

# Dr. Sarick Lars Matzen

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## Education

<b>University of California-Berkeley Ph.D.</b> Soil Biogeochemistry	2020; Berkeley, CA
<b>Hampshire College B.A.</b> Environmental Science	1999; Amherst, MA

## Academic Positions

January 1, 2025-present	<b>Assistant Professor</b>	University of Illinois-Chicago
2020-2024	<b>Postdoctoral Associate</b>	University of Minnesota-Twin Cities
2013-2020	<b>Graduate Student</b>	University of California-Berkeley
2014, 2018, 2019	<b>Research Assistant</b>	University of California-Berkeley
2014-2016	<b>Teaching Assistant</b>	University of California-Berkeley
1998-1999	<b>Scientist/Technical</b>	Lawrence Livermore National Laboratory

## Peer-reviewed Publications

8. Schuler, C. S., A. Patsis, S. C. Alexander, D. Hsu, W. S. Dowd, W. Lee, S. L. Matzen, M. A. Marcus, C. S. Sheik, J. McDermott, P. K. Kang, C. M. Santelli, B. M. Toner. 2024. Densely populated biofilms and linked iron and sulfur cycles in the fractured-rock continental subsurface. *Geochimica et Cosmochimica Acta* 375:229-246.
7. Baker, I., S. L. Matzen, C. S. Schuler, B. M. Toner, P. R. Girguis. 2023. The chemical footprint of a non-stalk-forming iron-oxidizing bacterium impedes abiotic iron oxidation. *PNAS Nexus* 1:1-10.
6. Matzen, S. L., C. E. Pallud. 2023. Critical perspectives on soil chemical properties limiting arsenic phytoextraction with hyperaccumulator *Pteris vittata*. *Geosciences* 13: 1-24.
5. Matzen, S. L., A. Olson, C. E. Pallud. 2022. Soil texture and climate limit cultivation of the arsenic hyperaccumulator *Pteris vittata* for phytoextraction in a long-term field study. *Journal of Hazardous Materials* 436:129151.
4. Matzen, S. L., G. Lobo, S. Fakra, A. Kakouridis, P. S. Nico, C. E. Pallud. 2022. Arsenic hyperaccumulator *Pteris vittata* shows reduced biomass in soils with high arsenic and low nutrient availability, leading to increased arsenic leaching from soil. *Science of the Total Environment* 818:151803.
3. Matzen, S. L., J. E. Arnold, R. Bennaton, C. E. Pallud. 2021. Safer soils: A step-by-step guide to soil sampling for urban food growers. *UC Agriculture and Natural Resources* (accepted, in press).
2. Matzen, S. L., S. Fakra, P. S. Nico, C. E. Pallud. 2020. *Pteris vittata* arsenic accumulation only partially explains soil arsenic depletion during field-scale phytoextraction. *Soil Systems* 4: 1-20.
1. Matzen, S. L., J. M. Beiriger, P. C. Torretto, P. Zhao, B. E. Viani. 2000. Uranium(VI) and neptunium(V) transport through fractured, hydrothermally altered concrete. *Radiochimica Acta* 88: 657-664.

*In preparation*

1. Matzen, S. L., Z. Steiner, B. Stewart, C. Schuler, J. Fitzsimmons, E. Achterberg, C. R. German, B. M. Toner. Nanoparticulate iron oxyhydroxides in carbon matrices stay suspended in the Rainbow hydrothermal plume (Mid Atlantic Ridge) across distance where most iron settles out. To be submitted to *Geochemica et Cosmochemica Acta*, February 2025.
2. Matzen, S. L., Hansen, A., Labine, K., Lamdon, J., Frahm, E., Moses Haller, M. M., Jelinski, N. Subsurface peaks in residential yard lead concentrations indicate movement of lead in soil profile. To be submitted to *Journal of Hazardous Materials*, February 2025.

*(In press, submitted, and in preparation manuscripts available upon request)*

### Recognition

#### *Honors*

Clay Minerals Society Reynolds Award	2018
University of California-Berkeley Chancellor's Award for Public Service – Civic Engagement by a Graduate Student	2017

#### *Fellowships (total \$191,378)*

Berkeley Connect Fellowship	2018-2019
The James P. Bennett Agricultural Fund Scholarship, Professor Earl Storie Memorial Scholarship, and Warren R. and Josephine K. Harding Graduate Student Fund	2018
University of California Global Food Initiative Fellowship	2015, 2016
National Science Foundation Graduate Research Fellowship	2014-2019
Hampshire College Harold F. Johnson Scholarship	1995-1999

### Presentations

*Presenting authors are listed in bold.*

#### *Invited Talks*

- 14. Matzen, S.**, Stewart, B., Steiner, Z., Breier, J., Fitzsimmons, J. N., Achterberg, E. P., German, C. R., Toner, B. M. 2025. Novel imaging reveals nanoparticulate hydrothermal iron available for export to iron-poor open ocean waters. Invited talk. American Chemical Society Spring Meeting, March 26, 2025. San Diego, CA.
- 13. Matzen, S.** 2024. Applying STXM in multi-modal environmental science investigations: From sample preparation to publication. Invited talk. National Synchrotron Light Source-II User Meeting. May 17, 2024, Virtual workshop.
- 12. Matzen, S.** 2023. Speciation of particulate iron in hydrothermal plumes with varying sulfur content. Invited Talk. Department of Oceanography, Texas A&M University. December 4, 2023, College Station, TX.

