

# Overview

**Dr. Carol Burns**  
**Executive Officer**  
**Science, Technology, and Engineering**

November 29, 2018

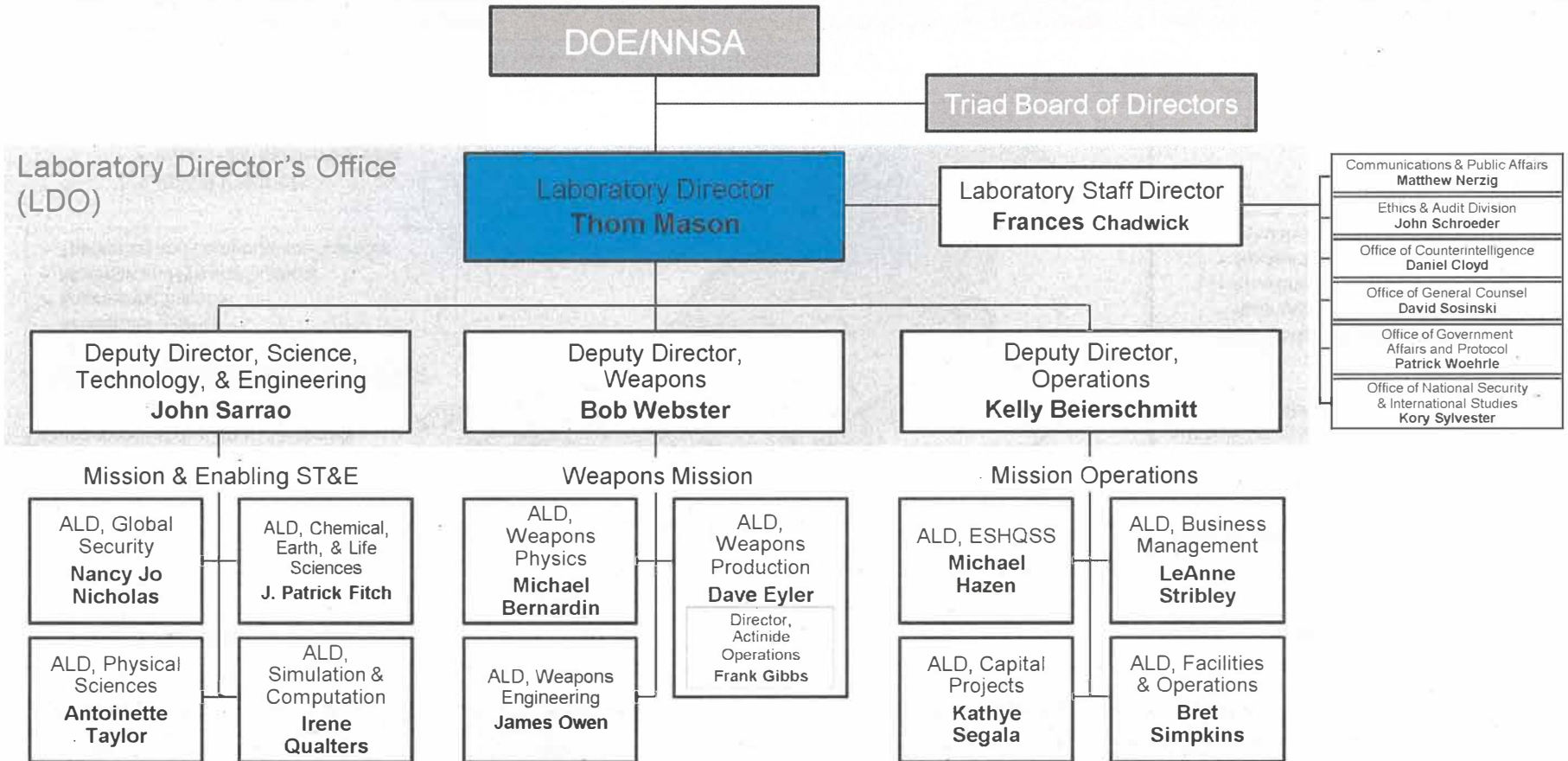


Managed by Triad National Security, LLC for the U.S. Department of Energy's NNSA

# Simultaneous excellence: Balance between operations and mission



# The Laboratory's new organizational structure



# The Laboratory is a complex, dynamic system of people, facilities, materials, and services

## Weapons Programs

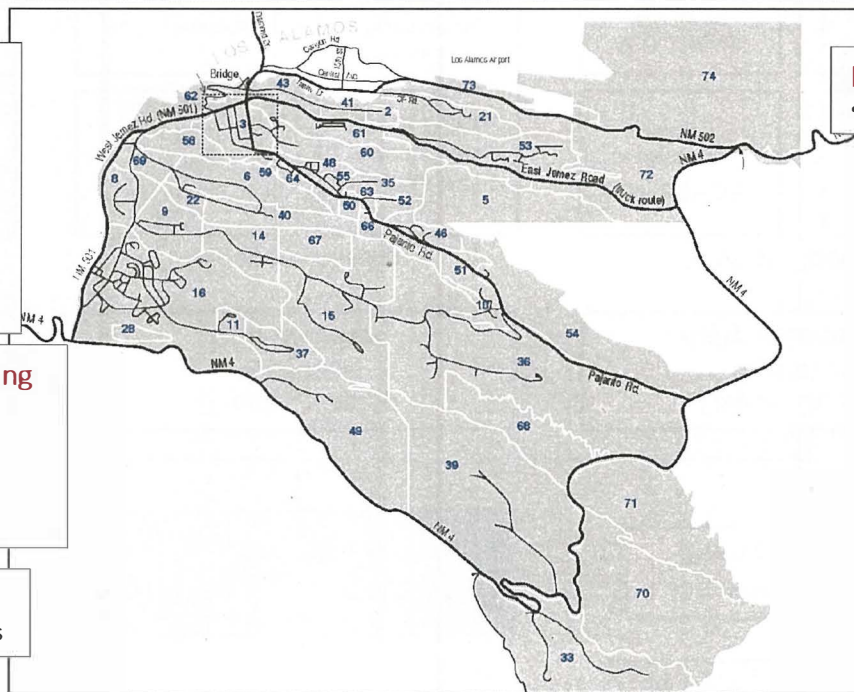
- Weapons Physics Design and Computation
- Weapons Engineering
- High Explosives
- Plutonium
- Tritium/GTS
- Uranium, Beryllium, Salts, Metals
- Detonators
- Component Fabrication and Assembly

## Science, Technology & Engineering

- Chemistry, Earth and Life Sciences
- Accelerator Science
- Engineering Sciences
- Materials and Physical Sciences
- Theoretical and Computational Sciences

## Capital Projects

- Project Management Services



## Director's Office

- Institutional Management

## Global Security

- Nuclear Nonproliferation
- Nuclear Counter-Proliferation
- Emerging Threats
- Intelligence Community
- National Defense and Homeland Security

## Institutional Operations

- Business Services
- Environmental, Safety, and Health
- Nuclear & High Hazard Operations
- Security and Mission Assurance

