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Title:	Management of Science, Technology, Engineering, and Mission
Author(s):	Duncan W. McBranch, Janet A. Mercer-Smith, and Lawrence E. Lucero
Intended for:	LANS Functional Management Review Los Alamos, NM, USA 11 April, 2011

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Form 836 (7/06)

Management of Science, Technology, Engineering, and Mission

Duncan W. McBranch, Janet A. Mercer-Smith, and Lawrence E. Lucero

The Laboratory provides science solution to the mission areas of nuclear deterrence, global security, and energy security. The capabilities support the Laboratory's vision as the premier national security science laboratory. The strength of LANL's science is at the core of the Laboratory. The Laboratory addresses important science questions for stockpile stewardship, global security, and energy security. The underpinning science vitality to support mission areas is supported through the Post Doc program, the fundamental science program in LDRD, collaborations fostered through the Institutes, and the LANL user facilities. LANL fosters the strategy of Science that Matters through investments, people, and facilities. Metrics evaluate the "health" of science and the Laboratory.

Management of Science, Technology, Engineering, and Mission

Duncan W. McBranch

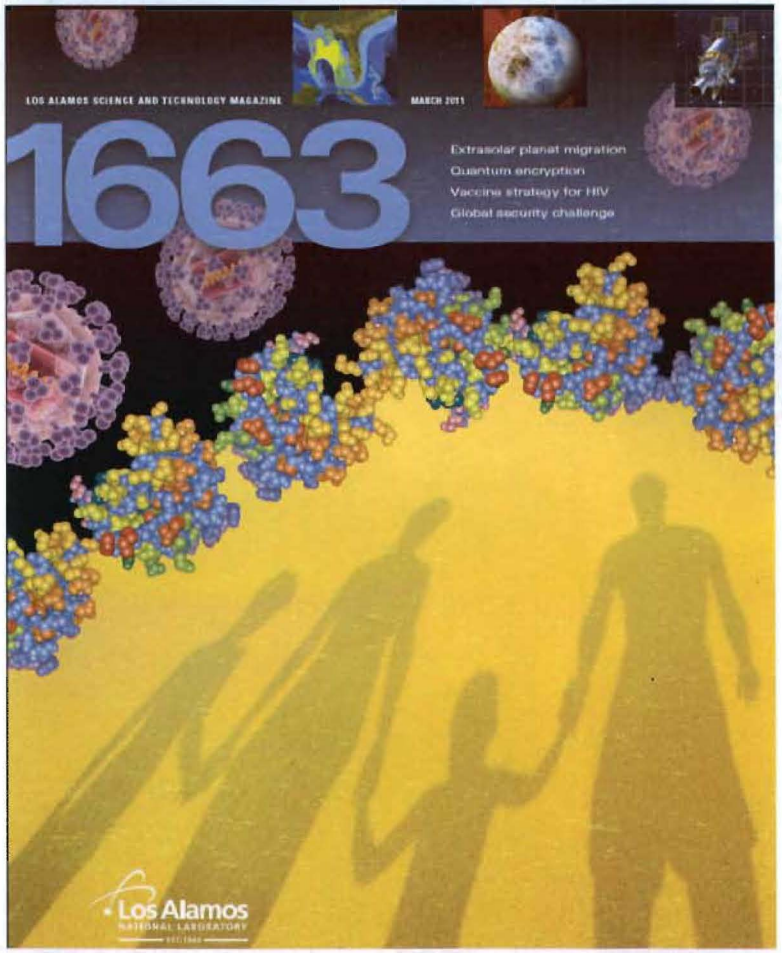
Deputy Principal Associate Director for
Science, Technology and Engineering

CAS Parent Validation Review
April 11, 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 Energy Security and other emerging national security challenges



