Pacific Northwest
NATIONAL LABORATORY

From the Classroom to Cleanup: Internships in Environmental Science

December 14, 2022

Christian Johnson
Senior Development Engineer, RemPlex Advisor

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U.S. DEPARTMENT OF ENERGY BATTELLE

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PNNL-SA-180576

Outline for Today

- What are the National Laboratories, the Office of Environmental Management, and RemPlex?
- Meet Staff and Interns
  - What do they do?
  - What were their experiences?
- Internship opportunities
- Tips on preparing and what mentors look for
- Q&A

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U.S. Department of Energy (DOE) National Laboratories

- Grew out of the Manhattan Project (development of the first atomic bomb)
- Performing critical research to solve the nation's most challenging problems
  - DOE's missions: scientific discovery, energy, environment, national security
  - Spanning basic research, development, and demonstration of technology
- Most comprehensive research and development network of its kind
  - Each laboratory has unique scientific tools, facilities, capabilities, and projects
- Routinely recognized for innovative research and technology transfer
  - R&D 100 (https://www.rdworldonline.com/2021-rd-100-award-winners/)
  - FLC (https://federallabs.org/flc-highlights/awards/awards-program-overview)
- More Information
  - https://www.energy.gov/national-laboratories
  - https://www.energy.gov/downloads/state-doe-national-laboratories-2020-edition
  - 17 labs in 17-minutes podcast/video

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U.S. Department of Energy National Laboratories

- 17 National Laboratories
  - Office of Science
  - Energy & Environment (FE, EERE, EM)
  - National Security

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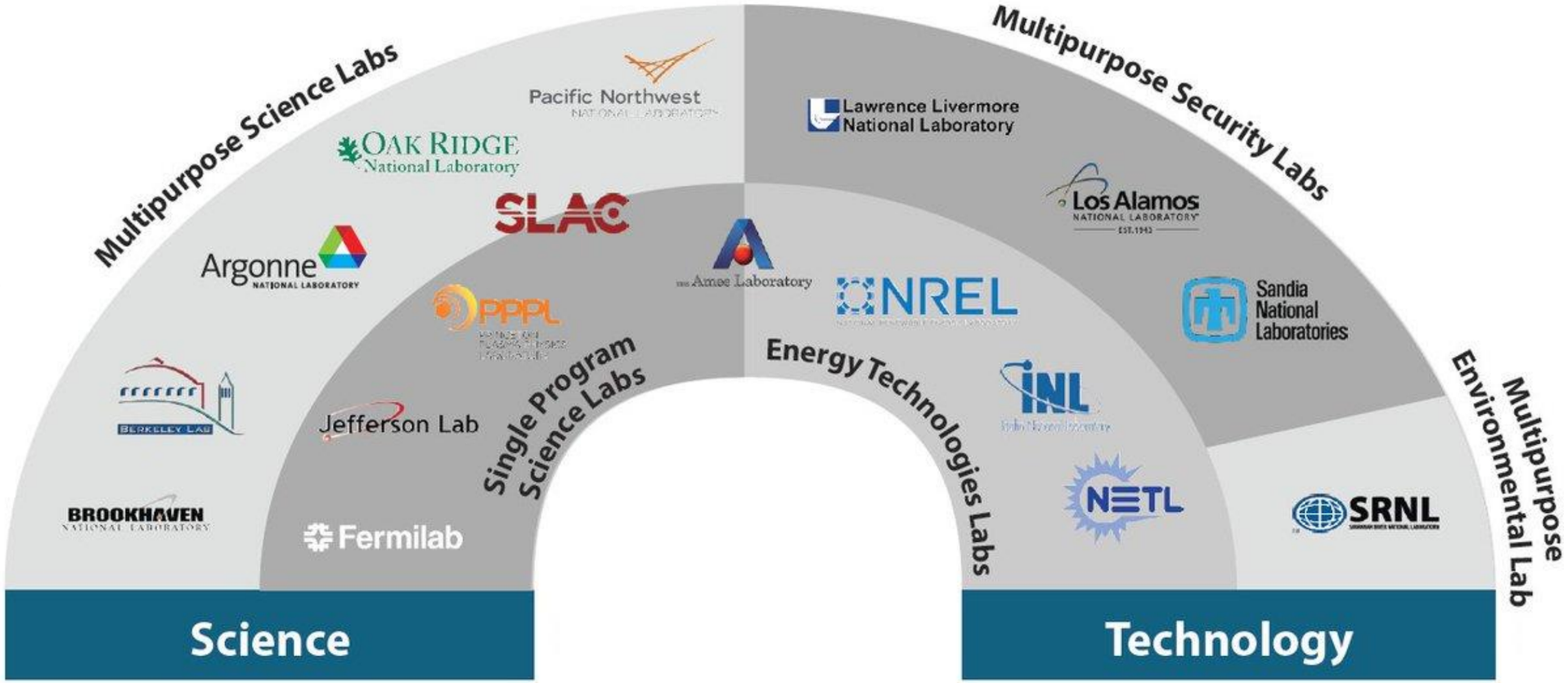

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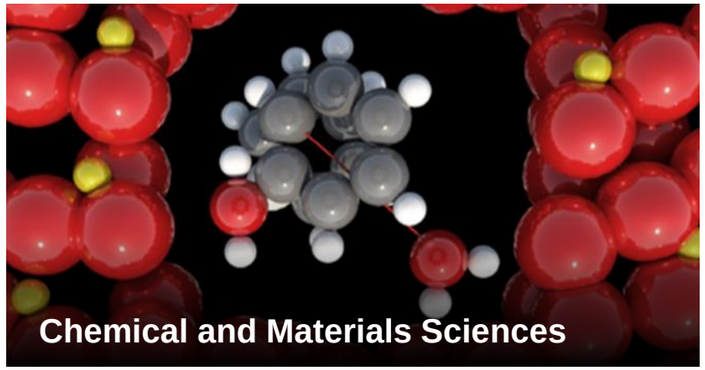
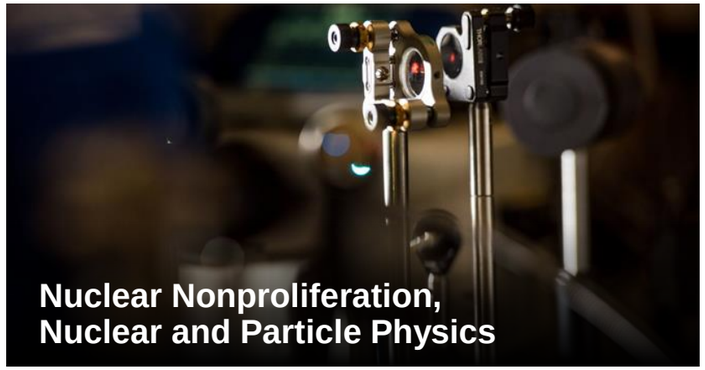
2017 Annual Report on the State of the DOE National Laboratories

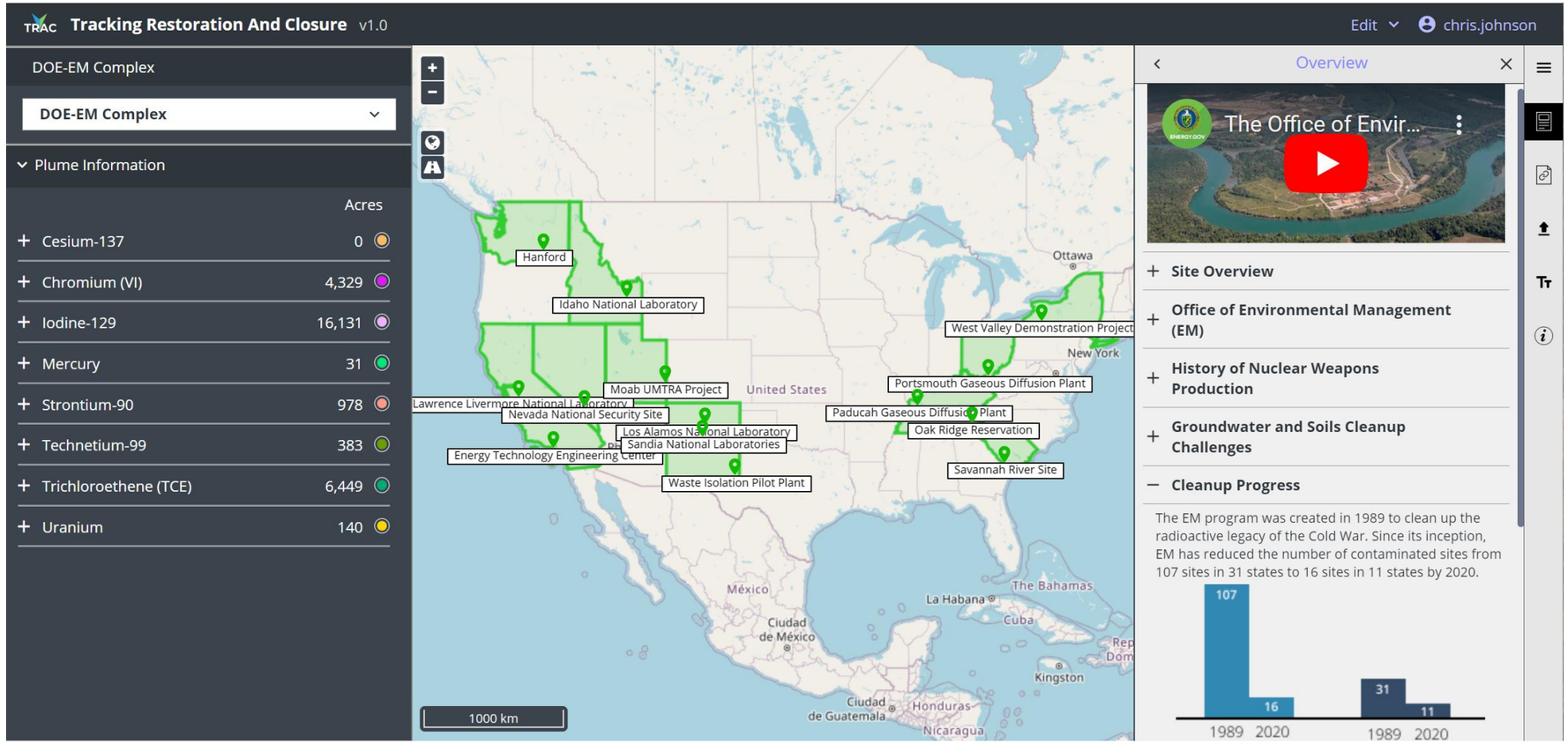
DOE's Science, Energy, Environment, and National Security Missions





