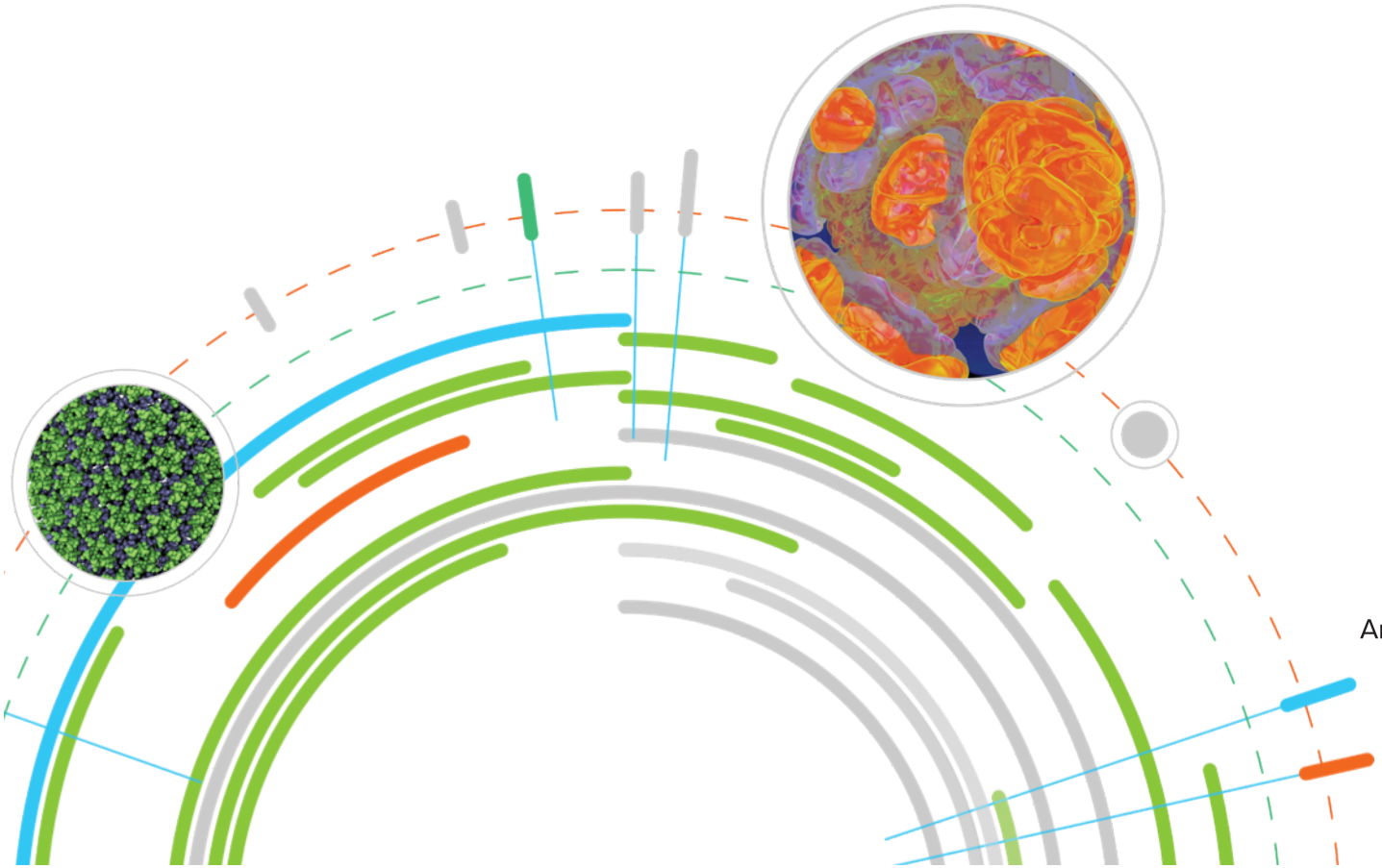
The INCITE Process

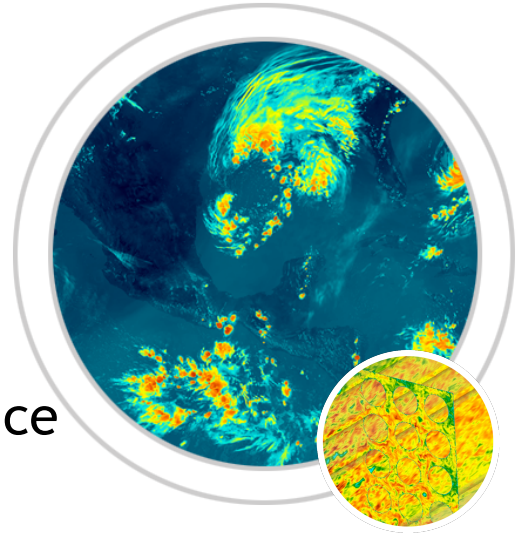
Katherine M. Riley



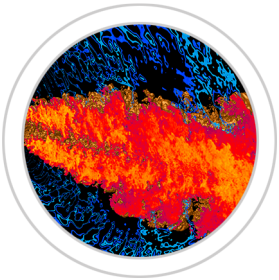
Argonne Leadership Computing Facility

Argonne NATIONAL LABORATORY

Providing the Nation with HPC

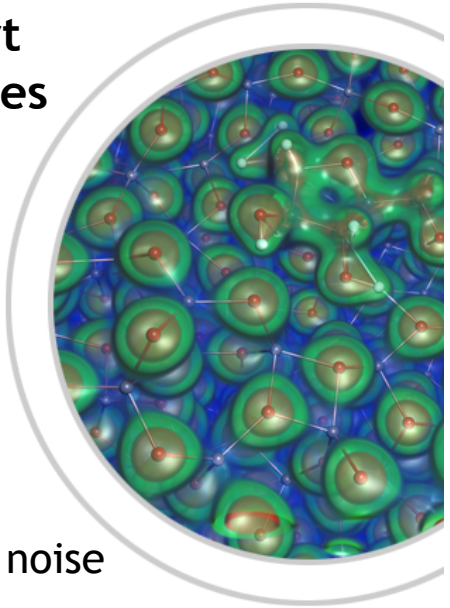


- Leadership computing is widely recognized as a gateway for scientific discovery and a tool for understanding the world around us.
