

An Overview of the Oak Ridge Leadership Computing Facility



Presented by:

Judith Hill

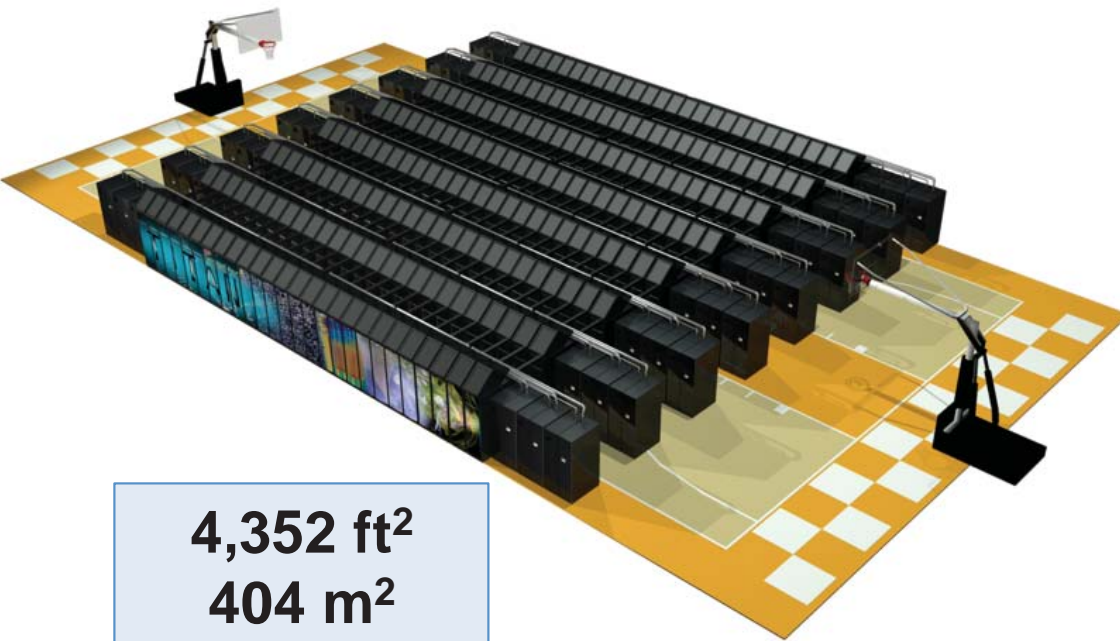
Task Lead for Scientific Computing Liaisons
Oak Ridge Leadership Computing Facility (OLCF)
National Center for Computational Sciences (NCCS)

CSGF Program Review: HPC Workshop
July 24, 2013
Washington, DC



ORNL's "Titan" Hybrid System: The Nation's Most Powerful Computer

#2 **TOP 500**
SUPERCOMPUTER SITES



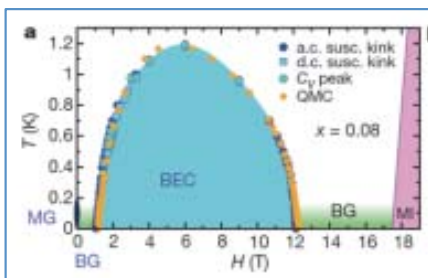
4,352 ft²
404 m²

SYSTEM SPECIFICATIONS:

- Peak performance of 27.1 PF
 - 24.5 GPU + 2.6 CPU
- 18,688 Compute Nodes each with:
 - 16-Core **AMD Opteron** CPU
 - **NVIDIA Tesla** "K20x" GPU
 - 32 + 6 GB memory
- 512 Service and I/O nodes
- 200 Cabinets
- 710 TB total system memory
- Cray Gemini 3D Torus Interconnect
- 8.9 MW peak power

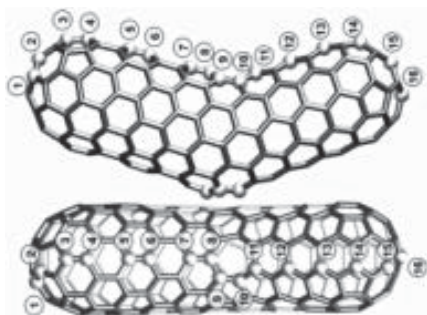
High-impact science at OLCF across a broad range of disciplines.

