Developing new methods to investigate nuclear physics input to the cosmological Lithium problem

K.J. Cook,[1] D.H. Luong,[1] and E. Williams[1]

[1]*Department of Nuclear Physics, The Australian National University, ACT 0200, Australia*

A significant challenge to nuclear astrophysics is the cosmological lithium problem, where models of Big Bang nucleosynthesis indicate abundances of ^{7}Li two to four times larger than what is inferred via spectroscopic measurements of metal-poor stars. Recent experimental techniques developed for nuclear reaction studies at energies near the fusion barrier, if extended to reactions of astrophysical interest, may help understand nuclear reactions that can affect the production of ^{7}Li during the Big Bang.

Experiments at the ANU, using new experimental techniques, have provided complete pictures of the breakup mechanisms of light nuclei in collisions with heavy targets, such as ^{208}Pb and ^{209}Bi [1]. These experiments revealed dominant breakup mechanisms which had not even been considered in theoretical models. The study of the breakup of ^{6}Li and ^{7}Li following interactions with ^{58,64}Ni and ^{27}Al acts as a stepping stone from this previous work towards future experimental studies of breakup reactions of astrophysical relevance. In all cases studied, breakup is dominantly triggered by transfer of nucleons between the colliding partners, but the transfer mechanisms are different. The findings of these experiments and experimental considerations for extensions to reactions of light nuclei, such as $d+^{7}$Be, will be presented.

---

[1] D.H. Luong *et al.*, Phys. Lett. **B 695**, 105109 (2011).