DOE Office of Environmental Management

- Created in 1989 to clean up radioactive legacy of the Cold War
- As of 2020, DOE-EM is responsible for soil and groundwater cleanup at 16 sites in 11 states
- trac.pnnl.gov
  - Good resource for overview
- www.energy.gov/em/cleanup-sites



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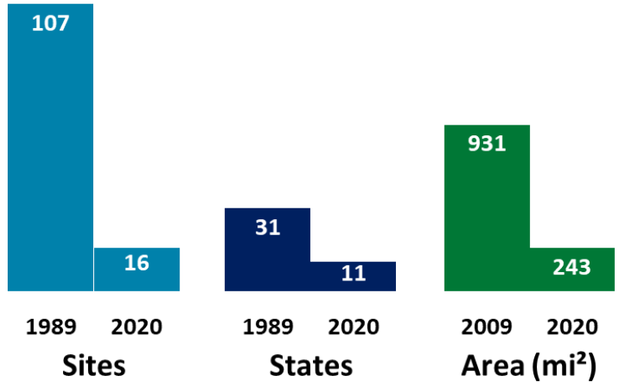
DOE-EM Cleanup Progress

- From inception through 2020, EM has
  - Reduced number of contaminated sites from 107 sites in 31 states to 16 sites in 11 states
  - Reduced the active footprint from 931 square miles to 243 square miles
- Remaining work is on most challenging cleanup issues
  - DOE-EM is meeting these challenges through collaborative interagency relationships and development of innovative solutions
  - National laboratories play a key role in solving these challenges



Rocky Flats site before and after restoration

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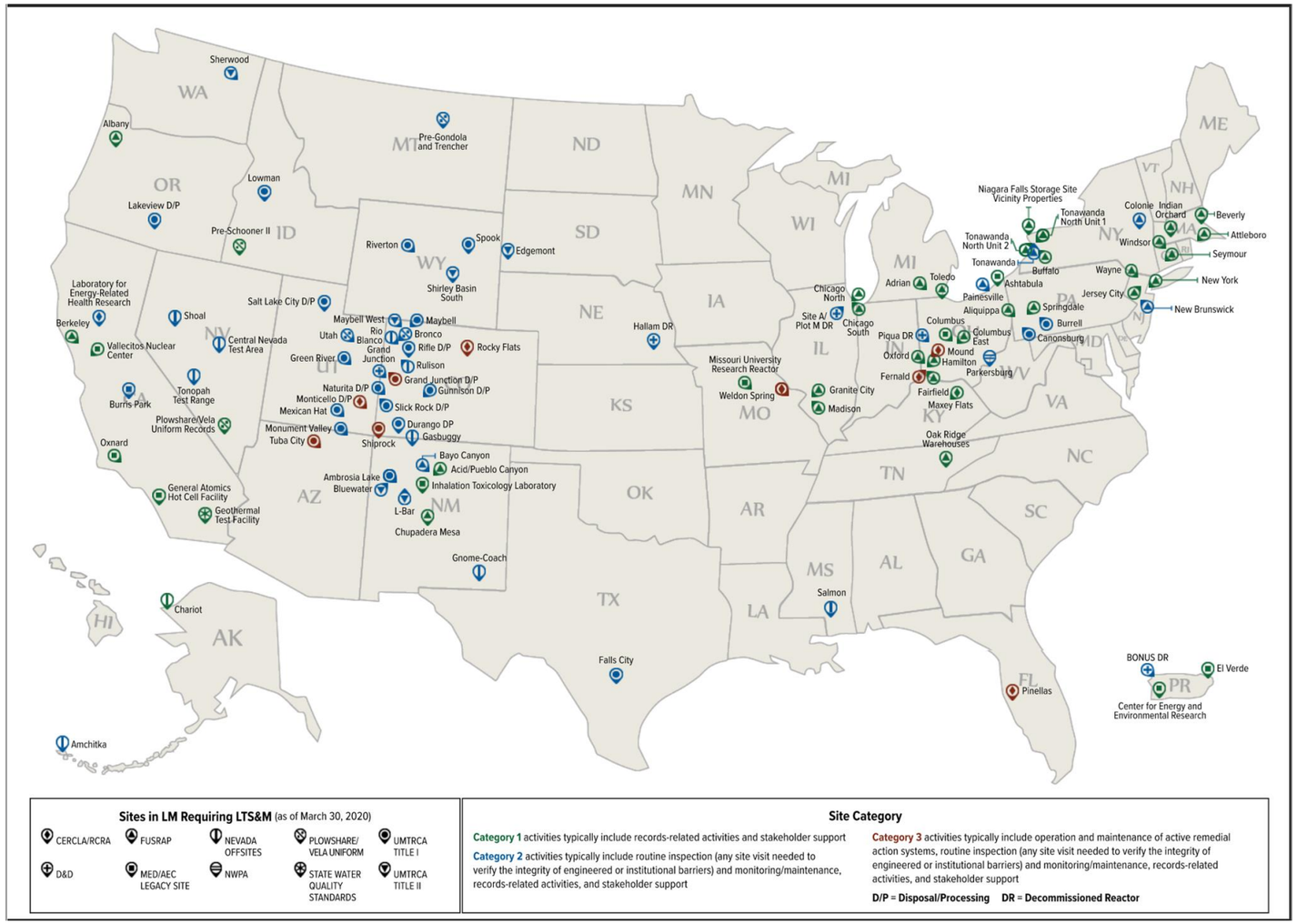
DOE Office of Legacy Management

- Cleaned up EM sites are transferred to the DOE Office of Legacy Management for long-term stewardship
  - www.energy.gov/lm/lm-sites
- DOE-LM
  - CERCLA/RCRA sites
  - Former uranium mining/processing sites
  - Formerly Utilized Sites Remedial Action Program (FUSRAP)
  - Deactivation & decommissioning
  - Misc. other sites



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RemPlex – Center for the Remediation of Complex Sites

Technical Leadership

Independent technical resource with proven track record of supporting deployment of advanced technologies and alternative strategies

Multi-institutional Collaborations

Integration and leveraging across federal and private partnerships to facilitate solution development

Solution Development

Leverage existing capabilities spanning all TRLs to provide solutions in adaptive remediation and long-term stewardship that enable risk-based remediation

remplex@pnnl.gov
www.pnnl.gov/projects/remplex

TRL = Technology Readiness Level

RemPlex

- Forum for discussion of challenges, barriers, and innovative solutions for successful remediation and long-term stewardship
  - Lessons learned
  - Better understand remediation needs worldwide
  - Collaboration
  - Doing research to move from basic science to deployed technologies
- Global Summit
- Seminars

Day 1 - RemPlex 2021 Virtual Global Summit

Day 1 full recording

NOV. 8 CASE STUDY RECORDING: Integrated Remedy Optimization: An Approach for Hanford Site Central Plateau Cleanup

NOV. 8 TECHNICAL SESSION RECORDING: Subsurface Remote Sensing for Contaminant Characterization and Remediation Applications

Day 2 - RemPlex 2021 Virtual Global Summit

Day 2 full recording

NOV. 9 CASE STUDY RECORDING: Environmental and Remediation Challenges and Responses Following Nuclear Accidents: Lessons Learned from the Fukushima Daiichi Accident