- The nation that leads the world in high-performance computing will have an enormous competitive advantage in every sector, from energy and environment to manufacturing.
- Scientific breakthroughs lead to advancements that help solve the great scientific, energy, environment, and security challenges of our time.



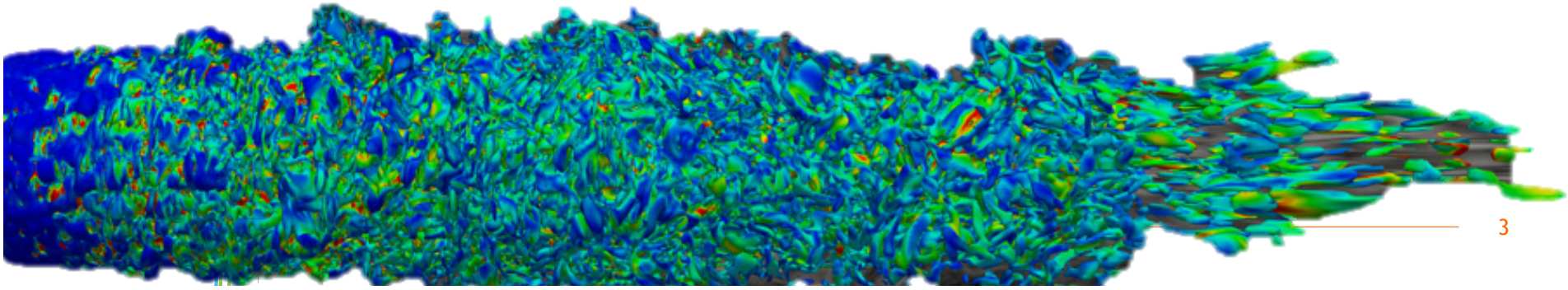
Who is ALCF?

