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

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Intended for: Nuclear Engineering and Technology Capability Review Committee
Los Alamos, NM, USA
17 May, 2011



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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

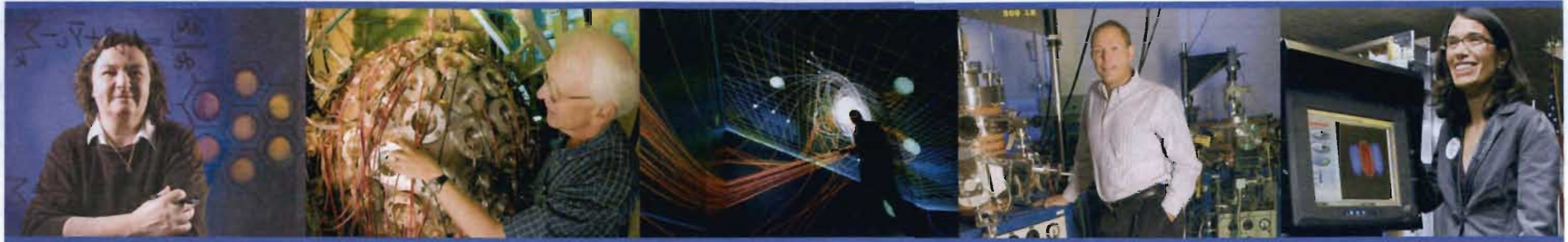
- **Present**

- 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

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Los Alamos National Laboratory

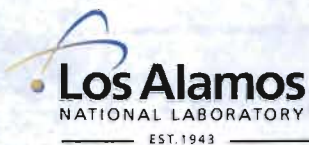
Duncan W. McBranch

Deputy Principal Associate Director for
Science, Technology and Engineering

Charge to the Nuclear Engineering and Technology Capability Review

May 17, 2011

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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.



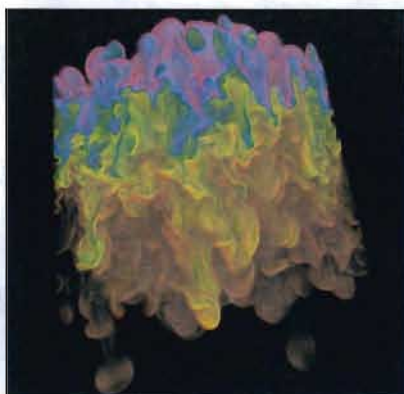
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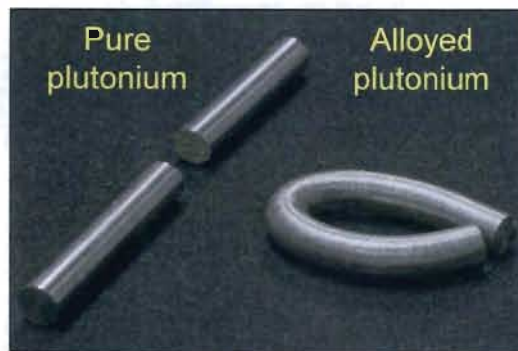