NOV. 9 PANEL DISCUSSION RECORDING: Community Revitalization

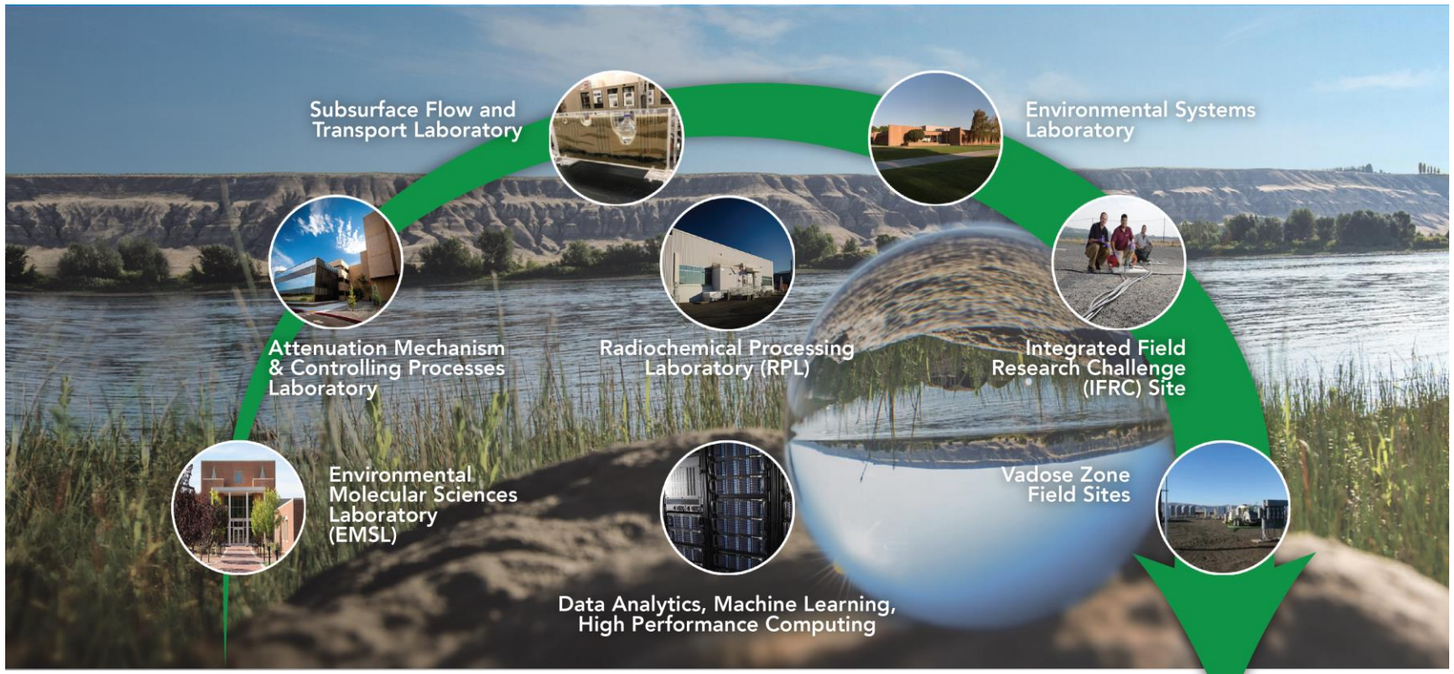
NOV. 9 TECHNICAL SESSION

Day 3 - RemPlex 2021 Virtual Global Summit

Day 3 full recording

NOV. 10 CASE STUDY RECORDING: Collaborative Process to Assess Department of Energy (DOE) Legacy Management High Risk Sites Using Tuba City, Arizona as an Example

NOV. 10 PANEL DISCUSSION RECORDING: Environmental Justice in the Context of Environmental Remediation Panel Discussion



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DOE Workforce Development

- Workforce development, including student internships, is an important aspect of managing and maintaining this important research capability
- Environmental cleanup research and development requires diverse, multidisciplinary teams (and the capabilities/facilities to support the research)
  - Engineering, material science, geology, physics, chemistry, biology, computer science, data science, etc.

Multidisciplinary Teams of Scientists and Engineers

State-of-the-Art Capabilities and Facilities

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Staff and Intern Speakers

- John Moon – DOE EM MSIPP Director
- Sarah Saslow – PNNL Staff
- Fred Day-Lewis – PNNL Staff
- Amoret Bunn – PNNL Staff
- Jordan Perkins – H.S. SRAP intern
- Arabella Chamberlain – SULI undergrad intern
- Mariah Doughman – MSIPP PhD intern
- Jackie Wells – SULI → PNNL Staff
- Emily Fabricatore – EM HQ intern → SRNL Staff

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DOE EM MSIPP

John Moon

DOE EM

MSIPP Program Manager

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DOE-EM MSIPP

- **Minority Serving Institutions Partnership Program**
- EM recognizes that successfully completing its legacy environmental cleanup mission will require maintaining a well-trained, technically skilled, and diverse workforce. … Engagement with universities and colleges provides an opportunity to inform students on the real challenges of the EM mission and position a future workforce "pipeline." This innovative program was designed to help address EM's future workforce needs by partnering with academic, government, and DOE contractor organizations to mentor future minority scientists and engineers in the research, development, and deployment of new technologies that address EM's environmental cleanup challenges.

- Budget FY 2021: $ 6M increased to FY 2022+: $56M

DOE-EM MSIPP Funding

MSIPP Programs	Funding
Grants	$ 30 M
Competitive Research Awards (CRA)	$ 10 M
Internships	$ 2 M
SR Env Sciences Field Station	$ 1.5 M
Postdoctoral Research Program	$ 3.5 M
Graduate Fellowship Program	$ 3.5 M
Other	$ 5.5 M
Total	**$ 56M**

DOE-EM MSIPP Efforts

- Internships
  - Onboard for 10-week summer program
  - Assigned across DOE National Laboratories and EM complex
  - National Laboratories include SRNL, PNNL, LANL, LLNL, ANL, ORNL, and DOE HQ
  - Increased from 25 students to 50 students

- SR Environmental Sciences Field Station
  - Hands on 10-week summer program
  - Assign research projects affiliated with the SR Ecology Laboratory and SRNL
  - Added Cybersecurity Program
  - Increased from 20 students to 40 students

A Brief Project Portfolio Overview

Sarah A. Saslow, PhD

Senior Chemist at Pacific Northwest National Laboratory

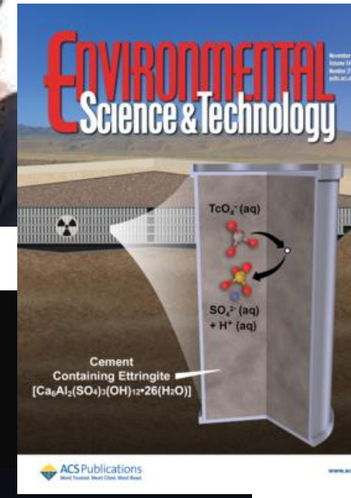
Research Interests

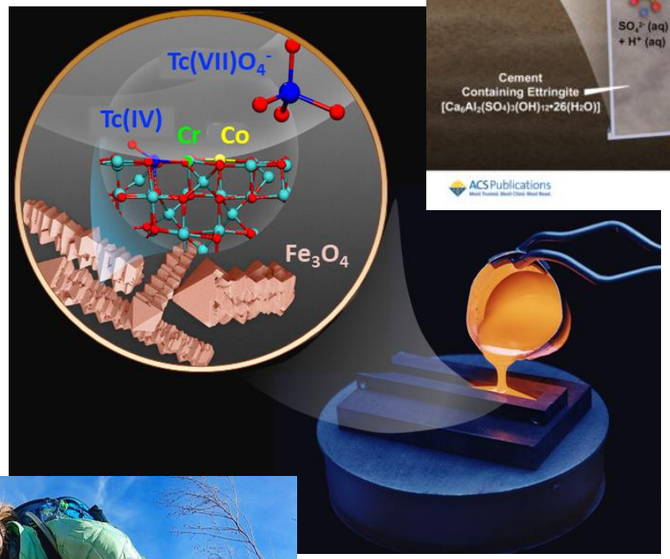
- Cement development for nuclear waste immobilization
- Subsurface contaminant fate and transport
  - ✓ Identifying useful retention mechanisms and how to control them
- Geochemical processes at interfaces and under nanoconfinement

Areas of Expertise

- Geochemistry
- Material Science
- Materials Characterization
- Subsurface remediation
- Cement formulation and testing
- Mentorship and Project Management
- Dog walking, mountain biking, bouldering, and surfing (aspiring)

- ✓ X-ray Absorption, Fluorescence, and Emission Spectroscopies
- ✓ X-ray Diffraction
- ✓ X-ray Photoelectron Spectroscopy





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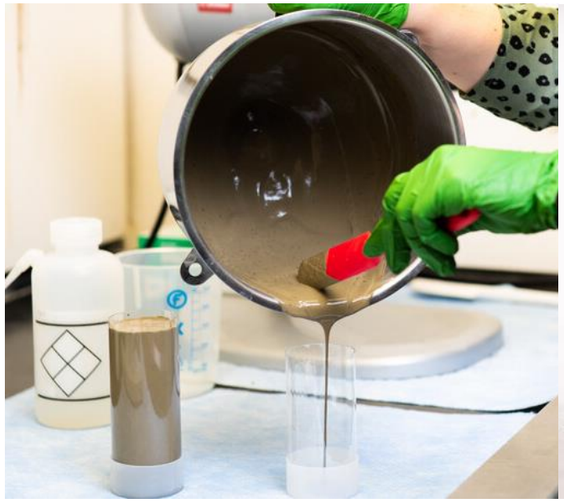
PNNL's Approach to Cement Design, Testing, and Characterization

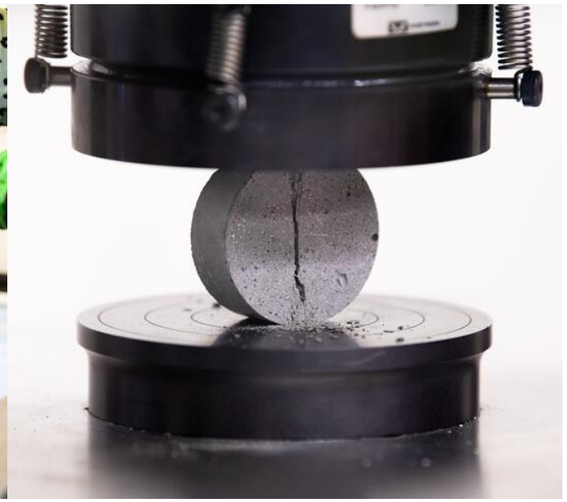
Objective: Design cementitious materials for long-term storage (>10,000 years) of nuclear waste that stabilize contaminants and strengthen with age

Formulation



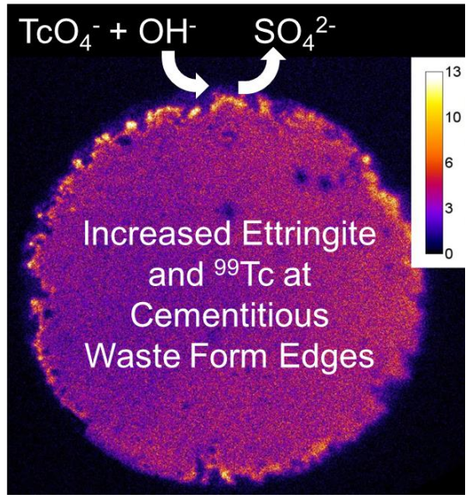
Changes in dry ingredient and additive recipes yield properties meeting operational and regulatory requirements

Testing



Use standard test procedures to benchmark physical, rheological, and chemical properties.

