Notre Dame Science
Department of Physics

TAMING THE COMPUTATIONAL SCALE EXPLOSION IN THE NUCLEAR MANY-BODY PROBLEM

Prof. Mark Caprio
Department of Physics , University of Notre Dame

Monday, April 30, 2012
4:00 P.M. NSH 124

A major outstanding problem in nuclear theory lies in developing the connection between single-particle and collective degrees of freedom, that is, predicting strong collective correlations which arise in the motion of nucleons within the nucleus. In principle, once the nucleon-nucleon force is known, prediction of nuclear structure is simply an exercise in solving the many-body Schrödinger equation. However, the nucleus is a strongly-correlated, finite size quantum many-body system, lying in the computationally challenging regime between the few-body problem and the thermodynamic limit. Direct quantum solution is overwhelmed by a combinatorial explosion in the dimension of the model space: the dimension of the eigenproblem rapidly becomes intractable as the number of nucleons and relevant single-particle states increases. This talk will introduce both the challenges in the nuclear problem and some approaches to *overcoming* them, through the use of group theory, symmetries, and optimized bases for the many-nucleon dynamics.

Nuclear Seminar

All interested persons are cordially invited to attend.