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

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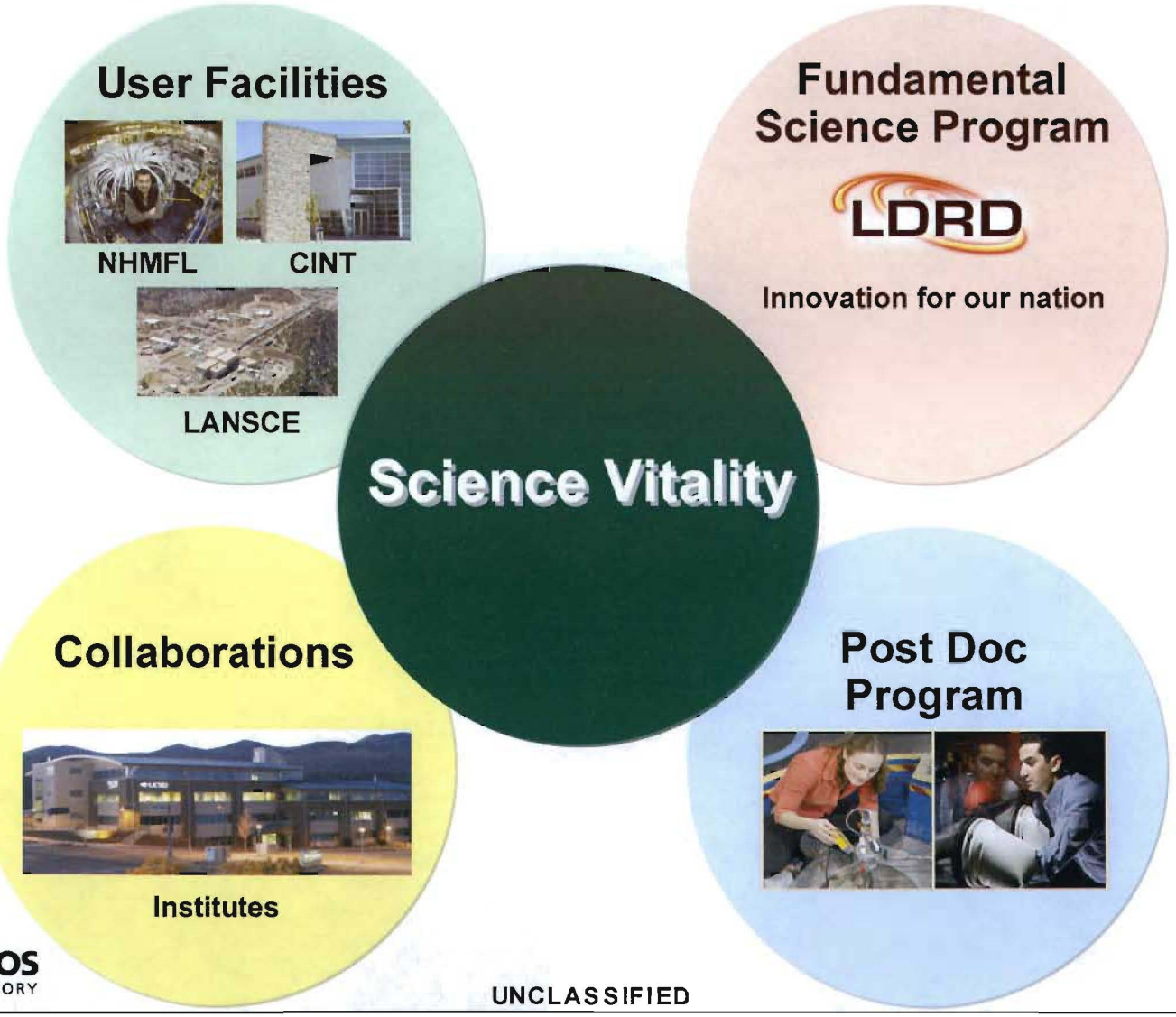
Science vitality underpins the Lab's mission areas.

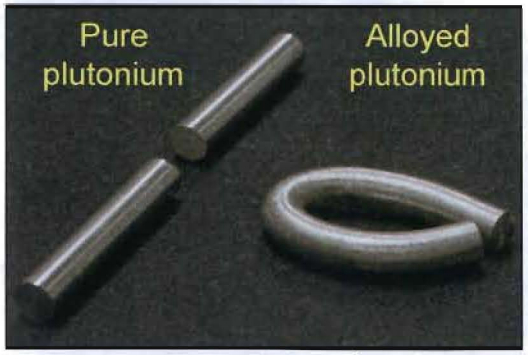


Science Strategy

LANL addresses key science issues for mission.