The ALCF provides researchers and industry with access to world-class supercomputing capabilities and a team of expert computational scientists to ensure that every project achieves top performance.



Work under way at the ALCF spans all scientific disciplines, including projects to help researchers:

- Conduct nanoscale studies of rechargeable lithium-air battery components to extend the range and power of electric vehicles
- Gain a physics-based understanding of factors that affect jet engine noise and efficiency of wind turbines to improve their performance
- Manage uncertainty in the renewable energy supply to reduce reserve requirements and stabilize electricity markets in the next-generation power grid



What Does ALCF Do?

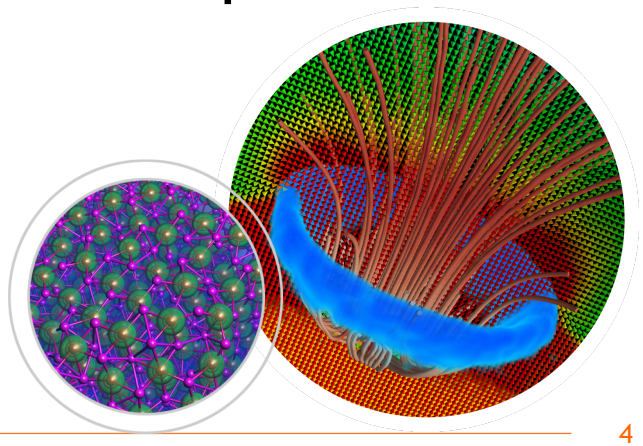
We deliver cycles to support computational science

- Will delivery nearly 6B core-hours to science in 2014 - **3.53B to INCITE**
- Overall availability for the resource exceeding 95%
- Averaging greater than 10 days between interrupts
- Gordon Bell finalists past five years, strong partnerships last two years

We partner with community to produce science

- More than 35 joint publications with ALCF scientists in 2013
- Catalysts (team of expert computational scientists) currently support more than 45 diverse projects across all major areas

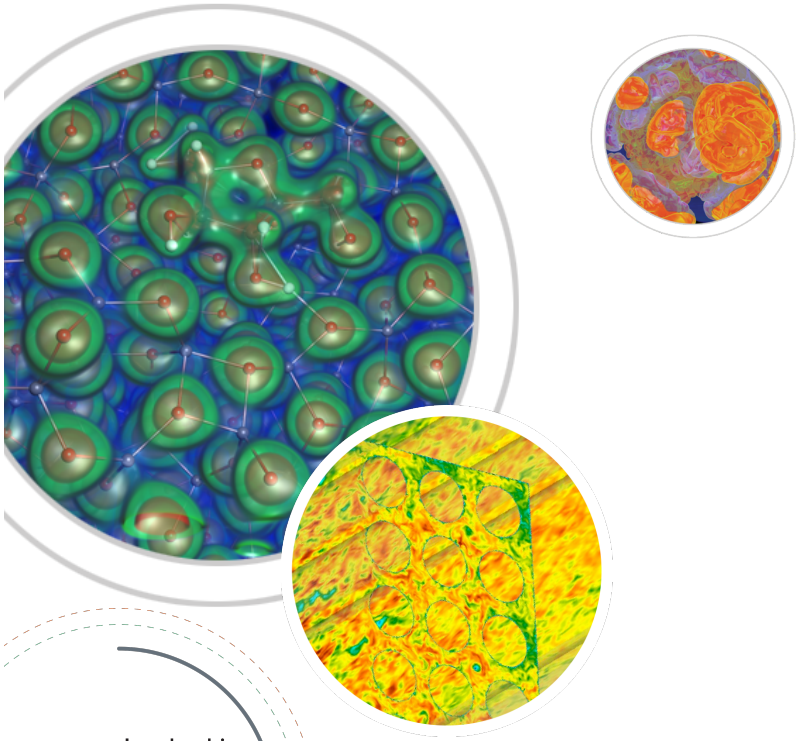
We partner with community on research and development both in hardware and software



Argonne Leadership Computing Facility

Innovative and Novel Computational Impact on Theory and Experiment (INCITE) Program

- **Is your science campaign outpacing the computing resources available to you?**
- **Do you have a long-term vision for your research campaign?**
- **Can you effectively use more than twenty million core-hours?**



INCITE is a peer-review program that awards time on DOE Leadership Computing resources. Open to researchers who have capability, time-to-solution, or computer architecture and data infrastructure requirements that can't be met by any other resource.

