

**weSTEM 2015, University of Illinois in Urbana-Champaign**

# **Surviving & Thriving in Graduate School**

Bernadette A. Hernandez-Sanchez

**Sandia National Laboratories  
Advanced Materials Laboratory**

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# Sandia is one of 17 National Laboratories



Federally Funded Research and Development Center (FFRDC)  
Government Owned/Contractor Operated (GO/CO)

# Sandia National Laboratory sites are located across the nation

Albuquerque,  
New Mexico



Livermore,  
California



SNL's major facilities are located at Albuquerque, New Mexico; Livermore, California; and at a test range near Tonopah, Nevada.



Kauai, Hawaii



Waste Isolation Pilot Plant,  
Carlsbad, New Mexico



Pantex, Texas



Tonopah, Nevada

188,300 acres.



# The Advanced Materials Laboratory Department, 1815

**Department 1815 is located at the Advanced Materials Laboratory (AML) – a Sandia-leased facility on the campus of the University of New Mexico**

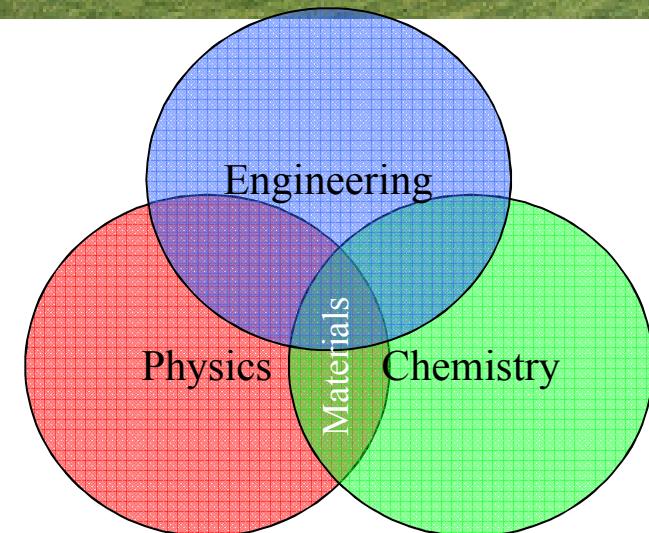
Research at the AML is focused on materials and process research in the areas of:

- ceramics,
- porous materials,
- catalysts,
- electronic materials,
- materials modeling,
- biomaterials,
- synthesis.

## Strategic Advantages:

- Access to students
- Greater opportunity for collaborations with UNM faculty
- Access to campus resources – equipment, library, computer, etc.
- Funding sources not readily available to Sandia (NSF)
- Joint purchase of novel instrumentation

*The Advanced Materials Laboratory, a part of Sandia National Labs since August, 1992*



*Developing materials science and engineering technology in the National Interest*



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# AML Success Story: Bernadette Hernandez-Sanchez is a Chemist & Principal Member of Technical Staff at Sandia. She is also a program manager for Water Power's Materials & Manufacturing Reliability Program.



*"My journey to become a chemist was initiated in high school through my hands on experiences at Sandia's AML. I extended my research experiences as undergraduate there because I had fun learning and being with my peers. As a post-doc, I saw how the national labs provided solutions to our nation's critical issues and was drawn to the possibilities of what I could achieve at Sandia. I love my research and still have fun today."*



BAHS Group

Manos ChemisTRY Program



Manos Volunteers

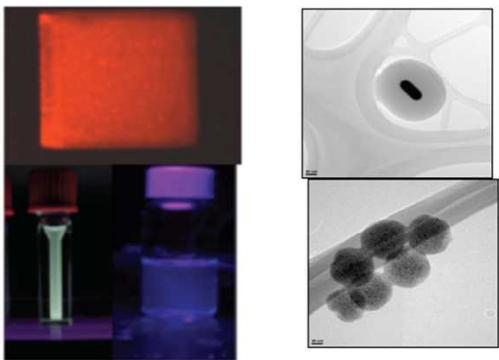




# HERNANDEZ-SANCHEZ: Nanoparticles for Energy, Detection, & Interactions

## Scintillators & Photonics

Understanding nanoscale radiation mechanisms & Uv-vis light interactions.