11. **Matzen, S.** Z. Steiner, L. Klose, T. Ely, J. Fitzsimmons, A. Kochinsky-Fritsche, E. Achterberg, C. R. German, B. M. Toner. 2023. Microscopy helps reveal how iron from deep sea hydrothermal vents feeds carbon-fixing phytoplankton in surface waters. Invited talk. Minnesota Microscopy Society Annual Meeting, University of Minnesota. May 5, 2023, Chaska, MN.
10. **Matzen, S.** 2023. Biogeochemical cycling of trace elements from urban agricultural soils to extraterrestrial ocean worlds. Invited talk. Geochemistry and BPE Seminars. Lamont-Doherty Earth Observatory, Columbia University. April 12, 2023, Palisades, NY.
9. **Matzen, S.** 2022. Biogeochemical cycling of trace elements from urban agricultural soils to deep ocean waters. Invited talk. Department of Soil and Crop Sciences, Texas A&M University. September 7, 2022, College Station, TX.
8. **Matzen, S.** 2021. Phytoremediation of arsenic in urban agricultural soils. Invited talk. Department of Soil, Water, and Climate, University of Minnesota. November 17, 2021, Saint Paul, MN.
7. **Matzen, S.** 2021. Microscale metal(loid) speciation informs bulk transport in soil/water/plant systems. Invited talk. Earth Science Research at the ALS: Present and Future. July 16, 2021, Virtual workshop.
6. **Pallud, C., S. Matzen, S. Fakra, P. S. Nico.** Phytoextraction with *Pteris vittata* leads to increased arsenic leaching in soil. Invited talk. Goldschmidt Conference, July 5-12, 2021, Virtual conference.
5. **Matzen, S.** 2021. Tender X-ray spectromicroscopy to study contaminant mobility in rhizosphere soils. Invited talk. Advanced Light Source TENDER Nanoprobe Workshop. March 18, 2021, Virtual workshop.
4. **Matzen, S.** 2019. Invited Panelist. Queering science: Rethinking biology, sex, and environment. With Erin Giglio, Ambika Kamath, Max Lambert, Caitlin McDonough, and Julia Monk. Queer Ecologies | Feminist Biologies, UC Berkeley Social Science Matrix, November 5, 2019, Berkeley, CA.
3. **Matzen, S., Olson, A., Pallud, C.** 2016. Plant-based remediation of arsenic-contaminated soil: Successes and challenges. Invited talk. Research Institute for Humanity and Nature, July 1, 2016, Kyoto, Japan.
2. **Pallud, C., S. Matzen, A. Olson.** 2015. Effects of soil texture on phytoremediation of arsenic-contaminated soils. Invited talk H41K-04. American Geophysical Union Annual Meeting, December 14-18, 2015, San Francisco, CA.
1. **Matzen, S.** 2014. Broadening access to rural queer land, agriculture, and community living: anti-oppression approaches to the meandering path of change. Invited talk. Production to Picture to Personhood: Food, Representation, and Identity in Contemporary American Cultures Conference, October 9, 2014, Berkeley, CA.

#### *Contributed Oral Presentations*

25. **Toner, B. M., Matzen, S., Gilbert, B., Myneni, S., Nico, P.** Mineral-organic matter interactions in aquatic systems: The need for integrated, multi-modal imaging and spectroscopy. Oral presentation, Session 14-4, September 22, 2024. Geological Society of America Connects 2024, September 22-25, 2024, Anaheim, CA.
24. **Matzen, S., Z. Steiner, T. Ely, J. Breier, Jr., J. Fitzsimmons, E. Achterberg, C. R. German, B. M. Toner.** Carbon matrices support transport of nanoparticulate iron from hydrothermal vents to open ocean waters. Session 12g, August 21, 2024. Goldschmidt Conference, August 18-23, Chicago, IL.

