HK 21: Plenary III

Time: Tuesday 9:00–10:30 Location: Audi-Max

Invited Talk HK 21.1 Tu 9:00 Audi-Max

Lattice QCD in Hadron Physics — •Andreas Schäfer — Institut für Theoretische Physik, Universität Regensburg, 93040 Regensburg, Germany

In recent years Lattice QCD became a most valuable source of information for many aspects of hadron structure which cannot be directly extracted from experiment. Basically, today one performs lattice calculations of experimentally known quantities to estimate systematic errors and then trusts lattice results for similar but unknown quantities within these uncertainties. Typical examples are the spatial structure of hadrons, the role of strange quarks in nucleon structure, the nature (exotic or non-exotic) of hadronic states, and the spin structure of hadrons. Enormous progress was made in nearly all aspects of such calculations, be it algorithms or hardware or the physics interpretation etc. Many crucial topics for modern high precision lattice calculations have to be delegated to talks in the parallel sessions for lack of time, e.g. the crucial role of chiral perturbation theory and the spectroscopy of excited hadrons.

Invited Talk HK 21.2 Tu 9:30 Audi-Max

Nuclear Astrophysics with Radioactive Beams — •Philip Woods — University of Edinburgh

The presentation will consider the remarkable new opportunties for experimental nuclear astrophysics studies that will be provided by the new generation of European radiaoctive beam facilities. These will become factories for explosive nuclear astrophysics studies. The talk will consider the key astrophysical issues that can be addressed at these facilities, and the novel experimental techniques that will be required.

Invited Talk HK 21.3 Tu 10:00 Audi-Max

Nuclear force studies in few-nucleon systems — •Johan Messchendorp — KVI, University of Groningen, Groningen, The Netherlands

Understanding the exact nature of the nuclear force is one of the long-standing questions in nuclear physics. In 1935, Yukawa has explained the pair-wise nucleon-nucleon (NN) interaction as an exchange of a boson. Current NN models are mainly inspired by Yukawa's idea and provide an excellent description of the high-quality database of proton-proton and neutron-proton scattering and of the properties of the deuteron.

The challenge lies in describing systems which involve more than two nucleons. Even for the simplest three-nucleon system, triton, a pair-wise NN interaction fails to describe such a system accurately enough, which has led to the introduction of three-nucleon forces and to alternative approaches such as chiral perturbation techniques. In the last decade, experiments at various laboratories were conducted to provide high-precision data in few-nucleon scattering processes, such as differential cross sections and polarization observables. These data form the basis to understand the various aspects of the many-body interactions via a rigorous comparison with ab-initio and self-consistent calculations including effects such as Coulomb and relativity.

In this paper, a review will be given of the experimental and theoretical activities in the field of few-nucleon systems. In particular, the most recent discoveries in three and four nucleon scattering reactions will be presented.