Computational Mechanics R&D Opportunities at Sandia

Jim Stewart, Senior Manager, *Computational Sciences & Math*

13th World Congress on Computational Mechanics

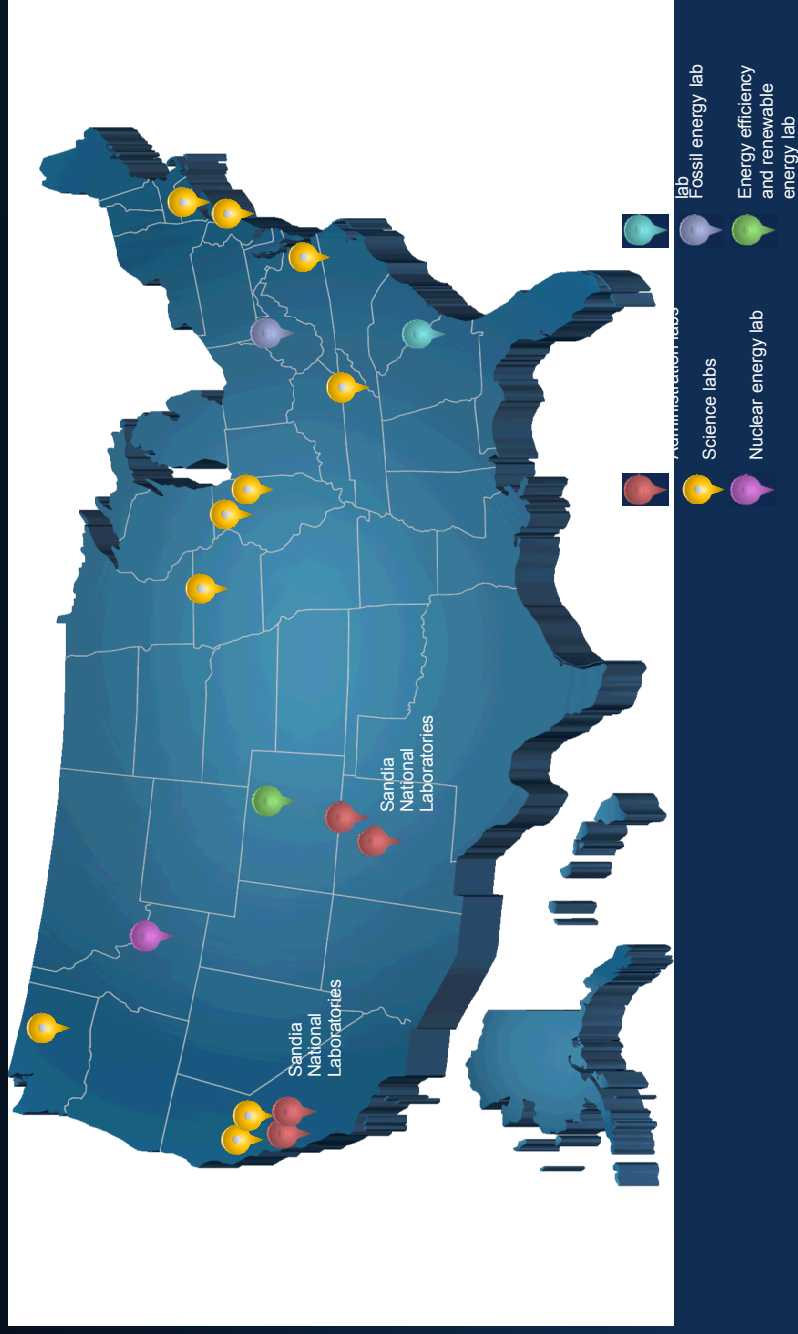***Workshop on Funding Opportunities for Computational Mechanics***

