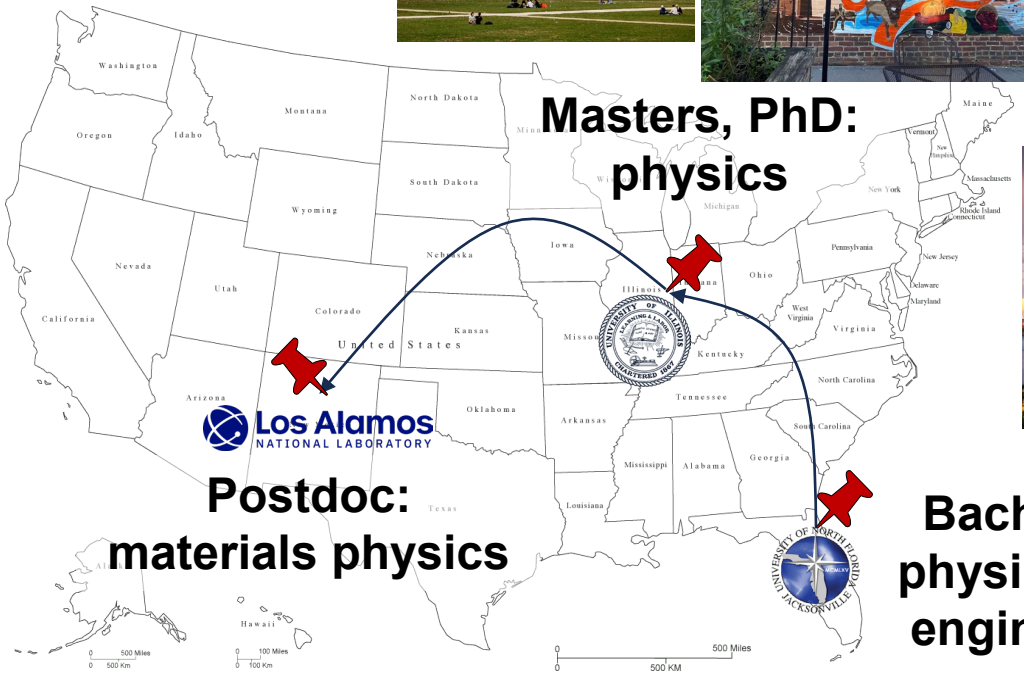
The Start of a Career at a National Lab

Caitlin Kengle

05/02/2025

LA-UR-25-24215

My path to LANL



Masters, PhD: physics

Postdoc: materials physics

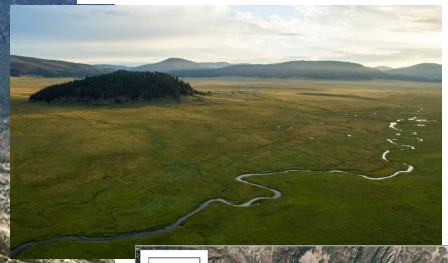
Bachelors: physics, civil engineering

Los Alamos, NM

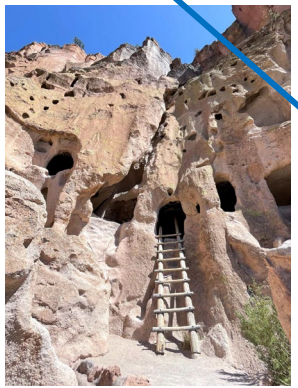
Pajarito Ski

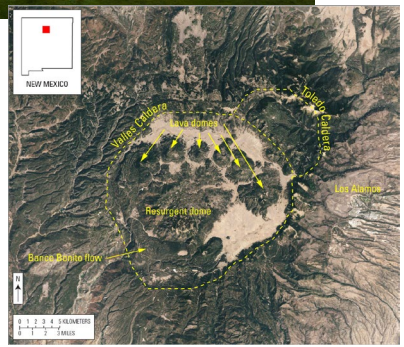
Jemez Mountains

Valles Caldera

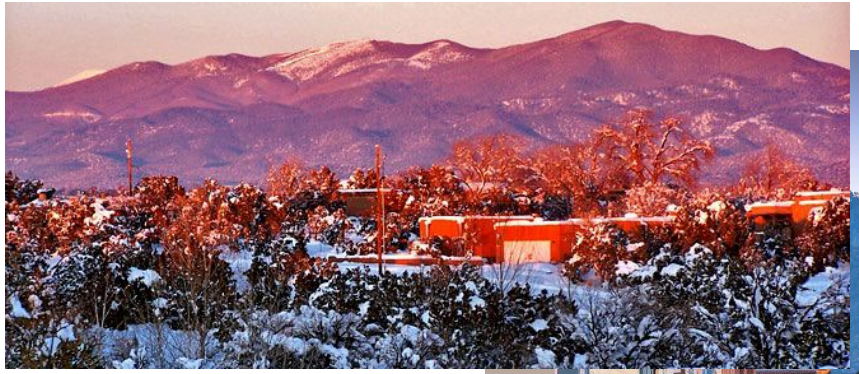


Bandelier National Monument

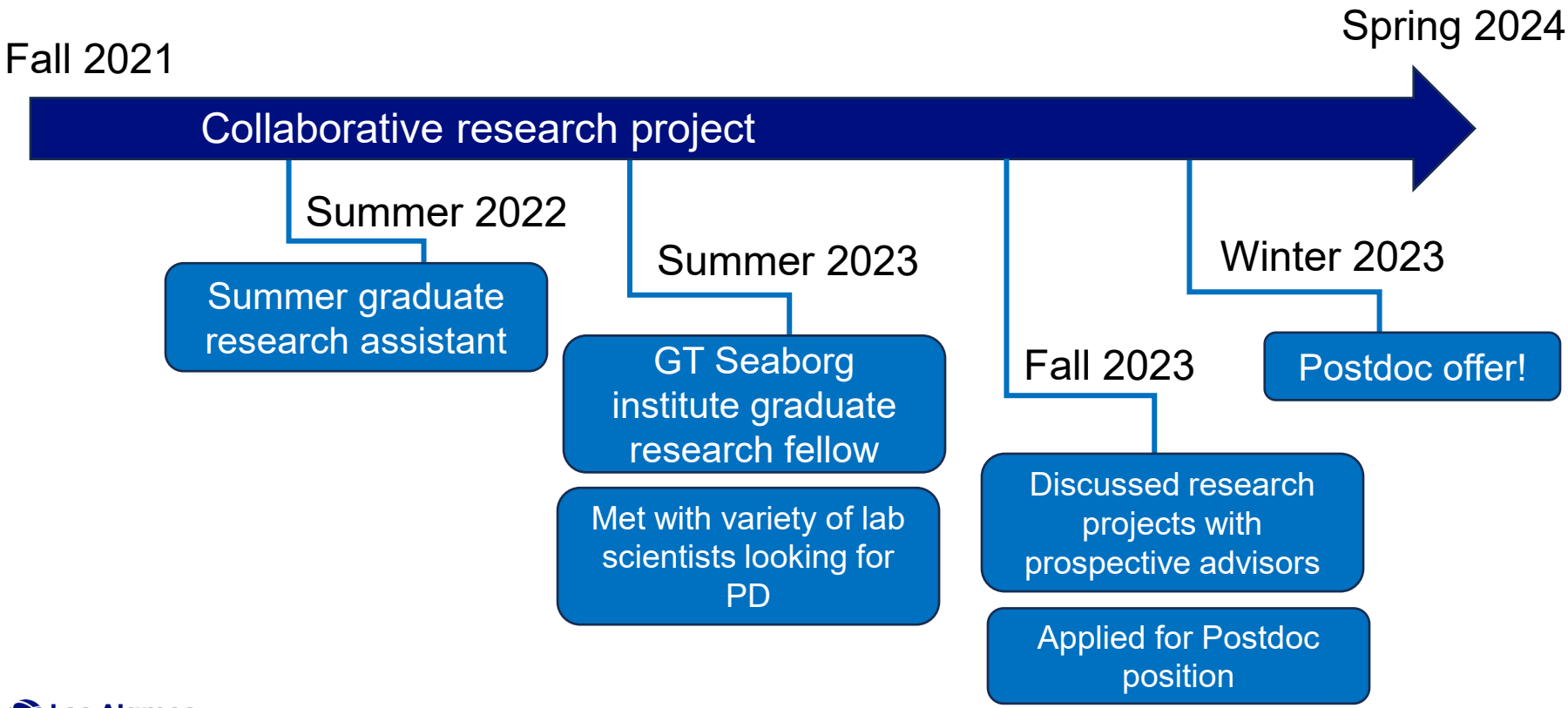




Santa Fe, NM



My path to LANL

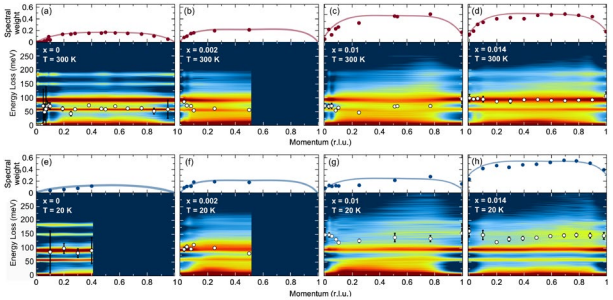


My PhD at UIUC

Spectroscopy

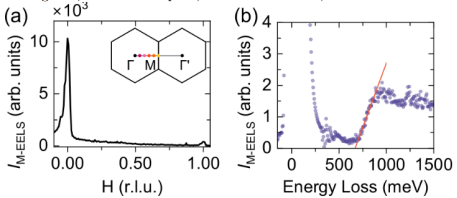
Non-RPA behavior of the valence plasmon in $SrTi_{1-x}Nb_xO_3$

Caitlin S. Kengle,[1,2] Samantha I. Rubeck,[1,2] Melinda Rak,[1,2] Jin Chen,[1,2] Faren Hoveyda,[1,2] Simon Bettler,[1,2] Ali Husain,[1,2] Matteo Mitrano,[1,2,*] Alexander Edelman,[3,4] Peter Littlewood,[3,4] Tai-Chang Chiang,[1,2] Fahad Mahmood,[1,2] and Peter Abbamonte[1,2,†]



Magnetic polaron formation in $EuZn_2P_2$

Matthew S. Cook,[1] Elizabeth A. Peterson,[1] Caitlin S. Kengle,[1] E. R. Kennedy,[1] J. Sheeran,[1] Clément Girod,[1] G.S. Freitas,[2] Samuel M. Greer,[1] Peter Abbamonte,[3,4] P.G. Pagliuso,[2] J. D. Thompson,[1] Sean M. Thomas,[1] and P. F. S. Rosa[1]

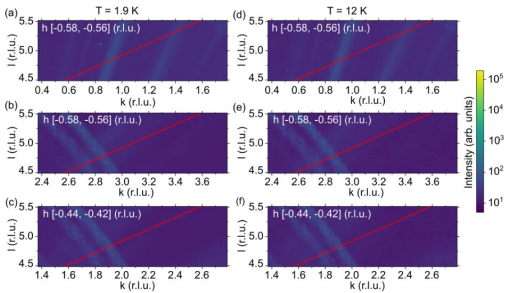


Diffraction

Editors' Suggestion

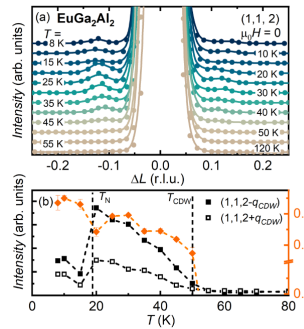
Absence of a bulk signature of a charge density wave in hard x-ray measurements of UTe_2

