



## The 2021 Academic Conference

Dear Saint Vincent College Community and Friends,

We welcome you to the 18th annual Saint Vincent College Academic Conference and our 2<sup>nd</sup> virtual presentation, during which we celebrate the interesting and often innovative work our students produce throughout the year. This conference is a testament to the dedication of Saint Vincent faculty and administrators who encourage and support students in conducting advanced scholarly inquiry and creative work in their disciplines. Saint Vincent faculty dedicate their time to mentoring students in critical scholarship, as well as in classroom projects in the Humanities, Natural Sciences, Computer Sciences, Social Sciences, Arts, and Business. The students who present at this conference have ambitiously seized these opportunities and brought their projects to completion. We are very proud of their work, and we invite you to take part in this event which recognizes their achievement.

The conference officially begins on Wednesday, May 5, at 2:30pm but, due to the COVID-19 related circumstances and the inclusion of live zoom presentations this year, some presentations may be submitted after the conference. So, we encourage students, faculty and members of the SVC Community to continue to stop by this page as we update presentations throughout the end of the semester. We have an internal platform for the SVC community and an external public platform for family and friends; these are included at the end of the letter. This program contains the schedule of oral and poster sessions and abstracts for each presented project, as well as the zoom links. Please peruse this e-booklet to find presentations that pique your interest and to learn more about the works our students have accomplished.

Many people have dedicated time and energy to bring this conference to fruition. The faculty, students, staff and administrators who were directly involved in planning the conference are listed in this program. This list, however, is far from comprehensive in recognizing the many individuals who extended themselves at this busy time of year to make this conference possible. This conference is truly a community-wide effort.

### **SVC Community presentations:**

<https://saintvincentcollege.sharepoint.com/:f:/s/academicconferencecommittee/EpeH1MpLaBNHkEDjmuD9wUIBpToBO4ANNiwYIhaaa9pFRA?e=VrHody>

### **Greater Community SVC page presentations:**

<https://www.stvincent.edu/community-events/2021-academic-conference.html>

We hope that you enjoy the 18<sup>th</sup> Annual SVC Academic Conference!

Most sincerely,

*Kayla G. Jachimowski*

Kayla Jachimowski  
Department of Criminology, Law, & Society

*Sarah Dumnich*

Sarah Dumnich  
Department of Mathematics

Conference Co-Chairs

## The 2021 Academic Conference

### **Saint Vincent College Sixteenth Annual Academic Conference 2021 Committee**

Dr. Kayla Jachimowski, Co-chair

Dr. Sarah Dumnich, Co-chair

#### **Committee Representatives**

Dr. Tim Kelly      Dr. Terrance Smith      Dr. Devin Fava  
Dr. I. Mitch Taylor      Dr. Derek Breid      Dr. Pete Smyntek

#### **Donors**

Support for the Academic Conference is given in memory of Dr. Greg Howard C'68, by Donna Howard

#### **Acknowledgements**

The committee wishes to thank everyone who helped to prepare for this conference. We especially thank the following people and groups for their assistance:

*Mr. Mike Hustava and the marketing department, for overseeing the public website, the Welcome Video, and helping create this program.*

*Mr. George Fetkovich, for designing the cover and promotional materials.*

*Ms. Angela Zalich, for their direction and assistance for the displays in Dupre Atrium.*

*The students and committee are also grateful to the departmental representatives who worked hard to upload, support, and oversee student submissions. The faculty moderators who provided a zoom option for students who preferred a live audience. And the faculty who assisted students with the preparation of their work. Names of faculty sponsors appear in their students' entries in this program.*

#### **Grant Support for Student Research**

*The following grant programs support student-designed research and study at Saint Vincent College. Individual project entries indicate grant-supported projects, where applicable, throughout the program.*

##### **The A.J. Palumbo Student Research Endowment**

Established in 1996, the Palumbo grant program supports student-initiated learning and discovery in the arts, sciences, humanities and professional programs. Grants are awarded on the basis of proposals submitted by the students and reviewed by a committee consisting of both faculty and students. The endowment memorializes the late Mr. A. J. Palumbo, a noted Pittsburgh industrialist.