- 23. Toner, B. M.** and Matzen, S. SYSTER: a program to support Earth and environmental science applications of scanning transmission X-ray microscopy, spectromicroscopy, and ptychography. Oral presentation, Session 6eO2, August 20, 2024. Goldschmidt Conference, August 18-23, 2024, Chicago, IL.
- 22. Baker, I.,** Matzen, S., Schuler, C., Toner, B. M., Girguis, P. R. The chemical footprint of an iron-oxidizing bacterium and its impacts on iron oxidation and mineralization. Oral presentation, Session 9e, August 20, 2024. Goldschmidt Conference, August 18-23, Chicago, IL.
- 21. Matzen, S.,** Z. Steiner, T. Ely, J. Breier, Jr., J. Fitzsimmons, E. Achterberg, C. R. German, B. M. Toner. Nanoparticulate iron oxyhydroxides in carbon matrices is a signature of hydrothermal vents regardless of plume chemistry. Oral presentation, Session 417, May 9, 2024, AbSciCon Conference, May 5-10, 2024, Providence, RI.
- 20. Matzen, S.,** Z. Steiner, L. Klose, T. Ely, J. Fitzsimmons, A. Koschinsky, E. Achterberg, C. R. German, B. M. Toner. Nanoparticulate iron oxyhydroxides aggregated in carbon matrices dominate iron speciation in hydrothermal plumes over the 1-100 km distance from vent source. Oral presentation, Session 13d, July 14, 2023, Goldschmidt Conference, July 9-14, 2023, Lyon, France.
- 19. Matzen, S.,** Z. Steiner, C. Hoffman, L. Moore, R. Bundy, J. Resing, J. Fitzsimmons, E. Achterberg, C. R. German, B. M. Toner. Nanoparticulate iron oxyhydroxides dominate iron speciation in hydrothermal plumes over the 1-100 km distance from vent source. Oral presentation OS55B-07, December 16, 2022, American Geophysical Union Annual Meeting, December 11-16, 2022, Chicago, IL.
- 18. Ely, T.,** A. A. Wackett, S. L. Matzen, B. M. Toner. Why is pyrite always present in hydrothermal vent plumes? Oral presentation OS45D-1232, December 15, 2022, American Geophysical Union Annual Meeting, December 11-16, 2022, Chicago, IL.
- 17. Matzen, S.,** S. Fakra, P. Nico, C. Pallud. Arsenic leaches from soil during phytoextraction with *Pteris vittata*. Oral presentation H22A-05, December 13, 2022, American Geophysical Union Annual Meeting, December 11-16, 2022, Chicago, IL.
- 16. Matzen, S.,** Z. Steiner, C. Hoffman, L. Moore, R. Bundy, J. Resing, J. Fitzsimmons, E. Achterberg, C. R. German, B. M. Toner. 2022. Changes in hydrothermal plume iron speciation in the 1-100 km distance from the vent source. Oral presentation, Session 14cT1. Goldschmidt Conference, July 10-15, 2022, Honolulu, HI.
- 15. Toner, B.,** A. A. Wackett, B. R. Kamermans, S. L. Matzen, T. Ely, E. P. Achterberg, C. R. German. Characteristics of hydrothermally derived particles from globally distributed deep-sea vent fields. Oral presentation, Session 12dT2. Goldschmidt Conference, July 10-15, 2022, Honolulu, HI.
- 14. Matzen, S.,** M. Bramble, T. Ely, A. A. Wackett, M. Pacheco, C. R. German, A. Gartman, K. Hand, B. M. Toner. 2022. Pyrite nanoparticles as biogeochemical tracers of hydrothermal activity on icy ocean moons. Oral presentation 212-04. AbSciCon Astrobiology Science Conference, May 15-20, 2022, Atlanta, GA.
- 13. Toner, B.,** S. Matzen, B. Kamermans, A. A. Wackett, T. Ely, C. R. German, E. P. Achterberg. 2022. Characteristics of hydrothermally derived particles from globally distributed deep-sea vent fields in Earth's oceans. Oral presentation 126-06. AbSciCon Astrobiology Science Conference, May 15-20, 2022, Atlanta, GA.
- 12. Matzen, S.,** S. Fakra, P. Nico, C. Pallud. 2022. Soil characteristics, fern growth, and transpiration affect soil arsenic leaching during phytoextraction with *Pteris vittata*. Oral presentation, Session GEOC025. American Chemical Society, March 20-24, 2022, San Diego, CA.

