Physics and life at the US DOE National Labs

Clark S. Snow
Some great advice

- Never trust a dog to watch your food. - Patrick, age 10
- When your dad is mad and asks you, "Do I look stupid?" don't answer him. - Michael, 14
- Never tell your mom her diet's not working. - Michael, 14
- When your mom is mad at your dad, don't let her brush your hair. - Taylia, 11
- Don't sneeze in front of mom when you're eating crackers. - Mitchell, 12
- Don't squat with your spurs on. - Jason, 9
- Don't pick on your sister when she's holding a baseball bat. - Joel, 10
- When you get a bad grade in school, show it to your mom when she's on the phone. - Alyesha, 13
- Never try to baptize a cat. - Elaine, 11
Personal Background

• Southern California native, go **Dodgers**!
• BS, MS Brigham Young University, go **Cougars**!
• Accepted twice to UIUC
• PhD with Lance Cooper in 2003

Starting UIUC

Graduation Day
My Research at UIUC

- Strongly correlated electron systems
- High-pressure Raman scattering at low-T and B-Field
# My Job Search

## On-Line Applications
- ~50 Applications
- 2 phone interviews
- 1 invitation for interview

## Direct Contact
- 2 Discussions
- 2 invitations for interview

## Referrals
- 2 Referrals
- 2 phone interviews
- 2 invitations for interview

### Location
- China Lake NWC
- Ridgecrest, CA
- Post-Doc at LANL
- Staff at Sandia
- UC Santa Barbara
- ATK Thiokol (Utah)

## Job offers:
1. Post-Doc at LANL
2. Staff at Sandia
3. Staff at ATK Thiokol
What I wanted in Life

US DOE National Lab

- Interesting Science
- Money
- Stability
- Good Location
- Family Time
Overview of the US DOE system
What do the DOE labs do?

- Everything!
- Nuclear Weapons
- Homeland Security
- Basic Science
- Energy Science
- Environmental Science

Fermi Lab – Dark Energy Camera

SRNL – ground water modeling

Sandia – z-machine
DOE Lab Culture

- Safety – ES&H (Environment, Safety and Health)
- Paperwork – goes with Safety
- Team work
- Meetings – goes with Team work
- Reports
- Funding
- Security
What do you work on (money)?

**LDRD**
LDRD projects must be in the forefront areas of science and technology relevant to DOE/NNSA missions. Normally LDRD projects will be relatively small and will also include one or more of the following characteristics—
(1) advanced study of hypotheses, concepts, or innovative approaches to scientific or technical problems;
(2) experiments and analyses directed towards “proof of principle” or early determination of the utility of new scientific ideas, technical concepts, or devices; and
(3) conception and preliminary technical analyses of experimental facilities or devices.
b. Normally LDRD projects will be limited to a maximum period of performance of 36 months. Exceptions may be granted by the (CSO/Deputy Administrator, NNSA, or his/her authorized designee.
c. The maximum funding level established for LDRD must not exceed 8 percent of a laboratory’s total operating and capital equipment budgets, including non-DOE funded work, for the year. The system for accrual of these funds, to a reasonable extent, must provide for equitable pro rata contributions by all sources of operating and capital equipment funding.

**WFO**
Industrial partners
Other Gov't agencies
NSF
DHS
DTRA
DARPA
ARPA-E
etc.

**Programmatic**
Existing programs funded by someone already or mandated by Congress.
What I wanted in Life

- 9/80 work schedule
- Volunteering encouraged
- Start 15 days vacation
- Flexible work schedule
- Very rare late nights/weekends

- Variety of departments
- Change careers without changing jobs
- Well supported labs
- You focus on science not other stuff
- Usually, assigned a technologist to work with

- PhD Physicist start ~$105K +/- $10K
- Cost of Living adjustments
- New employees Enhanced 401(k)
  No pension
  Decent Health Care
  Decent Dental
- Salary and Benefits indexed to industry
- Staff lay-offs not since 90's
- Whims of politics
- Generally small towns
The Sandia Workforce

- Onsite workforce: 11,554
- Regular employees: 8,949
- Gross payroll: ~$515M

_Data for FY12 through the end of March_
Sandia’s Sites

Albuquerque, New Mexico  
Carlsbad, New Mexico  
Tonopah, Nevada

Livermore, California  
Amarillo, Texas  
Kauai, Hawaii
Sandia in the Community

- United Way in 2011
  - New Mexico: >$4.6M
  - California: >$265,000
  - Participation
    - 2011 – 71.8%
    - 2010 – 70.3%
- Lockheed Martin donations to nonprofit organizations – $1.4M
- Volunteer hours in 2011–108,000
- K-12 education partnerships
- Began work on our 12th Habitat house in April 2012
National Security Challenges

1950s
- Nuclear weapons
- Production and manufacturing engineering

1960s
- Development engineering
- Vietnam conflict

1970s
- Multiple program laboratory
- Energy crisis

1980s
- Missile defense work
- Cold War

1990s
- Post–Cold War transition
- Stockpile stewardship

2000s
- Post 9/11
- National security

2010s
- Life Extension Programs
- START
- National security challenges
Nuclear Weapons

Pulsed power and radiation effects sciences

- Neutron generators
- Arming, fuzing and firing systems
- Safety systems
- Gas transfer systems

Warhead systems engineering and integration

Production agency
Defense Systems and Assessments

- Synthetic aperture radar
- Support for NASA
- Support for ballistic missile defense
- Ground sensors for future combat systems
Energy, Climate, and Infrastructure Security

Energy
Infrastructure
Climate

Crosscuts and enablers

Joint BioEnergy Institute
International, Homeland, and Nuclear Security

- Critical asset protection
- Homeland defense and force protection
- Homeland security programs
- Global security
Science and Engineering Foundations

Computing and information science

Materials science

Nanodevices and microsystems

Engineering sciences

Geoscience

Radiation effects and high-energy density science

Bioscience
What I do at Sandia

Radiation Damage in Materials
Metal-Hydrogen Interactions

Modeling

- DFT
- KMC

Experiments

- Thermodynamics of M-H systems
- Structure-Property changes with time
How to get hired

• Luck
  • don’t recommend

• Introduce Yourself
  • Speakers
  • recruiters

• Online Application
  • This is a must to comply with federal laws
  • Let recruiter know what positions you’ve applied to

• Personalize
  • Try to figure out the key words

• Begin ~1 year before Graduation

• Be Persistent
Being successful in a DOE Lab

Focus on problem, not technique
• Great opportunity to learn what you need to.
• Focuses effort.

Sell your work and yourself
Every good scientist is half B. F. Skinner and half P. T. Barnum.
-- Principal Skinner, on Bart's science project, "Duffless"

Make yourself invaluable
• Volunteer for programmatic work.
• Tackle the hard problems.
Final words of advice

I always pass on good advice. It's the only thing to do with it. It is never any use to oneself. ~Oscar Wilde, An Ideal Husband, 1895

• Enjoy Grad School
• Be confident
• Have Fun
• Join us at a US DOE National Lab