Characterization



3D imaging, synchrotron X-ray spectroscopy and scattering, and radiography probe the fundamental mechanisms driving lab observations.

Engineering Scale-Up

Reproducing laboratory tests at engineering scales is one of the major critical steps before implementing our technologies in the field.

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Saslow, S. A. (2020). ES&T **54**(21): 13610-13618.

A Nonlinear Research Path Got Me to PNNL

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5

Postdoc 2015 – 2017
Staff 2017 – Present

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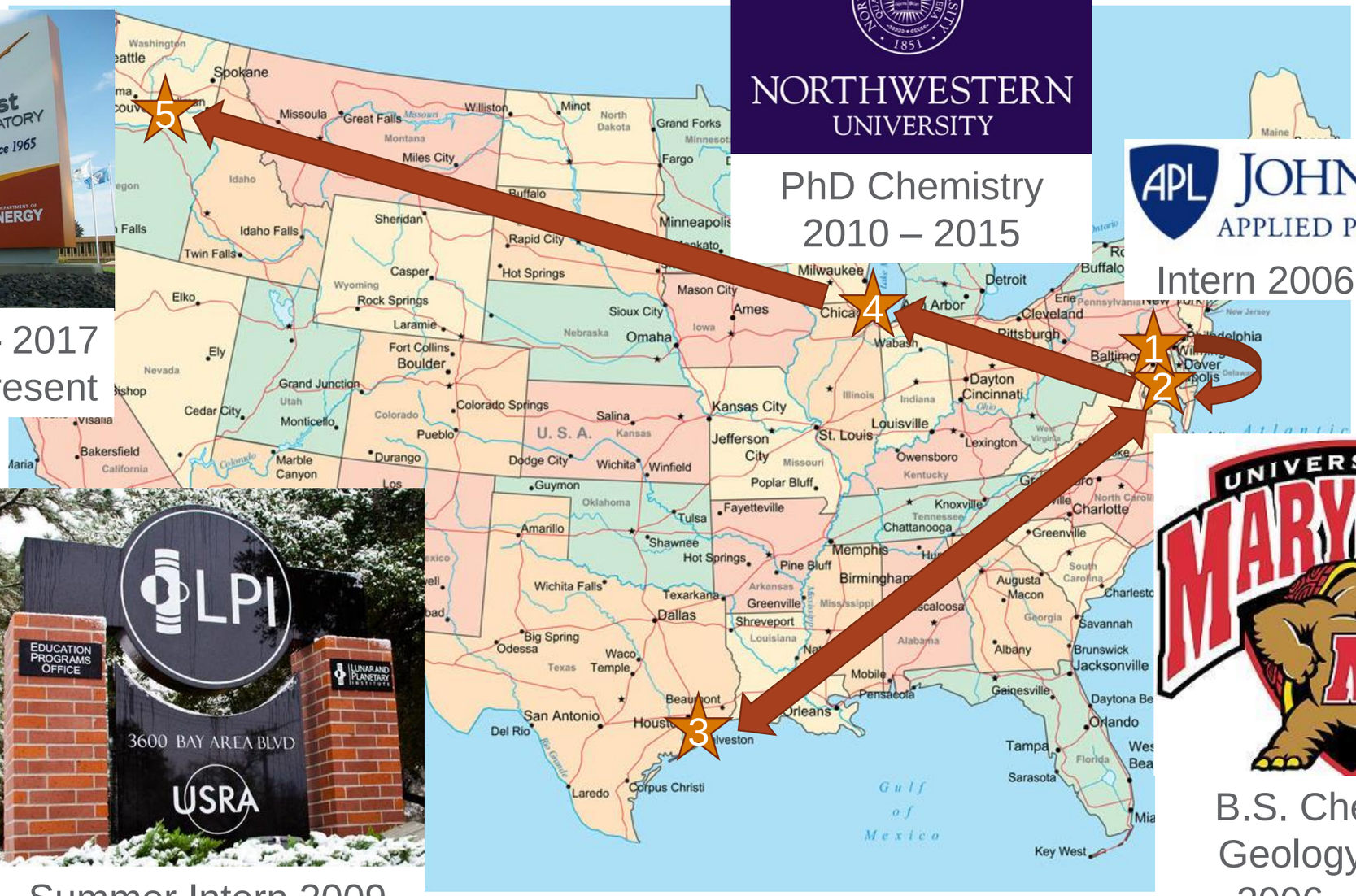
NORTHWESTERN UNIVERSITY

PhD Chemistry
2010 – 2015

1

APL JOHNS HOPKINS APPLIED PHYSICS LABORATORY

Intern 2006 – 2008, 2010



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Summer Intern 2009

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UNIVERSITY OF MARYLAND

B.S. Chemistry
Geology Minor
2006 – 2010

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Fred Day-Lewis – Chief Geophysicist/Lab Fellow

Education
- Ph.D., Stanford, 2001
- B.S. Hydrology/B.A. English, U. New Hampshire, 1994

Current research topics
- Groundwater/surface-water interaction
- Geophysical monitoring of remediation

Experience
- 1.5 years at PNNL, 18 at U.S. Geological Survey

Professional interests
- Inverse problems, geostatistics, digital signal processing & control

Skill summary
- Matlab, Python, field methods

Hobbies/personal interests
- Running, rock climbing, taking classes, my kids…

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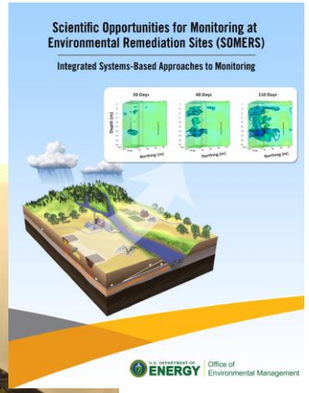
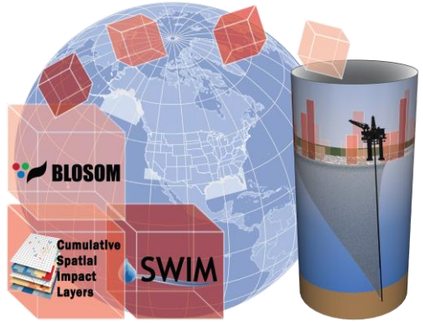
Amoret Bunn, Ph.D.
Senior Environmental Engineer

Research Interests

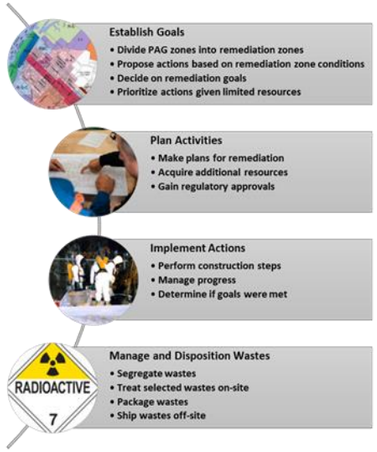
- Natural resource analyses & management
- UAV for radiation detection

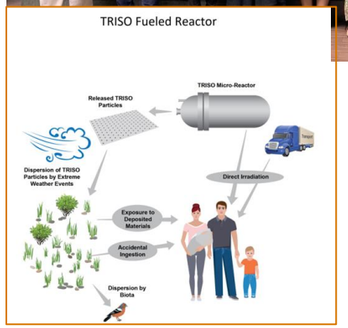




Areas of Expertise

- Human Health & Ecological Assessments
- Experimental Design and Decision Analysis
- Regulatory Compliance
- Incident Response & Biological Agents Awareness
- Interdisciplinary Team Development





