Notre Dame Science
Department of Physics

USING ULTRACOLD ATOMS TO MODEL NUCLEI AND NEUTRON MATTER

Colloquium

Prof. Ken O'Hara
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Wednesday, September 14, 2011
4:00 P.M. NSH 118
(Refreshments at 3:30 P.M. NSH 202)

It may seem surprising that a dilute, ultracold atomic gas could share anything in common with nuclei and/or neutron star matter since the details of their interactions and their absolute energy scales differ so dramatically. Yet when the deBroglie wavelength greatly exceeds the range of interactions and the scattering length is large, universal predictions that apply equally to a Fermi gas or dilute nuclear matter are expected. For example, we have observed the Efimov effect, first predicted in the context of nuclear physics, wherein three particles form an infinite geometric sequence of three-body bound states where successive states are related by a universal scale factor. I will also discuss measurements of the universal interaction energy for a strongly-interacting Fermi gas with zero-range interactions that would be relevant to the equation of state for extremely low-density neutron matter. By recently demonstrating a Fermi system with a large effective range in addition to a large scattering length, we hope to extend the pertinence of such measurements to neutron matter at densities of astrophysical interest.

Prof. O'Hara received his B.S. in Physics from the University of Notre Dame in 1994

All interested persons are cordially invited to attend.