



# OLCF: The Home of Game-Changing Science



The OLCF center ensures that the world’s most advanced computational scientists get the resources they need, allowing them to help improve both the world and our understanding of it.

Home to Jaguar, a Cray XT5 capable of 2.33 petaflops, the OLCF brings together an unequaled computing environment combining world-class staff with cutting-edge facilities and support systems. Through programs such as the Department of Energy’s Innovative and Novel Computational Impact on Theory and Experiment (INCITE), the center ensures that the world’s most advanced computational scientists get the resources they need, allowing them to help improve both the world and our understanding of it. And by bringing in elite scientists from all areas of the research community, the center guarantees it will be a computing powerhouse for the foreseeable future.

## DELIVERING PETASCALE SCIENCE

Established in 1992, the OLCF became the nation’s Leadership Computing Facility in 2004, charged with developing an unclassified computing resource 100 times more powerful than the systems of the day. The center’s response to this challenge is Jaguar, a Cray XT5 system that is capable of up to 2.33 petaflops. With 37,376 six-core AMD Opteron processors, 299 terabytes of memory, a 10-petabyte file system, 478 terabytes per second of memory bandwidth, and

input/output bandwidth of 244 gigabytes per second, Jaguar is the world’s fastest and most powerful supercomputer dedicated to open scientific research.

Jaguar was designed from the ground up as a scientific muscle machine. Powerful processors allow researchers to get the most science out of the fewest processors. Abundant memory allows them to tackle the largest problems ever attempted. And massive file system bandwidth eliminates the possibility of performance bottlenecks.

## SCIENTIFIC ACHIEVEMENT

Jaguar’s power was amply demonstrated when a team led by Markus Eisenbach of ORNL and colleagues from ORNL, Florida State University, and the Institute for Theoretical Physics and Swiss National Supercomputing Center achieved 1.84 petaflops on Jaguar using an application that analyzes magnetic systems and, in particular, the effect of temperature on these systems. This accomplishment, the fastest performance ever seen on a computer application, earned the team the prestigious 2009 Gordon Bell Prize. In fact, Jaguar is being used to provide insight in a variety of critical areas of scientific research.

- **Materials science:** Researchers using Jaguar are illuminating the world at the atomic and molecular level to unravel the secrets of processes such as superconductivity, catalysis, and electronic storage. Success in these endeavors may translate to powerful new technologies that enrich all areas of our lives.
- **Climate science:** The earth’s climate is an enormously complex system, and Jaguar is giving scientists the computing power they need to accurately replicate it piece by piece. Besides hosting the world’s most in-depth climate model, Jaguar allows researchers to explore specific areas such as abrupt climate change, the effect of clouds, and century-long ocean circulation patterns.

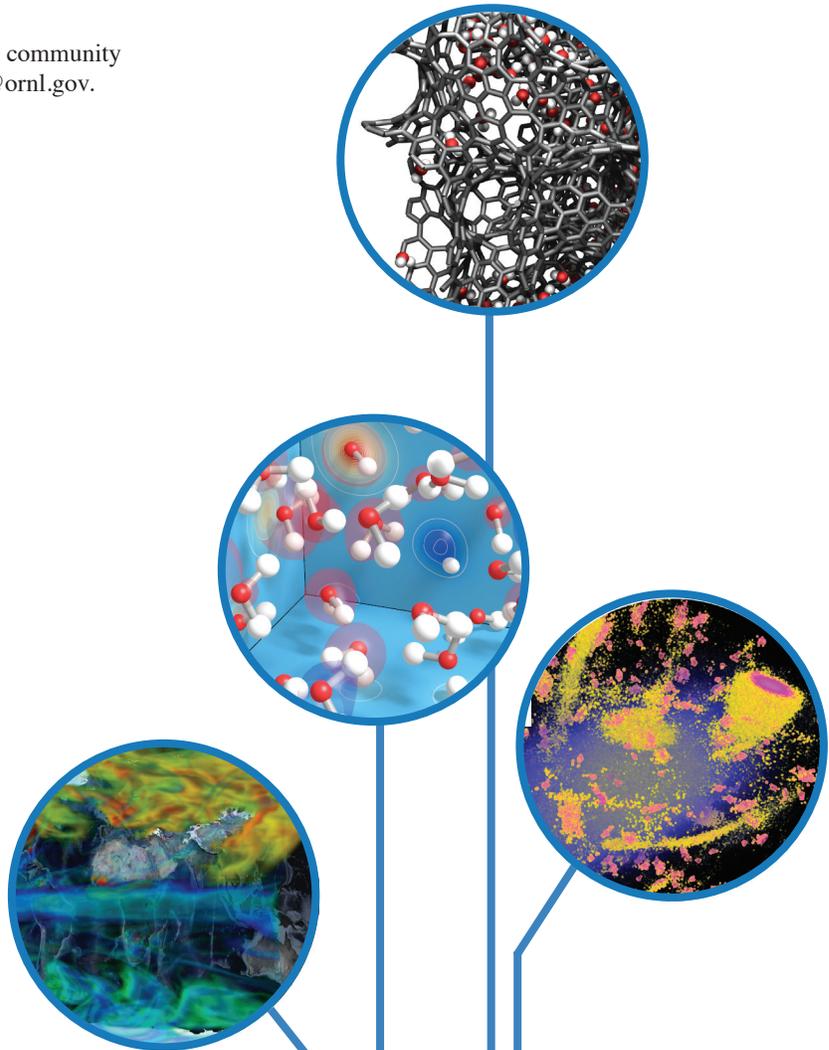


- Fusion energy: The process that drives the stars may one day provide us with inexpensive, relatively clean electricity, but scientists must first understand how to control a plasma that is far hotter than the sun. Researchers are using Jaguar to explain critical issues such as the magnetic fields that contain the fuel, the radio waves that heat it, and the turbulence that complicates the process.
- Astrophysics: Scientists from around the country use Jaguar to dissect mammoth stellar explosions, the evolution of galaxies, the mergers of giant black holes, and other events that help us understand our strange and violent universe.
- Basic science: Jaguar is helping researchers explain the bizarre, counterintuitive behavior of matter at the smallest scale.

If you think you have what it takes to be part of this community of researchers, contact Director Jim Hack at [jhack@ornl.gov](mailto:jhack@ornl.gov).

For more information, contact:

Oak Ridge Leadership Computing Facility  
Oak Ridge National Laboratory  
Phone: 865-241-7202  
Fax: 865-241-2850  
E-mail: [help@olcf.ornl.gov](mailto:help@olcf.ornl.gov)  
[www.olcf.ornl.gov](http://www.olcf.ornl.gov)



U.S. DEPARTMENT OF  
**ENERGY**

Office of Science