Caitlin S. Kengle,[1,2] Dipanjan Chaudhuri,[1,2] Xuefei Guo,[1,2] Thomas A. Johnson,[1,2] Simon Bettler,[1,2] Wolfgang Simeth,[3,4,5] Matthew J. Krogstad,[6] Zahir Islam,[7] Sheng Ran,[8,9,10] Shanta R. Saha,[8] Johnpierre Paglione,[8,11] Nicholas P. Butch,[8,9] Eduardo Fradkin,[1,2] Vidya Madhavan,[1,2] and Peter Abbamonte[1,2]



Incommensurate magnetic orders and topological Hall effect in the square-net centrosymmetric $EuGa_2Al_2$ system

Jaime M. Moya,[1,2] Shiming Lei,[2,*] Eleanor M. Clements,[3] Caitlin S. Kengle,[4] Stella Sun,[4] Kevin Allen,[2] Qizhi Li,[5] Y. Y. Peng,[5] Ali A. Husain,[6] Matteo Mitrano,[7] Matthew J. Krogstad,[8] Raymond Osborn,[8] Anand B. Puthirath,[9] Songxue Chi,[10] L. Debeer-Schmitt,[10] J. Gaudet,[3,11] P. Abbamonte,[4] Jeffrey W. Lynn,[3] and E. Morosan[2,†]



Article

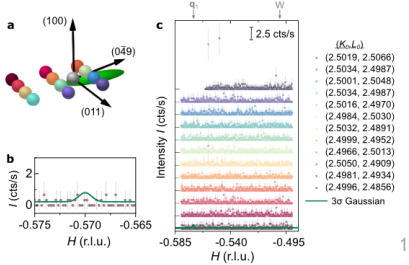
https://doi.org/10.1038/s41467-024-53739-8

Absence of bulk charge density wave order in the normal state of UTe_2

Received: 25 August 2024

Accepted: 22 October 2024

C. S. Kengle[1,2], J. Vonka[3], S. Francoual[4], J. Chang[5], P. Abbamonte[2], M. Janoschek[5,6], P. F. S. Rosa[1] & W. Simeth[1,5,6]

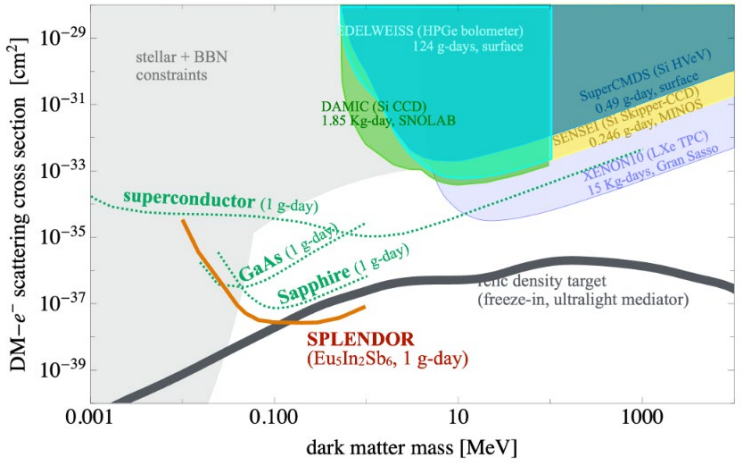


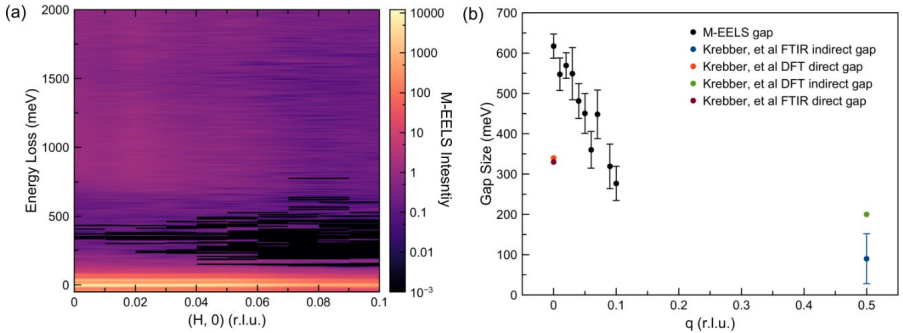
Los Alamos NATIONAL LABORATORY

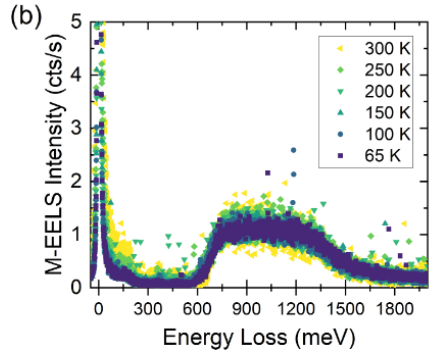
As a collaborator

Search for Particles of Light Dark Matter with Narrow-Gap Semiconductors = *SPLENDOR*

$$R_\chi = \frac{1}{\rho_T}\frac{\rho_\chi}{m_\chi}\int d^3\mathbf{v} f_\chi(\mathbf{v}) \int \frac{d^3\mathbf{q}}{(2\pi)^3} d\omega \delta(\omega + E'_\chi - E_\chi)\frac{\pi\overline{\sigma}(q)}{\mu_\chi^2} \times \underbrace{\frac{2\pi}{V}\sum_f |\langle f|\mathcal{O}_T(\mathbf{q})|i\rangle|^2 \delta(E_f - E_i - \omega)}_{S(\mathbf{q},\omega)},$$