For example in 2012:



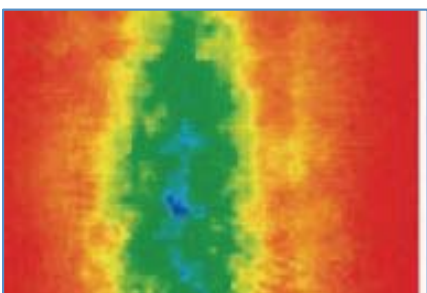
Materials: Quantum Magnets

“Bose glass and Mott glass of quasiparticles in a doped quantum magnet”
Rong Yu (Rice U.)
Nature (2012)



Carbon Nanomaterials

“Covalently bonded three-dimensional carbon nanotube solids via boron induced nanojunctions”
Hashim (Rice), *Scientific Reports* (2012)

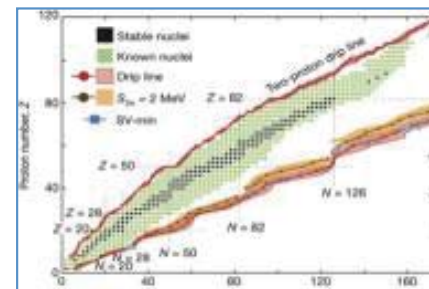


Plasma Physics:

“Dynamics of relativistic transparency and optical shuttering in expanding overdense plasmas”
S. Palaniyappan (LANL)
Nature Physics (2012)

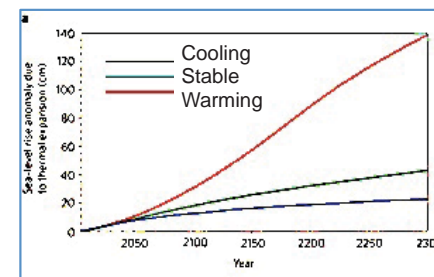
Nuclear Physics

“The Limits of the Nuclear Landscape”
J. Eriq, (UT/ORNL)
Nature (2012)



Climate Prediction and Mitigation

“Relative outcomes of climate change mitigation related to global temperature versus sea-level rise”
G.A. Meehl (NCAR),
Nature Climate Change (2012)