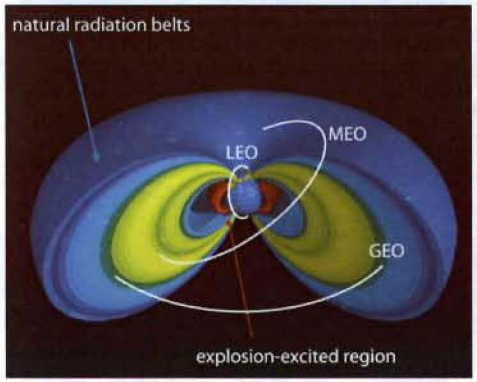
Stockpile Stewardship

Hydrodynamics: Turbulence

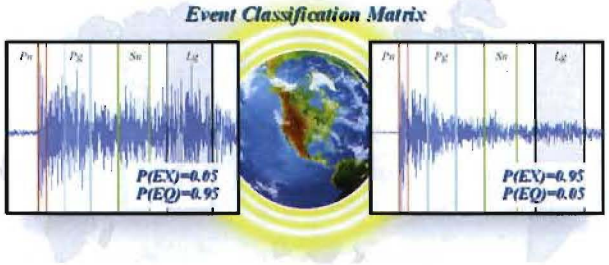


Plutonium Science: Metallurgy

Global Security

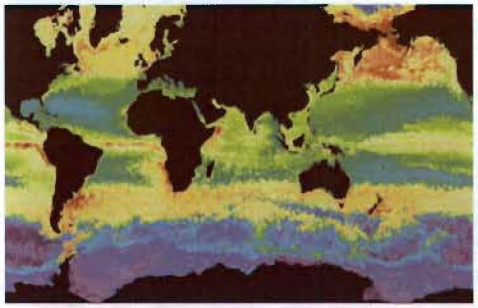


Threats from Space: Dynamic Radiation Environment Assimilation Model

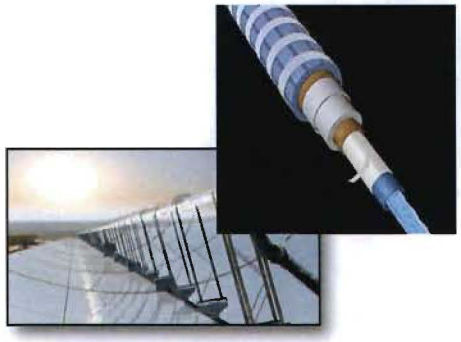


Seismic Detection of Nuclear Explosions

Energy Security



Climate/Energy Impacts: Simulation and prediction



Materials: Energy generation and transmission

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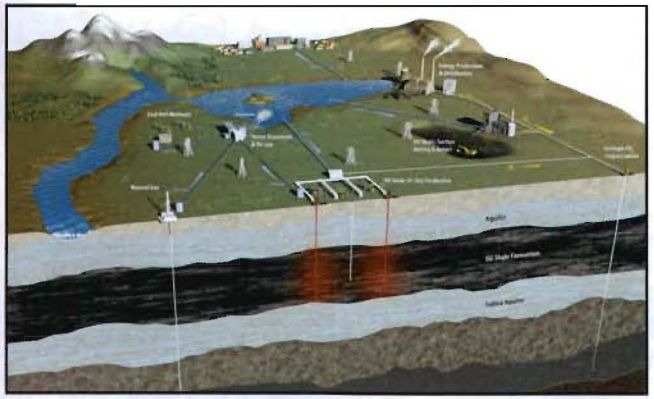
Science Strategy

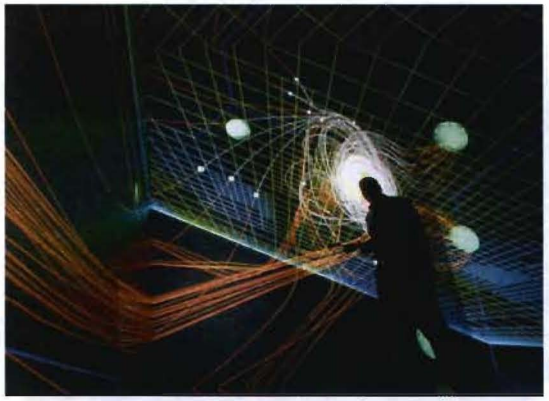
Los Alamos Science in the 21st Century

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.



Integrated process and system models



High performance computing and visualization

High Throughput Laboratory Network for infectious diseases

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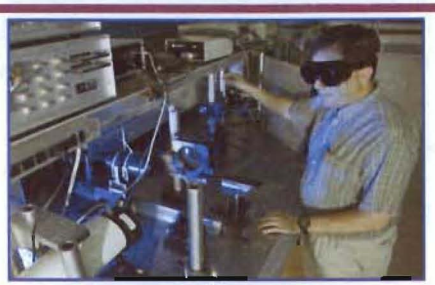
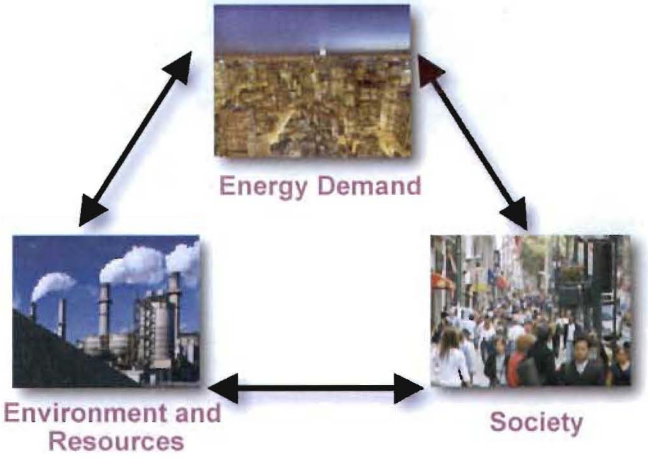
Managing a Science Laboratory in the National Interest