Contact: Julia C. White, whitejc@DOEleadershipcomputing.org

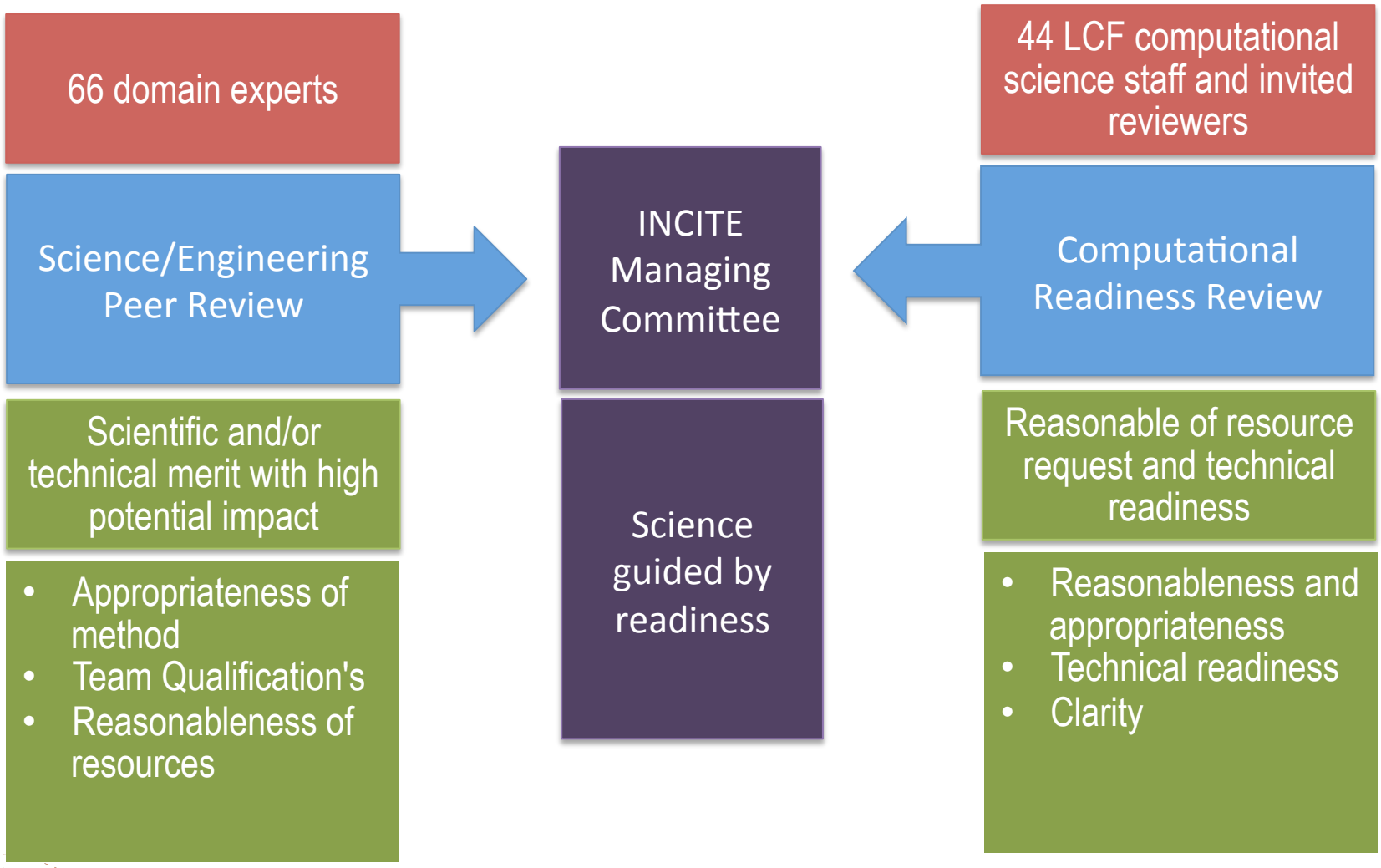
Allocation Programs at the LCFs

	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) ***2015 Call Open Now***		1x/year – (Closes February)		Rolling	
Duration	1-3 years, yearly renewal		1 year		3m,6m,1 year	
Typical Size	30 - 40 projects	50M - 500M core-hours/yr.	5 - 10 projects	10M – 300+M core-hours/yr.	100s of projects	.5M – 10M 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	
Readiness	**High**		**Medium to High**		**Low to High**	
Availability	Open to all scientific researchers and organizations ***Capability > 131,072 cores (16.7% of Mira)***					

Twofold review process

	New proposal assessment	Renewal assessment
1 **Peer review: INCITE panels** 2	• **Scientific and/or technical merit** • Appropriateness of proposal method, milestones given • Team qualifications • Reasonableness of requested resources	• Change in scope • **Met milestones** • On track to meet future milestones • **Scientific and/or technical merit**
