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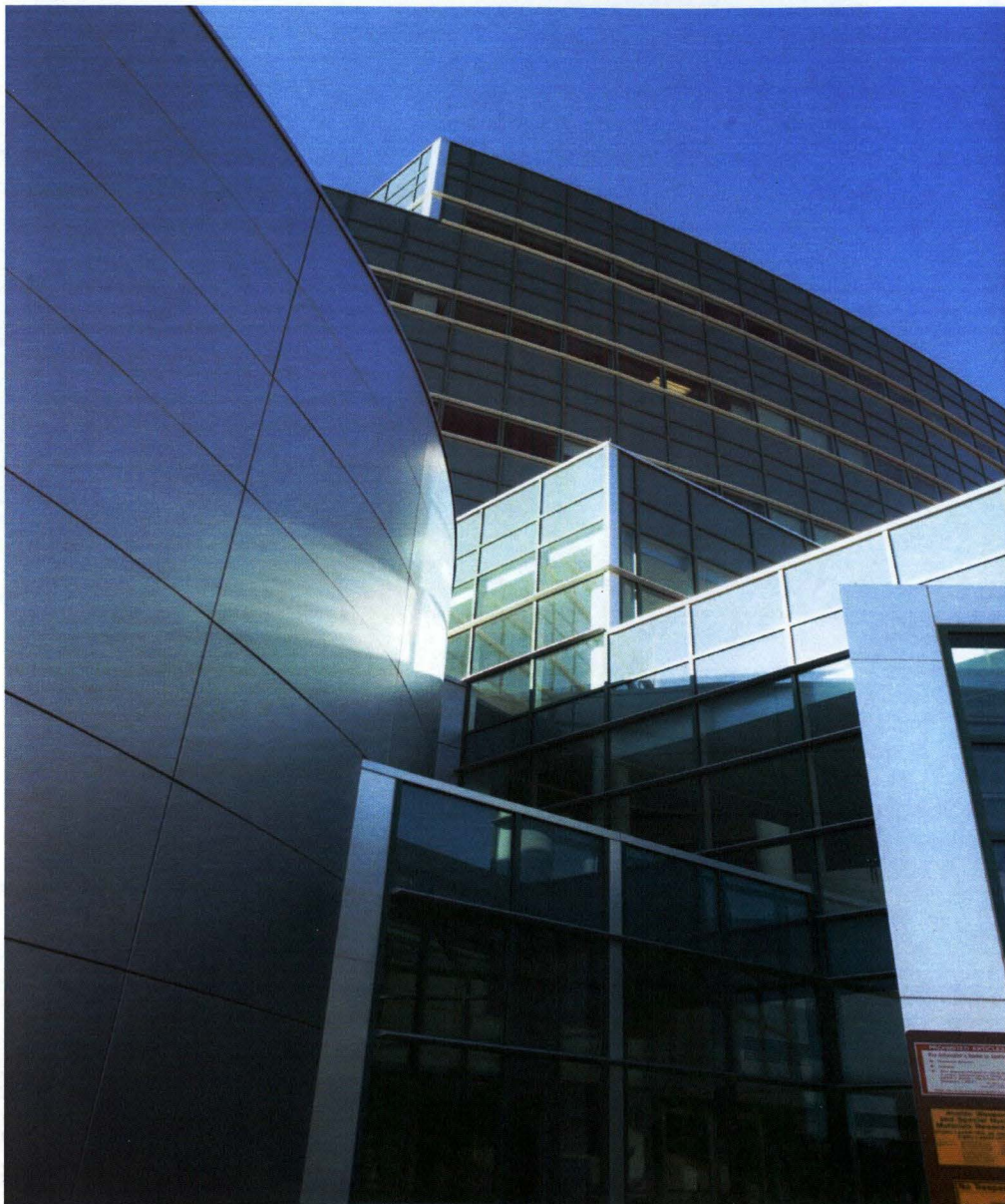
Title: Los Alamos National Laboratory Overview

Author(s): Jonathan Ventura

Intended for: Air Force Nuclear Weapons School
Albuquerque, NM



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Los Alamos National Laboratory Overview

Jonathan Ventura
Office of the Principal Associate
Director
Weapons Programs

March 2012



Operated by Los Alamos National Security, LLC for the U.S. Department of Energy's NNSA

UNCLASSIFIED



Los Alamos at the center of the Nation's deterrent posture for more than 69 years

- 1943 established as part of the Manhattan project
- 1945 Trinity device tested in New Mexico
- 1945 Little Boy and Fat Man detonated over Hiroshima and Nagasaki, Japan
- 1952 MIKE test—1st full scale thermonuclear device tested yield of 10.4 MT
- 1989 LANSCE proton radiography facility dedicated
- 1989 U.S. halts the design and manufacture of nuclear weapons
- 1992 U.S. conducts last underground nuclear weapons test
- 1994 Stockpile Stewardship Program established to ensure the safety, security and reliability of the stockpile w/o UGT
- 1999 DARHT experimental machine phase 1 operational
- 2007 1st LANL manufactured pit delivered
- 2008 Road Runner world's 1st supercomputer to achieve 1 petaFlop operations
- 2009 Full DARHT capability online
- 2010 Cielo supercomputer delivered
- 2011 NWC approves B61-12; last W88 WR pit delivered



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ADCLS Bioscience	ADE Accelerator Operations & Technology	ADEPS Materials Physics & Applications	ADIT Departmental Computing Services	ADTSC Computer, Computational, & Statistical Sciences
Chemistry	Applied Engineering & Technology	Materials Science & Technology	Network & Infrastructure Engineering	High Performance Computing
Earth & Environmental Sciences	Prototype Fabrication	Los Alamos Neutron Science Center	Software & Applications Engineering	Theoretical
Physics				

Laboratory-Directed Research & Development Program Office
 Science & Technology Base

Science Program Office
 Technology Transfer
 LANL Institutes

 Plutonium Science & Manufacturing Assoc. Director Tim George (Acting)	 Weapons Assoc. Director Bret Knapp
ADPSM Integrated Program Management	ADW Computational Physics
Nuclear Component Operations	Theoretical Design
Manufacturing Engineering & Technology	Weapons Experiments
Nuclear Process Infrastructure	Weapons Systems Engineering







