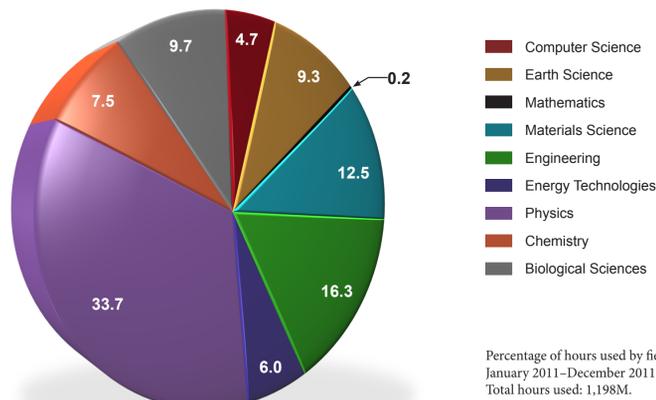


INSPIRING INNOVATION IN INDUSTRY THROUGH SCIENCE

Argonne Leadership Computing Facility

Leadership Computing and Computational Science

The Argonne Leadership Computing Facility (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. Industrial users are encouraged to apply. 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.

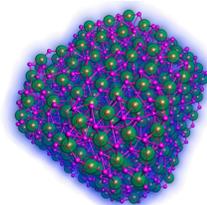


Percentage of hours used by field January 2011–December 2011. Total hours used: 1,198M.



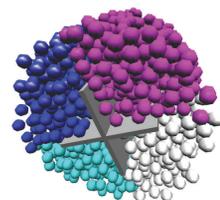
Breakthrough Science and Engineering

The Ultimate Battery Chemistry: Rechargeable Lithium/Air



A rechargeable Lithium/Air battery can potentially store ten times the energy of a Lithium/Ion battery of the same weight, making practical widespread use of fully electric cars. An interdisciplinary effort between IBM Research, Vanderbilt University, Oak Ridge National Laboratory (ORNL), and Argonne National Laboratory (ANL) is focusing on this problem, using ALCF resources to provide useful insights for the design of Li/ Air cells in solving the discharge/recharge reactions at the electrode-electrolyte interface in the future.

New Insights into Concrete's Flow Properties



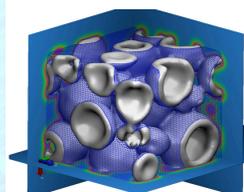
Researchers from the National Institute of Standards and Technology are leveraging Intrepid's computational resources to shed light on the mechanisms that control the flow and spread of concrete.

Improving Aircraft Engine Combustor Simulations



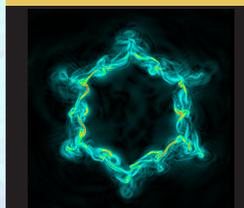
Pratt & Whitney explored leading-edge combustor design methods using ALCF's Intrepid system. The research led to improved capabilities and reduced solution times for three-dimensional combustor simulations. P&W is applying these improvements to the company's next-generation engine to deliver unprecedented reductions in emissions, noise, and cost of ownership compared to current engines.

Developing Better Consumer Products



Procter & Gamble researchers used the Intrepid system at the ALCF to perform unprecedented computer simulations on the molecular mechanisms of bubble formation in foams. 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..

Large-Eddy Simulation for Green Energy and Propulsion Systems



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.

World-Class Computing



Intrepid
 Production Scientific and Engineering Computing
 ▶ 557 TeraFLOPS
 Blue Gene/P

Eureka
 Data Analysis and Visualization
 ▶ 111 TeraFLOPS with 200 GPUs

Fusion
 Mid-Range Computing
 ▶ 26 TeraFLOPS,
 Intel architecture,
 12 Terabytes of memory



Mira
 Coming in 2012
 Unprecedented Scaling and Networking
 ▶ 10 PetaFLOPS IBM Blue Gene/Q