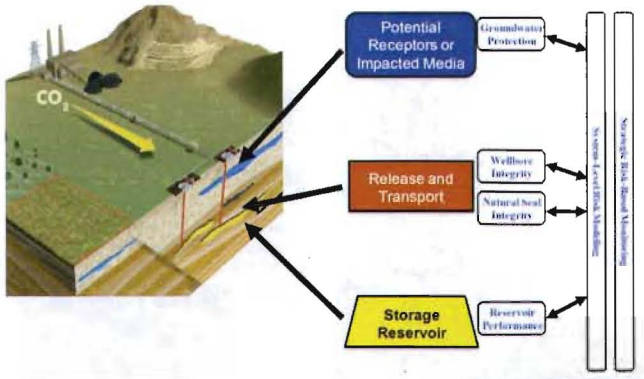
- Vital Science Enterprise



- Anticipate National Need



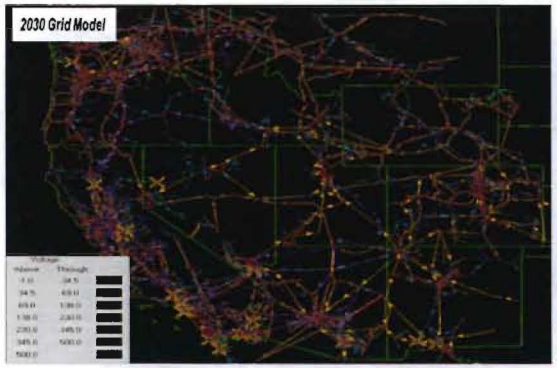
- Deliver System Solutions



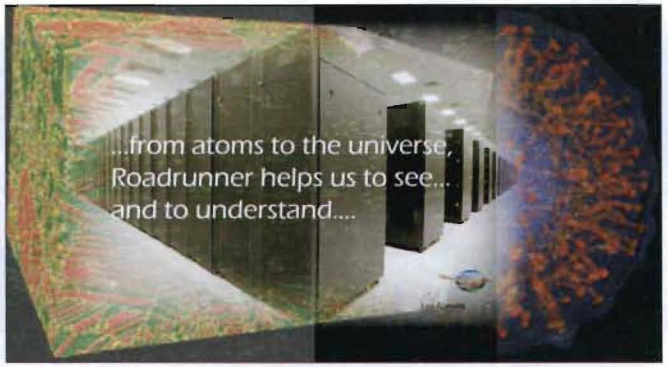
LANL is a capabilities-based laboratory.

- 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 STE capability inventory.
- Capabilities are continually evaluated.

LANSCE: Proton radiography



Infrastructure modeling

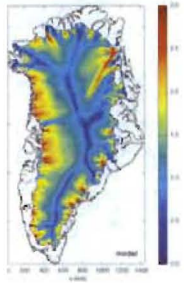


Roadrunner supercomputer

The capabilities of the Laboratory serve program.

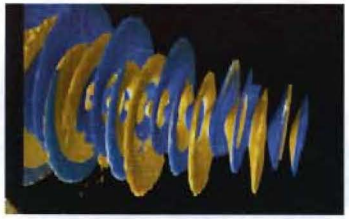
Weapons Science & Engineering

Accelerators & Electrodynamics



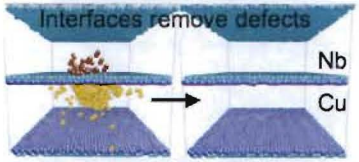
Information & Knowledge Science

Chemical Science



Computational Physics & Applied Mathematics

Biosciences



Materials

Earth & Space Sciences

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Diverse science achievements support the Lab's mission areas for national security science.

- Design of "Mosaic vaccines" for HIV (***Nature Medicine***).

Vaccine targets evolving strains of HIV

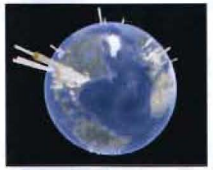
- Roadrunner kinetic plasma simulation shows formation and turbulent reconnection of magnetic flux ropes (***Nature Physics***).

Development of turbulent reconnection in flux ropes

- Past extended megadroughts in the southwestern US have implications for future climate (***Nature***).

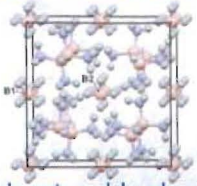
Core samples provide evidence of megadroughts.

- Understanding the structure of wealth, innovation, and crime in cities (***Nature***, ***Plos ONE***).



