

DENIN Environmental Scholars Internships

Dates of internship: November 1, 2021 – May 13, 2022 (Hybrid)

Location: Harker ISE Lab, University of Delaware, Newark, DE 19711

Number of positions available: 1-2

Faculty Mentor: Donald L. Sparks

Graduate Student Mentor: Fatemeh Izaditame

Professional Staff Mentor: Jason Fischel

Project Title: Sea-Level-Rise-Induced Release of Arsenic from Flood-Prone Contaminated Coastal Sediments

Research Description:

Sea-level rise (SLR) induces perturbations in the coastal hydrologic regimes altering the redox biogeochemistry and the fate of toxic metal(loid)s. Shifts in coastal hydrology result in movement of the saltwater-freshwater interface inward from the coast. Increasing salinity can increase metals mobilization and change their chemical forms in contaminated soils by changing equilibria for ion exchange and sorption processes. Coastal sediments are also subject to episodes of sediment resuspension due to a combination of SLR-induced flooding, waves, and currents. However, the influence of such disturbances on sediment chemistry and the release of pollutants is poorly understood. We aim to employ a host of advanced experiments and techniques to investigate the cycling and mobility of sediment-bound metal(loid)s (Fe, As) facing resuspension and saltwater intrusion. Students working on this project would be a component of a multi-disciplinary project and specific project goals will be formed to cater to students' interests. The results of this research will provide insights into how physical and chemical processes interact during SLR to release sediment-bound metals and control their distribution in the solution and solid phase.

Research Questions:

- i. How do the concentrations of dissolved/particulate arsenic change as a function of bottom shear stress and salinity?
- ii. How does the speciation of arsenic change in solution and on the solid phase as a result of the disturbances caused by hydrodynamic forces and flooding?

Student Learning Objectives: Professional and Research Skills

This internship focuses on the development of the following professional and scientific skills.

Broad Professional Skills	Specific Skills
Planning and time management	Ability to set and complete specific goals of varying scope
Work independently	Independent work ethic - work independently to problem-solve
Collaborative skills	Learning to complete tasks efficiently and effectively with others
Express ideas in writing and verbally	Communicate with diverse audiences - Development of impactful poster and oral presentations. Honing ability to deliver scientific results/impacts to people of interdisciplinary background. Learn to write literature review.
Broad Scientific Research Skills	Specific Skills
Understand scientific terms	Mechanistic and applied concepts regarding sorption and redox chemistry
Literature analysis	Ability to effectively find and utilize scientific manuscripts related to environmental chemistry
Use scientific tools	X-ray absorption spectroscopy, scanning electron microscopy, and additional advanced physical and chemical techniques
Recognize simple patterns in research data	Applying soil environmental chemistry concepts to qualitative and quantitative data.
Analyze research data	MATLAB, R, Excel, Plotly, Origin, and instrument-specific software utilization to form effective figures and tables.
Understand, apply, and explain scientific concepts and theories	Freedom to form questions and plan methods for addressing challenges. Learning to effectively communicate results through oral presentations and manuscript writing.

Prerequisites:

Introductory experience with chemistry.

Work Environment and Expectations:

Laboratory environment: Harker ISE Lab 4th floor. Hours are flexibly determined between student and mentor. Students may participate in a retreat, communications workshop at the end of internship.

Stipend:

\$3,500 Direct deposit is required.

Funding Source:

National Science Foundation, Delaware EPSCoR Track I

How to apply: https://ugresearch.udel.edu/PUB_Program.aspx