Science at Los Alamos National Laboratory

Stockpile Stewardship

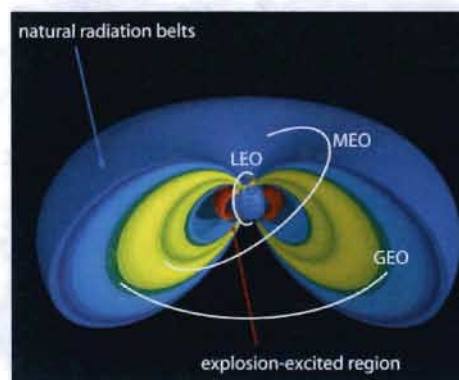


Hydrodynamics: Turbulence

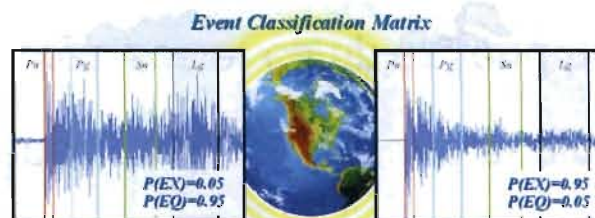


Plutonium Science: Metallurgy

Global Security

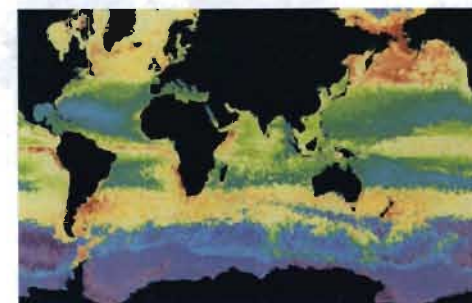


Threats from Space: Dynamic Radiation Environment Assimilation Model



Seismic Detection of Nuclear Explosions

Energy Security



Climate/Energy Impacts: Measurement, simulation, prediction



Materials: Energy generation and transmission

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

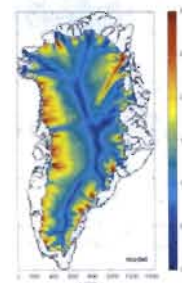
The capabilities of the Laboratory serve program.



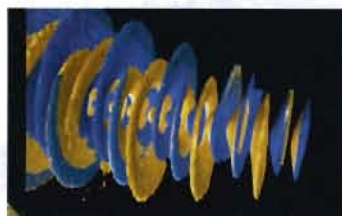
Weapons Science & Engineering



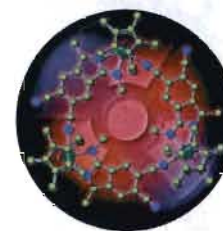
Accelerators & Electrodynamics



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.

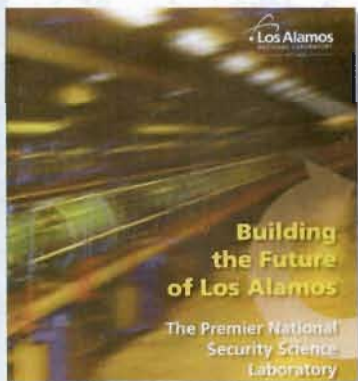
Materials for the Future



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.

LANL is a capabilities-based laboratory.

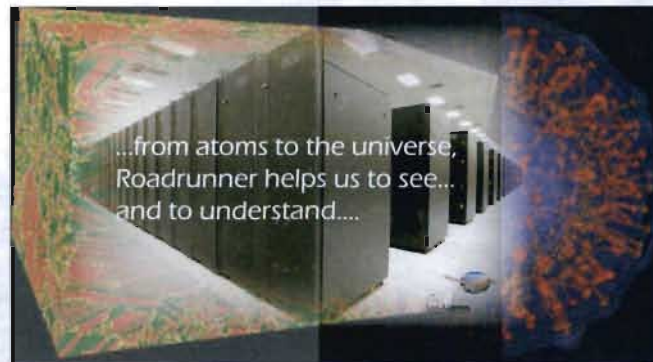
- Capabilities are chosen to be cross-cutting.
- Capabilities are led by an Associate Director.
- Capabilities do not reside in one organization.
- Many customers have access to the capability inventory.
- Capabilities are continually evaluated.



