

## DENIN Environmental Scholars Internships

Dates of internship: June 10, 2019 – August 16, 2019

Location: Delaware Biotechnology Institute, University of Delaware, Newark, DE 19711

Number of positions available: 1

Faculty Mentor: Thomas Hanson

Graduate Student Mentor: Alexa Bennett

Professional Staff Mentor:

**Project Title:** Understanding the Distribution of Cyanobacteria in Delaware Ponds.

### **Research Description:**

Cyanobacteria are phototrophic bacteria that often bloom in freshwaters when excess nutrients are present causing significant water quality problems. In extreme cases, cyanobacteria can produce toxins that negatively impact wildlife and human populations. The goal of this project is to understand what types of cyanobacteria bloom in Delaware freshwater ponds, identify relationships between nutrient concentrations and cyanobacteria types, and assess the potential for toxin production in Delaware freshwaters. This will be accomplished by a combination of DNA sequencing of samples from ponds and targeted isolation of cyanobacterial strains. By comparing the community structure of cyanobacteria and total bacteria with nutrient data already being collected by Tye Pettay and Scott Andres, we will be able to identify predictive relationships between nutrient status and the presence of potentially toxic cyanobacterial populations. Ultimately, combining these models with local remote sensing data should enable proactive remediation efforts to prevent rather than respond to bloom events.

### **Research Questions:**

How does nutrient status of ponds influence the type of cyanobacteria present and the presence of potentially toxic cyanobacteria?

1. Can representative cyanobacteria from Delaware freshwater blooms be brought into the laboratory for further study?
2. How do cyanobacteria populations vary through time in Coursey's pond and between different ponds with distinct physical and chemical conditions?

### **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.
Broad Scientific Research Skills	Specific Skills
Understand scientific terms	Correctly use terms and concepts from the fields of microbiology and molecular biology
Literature analysis	Ability to effectively find and utilize scientific manuscripts related to environmental microbiology
Use scientific tools	Microbial cultivation, microbial community analysis by next generation sequencing, bioinformatics
Recognize simple patterns in research data	Applying microbiology concepts to qualitative and quantitative data.
Apply research tools and techniques in research experiments	DNA isolation from environmental samples and isolates, PCR, and microbial growth assays to investigate Delaware River microbial communities.
Analyze research data	R, Excel, bioinformatics packages 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 biology.

**Work Environment and Expectations:**

Laboratory environment: Delaware Biotechnology Institute. Hours are flexibly determined between student and mentor. Students will work full time during the summer, June 10-August 16, 2019. Students will participate in scheduled events for the UD EPSCoR program and participate in an end of program research symposium.

**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](https://ugresearch.udel.edu/PUB_Program.aspx)