##### **The Elizabeth and Tom Andreoli Traveling Scholar Endowment**

Established in 1997, the Andreoli Traveling Scholar Endowment funds students who wish to enrich their education through special opportunities that require travel in the U.S. or abroad.

## Oral Presentations

### Live Oral Presentation Session Schedule

#### Session I

2:30pm – 3:45pm

#### **Criminology, Law, & Society**

Ashley Baker - *Examining the Effects of Marijuana Legalization in the United States*

Gretchan Baker - *Mental Health Effecting Crime: Social Bond Theory and Minority Communities*

Derek Fether - *Fatal Shootings and Body Camera Footage: An Analysis of Context in Law Enforcement Activity*

Thomas Franey - *Human Trafficking Enforcement: The Need for Change*

Jesse Gillespie - *Theoretical Analysis on Juvenile Gang Involvement*

Olivia Williams - *A Critical Analysis of Social Bond Theory on the Recidivism of Gang Members*

Moderator: Dr. Bruce Antkowiak

**Zoom Link:** <https://stvincent-edu.zoom.us/j/98981432729?pwd=ckgzOUtHM1lYampmT1ZSekFmUmE2Zz09>

#### **Anthropology**

Eileen Lynch - *Students Attitudes Towards Death in the Midst of the COVID-19 Pandemic*

Moira Sullivan - *Ethnographic Artifact Exhibit*

Nicole Reyes - *Consumer Behavior of College Students Buying Disinfectant and Sanitation Products*

Patrick Spollen - *The United Chronology of Cultures in the Greater Latrobe Area and Westmoreland County*

Moderator: Dr. Elaine Bennett

**Zoom Link:** <https://stvincent-edu.zoom.us/j/91386258901?pwd=dTU2V0ZlVdQeIA3cEF0OHpJOVNNQT09>

#### **Engineering Science**

Bruce Johnson, Nicholas Pietrusinski, Lauren Serafin, Killian Timko - *Capacitive Deionization (CDI) Water Desalination Electrode Production*

Kelly Sokol, Amanda Michel, Kyle Pope - *Campus Composting*

Danielle Koehler, Reese Capo, Jonas Wudkwyh, Eric Pennella, Dj Rossi, Michael

Moresea - *Concrete canoe capstone team*

Hannah Rudy, Nathaniel Rizza, Brandon Reno - *Engineering Capstone – Soft Material Tester*

Moderator: Dr. Derek Breid

**Zoom Link:** <https://stvincent-edu.zoom.us/j/93258018417?pwd=ZFRJVERsdzBUYjhMOXZuelF6WVFlZz09>

## Oral Presentations

### Live E-Poster Session Schedule

#### Session I

2:30pm – 3:45pm

#### SVC Student E-Poster Session

Shane Piper - *How do humans influence water quality in streams?*

Rachel Dudek - *The Importance of Poison Ivy (Toxicodendron radicans) in Overwintering Birds Visitation Frequency & Does increased Precipitation Affect Pollution Levels in South Central Pennsylvania Waterways?*

Sydney Weaver - *Wind Energy on Saint Vincent Campus*

Natalie Lamagna - *An investigation on iron-reducing bacteria impact on iron assimilation in plant tissue & Holding up the bank! An investigation of factors that affect streambank erosion*

Allie Shreffler - *The Effects of Precipitation on the Salinity of the Amazon River's Discharge*

Keith Kalp - *Effects of Microplastics and Pharmaceuticals on Zebrafish Fitness*

Kelly Linsenbigler - *Effects of Roadway Salt Runoff on Aquatic Ecosystems*

Jacob Bender - *How does different concentrations of microplastics affect the growth of Zebra Fish (Danio rerio)?*

Wyatt Stouffer - *Assessing Spatial and Temporal Variations in Surface Water Availability Among Four Major Rivers in PA & Investigating the Ability of Riparian Buffer Zones to Filter Nonpoint Pollution Sources*

Andrew Scott - *The Productivity of Aquaponic Growth in Lactuca sativa as a Means to Reduce Commercial Runoff*

Sarah O'Toole - *Effects of Climate and Streamflow on Nutrient Pollution in the Chesapeake Bay Watershed*

