**DENIN Environmental Scholars Internships**

Dates of internship: October, 2022 to May 2023

Location: Sharp Campus, University of Delaware, Lewes, DE 19958

Number of positions available: 1

Faculty Mentor: Andrew S. Wozniak

Graduate Student Mentor: Tia Ouyang

**Project Title:** Dissolved organic matter in the Indian River and Rehoboth Bays

**Research Description:**

Dissolved organic matter (DOM) generated within and transported to estuaries impacts biogeochemical cycles by forming of metal-DOM complexes, being exported to the ocean, deposited in sediments, and supporting secondary production. Its role in supporting secondary production by microbial communities, in particular, may contribute to harmful algal blooms and low dissolved oxygen events and negatively affect water quality and aquatic life, leading to long-term economic impacts on tourism and fishing industries in estuaries and adjacent bay regions. In Delaware, the Center for the Inland Bays reports that ~70% of water bodies do not meet water quality standards, and the Indian River and its associated bay regions are the most impaired waterways. Numerous studies investigate dissolved nutrient dynamics in the Indian River and Rehoboth bays (IRRBs). However, few studies characterize DOM, which provides valuable water quality management information. This study, therefore, investigates the temporal and spatial variations of DOM characteristics in IRRBs. Surface water samples will be collected monthly at 17 sites in IRRBs. The concentrations of dissolved organic carbon (DOC) and total dissolved nitrogen (TDN) and DOM spectral characteristics (via excitation-emission matrix spectroscopy) will be measured and compared to samples collected during Summer 2022. The dominant drivers of DOM characteristics between Indian River Bay and Rehoboth Bay (RB) will be assessed using multivariate and multiway statistical techniques. Variability in the data will be assessed to assess whether temporal or spatial factors most influence DOM variability.

**Research Questions:**What are the scales of variability for dissolved organic carbon quantities and composition in the Rehoboth and Indian River Bays?

1. Are spatial or temporal factors more important for determining dissolved organic matter composition?

2. Can variations in dissolved oxygen quantities (using data obtained from sensors) associated with specific organic matter sources?

**Student Learning Objectives: Professional and Research Skills**

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

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| 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. |
| Broad Scientific Research Skills | **Specific Skills** |
| Understand scientific terms | Mechanistic and applied concepts regarding estuarine carbon cycling, analytical chemistry techniques |
| Literature analysis | Ability to effectively find and utilize scientific manuscripts related to estuarine and dissolved organic matter chemistry |
| Use scientific tools | Excitation-emission matrix spectroscopy, dissolved organic carbon analysis, particulate organic carbon analysis, parallel factor analysis, and additional advanced physical, chemical, and statistical techniques |
| Recognize simple patterns in research data | Evaluate relationships among quantitative and qualitative environmental, land-use, and water quality data streams. |
| Apply research tools and techniques in research experiments | Filtration, field collections, wet laboratory techniques. |
| Analyze research data | R, Excel, 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, some environmental coursework.

**Work Environment and Expectations:**

Laboratory environment: Cannon laboratory on the Sharp Campus in Lewes. Hours are approximately 9AM to 5PM with the student expected to work ~8-10 hours per week during the Fall Semester doing field and laboratory work. During the Spring semester, the student will devote ~8-10 hours per week to conduct data analyses and additional field and laboratory work.

**Stipend:**

$4,500 Direct deposit is required.

**Funding Source:**

National Science Foundation, Delaware EPSCoR RIITrack I

**How to apply:** Please submit your resume, cover letter and unofficial transcript to Dr. Yolanda Williams-Bey at Yolanda@udel.edu