

NUCLEAR SEMINAR

- Speaker:** Dr. Scott Marley
University of Notre Dame
- Title:** *Study of the Structure of ${}^9\text{C}$ via the $d({}^{10}\text{C},t){}^9\text{C}$ Reaction and the Reliability of Ab-Initio Transfer Form Factors*
- Date:** Monday, September 17, 2012
- Time:** 4:00 pm EST
- Place:** Nieuwland Science Hall Room 124

*Refreshments will be served prior to the seminar in room 124.

ALL INTERESTED PERSONS ARE CORDIALLY INVITED TO ATTEND

The structure of the neutron-deficient nucleus ${}^9\text{C}$ is poorly known. Only a few excited states have been observed and little information exists on their single-particle characteristics. The measured ground-state magnetic dipole moment is anomalously small in comparison to the mirror nucleus ${}^9\text{Li}$, suggesting possible higher order configurations in the ground-state wave function. Both ${}^{10}\text{C}$ and ${}^9\text{C}$ are accessible via *ab-initio* calculations using modern techniques such as the Quantum Monte Carlo (QMC) approach [1]. In addition to the excitation energies in the $A = 9$ and 10 systems, it is possible to calculate the spectroscopic overlaps that are relevant for the neutron-removing reaction ${}^{10}\text{C}(d,t){}^9\text{C}$ with the wave functions for both ${}^9,{}^{10}\text{C}$. In order to test the predictions from this and other calculations of the neutron-pickup spectroscopic factors, the ${}^{10}\text{C}(d,t){}^9\text{C}$ reaction, in inverse kinematics has been studied. The radioactive ${}^{10}\text{C}$ beam was produced at the ATLAS In-flight facility through the $p({}^{10}\text{B}, {}^{10}\text{C})n$ reaction using a 185-MeV ${}^{10}\text{B}$ beam incident on a cryogenic H_2 gas cell. The secondary ${}^{10}\text{C}$ beam had an energy of 171 MeV and an intensity of approximately 2×10^4 pps. The beam was incident on a $660 \mu\text{g}/\text{cm}^2$ deuterated polyethylene $(\text{CD}_2)_n$ target. Tritons were detected in a series of annular double sided silicon detectors covering θ_{lab} between 8 and 42 degrees. The heavy recoils from particle-bound, or unbound states in ${}^9\text{C}$ were detected in a set of forward-angle silicon detectors in a ΔE -E configuration. The ground-state transition was clearly observed and angular-distribution data were extracted. The neutron-pickup spectroscopic factor was deduced from a comparison with distorted-wave Born approximation calculations, with bound-state form factors calculated either with the usual approach of calculating a n - ${}^9\text{C}$ bound state in a Woods-Saxon potential, or from wave functions derived from QMC calculations. A comparison between the results using these two methods will be presented providing insight into the reliability of form factors for nucleon transfer derived from *ab-initio* approaches.

[1] S. C. Pieper and R. B. Wiringa, Annu. Rev. Nucl. Part. Sci. 51:53–90 (2001).