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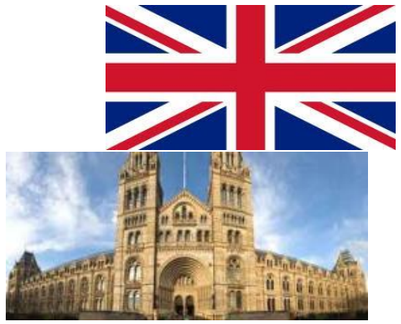
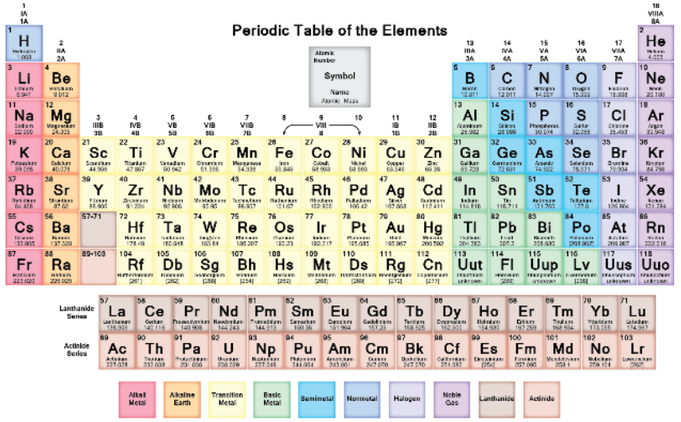
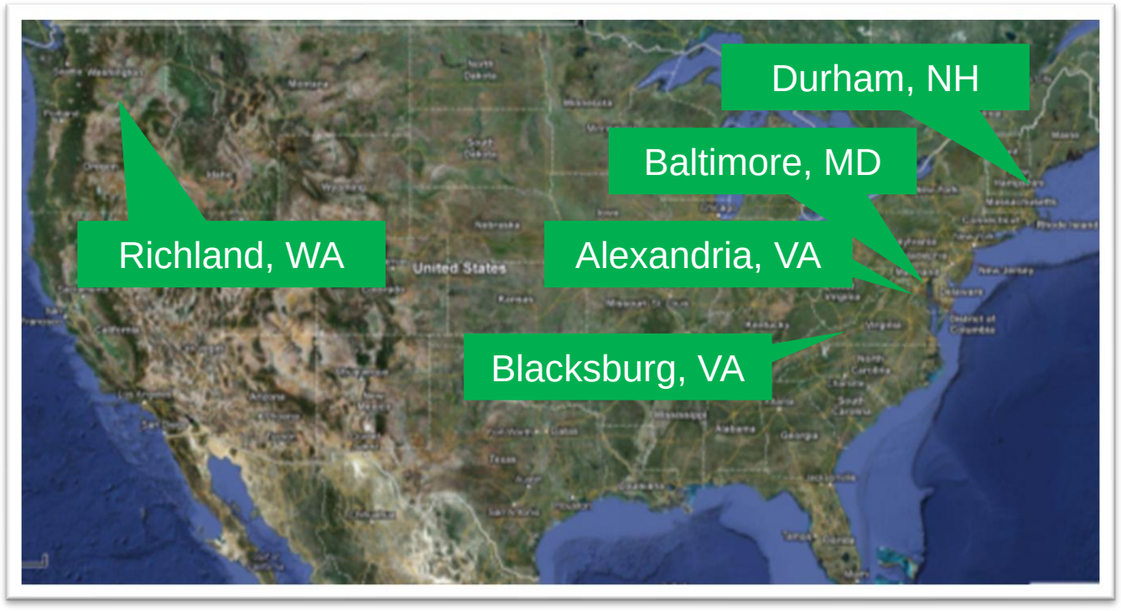
How did I get to the position?

- Grew up in Virginia
- Interned at the Smithsonian's National Natural History Museum
- B.S., Biology, Virginia Tech
- M.S. and Ph.D., Civil Engineering, University of New Hampshire
- Studied at British Natural History Museum
- Then I got a job with U.S. Department of Energy







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Jordan Perkins
H.S. – Student Research Apprenticeship Program

- Summer 2022 SRAP intern
  - Richland H.S. rising senior
- Background / experience / skills
  - AP capstone project
    - ✓ Identify themes and gaps related to virtual versus in-person learning platforms
    - ✓ Used Excel for data analysis
  - Public communication/speaking skills
    - ✓ Tri Cities Ms. Juneteenth program
- Career interests
  - Environmental chemistry and toxicology
  - B.S. at U. Washington or WWU

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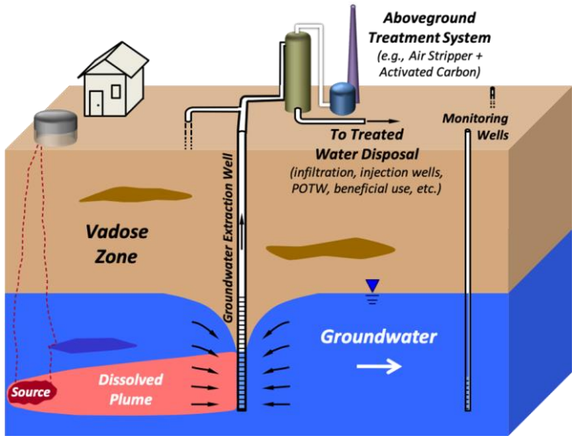
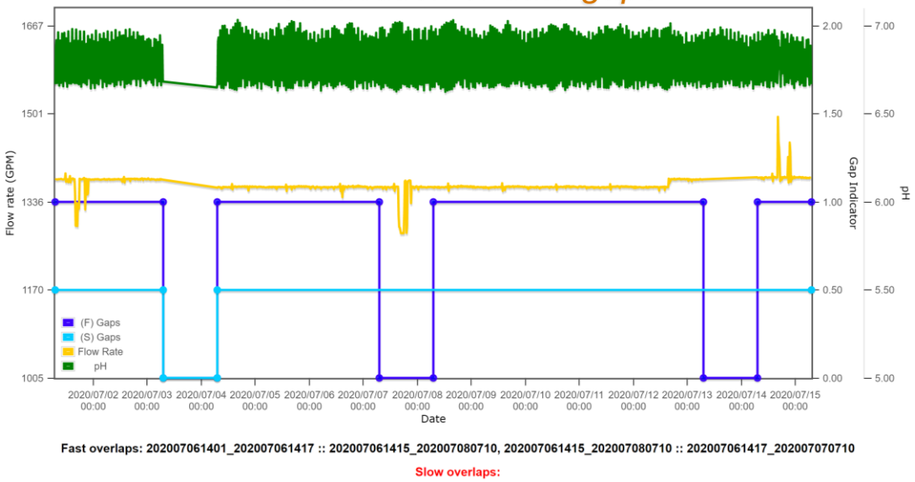
Pump-and-Treat (P&T) Data Analysis

- Objective: automate identification of pump-and-treat sensor data gaps and overlaps
- Approach: parse sensor database file names, apply logic to determine gaps and overlaps
  - Developed prototype in Excel
  - JavaScript function for use with HYPATIA app
- Outcome: time series dataset that indicates times of data gaps
  - Will be used as a data availability indicator in HYPATIA software
  - Facilitates interpretation of data
    - ✓ Statistics / analytics, machine learning



Pump-and-treat remediation system

Identification of data gaps



HYPATIA software for P&T data visualization & analysis

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Thoughts on My DOE Internship

- What did I do to prepare?
  - Developed a resume and received a letter of recommendation
- What did I learn?
  - Making online connections is possible and powerful! Take advantage of the opportunity.
  - Ask plenty of questions
- What would have been useful to do prior to the internship?
  - Have a better understanding of the skills I would need to develop to have a successful internship
- What was interesting or unexpected?
  - Many online lectures available for exploring different topics
  - Your work environment is not micromanaged, but expectations and goals are clear
  - Very friendly environment to grow
- How did this internship inspire me?
  - Challenged me to think outside of the box
  - Exposed me to topics in science that I had a passion for
  - Solidified my top choice college

Arabella Chamberlain
Science Undergraduate Laboratory Internship

- Summer 2022 Remote SULI intern
  - Graduated with a B.A. in Physics and Computer Science from Coe College, IA
- Previous Research
  - Analyzed NASA MARSIS data
    - ✓ Used Excel for data analysis of local electron density profiles
  - Improved Atmospheric Correction in Airborne Radiance Retrievals
    - ✓ Analyzed data in ENVI, SNAP, and Acolite
    - ✓ Applied several standard and novel atmospheric correction techniques
- Continuing Education
  - Atmospheric and Oceanic Sciences Program
  - First-year PhD Student at University of Colorado Boulder

Hanford Site Monitoring

Hanford Site has over 800 waste sites!

- Hard to monitor on that scale
- Waste has reached depths below the reach of surface-based removal methods
- Poses risk to the groundwater system

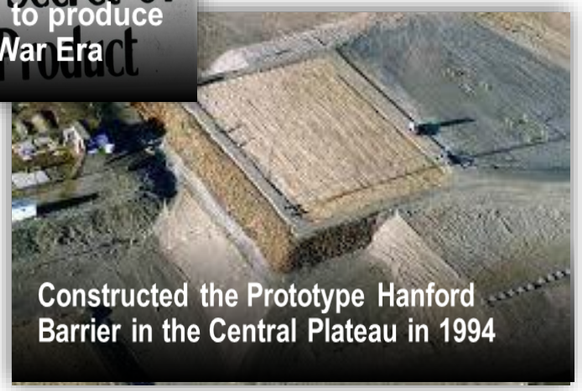
Risks of Groundwater Contamination

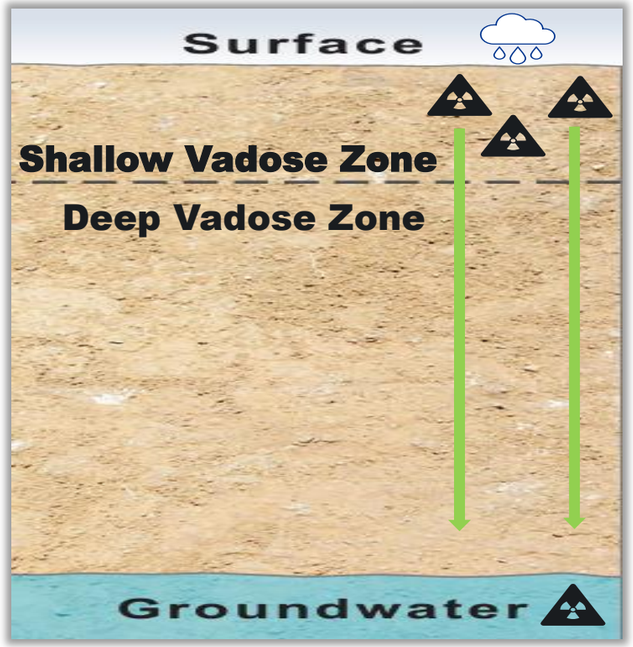
- Degraded drinking water quality
- High costs of cleanup
- Disruption and destruction of ecosystems

