ALCF Provides U.S. with Award-Winning Resources

- Intrepid, the IBM Blue Gene/P system at the ALCF, ranked No. 1 on the Graph 500 list for the second consecutive year.
- The IBM Blue Gene®/Q again topped the Green500 list for delivering significantly better performance than its predecessor system with the same number of cores and only a marginal increase in power consumption.
- For his work at the ALCF in multiscale brain blood-flow simulations, George Karniadakis of Brown University was named one of five finalists selected in 2011 for the prestigious Gordon Bell Award.
- Two DOE OASCRs awards were given at the SciDAC Annual Conference in July, 2011, for Argonne computer visualizations modeling multi-scale blood flow and early galaxies.
- The ALCF houses Intrepid, an IBM Blue Gene/P, one of the world's fastest computers for open science. Intrepid enables users to address a wide array of problems in science and engineering at unprecedented scale and speed. Despite its power, the energy-efficient system uses one-third the electricity of comparably sized machines built with more conventional parts. President Obama awarded IBM with a National Medal of Technology and Innovation for its Blue Gene family of supercomputers.

IBM Blue Gene Supercomputer recipient of the 2008 National Medal of Technology and Innovation

ALCF wins EStar award

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U.S. DEPARTMENT OF ENERGY

Argonne National Laboratory is a U.S. Department of Energy laboratory managed by UChicago Argonne, LLC

March 2012
alcf-leadingedge-0312

Argonne NATIONAL LABORATORY | Argonne Leadership Computing Facility

Leading-Edge Supercomputing Key to National Competitiveness

With new challenges to American competitiveness—globalization, high-speed communications and energy sustainability issues—our top scientists and researchers need world-class, supercomputing resources for discovery and innovation to drive U.S. productivity and leadership in world markets and to raise the standard of living for all Americans.

Sponsored by the U.S. Department of Energy's Office of Science, the Argonne Leadership Computing Facility (ALCF) works hand in hand with the world's best scientists to enable transformative research to solve the most difficult challenges in biology, chemistry, energy, climate, materials, physics, and other scientific realms—discoveries that will allow the nation to address key issues, like developing sustainable energy, guarding the health of our citizens, and protecting American economic security.

Multipurpose Research Facility Leads Advances in Industry, Medicine and More

Unlike single-purpose research facilities, the supercomputing resources at the ALCF are broadly applicable, thereby providing critical support for dramatic advances in American industry, medicine, and science.

Since its founding in 2006, the ALCF has provided more than 4 billion compute hours on some of the world's most powerful supercomputers to scientists at work on pressing issues of national importance, including efforts to:

- design technologies to reduce carbon emissions
- enhance the safety and availability of nuclear energy
- assess the impacts of climate change to guide global environmental policy
- gain insight into deadly human blood diseases and dangerous heart rhythm disorders
- model the molecular basis of Parkinson's disease and related diseases of the brain to speed development of drug therapies
- accelerate the pace of discovery in hydrogen fuels research
- validate computer models used in mapping earthquake hazards

Delivering Faster, More Powerful Resources to Meet Growing National Needs

As the nation's need for scientific computing grows, scientists need increasingly powerful supercomputing resources to tackle ever more complex phenomena. ALCF's next supercomputer, Mira, the 10-petaflops Blue Gene/Q system, is scheduled to be delivered in 2012.

As one of the world's most powerful supercomputers, Mira will feature a peak speed nearly twenty times faster than its predecessor, and larger memory and storage capacity. With it, researchers will be able to design new drugs and therapies faster, analyze climate change, and be able to better predict the occurrence and intensity of natural disasters.

ALCF Removes Barriers to Innovation: Cuts R&D Costs, Speeds Time to Market

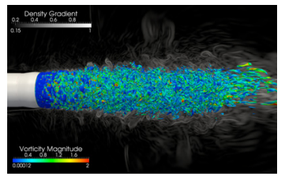
Staying competitive and innovative in industry requires advanced computing capabilities that are often prohibitively complex or expensive to maintain in-house. The ALCF removes this barrier by giving industry the ability to tap into world-class high-performance computing systems to tackle key challenges, reduce costs and speed time-to-solution. Whether for small-scale modeling and simulation or large-scale, computationally intensive projects, the ALCF can meet a wide range of near- and long-term computational needs to help U.S. industry maintain a competitive edge.

ALCF Collaborates with Industry to Protect U.S. Market Share

The ALCF offers computing capability and technical expertise to some of the most well-known companies seeking transformative products and technologies for industry. Among these are Pratt & Whitney and Procter & Gamble. Others who have used ALCF resources to benefit their industry applications and to reduce time-to-solution include General Electric Global Research and the National Institute of Standards and Technology.