Predict socioeconomic potential of cities

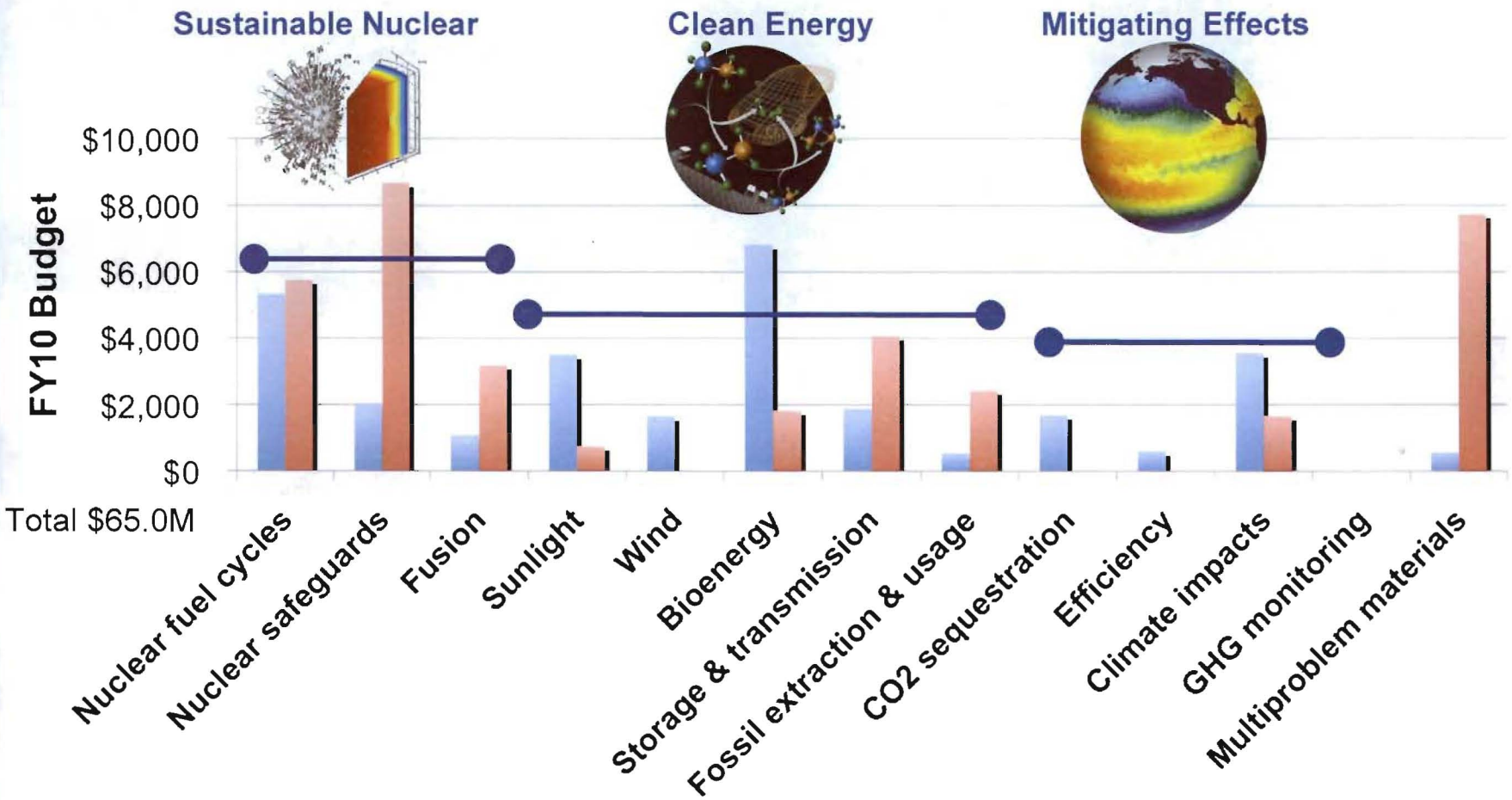
- Neutron diffraction sheds light on crystal structure of hydrogen storage material (***Chemical Communications***).



Understand hydrogen storage and release

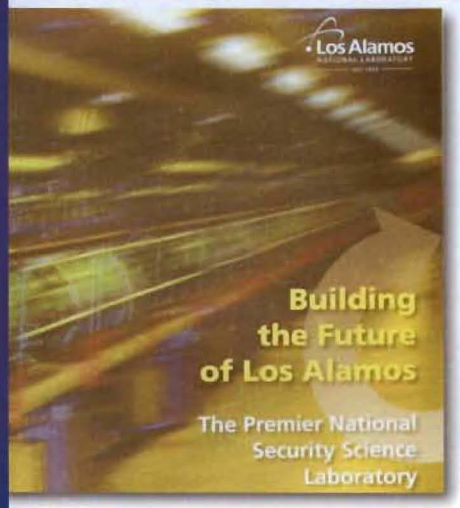
Meeting program needs draws on diverse capabilities.

Example: Energy solutions draw on a diversity of S&T.



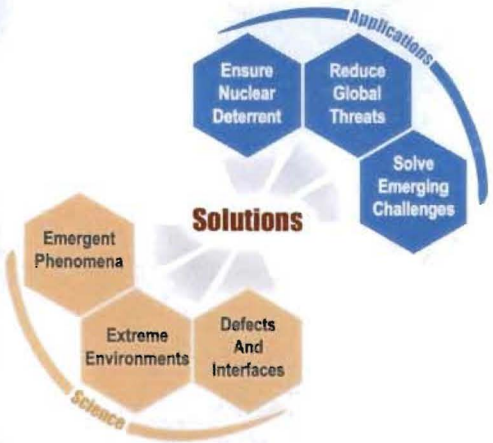
Including first two levels of relevance:
- Addresses identified mission challenge
- Builds underlying science and technology

"Science that Matters" guides LANL STE strategy.



