HAW14-2014-000912

Abstract for an Invited Paper
for the HAW14 Meeting of
the American Physical Society

Transfer Reactions: From Nuclear Structure to Astrophysics[1]

CATHERINE DEIBEL, Louisiana State University

Transfer reactions are powerful tools for studying the single-particle structure of nuclei and improving our understanding of astrophysical reaction rates. While historically much of the progress of the past has focused on the study of nuclei close to stability using stable beams, recent developments of radioactive ion beams have extended transfer reaction studies farther from stability, opening up hitherto unexplored areas of the nuclear chart. New experimental techniques to take full advantage of these beams have been developed to study transfer reactions in inverse kinematics with high efficiency and resolution. For example, the new HELIcal Orbit Spectrometer (HELIOS) at ATLAS and the Oak Ridge Rutgers University Barrel Array (ORRUBA) at HRIBF have allowed the study of multiple neutron-rich isotopes through (d,p) reactions on unstable beams ranging from ^{15}C [1] to ^{132}Sn [2]. In addition, stable beam transfer reactions still play a crucial role, both through providing stringent tests of theoretical models and via new experimental approaches using coincidence techniques. Reaction rates involving proton-rich nuclei have been studied indirectly with light, stable beams using, for example, high-resolution charged-particle spectroscopy of neutron pick-up reactions such as (d,t) [3] and (^{3}He,α) [4] enabling measurements of excitation energies, spins and particle partial widths of resonances important in explosive nucleosynthesis. The general mechanism of transfer reactions will be discussed and several recent examples of transfer reaction studies, using both stable and radioactive ion beams, relevant for nuclear structure and nuclear astrophysics will be presented.

[1] A. H. Wuosmaa *et al.*, Phys. Rev. Lett. **105**, 132501 (2010).
[2] K. L. Jones *et al.*, Nature **465**, 454 (2010).
[3] D. Irvine *et al.*, Phys. Rev. C **88**, 055803 (2013).
[4] C. M. Deibel *et al.*, Phys. Rev. C **80**, 035806 (2009).

[1]Supported by US Department Of Energy Grant No. DE-FG02-96ER40978.