Threat Identification & Response
 Assoc. Director
 Scott Gibbs



ADTIR
 Decision Applications

International & Applied Technology

Intelligence & Space Research

Nuclear Nonproliferation

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ADBS Acquisition Services	ADESHQ Environmental Protection	ADMIP Infrastructure Planning	ADNHQ CMR Facility Operations	ADSS Emergency Operations
Central Training	Industrial Hygiene & Safety	Maintenance & Site Services	Engineering Services	Safeguards
Human Resources	ISMS/Worker Safety Office		Environmental & Waste Management Facility Operations	Security Services
Information Resource Management	Occupational Medicine		Fire Protection Division	Security Operations
	Quality Assurance		LANSCE Facility Operations	Physical Security
	Radiation Protection		Operations Support	
	Waste & Environmental Services		Safety Basis	
	Environmental Safety Health Deployed Resources		Science & Technology Operations	
	ES&H Integration Office		TA-21 Facility Operations	
			TA-55 Facility Operations	
			Utilities & Institutional Facilities	
			Weapons Facility Operations	

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

CMRR

Functions

12/05/11

EST. 1943

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LANL is part of the nuclear security enterprise that is delivering on its national security commitments

National Laboratories and Test Site



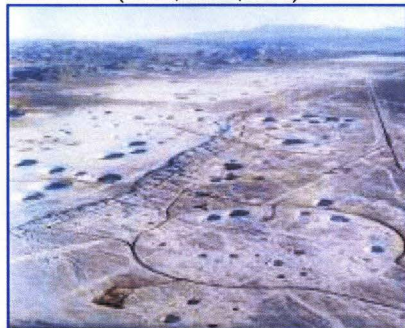
**Los Alamos
National Laboratory**
Los Alamos, New Mexico
Nuclear design lab
(B61, W76, W78, W88)



**Lawrence Livermore
National Laboratory**
Livermore, California
Nuclear design lab
(W80, W87, B83)



Sandia National Laboratories
Systems engineering, neutron
generators, and non-nuclear
component
Los Alamos
NATIONAL LABORATORY
EST. 1943



**Nevada National
Security Site**
Nevada
Experimental site and
"subcritical" nuclear material tests



Pantex Plant
Amarillo, Texas
Weapons assembly/disassembly



**Y-12 National Security
Complex**
Oak Ridge, Tennessee

Production Complex



Kansas City Plant
Kansas City, Missouri
Nonnuclear manufacturing/
Procurement



Savannah River Site
Aiken, South Carolina
Tritium operations

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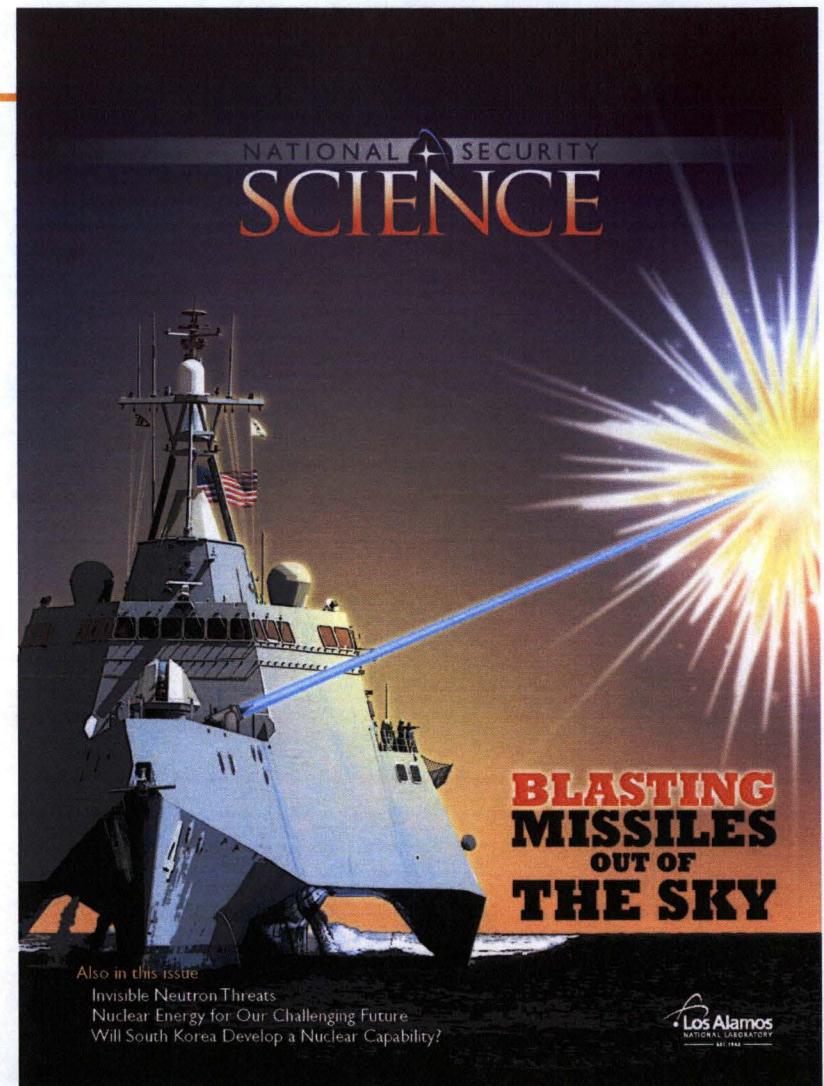


LANL's Mission and Vision

Mission develop and apply leading edge science, technology, and engineering solutions that:

- Ensure a safe, secure, and effective nuclear deterrent
- Reduce global threats
- Solve energy security and other emerging national security challenges