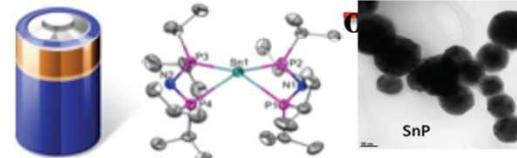
## Chalcogenides

Infrared Imaging or Solar



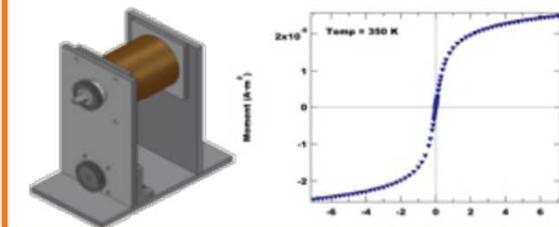
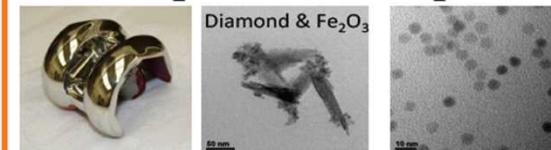
## Phosphides

Anodes, Magnets,



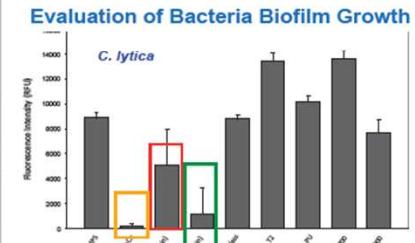
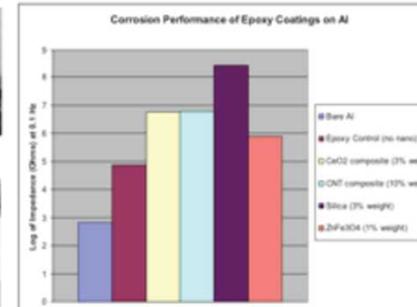
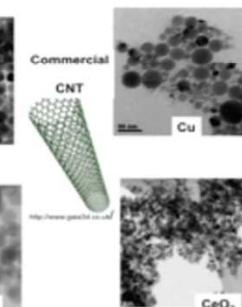
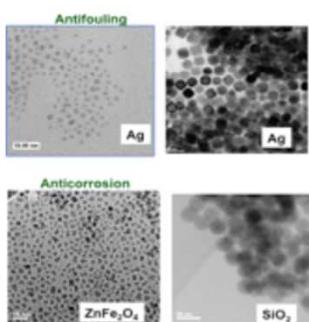
## Magnetic Assisted Polishing

Magnetic & Abrasive Particles to nanopolish knee implants



## Protective Nanocoatings for Marine & Hydrokinetic Technology

For the prevention of corrosion, biofouling, sediment erosion, and mineral fouling

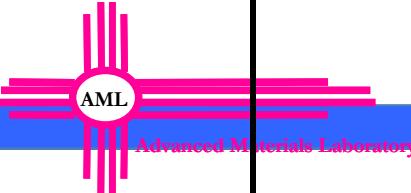


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# What Path did I Take?



Senior Member of  
Technical Staff  
2008-present



**Rio Grande  
High School  
(1990-1994)**



*T. J. Boyle*

**B.S. Chemistry  
(1994-1999)  
ACS Scholar**



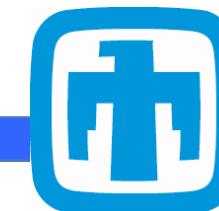
*M.D. Heagy*



**Ph.D. Solid State  
Chemistry  
(1999-2004)**



*E. R. Fisher & P. K. Dorhout*



**Postdoc  
(2004-2008)**



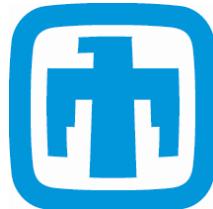
*T. J. Boyle*



*W. F. Hammetter*

# Chemistry Rocks!

My First Introduction to an Inorganic Chemistry Lab



Schlenk Line



Glove Box



Chemistry was my extracurricular activity!