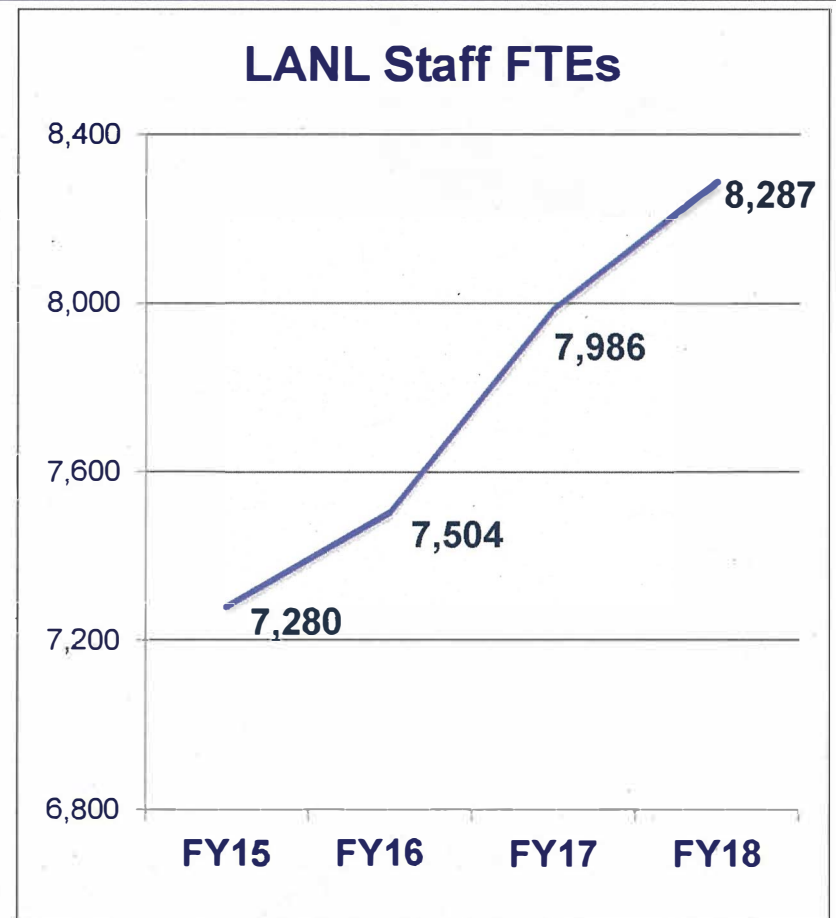
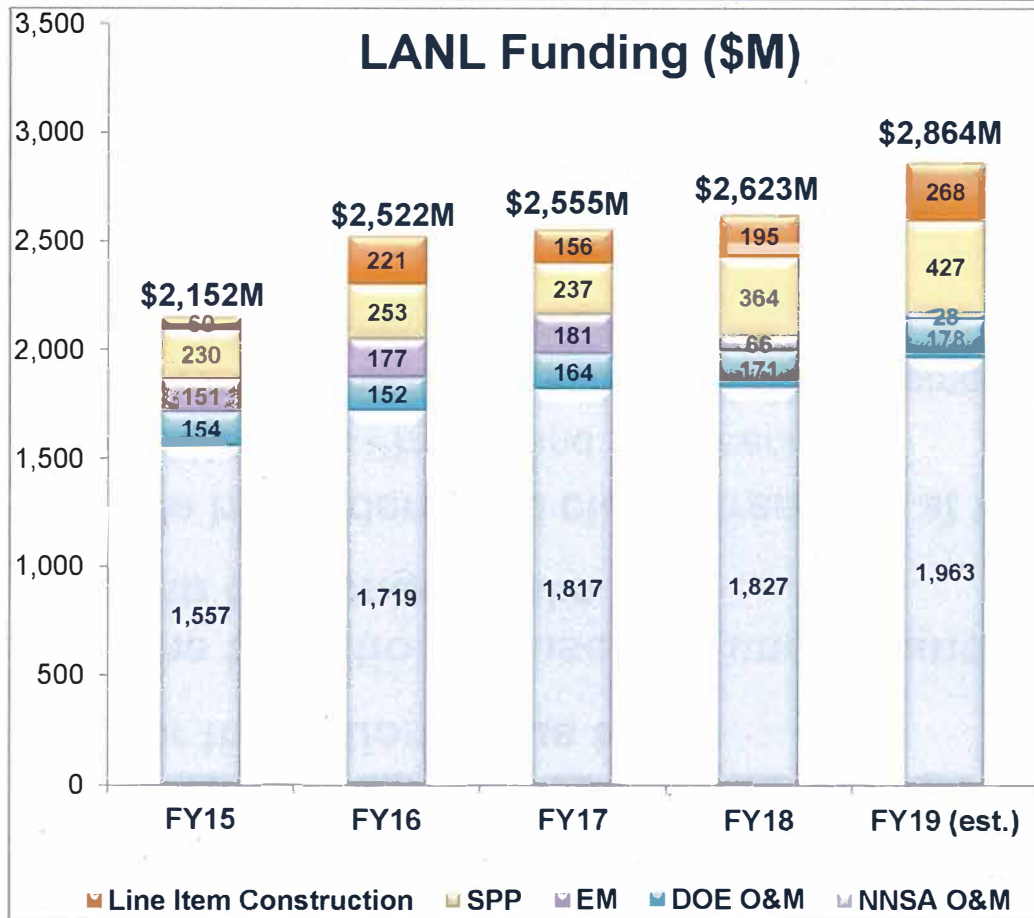
40 square miles   47 technical areas   1,280 buildings/9M sq ft   11 nuclear facilities   268 miles of roads