July 26, 2018

U.S. DEPARTMENT OF ENERGY

NNSA
National Nuclear Security Administration

Sandia is a Dept. of Energy National Laboratory

Two Main Locations (Albuquerque, NM & Livermore, CA)
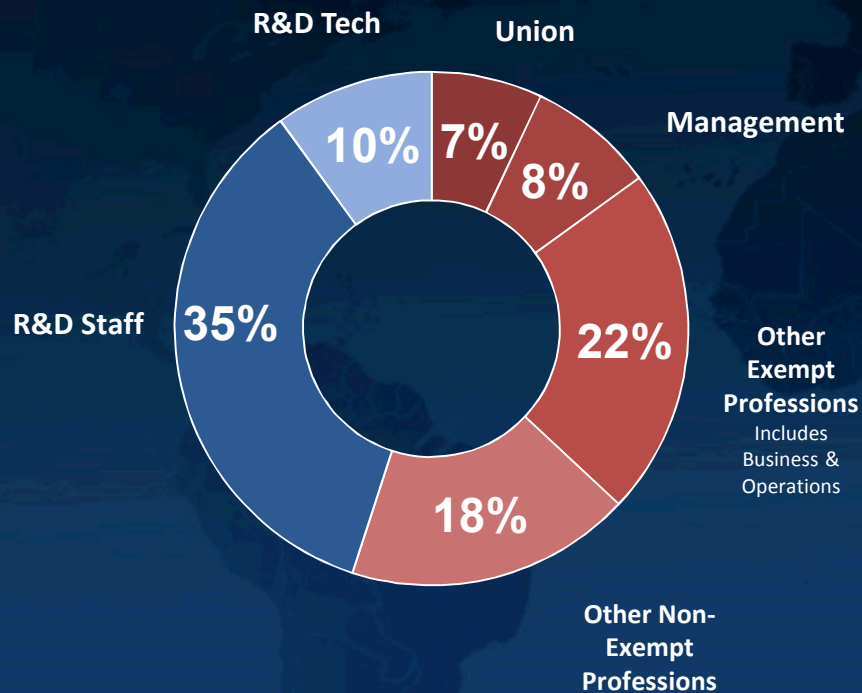
Our Workforce ~12,000 employees

~10,600 Regular employees
~2,000 Temporary employees, students & postdoctoral appointees

New Mexico Site:
Workforce: ~9,600
R&D employees: ~4,800
(R&D Staff & Technologists)

California Site:
Workforce : ~1,000
R&D employees: ~600
(R&D Staff & Technologists)

R&D Tech
Union
Management
Other Exempt Professions
Includes Business & Operations
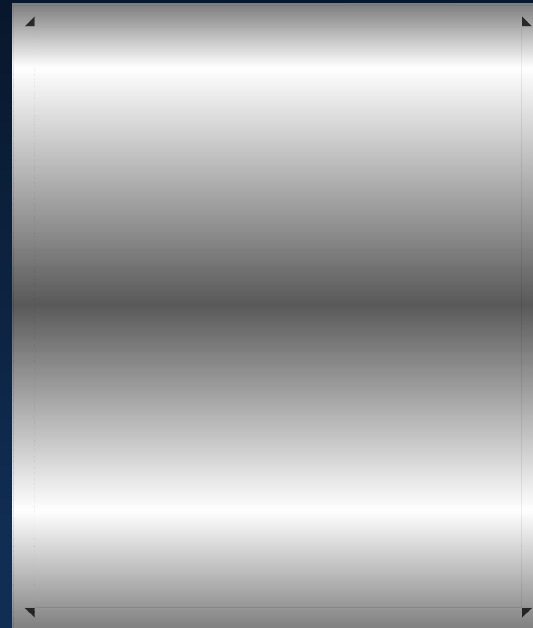**Other Non-Exempt Professions**
R&D Staff

10%
7%
8%
22%
18%
35%

Internships

Encourages qualified students to develop interests in critical skills areas related to our mission, with the ultimate objective of developing our pipeline for our future. Available for Summer, Year Round and Co-op.
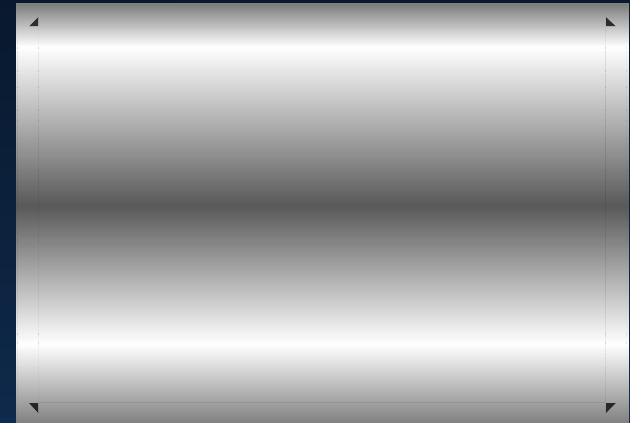
Eligibility Criteria

