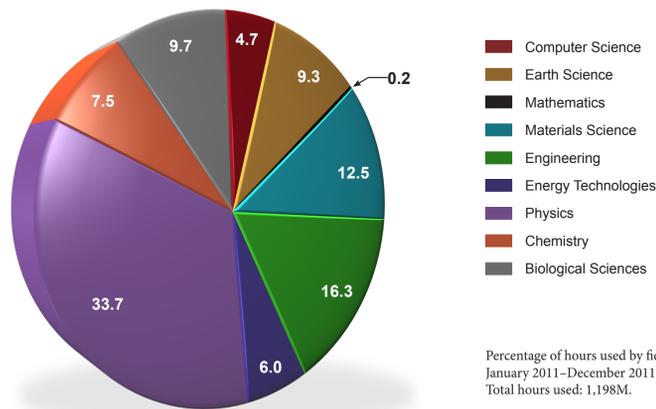


# INSPIRING INNOVATION IN INDUSTRY THROUGH SCIENCE

## 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.

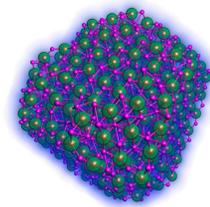


Percentage of hours used by field  
 January 2011–December 2011.  
 Total hours used: 1,198M.



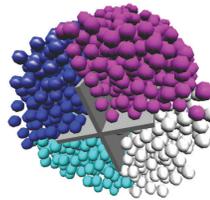
### Breakthrough Science and Engineering

#### The Ultimate Battery Chemistry: Rechargeable Lithium/Air



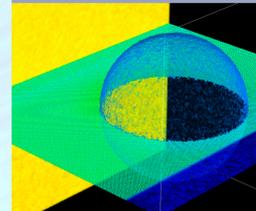
A rechargeable Lithium/Air battery can potentially store ten times the energy of a Lithium/Ion battery of the same weight, making practical widespread use of fully electric cars. An interdisciplinary effort between IBM Research, Vanderbilt University, Oak Ridge National Laboratory (ORNL), and Argonne 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



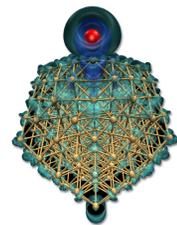
Researchers from the National Institute of Standards and Technology are leveraging Intrepid's computational resources to shed light on the mechanisms that control the flow and spread of concrete.

#### Reducing Erosion in Nuclear Power Plants



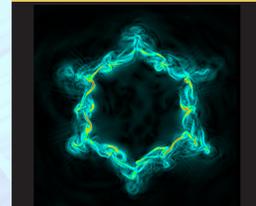
Maintaining the soundness of nuclear reactors is a major concern for scientists, engineers, and the general public. Among many factors, "cavitation erosion" of cooling system components is a significant mechanism for long-term degradation in nuclear power plants. Researchers at the University of Southern California (USC) are using Intrepid to simulate and unravel the complex mechanochemistry problems.

#### Better Catalytic System Designs through Nanoscale Research



Improved emissions control requires an understanding of how catalysts behave at their most fundamental atomic level—the nanoscale. A team led by Argonne National Laboratory is using Intrepid to study catalytic nanoparticles, paving the way for improved catalytic system designs with wide-ranging industrial applications.

#### 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