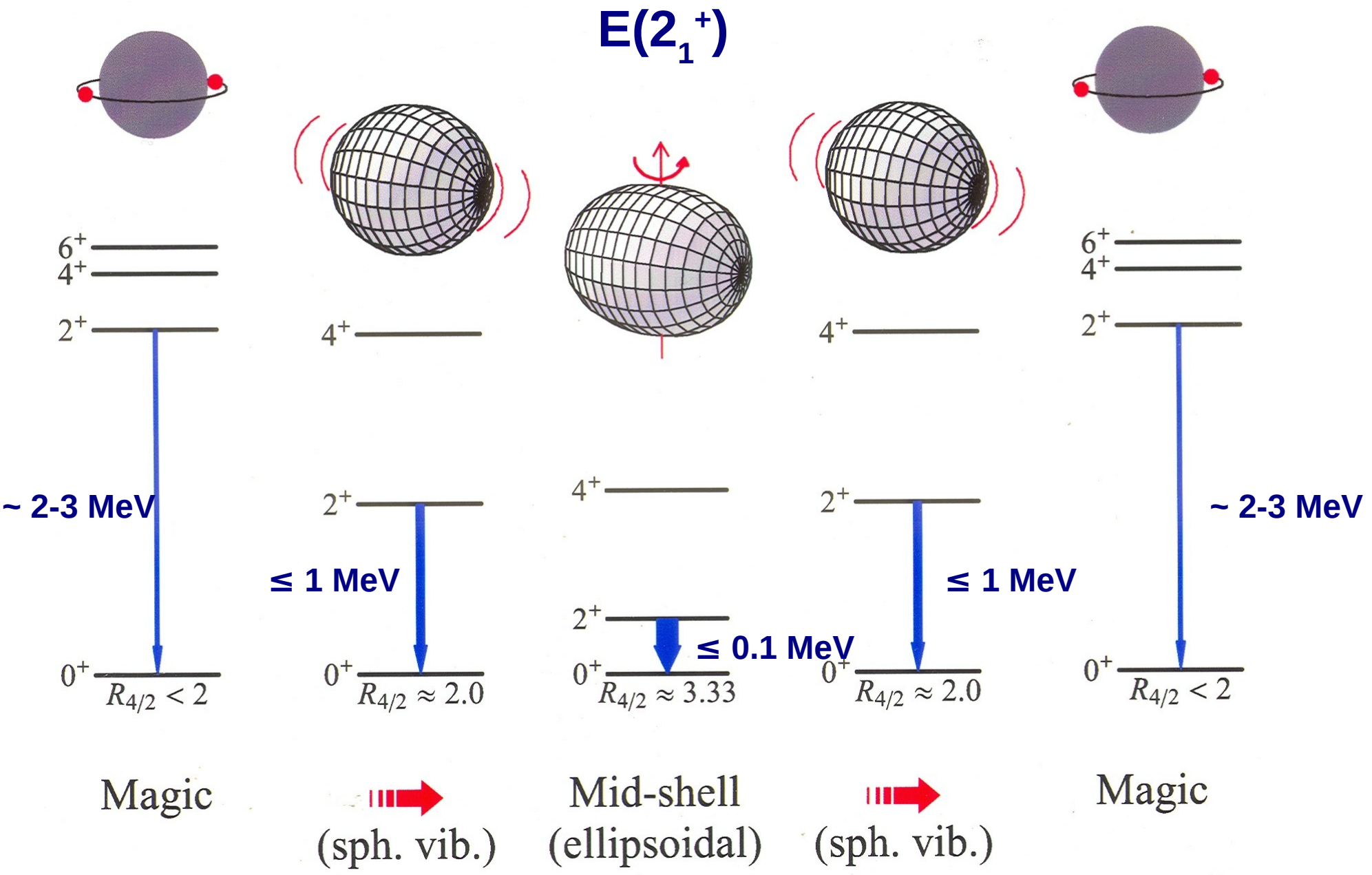
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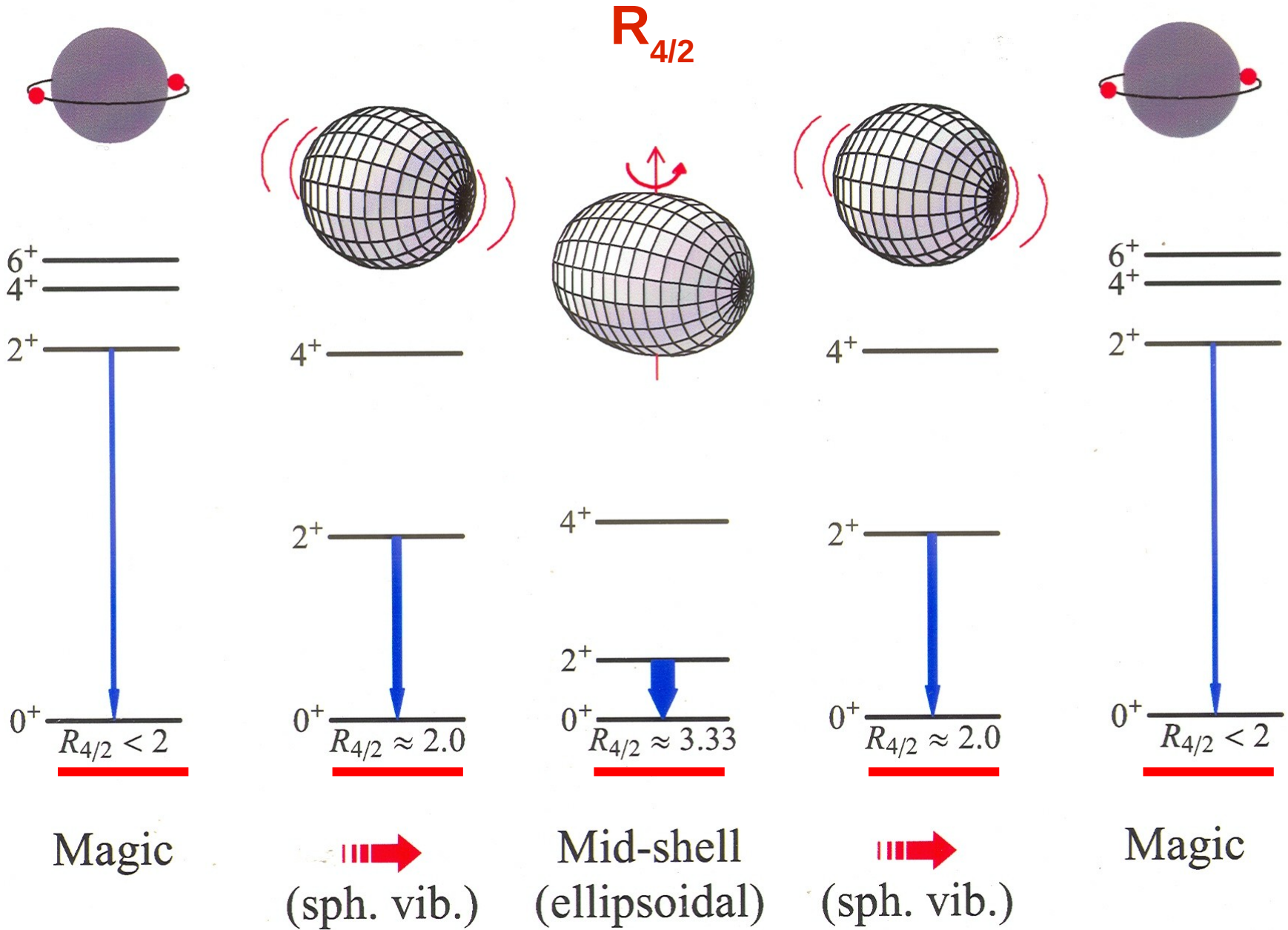
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→ direct impact on SPE's, monopole shifts, tensor forces, needs exp. test