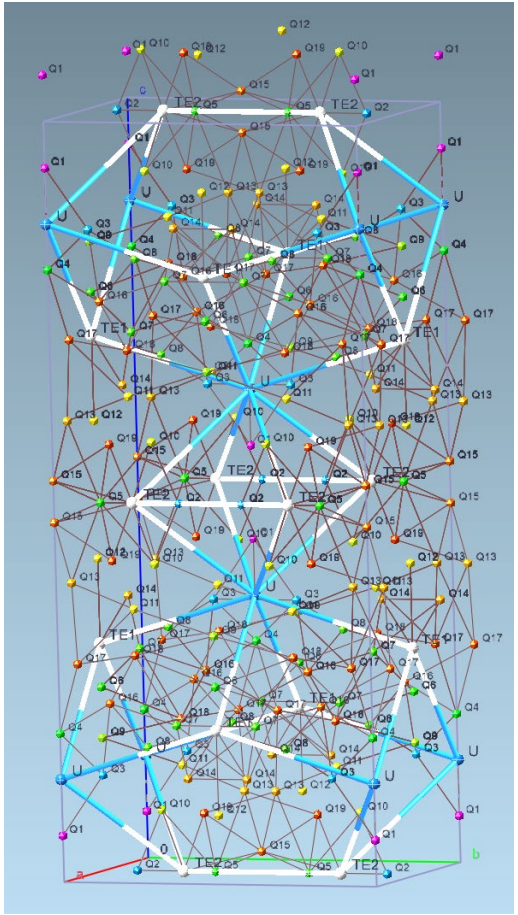


As a summer graduate student

Hired to study atomic displacement parameters in UTe_2

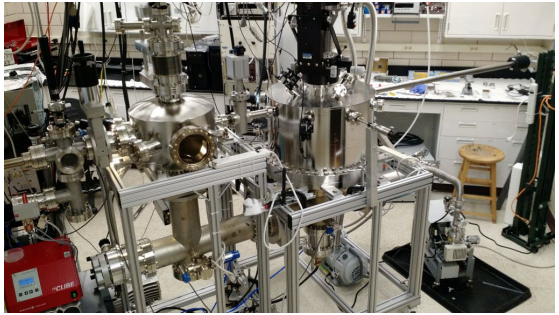
- ✓ Never done in my PhD
- ✓ Not what I was collaborating with LANL on

Prompted my involvement in searching
for CDW in UTe_2 with X-rays
(Largest chapter in my thesis)

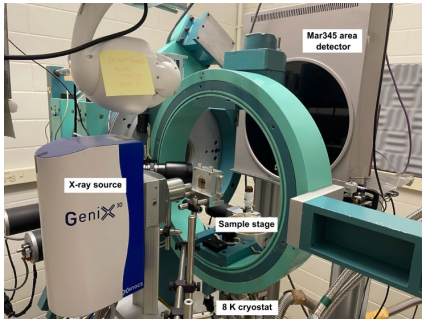


PhD → Postdoc

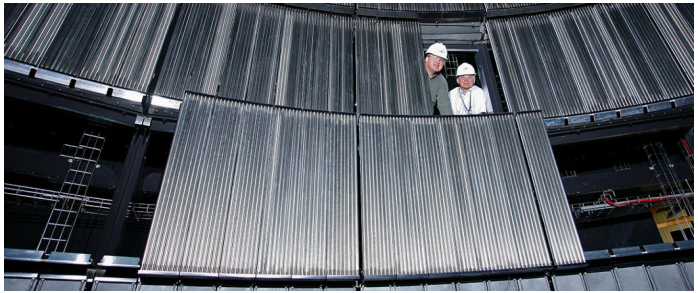
$$\chi_{\rho\rho}(\mathbf{r},\mathbf{r}',t-t') = -i\left\langle[\hat{\rho}(\mathbf{r},t),\hat{\rho}(\mathbf{r}',t')]\right\rangle\theta(t-t')/\hbar,$$



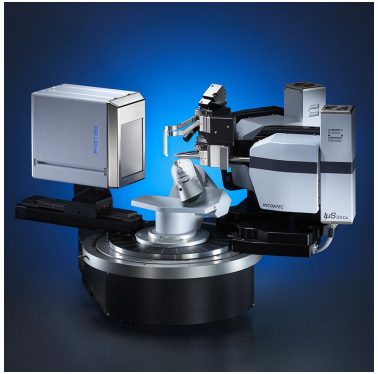
$$\chi_{nn}(\mathbf{r},\mathbf{r}') = -i\langle[\hat{n}(\mathbf{r},t),\hat{n}(\mathbf{r}',t')]\rangle\Theta(t-t')/\hbar$$



$$\chi_{SS}(\mathbf{r},\mathbf{r}',t-t') = -i\left\langle[\hat{S}(\mathbf{r},t),\hat{S}(\mathbf{r}',t')]\right\rangle\theta(t-t')/\hbar,$$

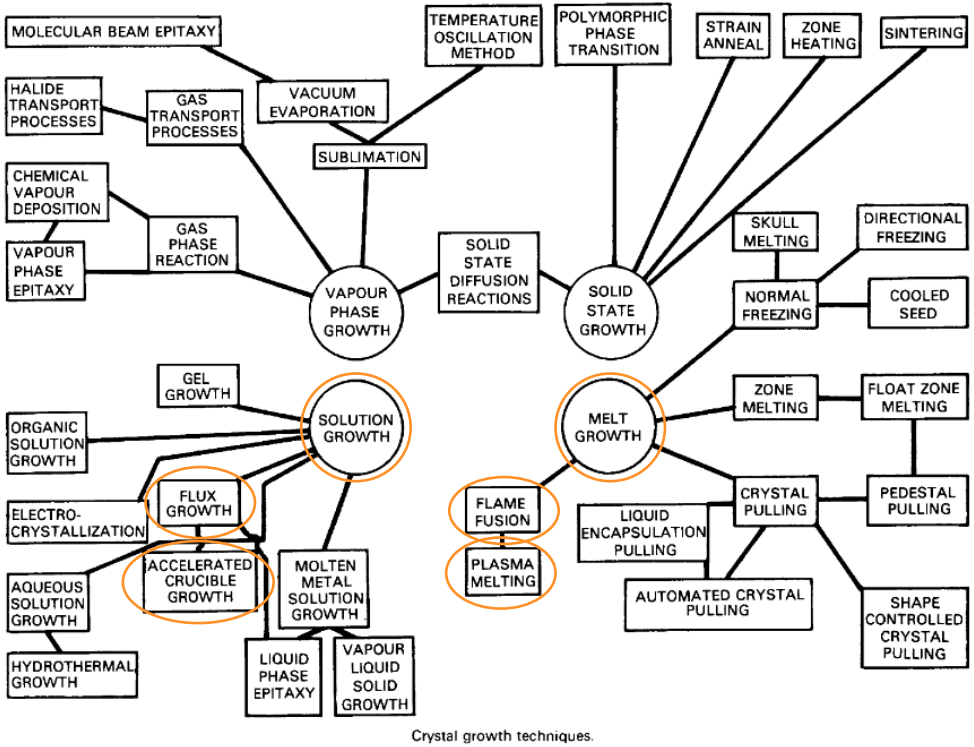


+



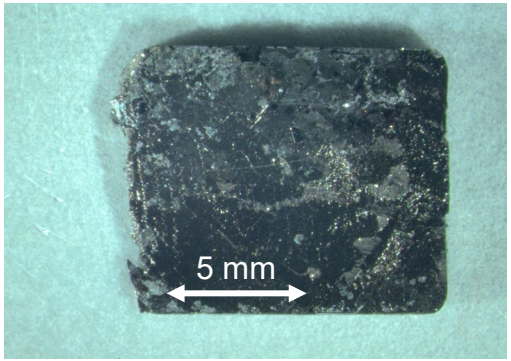
My postdoc: bulk crystal synthesis

Mentor: Priscila Rosa

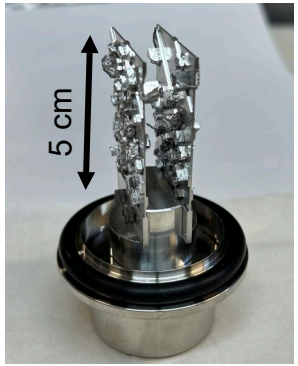


Crystal growth techniques.

