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Title:	Los Alamos National Laboratory: Charge to the Nuclear Engineering and Technology Capability Review
Author(s):	Janet A. Mercer-Smith, Everett P. Springer, and Duncan W. McBranch
Intended for:	Nuclear Engineering and Technology Capability Review Committee Los Alamos, NM, USA 17 May, 2011

Form 836 (7/06)

Los Alamos National Laboratory: Charge to the Nuclear Engineering and Technology Capability Review

Presentation for the Nuclear Engineering and Technology Capability Review

May 17, 2011

Janet A. Mercer-Smith, Everett P. Springer, and Duncan W. McBranch

The Laboratory mission encompasses a full spectrum of national security activities, including Nuclear Deterrence, Global Security, and Energy Security. The capabilities at Los Alamos support vital national security challenges. These capabilities are strategic areas where LANL needs to excel and are led by an Associate Director. The Capability Reviews are an important component of the science focus, because the external peer review process is used to continuously improve the quality of LANL's science, technology, and engineering. The charge for the Nuclear Engineering and Technology Capability Review is cross-cutting. The committee is asked to assess the quality of science, technology, and engineering within the Capability; evaluate the integration of this capability across Laboratory organizations; assess the relevance of the capability's science, technology, and engineering contributions to current and emerging LANL programs; assess the LDRD project "Advanced Neutronic Modeling"; and advise the Laboratory Director and the Principal Associate Director for Science, Technology and Engineering on the health of the capability. Laboratory Management will use the committee's report for capability planning, and will provide it to DOE as part of LANL's annual performance plan.

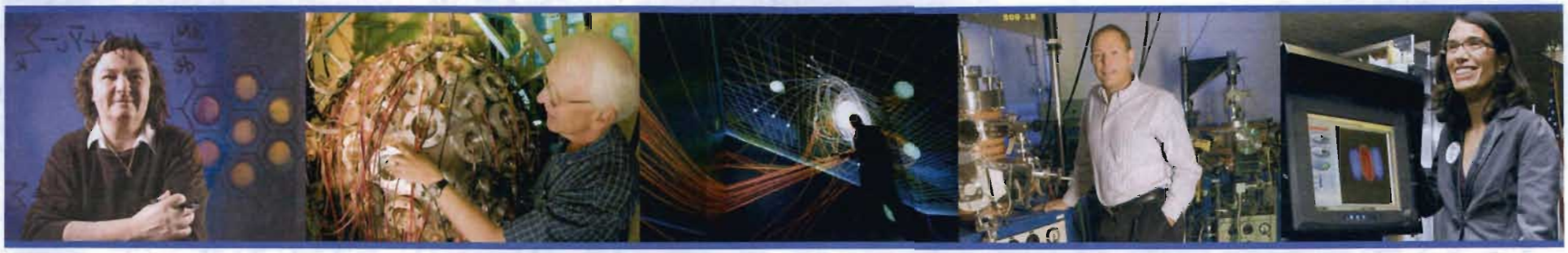
Materials for the Future

- **Past**
  - Discovery of multiple phases of plutonium, development of plutonium alloys
  - Development of insensitive high explosives
  - Development of materials for fusion reactors, radiation casings, and neutron sources

- **Present**

- Facilities: Center for Integrated Nanotechnologies (CINT), Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT), Los Alamos Neutron Science Center (LANSCE), National High Magnetic Field Laboratory (NHMFL), Sigma, CMR, PF-4, Electron Microscopy Laboratory, Trident, etc.
- Superconductivity
- Fuel cells
- Energetic materials synthesis and diagnostics
- Actinide and radioactive material
- Shocked materials
- Energy Frontier Research Centers

- **Future**
  - Theme of controlled functionality
    - Defects and interfaces
    - Extreme Environments
    - Emergent phenomena
  - Matter-Radiation Interactions in Extremes (MaRIE)
  - Materials Test Station
  - Exascale computing



Los Alamos National Laboratory

Duncan W. McBranch

Deputy Principal Associate Director for
Science, Technology and Engineering

Charge to the Nuclear Engineering and Technology Capability Review

May 17, 2011

LANL Mission

***Our mission as a DOE national security science laboratory* is *to* develop and apply science, technology, and engineering solutions to:**

- Ensure the safety, security, and reliability of the U.S. nuclear deterrent
- Reduce global threats
- Solve emerging national security challenges

Our vision is to be the premier National Security Science Laboratory.