Vision the premier National Security Science Laboratory



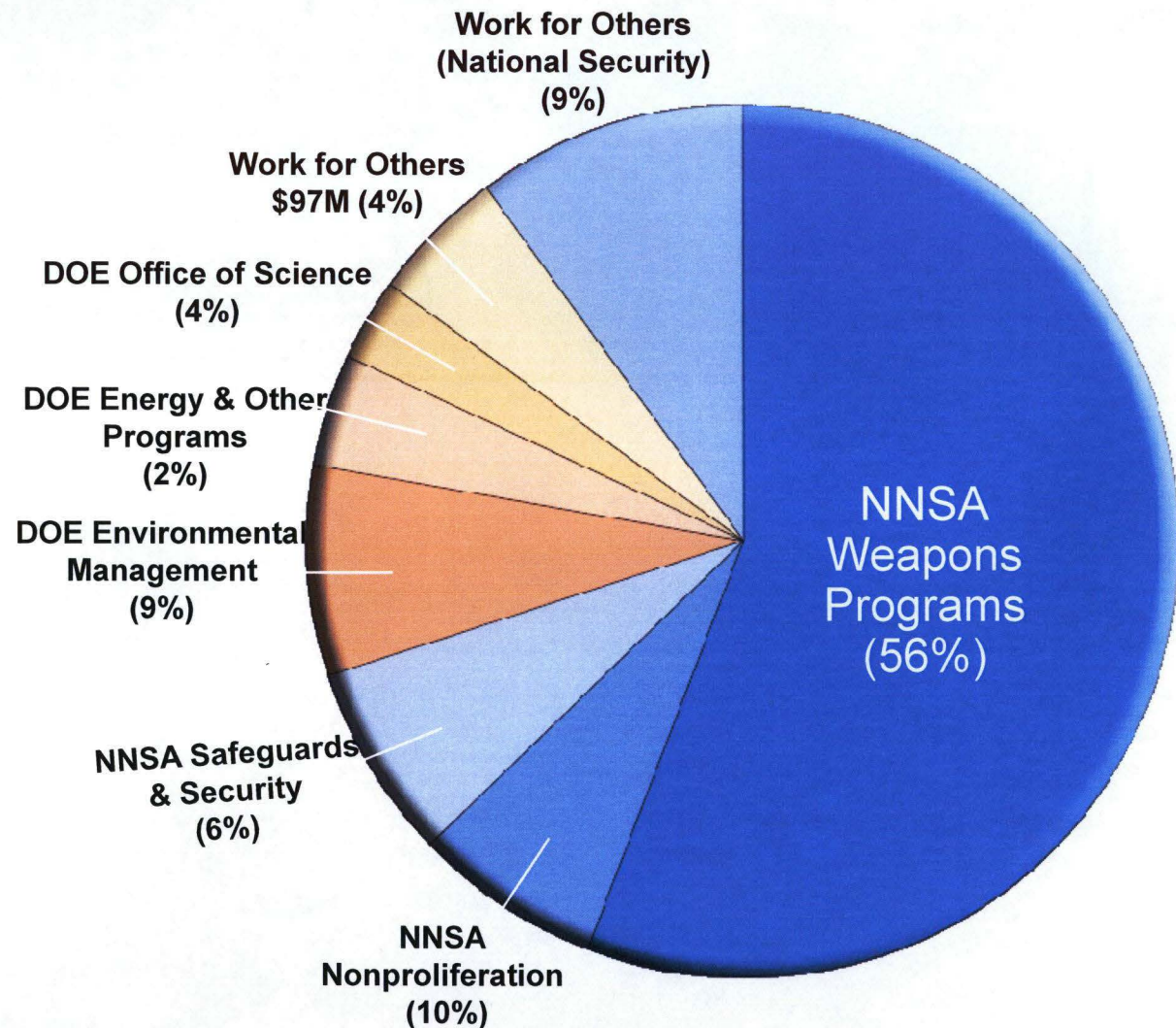
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People → Capability → Mission Impact



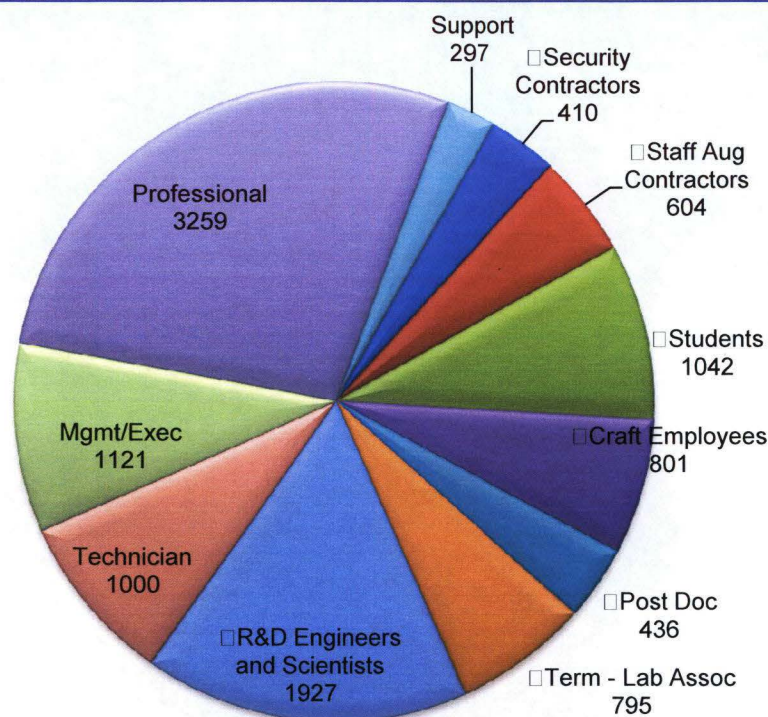
Laboratory budget is declining and managing that is critical to the long term health and vitality