- Know exactly the crystal quality
- Can get exactly what I want (when I want it)



~1.2 g single crystal



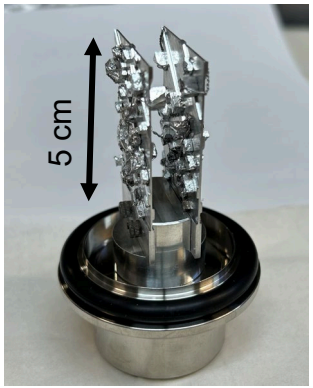
~100 coaligned single crystals

My postdoc: crystal growth + neutron scattering

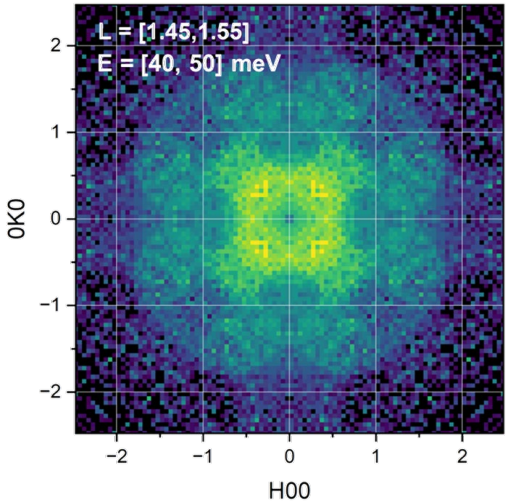
Mentor: Allen Scheie

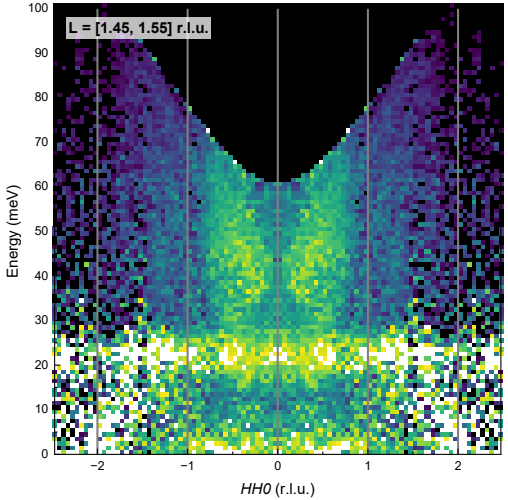
Goal: measure effects of crystal dimensionality on 5*f* magnetism

Synthesize cubic (3D) 5*f* paramagnet



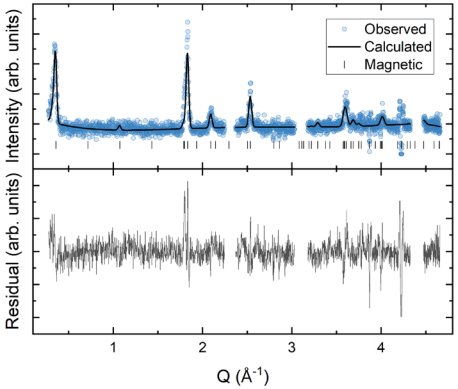
Perform inelastic neutron spectroscopy

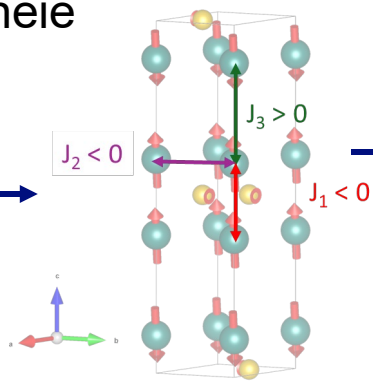




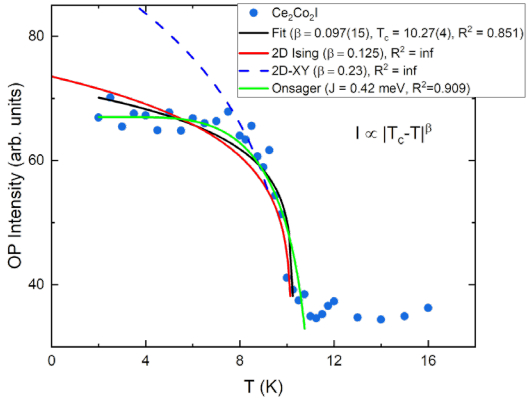
My postdoc: neutron scattering + simulation

