U.S. Department of Energy's
Office of Science
Advanced Scientific Computing Research Program

Exascale Workshops

ASCAC Meeting
October 28-29, 2008

Lali Chatterjee, Program Manager
Office of Advanced Scientific Computing Research
Office of Science
Department of Energy

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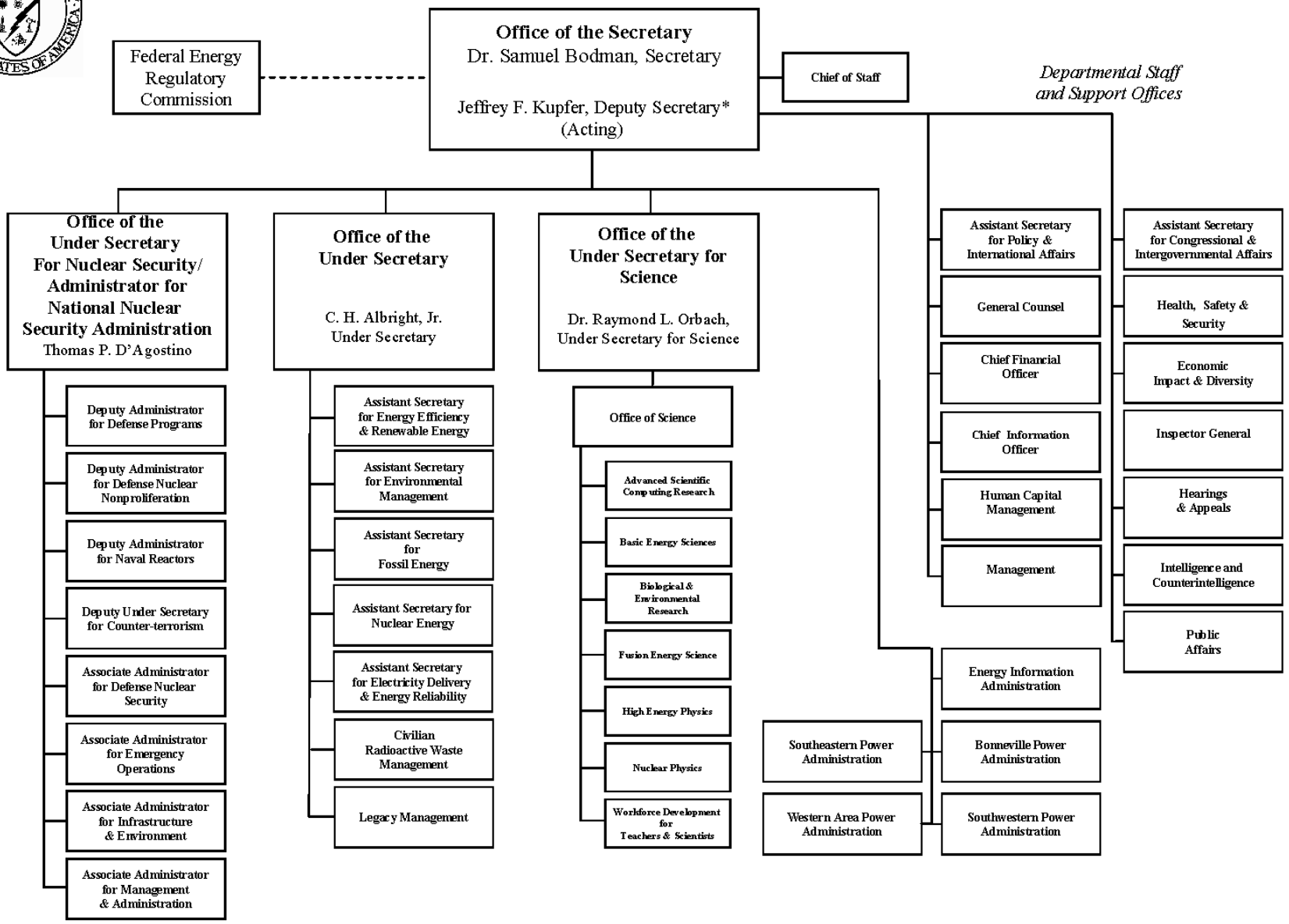
Science Needs

Science Communities

are exploring Challenges that can be addressed with Exascale Computing through a Series of DOE sponsored

Exascale Workshops

DEPARTMENT OF ENERGY



* The Deputy Secretary also serves as the Chief Operating Officer

10 Mar 08

Key Questions

What are the
Science Grand Challenges?