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

Materials for the Future



Information Science and Technology for Integrative and Predictive Science

Science of Signatures

Controlled Functionality
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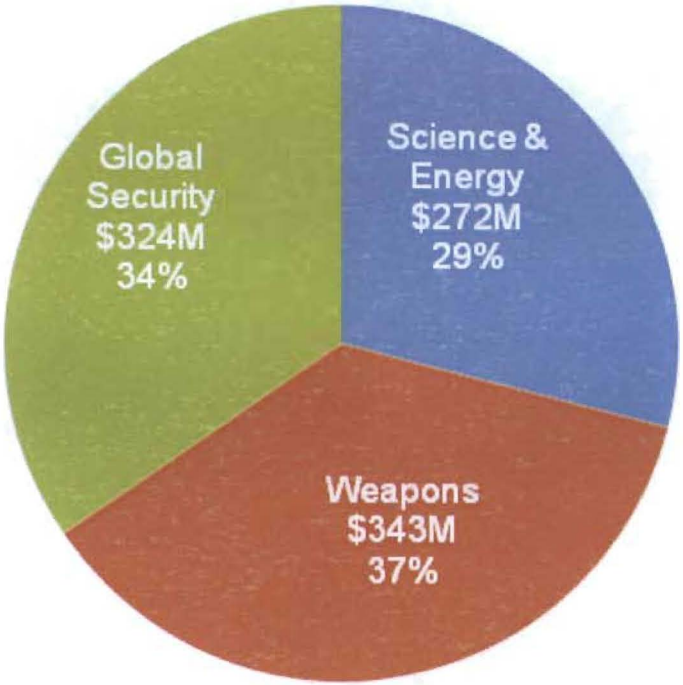
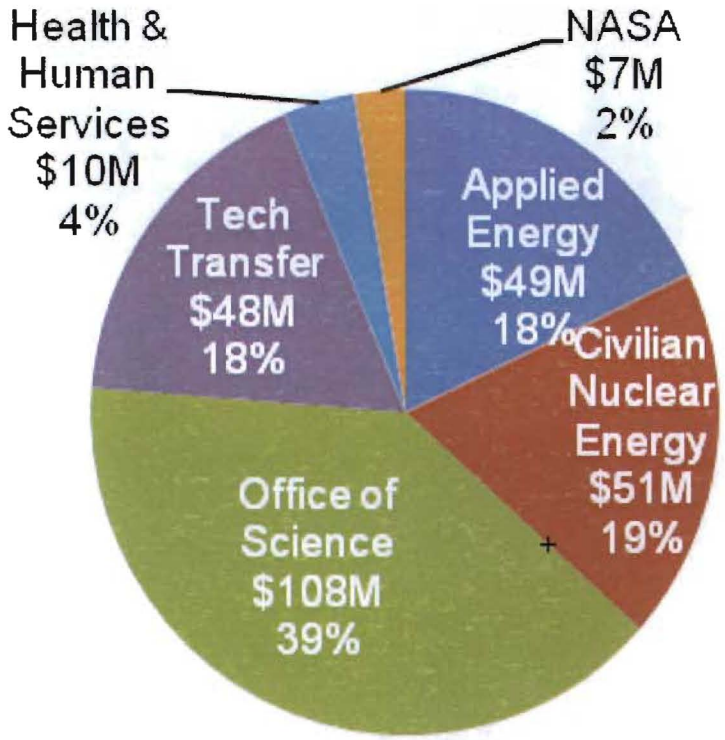
FY10 Laboratory R&D Budget

Laboratory's R&D Funding: $939M**



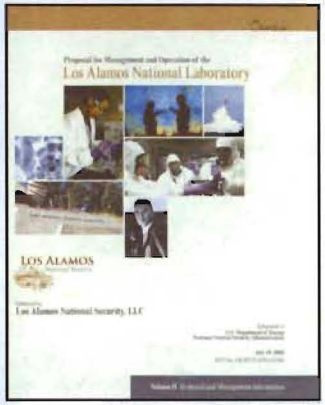
Science & Energy Funding: $273M**



+ Includes Genome, Tropical Western Pacific, and Stimulus

**includes $31M of Stimulus

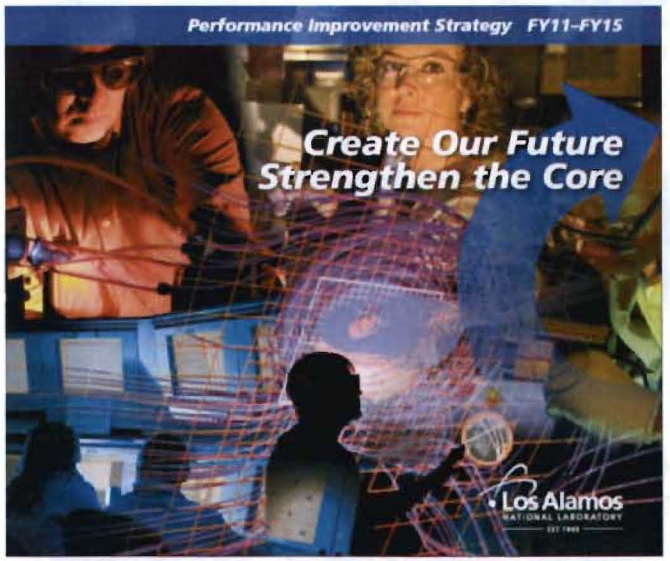
Evolution, Transformation and Integration of Current Metrics



LANS Proposal 2005

- **Reflect the application of CAS philosophy and performance management tools to pre-existing science metrics.**
- **Evolved and transformed into their current state from the vision and commitment expressed in the LANS Proposal.**

- **Represent a high-level slice across critical strategic and tactical ST&E initiatives and activities to support key institutional goals:**
  - *Develop sustainable solutions that allow resilient adaptation to growing global energy demand.*
  - *Become the premier capabilities-based national security science laboratory.*
- **Expressed in the Institutional Performance Improvement Strategy and executed through PADSTE's Institutional Commitments.**



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Science Metrics

Evaluating the "Health" of Science at the Laboratory

Quality
Use standard metrics.

Metric	Baseline	Performance
Peer-reviewed Publications	4 years	
Citations	2 years	
Capability Reviews	4 Years	
Invention Disclosures	4 Years	
Patent Applications	4 Years	

People
Derive indicators of the quality, productivity, and alignment of staff to current mission and future needs.

