

Relativistic (hyper-)nuclear structure with microscopic interactions

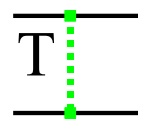
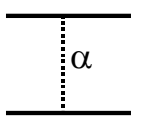
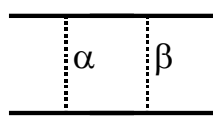
H. Lenske, C. Keil

Motivation:

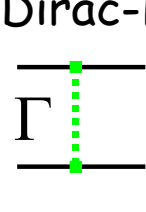
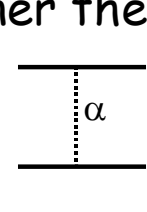
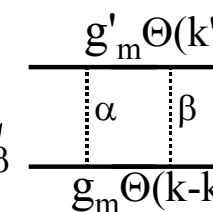
- **microscopic** description of baryonic **in-medium** interactions
- systematic treatment of **many-body effects**
- test of **flavor symmetries**, exploration of **flavor dynamics**
- applications to **exotic nuclei** (\rightarrow SuperFRS) and **hypernuclei** (\rightarrow HESR)


Theoretical framework:




- Bonn type meson exchange theory

$$\overline{T} = \sum_{\alpha} \overline{\Gamma}_{\alpha} + \sum_{\alpha, \beta} \overline{\Gamma}_{\alpha\beta} + \dots \quad \mathcal{T} = \mathcal{V} + \mathcal{V}G^{(2)}\mathcal{T}$$




- Dirac-Brueckner theory

$$\overline{\Gamma} = \sum_{\alpha} \overline{\Gamma}_{\alpha} + \sum_{\alpha, \beta} \frac{g'_m \Theta(k'-k'_F)}{g_m \Theta(k-k_F)} \overline{\Gamma}_{\alpha\beta} + \dots \quad \Gamma = V + Vg^{(2)*}Q\Gamma$$




$$\Sigma = \text{Diagram 1} - \text{Diagram 2}$$



$$\text{Red line} = \text{Black line} + \text{Black line} \circlearrowleft \Sigma \text{ Black line}$$




$$\Sigma = \int dq' [\langle qq' | \Gamma | qq' \rangle - \langle qq' | \Gamma | q'q \rangle]$$

$$g^{(2)*} = g^{(2)} + g^{(2)} \Sigma g^{(2)*}$$

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Theoretical framework (contd.):

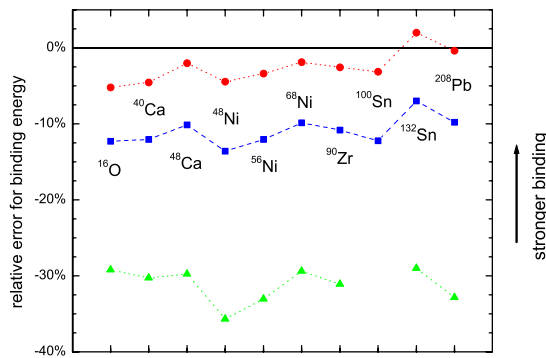
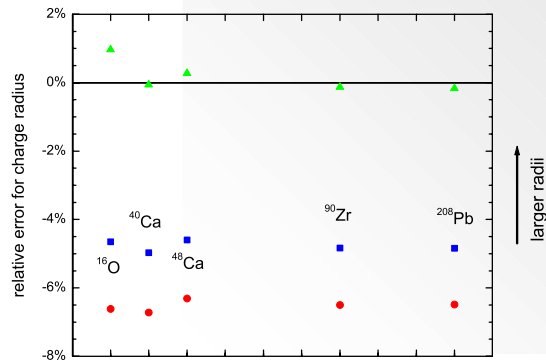
- density dependent relativistic hadron field theory (DDRH)
 - field theory with vertex functionals $\Gamma(\psi_i)$
 - mapping of medium effects onto vertex functionals:

$$\sum^{DB} \stackrel{!}{=} \sum^{DDRH}$$

Fuchs, Lenske, PRC52 (95)

Applications: DDRH RMF calculations

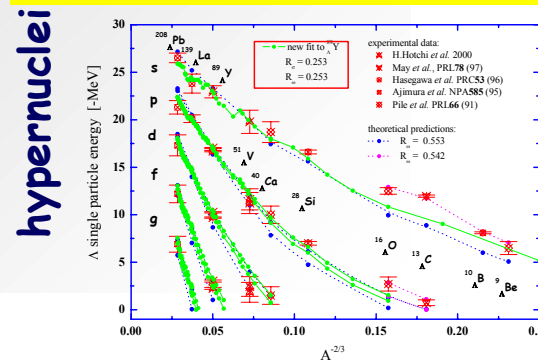
extreme isospin



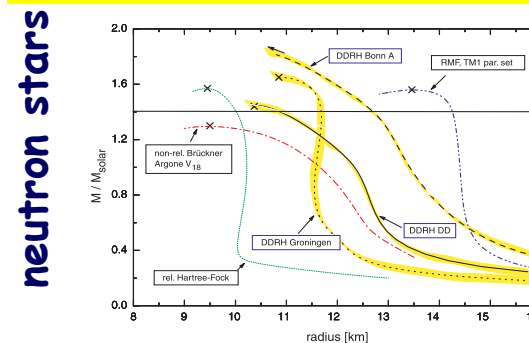
Hofmann, Keil, Lenske PRC64 (01)

strangeness physics

Keil, Hofmann, Lenske, PRC61 (00)



Hofmann, Keil, Lenske PRC64 (01)



Keil, Lenske, Hirscheegg '03

