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Afternoon Session: Exotic nuclei. Bosonic embedded gaussian ensembles

Monday, October 6, 2014 2:30 PM (2 hours)

Jason Holt
Nuclear forces and exotic nuclei.

Within the context of valence-space Hamiltonians derived from different ab initio many-body methods, I will discuss the importance of 3N forces in understanding and making new discoveries in two of the most exciting regions of the nuclear chart: exotic oxygen and calcium isotopes. Beginning in oxygen, we find that the effects of 3N forces are decisive in explaining why 24O is the last bound oxygen isotope [1,2].
Furthermore, 3N forces play a key role in reproducing spectra, including signatures of doubly magic 22,24O, as well as properties of isotopes beyond the dripline. The calcium isotopes, with potentially three new magic numbers beyond the standard N=20,28, present a unique laboratory to study the evolution of shell structure in medium-mass nuclei. From the viewpoint of two-neutron separation energies and spectroscopic signatures of doubly-magic systems, I emphasize the impact of 3N forces in reproducing the N=28 magic number in 48Ca and in predicting properties of 50-56Ca, which indicate new N=32,34 magic numbers.
Finally, I will highlight new efforts to quantify theoretical uncertainties in ab initio calculations of medium-mass nuclei by exploring resolution-scale dependence of observables in sd-shell isotopic/isotonic chains.

Adrian Ortega
Eigenvalue and eigenvector statistics for bosonic embedded gaussian ensembles

Within the framework in Random Matrix Theory (RMT), there exists the Bosonic Embedded Gaussian Ensembles. In the last few years, there has been a renewed interest in such ensembles. These ensembles display different eigenvalue and eigenvector correlations compared against the canonical ensembles of RMT. I shall describe briefly these bosonic ensembles when the single-particle states are two. Novel results will be presented for three single-particle states.
In this framework, I shall describe also some numerical experiments on a variation of the Bose-Hubbard model, namely the Random Bose-Hubbard model. Another ongoing interesting

project is the study of quantum dynamics in disordered networks, and the roles that play the particle correlations that benefits the transition probability between two ocupation-number states.

Presenters: ORTEGA, Hugo Adrian; HOLT, Jason