Diffraction Mentor: Allen Scheie

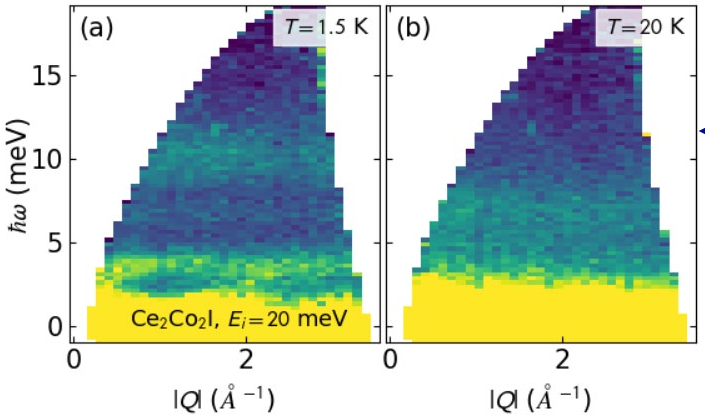


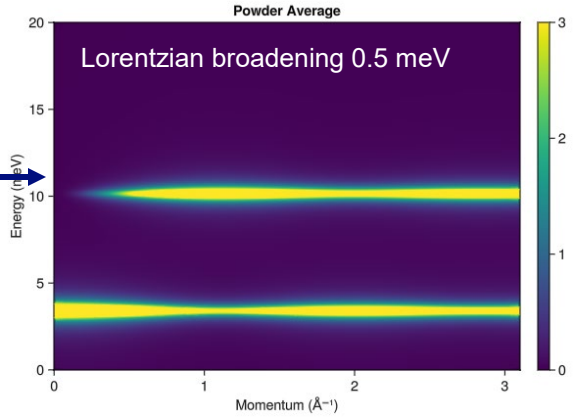


Sunny.jl: Spin dynamics and generalization to SU(N) coherent states



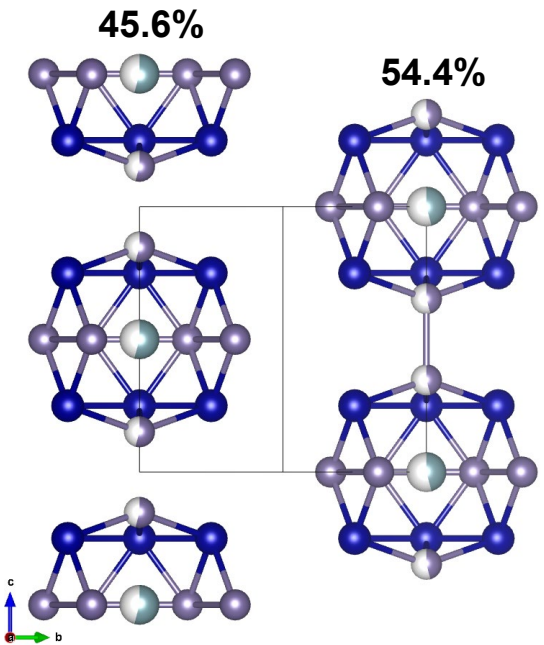
Spectroscopy

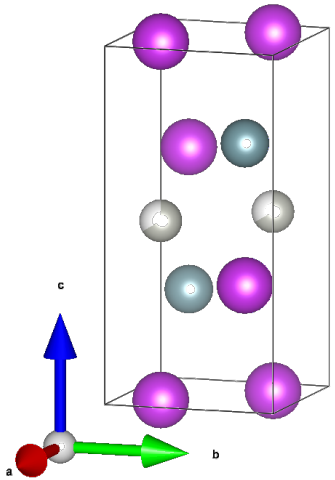


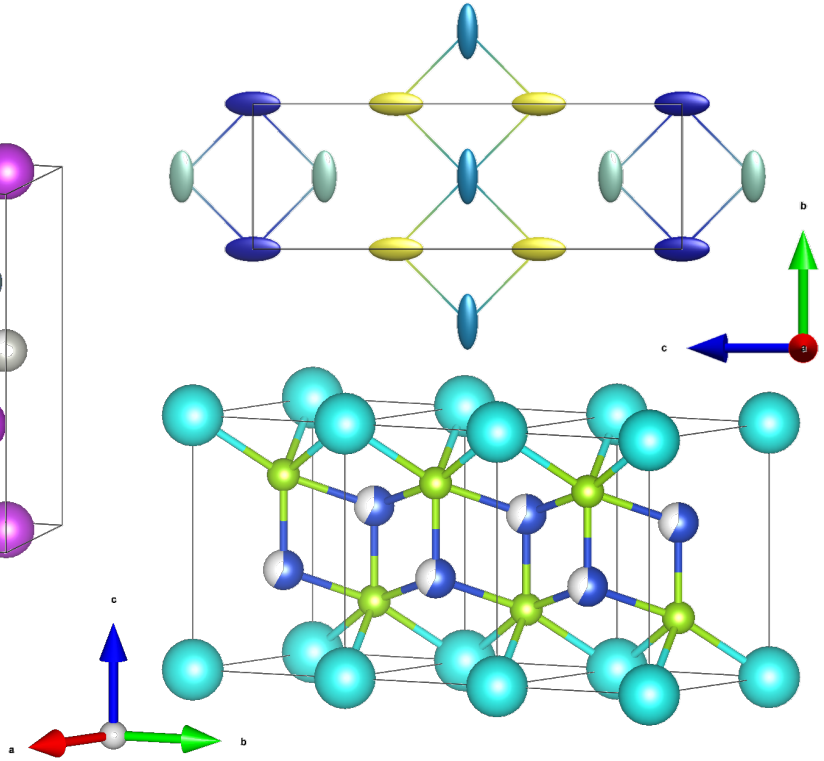


My postdoc: single crystal x-ray diffraction

Mentor: _____



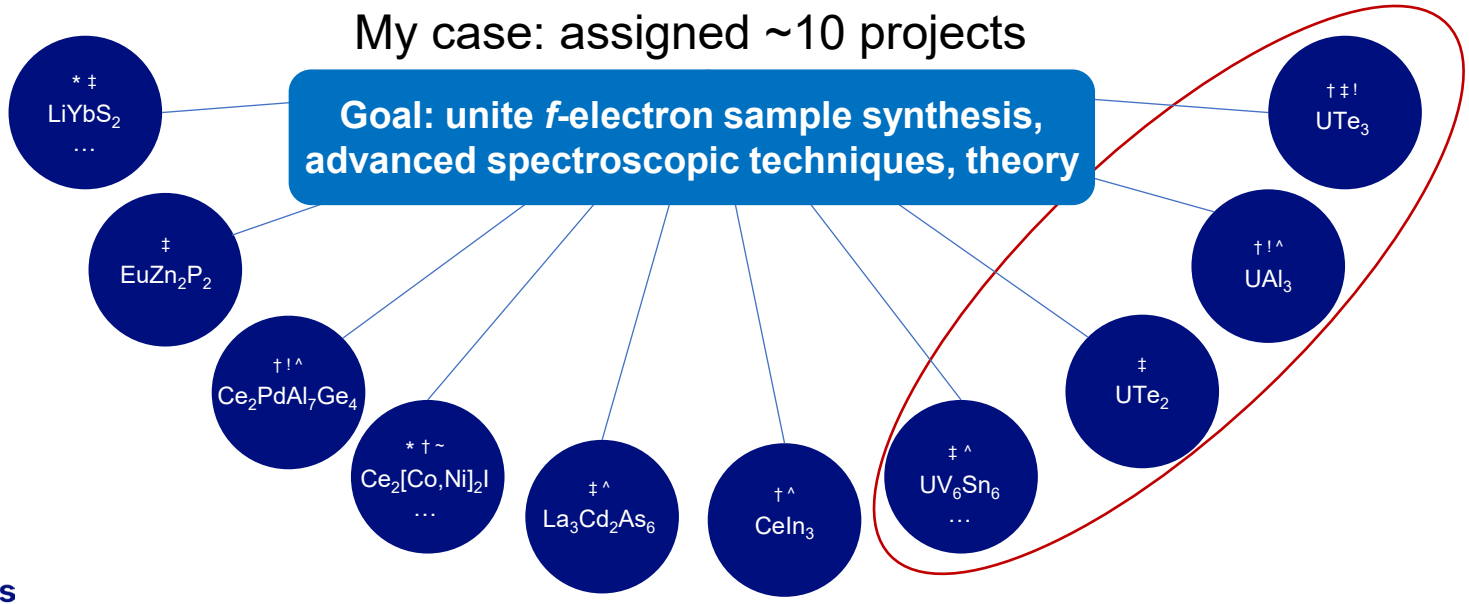




Structure of work as postdoc

Differs significantly based on mentorship, proposed work, etc!

* Neutron Diffraction
† Neutron Spectroscopy
‡ X-Ray Diffraction
! Sample synthesis
~ Modeling (me)
^ Modeling (collaborators)



Focus on *5f* magnetism, structure-property relations

= fellowship opportunities

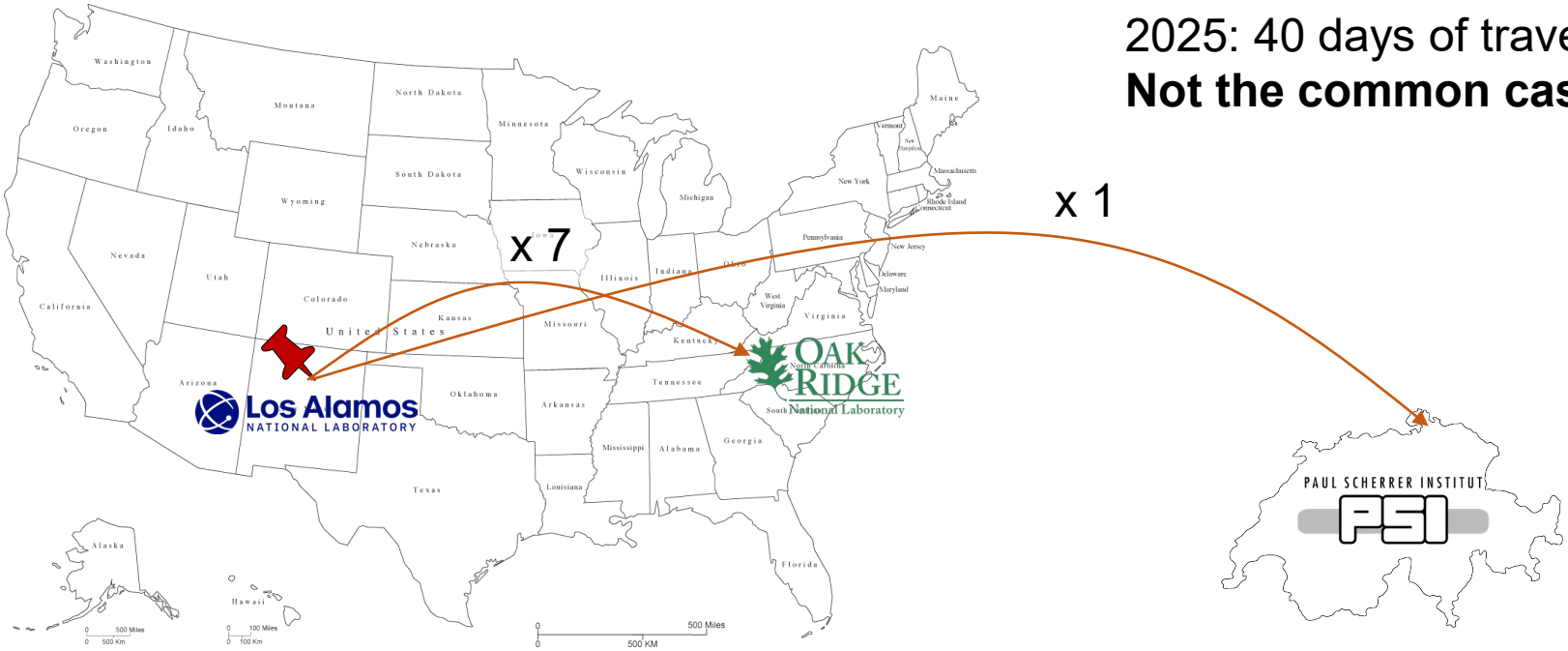
LANL Home / Engage / Collaboration / NSEC / Seaborg Institute / Seaborg Postdoctoral Fellows /

