SYMM 1: Mass Matters: Prospects of Bridging Nuclear Physics, Mass Spectrometry, and Astrophysics

Time: Tuesday 11:00–12:30 Location: Kurt-Alder HS Chemie

Invited Talk SYMM 1.1 Tue 11:00 Kurt-Alder HS Chemie
Mass measurements with RIBs — •Guy Savard — Argonne National Laboratory, Lemont, Illinois, USA

Mass measurements on short-lived isotopes provide key input to our understanding of many physical and astrophysical processes. The ability to make such measurements has grown tremendously over the last decade with a number of laboratories implementing new techniques that have provided higher sensitivity, higher accuracy, and in some cases both. These new approaches will be surveyed and some high profile results they have enabled presented. Coming new capabilities will also be highlighted.

Invited Talk SYMM 1.2 Tue 11:30 Kurt-Alder HS Chemie
LUNA -Experimental challenges in Underground Nuclear Astrophysics Laboratory — •Alba Formicola — INFN-Roma- P.le Aldo Moro, 2 - 00185 Roma

Stellar evolution and related nucleosynthesis play a fundamental role in the understanding of the origin of the chemical elements, the generation of energy, the luminosity of neutrinos and in many related astrophysical problems. The main goal of nuclear astrophysics is to provide a firm base for all these studies. Thousands of nuclear interactions, either strong or weak processes, are of astrophysical interest. For most of them, the knowledge of their cross sections (or reaction rates) at relatively low energy is required to understand the synthesis of the elements. The Laboratori Nazianali del Gran Sasso (INFN) has been for a long time a unique infrastructure hosting an accelerator devoted to Nuclear Astrophysics, the Laboratory for Underground Nuclear Astrophysics (LUNA). The LUNA Collaboration has shown that, by going underground and by using the typical techniques of low background physics, it is possible to measure nuclear cross sections down to the energy of the nucleosynthesis inside stars. I will give an overview of the experimental techniques adopted in underground nuclear astrophysics and will present a summary of the LUNA main recent results and achievements.

Invited Talk SYMM 1.3 Tue 12:00 Kurt-Alder HS Chemie
The r-process: connecting astrophysics and nuclear physics — •Almudena Arcones — Institut für Kernphysik, Technische Universität Darmstadt, Germany — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — Max-Planck-Institut für Kernphysik, Heidelberg, Germany

Our understanding of the origin of heavy elements by the r-process (rapid neutron capture process) has made great progress in the last years. In addition to the gravitational wave and kilonova observations for GW170817, there have been major advances in the hydrodynamical simulations of neutron star mergers and core-collapse supernovae, in the microphysics included in those simulations (neutrinos and high density equation of state), in galactic chemical evolution models, in observations of old stars in our galaxy and in dwarf galaxies, and in nuclear theory and experiments. This talk will report on recent breakthroughs in understanding the extreme environments in which the formation of the heavy elements occurs, as well as open questions regarding the astrophysics and nuclear physics involved.