***The Laboratory's
FY12 annual
funding is
approximately
\$2.2 billion.**



People are the MOST important resource of the laboratory

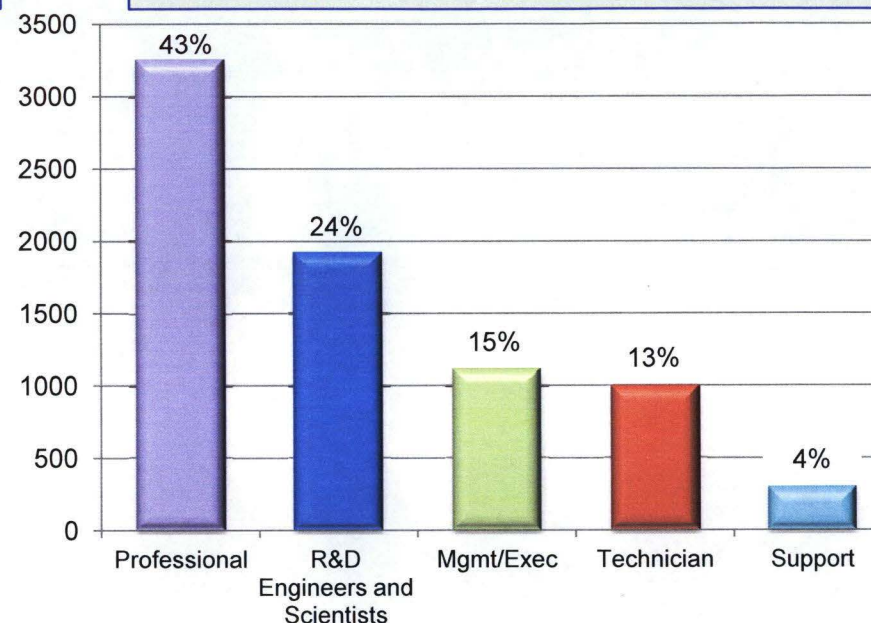
LANL Staffing 11,692 employees a decrease of 490



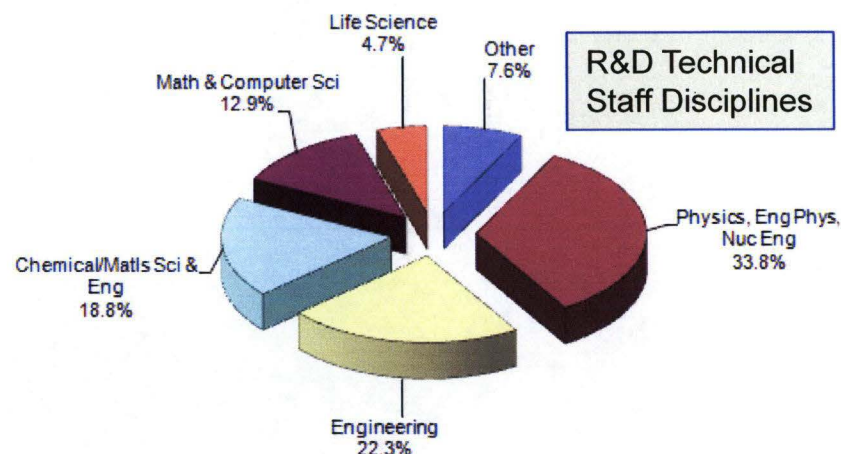
Career (Regular) Employees

- R&D Engineers and Scientists
- Technician
- Management/Executives
- Professional
- Support

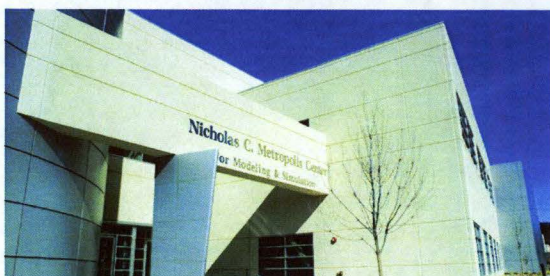
LANL Career Employee Distribution 7,604



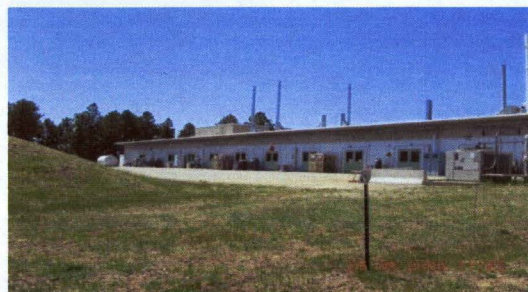
R&D Technical Staff Disciplines



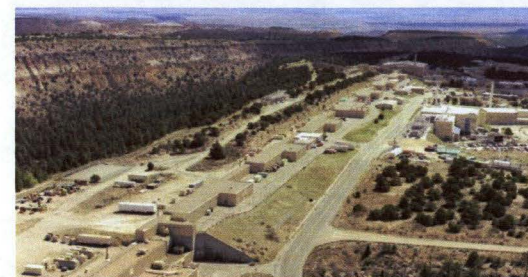
LANL's science and engineering infrastructure a critical component of U.S. deterrent



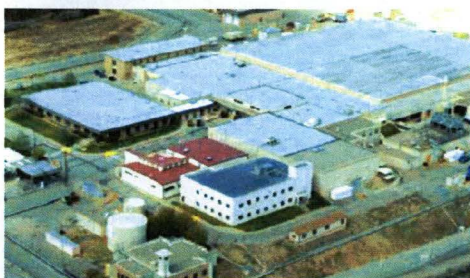
Metropolis Center for Modeling & Simulation



High Explosive laboratories



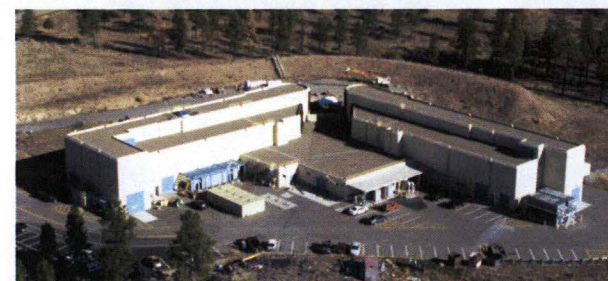
Los Alamos Neutron Science Center



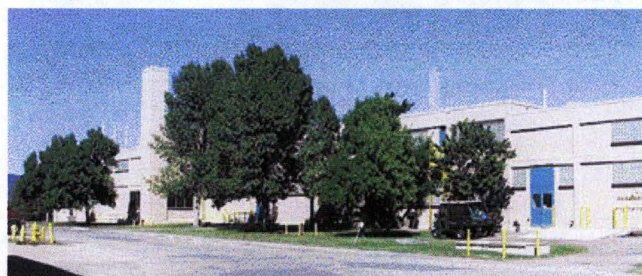
Plutonium Processing Facility



Chemistry and Metallurgy Building



Dual Axis Radiographic Hydrotest Facility



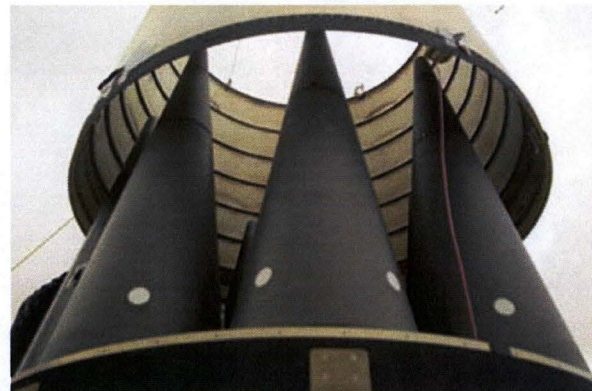
SIGMA Building



Chemistry & Metallurgy Research Replacement (RLUOB)