Why is Exascale Computing needed to help solve them?

What are the Priorities?

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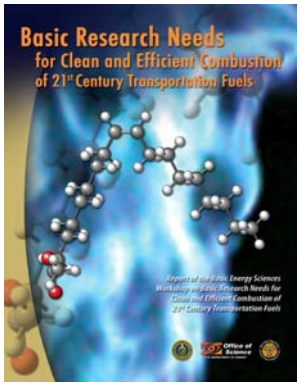
Format & Structure

- Opening and Plenary Session
- Break Out Sessions
- Inter-Connectivity/Overview Groups
- Writing Team Meetings

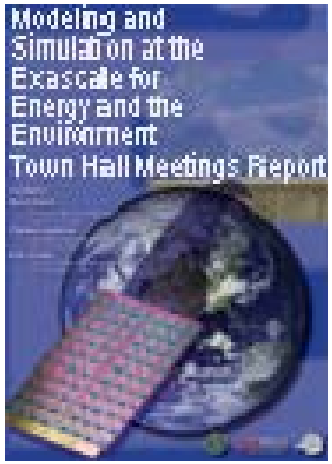
Deliverable: Workshop Report

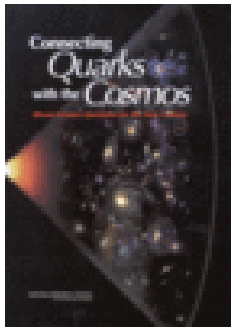
Identifying Science Community Needs for Exascale Computing.

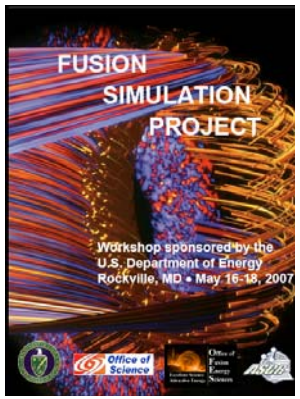
Building on Prior Studies

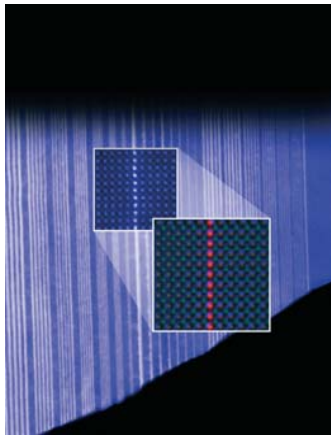


Recent DOE workshops and reports have identified important challenges across science and these provide a starting point for the workshop deliberations.



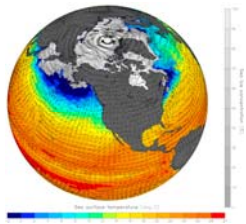






BESAC Report
Directing Matter & Energy
Five Challenges for
Science and the Imagination

Climate Example



BER 2008 Workshop identified *three* Outstanding Grand Challenges in Climate Change Science

* Characterize the Earth's current climate, and its evolution over the last century to its present state*

* Predict regional climate change for the next several decades *

* Simulate Earth System changes and their consequences over centuries*

http://www.sc.doe.gov/ober/berac/Grand_Challenges_Report.pdf

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Climate Workshop

Nov 6-7, '08 Bethesda Hyatt, MD

Challenges in Climate Change Science & the Role of Computing at the Extreme Scale

Chair Warren Washington (NCAR)

Welcome Address - Ray Orbach (video)

Plenary Talks & Break Out Sessions

DOE Program Contacts:
Anjuli Bamzai (BER) & Lali Chatterjee (ASCR)

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Climate Workshop Highlights

Panels and Leads:

