

**Rebecca Berry Ph.D.**

### **Evaluating the Impact of Generative AI on Student Learning and Academic Work**

The rapid introduction of generative AI has changed the way college students approach assignments. Research assistants will work with me to perform a systematic comparison of anonymized student work before generative AI tools were widely used and after AI integration was allowed under structured guidelines. We will seek to determine if the use of generative AI changes the quality of student work (structure, clarity, source integration) and if these changes are uniformly distributed across all types of students. This study will contribute to ongoing national conversations in higher education regarding ethical AI integration, instructional design, and assessment practices. Additionally, we will analyze the responses from a school wide survey of student and faculty perceptions of AI and develop a follow up survey to be deployed the following fall semester. Ideal candidates include students interested in pedagogy, cognition, ethics, or educational technology. Familiarity with qualitative and/or quantitative data analysis is preferred.

If interested please [email](#) Dr. Berry.

**Dr. Suparna Bhalla**

### **Project 1: Isolation and Characterization of a novel bacteriophage**

Bacteriophages, viruses that infect bacteria, are among the most abundant entities on earth, with an estimated  $10^{31}$  particles in the biosphere. This interaction between bacteria and viruses is critically important in maintaining the delicate homeostasis of our environment. However, the process by which these viruses infect their bacterial hosts is intricate and not fully understood. Bacteriophages are also promising potential tools for treating bacterial infections, particularly as numbers of antibiotic resistant bacteria are on the rise. Therefore, research in the field of bacteriophage biology will lead to a greater understanding of how viruses and bacteria coexist in nature and may provide therapeutic tools for disease in the near future. This project involves the isolation, purification, amplification and analysis of novel bacteriophages from biological samples gathered from the Mount Saint Mary College campus. Analysis of these phages can provide crucial insight into how bacteriophages infect their hosts and how the genes that code for proteins involved in this process have evolved over time. For the past several years (2016 - date), Mount Saint Mary College has been a member of the prestigious Howard Hughes Medical Institute (HHMI) sponsored Science Education Alliance – Phage Hunters Advancing Genomics and Evolutionary Science (SEA-PHAGES) program involved in the isolation and characterization of these novel phages. This project is a continuation of that collaboration.

As part of this project, student(s) will:

- Embark on a discovery project where they will use microbiological and genetic methods to isolate novel bacteriophage(s) from their environment(s), using a choice of bacterial host(s).

- Use the techniques acquired to investigate the lysogenic life cycle of their and previously isolated phages
- Prepare publication ready data for the isolated lysogens.

**\*Project Requirements:**

The discovery part of the project is open to everyone and no prior science background or laboratory skills are required.

If interested please [email](#) Dr. Bhalla.

**Dr. Suparna Bhalla**

**Project 2: Characterizing the enzyme Malate Dehydrogenase (MDH)\***

Malate dehydrogenase (MDH) is a key enzyme found in all living organisms where it plays a central role in metabolism. Essential for cellular energy production, this enzyme catalyzes the reversible oxidation of malate to oxaloacetate using NAD<sup>+</sup>/NADH as a cofactor. Mutations and dysregulation of this enzyme has been linked to severe neurodevelopmental disorders and overexpression of this enzyme can be seen in a variety of cancers. As it sits at the crossroads of several key metabolic processes, MDH activity is tightly regulated and sensitive to cellular conditions such as pH, temperature, substrate concentration, and redox state. The activity and regulation of this enzyme is strongly correlated with its structure which while quite conserved, also shows remarkable diversity. We have recently embarked on a project using the watermelon MDH gene and aim to understand how the structural differences affect its regulation.

As part of this project, student(s) will:

- Express and purify recombinant MDH in E.coli
- Use molecular visualization techniques to generate a hypothesis that which they will then test in the laboratory performing a variety of enzyme kinetic assays to correlate structure with function.

**\*Project Requirements:**

This project is appropriate for rising junior level students who have had a background majors level biology courses work and at least one semester of organic chemistry including genetics as part of their academic background.

If interested please [email](#) Dr. Bhalla.

**Dr. Suparna Bhalla**

**Project 3: Investigating the molecular mechanisms involved in the anti-proliferative effects of the phytochemicals on cancer cells**

Phytochemical or plant derived agents have historically been used for medicinal purposes in several Asian cultures and are now gaining popularity in the US. Natural products have the advantage of availability and apparently have fewer side effects. Despite their increase in

popularity, only a few such compounds have been subjected to rigorous controlled studies and most of the data in support of their benefits remains anecdotal. Our goal is to test for their anti-proliferative properties and understand the mechanism involved in mediating this effect.