Seaborg Postdoctoral Fellows Program

Additional application, mentor nominated
Covers 50% of my salary

Other fellowships available for other disciplines

Offsite beamtimes = plenty of travel



2025: 40 days of travel

Not the common case

“The Lab”

Capability Pillars

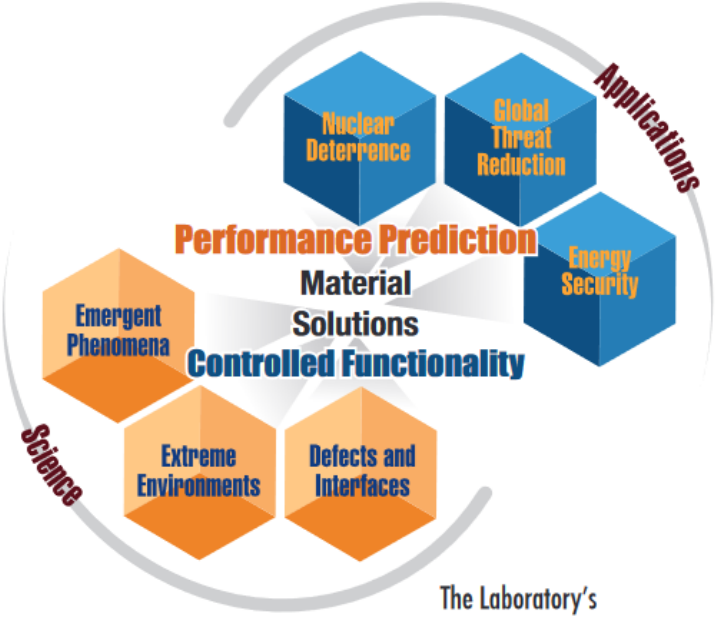
- Weapons Systems
- Information, Science, and Technology
- Science of Signatures
- Complex Natural & Engineered Systems
- Nuclear and Particle Futures
- Materials for the Future

“The Lab”

Capability Pillars

- Weapons Systems
- Information, Science, and Technology
- Science of Signatures
- Complex Natural & Engineered Systems
- Nuclear and Particle Futures
- **Materials for the Future**

Materials for the Future

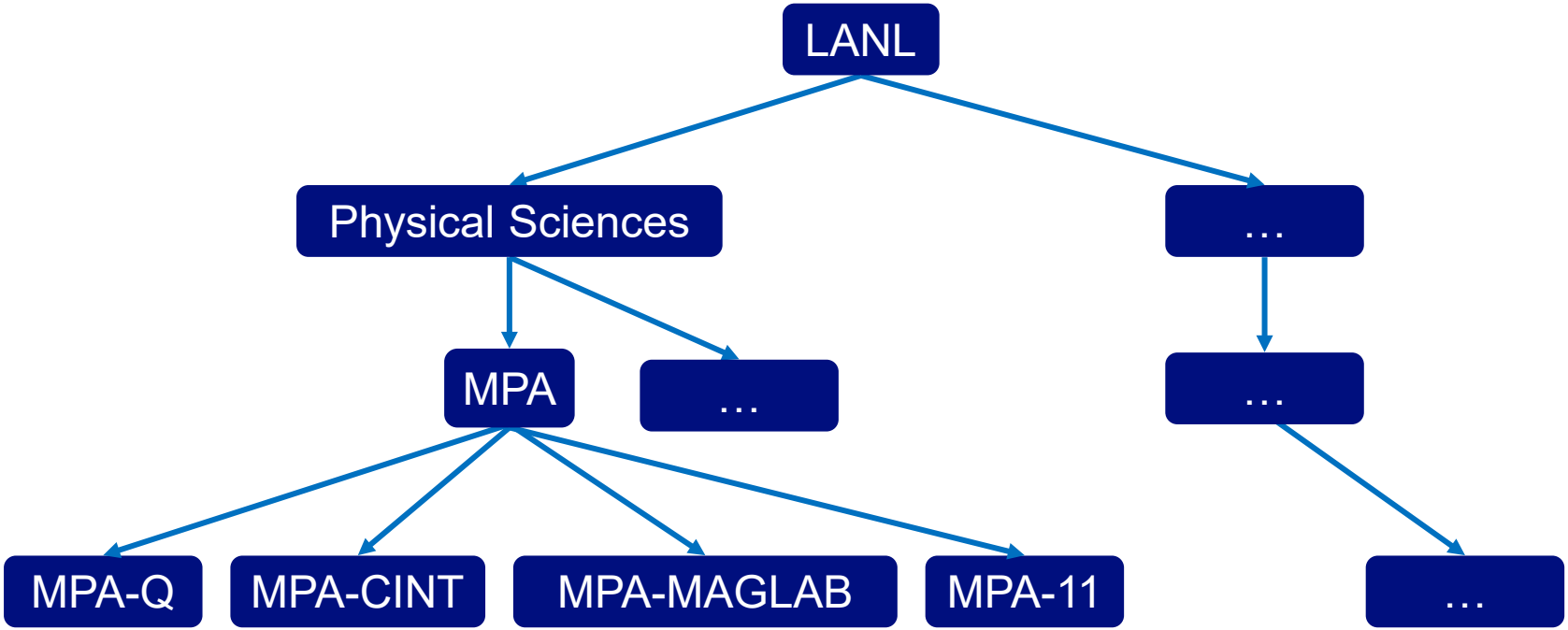


The Laboratory's materials strategy diagram.

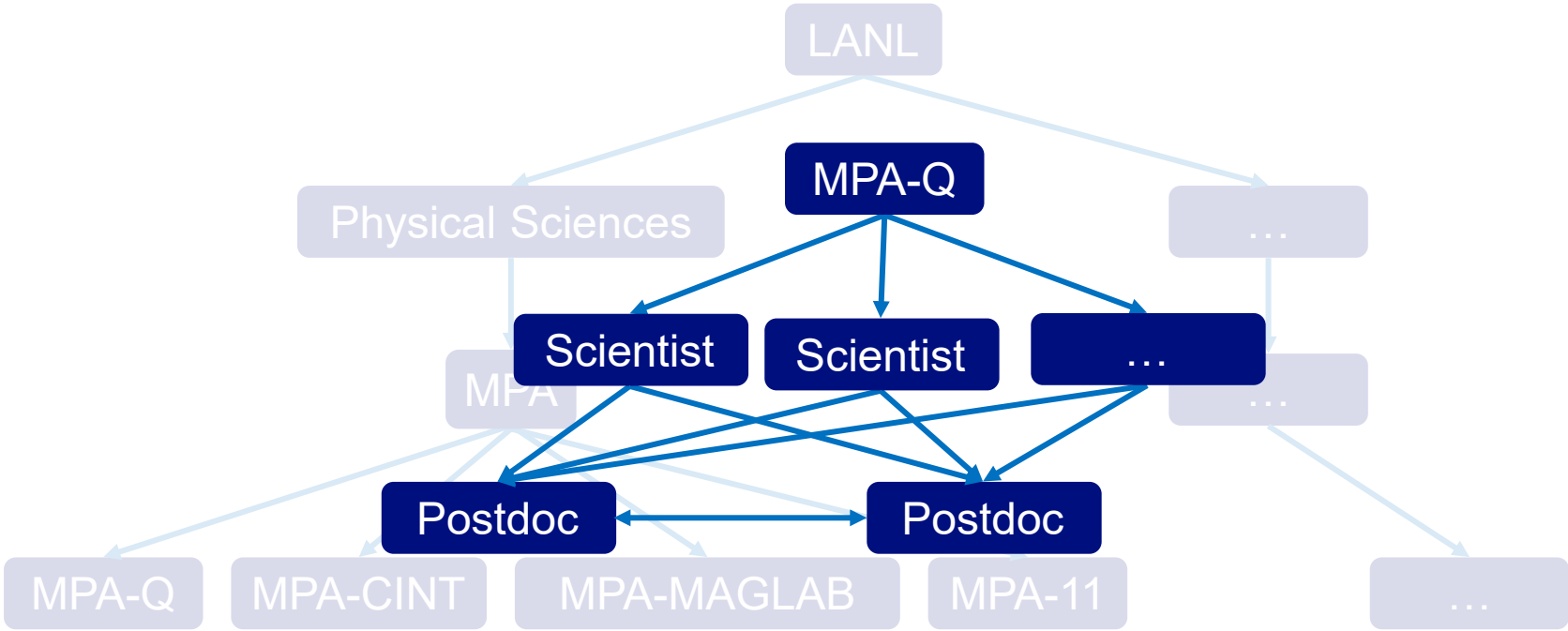
Subcategories

- Complex Functional Materials
- Material Resilience in Harsh Service Conditions
- Manufacturing Science
- Actinide and Correlated Electron Materials
- Integrated Nanomaterials
- Energetic Materials
- Materials Dynamics