~8,300 career employees/~12,000 workers on site   2,380 R&D scientists   1,100 veterans   400 postdocs   1,880 students

\$2.8B budget   4,700 projects   600 B&R codes

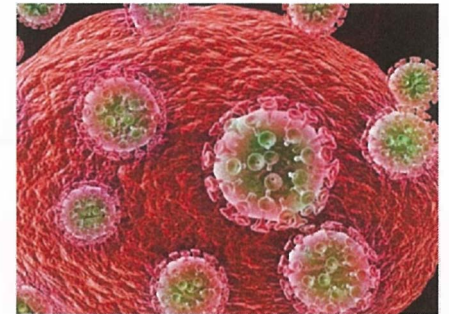
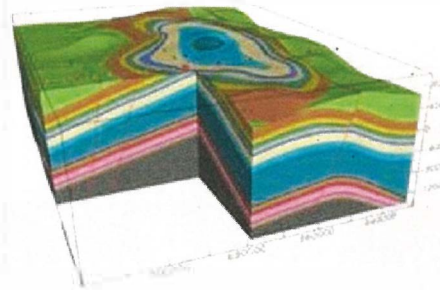
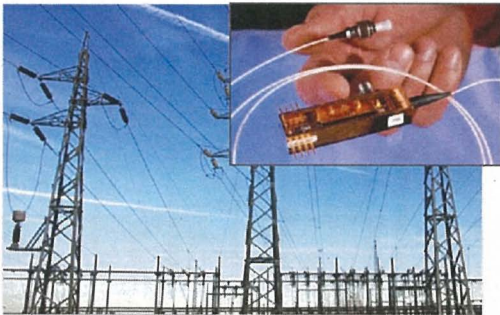
11 Directorates   60 Divisions

# The Lab has a steady budget and a growing staff



# Our commitment to NNSA: Ensuring continuity where critical

- We are committed to the Laboratory's success; this work is too important for the nation for us to fail
- The transition focused on understanding what's going well and challenges/risks
- We have identified clear strengths at the Laboratory:
  - Weapons Physics and Engineering
  - World-class Science, Technology & Engineering that underpins the Laboratory's national security mission



# Eight R&D 100 awards in 2018 reflect innovation and collaboration in support of our national security mission

2018 R&D 100 ENTRY  
Los Alamos National Laboratory

## Charliecloud

High-performance parallel file system

The award-winning Charliecloud file system enables the world's fastest supercomputers to share data across multiple compute nodes, reducing the time to process large-scale scientific datasets.

2018 R&D 100 WINNER

2018 R&D 100 ENTRY

## GUFU

Graph User-Friendly Framework

Patent-pending software for supercomputer user control interface

From its initial use as a framework for user control interface, GUFU has evolved into a powerful tool for managing large-scale computing resources.

2018 R&D 100 WINNER

2018 R&D 100 ENTRY  
Los Alamos National Laboratory, Queen's University Belfast, University of Birmingham

## LIGHTHOUSE

DIRECTIONAL RADIATION DETECTORS

Leading Us to Safety

Lighthouse Detectors precisely determine the direction, location, intensity, and waveform of a nuclear radiation signal.

2018 R&D 100 WINNER

2018 R&D 100 ENTRY

## Long-range Wireless Sensor Network

Affordable, easy-to-use wireless data collection

- Rugged, low-cost, wireless sensor network for public domain use in the desert
- Scalable network capable of monitoring 100 nodes across 40 miles with 100% data transmission reliability
- Affordable, low-power, low-cost, wireless sensor network for public domain use in the desert
- Self-healing network architecture for remote, unattended, long-term monitoring

2018 R&D 100 WINNER

2018 R&D 100 ENTRY  
Los Alamos National Laboratory

## Rad-Hard Single-Board Computer for Space

Strong, dense, low weight, power use, and cost with a radiation hardened single-board computer

2018 R&D 100 WINNER

2018 R&D 100 ENTRY  
Los Alamos National Laboratory, Fermilab, Los Alamos National Laboratory

## Silicon Strip Cosmic Muon Detectors for Homeland Security

Quickly distinguishes potential threat from a nonthreat

- Dose naturally occurring muons coming from the atmosphere
- Muon scattering enables remote detection of shielded clandestine material
- Slim profile allows flexible, nonintrusive monitoring
- Light weight, portable port