As part of this project, student(s) will:

- Perform a literature search on the current knowledge of phytochemicals and their role as potential anti-proliferative agents
- Identify the phytochemical they want to investigate
- Learn to culture mammalian cells, and several techniques in molecular and cell biology, such as isolation of RNA, synthesis of cDNA, and performing PCR.

**\*Project Requirements:**

- This project is appropriate for students who have had a minimum of a year of major level biology course work including genetics as part of their academic background.

If interested please [email](#) Dr. Bhalla.

**Dr. Mike Daven**

**Mathematical Strategies for Board Games and Card Games**

In this project, students will explore the mathematics of games and demonstrate that mathematics can be fun too! Many board games and card games have mathematical properties that help to find a winning strategy. In this project, we will investigate the mathematics that underpins a number of games. We'll start by exploring a variety of games, and then focus on a particular game. Next, we'll design a new version of this game so that it has our own "flavor", perhaps by creating a new board, additional cards, new rules, or other twists. We'll then playtest our game with different audiences to determine if our "new" game is fun or needs further development. This project is suitable for students who have completed at least one math course. The main requirement is that the student likes to play games!

If interested please [email](#) Dr. Daven

**Dr. Lee Fothergill**

**2D Game Development of the Mount Saint Mary College Campus**

Project Overview: This summer research project will involve undergraduate students in the design and development of a 2D digital game based on the Mount Saint Mary College campus. Using the Construct game development platform, students will collaboratively recreate recognizable campus locations and translate them into an interactive game environment. The project blends game design, programming logic, digital art, and spatial storytelling, while encouraging students to engage deeply with their physical campus as a designed space.

## Research Goals

- Explore how real-world environments can be translated into interactive 2D game spaces
- Investigate player navigation, engagement, and level design using a familiar setting
- Develop technical and creative skills in game development using Construct
- Produce a playable prototype that represents Mount Saint Mary College's campus

## Student Prerequisites:

- Interest in game design, computer science, digital media, or interactive art
- Some prior exposure to Construct, programming logic, or digital design (preferred but not required)

If interested please email [Dr.Fothergill](mailto:Dr.Fothergill)

## **Prof. Mouhamed Halwani**

### **In Vitro Evaluation of Sodium Bicarbonate Supplementation on Representative Gut Microbiota**

Sodium bicarbonate is widely used in endurance athletics as an ergogenic aid due to its buffering capacity, which may delay fatigue by neutralizing metabolic acidosis. However, oral supplementation exposes the gastrointestinal tract—and its resident microbiota—to transient changes in pH and ionic concentration. The consequences of these changes on gut microbial populations remain poorly characterized.

This project will evaluate the effects of sodium bicarbonate on two representative gut-associated bacteria: *Bacteroides thetaiotaomicron* (a dominant anaerobic commensal involved in carbohydrate metabolism) and *Lactobacillus* species (commonly associated with gut homeostasis and probiotic function). Using controlled in vitro culture systems, students will assess microbial growth under increasing concentrations of sodium bicarbonate that reflect physiologically relevant exposure levels.

Experimental methods will include standardized broth culture assays, serial dilutions, optical density measurements via spectrophotometry, and viability plating to determine growth kinetics and potential inhibitory or stimulatory effects. pH monitoring will be incorporated to distinguish direct ionic effects from environmental alkalization. Replicates and statistical analyses will be emphasized to ensure reproducibility.

This study will provide foundational data regarding how performance supplementation may influence gut microbial balance. Findings may contribute to broader discussions in sports science, microbiome research, and evidence-based supplementation practices.

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## **Characteristics of Successful Applicants**

Applicants should:

- Be Biology, Biochemistry, Exercise Science, or related STEM majors
- Have successfully completed Microbiology with laboratory experience
- Demonstrate proficiency in sterile technique and microbial culture handling

- Be comfortable performing serial dilutions, spectrophotometric measurements, and quantitative assays
- Have strong organizational and data-recording skills
- Be interested in microbiome research, sports physiology, or host–microbe interactions
- Be able to commit 125–135 hours between May 18 and July 10, 2026

Students should be prepared for independent laboratory work, careful pH-controlled experimental design, and quantitative data analysis

If interested please email [Prof. Halwani](#)

### **Dr. Micah Modell**

#### **Extending the gamification options in CoLab.online**

Description: One of the more engaging components of CoLab.online involves a gamification intervention to structure reading assignments with a Bingo theme. The intervention has evolved over time, based in part on co-design activities involving the student/users of the system. I'd like to extend the functionality to add new game themes and interactions. The ideal candidate is interested in game design and development and computer programming. They need not be expert in either of these areas but they must be interested in learning more.

