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Microscopic Shell Model Interactions and Effective Operators

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As experimental efforts have shifted towards the study of rare isotopes, the predictive power of the wildly successful (but heretofore phenomenological) nuclear shell model is challenged by the scarcity of nearby data to constrain its parameters. Therefore, the ability to reliably calculate these parameters directly from the underlying nuclear forces, and relying less on experimental data, becomes increasingly urgent as we move away from stable nuclei. In this talk, I summarize recent progress towards this goal using the in-medium similarity renormalization group (IM-SRG) to construct microscopic shell model interactions and effective operators starting from the underlying inter-nucleon forces and currents.

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