Computational readiness review: LCF centers	• Technical readiness • Appropriateness for requested resources	• Met technical/ computational milestones • On track to meet future milestones
Award Decisions	• INCITE Awards Committee comprised of LCF directors, INCITE program manager, LCF directors of science, sr. management	

Twofold Review Process



Computational Readiness Questions

- Need and Effective use of INCITE resources
  - Capability or architectural requirements
  - Can the work only be done on a LCF resource?
  - Optimization level of production work
  - Feasibility of LCF platform

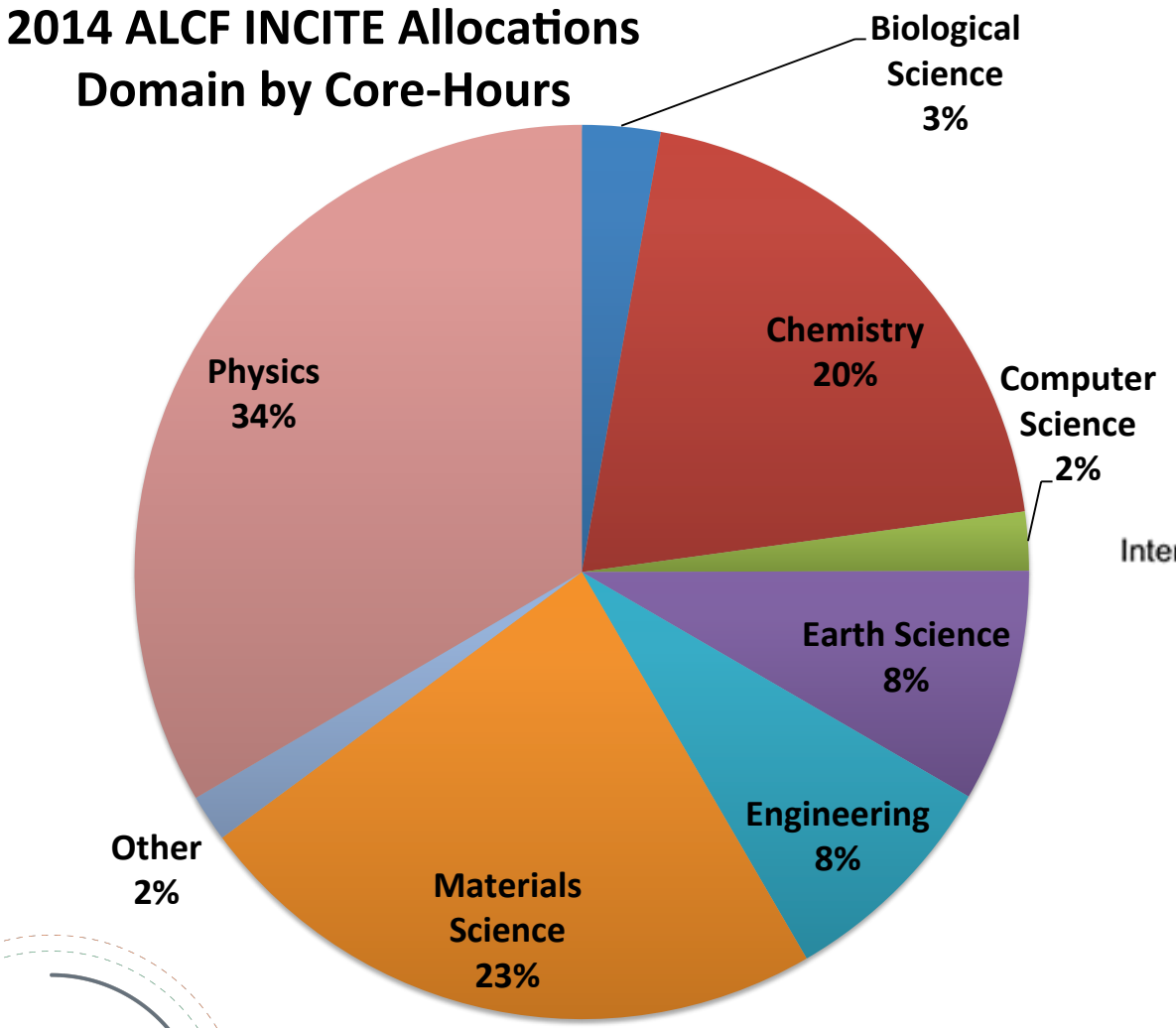
- Computational Plan
  - Justification of the time request including basis of estimate
  - Are the people, codes and science ready to go?
  - How much time to get going?