If interested please email Dr. [Modell](#)

### **Dr. Micah Modell**

#### **Refinement of a collaboration-focused learning management system (LMS)**

Description: This summer I plan to engage students in improving the system by developing our understanding of collaboration theory and (simultaneously) by imagining and describing alternative systems interactions, testing them with real people and then implementing them in the live system. We will use popular modern tools to prototype, build and test the system. Interested students should have an interest in sketching, design and/or learning to program. Fluency in a language other than English is a plus!

If interested please email Dr. [Modell](#)

### **Dr. Micah Modell**

#### **Technically better team dynamics**

Description: Ever participate in a group project that just worked, where collaboration felt smooth and productive and you were pleased with the results? Or the opposite, where the group never really became a high-functioning team? Ever think about why these experiences are so different? Join us for the continuation of a study that examines the behaviors that shape a group's success across multiple environments.

For several summers SURE students have identified observable -behaviors that influence group dynamics. The work of SURE students led to a presentation at an internationally recognized conference, and now we're now updating and extending that work using current literature and Artificial Intelligence-assisted analysis methods.

This summer we aim to collaborate with AI to:

- Analyze and publish the results.
- Compare the results of the prior years with those of our AI-enhanced approach.
- Present research at national conferences; ensure results are shared broadly.

In addition to myself (Micah Modell), the current team already includes a member of the 2022 SURE project who has since graduated and is a PhD candidate at Liberty University, and Dr. Sonya Abbye-Taylor, a former Mount faculty member in the School of Education.

Open to students from ALL disciplines.

Ideal for those interested in group behavior, teamwork, learning environments, collaboration, and curious about the power of AI.

If interested please email Dr. [Modell](#)

### **Dr. James Moran**

#### **Immune Safety of the Synthetic Blood Substitute OxyVita®**

This project is a continuation of a recent collaborative effort with the local biotech company OXYVITA, Inc. They produce a synthetic blood substitute made from bovine (cow) hemoglobin. This blood substitute is a cell-free oxygen carrier that could reduce the need for blood donated by human donors and reduce the risks associated with donor/recipient mismatches in blood transfusions. The company and their collaborators have done a fair amount of animal studies and are preparing for Phase I clinical trials in humans. Although the product has shown little to no pathology in acute animal studies, very little has been done to investigate the effects of repeat exposure to the product. In other words, what would happen to an individual receiving a second or a third transfusion with this blood substitute? Would they develop an immune response to this foreign (cow) molecule and would that be associated with pathology? Preliminary studies suggest that mice repeatedly immunized with Oxyvita produce a robust antibody response to the molecule. Interestingly, we have not observed any obvious systemic inflammation or deterioration of the animals' health by monitoring body weight or measuring inflammatory cytokine concentrations in the blood. My goal for this summer is to continue our efforts in measuring the innate and adaptive immune responses to the OxyVita molecule using *in vitro* cell culture. Research students will learn valuable techniques in immunology and biotechnology and will have opportunities to collaborate with scientists in an industrial setting.

If interested please email [Dr. Moran](#)

### **Dr. Douglas A. Robinson, Jr.**

#### **Tree canopy organism population surveys**

**Project:** The organisms that live above and below ground have received very little study, typically because of the degree of difficulty accessing these locales. Improved techniques

associated with accessing tree canopies using arborist equipment (ropes, climbing equipment, etc.) has broadened the breadth and depth of questions that can be asked about the creatures that call tree canopies 'home'. In this study, we will work with collaborators from a dozen institutions to identify and quantify the animals found in deciduous trees (think: oak trees) at different heights (30-60'). Using insect traps and camera 'traps', we will document the timing and frequency of canopy use to better understand canopy ecology in northeastern North America. We will coordinate our efforts with other biologists, contribute to a larger project, and learn skills that take us into the canopy!

**Requirements:** Interest in learning more about the environment and the organisms that inhabit it! Basic biology knowledge (college-level course would be best, but not required) and willingness to perform research outdoors and indoors.

**Student responsibilities:**

Students will assist in the design of the research project, learn arborist techniques to ascend/descend into/from tree canopies. Student will also learn the correct statistical analyses to complete interpretation of the results and assemble a presentation that documents the research project background, materials and methods, results, and interpretations.

If interested please email [Dr. Robinson](#)