SAND2011-1817P

Nurture discovery science for fundamental breakthroughs in interfacial science, quantum phenomena, materials physics, bioscience, gas-phase chemistry, nanomaterials systems & architecture, and math algorithms

Sandia's existing facilities and capabilities are a good start to developing solutions to the energy, climate, and infrastructures challenges defined by the President, but they are not the complete answer. We will need to develop new facilities, new capabilities, and expand or establish partnerships with other research institutions (national labs, universities, industry).

Sandia must establish new laboratory centers because the research they will undertake is so novel that nothing now exists to pursue it to its potential. In order to nurture this discovery science and engineering, Sandia seeks to leverage its expertise to

- establish an energy storage research center, in particular on bio-inspired materials for energy storage (joint with PNNL) and foundational electrochemistry;
- develop an international collaboration for nuclear fusion systems research in support of International Thermonuclear Experimental Reactor (ITER) in the critical area of plasma-materials interactions;
- win a new core BES/MS program start in strong light-matter interactions and another to investigate the growth and electron transport of graphene;
- develop successful scientific focus area in arid-land ecology of fungal microbial communities for improved cellulolytic processes for more efficient biofuels production;
- start an OFES user center for low-energy plasma diagnostics;
- grow fundamental math/CS research in data-centric analysis and uncertainty quantification and develop strategy to inject advances into mission organizations/applications; and
- start a BES center for advanced crystalline materials growth science.

In all of these efforts, Sandia would seek out collaborative partnerships with other institutions in order to better leverage all available capabilities. A shining example of this collaborative spirit is the Center for Integrated Nanotechnologies (CINT), which we co-host with Los Alamos. Sandia will continue to nurture and grow this relationship and expand CINT's impact on Sandia's mission areas and our partnerships with industry.

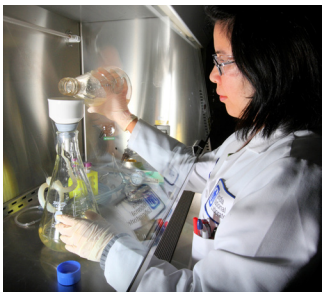
High-Performance Computing for All Researchers

New work on Sandia's Red Storm is making high-performance computing (HPC) more accessible—removing it from the solitary confinement of its specialized operating system. Red Storm's HPC capabilities are also being utilized in unclassified modes to contribute to global efforts to combat climate change and help solve other problems of national interest.

A technique called virtualization in effect separates the hardware of a computer from its operating system. Operating through this programming translation, a program not native to Red Storm can run on nodes of the machine. Researchers around the world should one day be able to run their own simulations on HPC machines at remote sites without having to reconfigure their software to the machine's specific hardware/software environment. This work, for the first time, brings defense-scale HPC to bear on alternative energy projects that otherwise could take months or even years to complete.

Novel Biofuels Research

Sandia researchers are working to modify an endophytic fungus so that it will produce fuel-type hydrocarbons for transportation purposes. The fungi turn cellulosic material directly into fuel-type hydrocarbons without any mechanical breakdown—eliminating the cost-intensive industrial processes that are typically required to break down biomass. Through genetic manipulation, the Sandia team hopes first to identify these pathways, and then to improve the yield and tailor the molecular structure of the hydrocarbons it produces.



Sandia's Eizadora Yu prepares biomass harvested from liquid fungal cultures for nucleic acid analysis.

For more information, contact:
PI/Manager Name, 505-XXX-XXXX, anyname@sandia.gov

SAND2010-xxxxX (Month 2010)

Sandia National Laboratories is a multiprogram laboratory managed & operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

NNSA National Nuclear Security Administration

Sandia National Laboratories