…and other environmental implications

Goal: Monitor subsurface fluid flux through the barrier

- *Flux* – Distance the water has moved downward in the vadose zone over time
- *Prototype Hanford Barrier* – surface barrier constructed in 1994 to mitigate risks of groundwater contamination





U.S. Department of Energy. *Deep Vadose Zone: Addressing Contamination Deep in the Vadose Zone.*

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Apply neural networks on smaller scale of the Prototype Hanford Barrier to use on larger scale of the Hanford Site as a whole

Objective

Strengthened skills in *Python, JupyterLab, TensorFlow, Keras, Excel*

Subsurface moisture data is ***necessary*** to predict the flux with neural networks

Findings

Neural networks can outperform linear regression models in predictions of subsurface flux

Neural networks can be difficult to construct, but may be less time-consuming and more cost effective than current techniques

Summary

Developed scientific writing and communication skills, gained an encouraging mentor, experienced day-to-day life of a researcher at a national laboratory

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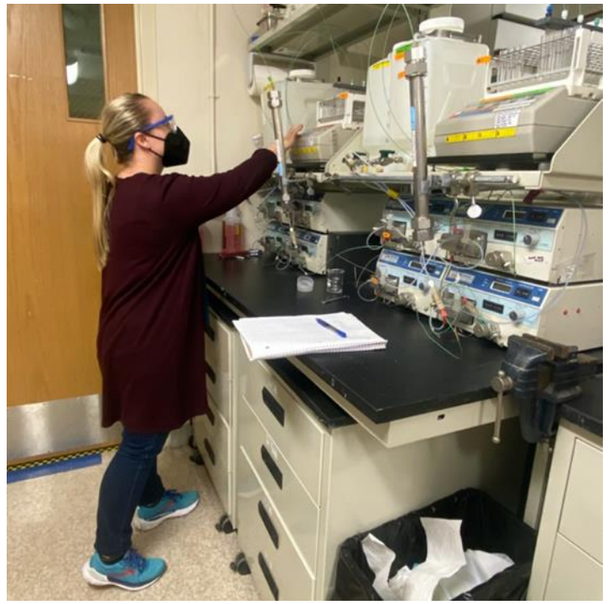
My Experience as a DOE Intern

- What did I do to prepare?
  - Develop skills in computer science
    - ✓ Learn a programming language. Python is a good place to start!
  - Read up on current research I was interested in
    - ✓ Review a few papers about the projects you apply to. Gives you a feel for the research!
- What would have been useful to have done?
  - Take a statistics course
    - ✓ Lots of analysis requires a basic understanding of statistics. Take a class or learn online if you can!
  - Take the initiative
    - ✓ Always be ready to take on a new opportunity! You never know what will come out of it.

Overall thoughts: I had an amazing time and grew so much as an independent researcher during my time in the SULI program. My mentor challenged me daily and helped become a stronger scientist who thinks critically and asks questions and helped me develop connections to other scientists and opportunities. Creating a final report and presentation was great preparation for the kind of work I would face in my graduate studies. Working as a DOE intern is a great springboard to get experience with research in a safe and supportive environment!

Mariah Doughman

- Graduate Student – DOE-FIU Science and Technology Workforce Development Program
- Summer 2022 intern
  - DOE Fellow – Soil and Groundwater Laboratory
  - Florida International University Chemistry Ph.D. Candidate
- Background
  - Co-mingled contaminant fate and transport in the subsurface
  - Host:guest interaction for the development of an economical rapid assay for field detection of PFAS in water
- Career Interests
  - Geochemistry
  - Remediation technologies for radionuclides and other contaminants of concern



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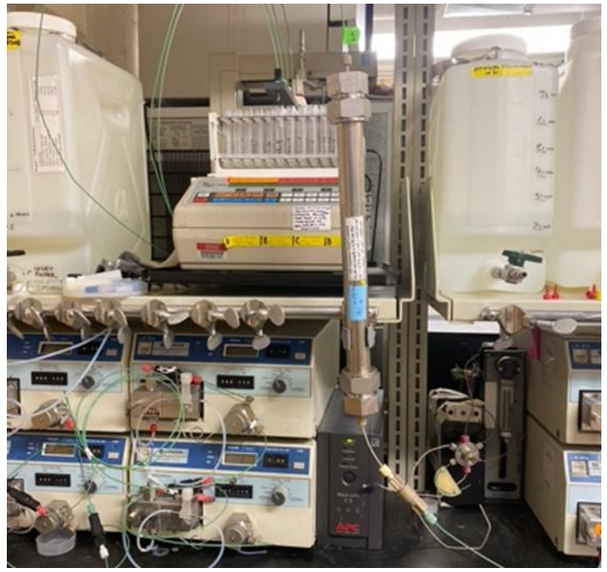
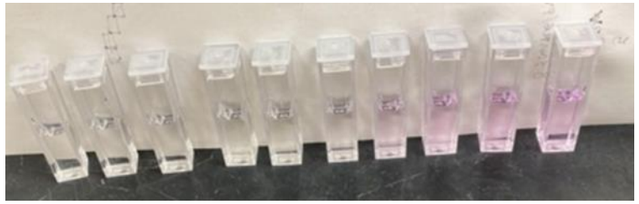
Sorption and Desorption of Cr(VI) in Hanford Sediments



- Objective: measure adsorption and desorption of Cr(VI) to determine if the Cr(VI) remaining in the subsurface undergoes natural attenuation processes
- Approach:
  - Sediment characterization
  - Batch adsorption studies
  - Column studies



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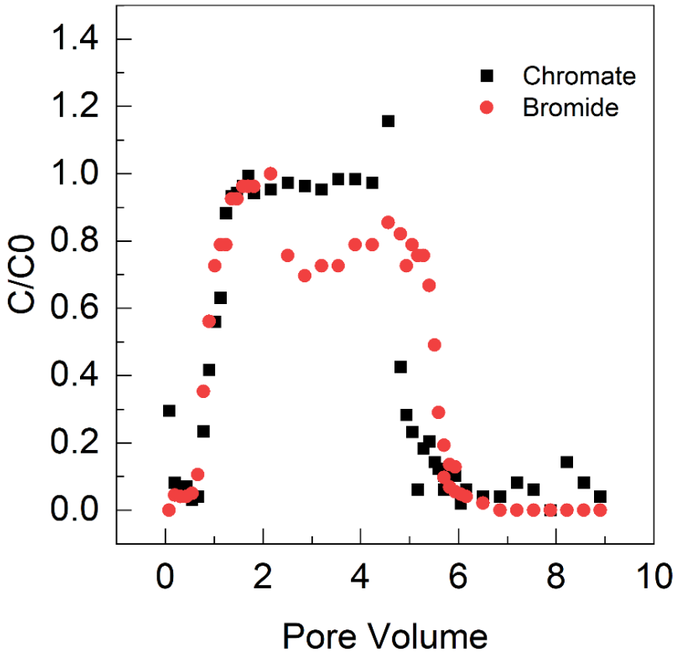
Outcomes/Implications

- Minimal retardation, R = 1.25
- Low chromate adsorption, K_d = 0.036 L/kg
- K_d for batch experiment (1.66 L/kg) larger than column experiment (0.036 L/kg)
  - Possibly due to increase in accessible clay adsorption sites from stirring and abrasion and from a longer residence time (14 days vs. 1.7 hours)
- Results indicate that Cr(VI) will be mobile under site conditions
- Mobility should be considered when developing passive remediation strategies (monitored natural attenuation)



Thoughts on My DOE Internship

- What did I learn?
  - I was able to develop a new skill set in establishing and running a column experiment
- What was inspiring / interesting to me?
  - The B-Reactor tour was particularly inspiring and brought into perspective the work we do
  - Networking with and learning from scientists in the Energy and Environment Directorate and other PNNL staff
  - Tours of different lab spaces
  - I also enjoyed meeting and learning from other PNNL interns
- What did I do to prepare?
  - Reading mentor's published work was helpful prior to arriving at PNNL

Jackie Wells – Earth Scientist I

- **Education**
  - B.S. Bioengineering, WSU, 2017
  - M.S. Environmental Engineering, OSU, 2021
- **Current research focus**
  - Soil and Groundwater Remediation/Monitoring
    - ✓ Pump-and-Treat resins
    - ✓ Bioremediation
  - Durability of Glass in Natural Environment
    - ✓ Testing physical and bio-corrosion of different glasses
    - ✓ Archeological analogues to predict long-term performance
- **Experience**
  - 3 years at PNNL
  - Biogeochemistry, environmental microbiology, glass/material science
- **Skill summary**
  - RAD Worker II, Bio Safety Level II, Field Work, Analytical Instrumentation (ICP, IC, XRD, etc.)