# Undergraduate Laboratory Fun

Ready or Not Here I come-  
Graduate School



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# Graduate School?



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# My Obstacles

---

- Passing metrics-cumulative exams, classes
- Time management (teaching/research/class)
- Family
- Can't do it alone
- Self-Doubt-Can I do this?
- Should I get a PH.D.? (visit  
[www.shouldidgetaphd.com](http://www.shouldidgetaphd.com))
- Motivation
- Grammar-keep practicing



# “You’re No Good to Me in Lab Unless you Pass your ....”

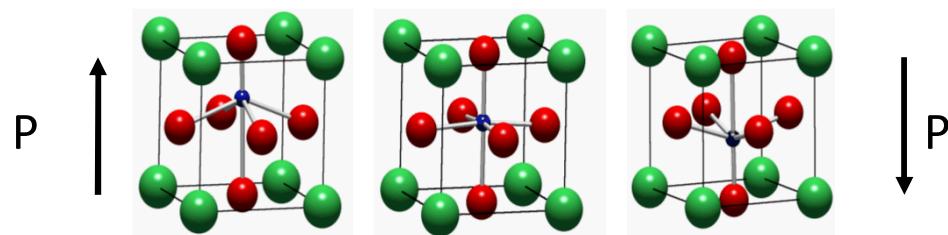
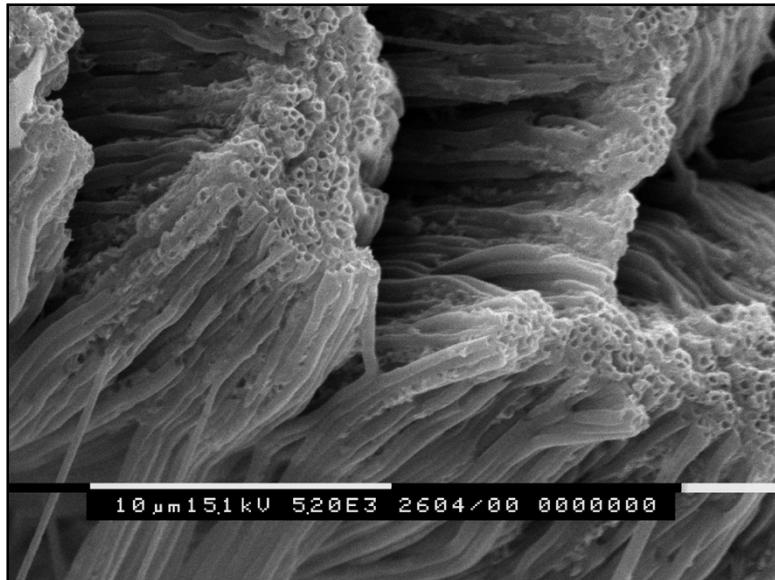
- Cumulative Examinations:
  - 2 week crash course: independent study
  - Failed several
  - Asked for help!
  - Pay attention-great skill to have for future proposals!
- Classes
- Time management
- Oral Examinations



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# Doctoral Research at Colorado State University

- Ph.D. Inorganic Solid State Chemistry w/ Profs: Peter K. Dorhout & Ellen R. Fisher



- Understand fundamental correlation between size & property
- Develop composite materials

Hernandez, B. A.; et al. *Chem. Mater.* **2002**, 14(2), 480–482.  
Chang, K.-S.; et al. *J. Korean Chem. Soc.* **2002**, 46(3), 480–482.  
Hernandez-Sanchez, B. A. Ph.D. Dissertation, Colorado State University, CO, **2004**  
Hernandez-Sanchez, B. A.; et al. *Chem. Mater.* **2005**, 17 (24), 5909–5919.  
Chang, K.-S.; et al. *Optical Materials*; Sept. **2007**; vol.30, no.1, p.132-4