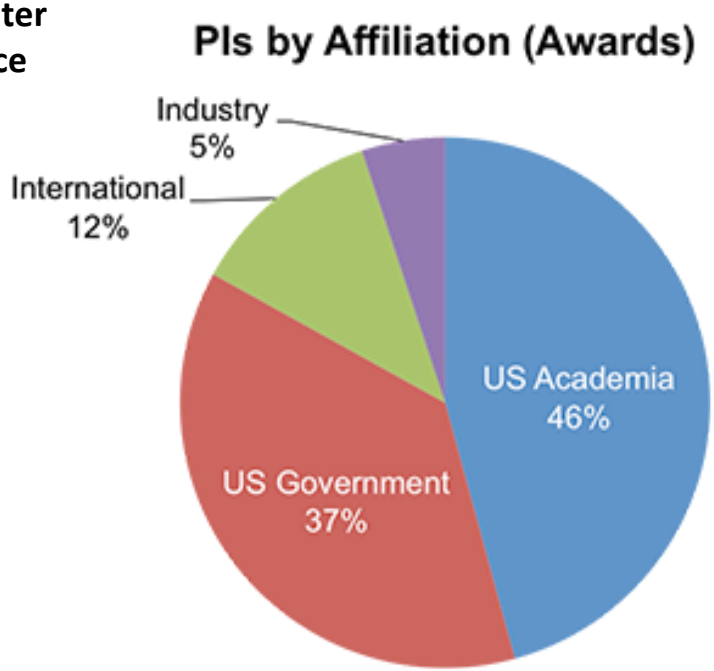
Peer Panel Review

- Science and/or technical merit/impact
- Appropriateness of the proposed method
  - Will conclusions be valid?
  - Best available methods and techniques?
  - Articulated milestones
- Competency of proposer's personnel and adequacy of proposed resources
  - Are people in place?
  - How qualified are the personnel?
- Reasonableness and appropriateness of the proposed request for computational resources
  - How well does the application articulate the need for petascale computing resources? Place this in the context of the state-of-the-art research in this field.
  - Please assess the reasonableness of the estimates of the required computational resources to achieve the scientific/technical objectives.
- For renewals – are milestones reached? Evidence they can use the resource well?

INCITE Science at the ALCF

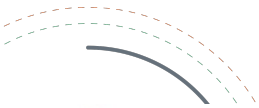
- sdfsdfsdf





Argonne Leadership Computing Facility

Questions



Scientific Support is Collaboration

The ALCF is staffed with a team of computational scientists, expert in their domain, scalable algorithms and performance engineering.