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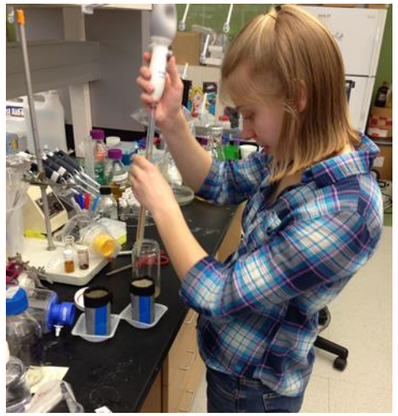
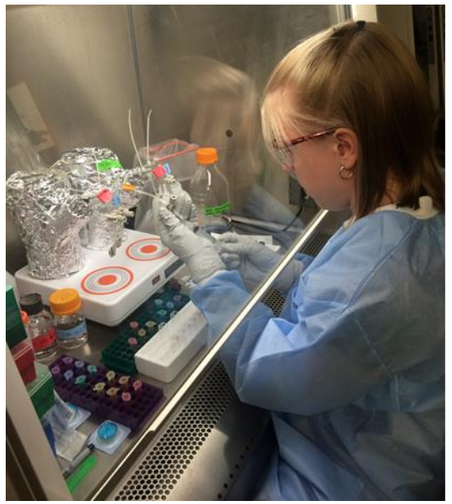
Path from Intern to Research Associate

WSU Lab: 2014-2017
Bio-cement with Engineers w/o Boarders club

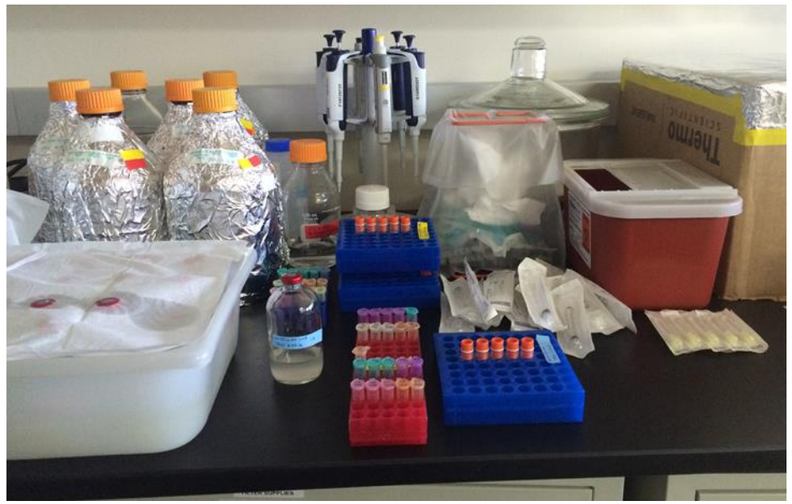


SULI Summer: 2015
Biotransformation of iodate & nitrate + 1 microbe



PNNL Intern: 2017
Cyanide impacts on groundwater microbes; Columbia R. water monitoring

Post-Bach RA: 2017-2019



SULI Summer: 2016
Biotransformation of iodate & nitrate & iron + 3 microbes

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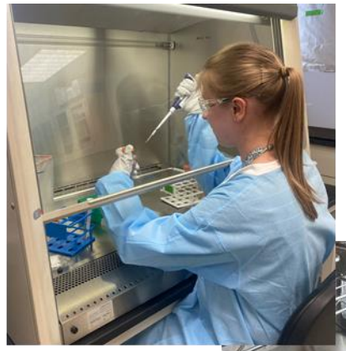
Path from Research Associate to Staff

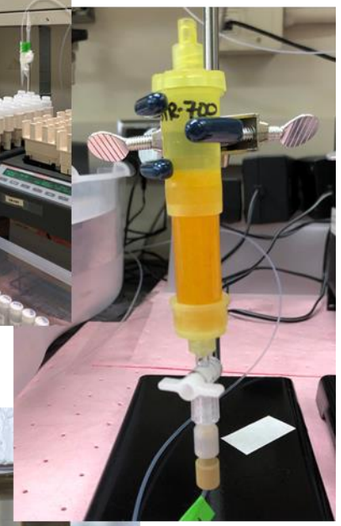
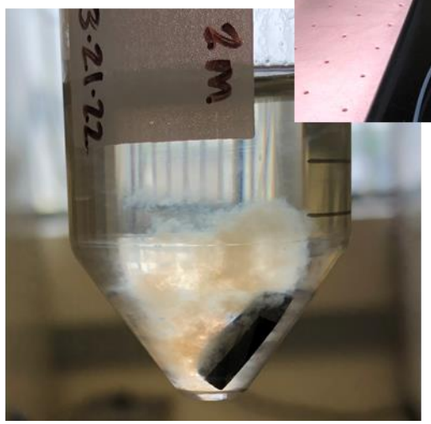
Post-Bach RA: 2017-2019
Ancient glass, fish tagging, hydrobiogeochemistry



MS in EnvE: 2019-2021
Stormwater Remediation: Flume studies and bioswale



Earth Scientist: 2021-Present
Pump-and-treat resins, glass durability

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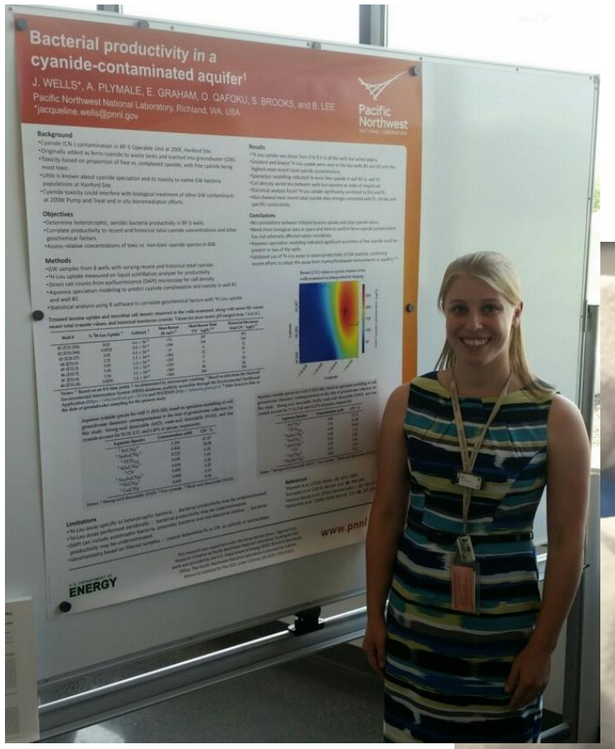
Thoughts on My Career Path: Intern to Staff

- Learned technical skills
  - Experiment/project planning
  - Lab techniques, data analysis, scientific writing
- Opened future work opportunities
  - Intern → Post-Bach RA → Staff
- Inspired passion in environmental research
  - Bioremediation, Soil & Groundwater, Field Work
- Instrumental to Grad School Acceptance
  - Proved I could handle research projects
- Connected me with knowledgeable mentors
- I would 100% do it again!



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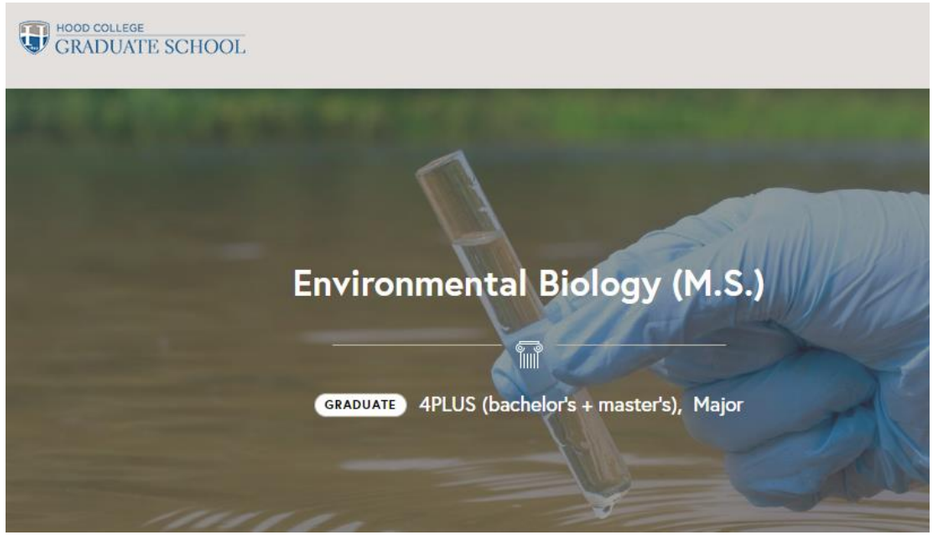
Emily Fabricatore – Staff Environmental Scientist, SRNL

- BA in Biology (2011) from Hood College, Frederick, MD
- MS in Environmental Biology (2020) from Hood College, Frederick, MD
  - Climate change focus
- Interned at DOE-EM HQ through the DOE Scholars Program
  - June 2019 - July 2020



Internship Experience

- June 2019: 10-week summer internship at DOE-EM HQ
  - Working with Rob Seifert and Skip Chamberlain (EM-4.12 – Subsurface Closure)
  - Pump-and-treat data
    - ✓ Presented to EM-4.1 (Infrastructure Management and Disposition Policy) on findings
    - ✓ Waste Management 2020 Abstract/Paper: "The Incorporation of Pump and Treat Data in the New Tracking Restoration and Closure (TRAC) Web-Based Mapping Tool"
  - Visited SRNL with other summer interns to experience life at a DOE lab/site
- August 2019 - July 2020: Internship extension
  - Worked with Skip Chamberlain and Carol Eddy-Dilek (SRNL)
  - DOE-EM complex-wide monitoring well data for ALTEMIS
  - DOE-EM complex-wide PFAS assessment
  - Site data/document collection for integration into TRAC
  - DOE-EM complex-wide coal ash inventory

Savannah River National Lab. (SRNL) Projects

- SRNL: Environmental Sciences and Dosimetry Group
- Scientist/Senior Scientist: August 2020 to Present
  - Climate: Vulnerability Adaptation and Resilience Plan (VARP)
  - ALTEMIS - Advanced Long-Term Environmental Monitoring Systems
  - PFAS lead on complex-wide assessment
  - Groundwater closure strategy

