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Renormalization effects in a field theory of finite nuclei

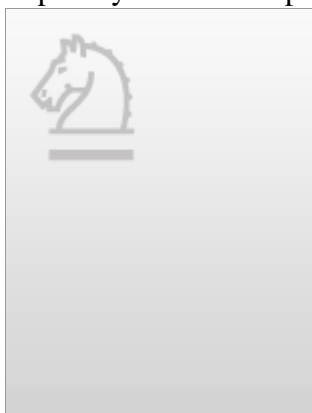
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Abstract

The ground-state of a finite system of nucléons coupled via scalar and vector mesons is studied using functional methods. A trial wavefunctional representing the fluctuations of the quantum fields about their mean values is used as an input for a variational principle. A simple expression for the renormalized ground-state energy density of closed-shell nuclei is obtained, and all parameters are determined by fitting to the fermi momentum and binding energy of nuclear matter, and to either the surface energy or the surface thickness of heavy nuclei. Calculations for semi-infinite nuclear matter and for ^{40}Ca yield results in reasonable agreement with experiment, but show that renormalizations can be large quantitatively and depend rather strongly on the specific mechanism for renormalization.

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- [Pervez Hoodbhoy^{\(1\)}](#)

Author Affiliations

- 1. Department of Physics, Quaid-e-Azam University, Islamabad, Pakistan

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