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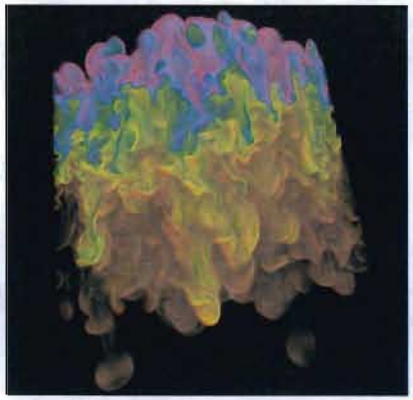
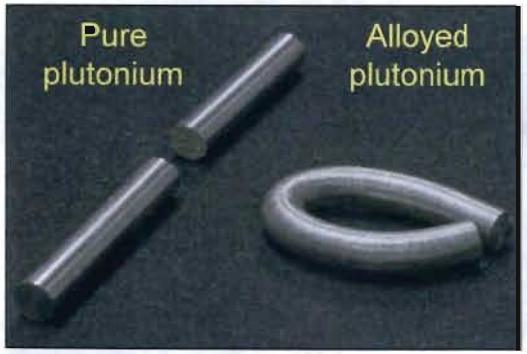
Mission Areas

Science at Los Alamos National Laboratory

Stockpile Stewardship

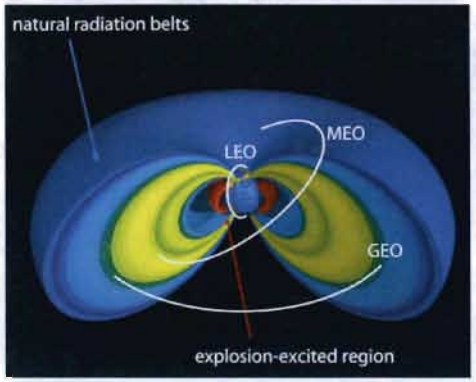


Hydrodynamics: Turbulence

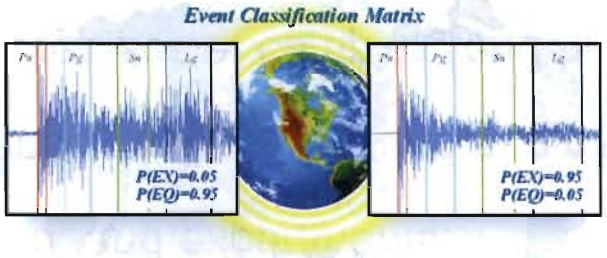


Plutonium Science: Metallurgy

Global Security

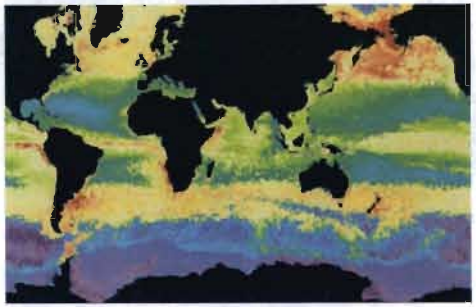


Threats from Space: Dynamic Radiation Environment Assimilation Model



Seismic Detection of Nuclear Explosions

Energy Security



Climate/Energy Impacts: Measurement, simulation, prediction

Materials: Energy generation and transmission

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Science

Los Alamos Science in the 21st Century

The Premier National Security Science Laboratory:

- Integrates theory, simulation, and experiments.
- Uses multidisciplinary science, technology, and engineering.
- Solves problems that are large scale, complex, and high impact.
- Utilizes unique, multifaceted, or experimental and computational facilities.
- Develops technology that is highly complex, and sensitive or classified nature.

Nuclear materials

High performance computing and visualization

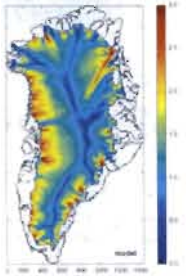
Repository concepts

Capabilities

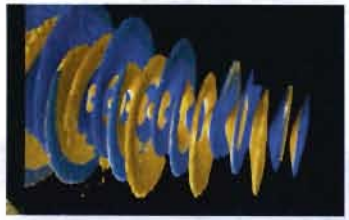
The capabilities of the Laboratory serve program.