INNOVATION CASE STUDY #1

ALCF Helps GE Deliver Low-Noise Wind Turbines and Jet Engines



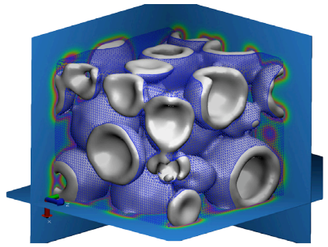
Understanding the complex turbulent mixing noise sources for wind turbine airfoils and jet exhaust nozzles is vital to delivering the next generation of low-noise wind turbines and jet engines. Using ALCF resources, scientists at GE Global Research are investigating methods to reduce airfoil trailing edge noise—a key component in wind turbine noise generation. Predicting noise from first principles, while numerically expensive, is a promising method to characterize noise for hard-to-measure details and sources.

"Simulation-based aeroacoustics via large-scale computing—the focus of this collaboration with ALCF—is a key enabler to tackling the yield-limiting noise barrier for wind turbines."

—Dr. Gary Leonard, GE Global Research

INNOVATION CASE STUDY #2

ALCF Lets Procter & Gamble Develop Better Consumer Products



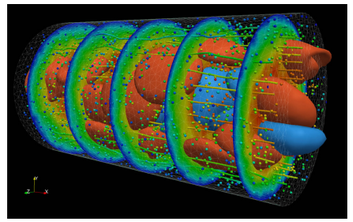
Procter & Gamble (P&G) researchers used the Blue Gene/P system at the ALCF to investigate the molecular mechanisms of bubble formation in foams. Their access to ALCF resources allowed them to perform computer simulations at an unprecedented scale on the dissolving of soap and foaming of suds. An understanding of how suds form and break down is critical in the development of many consumer goods, foods, and fire control materials. Ultimately, the work is expected to help P&G formulate products faster and more efficiently. The consumer wins by getting better products sooner, and at better value, than would have been possible using traditional methods.

"We wouldn't be able to conduct a computational experiment of this size without our partnership with Argonne. Through this research, we have experienced a dramatically exciting new approach to evaluate materials."

—Tom Lange, Procter & Gamble

INNOVATION CASE STUDY #3

ALCF Aids Research to Treat Deadly Diseases of the Brain

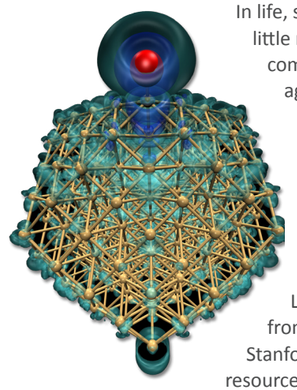


Brain aneurysms, bulges in brain blood vessels, lead to strokes for over 40,000 Americans each year. Cerebral malaria, a disease that inhibits blood flow within the brain, kills more than 1.5 million people worldwide each year. To find new treatments for these and other devastating diseases, doctors need to understand how the three types of blood vessels groups of the brain work, both alone and together.

Professor George Karniadakis from Brown University is leading a team of researchers using ALCF resources to create highly detailed models of blood flow within the complex blood vessel networks in the brain. The ALCF's powerful supercomputer allows the researchers to create 'multiscale' models—models that show the intricacies of all three scales of blood vessel networks working together. Multiscale models provide doctors with the most realistic picture of blood flow in the brain, and the greatest hope for accelerating research that may lead to improved diagnosis and treatment for patients with blood flow complications.

INNOVATION CASE STUDY #4

ALCF Paves Way for Better Catalytic System Designs for Industry



In life, sometimes to get the ball rolling, you need a little nudge. In a chemical reaction, that nudge often comes in the form of a catalyst. A catalyst is an agent that speeds a chemical reaction along, or causes a reaction that otherwise would not have occurred. Platinum, a common catalyst, is used in catalytic converters to remove toxins from exhaust. Improved emissions control requires an understanding of how catalysts behave at their most fundamental atomic level—the nanoscale. Jeff Greeley at Argonne National Laboratory leads a team, including researchers from the Technical University of Denmark and Stanford University, that uses the supercomputing resources at the ALCF to study catalytic nanoparticles. Calculating catalysis on particles with as few as one thousand atoms takes several days on the world's fastest supercomputers. The process is so time intensive and the calculations are so complex, the research would be impossible without supercomputers like the ALCF's Blue Gene/P. With access to the world-class computing resources needed to explore the behavior of catalysts at the nanoscale, Greeley and his team are paving the way for improved catalytic system designs with wide-ranging industrial applications.

Mission and Vision

The ALCF's mission is to accelerate major scientific discoveries and engineering breakthroughs for humanity by designing and providing world-leading computing facilities in partnership with the computational science community.

The ALCF strives to be the leading computational center for extending the frontiers of science by facilitating research into key national problems that require innovative approaches and the largest-scale computer systems.

Research done at the ALCF carries with it the potential to make a significant impact for our country. Access to our supercomputing resources can mean a huge leap forward in their work, so we encourage scientists to think well beyond today, and to imagine propelling their research forward by years or even decades.

Leadership Computing and Computational Science

The ALCF is a national user facility funded by the U.S. Department of Energy, but open to all. ALCF computing time and staff resources are provided at no cost to users through multiple, peer-reviewed programs. ALCF supports research and engineering in a wide variety of disciplines. Projects used nearly 1.2 billion core hours at the ALCF in 2011. ALCF staff provided intensive computational science support to over 80 projects.