- Provide a "jump-start" in the use of ALCF resources
- Align the availability of ALCF resources with the needs of the project team
- Collaborate to maximize the value that ALCF can bring to our projects
- Connect the needs of the scientific community with future and current hardware

Two categories of collaboration and contribution to teams using the ALCF:

Tactical/Collaborative

- Short term, fast solutions
  - Compiling, Debugging, System Use
- Targeted problem resolution
  - Resolve a specific hard problem like restructuring I/O
- Long term collaborations
  - In depth work on a code that be over a long period of time
  - Constrained by staff

Strategic

- Training
  - Postdocs, students, community
- Understand HPC needs for different communities
- Plan for future needs
  - Help planning new facilities
  - Advise/Participate in long term code development paths

Transitioning Applications with New Hardware

What the LCFs offer

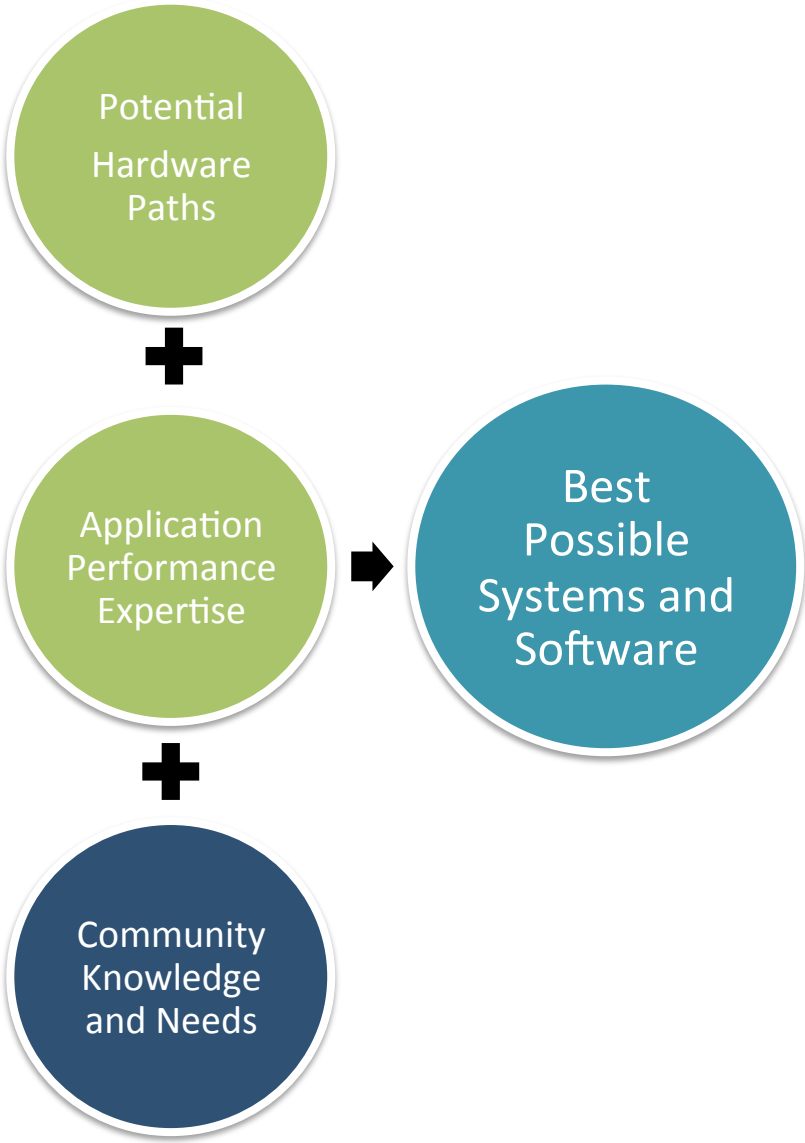
- Largest-scale computing resources
- Current and future hardware expertise
- Application level expertise and performance

What we need

- Engage future communities not just current ones
- Extract requirements and potential