- Min. cumulative GPA (3.0 Undergrad/Grad)

- Have U.S. citizenship for positions that require clearance or as stated in the job posting

- Full-time enrollment status at an accredited college, university, or local high school

- At least 16 years of age
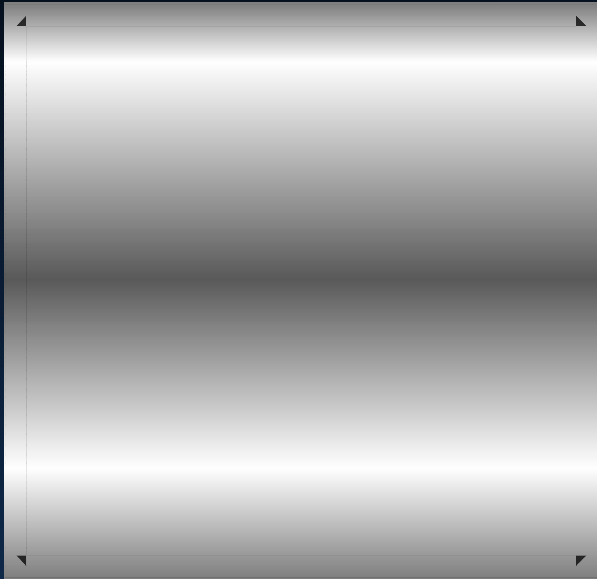
Technical Institute Internships

Technical institute interns perform leading-edge research under the guidance of Sandia research mentor and use world-class equipment and facilities.

- Center for Computing Research (CCR)
- Interdisciplinary Design, Engineering, and Assurance Students (IDEAS)
- Nonlinear Mechanics and Dynamics (NOMAD)
- Science of Extreme Environments Research Institute (SEERI)
- Energy Surety Incubator (ESI)
- Interns for Security, Arms Control, and Force Protection Engineering (iSAFE)
- Center for Analysis Systems and Applications (CASA)
- Center for Cyber Defenders (CCD)
- Monitoring Systems and Technology Intern Center (MSTIC)
- Summer Product Realization Institute for Nuclear Weapons (NW SPRINT)
- Research and Applications of Mechanics of Structure (RAMS)
- RISE - CS/CE/Cyber/IT Technologies

Technical Institute Programs Website

Post-doc Opportunities

Key areas for post-docs at Sandia:

- Computer science
- Computational mechanics
- Microelectronics and microfluidics
- Nanotechnology
- Combustion
- Physics
- Hydrogen
- Chemistry and materials science
- Biosciences and biotechnology

Eligibility Criteria

- A recent PhD (awarded within the past five years) or the ability to complete all PhD requirements before beginning

Fellowship Opportunities

Sandia provides postdoctoral fellows with professional-development opportunities and prepares fellows to conduct independent, groundbreaking research.

Ph.D. Level Fellowships

- Harry S. Truman Fellowship

- Jill Hruby Fellowship

- John Von Neumann

Applications accepted during the fall

ACADEMIC ALLIANCE PROGRAM

Partnerships enrich our mutual capabilities and expand our impact

Solve significant problems we could not address alone

Sustain and enrich our talent pipeline

Accelerate the commercialization and adoption of new technologies

Features of program

- **Sandia manager on-site at each institution**

- **Talent development programs**

- **LDRD investments ($$$)**

- **Upcoming:**

    - Large-scale collaborations

    - Technology commercialization

DOE/NNSA PSAAP
Predictive Science Academic Alliance Program

- **Primary Goal:** To establish validated, large-scale, multi-disciplinary, simulation-based *"Predictive Science"* as a major academic, applied research program

- **Predictive Science**
  - Application of verified and validated computational simulations to predict properties and dynamics of complex systems

- Collaborations with universities involve training, recruiting, and working with top researchers in key disciplines

- Engage U.S. academic community in making significant advances in predictive modeling and simulation technologies

PSAAP Phase II (2014-Present)