11. **Matzen, S.**, M. Pacheco, T. Ely, A. A. Wackett, A. Gartman, C. R. German, B. M. Toner. 2022. Constraining effects of ocean chemistry on nanopyrite chemical and morphological evolution in order to predict long-range iron transport. Oral presentation, Session GEOC001. American Chemical Society, March 20-24, 2022, San Diego, CA.
10. **Matzen, S.**, T. Ely, A. A. Wackett, A. Gartman, C. R. German, B. M. Toner. 2021. Effects of ocean chemistry on chemical and morphological evolution of iron sulfide nanoparticles. Oral presentation, Session 8c. Goldschmidt Conference, July 5-12, 2021, Virtual conference.
9. **Matzen, S. L.**, J. E. Arnold, R. Bennaton, C. E. Pallud. 2021. Growing food safely in urban soils: A harm reduction approach. Oral presentation. Agroecological City Conference, March 10, 2021, Virtual conference.
8. **Matzen, S.**, S. Fakra, C. Pallud. 2019. Arsenic transport in the rhizosphere of *Pteris vittata*, an arsenic-hyperaccumulating fern. Oral presentation 54-4. Soil Science Society of America Annual Meeting, January 6-9, 2019, San Diego, CA.
7. **Matzen, S.**, C. Pallud. 2018. Arsenic mobilization in the rhizosphere of *Pteris vittata*, an arsenic-hyperaccumulating fern. Oral presentation, Session 13k. Goldschmidt Conference, August 12-17, 2018, Boston, MA.
6. **Matzen, S.**, Olson, A., Pallud, C. 2017. Arsenic uptake in the hyperaccumulating fern *Pteris vittata* from soils contaminated with pyrite cinders. Oral presentation 339-9. Soil Science Society of America Annual Meeting, October 22-25, 2017, Tampa, FL.
5. **Matzen, S.**, C. Pallud. 2017. Optimizing arsenic phytoextraction from pyrite cinders using a hyperaccumulating fern. Oral presentation, Session 13a. Goldschmidt Conference, August 13-18, 2017, Paris, France.
4. **Matzen, S.**, Olson, A., Pallud, C. 2016. Effect of soil texture and fertilization on arsenic phytoextraction with the hyperaccumulating fern *Pteris vittata* under field conditions. Oral presentation 385-6. Soil Science Society of America Annual Meeting, November 6-9, 2016, Phoenix, AZ.
3. **Matzen, S.**, A. Olson, C. Pallud. 2015. Effects of fertilizer on arsenic accumulation in a hyperaccumulating fern: A two year phytoremediation field study. Oral presentation 199-12. Soil Science Society of America Annual Meeting, November 16-19, 2015, Minneapolis, MN.
2. **Matzen, S.**, A. Olson, C. Pallud. 2015. Optimizing arsenic phytoextraction from an urban brownfield: A two year field study. Oral presentation 2057. Goldschmidt Conference, August 16-21, 2015, Prague, Czech Republic.
1. **Matzen, S.**, Olson, A., Pallud, C. 2015. Towards sustainable remediation of arsenic-contaminated soils. Annual Meeting, Long-term Sustainability through Place-Based, Small-scale Economies: Approaches from Historical Ecology. Research Institute for Humanity and Nature, Kyoto, Japan.

*Contributed and Invited Poster Presentations*

19. **Toner, B. M.**, Matzen, S., Gilbert, B., Myneni, S., Nico, P. SYnergy of Soft and Tender X-rays for Earth Research (SYSTER). Poster presentation, Session 14e. Goldschmidt Conference, August 18-23, Chicago, IL.
18. Toner, B. M., **S. Matzen**, M. Bramble, T. Ely, A. A. Wackett, M. Pacheco, Z. Gainsforth, A. Gartman, C. R. German, K. P. Hand. Iron nanoparticles as biogeochemical tracers of hydrothermal activity on icy ocean

worlds: Effects of Europa surface-like radiation on particulate chemistry and morphology. Poster presentation 221-100. May 7, 2024, AbSciCon Conference, May 5-10, 2024, Providence, RI.

**17. Matzen, S.,** S. Fakra, P. Nico, C. Pallud. 2022. Soil characteristics, fern growth, and transpiration affect soil arsenic leaching during phytoextraction with *Pteris vittata*. Invited poster presentation, Sci-Mix. American Chemical Society, March 20-24, 2022, San Diego, CA.

**16. Matzen, S.,** M. Pacheco, T. Ely, A. A. Wackett, A. Gartman, C. R. German, B. M. Toner. Pyrite nanoparticles as biogeochemical tracers: Constraining the effects of ocean chemistry on particle chemical and morphological evolution. Poster presentation P35C-2146. American Geophysical Union Annual Meeting, December 12-17, 2021, New Orleans, LA.

**15. Matzen, S.,** S. Fakra, P. Nico, C. Pallud. 2021. Arsenic phytoextraction: Mixed rhizosphere redox conditions suggest mechanisms for arsenic release for uptake and leaching. Poster presentation. Advanced Light Source User Meeting. August 11, 2021, Virtual meeting.

**14. Matzen, S.,** A. Wackett, N. Jelinski, C. German, B. Toner. 2020. Iron nanoparticle oxidation and aggregation behavior informs the fate of hydrothermal iron exported to oceans on Earth and beyond. Poster presentation. American Geophysical Union Annual Meeting, December 1-17, 2020, Virtual Conference.

**13. Matzen, S.,** J. Arnold, R. Brewer, R. Bennaton, J. Sowerwine, C. Pallud. 2020. Testing urban soils for lead: Community-based use of the incremental sampling method to increase data quality and accessibility. Poster presentation. American Geophysical Union Annual Meeting, December 1-17, 2020, Virtual Conference.

**12. Matzen, S.,** S. Fakra, P. Nico, C. Pallud. 2019. An arsenic-hyperaccumulating fern mobilizes arsenic in rhizosphere soil through processes known to release phosphorus, and prefers a low phosphorus environment. Poster presentation. American Geophysical Union Annual Meeting, December 9-13, 2019, San Francisco, CA.

**11. Matzen, S.,** S. Fakra, P. Nico, C. Pallud. 2019. Arsenic speciation and transport in the rhizosphere of an arsenic-hyperaccumulating fern. Poster presentation. Rhizosphere 5 Conference, July 7-11, 2019, Saskatoon, Saskatchewan, CA.