Weapons Science & Engineering

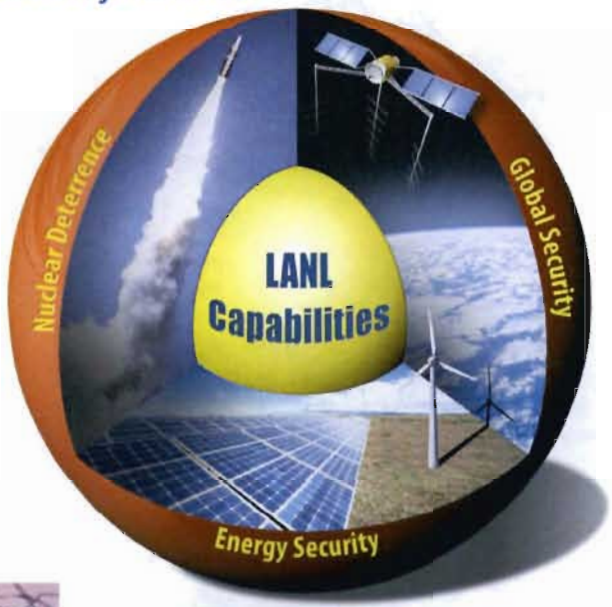
Accelerators & Electrodynamics



Information & Knowledge Science



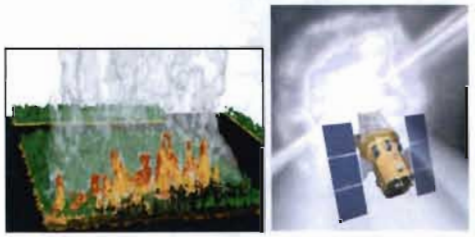
Computational Physics & Applied Mathematics



Chemical Science

Biosciences

Materials



Earth & Space Sciences

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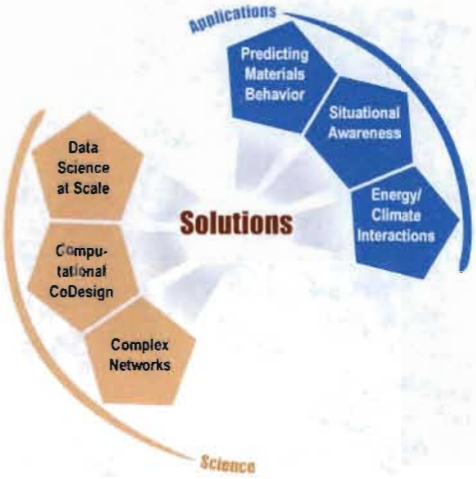
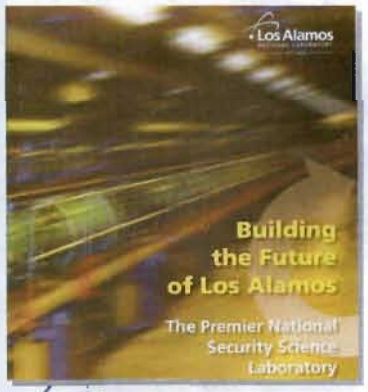
"Science that Matters" guides LANL STE strategy.

Materials for the Future

Information Science and Technology for Integrative and Predictive Science



Science of Signatures



- Three "Science that Matters" pillars utilize capabilities.
- Strategic investments are aligned with the pillars.
- Capabilities are enhanced by STE strategy.

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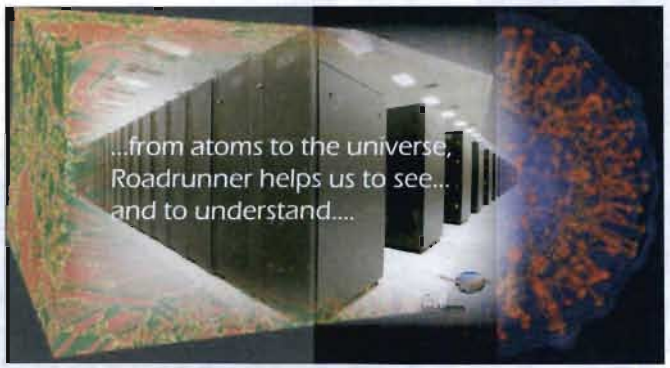
LANL is a capabilities-based laboratory.