- **Multi-disciplinary Simulation Centers**
  - **University of Utah**
    - Center for High Efficiency Electric Power Generation with Carbon Capture
  - **University of Illinois-Urbana-Champaign**
    - Center for Exascale Simulation of Plasma-Coupled Combustion
  - **Stanford University**
    - Predictive Simulations of Particle-laden Turbulence in a Radiation Environment
- **Single-discipline Centers**
  - **University of Florida**
    - Center for Compressible Multiphase Turbulence
  - **Texas A&M University**
    - Center for Exascale Radiation Transport
  - **University of Notre Dame**
    - Center for Shock Wave-processing of Advanced Reactive Materials

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PSAAP Phase III (Funding to begin in 2020)
- Request for Information (RFI) has been issued
- RFI responses due July 30, 2018
- *Blackout period (no communication regarding PSAAP III with lab personnel)*

Other Ways to Engage w/ Sandia

- **Direct Research Contract**
  - Specific project funding w/ budget and statement of work
  - Often includes funding for a student
  - How to obtain? *Requires networking/relationship with project staff!*

- **Faculty Sabbatical**
  - Can span anywhere from one semester to an entire year
  - Sandia pays a portion of salary

- **DOE Funding Opportunity Announcements (FOAs)**
  - Office of Science: https://science.energy.gov/funding-opportunities
  - Office of Fossil Energy: https://www.energy.gov/fe/solicitations-and-business-opportunities
  - Office of Energy Efficiency & Renewable Energy: https://www.energy.gov/eere/funding/eere-funding-opportunities
  - Office of Nuclear Energy: https://www.energy.gov/ne/services/funding-opportunities
  - Advanced Research Projects Agency – Energy (ARPA-E): https://arpa-e-foa.energy.gov

Many opportunities to team with lab personnel

DOE Office of Science

- **Many programs within Office of Science**
    - ASCR (Advanced Scientific Computing Research)
    - BES (Basic Energy Sciences)
    - BER (Biological and Environmental Research)
    - Fusion Energy Sciences, High Energy Physics, Nuclear Physics

> *Most aligned with computational mechanics community*

- **Early Career Research Program**
    - https://science.energy.gov/early-career/
    - 2018 selections just announced: *84 recipients (30 from DOE labs, 54 from universities)*
    - University researchers receive at least $150K/year for 5 years

- **2018 Continuation of Solicitation for the Office of Science Financial Assistance Program**
    - This FOA is currently open until Sept. 30, 2018
    - Expect between 200-350 new awards per year
    - Largest award in 2017 was $4M/year (although most are much smaller)

BACKUP SLIDES

CCR Summer Intern Program

- **The Program**
    - ~35 students/year (limited only by physical space)
    - 3 month internships
    - Open to US citizens and foreign nationals
    - Postings for graduate students, undergraduates, high school students

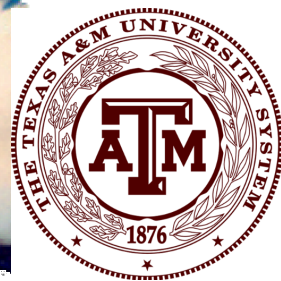# Nonlinear Mechanics and Dynamics (NOMAD) Research Institute

- Hosted by Sandia National Laboratories and University of New Mexico

- Collaborative opportunity to work on research in topic areas across nonlinear mechanics and dynamics

- 7 week program held in Albuquerque, New Mexico; open to graduate and highly qualified undergraduate level students
  - Mentorship opportunities for faculty

- Interested students please contact NOMAD organizers at:
  - nomad@sandia.gov

For more information, please visit: http://www.sandia.gov/careers/students_postdocs/internships/institutes/nomad.html

Sandia Senior Design 'Coopetition'

- **Common design project at multiple universities/colleges with opportunities to collaborate and network**

- **Builds capacity in minority serving institutions and a provides a stepping stone to graduate institutions**

- **Emphasize computation simulation enabled design**

RAMS – Research and Applications in Mechanics of Structures

- **Summer internship program focused on building capacity in computational simulation**

- **~20 graduate students and some advanced undergraduates participate from partner institutions across the US**

- **Interns mentored by senior staff in projects exercising state of the art computational mechanics**