Argonne NATIONAL LABORATORY

The Argonne Leadership Computing Facility

Jeff Hammond
Assistant Computational Science
Argonne Leadership Computing Facility

jhammond@anl.gov

https://wiki.alcf.anl.gov/parts/index.php/Main_Page
https://wiki.alcf.anl.gov/parts/index.php/User:Jhammond

ALCF Blue Gene/Q and Friends

See alcf.anl.gov for full hardware details…

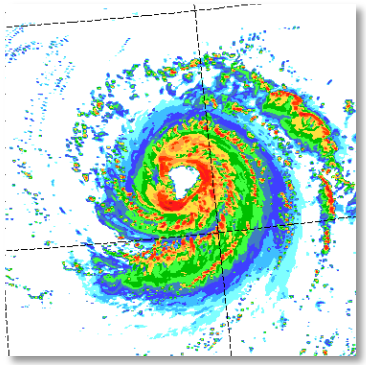
- *Mira* – 48-rack BGQ
- *Cetus* – 1-rack BGQ
- *Vesta* – 2-rack BGQ
- Tukey – AMD-NVIDIA-IB
- Storage – 30 PB capability

The Vesta system is a 2-rack T&D machine for porting, testing and tuning. Mira (48 racks), Cetus (1-rack for debug/small queue) and Tukey are the production ecosystem that enables INCITE, etc. They share a huge filesystem for in-situ analytics.

Allocations @ LCF

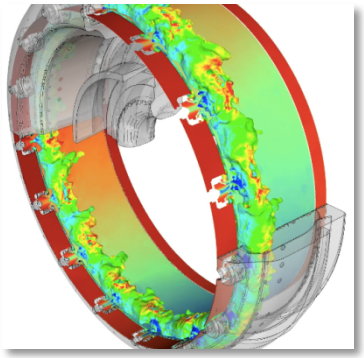
	INCITE 60%		ALCC 30%		ALCF Discretionary 10%	
Mission	High-risk, high-payoff science that requires LCF-scale resources*		High-risk, high-payoff science aligned with DOE mission		Strategic ANL and ASCR use	
Call	1x/year – (Closes June)		1x/year – (Closes February)		Rolling	
Duration	1-3 years, yearly renewal		1 year		3m,6m,1 year	
Typical Size	**30 - 40 projects**	**10M - 100M core-hours/yr.**	**5 - 10 projects**	**1M – 75M core-hours/yr.**	**100s of projects**	**10K – 1M core-hours**
Review Process	**Scientific Peer-Review**	**Computational Readiness**	Scientific Peer-Review	Computational Readiness	Strategic impact and feasibility	
Managed By	INCITE management committee (ALCF & OLCF)		DOE Office of Science		LCF management	
Availability	Open to all scientific researchers and organizations * Capability >20% of cores					

ALCF Scientific Accomplishments



Climate

Used leadership class, vortex-following calculation to more accurately predict hurricane track, to better mitigate risks.

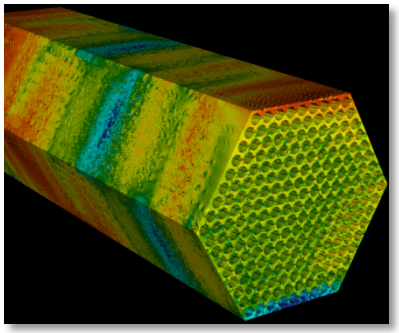


Gas Turbines

Two-phase flow and combustion modeling identified instability mechanisms that reduce efficiency, leading to design of more efficient aircraft engines.

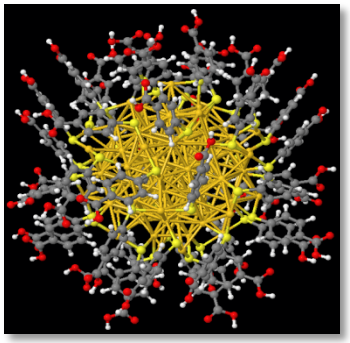
Nuclear Energy

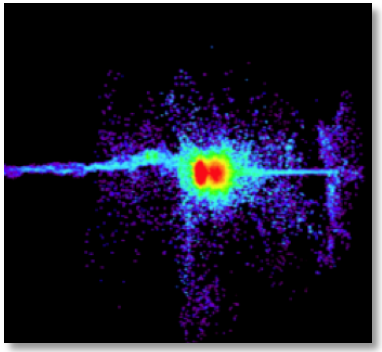
High-fidelity fluid flow and heat transfer simulation of next-generation reactor designs, aiming to reduce the need for costly experimental facilities.



Nano Catalysts

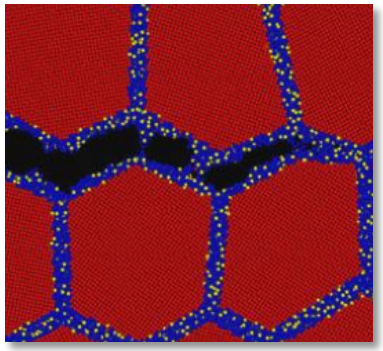
Mapped out properties of a wide range of gold nanoparticles to design catalysts for fuel cells and methane conversion.





Fusion Energy

New hybrid algorithm allowed study of physics in Fast Ignition inertial confinement fusion over a much greater density range than planned.



Materials Science

Molecular dynamics simulation explained how a minute sulfur impurity embrittles nickel—relevant to next-generation nuclear reactor design.