Metric	Baseline	Performance
Awards	4 years	
Pipeline	New	

Science & Energy Programs
Determine delivery performance, impact, and utilization of program assets in support of mission.

Metric	Baseline	Performance
ST&E Energy Security Program Performance	New	
User facilities	4 years	
Voice of the Customer	New	

Strategic Directions & Investments
Indicate ability to respond to current and future mission needs and emergent national needs.

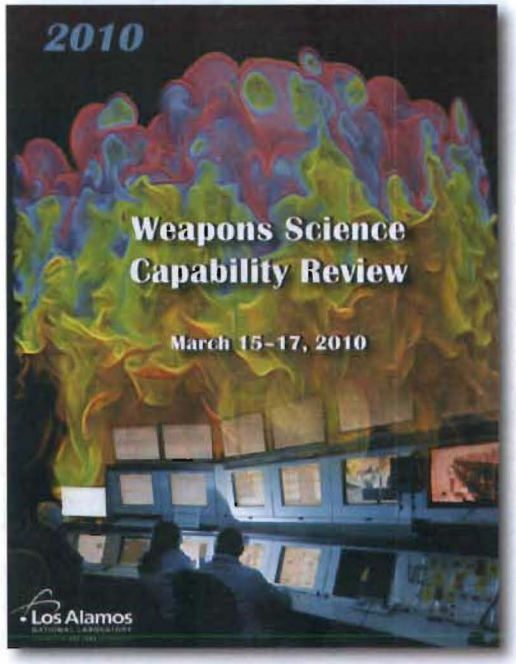
Metric	Baseline	Performance
Institutional Investments	4 years	
ST&E Workforce Strategic Direction	New	

LANL uses external peer review to measure and improve the quality of its science, technology and engineering (STE).

- LANL adopted capability reviews to assess the STE quality and institutional integration and to advise Lab management on STE's current and future health.

Accelerators and Electrodynamics Capability Review Committee

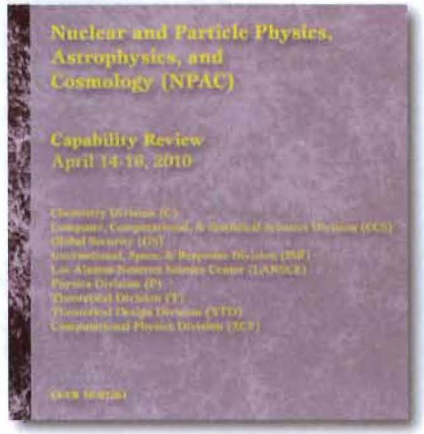
- The principal product of the capability review is a report that includes the review committee's assessments, commendations, and recommendations for STE.



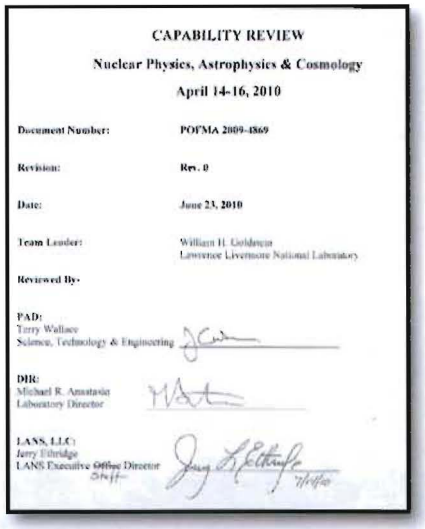
- To assure committee independence, the LANS Science and Technology Committee and committee chair are part of the capability review committee selection process.

Examples from report of the Nuclear and Particle Physics, Astrophysics, and Cosmology (NPAC) capability review.

- **Notable scientific accomplishments**
  - Three DOE Office of Science early career awards and PECASE Award in NPAC science demonstrate that LANL attracts outstanding staff.
  - Successful operation and conclusion of the MiniBoone experiment featured LANL in leadership design, construction, and operating roles.
  - Calculation of the Equation of State for the sQGP makes possible more quantitative calculations of quantities, such as the viscosity or energy loss coefficients in quark-gluon plasma experiments.
  - Discovery of a mysterious ribbon of energetic neutral atoms by the LANL-built IBEX-HI instrument on NASA's Interstellar Boundary Explorer.



- **Recommendations**
  - Implement the results of the NPAC Strategic Capability Planning Study.
  - Expand the planning study to address the problem of achieving stable base funding for NPAC science.
  - Establish an Astrophysics Center with base support from NNSA, to help meet its future workforce and technology needs and sustain basic science capability in astrophysics and cosmology.


