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Nuclear Methods for Astrophysical Purposes

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It is widely known that nucleosynthesis takes place into stars. Element lighter than Iron and heavier than Lithium (partially produced in primordial nucleosynthesis) are in fact produced during stellar evolution by means of the interaction between charged and neutral particles. About charged particles its interactions is strongly hampered by the presence of the Coulomb barrier –usually around some MeV –that is much higher than the typical energies of thermal agitation of particles inside a star (between tenth and thousands of keV). This fact generates the strong, exponential fall of the cross-section that can be observed in many experiments that have been conducted through the years. This often makes really hard –when not virtually impossible –the study of this reactions in our laboratories around the world. Regarding the reactions involving neutrons in the entrance channel, experiments are complicated by the many difficulties involved in produce a suitable neutron beam. To overcome these problems many indirect methods have been developed through the last decades, and in particular the Asymptotic Normalization Coefficient (ANC) method and the Trojan Horse Method (THM) have proven to be quite useful to study reactions involving charged particles and neutrons in the entrance channel.

Primary author: GIUSEPPE FERDINANDO D'AGATA, JAROMIR MRAZEK 1 , VACLAV BURJAN 1 , ANASTASIA CASSISA

Presenter: D'AGATA G.F. (Nuclear Physics Institute of the Czech Academy of Sciences, Řež)

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