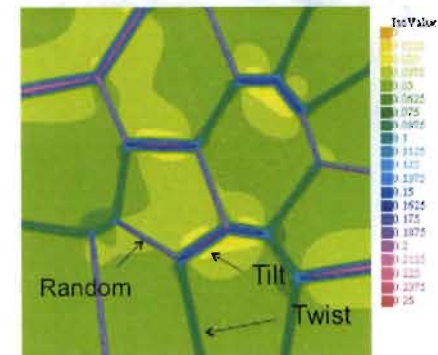
Tools to teach nuclear safeguards



LANSCE



Roadrunner supercomputer



Design and analysis of nuclear fuels



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LANL Organization

Audits & Ethics Director
Jeanette Y. Rennie

Community Programs Office
Kurt Steinhaus

Chief Prime Contracts
Steve Shook

Office of Equal Opportunity & Diversity
Charles (CJ) Bacino

Ombuds Office
Kirk Christensen

Comm. & Gov. Affairs
Lisa Rosendorf

Institutional Leaders

Michael R. Anastasio
Laboratory Director

Isaac E. Richardson
Deputy Laboratory Director

Executive Director
Rich Marquez

Executive Office Manager
Peggy Gonzales

Contractor Assurance Officer
Roland Knapp

Chief Information Security Officer
Jamil Farshchi

Chief Information Officer
Tom Harper

General Counsel
David Sosinski

Chief Financial Officer
Glenn Kizer

LANL, LLC Executive Staff Director
Jerry Ethridge

Terry Wallace
Principal Associate Director

Science, Technology & Engineering

Charles McMillan
Principal Associate Director

Weapons Programs

William Rees, Jr.
Principal Associate Director

Global Security

Mike Mallory
Principal Associate Director

Operations & Business

Paul Henry
Principal Associate Director

Capital Projects

Chemistry, Life, & Earth Sciences Assoc. Director Nan Sauer (Acting)	Engineering & Engineering Sciences Assoc. Director Paul Wanstuck (Acting)	Experimental Physical Sciences Assoc. Director Susan Seestrom	Information Technology Assoc. Director Carolyn Zerkle	Theory, Simulation, & Computation Assoc. Director Alan Bishop
ADKLES Biology	ADE Accelerator Operations & Technology	ADEPS Materials Physics & Applications	ADIT Departmental Computing Services	ADTSC Computer & Computational Sciences
Chemistry	Applied Engineering & Technology	Materials Science & Technology	Network Infrastructure and Engineering	High Performance Computing
Earth & Environmental Sciences	Prototype Fabrication	Los Alamos Neutron Science Center	Software and Applications Engineering	Theoretical Physics

Physics

Laboratory Directed Research & Development Program Office

Science & Technology Base

Science Program Office

Technology Transfer

LANL Institutes

Plutonium Science & Manufacturing Assoc. Director Carl Beard	Weapons Assoc. Director Bret Knapp
ADPM Integrated Program Management	ADW Computational Physics
Nuclear Component Operations	Theoretical Design
Manufacturing Engineering and Technology	Weapons Experiments
Nuclear Process Infrastructure	Weapons Systems Engineering

Threat Identification and Response
Assoc. Director
Scott Gibbs

PAGIS

Deviation Applications

International & Applied Technology

International Space & Response

Nuclear Nonproliferation

Business Services Assoc. Director Mark Barth	Environment, Safety, Health, & Quality Assoc. Director Chris Cantwell	Maintenance & Infrastructure Planning Assoc. Director Jay Johnson (Acting)	Nuclear & High Hazard Operations Assoc. Director Robert McQuinn	Safeguards & Security Assoc. Director Michael Lansing
ADBS Acquisition Services	ADSHO Environmental Protection	ADMS Infrastructure Planning	ADNHHO CMR Facility Operations	ADSS Emergency Operations
Central Training	Industrial Hygiene and Safety	Maintenance & Site Services	Engineering Services	Safeguards
Human Resources	ISMS/Worker Safety Office		Environmental & Waste Management Facility Operations	Security
Information Resource Management	Occupational Medicine		Fire Protection Division	
	Quality Assurance		Institutional Facilities & Central Services Operations	
	Radiation Protection		LANCER Facility Operations	
	Waste and Environmental Services		Operations Support	
	Environmental Safety Health & Compliance Resources		Safety Area	
			Science & Technology Facility Operations	
			TA-21 Facility Operations	
			TA-55 Facility Operations	
			Utilities & Infrastructure Facility Operations	
			Waste Facility Operations	

Environmental Programs Assoc. Director Michael Graham	Project Management Assoc. Director John Bretake (Acting)
ADBP Business & Project Services Division	ADPM CMR
Corrective Actions	Site Projects
Engineering & Technology	Project Functions
Regulatory Management	
TA-21 Closure	
TA-54 Closure	
Waste Disposition	

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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.



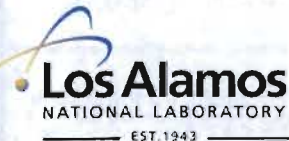
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Charter for the Nuclear Engineering and Technology Capability Review Committee

- **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.

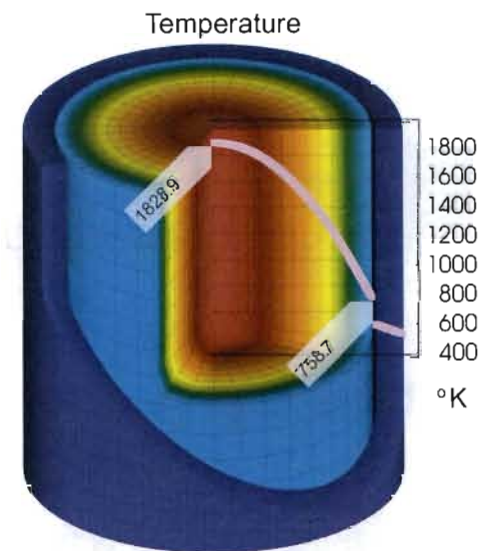


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Capability Assessment Evaluation

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.