2018 R&D 100 WINNER

2018 R&D 100 ENTRY

## Universal Bacterial Sensor

Enables identification and detection

- Comprehensive: identifies any bacteria from a mixed culture or sample in seconds
- Robust: cannot be tricked by bacterial evolution or adaptation
- Fast: runs in 30 minutes, complete detection in 15
- Easy: can be used by anyone with a laptop and a smartphone
- Flexible: can be used for any bacteria

2018 R&D 100 WINNER

2018 R&D 100 ENTRY

## ViDeoMAGic: Video-Based Dynamic Measurement & Analysis

Revolutionary method that extracts pixel-level vibration/dynamics info from vibrating structures

- Extracts both spatial and temporal information from a single video frame
- Achieves pixel-level resolution, temporal resolution, and dynamic range
- Works automatically—requires no user supervision
- Only technology that effectively works in real-world, real-time application environments

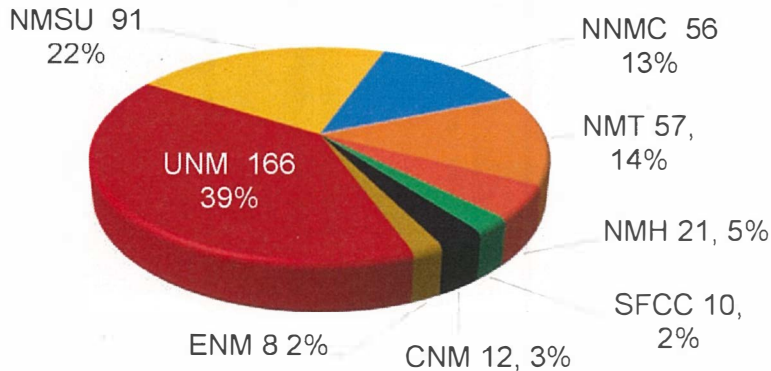
2018 R&D 100 WINNER

# Our student and postdoc pipeline is crucial for recruiting the workforce of the future

- 1,880 students and 400 postdocs were part of our workforce in FY18
- Conversion of postdocs to technical staff is our most highly utilized early career pipeline

Percentage of total LANL population who were former students or postdocs		
<b>36%</b>	<b>61%</b>	<b>33%</b>
All LANL employees (Reg, TRMA)	All R&D scientists & engineers	Managers

**NM Students at LANL: College Distribution**



Summer Physics Camp

Supercomputing Challenge

**41% of Los Alamos employees are native New Mexicans**

**26.3% of regular/term employees have at least 1 degree from NM college/univ.**



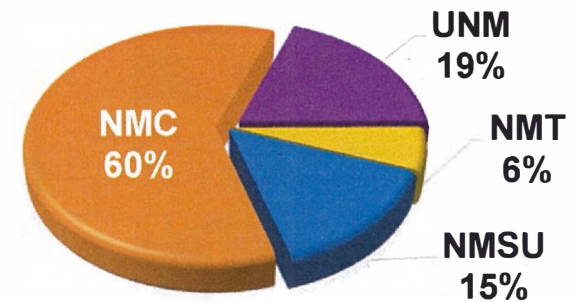
# R&D collaborations are essential for national security and attracting a world-class workforce

- Institutional Agreements (NMC, NM Tech)

Former Lab Director  
Terry C. Wallace, Jr.  
and NM Tech President  
Stephen G. Wells



FY18 University Subcontracts (NM):  
\$27,586K



- Joint Appointment Agreements through the New Mexico Consortium



Bette  
Korber



Jay  
Misra



Hameed  
Badawy



Edwin  
Fohitung

- Regional Educational Academic Collaborations (REACT)



# Our S&T continues to have a broader economic impact

- Commercialization successes



V I O M E



- Economic investments and results

NM Small Business Assistance Program (NMSBA) 2000–17	Venture Acceleration Fund (VAF) 2006–17
2,797 small businesses assisted	66 awards
\$57.9M assistance provided	\$3.9M invested
7,853 jobs created/retained	818 jobs created/retained
\$378.1M revenue generated	\$180.6M revenue generated

