Contribution ID: **57** Type: **Invited Presentation**

Fusion with Exotic Nuclei Using Microscopic Methods

Thursday, 1 June 2017 15:30 (15 minutes)

Fusion reactions are affected by nuclear structure and many dynamical processes.Some effects of internal nuclear structure on reactions such as heavy-ion fusion can be seen by studying features of experimental fusion barrier distributions.Until more recently, theoretical modelling of these reactions were largely of phenomenological nature. Whilst this approach is useful to start with and works very well for light stable systems, moving towards heavier and more exotic systems demands more powerful theory to be able to both describe processes observed experimentally and predict fusion cross sections for exotic nuclei. Upcoming exotic beam facilities provide motivation to understand reaction with neutron rich nuclei theoretically. Microscopic approaches based on energy density functionals (EDF) provide insightful tools to study heavy-ion reactions including fusion. The same EDF can be used to describe both structure and reaction properties on the same footing [1].

Based on this method, one can investigate reaction dynamics, such as near barrier fusion, with both stable and exotic nuclei [2,3]. We use both static and time-dependent versions of the EDF method to study the fusion reactions along isotopic chains. For instance, there are clear differences between potential barriers calculated with static and time-dependent Hartree-Fock methods.

A key result is that the dynamics plays a major role in the reaction, washing out static effects such as neutron skins which are expected to lower the bare potential barrier [2]. Instead, coupling to transfer channels, which have been studied microscopically in [3], is shown to play an important role.

References:

[1] C. Simenel, M. Dasgupta, D. J. Hinde and E. Williams, Phys. Rev. C 88, 064604 (2013).

[2] K. Vo-Phuoc, C. Simenel and E. C. Simpson, Phys. Rev. C 94, 024612 (2016).

[3] K. Godbey, A. S. Umar and C. Simenel, Phys. Rev. C 95, 011601(R) (2017).

Primary author: Dr SIMENEL, Cedric (Australian National University)

Co-authors: Dr SIMPSON, Edward (Australian National University); Ms VO-PHUOC, Kirsten (Australian National University); Mr GODBEY, Kyle (Vanderbilt University); Prof. UMAR, Sait (Vanderbilt University)

Presenter: Dr SIMENEL, Cedric (Australian National University)

Session Classification: Breakout 2