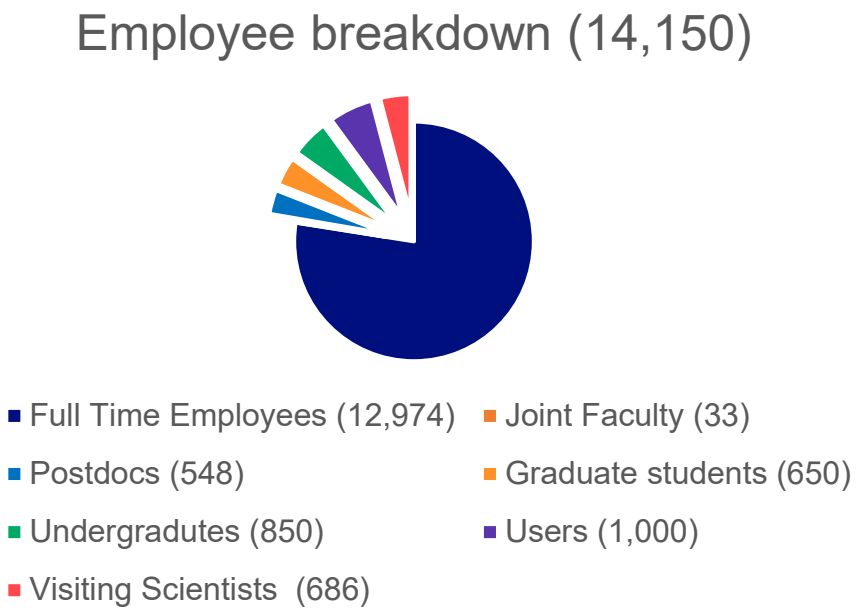
Lab organization



Lab organization



Lab organization

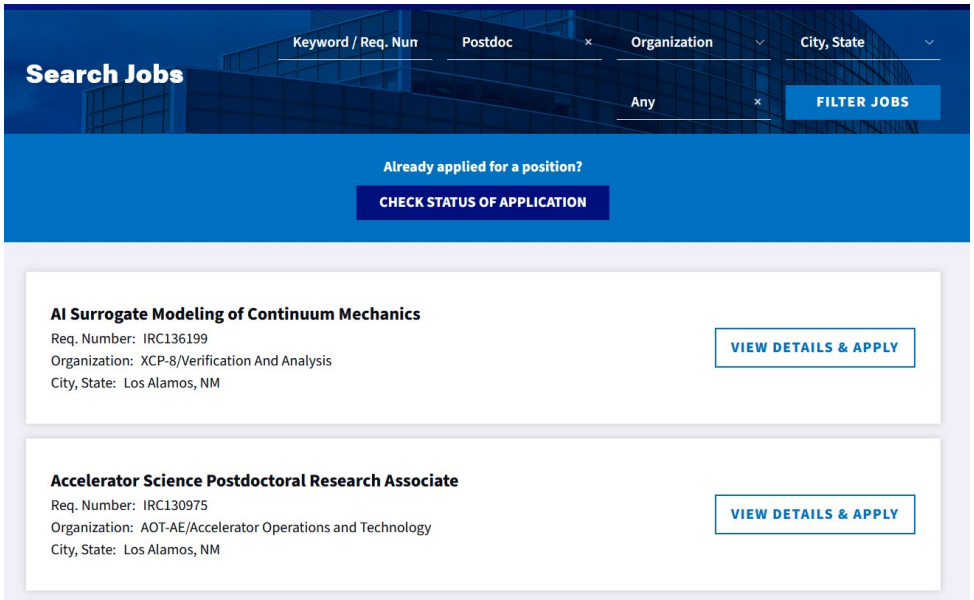


Differences between national lab work + university work

- Scope of work more explicitly defined
- Emphasis on work-life balance
- Salary
- Safety protocols/trainings
- Few graduate students/work primarily done by postdocs
- Less hierarchical
- More hierarchical

Los Alamos NATIONAL LABORATORY

Process of applying for postdoc position



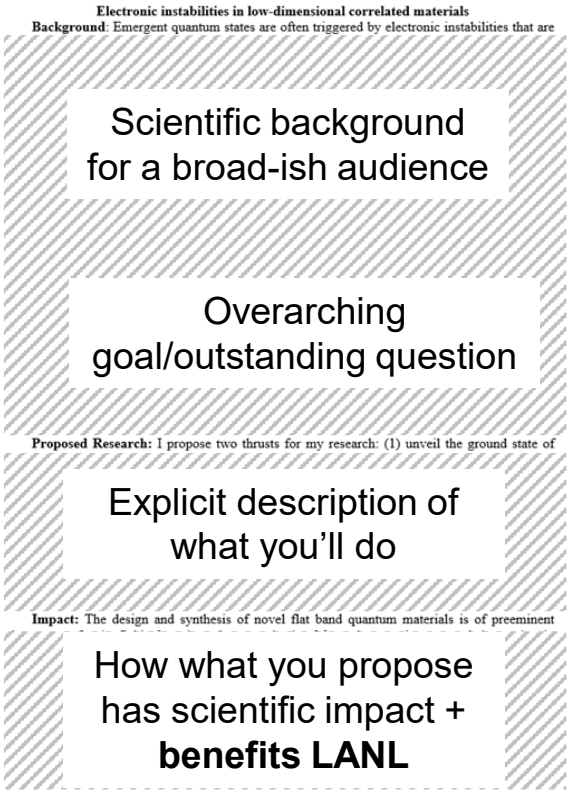
Postdoc hiring process

- A bit more formal than at a university
- **You must be sponsored by a member of the technical staff who submits your hiring package on your behalf!**

Find a mentor—they will likely guide you through this process

Write 1 page research proposal

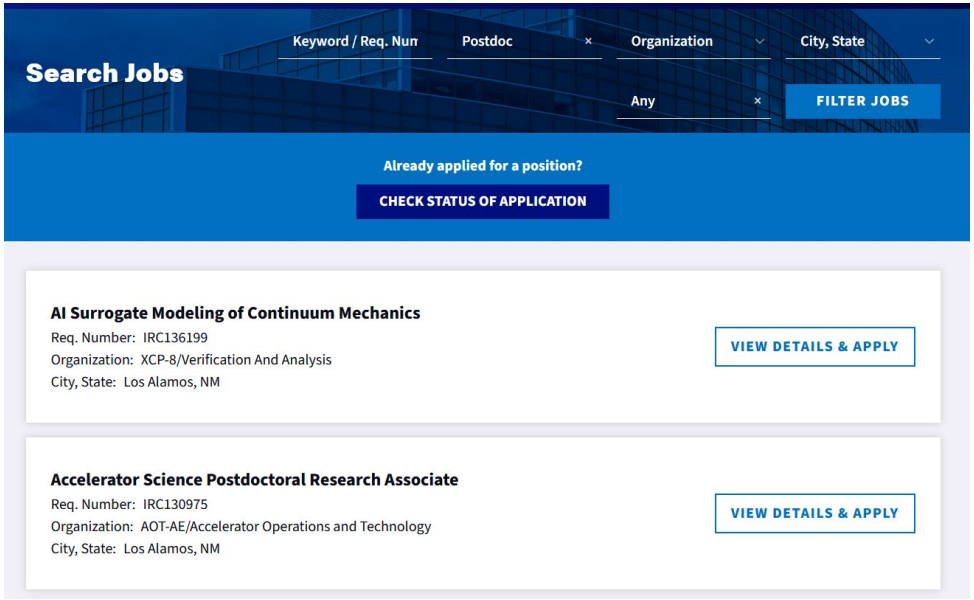
Provide CV + names for recommendation letters