**10. Matzen, S.,** S. Fakra, P. Nico, C. Pallud. 2018. Arsenic speciation in the rhizosphere of an arsenic-hyperaccumulating fern. Poster presentation. Advanced Light Source User Meeting, October 2-4, 2018, Berkeley, CA.

**9. Khurram, A.,** Matzen, S., Setty, S., Fakra, S., Pallud, C. 2017. Effects of soil texture and flow rate on leaching of arsenic from historically contaminated sites. Poster presentation. AGU Pathfinder 2017 Fall Virtual Poster Showcase. October 25, 2017. *Awarded third place overall in Undergraduate Showcase.*

**8. Matzen, S.,** A. Olson, C. Pallud. 2016. Effects of soil texture and soil fertilization on arsenic phytoextraction. Poster presentation 212. Goldschmidt Conference, June 26-July 1, 2016, Yokohama, Japan.

**7. Matzen, S.,** A. Olson, C. Pallud. 2014. Optimizing arsenic phytoremediation: Effects of fertilizer on brake fern arsenic uptake and biomass production in heterogeneous field conditions. Poster presentation 334-42. Soil Science Society of America Annual Meeting, November 2-5, 2014, Long Beach, CA.

6. **Matzen, S.,** A. Olson, C. Pallud. 2014. Improving arsenic phytoremediation efficiency under heterogeneous field conditions: Effects of fertilizer on brake fern arsenic accumulation and biomass production. Poster presentation 27. Complex Soil Systems Conference, September 3-5, 2014, Berkeley, CA.
5. **Matzen, S.,** A. Olson, C. Pallud. 2014. Optimizing arsenic phytoremediation with the brake fern, *Pteris vittata*: Effects of fertilization on biomass production and contaminant removal. Poster presentation 6. Soil in the City Conference, June 29-July 2, 2014, Chicago, IL.
4. **Matzen, S.,** A. Olson, C. Pallud. 2014. Optimizing arsenic uptake by a hyperaccumulating fern through fertilizer use. Poster presentation 283. Goldschmidt Conference, June 8-13, 2014, Sacramento, CA.
3. **Matzen, S.,** A. Olson, C. Pallud. 2014. Can Brake Ferns (*Pteris vittata*) Efficiently Remediate Urban Soils Contaminated with Arsenic? Optimizing Phytoremediation through Fertilizer Use. Poster presentation 16. Soil's Role in Restoring Ecosystem Services Conference, March 6-9, 2014, Sacramento, CA.
2. **Matzen, S.L.,** P.C. Torretto, P. Zhao, B.E. Viani. 1999. Experimental Investigation of Radionuclide Transport through Fractured, Hydrothermally Altered Concrete. Poster presentation PB1-28. 7<sup>th</sup> International Conference on the Chemistry and Migration Behaviour of Actinides and Fission Products in the Geosphere, September 26 - October 1, 1999, Lake Tahoe, NV.
1. **Matzen, S.L.,** P.C. Torretto, P. Zhao, B.E. Viani. 1998. Radionuclide Transport through Fractured, Hydrothermally Altered Concrete. Poster presentation H32F-13. American Geophysical Union Annual Meeting, December 6-10, 1998, San Francisco, CA.

*Details of invited seminars (3) available upon request.*

### Research Funding and Travel Awards

*Research funding (13 grants totaling \$75,049)*

Clay Minerals Society Research Grant	\$6,000	2017, 2018
Phipps Conservatory Botany in Action Fellowship	\$15,000	2016, 2017, 2018
The Green Initiative Fund Spring Grant	\$18,100	2018
Chancellor's Community Partnership Fund	\$10,000	2017
Berkeley Collegium Narrowing the Gap Between Teaching and Research Grant	\$19,950	2017
Sigma Xi Grant in Aid of Research	\$1,000	2017
The Green Initiative Fund Mini-Grant	\$1,999	2017
Chancellor's Advisory Committee on Sustainability Innovation Grant	\$1,000	2015
Environmental Science, Policy, and Management Extra Summer Grant	\$750	2015
Environmental Science, Policy, and Management Starter Grant	\$1,250	2013

*Professional Development and Travel/Conference awards (12 awards totaling \$8,524)*

CFANS Professional Development Funds	\$500	2024
NASA SCoPE AGU SciAct Affiliate Award	\$1,671	2022
UMN Postdoctoral Association Career Development Award	\$500	2022
Goldschmidt Conference Registration Grant for NASA Funded Research	\$235	2021
CFANS Professional Development Funds	\$1000	2020, 2021
Rhizosphere 5 Conference Student Travel Award	\$570	2019
Goldschmidt Conference Travel Award	\$400, \$1,250, \$1,250	2014, 2015, 2017
UC-Berkeley Graduate Division Conference Travel Award	\$1,500	2016

UC-Berkeley Environmental Science, Policy, and Management Travel Grant	\$794	2016
UC-Berkeley Graduate Division Travel Award	\$525	2014
UC-Berkeley Graduate Assembly Travel Award	\$300	2014
North Carolina Natural Resource Conservation Workshop Scholarship	\$200	1995

*National Lab User Time (internationally competitive)*

**8. National Synchrotron Light Source II (NSLS-II)** general user proposal. Matzen, S. L., B. M. Toner. 2022. Dust on Europa's ice shell as a biogeochemical tracer of life-conducive conditions on the ocean floor. Beamlines: XFM (X-ray Fluorescence Microprobe) and QAS (X-ray Absorption Spectroscopy). Awarded 6.75 days (20.25 shifts).

