**DENIN Environmental Scholars Internships**

Dates of internship: June 7, 2021 – August 13, 2021

Location: Cannon Lab, University of Delaware, Lewes, DE 19958

Number of positions available: 1

Faculty Mentor: Andrew S. Wozniak

Graduate Student Mentor: Tia Ouyang

Professional Staff Mentor: Alina Ebling

**Project Title:** Assessing bio- and photo-degradation effects on fluorescent dissolved organic matter signals in the Murderkill estuary

**Research Description:**

Dissolved organic matter (DOM) is a major carbon component in river and estuarine waters with impacts for heterotrophic respiration, carbon export, and water quality. DOM serves as a carbon source for microbial heterotrophs who, in the presence of an overabundance of DOM, can draw dissolved oxygen levels down to hypoxic or anoxic levels. DOM in river-estuaries comes from both autochthonous (primary production) and allochthonous (natural and anthropogenic watershed sources) sources, and these sources deliver DOM of differing molecular compositions which can impact their fate in the estuary and their impacts on water quality. An understanding of the temporal and spatial variations in the relative contributions of DOM from various allochthonous and autochthonous sources in a given river-estuary system is vital for understanding DOM impacts. We are evaluating the utility of fluorescence spectroscopy for providing a source fingerprint of DOM sources to the Murderkill estuary. With this internship, the intern will evaluate how microbial and photochemical processes alter the source-specific DOM signals during transport through the estuary to understand a) which DOM components are more or less susceptible to these degradative processes and b) how these degradative processes impact the utility of the fluorescence spectroscopic tool.

**Research Questions:**How do microbial and photochemical processes alter DOM during transit in the Murderkill River estuary?

1. Which allochthonous and autochthonous DOM components are susceptible to microbial and photochemical degradation?
2. How do bio- and photo-degradative processes impact our ability to use fluorescence spectroscopy to trace DOM sources in the Murderkill River estuary?

**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 and dissolved organic matter chemistry |
| Literature analysis | Ability to effectively find and utilize scientific manuscripts related to environmental chemistry |
| Use scientific tools | Organic carbon quantification, fluorescence/excitation-emission matrix spectroscopy, wet lab chemical techniques. |
| Recognize simple patterns in research data | Applying estuarine biogeocheical and photochemistry concepts to qualitative and quantitative data. |
| Apply research tools and techniques in research experiments  | Setting up laboratory experiments, performing filtrations and extractions. |
| Analyze research data  | MATLAB, R, Excel, 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, environmental science, familiarity with river, estuary environments.

**Work Environment and Expectations:**

Laboratory environment: Cannon laboratory on the Hugh R. Sharp campus in Lewes. Students will work full time during the summer. Housing accommodations in Lewes can be arranged with sufficient notice. Students will also participate in DENIN Environmental Scholar programming and have the opportunity to be involved with programming related to the SMSP REU program held on the Hugh R. Sharp campus.

**Stipend:**

$4,000.

**Funding Source:**

Project WICCED (National Science Foundation, Delaware EPSCoR Track II)

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