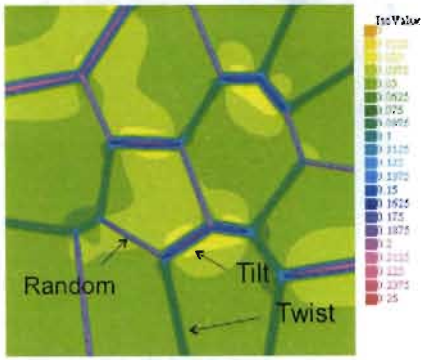
- Capabilities are chosen to be cross-cutting.
- Capabilities are led by an Associate Director.
- Capabilities do not reside in one organization.
- Many customers have access to the capability inventory.
- Capabilities are continually evaluated.

Tools to teach nuclear safeguards

LANSCE



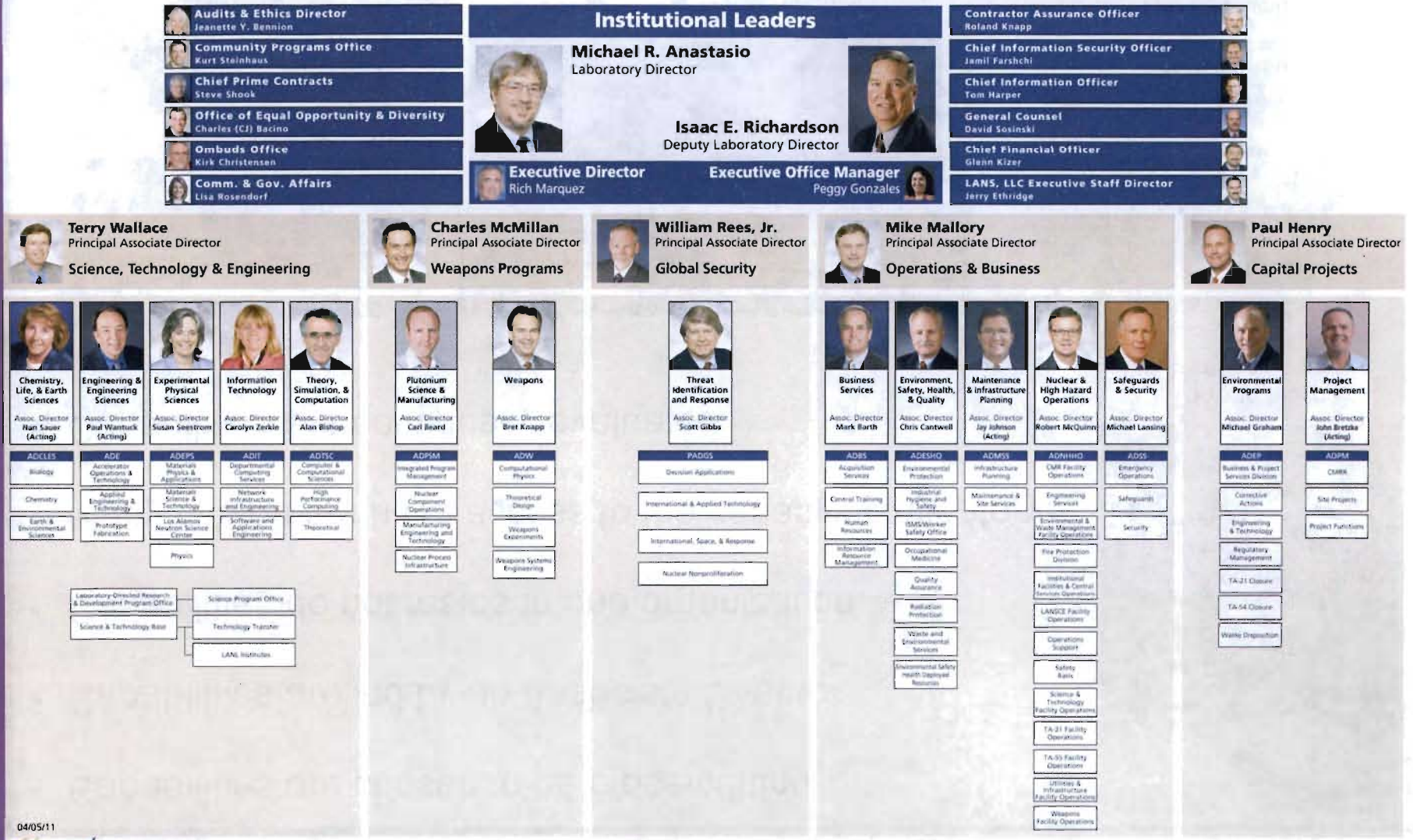
Roadrunner supercomputer



Design and analysis of nuclear fuels

LANL Organization

Organization



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Capability Reviews

- LANL uses external reviews to measure and continuously improve the quality of its science, technology and engineering (STE).
- Capability reviews are chartered by the Director and PADSTE.
- LANL uses capability reviews to assess the STE quality and institutional integration and to advise Laboratory Management on the current and future health of the STE.
- The capability reviews are ***cross-cutting*** across directorates. They provide a holistic view of STE quality, integration to achieve mission requirements, and mission relevance.
- The principal product of the capability review is a report that includes the Committee's assessments, commendations, and recommendations for the capability.

Laboratory Management will use this report for capability planning and provide it to DOE as part of LANL's annual performance plan.

Charter for the Nuclear Engineering and Technology Capability Review Committee

- ***Assess the quality of science, technology and engineering*** within the capability in the areas defined in the agenda. Identify issues to develop or enhance core competencies in this capability.

- ***Evaluate the integration of this capability*** across the Lab organizations listed in the agenda in terms of joint programs, projects, proposals, and/or publications. Describe the integration of this capability in the wider scientific community using recognition as a leader within the community, ability to set research agendas, and attraction and retention of staff.

- ***Assess the relevance*** of this capability's science, technology and engineering contributions to current and emerging LANL programs, including Nuclear Deterrence, Global Security, and Energy Security.

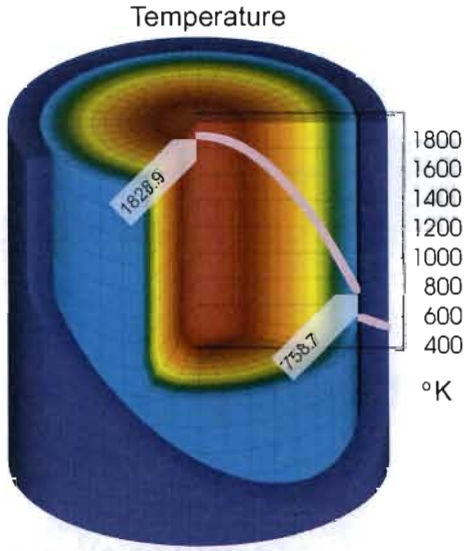