**7. Advanced Light Source (ALS)** general user proposal. Matzen, S. L., B. M. Toner. 2021. Role of iron-bearing colloids in delivery of limiting nutrients from the seafloor to carbon-fixing phytoplankton. Beamlines: COSMIC (Ptychography) and 5.3.2.2 (Scanning Transmission X-ray Microscopy). Awarded 26.3 days (79 shifts).

**6. National Synchrotron Light Source II (NSLS-II)** general user proposal. Matzen, S. L., B. M. Toner. 2021. Local to global: Processes determining export of iron from deep-sea hydrothermal vents to carbon-fixing phytoplankton. Beamlines: XFM (X-ray Fluorescence Microprobe) and QAS (X-ray Absorption Spectroscopy). Awarded 13.7 days (41 shifts).

**5. Advanced Light Source (ALS)** rapid access proposal. Matzen, S. L., C. E. Pallud, P. S. Nico. 2019. Arsenic mobilization in the rhizosphere of arsenic hyperaccumulator *Pteris vittata*. Beamline: 10.3.2 (X-ray Fluorescence Microprobe). Awarded 1 day (3 shifts).

**4. Advanced Light Source (ALS)** general user proposal. Matzen, S. L., C. E. Pallud, P. S. Nico. 2017-2019. Imaging arsenic gradients in the rhizosphere of *Pteris vittata*, an arsenic-hyperaccumulating fern. Beamline: 10.3.2 (X-ray Fluorescence Microprobe). Awarded 9.6 days (29 shifts).

**3. Advanced Light Source (ALS)** rapid access proposal. Matzen, S. L., C. E. Pallud, P. S. Nico. 2017. Imaging arsenic gradients in the rhizosphere of *Pteris vittata*, an arsenic-hyperaccumulating fern. Beamline: 10.3.2 (X-ray Fluorescence Microprobe). Awarded 1 day (3 shifts).

**2. Stanford Synchrotron Radiation Laboratory (SSRL)** user proposal. Matzen, S. L., C. E. Pallud, P. S. Nico. 2016-2019. Arsenic speciation and bioavailability in soils remediated with the arsenic-hyperaccumulating fern, *Pteris vittata*. Beamline: 7-3 (X-ray Absorption Spectroscopy). Awarded 14.9 days (44.7 shifts).

**1. Stanford Synchrotron Radiation Laboratory (SSRL)** user proposal. Matzen, S. L., C. E. Pallud, P. S. Nico. 2016. Characterizing arsenic bioavailability in fine- and coarse-textured urban agricultural soils. Beamline: 11-3 (X-ray Diffraction). Awarded 16 hours (2 shifts).

### Teaching Experience

<b>Instructor of Record</b> , University of Minnesota-Twin Cities ESPM 4601: Environmental Pollution (online undergraduate/graduate course; ~25 students)	2020
<b>Sustainable Soils Research Incubator</b> , University of California-Berkeley Designed and taught 4-semester Special Field Methods course to increase support for underrepresented students in environmental sciences (12 undergraduates). Final project module featured on Berkeley Center for Teaching and Learning webpage.	2017-2018



- Graduate Student Instructor**, University of California-Berkeley 2016  
 ESPM 131: Soil Microbial Ecology (in-person undergraduate/graduate course; ~40 students)
- Graduate Student Instructor**, University of California-Berkeley 2014, 2015  
 ESPM 117: Urban Garden Ecosystems (in-person undergraduate/graduate field course; ~80 students/year)