CAPABILITY REVIEW

Nuclear Physics, Astrophysics & Cosmology

April 14-16, 2010

Document Number:	POFMA 2009-4869
Revision:	Rev. 0
Date:	June 23, 2010
Team Leader:	William H. Goldstein Lawrence Livermore National Laboratory
Reviewed By:	

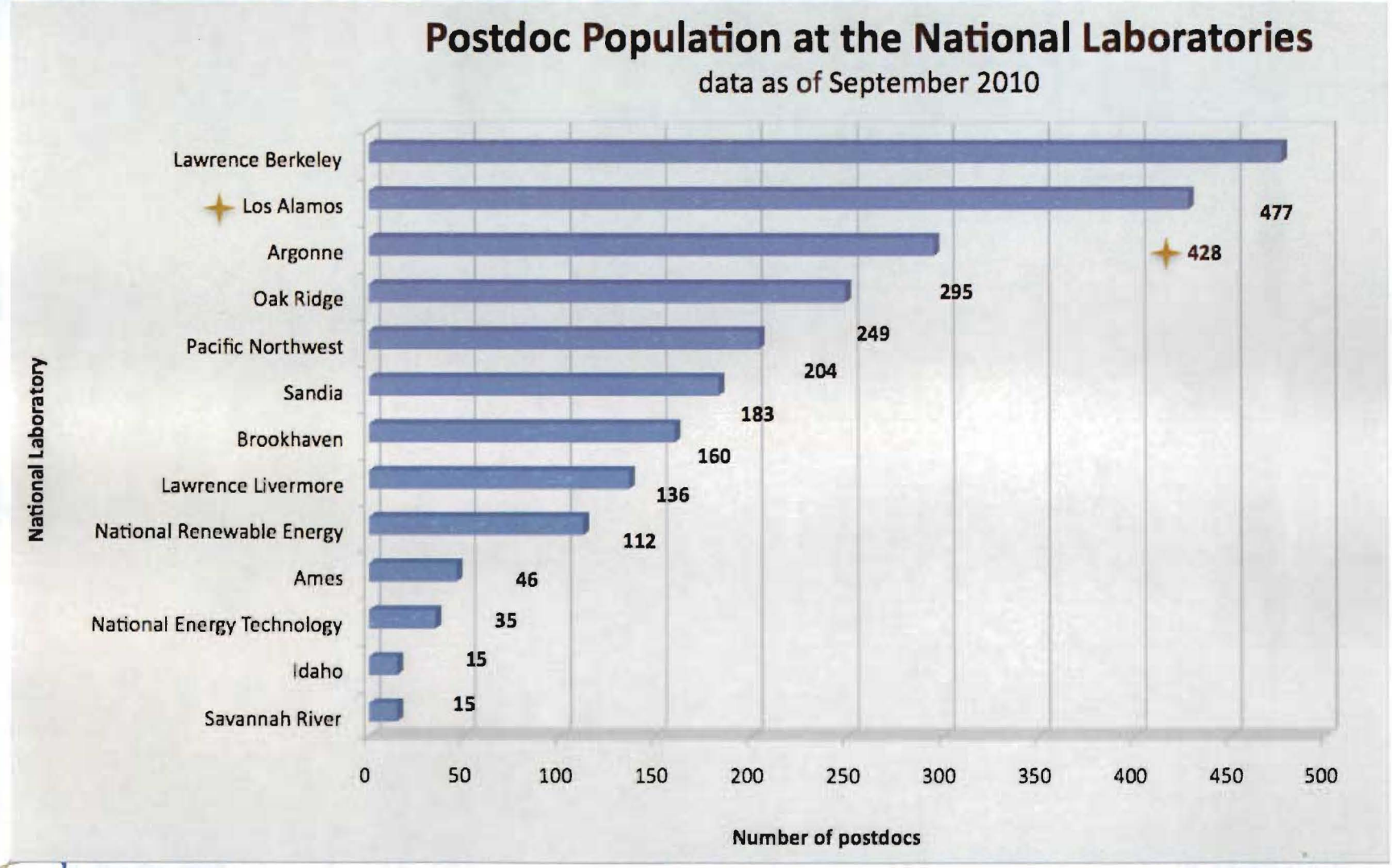
PAD:
Terry Wallace
Science, Technology & Engineering

DIR:
Michael R. Anastasio
Laboratory Director

LANS, LLC:
Jerry Eldridge
LANS Executive Office Director

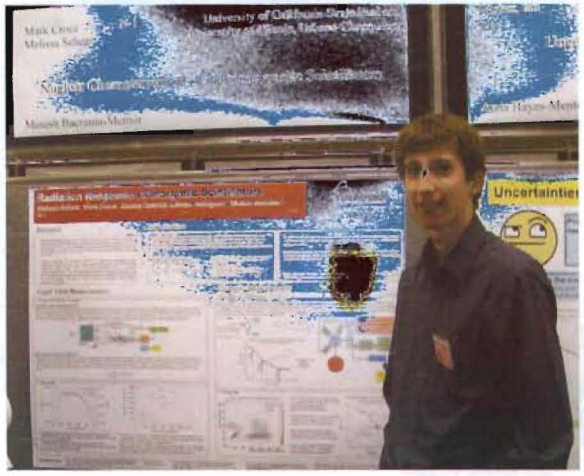
- **A PADSTE Management Review Board addresses recommendations from the capability reviews.**

Los Alamos is a national leader for postdoc programs.



Student and Postdoc Programs are a critical part of the LANL employment pipeline.

- *28%* of all employees were former students or postdocs; *23%* of all managers.
- *45%* of new hires in FY09 were former students or postdocs.
- *8.7%* of current LANL regular employees with PhD degrees received their PhD from a UC campus.
- Since 2005, *8.4%* of the postdocs converted to staff came from UC.



Postdoc conversion is the major mechanism for staff hiring.