- Model Development and Integrated Assessment

  David Bader and Bill Collins

- Algorithms and Computational Environment

  John Drake and Mark Taylor

- Data, Visualization & Productivity

  Dean Williams and Don Middleton

- Decadal Predictability and Prediction

  Ben Karman

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High Energy Physics and Nuclear Physics Workshops

High Energy Physics Workshop

Dec 9-11,'08 SLAC National Accelerator Laboratory

Chair Roger Blandford (KIPAC/SLAC)
Co Chairs Young-Kee Kim (FNAL)
Norman Christ (Columbia University)

Nuclear Physics Workshop

Jan 26-28, '09 Washington DC

Chair Glenn Young (ORNL)
Co-chairs: David Dean (ORNL)
Martin Savage (U of Washington)

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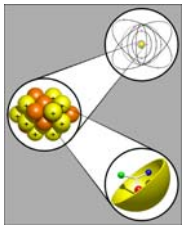
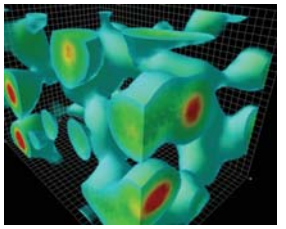
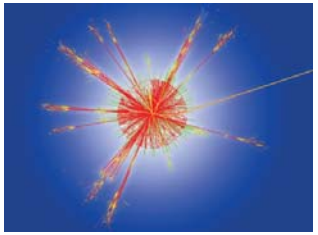
Quarks to Cosmos

Fundamental Science Questions

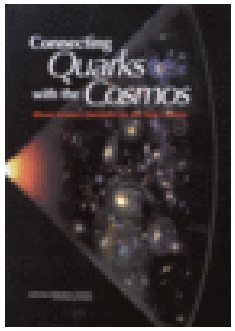


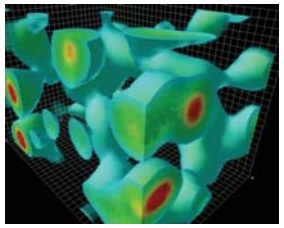


- What Is Dark Matter?
- What Is the Nature of Dark Energy?
- How Did the Universe Begin?
- Did Einstein Have the Last Word on Gravity?
- What Are the Masses of the Neutrinos, and How Have They Shaped the Evolution of the Universe?
- How Do Cosmic Accelerators Work and What Are They Accelerating?
- Are Protons Unstable?
- What Are the New States of Matter at Exceedingly High Density and Temperature?
- Are There Additional Space-Time Dimensions?
- How Were the Elements from Iron to Uranium Made?

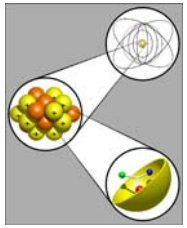


Answers?





'Quarks to Cosmos' questions need a synergy of Theory, Experiment, Simulation, Astrophysics, Accelerator Science, Cosmology, ESnet, and High Performance Computing for answers



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More 2009 Workshops

Nuclear Energy Workshop - Early March 2009

Chairs: Robert Rosner, ANL & Ernie Moniz, MIT

Fusion Science – March 2009

Chairs: Bill Tang, PPPL & David Keyes, Columbia U

Biology - Early Spring 2009

Chair: Rick Stevens ANL

Material Science and Chemistry

Planned for summer 2009

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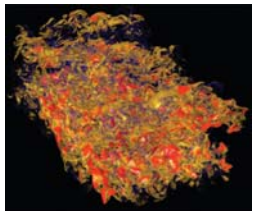
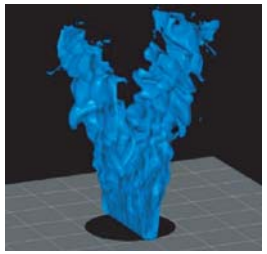
Science and Exascale





The Exascale Workshops will help define

Where, When & How

Exascale Computational Science

will be part of the synergy that will solve the Outstanding Science Grand Challenges of tomorrow

'Genius is one percent inspiration and 99 percent perspiration'

(Attributed to Thomas Alva Edison)

Thank you