Modern few- and many-body simulations of nuclei rely on precise nuclear forces and electro-weak currents. A powerful tool which makes such high-precision calculations possible without losing connection to Quantum Chromodynamics (QCD), the fundamental theory of the strong interaction, chiral effective field theory (EFT). Instead of working directly with quarks and gluons it is more efficient to formulate an effective field theory of QCD with pions and nucleons as explicit degrees of freedom. The relevant symmetries of QCD are by construction implemented in chiral EFT and equip one with a small expansion parameter in the low energy sector. Nuclear forces and currents can then be determined via perturbation theory. The increase of precision is achieved by going to higher orders in this expansion.

In my talk I will review the current status of the construction and implementation of chiral nuclear forces. In the same formalism I will present the most recent calculations of nuclear electro-weak currents. I will show that gauge and chiral symmetry requirements lead to the well-known continuity equations for the current and charge operators which, however, get modified at higher orders. Selected applications will be discussed.

Einführung: Prof. Dr. E. Epelbaum

Die Fakultät lädt alle Interessierten herzlich ein.

Ab 11.45 Uhr Kaffee/Tee im Hörsaal