#### *Guest Lectures*

- 8. Matzen, S.** 2022. Safer soils for urban food growers. Guest Lecture, FDSY 1016W Growing Food & Building Community: Urban Agriculture in the Twin Cities, November 16, 2022. Sustainable Agriculture and Food Systems, University of Minnesota.
- 7. Matzen, S.** and Toner, B. 2022. Ecology of deep-sea hydrothermal vents. Guest Lecture, FW 2003 Introduction to Marine Biology, April 15, 2022. Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota.
- 6. Matzen, S.** 2018. Arsenic and selenium. Guest Lecture, ESPM 131 Soil Microbial Ecology, April 2, 2018. Environmental Science, Policy and Management Department, UC Berkeley.
- 5. Matzen, S.** 2015, 2016, and 2018. Land degradation: A dry subject? Guest Lecture, GEO 137 Global Environmental Problems, February 19, 2015, January 28, 2016, and January 23, 2018. Geography Department, UC Berkeley.
- 4. Matzen, S.** 2017. Dealing with urban soil contamination. Guest Lecture, ESPM 117 Urban Garden Ecosystems, September 19, 2017. Environmental Science, Policy and Management Department, UC Berkeley.
- 3. Matzen, S.** and Pallud, C. 2017. Introduction to ecologically based soil fertility management. Guest Lecture, ESPM 118 Agroecology. Environmental Science, Policy and Management Department, UC Berkeley.
- 2. Matzen, S.** and **Olson, A.** 2013, 2014, and 2015. Towards sustainable remediation of arsenic contaminated soils. Guest Lecture, ESPM 24 Soil Pollution and Remediation Freshman Seminar, November 20, 2013, November 14, 2014, and December 2, 2015. Environmental Science, Policy and Management Department, UC Berkeley.
- 1. Matzen, S.** 2014. Soil contamination and remediation. Guest Lecture, ESPM 120 Soil Characteristics, December 3, 2014. Environmental Science, Policy and Management Department, UC Berkeley.

#### **Professional Training**

- EXAFS 2020 - SSRL Summer School on Synchrotron X-Ray Absorption Spectroscopy** 2020  
 (September 8-10, 2020, remote)  
 Emphasis on EXAFS data analysis.
- ALS User Meeting Tutorials** (August 27-28, 2020, remote) 2020  
 STXM data collection and analysis, microprobe use for environmental samples.
- Solute Imaging Summer School 2019: High-resolution chemical imaging of solutes in soils and sediments** (September 12-17, 2019, BOKU, Tulln, Austria) 2019
- Multi-increment Soil Sampling and Analysis Training** (October 30-November 1, 2017, US EPA Wilcox Superfund Site, Bristow, OK) 2017

Worked with Deanna Crumbling (US EPA ret.) and Matthew Johnson (US EPA) to learn and apply the multi-increment soil sampling method and portable X-ray fluorescence analysis to analyze soils for lead (Pb) during field sampling campaign.

**EXAFS 2016 - SSRL Summer School on Synchrotron X-Ray Absorption Spectroscopy** 2016  
(July 18-22, 2016, Menlo Park, CA)  
Emphasis on sample preparation and data collection.

### Diversity, Equity, and Inclusion

**Department of Soil, Water, and Climate Anti-Racism Advisory Board organizer,** 2020-2023  
University of Minnesota-Twin Cities  
Working to amplify BIPOC leadership in department anti-racism efforts

**College of Food, Agriculture, and Natural Resources DEI Strategic Planning** 2021  
**Committee,** University of Minnesota-Twin Cities  
Developed strategic plan to increase diversity, equity, and inclusion in College in response to climate survey

**Decolonization Roundtable: The History of the Morrill Act: Focus on Minnesota,** 2020  
University of Minnesota-Twin Cities  
Attended and participated in document review to track indigenous lands used to build wealth of University of Minnesota (November 2020)

**Toner Group DEI Discussions,** University of Minnesota-Twin Cities 2020-present  
Facilitated group discussions on DEI goals, presented on DEI literature (Jul 2020, Sep 2020, Nov 2022, on-going as needed)

**Living Our Values Working Group member,** University of Minnesota-Twin Cities 2020  
Supported department in responding to anti-Black police violence (July-August 2020)

**Environmental Science, Policy, and Management Graduate Diversity Council,** 2013-2020  
University of California-Berkeley  
Supported recruitment and retention of faculty from underrepresented groups (active member 2013-2015)

### Mentoring

**Goldschmidt Conference Mentor** 2022  
Mentored 3 early career attendees.

**Undergraduate Research Assistant Mentor,** University of California-Berkeley 2013-2020  
Mentored 63 undergraduate research assistants, including 7 senior thesis students, in field, greenhouse, and laboratory research.

**Berkeley Connect Mentor,** University of California-Berkeley 2018-2019  
Mentored 80 undergraduates in 1-1 and small group meetings, focused on increasing sense of belonging for junior transfers and international students

### Service and Outreach

*University Service (in addition to DEI service, above)*

**Botany in Action Fellowship Review Committee,** Phipps Conservatory, Pittsburgh, PA 2023-2024

**Postdoctoral Association Career Development Award Review Committee,** 2022  
University of Minnesota

**Just Food Podcast Episode 5, Healthy Soil in Richmond's Concrete Jungle,** Berkeley 2017  
Food Institute, University of California-Berkeley

- Building Sustainability Curriculum and Learning at Berkeley-Graduate Student Organizer**, University of California-Berkeley 2016-2017  
Organized year-long faculty program to support integration of sustainability concepts into courses in diverse disciplines
- Environmental Science, Policy, and Management Starter Grant Review Committee**, University of California-Berkeley 2015