Paleoclimate Climate Change

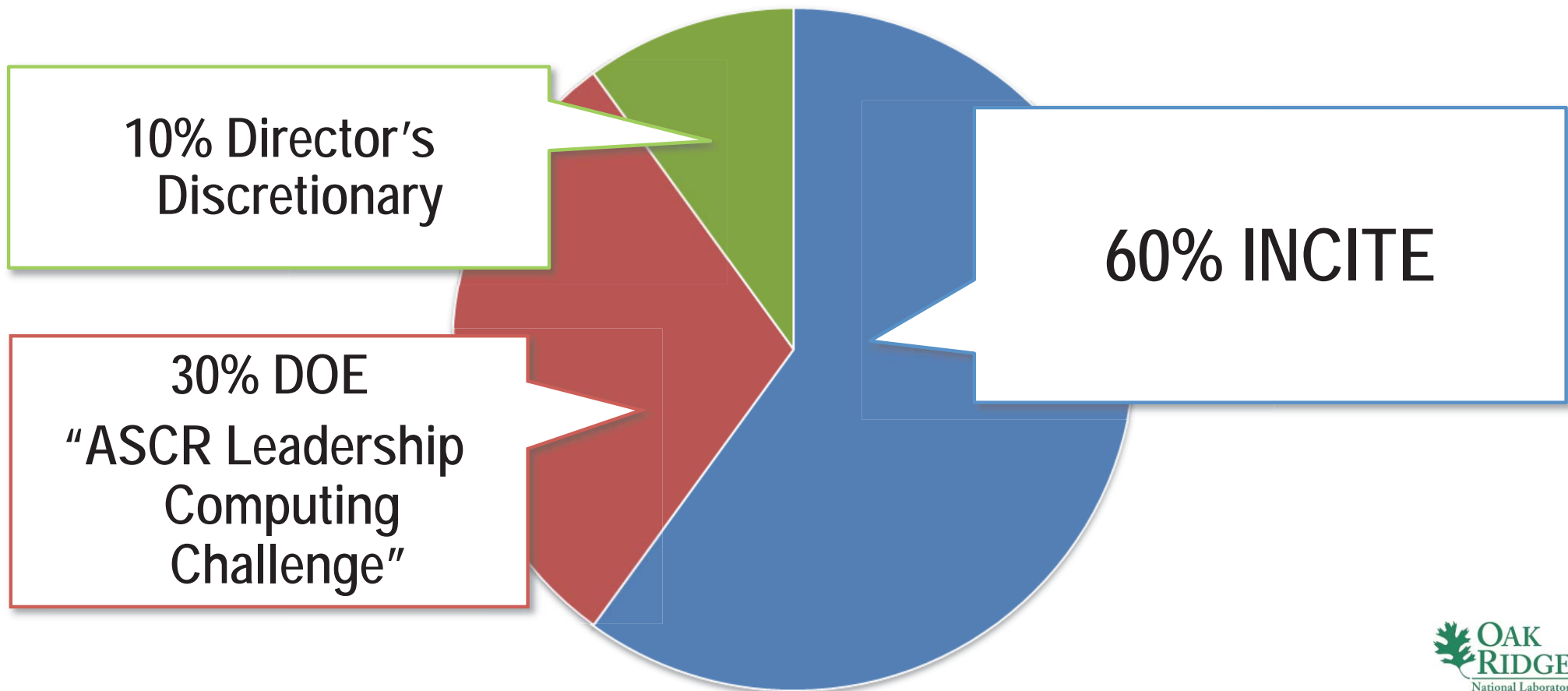
“Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation”
J. Shakun, (Harvard/Columbia)
Nature (2012)



DOE Computational Facilities Allocation Policy for Leadership Facilities

Primary Objective:

- *“Provide substantial allocations to the open science community through an peered process for a small number of high-impact scientific research projects”*



OLCF allocation programs

Selecting applications of national importance

	60% INCITE		30% ALCC		10% Director's Discretionary	
Mission	High-risk, high-payoff science that requires LCF-scale resources		High-risk, high-payoff science aligned with DOE mission		Strategic LCF goals	
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	20M - 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		OLCF management	
Availability	Open to all scientific researchers and organizations including industry					

What is INCITE?

INCITE: Innovative and Novel Computational Impact on Theory and Experiment

Provides awards to academic, government, and industry organizations worldwide needing large allocations of computer time, supporting resources, and data storage to pursue transformational advances in science and industrial competitiveness.

INCITE is jointly run by the ALCF and OLCF, managed by Julia White



ALCC



- ASCR Leadership Computing Challenge
- Awards ~30% of time at OLCF
- Emphasis on high-risk, high-payoff simulations in areas directly related to DOE's energy mission

<http://science.energy.gov/ascr/facilities/alcc/>

OLCF Director's Discretion



- Opportunity to enhance scalability and productivity of scientific codes
- Preparation for INCITE or ALCC

<https://www.olcf.ornl.gov/support/documents-forms/>

CSGF Allocation Program



- Subset of DD time specifically for CSGF fellows
- Only CSGF fellows can use the allocation for their own research
- Review process differs from usual DD

Relevant links

INCITE Program

<http://www.doeleadershipcomputing.org/>

ALCC

<http://science.energy.gov/ascr/facilities/alcc/>

Oak Ridge Discretionary Program

<https://www.olcf.ornl.gov/support/documents-forms/>

Contacts

For details about the INCITE program:

www.doeleadershipcomputing.org
INCITE@DOEleadershipcomputing.org



For details about the OLCF:

www.olcf.ornl.gov
help@nccs.gov, 865-241-6536



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Questions?