Traditional Solid State Synthesis



Plasma Deposition



Hydrothermal & Solvothermal



# Life Happens, Life Goes On

- My little sister
- I got married
- Supportive family, friends, and mentors
- Life outside the lab



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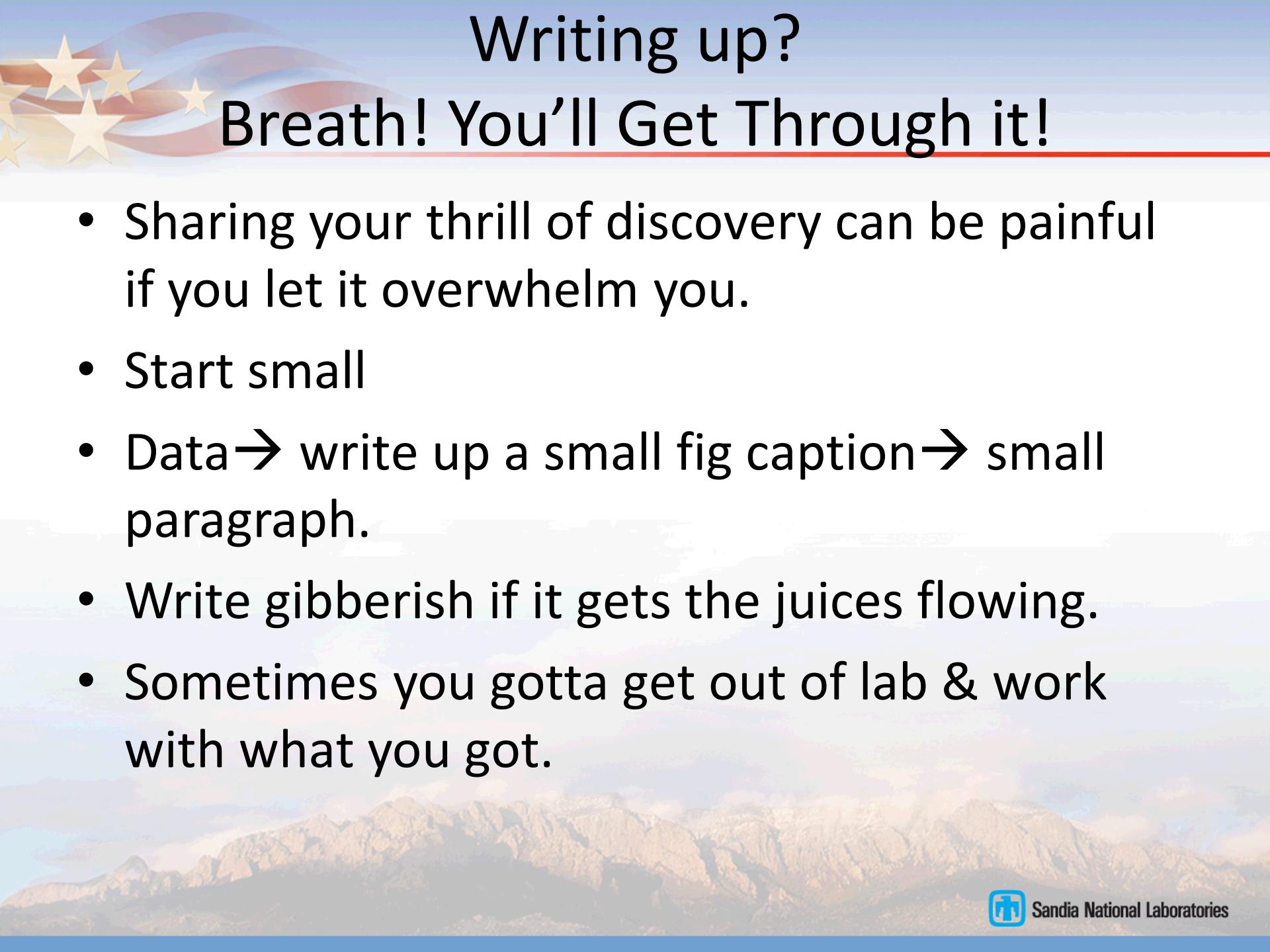


