



Dates of undergraduate research opportunities: **January 2019 – October 2023**

Location: **Cannon Hall, Wesley College, Dover, DE 19901**

Number of positions available: **2-3 (Wesley College undergraduates only)**

Research Mentor: **Kevin E. Shuman, Ph.D.**

Project Title:

1. Microbiome: The Microbiome of the St. Jones river near Silver Lake (Dover, DE)
2. Isolation and Characterization of Environmental Bacteria: Enrichment and isolation of bacteria from the St. Jones river near Silver Lake (Dover, DE)

Research Description:

1. Microbiome: A microbiome is defined as all the microorganisms that live within an environment. These microorganisms play a important role in the transformation of chemicals within the environment. Changes in what chemicals are present (e.g., fertilizers, pesticides) and physical conditions of the environment (e.g., temperature, salinity, pH) can lead to alterations in the makeup of the microbiome. The aquatic microbiome of the Saint Jones river will be studied. Students will collect water samples from selected sites near Silver Lake (Dover, DE) on a weekly basis. Total genomic DNA will be extracted from the collected samples and submitted for sequencing and analysis through the WiCCED Microbiome core. The resulting sequence data will be further analyzed to answer research questions proposed by the students.
2. Isolation and Characterization of Environmental Bacteria: Many biotechnologically relevant products (e.g., DNA polymerase, antibiotics, restriction enzymes) are derived from microorganisms isolated from various environments. Some microorganisms, capable of metabolizing pollutants, can also directly be used in the bioremediation of contaminated sites. Students will isolate environmental bacteria from enrichment cultures inoculated from samples collected from the Saint Jones River near Silver Lake (Dover, DE). Environmental isolates will be identified using the Biolog Microbial Identification System and confirmed by 16S rRNA gene sequencing. The growth characteristics of the environmental isolates will be determined and compared to the scientific literature.

Research Questions:

1. Microbiome: How do changes in the physiochemical conditions of the St. Jones alter its microbiome?
2. Isolation and Charactization of Environmental Bacteria: Can bacteria isolated from the St. Jones river be used in the bioremediation of pollutants or provide biotechnologically relevant products?

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	General understanding of biological/microbiological concepts and terms.
Literature analysis	Ability to effectively find and utilize scientific manuscripts related to microbiology.
Use scientific tools	Students will be trained in aseptic technique, bacterial culturing and growth characterization, microscope slide preparation and staining techniques for light microscopy, and microbial identification using the Biolog Microbial identification system and 16S rRNA gene sequencing.
Recognize simple patterns in research data	Analyze growth data using Microsoft Excel using Student's t-test and correlation statistics.
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:

STEM major with an introductory experience with chemistry and students should have completed Pre-Calc. I.

Work Environment and Expectations:

Laboratory environment: Cannon Hall, Wesley College. Hours are flexibly determined between student and mentor. Students will work part time during the fall and spring semesters, and full time during the summer internship program, June 3-August 9, 2019. Students are required to register for 1-2 Directed Research Credits (CH265/365) and will also participate in a retreat, communications workshop, Scholars Day, and end of summer-internship symposium.

Stipend:

\$5,000 in summer; \$10/hour during the academic year. Direct deposit is required.

Funding Source:

National Science Foundation, Delaware EPSCoR Track II

How to apply:

<https://wesley.edu/academics/undergrad-research> (EPSCoR link) or email: Malcolm.Dsouza@Wesley.Edu.