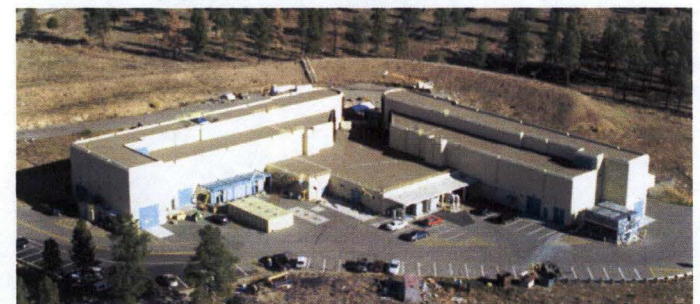
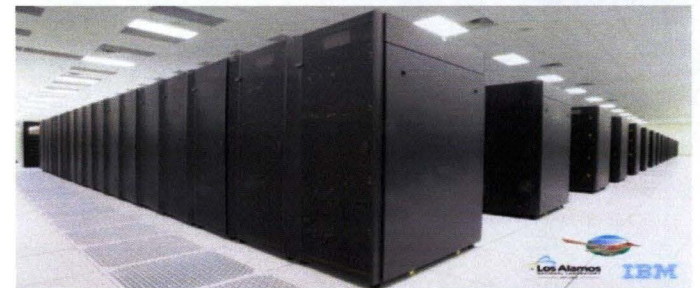
LANL is the design laboratory for the majority of the Nation's on alert deterrent

- LANL is the design laboratory for:
 - B61 Bomb
 - W78 ICBM
 - W76 SLBM
 - W88 SLBM



LANL maintains a carefully balanced three part weapons program to sustain the Nation's deterrent

- **Stockpile management**
 - LEPs, Alts, Mods
 - Surveillance
 - Annual Assessment
- **Using science, technology and engineering investments**
- **Infrastructure investments**
 - Create state-of-the-art facilities to sustain laboratory capabilities
 - Hire and train next generation

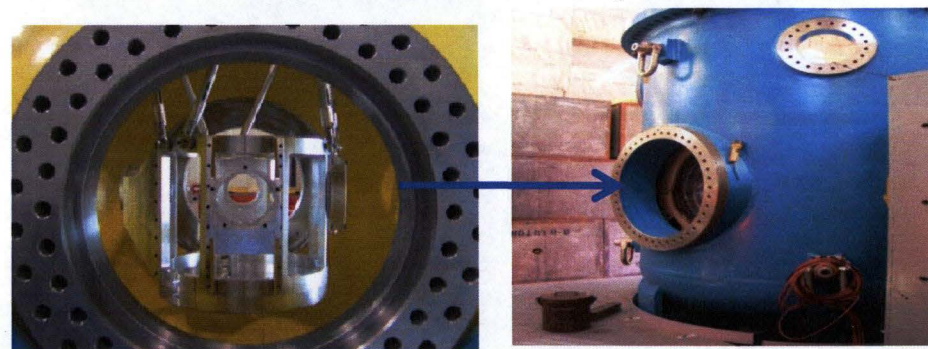


DARHT world class imaging in support of the deterrent

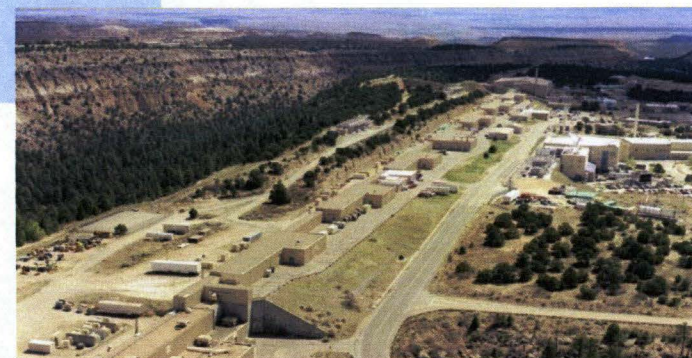
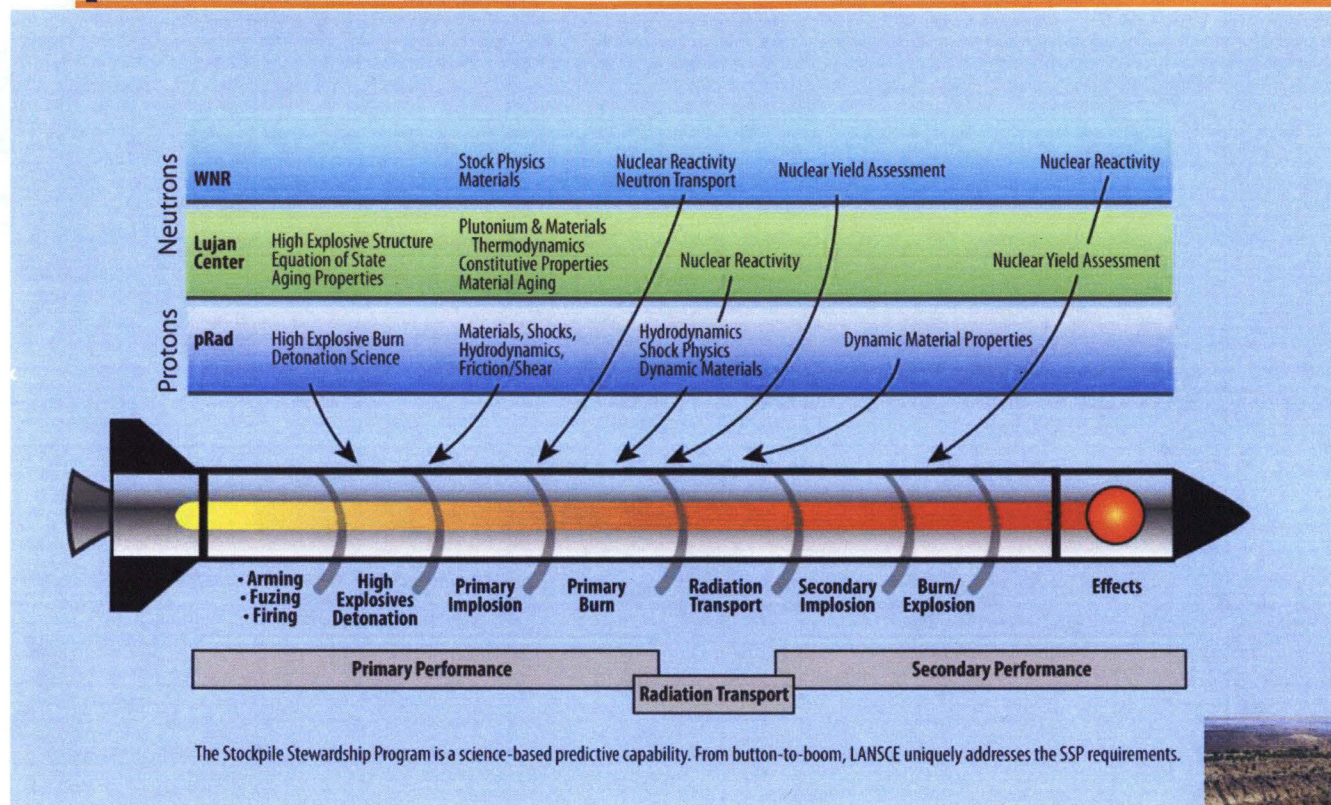
- World class X-ray radiography for non-nuclear hydrodynamic tests
- Axis 1 single image
- Axis 2 four images
- World's first dual axis experiment December 2009
- Experiments fully contained to reduce environmental impacts and increase shot rate