# Thrill of Discovery

- 52<sup>nd</sup> Meeting of Nobel Laureates
- U.S. Delegation Member 1 of 27
- Washington, D.C.
- Lindau, Germany (400 attendees)
- Inspirational
  - Science, ethics, education, politics, religion
  - Prof. Dr. Ahmed Hassan Zewail
    - “Thrill of Discovery”
- Motivation and reminded me of why I chose to study chemistry & pursue my Ph.D.



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# Writing up? Breath! You'll Get Through it!

- Sharing your thrill of discovery can be painful if you let it overwhelm you.
- Start small
- Data → write up a small fig caption → small paragraph.
- Write gibberish if it gets the juices flowing.
- Sometimes you gotta get out of lab & work with what you got.





# Your Mission for Success

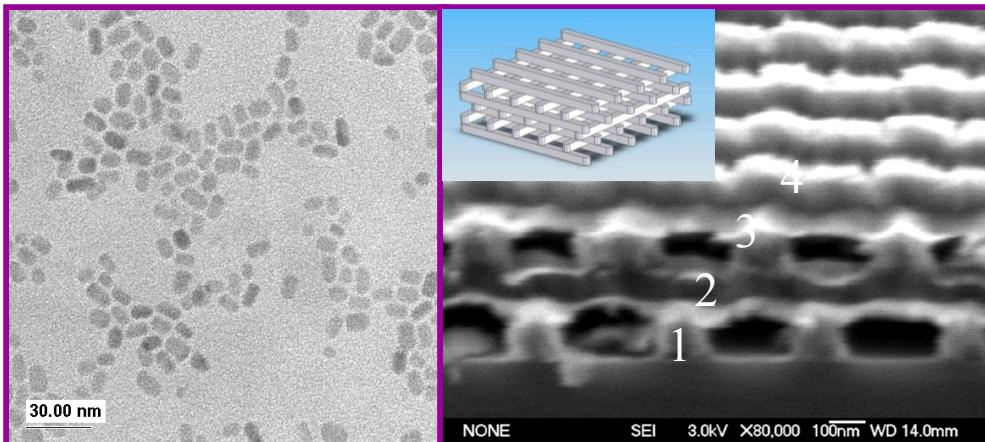
- Present at National Meetings
- Publish
- Professional Development Workshops
- Proposal Writing
  - Ask to help with and read proposals
- Peer Review
- Volunteer & Lead (once in a while)
- Network-for that next opportunity



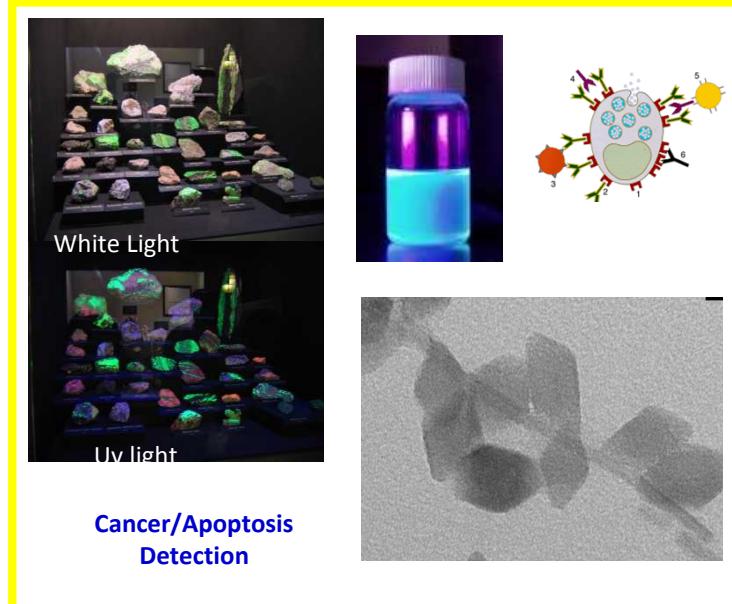
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# Postdoctoral Research at Sandia National Laboratories

