

# Neutrino-Nucleus Interactions Collaboration

A NP-HEP collaborative effort to improve modeling of  $\nu$ - $A$  scattering for  $\nu$  oscillations and supernova  $\nu$  experiments

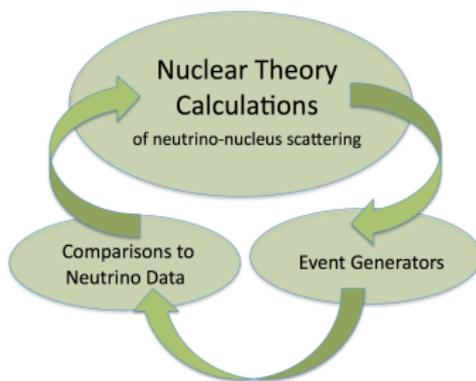
A white paper describing this effort has been submitted to the HEP and NP Offices of Science of the DOE

The NNIC collaboration involves the following researchers at four national labs:

- **ANL**: Lovato, Pieper, and Wiringa
- **LANL**: Carlson and Gandolfi
- **TJNAF**: Schiavilla
- **FERMILAB**: Brice, Morfín, Perdue, Zeller

# $\nu$ - $A$ Interactions for HEP Experiments

- The NNIC has been set up to address the need to provide reliable estimates of  $\nu$ - $A$  cross sections in a wide energy range
- The theory effort will focus on the development of quantum Monte Carlo (QMC) methods for *ab initio* calculations of electroweak response in  $^{12}\text{C}$  and  $^{40}\text{Ar}$
- The experimental effort will focus on the implementation of these QMC results into  $\nu$ - $A$  event simulators



# Request Outline

The long-term goal of NNIC is to provide a realistic and consistent dynamical framework to describe  $\nu$ - $A$  interactions

Given the breadth and depth of the research program, a significant level of support for postdocs (3 in steady state) and long-term visitors is justified

Travel funds to ensure effective collaboration and to hold an annual small workshop are also justified

Fermilab has already seeded this effort by providing funds to hire a postdoc to work with the LANL group

The NNIC program could help establish a significant research community at the intersections of nuclear and particle physics, relevant to neutrino physics

This research could eventually grow into a national program, including faculty, laboratory staff, postdocs, and graduate students