DARHT Containment System

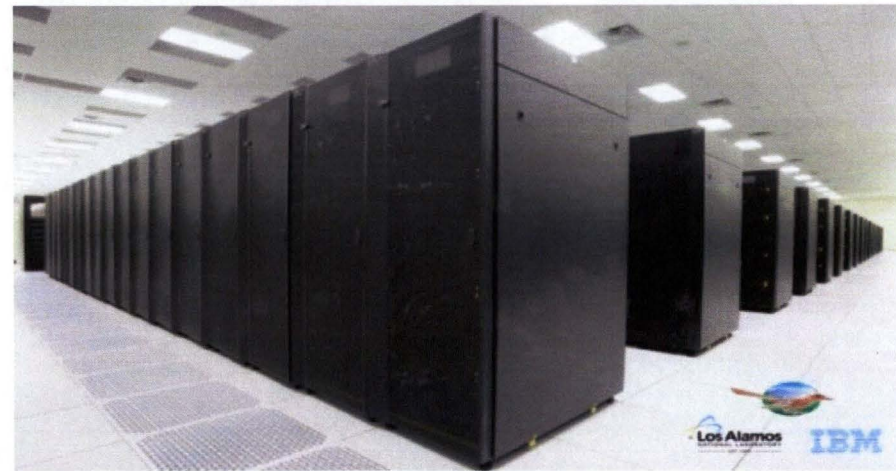


LANSCCE contributes to understanding weapons performance



Supercomputing critical to sustaining the deterrent and other national security missions

- Stockpile challenges are increasingly complex as systems age
- DARHT, LANSCE provide large data sets to resolve stockpile challenges
- Data sets require ever more capable machines to rapidly process data
- Road Runner @1.105 petaflops and Cielo @ 1.35 petaflops are key resources for LANL



Stockpile issues are requiring improvements in simulation fidelity

These stockpile issues

- Need to mature new technology for SLEPs
- Need to improve understanding to resolve SFIs
- Need to resolve nuclear test anomalies
- Need to improve weapon surety

Drive these simulation fidelity improvements

- **Physics fidelity**
 - Replace calibrations with physics models to improve confidence of extrapolation away from the nuclear test base
- **Numerical fidelity**
 - SFIs sensitive to fine scale features, requiring much finer resolution
- **Geometric fidelity**
 - Neglected features need to be included; many are inherently 3D

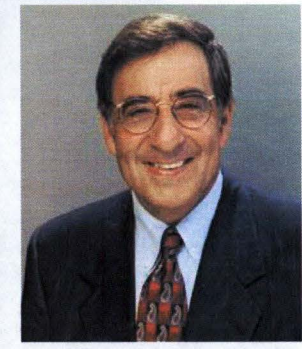
Trinity will dramatically increase the fidelity of weapon simulations

TA-55 the Nation's center of plutonium science and manufacturing



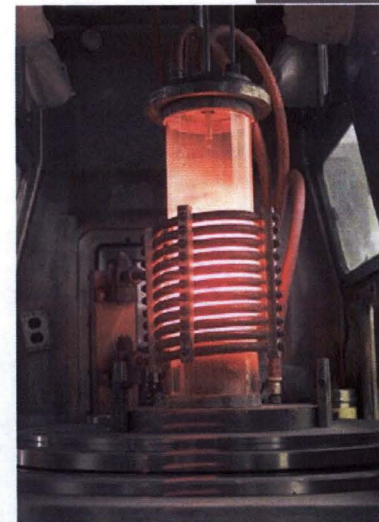
Annual Assessment applying the intellectual, experimental, computational, and engineering strengths of the lab

- Detailed reports are prepared on each warhead
- Lab Director briefed in detail
- INWAP is strengthening the process
- Lab Director issues letter to Secretaries of Defense & Energy and Chair of the NWC
- Lab Director briefs the Secretary of Energy
- STRATCOM issues separate report and briefs the Secretary of Defense
- Secretaries of Defense & Energy brief the President
- President advises Congress