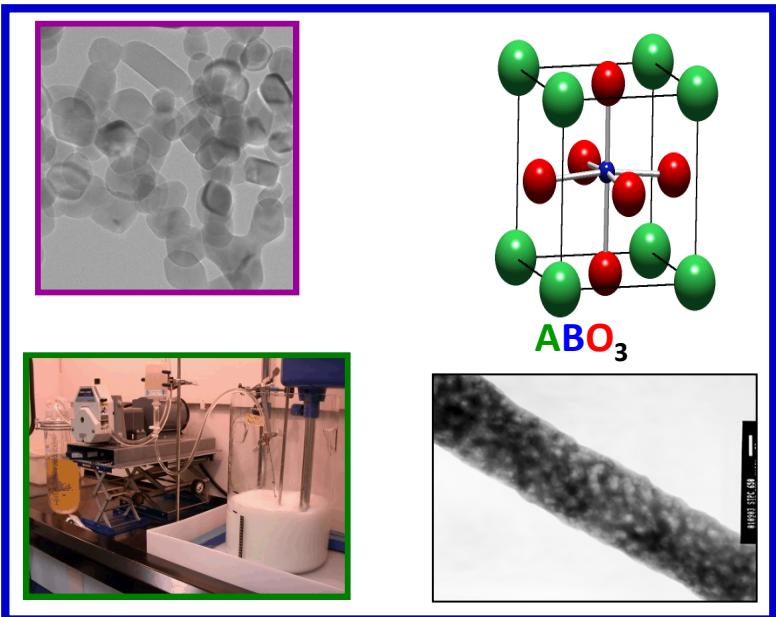
## Photonic Crystal Devices (I)



## Non-Toxic Probes (II)

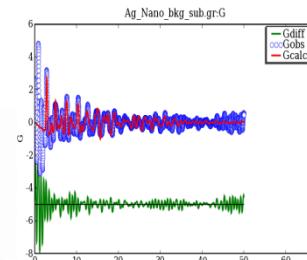
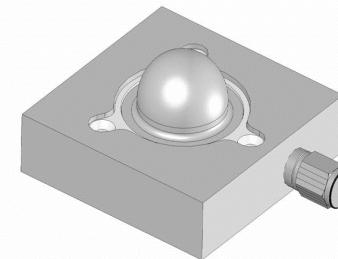


## Electroceramics (III)



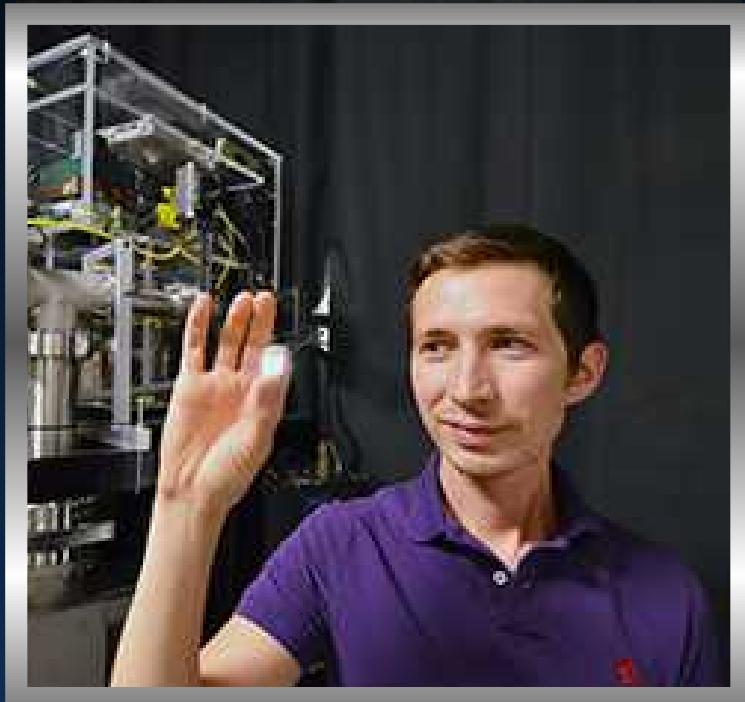
## Characterization (IV)