Internship Takeaways & Recommendations

- Branch out and talk to different people
  - Do they like their job?
  - What do they do?
  - Can you help them with anything?
  - Relationships > expertise
- Get a high-level understanding of DOE
  - Seeing the bigger picture will help with finding what you might want to do
  - Can help in any job position in the DOE space
  - HQ and Site/Lab perspective, if you have the opportunity
- Do your best in everything
  - It will not go unnoticed
  - Positive recommendations will go a long way to securing a job
- Accept all projects/tasks that come your way
  - You might not think you'll enjoy something but could end up loving it

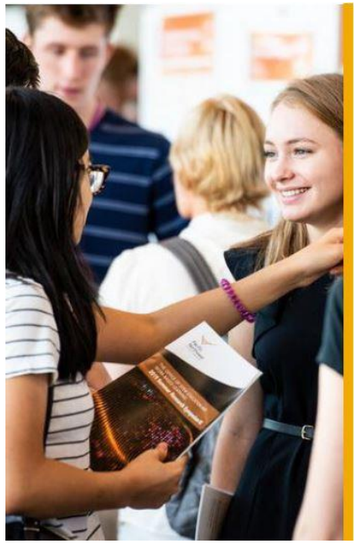
Description of Program-based Internship Opportunities

Program opportunities are available across the range of National Labs, DOE Offices (HQ and field offices), and DOE-EM / DOE-LM Sites

There are also non-program positions for Tech Students, and research associates (i.e., Post-Bachelors/Masters/Doctorate)

Be sure to check out individual National Lab / Site / Office webpages for specific opportunities

PNNL High School Internship Programs



PNNL HS Program Manager

Emily Dykes

emily.dykes@pnnl.gov

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About the Programs (SRAP, YWIS, etc.)

- HS students work alongside STEM professionals on research projects
- **36-week** academic year, or **10-week** summer intern programs
- Networking, career awareness, & professional development opportunities

Eligibility

- E**nrolled in a public or private school** and interested in a STEM career
- **Enroll in WBL-required classes**
- ≥ **16 years old** at internship start, in **grade 10-12** at time of application
- **Cumulative GPA of 3.0 or higher** (9th grade through current standing)

Application (via careers.pnnl.gov)

- **Applications open** in February and close mid-March (deadlines vary)
- Work with your H.S. Work-Based Learning Coordinator

Virtual 2023 H.S. Career Connections Expo

- February 1 and 2, 2023

Register here

Pacific Northwest NATIONAL LABORATORY

SULI & CCI Programs

Research internships for undergraduate students

PNNL Program Manager Contacts

SULI: Nicole Castilleja Bentley
nicole.Bentley@pnnl.gov

CCI: Nancy Roe
nancy.roe@pnnl.gov

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- **Where:** SULI programs at 17 national labs, CCI at 16; each with different scientific capabilities and focus areas; you can select up to 2 labs of interest when you apply
- **Appointment Terms:**
  - **10 weeks** in Summer (May – August)
  - **16 weeks** in Fall or Spring
    - **CCI has a flex schedule**
- **Mentors:** Each student is assigned to a Lab staff scientist in a specific area of research related to the student's interests and major. Students must work on a research project for which they can publish or present findings.
- **Pay:** **$650** week (*based on 40 hours a week*)
- **Benefits:** **$250** week for housing; variable travel reimbursement
- **Deadline for Summer 2023:** Jan 10, 5pm EST

MSIPP – Minority Serving Institution Partnership Program

- MSIPP-EM internships support the missions of DOE-EM
  - Undergraduate, masters, PhD interns, and post-Doctorate
- Ten-week internship under the guidance of a research staff member
  - Internship activities may include laboratory and site tours, professional development seminars, workshops, lectures, and even social or off-site activities
  - PNNL internship postings going up in December, will close at end of February 2023
- Internships are compensated (stipend or salary)
  - May include domestic travel to and from the host location
- Eligibility Criteria
  - Be currently enrolled as a full-time undergraduate or graduate student at an accredited Minority Serving Institution
  - Be working towards a science, technology, engineering, or mathematics (STEM) degree
  - Have a cumulative minimum GPA of 3.0 on a 4.0 scale
  - Be a United States citizen

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Sabrina Hoyle
sabrina.hoyle@pnnl.gov

Resource Links – PNNL and Key Intern Programs

- RemPlex – https://www.pnnl.gov/projects/remplex/learn-study
- PNNL Internships – https://www.pnnl.gov/stem-internships
  - SULI/CCI: https://www.pnnl.gov/wdts-internships
  - SRAP: https://www.pnnl.gov/student-research-apprenticeship-program
  - YWIS: https://www.pnnl.gov/young-women-science
  - MSIPP-EM: https://www.pnnl.gov/environmental-management-internship
  - Other: https://careers.pnnl.gov/
- DOE Office of Science's Workforce Development for Teachers and Scientists
  - SULI: https://science.osti.gov/wdts/suli
  - CCI: https://science.osti.gov/wdts/cci
- MSIPP-EM – https://srnl.doe.gov/msipp/internships.htm

Other Internship Programs

- Office of Science Grad. Student Research – https://science.osti.gov/wdts/scgsr
  - WDTS program to prepare graduate students for STEM careers important to the DOE Office of Science mission
  - Next SCGSR deadline: May 2023
- Minority Educational Inst. Student Partnership Prog. – https://orise.orau.gov/MEISPP
  - DOE Offices and Laboratories
  - Deadline for Summer 2023: January 31, 2023
- DOE Scholars – https://orise.orau.gov/doescholars/
  - Undergrad and Graduate for internships at DOE Offices and Field Sites
  - Deadline for Summer 2023: January 22, 2023
- GEM Fellowship – https://www.gemfellowship.org/gem-fellowship-program
  - Fellowships for MS or PhD students in Computer Science or Engineering
- Oak Ridge Institute for Science and Education
  - https://orise.orau.gov/internships-fellowships/index.html

What Now?

- Start early! Don't procrastinate.
- Make use of the links/resources for details on the programs
  - Review the eligibility and minimum requirements
  - Pay attention to deadlines
- What you will need
  - Essay(s) / personal statement – describing your interests, experience, future aspirations
  - Cover letter
  - Resume
  - Unofficial transcript
  - References
- Know something about where you are applying – research the position / organization
  - E.g., for SULI you need to pick 2 labs – pick ones that make sense for your interests (i.e., don't pick NETL if your interest is biology)

What Can I Do To Prepare?

- Look for opportunities to practice communication, both written and verbal
- Take STEM courses that align with your interests and impart useful skills
  - Formal courses or online (YouTube, LinkedIn Learning, etc.)
- Develop STEM skills that you can tout
  - Lab work
  - Scripting / coding languages (Python, JavaScript, VBA, SQL, etc.)
  - Data analysis software (Excel, R, Matlab, etc.)
- Spend time considering your interests and aspirations
  - You don't need to have your career path all mapped out, but have ideas about what interests / intrigues you
- Get involved – at a job, in extracurricular clubs, in the community, etc.

Look ahead to where you want to go with school and career, and start early to build your soft skills, technical skills, interests, etc.

What Are Mentors Looking For?

- Variations depending on level (H.S., undergrad, graduate)
- What is the student interested in?
- What are the student skills?
- What coursework has the student completed?
  - Foundation for mentor to build on, but not a primary factor
- What is the nature of the student's experience?
  - Many kinds of job experience or extracurriculars or community involvement can be telling about student characteristics
  - Leadership, teamwork, reliability, communication, etc.
- Grades
  - Are an indicator, but not a primary factor

Key coursework

Math and statistics
Biology, chemistry, physics
Earth science (geology, hydrology, etc.)
Engineering classes
(Computer classes)
Writing & presentations

Communication

Problem Solving

Looking for Individuals Who Are…

- Passionate or maybe still finding their passion

CREATIVE

CURIOUS

ENGAGED

INCLUSIVE

COLLABORATIVE

ALWAYS LEARNING

ADAPTABLE

COMMUNICATIVE

COURAGEOUS

COMPASSIONATE

ADVENTUROUS

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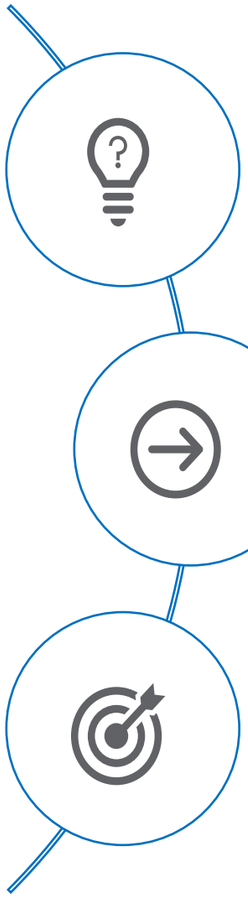
A Few More Things to Consider

- Getting paid is nice, but the big prize from an internship is the **experience** and **mentoring**
  - Take advantage of the networking, seminars, and other opportunities to build knowledge and skills
- Opportunities may be remote/virtual or onsite – both can be great experiences
  - May depend on the nature of the work
- Be sure to identify your interests – helps intern program coordinators place your application with potential mentors
  - E.g., if applying for environmental related work at PNNL, mention **RemPlex**

Webinar Take-Aways



National Laboratories perform critical research to solve the nation's most challenging problems in areas of basic science, energy, environment, and national security

Environmental cleanup research and development requires multidisciplinary teams (engineering, material science, geology, physics, chemistry, biology, computer science, data science, etc.)

Multiple programs (e.g., SULI, CCI, MSIPP, SRAP, YWIS, etc.) exist for internships for students from high school through undergraduate and graduate levels

Do your homework, apply early, demonstrate good writing and attention to detail, highlight your interests, skills, and characteristics

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Pacific Northwest
NATIONAL LABORATORY

Thank You

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www.pnnl.gov/projects/remplex/

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