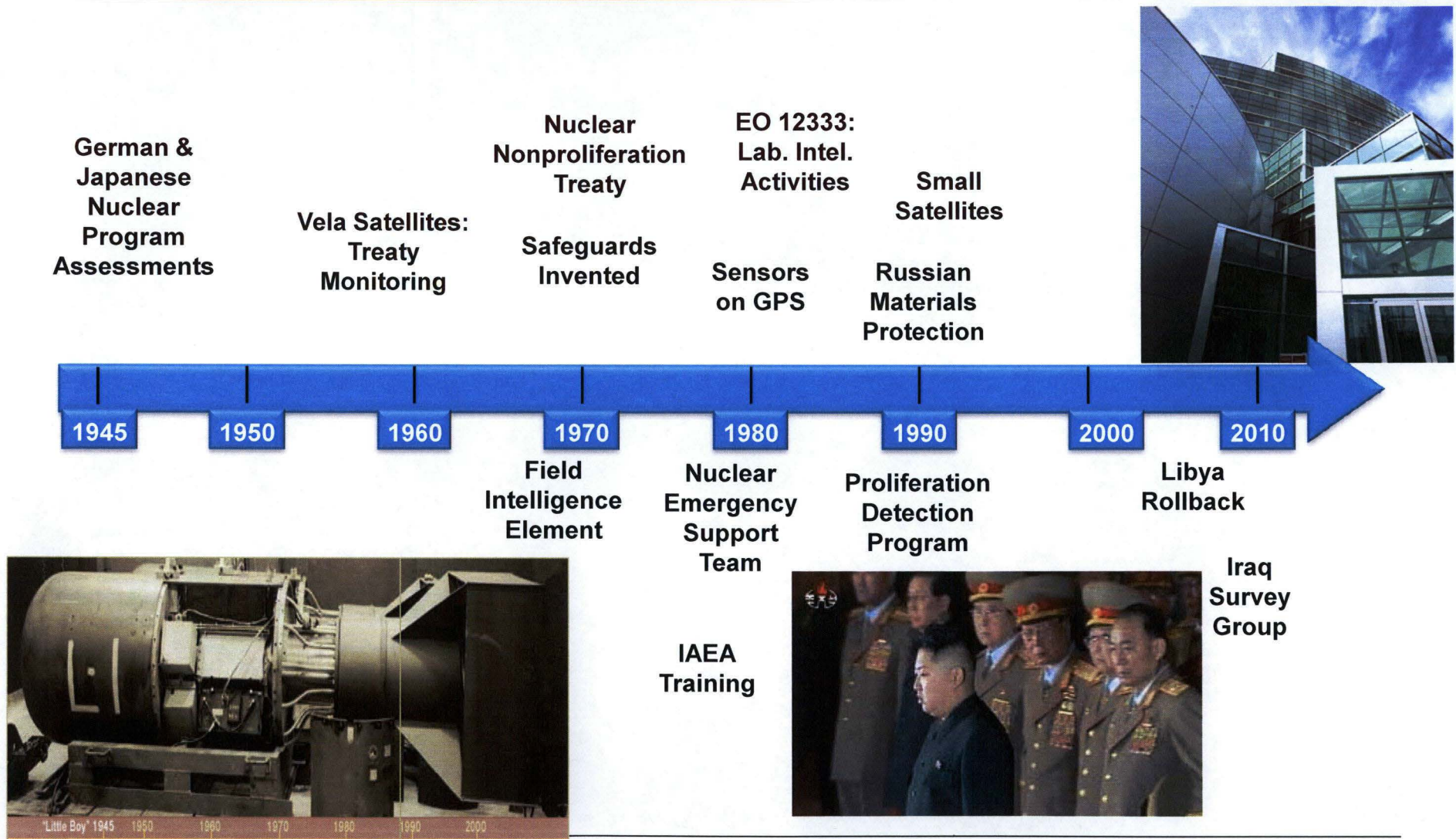


Continued success of the Stockpile Stewardship requires management attention and focus

- **Challenges confronting the program**
 - Sustaining bipartisan support
 - Managing budgetary resources
 - Downsizing staff
 - Executing program
 - Balancing risk (safety and security)
 - Recruiting and retaining workforce for future
 - Investing in scientific and engineering tools
 - Addressing infrastructure requirements



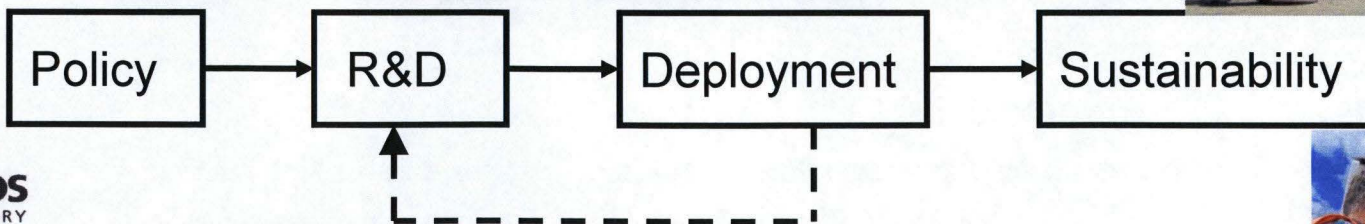
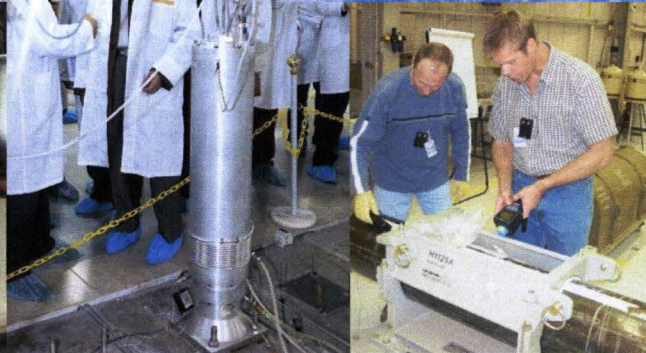
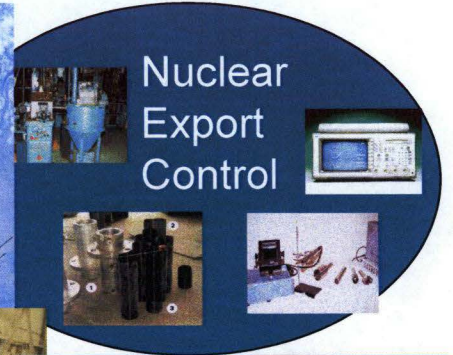
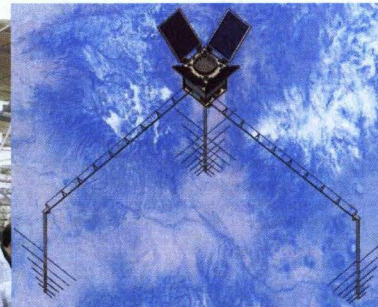
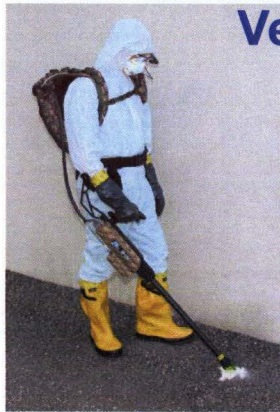
For 65+ years, LANL has served the mission of national security beyond the weapons program