- Traditional and novel mechanisms



Entrepreneurial Postdoc Fellowship Program



DisrupTECH: Investor and Industry training for scientists

# Los Alamos National Laboratory is one team, dedicated solely to the success of our National Security Mission

- Commitment to mission delivery and ST&E excellence
- Operational excellence as important as mission and ST&E
- Non-profit, public service motivation & community commitment
- Partnership with NNSA and National Security Enterprise
- Integrity, competence, authority, & accountability as core values
- One Lab Agenda to chart our Laboratory's path forward

# Backup Slides

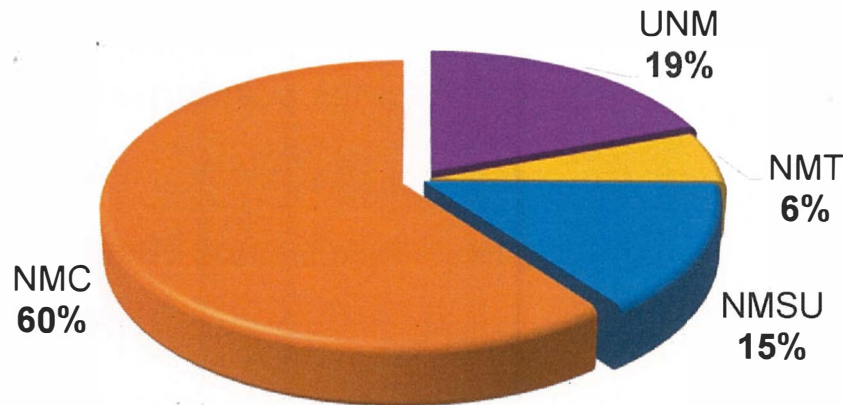
# LANL socio-economic goals and achievements (FY18)

Category	FY18 Goal	FY18 Percent Achieved
Small Business (SB)	52%	58.6%
Small Disadvantaged Business (SDB)	20%	21.3%
Women-Owned Small Business (WOSB)	14%	12.5%
HUBZone Small Business (HUBZone)	3.0%	7.4%
Veteran-Owned Small Business (VOSB)	5.0%	7.3%
Service-Disabled Veteran-Owned Small Business (SDVOSB)	3.0%	3.4%
New Mexico	—	55.6%
Northern New Mexico	—	40.8%

# University Subcontracts – New Mexico

## FY18 Funding Distribution – New Mexico

Total University Subcontract Funding: \$27,586K



**NMT:** New Mexico Institute of Mining & Technology  
**NMSU:** New Mexico State University  
**NMC:** New Mexico Consortium  
**UNM:** University of New Mexico

- **Total NM Funding: \$8,256K**
- **70 subcontracts**
- **67% increase over FY17**
- **\$117K average/subcontract**

52% of NMC funding is associated with the “**Ultrascale Systems Research Center**” (USRC), a collaboration between NMC and LANL to engage universities and industry nationally in support of high performance computing research

## Examples of novel mechanisms

<b>Institutional Agreements</b>	More than an MOU, an IA may cover intellectual property, user facility visits, special appointments (see Joint Appointments), and almost any other type of collaboration.
<b>Joint Appointments</b>	An evolving arena for faculty to engage at the Lab and staff to engage on campus, Joint Appointments may cover teaching, research, and mentorship. When funded research projects are involved, invoicing pathways may involve Institutional Agreements, University Contracts, or Special Payment Memos. A pilot program for Joint Appointments has been underway through NMC for two years.
<b>Joint Institutes</b>	A model for this type of interaction is the Engineering Institute between LANL and the UCSD. This JI offers graduate-level curriculum taught by faculty and staff, summer schools, and year-round research opportunities through the Student Program.
<b>New Mexico Consortium</b>	Non-profit academic institution, facilitating collaboration with LANL staff through in-house research in Los Alamos, computing resources, proposal submissions to foundations and agencies that are otherwise difficult or impossible for lab-university collaborations, a Joint Appointment Program, an Outside Activity Program, and the Entrada Biolab.
<b>Special Lab Contribution in Joint Research Programs</b>	For qualifying institutions, programs that allow collaborative access to lab facilities include the UC Lab Fee Research Program, DOE EPSCoR, and NSF EPSCoR.

