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# Effective interactions for nuclear structure calculations

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## Résumé

Experimental interest in nuclei far from stability, especially due to advancements in rare isotope facilities, has stimulated improvements in the description of exotic nuclei. However, standard techniques developed for nuclear structure calculations, Configuration Interaction theory and Energy Density Functional methods, lack either the generality or accuracy necessary for reliable calculations away from stability. Hybrid methods, which combine Configuration Interaction theory and Energy Density Functional methods in order to exploit their beneficial properties, are currently under investigation for improved theoretical capabilities. A new technique to produce nuclear Hamiltonians has been developed, implementing renormalization group methods, many-body perturbation theory, and Energy Density Functional methods. The number of free parameters is limited in order to focus on a connection to the underlying physics. The main benefit of the approach is an improvement in the quality of effective interactions outside of standard model spaces, and an application to the island of inversion region displays the capability of the method.

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