Tanner (Richard) DeTesta - *Rebound of Land Subsidence as Shown by the Subsidence Index & Effect of Mushroom Growth on Runoff of Nitrates and Phosphates*

Alyssa Baker - *Inhibiting Parthenogenesis in Marmorkrebs, Procambarus virginalis (Lyko, 2017)*

Kimberly Horn - *Evaluating the Gene Targets of microRNAs Associated with Parkinson's Disease*

Moderators: Dr. Pete Smyntek & Dr. Caryl Fish

**Zoom Link:** <https://stvincent->

[edu.zoom.us/j/95096773341?pwd=SFZyZ3BnOTBGWVpDMUg5UVdqN0FWUT09](https://stvincent-edu.zoom.us/j/95096773341?pwd=SFZyZ3BnOTBGWVpDMUg5UVdqN0FWUT09)

## Oral Presentations

### Live Oral Presentation Session Schedule

#### Session II

4:00pm – 5:15pm

#### Engineering Science

Ethan Yant, Vee Guillaume, Matt Byrne, Toni DeBastiani - *All Tied Up: A Trash Bag Tying Design Process*  
Kelly Sokol, Cara Luallen, Patrick Hoover, Killian Timko - *Trash Bag Tying Solution for Bearcat B.E.S.T. Students*

Erin Eichelberger, Tyler Condrasky, Thomas Hedgepeth, Griffin Prinkey - *Trash Bag Tying Design*

Nico Molnar, Kyle Pope, Josh Hoffman, Hunter Cindric - *Skoupidia Inc.'s Trash Bag tying Device*

Moderator: Dr. Derek Breid

**Zoom Link:** <https://stvincent->

[edu.zoom.us/j/98247933345?pwd=Rk1HZUZRNuXsdzINTFU4eWITdk9hdz09](https://stvincent-edu.zoom.us/j/98247933345?pwd=Rk1HZUZRNuXsdzINTFU4eWITdk9hdz09)

#### Criminology, Law, & Society

Christopher Miller - *Sovereign Citizen Movement*

Debra Pietranico - *Sexual Assault and Bystander Intervention*

Michael Stasko - *Sex Offenders and Recidivism Rates*

Luke Thomas - *Underage Drinking Understood by Social Learning Theory*

Moderator: Dr. Bruce Antkowiak

**Zoom Link:** <https://stvincent->

[edu.zoom.us/j/98981432729?pwd=ckgzOUtHM1YampmT1ZSekFmUmE2Zz09](https://stvincent-edu.zoom.us/j/98981432729?pwd=ckgzOUtHM1YampmT1ZSekFmUmE2Zz09)

#### Theology

Elizabeth Elin - *Birth, Death, and Rebirth: Creation Imagery and Old Testament Echoes in Matthew 24:15-31*

Katarina McCaffrey - *The Road to Emmaus*

Madison Powell - *Davidic Typology and Inclusivity in Matthew 2:1-12: An Exegesis*

Moderator: Dr. Chris McMahan

**Zoom Link:** <https://stvincent->

[edu.zoom.us/j/91402443592?pwd=aEU0a3Fhd0U3K09rL1luME5Hd3pxZz09](https://stvincent-edu.zoom.us/j/91402443592?pwd=aEU0a3Fhd0U3K09rL1luME5Hd3pxZz09)

Oral Presentations

**Live Oral Presentation Session Schedule**

**Session II**

**4:00pm – 5:15pm**

**Chemistry**

Mary Anand - *Investigation of curcuminoids as novel inhibitors of matrix metalloproteinase-13 for treatment of osteoarthritis*

Danielle Chorba - *Varying macronutrient ratios in the ketogenic diet for type 2 diabetes treatment in animals*

Nicholas Driscoll - *Electronically Controlled Delivery of Kynurenic Acid via PEDOT Functionalized Carbon Nanotube Coatings*

Brandon Lowe - *The synthesis of hydrogen bonding ortho-substituted benzaldehyde hydrazone peptoid monomers*

Anmarie Misterkiewicz - *Synthesis of an adamantyl substituted N-heterocyclic carbene*

Madeline Mutinelli - *Investigation of the Polyethylene Microparticle Protein Corona in a Simulated Human Gastric Microbiome.*

