U.S. DEPARTMENT OF ENERGY
INCITE
LEADERSHIP COMPUTING

**Type:** New
**Title:** "Nuclear structure and nuclear reactions"


**Principal Investigator:** James Vary, Iowa State University
**Co-Investigators:** Joseph Carlson, Los Alamos National Laboratory
Pieter Maris, Iowa State University
Hai Ah Nam, Oak Ridge National Laboratory
Petr Navratil, Lawrence Livermore National Laboratory
Witold Nazarewicz, University of Tennessee
Steven Pieper, Argonne National Laboratory


**Scientific Discipline:** Physics: Nuclear Physics

**INCITE Allocation:** **43,000,000 processor hours**
**Site:** Oak Ridge National Laboratory
**Machine (Allocation):** Cray XT (28,000,000 processor hours)
**Site:** Argonne National Laboratory
**Machine (Allocation):** IBM Blue Gene/P (15,000,000 processor hours)


**Research Summary:**
Developing a comprehensive description of all nuclei (stable and unstable) and their reactions requires investigations of rare and exotic isotopes with unusual proton-to-neutron ratios that are difficult to produce and study experimentally because of their short lifetimes. We perform state-of-the-art simulations to provide needed predictions where direct experiment is not possible or is subject to large uncertainties.

Predictions for the structure and reactions of nuclei, with assessed uncertainties, are important for the future of the nation's energy and security needs. Such calculations are relevant to many applications in nuclear energy, nuclear security and nuclear astrophysics, where rare nuclei lie at the heart of nucleosynthesis and energy generation in stars.


2011 Top awards by size of award
Award amts in millions of cpu hours

1. 110 – Climate
2. 80 – LQCD
3. 80 – Supernovae
4. 75 – Catalysis
5. 60 – Combustion
6. 60 – Supernovae
7. 50 – ITER Fusion
8. 50 – Magnetic materials
9. 50 – Blood flow/stroke
10. 50 – Supernovae
11. 50 – Plasma/NIF
12. 45 – Stress/cracking
13. 45 – Boeing CFD
14. 43 – Nuclear theory*

+ 43 more awards of smaller amts

*We received 85% of proposed amt.