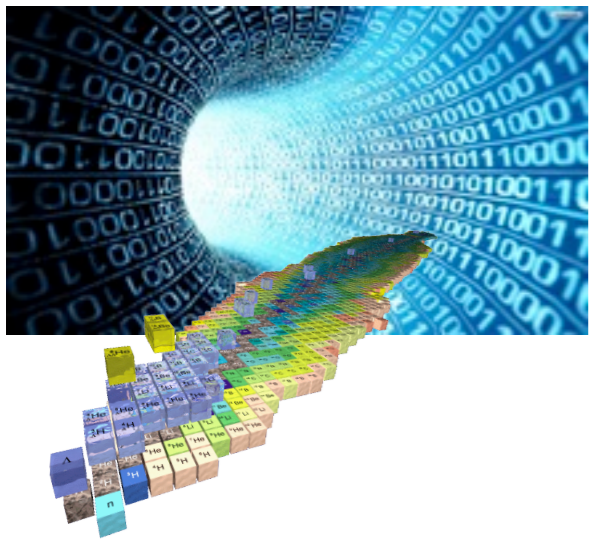


Nuclear Forces from Quantum Chromodynamics

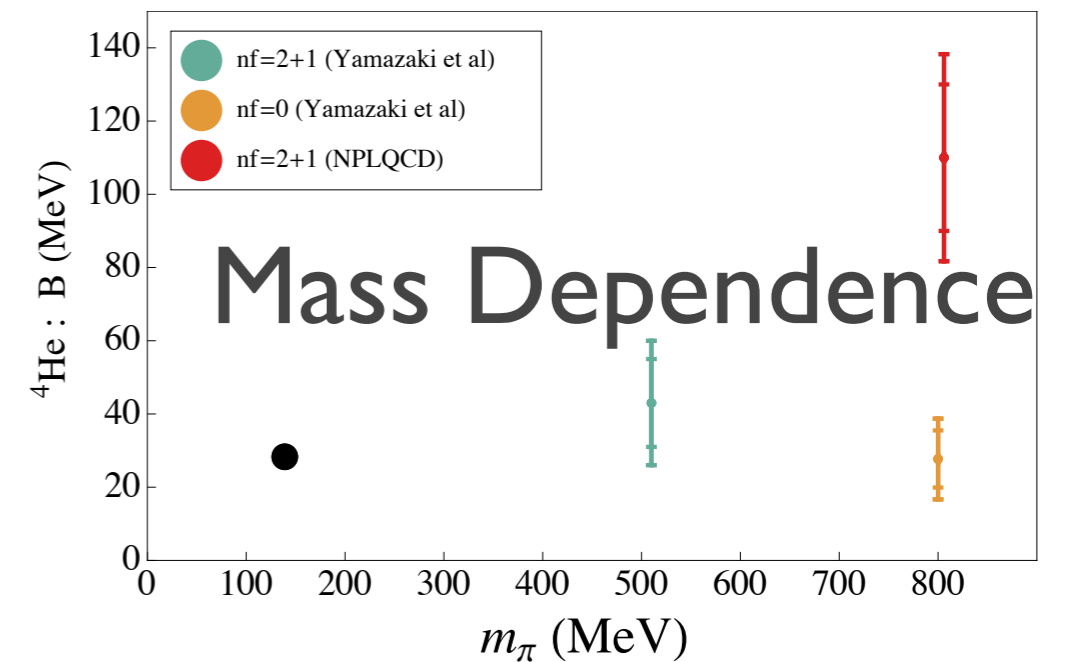
