

COOPER JAMES YERBY, PhD

Fellow, U.S. Department of Energy | Washington, D.C., United States
+1 (913) 952-8151 • yerby@sas.upenn.edu • linkedin.com/in/cooper-yerby

PROFESSIONAL EXPERIENCE

Fellow, Office of Critical Metals & Energy Innovation (CMEI)

Jul 2024 – Present

U.S. Department of Energy HQ — Washington, D.C., USA

- Lead author of a 30-page DOE report to the U.S. House Committee on Appropriations on domestic NdFeB magnet manufacturing equipment supply chains
- Reviewed and ranked 80+ mining and materials-refining grant applications (\$5M–\$100M) across DOE offices
- Led due-diligence teams for DOE's interagency coordination with IRS (30D EV tax credit) and DOE (battery supply-chain analysis) in support of the National Security Council

DOE SCGSR Research Fellow

Jan – Jun 2024

Argonne National Laboratory — Lemont, IL, USA

- Engineered and tested membrane systems to selectively extract critical minerals (REEs, Ni, Co) from waste and leachate streams under Dr. Seth Darling, Chief Science & Technology Officer, Advanced Energy Technologies Directorate
- Integrated experimental results with first-principles computational modeling for membrane-based critical-metals separations

Mentor & Educational Coordinator

Mar 2020 – Dec 2022

NSF Center for Sustainable Separation of Metals — Philadelphia, PA, USA

- Collaborated weekly with an NSF-selected team of critical-metals separations scientists on research advancements and industrial applications
- Led national outreach translating separations research into educational modules adopted by 700+ U.S. schools

Benjamin Franklin Fellow, Doctoral Researcher

Aug 2019 – Jun 2024

University of Pennsylvania — Philadelphia, PA, USA

- Designed and ran 5,000+ computational physics simulations showing biologically inspired membranes achieve enhanced water transport and salt rejection compared to conventional reverse osmosis
- Developed a methodology, with collaborators in Brazil and China, to characterize halogen gases as atmospheric antifreeze agents
- Mentored and trained 6 undergraduate researchers in data analysis, technical writing, and computational chemistry software

Electromicrobiology Research Fellow

May 2018 – Jun 2019

Swiss Institute of Life Technologies at EPFL — Sion, Switzerland & Los Angeles, CA

- Designed and operated a low current-density microbially mediated arsenic electrocoagulation system, removing >99.6% of arsenic from contaminated solutions
- Invited by the government of Saudi Arabia to present research at the KAUST Winter Enrichment Program (Jan 2019)

Cryogenic Astrobiology Research Fellow

Jun 2017 – Apr 2018

NASA Jet Propulsion Laboratory — Pasadena, CA, USA

- Developed an experimental model showing life can be transported over longer distances in space at sub-200°K temperatures
- Increased NASA's irradiated-spore data collection efficiency by 200% and presented research at the Earth-Life Science Institute Symposium, Tokyo

DEGREES

Ph.D., Earth & Environmental Sciences

2024

University of Pennsylvania — Philadelphia, PA, USA

B.S./M.S. (Progressive Degree Program), Geological Sciences; Minor in Finance

2019

University of Southern California — Los Angeles, CA, USA

NARRATIVE OF RESEARCH EXPERIENCE

My research background bridges geomicrobiology, physical chemistry, and critical-minerals separations science. As a Benjamin Franklin Fellow at the University of Pennsylvania, I utilized molecular dynamics simulations to characterize how halogen bonding and trace-gas adsorption govern ice nucleation, ice growth, and quasi-liquid-layer structure at cloud-relevant temperatures: work aimed at improving atmospheric models of chemical transformations that occur in clouds. In parallel, I used the same molecular dynamics software packages to design and run large-scale computational-physics simulations of new membrane architectures for critical metals separations. My simulations demonstrated that tunable pore structures and surface charges in membranes inspired by biology can lead to enhanced metals separations with fewer chemical inputs than traditional solvent extraction. At Argonne National Laboratory, as a DOE SCGSR Fellow, I engineered and tested novel membrane systems inspired by previous computational work to selectively extract rare earth elements, nickel, and cobalt from mining waste and leachate streams under varied temperature and pH conditions. My current work at the U.S. Department of Energy applies my technical background to national supply-chain policy to help direct research funding towards innovative methods to procure more critical metals in a cost effective and environmentally friendly manner. At the DOE, I've authored a 30-page Congressional report on the "Feasibility of Producing and Procuring Rare Earth Magnet Manufacturing Equipment to Support the U.S. Domestic Supply Chain" and have continued to work with the Francisco Atmospheric Chemistry lab at Penn to refine the simulation work from my PhD thesis to address reviewer feedback.

KEY PUBLICATIONS

1. Yerby, C.J., Kusimo, A. "Feasibility of Producing and Procuring Rare Earth Magnet Manufacturing Equipment to Support the U.S. Domestic Supply Chain." In review, U.S. House Committee on Appropriations, 2026.
2. Yerby, C.J., Bertho, G.G., Zhu, C., Francisco, J.S., Yang, D.B. "Weak Adsorption, Strong Consequences: How Trace Gases Control Ice Growth and Quasi-Liquid-Layer Structure." In submission, Science Advances, 2026.
3. Yerby, C.J., Bertho, G.G., Zhu, C., Francisco, J.S., Yang, D.B. "Molecular Dynamics Studies of Halogen Bonding on the Freezing in Clouds." In preparation for submission to Nature, 2026.

HONORS

- DOE SCGSR Awardee — \$35,000 research fellowship, Argonne National Laboratory (2023)
- Benjamin Franklin Fellow — fully-funded five-year doctoral fellowship, University of Pennsylvania (2019)
- USC Global Scholar Prize — \$10,000; recognized among the 10 most globally impactful senior theses in a class of 4,000+ (2019)
- Mork Family Scholar — full tuition plus \$5,000 stipend; ~10 awarded from a pool of 70,000+ applicants (2015)
- Coca-Cola National Scholar — \$20,000 educational stipend; 1 of 150 selected from 102,000 applicants (2015)

PROFESSIONAL SOCIETY MEMBERSHIPS

American Geophysical Union (AGU) • Federal Consortium for Advanced Batteries (FCAB) • DOE Critical Metals Collaborative (CMC)