- ***Advise the Laboratory Director/Principal Associate Director for Science, Technology and Engineering on the health of the capability*** including the current and future (5 year) science, technology and engineering staff needs, mix of research and development activities, program opportunities, environment for conducting science, technology and engineering.

- ***Assess the Los Alamos LDRD project*** titled, "Advanced Neutronic Modeling," using the criteria performance, quality, and relevance for the current status of the project. Provide advice on the future directions and opportunities for the project.

Capability Assessment Evaluation

Evaluation of topics in the agenda must address the following criteria:

- ***Comparison to peers:***
  - State how this work compares to similar or related work conducted by others.
- ***Sustainability:***
  - State the extent to which the contribution strengthens or weakens LANL capabilities.
  - How does this activity/contribution build core competencies or other resources that contribute to the vitality of the activity itself and the long term vigor of the Lab and its ability to meet the needs of the nation?
- ***Integration:***
  - Describe the interactions between organizations within the Laboratory.
  - Describe the interactions between the capability and the scientific community.
- ***Program relevance:***
  - State the current programs that the capability supports and its effectiveness in supporting current missions.
  - Identify future missions or programs that this capability can support.



Model across scales for predictive, physics-based fuel performance

Communicating Conclusions with Management

- An Executive Out-Brief is held for the Director and Principal Associate Directors.
- The committee must prioritize its assessment and advice for the out-briefing and the report.
- Specifically, the Committee should identify and prepare for presentation:
  - Assessment of STE topics covered in the agenda.
  - Between 3 and 7 prioritized most notable contributions observed in the review.
  - Between 3 and 7 prioritized most important "actionable" recommendations.
- The committee holds an open out-brief for the staff.
- The Committee must submit its assessment and advice via written report within 30 days of the end of the review.

Out-brief and report templates are available for the Committee's use.