

UNIVERSITY OF NOTRE DAME  
DEPARTMENT OF PHYSICS

# NUCLEAR SEMINAR

Monday, February 5

## *Proton Transfer Reactions Studied Using the VANDLE Neutron Detector Array*

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Single nucleon transfer reactions are powerful tools for the study of the structure of nuclei. The spectroscopic properties of unstable isotopes help to constrain nuclear structure models of more exotic nuclei. In inverse kinematics, proton transfer reactions, such as (d,n), may be used to study the properties of short-lived radioactive ion beams (RIBs). By measuring the energy and angle of the outgoing neutron, it is possible to extract spectroscopic information about the single-particle proton states of the recoil nucleus in much the same way as probing neutron states using neutron transfer (d,p). With the development of new accelerator facilities, such as the Facility for Rare Isotope Beams (FRIB) in the U.S., comes the need for new spectroscopic tools. The Versatile Array of Neutron Detectors at Low Energy (VANDLE) is an array of plastic scintillator bars, which are used to measure neutrons using a time-of-flight method with large angular coverage. In 2016, at the University of Notre Dame, stable beams of  $^{12}\text{C}$  and  $^{16}\text{O}$  at energies near the Coulomb barrier were used to perform (d,n) measurements in inverse kinematics using VANDLE as a proof-of-concept for future proton transfer reaction measurements. Angular distributions from this run will be presented and will be compared to previous measurements of  $^{12}\text{C}(d,n)$  [1] and  $^{16}\text{O}(d,n)$  [2] as well as to recent calculations performed using an exact three-body Faddeev-AGS method [3].

[1] - H.R. Schelin et. al., Nucl. Phys. A, 414, 1 pg. 67-84 (1984)

[2] - S.T. Thornton, Nucl. Phys. A, 137 531-544 (1969)

[3] - A. Deltuva, Phys. Rev. C 92, 064613 (2015)

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**4 pm – 5 pm**  
**Nuclear Science**  
**Laboratory**  
**124 Nieuwland**  
**Science Hall**

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All interested  
persons are  
cordially invited  
to attend

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Refreshments will be  
served prior to the  
seminar in room 124