Max Planchon - *Analysis of a Technique for Synthesis of Size-Controlled Colloidal Bismuth Nanoparticles*

Hannah Schilpp - *Effect of UV Light Exposure on Surface Characteristics and Sorption Capacity of Microplastics*

Brandon Silvis - *Electrochemical detection of glucose using a PEDOT/CNT functionalized Platinum electrode with integrated glucose oxidase*

Thomas Syphan - *Synthesis and testing of Cu(II)-binding peptoid monomers for use in amphipathic antimicrobial drugs*

Joel Taylor - *Synthesis of Bulky Copper Carbenes in a Copper Click Reaction to Determine the Impact on the Yield of Triazoles*

Moderator: Dr. Mitch Taylor

**Zoom Link:** <https://stvincent-edu.zoom.us/j/93207380663>

[pwd=WERVV2ZvQkV2NE5qczVwanh5U1pOZz09](https://stvincent-edu.zoom.us/j/93207380663?pwd=WERVV2ZvQkV2NE5qczVwanh5U1pOZz09)

## Oral Presentations

### On display in the Dupre Atrium

#### Engineering

##### **Selected projects from Design and Fabrication with Modern Materials**

Students will display two of their projects from class and the design and fabrication process in developing the final products. In the first project, students developed wooden lamps from laser-cut sheets of plywood. In the second project, students explored molding and casting to rapidly reproduce 3D printed parts.

Student participants: Anthony Berardelli, Zach Kuzel, Cara Luallen, Jake Mortimore, Hannah Rudy, Salvatore Zuber

Faculty Advisor: Dr. Adam Wood

#### Art

##### **Selected works from Senior Exhibition and Professional Seminar are displayed in the Dupre Atrium**

*Artist Biographies appear at the end of the this program*

Faculty Advisor: Br. Mark Floreanini

### On display Online

#### Theology

##### **Thomas Merton: Monk, Writer, Spiritual Master**

Click Below for the Demonstration!

[Creative Expression in the Style of Thomas Merton - VCA \(verostkocenter.org\)](https://www.verostkocenter.org)

The Spring 2021 Honor's course, TH 346H-01: Thomas Merton: Monk, Writer, Spiritual Master explored Merton's life and thought primarily through his writing but was enhanced by an interdisciplinary approach that included the study of Merton's artistic practices. Merton's photography, like his writing, reveals his contemplative vision of the world. This assignment is designed to give students the opportunity to express the contemplative vision that studying Merton's art and writing have inspired. As the COVID-19 pandemic affects millions throughout the world, Merton's reverence for often overlooked beauty and the monastic practice of solitude take on new relevance. The photographs and writing displayed here are the fruit of a semester-long study and reflection on Merton's contemplative vision of life as meaning hidden in plain sight. On display through the end of the semester.

Student Participants: Joseph Choby, Zachary Choby, Elise Debrot, Madison Hill, Ethan Krammerer, Colten McCutcheon, Kristin Neely

**Faculty Advisor:** Dr. Patricia Sharbaugh

**Faculty Advisor:** Mr. Andrew Julo



## Oral Presentations

### **Consumer Behavior of College Students Buying Disinfectant and Sanitation Products**

Nicole Reyes

Faculty Sponsor(s): *Dr. Elaine Bennett*

Discipline(s): Anthropology

*This project focuses on consumer behavior of college students buying disinfectant and sanitation products during COVID-19. Due to time restrictions, my submission will be considered a pilot study conducted to test a set of questions related to the consumer behavior of college students and their thoughts/perspectives on buying disinfectant/sanitation products for face validity and salience. Semistructured interviews with students of Saint Vincent College will examine disinfectant/sanitation product preferences, price sensitivity, and quality preference.*

### **Ethnographic Artifact Exhibit**

Moira Sullivan

Faculty Sponsor(s): *Dr. Elaine Bennett*

Discipline(s): Anthropology

*A.J. Palumbo Student Research Endowment*

*The goal of this project is to curate an exhibit of the Anthropology Department's John G. Erickson Artifact Collection. The exhibit presents rich cultural information on the artifacts that will be accessible to the a lay population and will help people learn about the cultures that used those artifacts.*