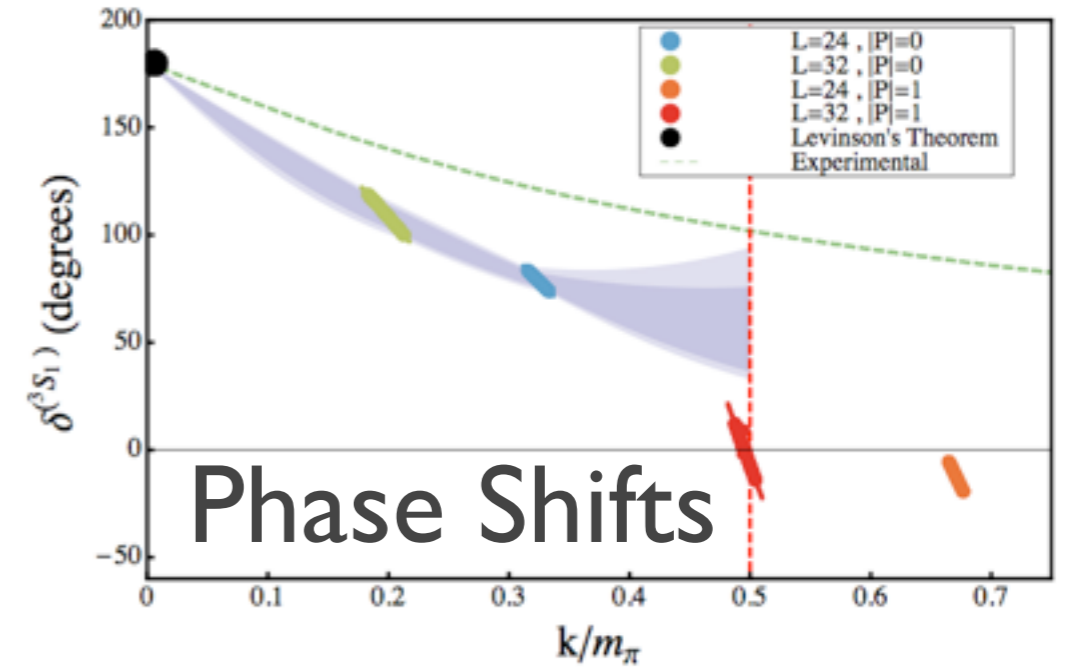
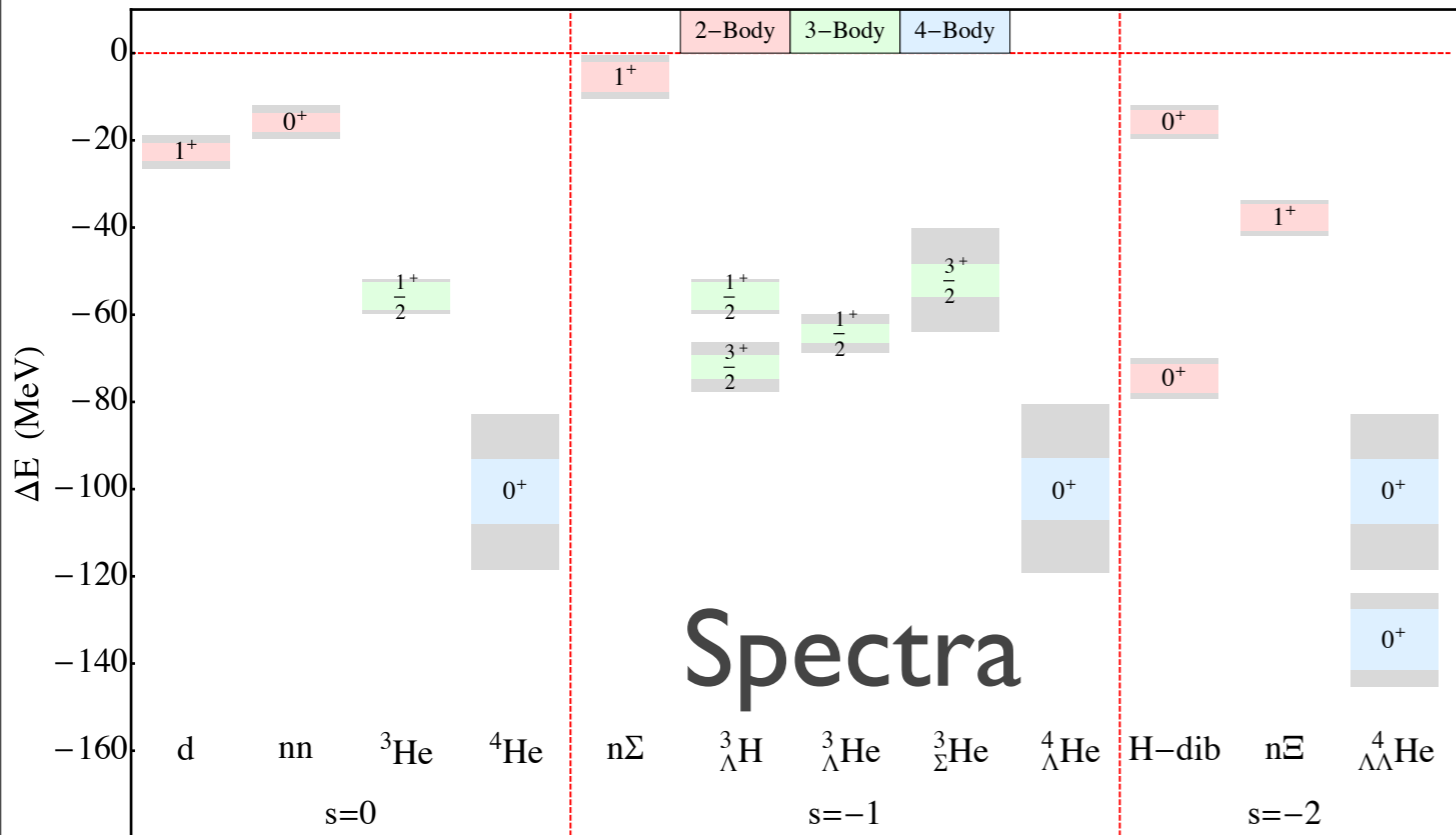
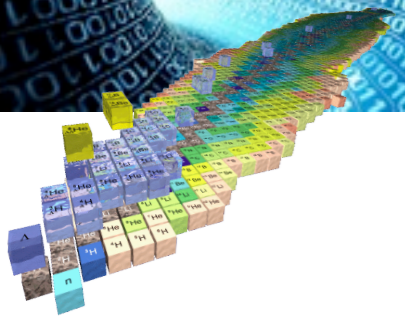