Evolution of nuclear structure



Evolution of nuclear structure



$R_{4/2}$ Systematics A~90

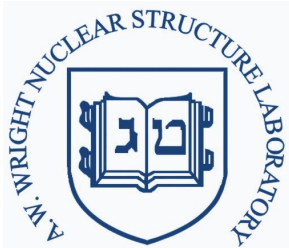
Zr	1.41	1.6	1.6	1.57	1.51
Sr	2.34 ($\Pi p_{1/2}$)	2.00	2.05	2.56	2.20
Kr	1.44	2.12	2.49	2.35	2.28
Se	1.46	2.23	?	?	?
Ge	1.51	2.68	?	?	?
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Well-known $d_{5/2}$ sub-shell at N=52: Zr – chain
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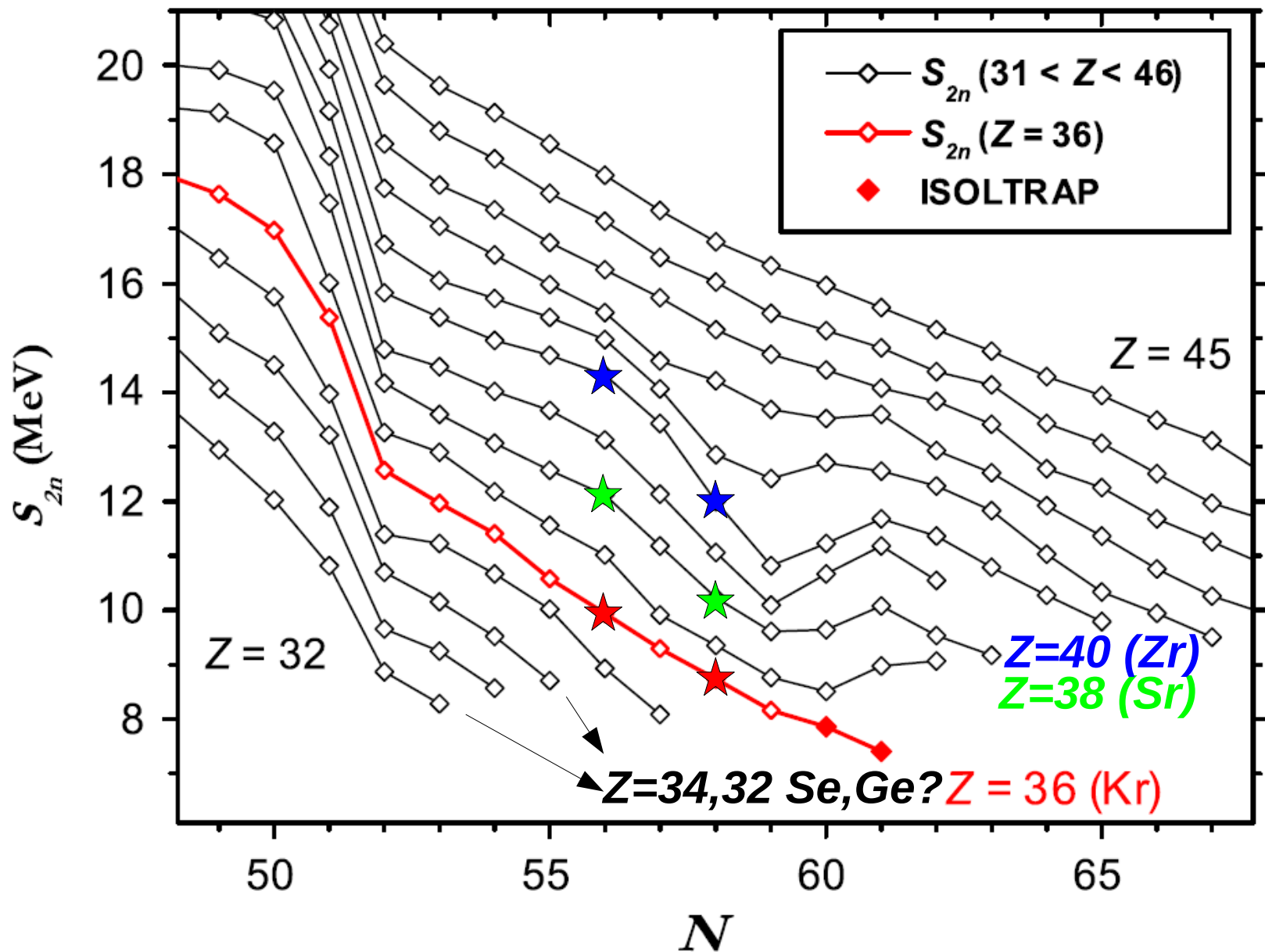
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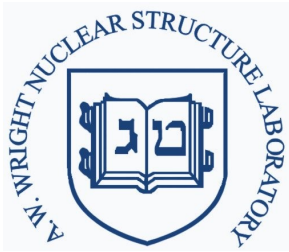
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Shell-Gap: Would also mean S_{2n} Drop

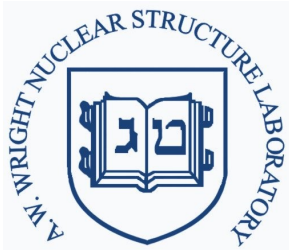




Experiment Considerations

- **Locate the first excited 2^+ states in ^{88}Ge , ^{90}Se**
- **Also nearby (lighter) isotopes should be in the cocktail**
- **For some, $R_{4/2}$ may be accessible (depending on odd-odd GS spins)**
- **Learn from energies what to expect for S_{2n} / masses**
- **Conservative estimate: @2.5 pA U: ~ 50 $^{88}\text{Ga} \rightarrow \text{Ge}$ / day**
- **15% γ x 50% β efficiency $\Rightarrow \sim 4$ γ 's / day, 40 in 10 days**
- **Should be doable; ^{90}Se is comparably easy! Both (and N=54's) in the same shot – maybe combined with other Lol's (*Garnsworthy et al.*)**
- **γ -singles after β -decay (for strong channels, doubles may be tried)**
- **β -delayed n and 2n channels can be expected strong! (n-detection?)**
- **Euroball's large efficiency and Riken's yields should compensate**
- **Odd-odd β -decay mothers can be expected to have low-j odd-parity**
- **Short β -decay mother halflives, probably 10's of ms's**

- ***As for other proposals: if it cannot be done at RIKEN, it cannot be done!***



Collaboration

V. Werner, P. Regan,

Zs. Podolyak, R. Krücken, A. Garnsworthy, G. Hackman,

P. Doornenbal,

please let me know if you're interested