### BED XRD



A-PDF

# Post-doc opportunities



## Key areas for postdocs at Sandia:

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

## Requirements

- Min. cumulative GPA (3.5 Undergrad/3.7 Grad)
- U.S. citizenship
- A recent PhD (awarded within the past three years) or the ability to complete all PhD requirements before beginning
- No previous postdoc appointments at a national laboratory

Truman Fellowship for Postdoctoral Researchers

[http://www.sandia.gov/careers/students\\_postdocs/fellowships/truman\\_fellowship.html](http://www.sandia.gov/careers/students_postdocs/fellowships/truman_fellowship.html)

# 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.

## Requirements

- Min. cumulative GPA (3.2 Undergrad/3.5 Grad)
- U.S. citizenship
- Full-time enrollment status at an accredited college, university, or local high school
- At least 16 years of age



# You're Stronger Than You Think!

- Seek help when you need it.
- Surround yourself with supportive people.
- Remember the Thrill of Discovery & Share it!
- Practice your communication skills
- Have Fun!
- Opportunities are coming!



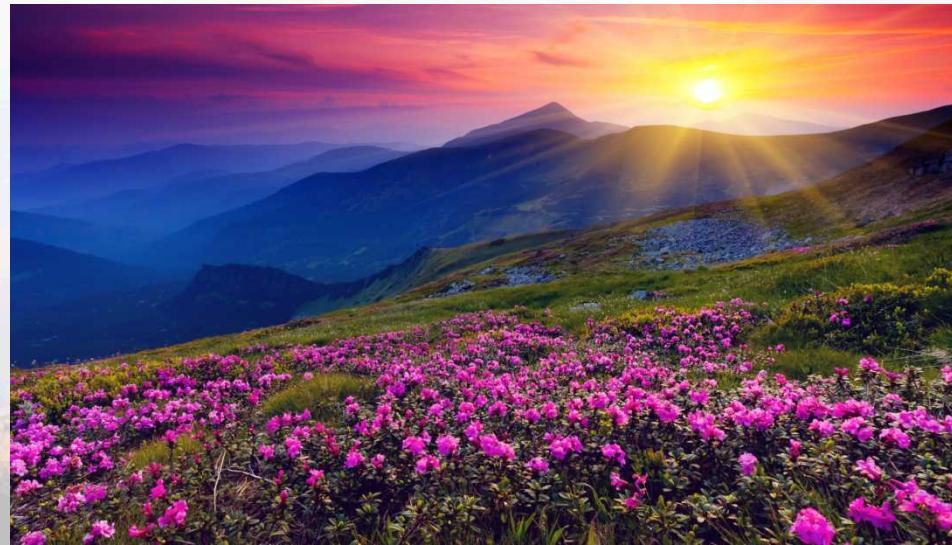
Dorothy Hodgkin



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# Graduate School?



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# THANK YOU!



**ACS**  
Chemistry for Life®

## Scholars Program

**Dr. Timothy J.  
Boyle  
SNL**



**Professor  
Michael D. Heagy  
NMT**



**Professor  
Ellen R. Fisher  
CSU**



**Professor  
Peter K. Dorhout  
CSU**





# Sandia Student & Postdoctoral Resources

## Student Internship & Postdoctoral Positions

[http://www.sandia.gov/careers/students\\_postdocs/postdocs.html](http://www.sandia.gov/careers/students_postdocs/postdocs.html)

## Truman Fellowship for Postdoctoral Researchers

[http://www.sandia.gov/careers/students\\_postdocs/fellowships/truman\\_fellowship.html](http://www.sandia.gov/careers/students_postdocs/fellowships/truman_fellowship.html)



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