DNP19-2019-000102

Abstract for an Invited Paper
for the DNP19 Meeting of
the American Physical Society

Chiral effective field theory for the nuclear equation of state[1]

INGO TEWS, Los Alamos National Laboratory

Neutron stars are astrophysical objects of extremes. They contain the largest reservoirs of degenerate fermions, reaching the highest densities we can observe in the cosmos, and probe matter under conditions that cannot be recreated in terrestrial experiments. In August 2017, the first neutron-star merger has been observed, which provided compelling evidence that these events are an important site for the production of elements heavier than iron in the universe. Furthermore, the gravitational-wave signal of such events might shed light upon the nature of strongly interacting matter in the core of neutron stars. To understand these remarkable events, reliable nuclear physics input is essential. In this talk, I will explain how to use Chiral effective field theory and advanced many-body methods to provide a consistent and systematic approach to strongly interacting systems from nuclei to neutron stars and allow precision studies with controlled theoretical uncertainties. I will present recent results for the equation of state relevant for the nuclear astrophysics of neutron stars and neutron-star mergers, and will discuss future directions and opportunities.

[1]This work was supported in part by the U.S. DOE under Grant No. DE-AC52-06NA25396 and by the LANL LDRD program.