*To create these exhibits, I examined the uses of the artifacts in our collection and did research on the cultures they originate from, then used that information to create a visually compelling, informative display connecting the specific artifact back to its culture of origin. The Asian exhibit features artifacts from the Ainu people of Japan, ancient China, and depictions of the Buddha from China and India.*

### **Students Attitudes Towards Death in the Midst of the COVID-19 Pandemic**

Eileen Lynch

Faculty Sponsor(s): *Dr. Elaine Bennett*

Discipline(s): Anthropology

*Death is often considered a taboo subject, but in a pandemic, the topic of death and disease are hard to ignore. This study was designed to examine the factors that students identify as influences on their attitudes towards death, how students' attitudes have been affected by the COVID-19 pandemic, and to assess students' concerns of their personal risk and the risk of others of dying after contracting COVID-19. Each participant took a Likert-scale questionnaire containing several statements related to different attitudes toward death which the participant had to rate the degree to which they agreed or disagreed, and was interviewed on their thoughts about death generally and in the context of the COVID-19 pandemic. The qualitative data from each interview and the quantitative data from the questionnaire will be compared and analyzed to examine the factors of influence on students' attitudes towards death.*

**The United Chronology of Cultures in the Greater Latrobe Area and Westmoreland County**

Patrick Spollen

Faculty Sponsor(s): *Dr. Elaine Bennett*

Discipline(s): Anthropology

*People have been occupying Southwestern Pennsylvania for at least 16,000 years; however, the archaeological record of human occupation of the area is incomplete. This complicates our ability to fully understand the human history of the region. The discovery of Meadowcroft Rock Shelter and other archaeological sites has not only advanced Pennsylvanian pre-history and history but fills in gaps in the prehistoric and historic timeline of North America. This paper attempts to compile and synthesize what is known of human occupation, particularly in Westmoreland County from pre-history through the beginning of the industrialism in the region. This paper will also specifically discuss the limitations and delimitations of the archaeological record for this period in terms of the cultural characteristics of the peoples living in the region.*

**Electrochemical detection of glucose using a PEDOT/CNT functionalized Platinum electrode with integrated glucose oxidase**

Brandon Silvis

Faculty Sponsor(s): *Dr. I. Mitch Taylor*

Discipline(s): Biochemistry, Chemistry

*Hypersensitive detection of blood and cerebrospinal fluid solutes is essential in medical testing and diagnosis. We aim to develop an ultrasensitive glucose detection technique which allows for real time detection of glucose concentrations in a variety of biological samples (cerebrospinal fluid, blood, urine, etc.). We plan to incorporate the enzyme glucose oxidase inside of a conductive polymer nanocomposite coating to increase sensitivity for detection of hydrogen peroxide, a correlative biproduct of the glucose oxidase reaction. This technology has the possibility to allow for sensitive, real-time detection of glucose concentrations with high temporal resolution. We have successfully optimized the procedure for coating the conductive polymer onto glassy carbon electrodes. We have also confirmed the incorporation of Glucose Oxidase into the nanocomposite coating on the electrode. Further testing is required to optimize enzyme incorporation to increase linear range of measurement.*

**The synthesis of hydrogen bonding ortho-substituted benzaldehyde hydrazone peptoid monomers**

Brandon Lowe

Faculty Sponsor(s): *Dr. Daryle Fish*

Discipline(s): Biochemistry, Chemistry

*Peptides are sequences of amino acids that combine to form proteins, essential macromolecules with a wide variety of functions resulting from structural interactions between chemical groups on the amino acids. This integral structure/function relationship of proteins has led scientists to synthesize amino acid derivatives with different chemical group substituents with the goal of generating new foldamers with unique structures and potential functions. One class of peptide derivatives are peptoids, which have substituents on the nitrogen of the backbone rather than the carbon. These peptoids allow for free rotation of the backbone, which typically is unavailable in natural peptides. In this research, I hoped to synthesize peptoid monomers which would induce a typically unfavorable backbone angle. These substituents chosen were carefully selected based on principles from previous literature that had showed favorable progress towards the stabilization of the unusual backbone angle.*