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Science challenges for Nuclear Nonproliferation Programs

Nonproliferation, Arms Control Policy, Monitoring and Verification, International Safeguards and Export Control

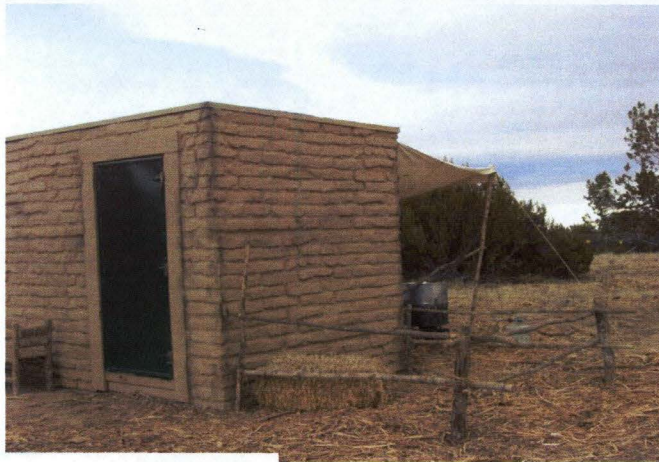


Science challenges for Global Security making a difference for the troops

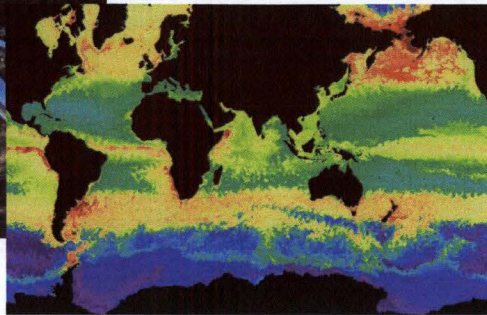
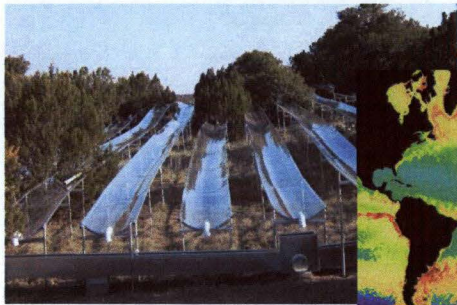
- LANL's HE expertise in the areas of:
 - Homemade explosives - explosives chemists
 - Improvised explosive devices - using HMEs in IED's or EFP's
 - Small scale testing - safety and sensitivity
 - Detection - properly identifying HMEs
 - HME database - information tool for our troops



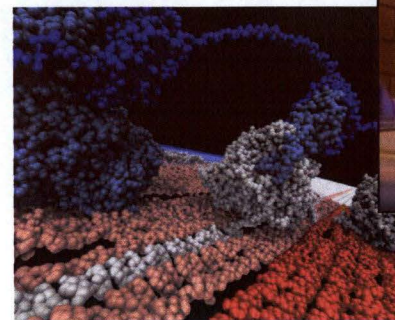
Realistic training scenarios reinforce class room knowledge to troops



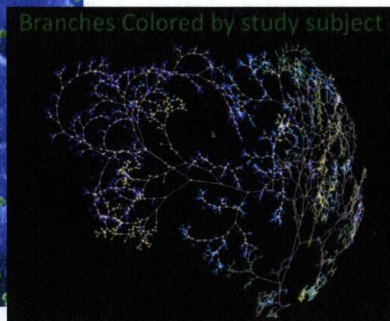
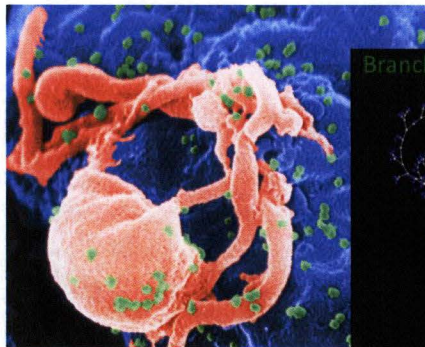
Questions for Science and Energy



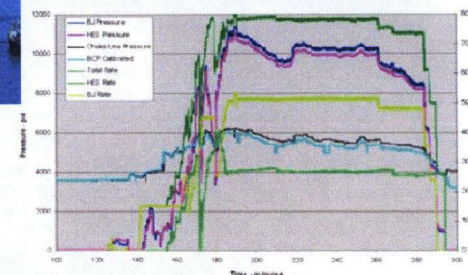
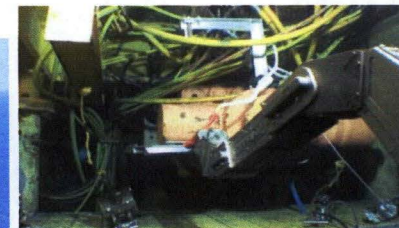
Climate / Energy Impacts:
Measurement, simulation, and prediction



Unconventional Fuels:
Extraction of energy



Theoretical Biology: HIV evolution and design of "mosaic vaccines"



Conventional fuels:
Responding to disasters with technology