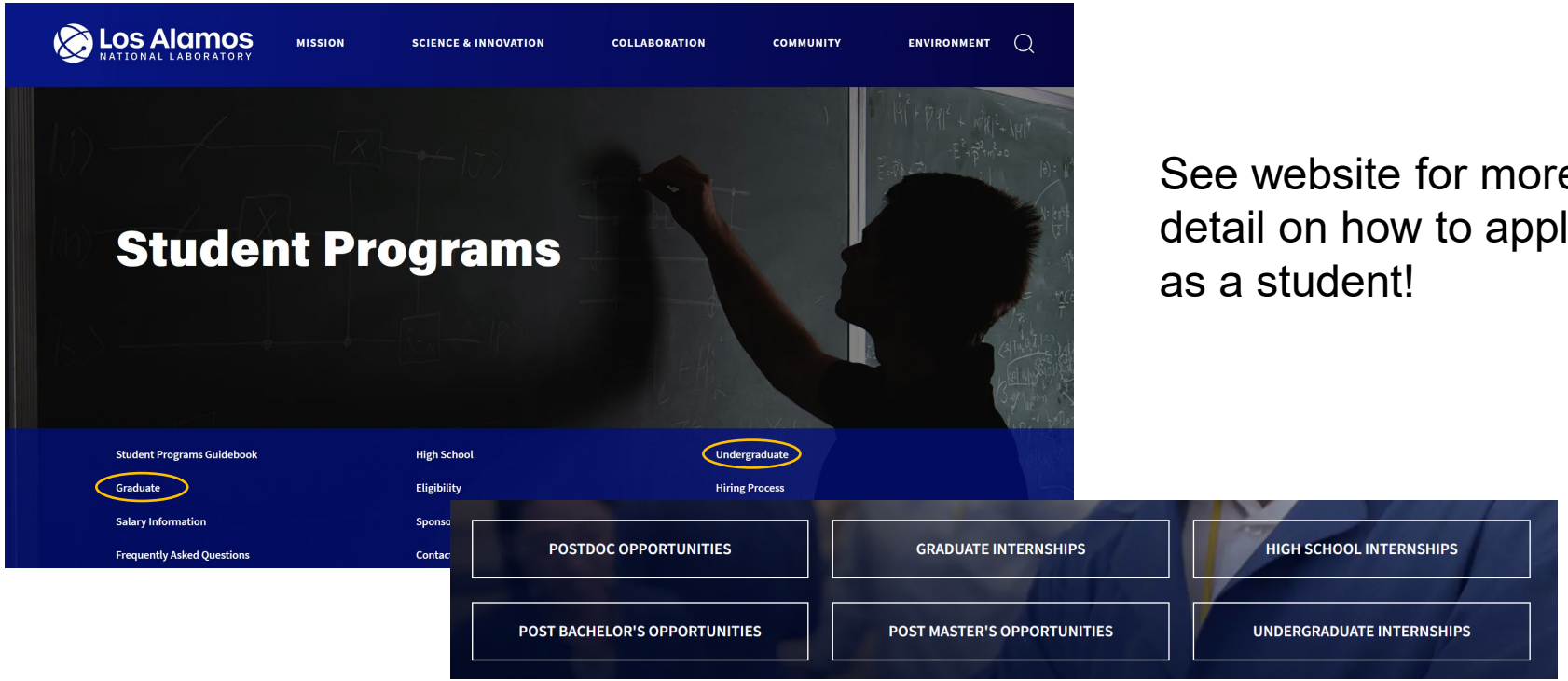
Different ways to get hired

- Booths at conferences
- Collaborate in PhD work
- Summer schools
- Summer internships
- Connect through professors who know people
- “Blind” apply: jobs.lanl.gov
  - Reach out to the scientist in charge of posting

Current Postdoc opportunities



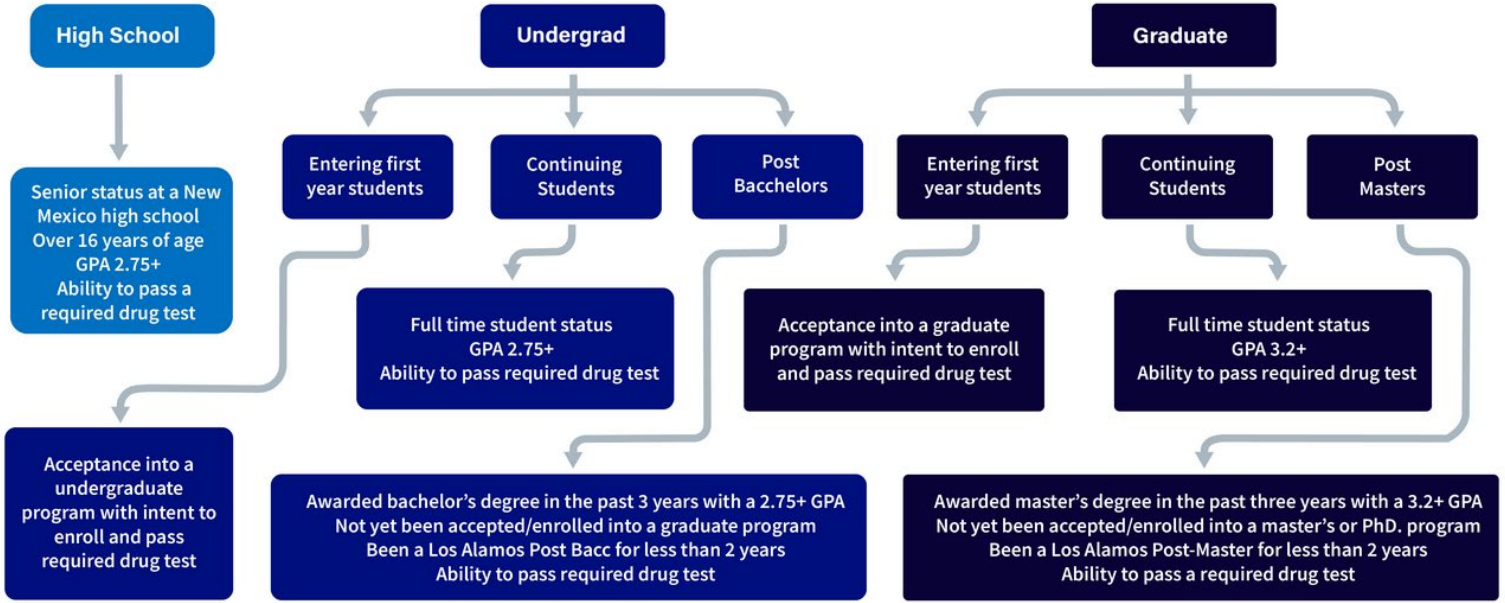
LANL internships



See website for more detail on how to apply as a student!

https://www.lanl.gov/engage/collaboration/student-programs

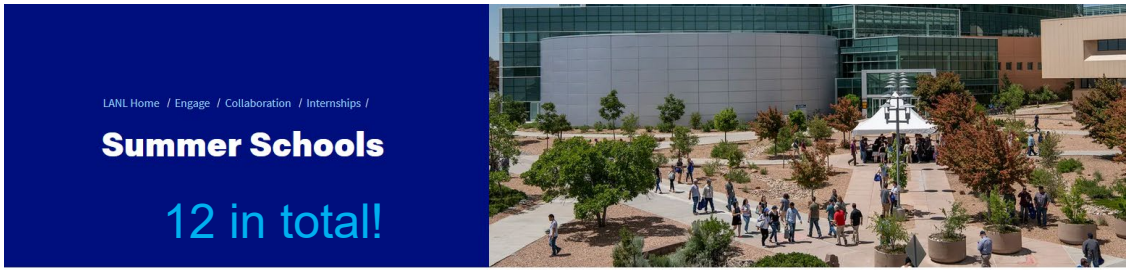
Student eligibility



Summer Schools

Including:

- Applied machine learning research internship
- Computational Physics Workshop
- Quantum Computing School
- Supercomputer Institute



https://www.lanl.gov/engage/collaboration/internships/summer-schools

What scientists are looking for in postdoc candidates

- “Multiple papers where the student clearly led the project”
- “Self motivation”
- “That they’ve given a handful of talks”
- “That they know details about what they talk about in their job talk”
- “Make sure you fit the criteria for the job posting”

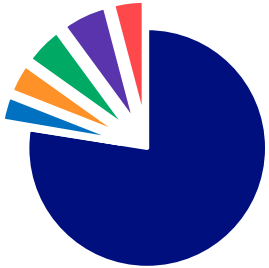
Independence

Questions?

Contact: ckengle@lanl.gov

Demographic

Employee breakdown (14,150)



- Full Time Employees (12,974)
- Joint Faculty (33)
- Postdocs (548)
- Graduate students (650)
- Undergradutes (850)
- Users (1,000)
- Visiting Scientists (686)

Average age: 44