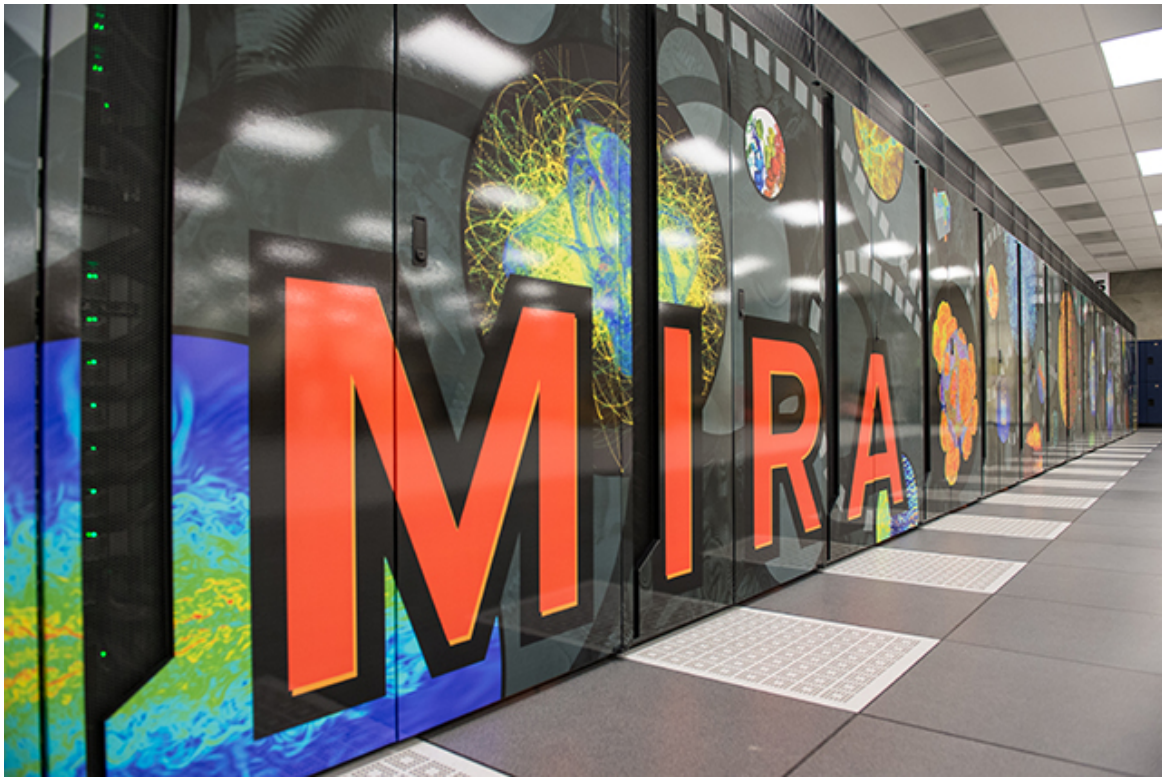
Some Impacts From Approach

- Improved ease of use for current architectures
- Active efforts for improved workflows
- Planned significant efforts for data and it's relationship with exascale/ extremescale



Production Systems: ALCF-2

Mira – *BG/Q system*
- 49,152 nodes / 786,432 cores
- 786 TB of memory
- Peak flop rate: 10 PF



Cetus – *BG/Q system*
- 1,024 nodes / 16,384 cores
- 16 TB of memory
- Peak flop rate: 209 TF

Vesta - *BG/Q system*
- 2,048 nodes / 32,768 cores
- 32 TB of memory
- Peak flop rate: 419 TF

Tukey – *NVIDIA system*
- 96 nodes / 1536 AMD CPU cores
- 192 NVIDIA Tesla M2070 GPUs
- 6 TB memory / 1.1TB GPU memory
- GPU Peak flop rate: 99 TF

Storage - Scratch: 28.8 PB raw capacity, 240 GB/s bw (GPFS); Home: 1.8 PB raw capacity; Tape: 16 PB of archival storage, 15,906 volume tape archive (HPSS)