Calculating nuclear forces with Lattice QCD is critical for:

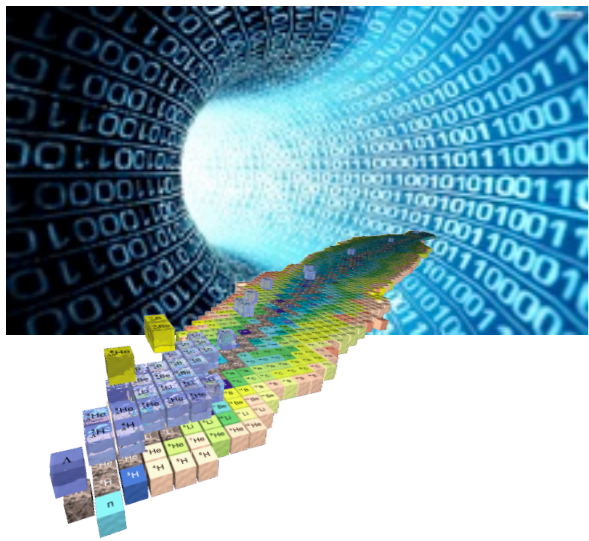
- refining the 3-body and 4-body chiral nuclear forces used in nuclear many-body calculations to provide the requisite accuracy and precision needed for both theory and experiment
- improving the precision of nuclear matrix elements relevant for electroweak processes, such as neutrino interactions, and for possible Dark Matter candidates
- understanding how nuclei emerge from QCD
- exploring exotic few- and many-body systems inaccessible in the laboratory



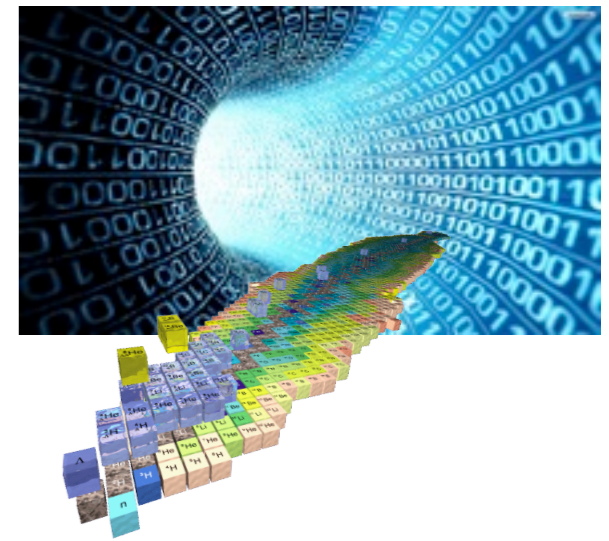
Present Status



- Extensive study of s-shell nuclei and hypernuclei, and baryon-baryon interactions at SU(3) symmetric point
- Similar calculations at a pion mass of ~ 430 MeV almost complete



Future Requirements



Ultimate Goal : Calculations of the nuclear forces, light nuclei and hypernuclei, nuclear matrix elements and reactions at the physical quark masses including electromagnetism

- Continued/increased access to Leadership-Class computing resources
 - coming generations of 100 Pflop, 1 Exaflop machines
- Increased access to capacity-computing resources
- Increased support for HPC capable workforce (SciDAC or similar)
- Close collaboration with nuclear many-body theorists