*Professional Service*

- Reviewer**, NASA, NSF, *Chemical Geology, Applied Soil Ecology, Plants, Environmental Science and Pollution Research, JGR Biogeosciences* 2021-present
- Goldschmidt Conference Workshop Organizer, Summer 2025 Meeting** 2024-2025  
Workshop: *Soft and tender X-ray imaging and spectroscopic analysis of Earth and environmental samples* (1-day workshop, July 6, 2025; Co-organizers: Brandy Toner, Sam Webb, Eleanor Spielman-Sun, David Shapiro, Kyounglim Kang)
- Goldschmidt Conference Session Convener, Summer 2025 Meeting** 2024-2025  
Session: *Use-inspired geochemistry: the science underpinning environmental solutions* (Co-conveners: Brandy Stewart and Case van Genuchten)
- Advanced Light Source Virtual Tutorial Organizer** 2024  
*Earth & Environmental Science Applications of X-ray Spectromicroscopy for New Users* (August 14, 2024)
- Goldschmidt Conference Session Convener, Summer 2024 Meeting**, Chicago, IL 2023-2024  
Session: *A geochemical perspective toward environmental solutions* (Co-conveners: Brandy Stewart and Case van Genuchten)
- Advanced Light Source Microscopy Program Review Panel** 2023
- NASA Exploring Ocean Worlds Grant Executive Committee** 2023
- American Chemical Society Session Convener, Spring 2022 Meeting**, San Diego, CA 2021-2022  
Session GEOC025: *Contaminant Cycling in Natural and Built Environments within Urban and Industrial Areas* (Co-conveners: Brandy Stewart)
- American Geophysical Union Outstanding Student Poster Award Judge** 2021
- Soil Science Society of America Webpage and Blog Post** 2017-2019  
Worked with media team to revise community gardening webpage; submitted an invited blog post on phytoremediation.
- Goldschmidt Conference Session Convener, Summer 2017 Meeting**, Paris, France. 2017  
Session 13a: *Sustainable Soil Remediation: Biogeochemical Foundations and Innovative Approaches.*

*Public Service and Outreach*

- Community based soil lead sampling**, Twin Cities, MN 2024  
Used portable X-ray fluorescence to measure lead concentration in residential yards (4), brownfields (3), and community gardens (1).
- East Phillips Indoor Urban Farm Project**, Minneapolis, MN 2020-present  
Support environmental justice coalition working to replace emissions-heavy municipal development with indoor urban farm on arsenic-contaminated site. Interviewed for Hazzard, A. 2023. East Phillips residents unconvinced that Roof Depot demolition would be safe. *Sahan Journal*.
- Soil Sampling at Lower Phalen Creek Project**, Saint Paul, MN 2022  
Lead soil sampling in collaboration with Nic Jelinski (UMN) and University of Wisconsin – River Falls faculty and students to support indigenous-led sacred site preservation and habitat restoration project at a local brownfield.
- Moving South Berkeley Forward**, Berkeley, CA 2017-present

In collaboration with Berkeley Community Gardening Collaborative, developed and continue to support environmental science training program for youth of color where high school students (4 annually) are paired with UC Berkeley undergraduate mentors (2 annually) to conduct soil testing and neighborhood outreach.

- Urban Soil Sustainability PhD Research Blog** hosted at [www.sarickmatzen.com](http://www.sarickmatzen.com) 2016-2020
- Community Soil Lead Testing Workshops**, El Sobrante and Berkeley, CA and virtual 2019-2021  
Workshop series with University of California Cooperative Extension to train community members (80) to sample soil; provided free soil testing for lead (Pb) and recommendations for gardening in soil. Tested 25 sites.
- Santa Fe Right-of-Way Soil Remediation Project**, Berkeley, CA 2013-2019  
Worked with Berkeley Community Gardening Collaborative, Berkeley Partners for Parks, Spiral Gardens Community Food Security Project, the Ecology Center, and the City of Berkeley to determine feasibility of phytoextracting arsenic from abandoned railroad right-of-way.
- Urban Tilth Soil Building Team**, Richmond, CA 2015-2019  
Developed soil remediation plan for 4-acre new urban farm in collaboration with Urban Tilth staff and Joshua Arnold. Trained 5 high school interns to sample soil. Supported soil carbon sequestration through cover crop use.
- Black Butte Community Farm Manager**, Weed, CA 2009-2013  
Started and managed a community farm as part of a brownfield remediation project.

*Community Outreach Presentations*

4. **Matzen, S. and R. Bennaton.** 2021. Safer soils for urban food growers. UC Agriculture and Natural Resources webinar. July 15, 2021. Virtual.
3. **Matzen, S.** 2017. Dealing with urban soil contamination. Urban Agroecology Short Course, June 21, 2017, UC Berkeley.
2. **Arnold, J. and S. Matzen.** 2016. Can training programs help urban farmers deal with soil contamination? Workshop. Sustainable Agriculture Education Association Annual Meeting, July 29-31, 2016, Santa Cruz, CA.
1. **Arnold, J. and S. Matzen.** 2015 and 2016. Ecologically based soil fertility and contamination management. Urban Agroecology Short Course, June 24, 2015 and June 21, 2016, UC Berkeley.