## Oral Presentations

### **Analysis of the Gastrointestinal Tract in Multiple Species of Pennsylvania Bats**

Sarah Maidment

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Bats are an essential cornerstone to our western Pennsylvania ecosystem, but due to an infectious fungal disease called White Nose Syndrome (WNS) their populations are in severe decline. WNS, caused by *Pseudogymnoascus destructans*, can spread easily during hibernation due to close contact. This fungal infection decays the bats' wings and causes them to wake up more frequently in the winter. This hinders their flight and uses up their fat reserves. For the current study, I wanted to examine the prevalence of WNS in our area by sequencing fungal DNA from bat guano found from under natural bat roosts. These guano samples were taken from different locations in western Pennsylvania. DNA extraction and sequencing were performed by the company Jonah Ventures. These results showed no traces of *Pseudogymnoascus destructans* but gave an interesting look into the fungal communities living in the gut and on the guano of bats in our area.*

### **Identification of *Staphylococcus epidermidis* eDNA Biofilm Mutants**

Kaitlyn Schiffer

Faculty Sponsor(s): *Dr. Jennifer Koehl*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

**Staphylococcus epidermidis* is a prominent cause of hospital-acquired and prosthetic joint/surgical infections. They form biofilms, communities of microbes, that are antibiotic-resistant and difficult to treat. Extracellular DNA (eDNA) is a structural component of the biofilm that plays a role in adhesion and antibiotic resistance. Studying eDNA may give insight into its potential as a drug target for biofilm eradication without increasing drug resistance. This study took three strains of *S. epidermidis* and found the strongest biofilm-producing strain. This strain was then mutated both with a chemical and with ultraviolet light to see if eDNA could be disrupted. Results showed a significant difference between different amounts of biofilm produced when comparing *S. epidermidis* strains, but not between the mutated strains of the bacteria. While this project was able to determine biofilm production in *S. epidermidis*, eDNA was not conclusively mutated to produce less biofilm.*

## Oral Presentations

### **A functional study of absence epilepsy in *Danio rerio* using CRISPR/Cas9 induced mutagenesis**

Emily Rohm, Grace Leonard

Faculty Sponsor(s): *Br. Albert Gahr O.S.B.*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*The neurological disease epilepsy can be caused by genetic mutations in the ion channels and synapses of the brain. The purpose of this study is to determine if induced mutations in SLC6A1 (a gene that codes for a transporter of the neurotransmitter GABA in the synapse) and CACNA1H (a gene that codes for T-type voltage gated calcium channels concentrated in the thalamocortical network) respectively contribute to epileptogenesis in zebrafish embryos. The gene-editing technique CRISPR/Cas9 was used to induce the mutations through lipofection. Both phenotype and genotype analyses were performed on the surviving embryos through behavior observations such as light and touch stimulation, and standard PCR. Genotype analysis has determined that no mutations had been made in the survivors of the treatment groups. However, behavioral observations suggest seizure-like activity in the embryos post-fertilization.*

### **A modified ketogenic diet may provide protection against pristane-induced rheumatoid arthritis in a rat model**

Jacob DeSchepper, Baylin Snyder

Faculty Sponsor(s): *Dr. Bruce Bethke*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Rheumatoid Arthritis (RA) is an autoimmune condition effecting 54 million Americans. Current treatments for this life-limiting disease are associated with uncomfortable side effects. Recent research, however, suggests that a modified form of a ketogenic diet may be able to slow progression of the disease without the use of immunomodulatory and anti-inflammatory medications. In this study the influence of a modified ketogenic diet, consisting of 65% fat, 25% protein, and 10% carbohydrate, on the progression of an induced form of RA was tested in late adolescent rats. Detailed analysis of the rat's gait in terms of limb swing time, swing angle, and swing length following pristane induction of RA suggest that animals fed a modified ketogenic diet exhibited a delay in disease onset and progression relative to animals on a standard rodent diet. However, additional studies analyzing multiple metrics will be required to confirm this observation.*

## Oral Presentations

### **A Survey of Western Pennsylvania Tick Species and the Pathogens They Carry**

Rachel Keller

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*A survey of ticks in Western Pennsylvania can provide valuable information with ecological and medical applications. Different species of ticks in Pennsylvania are known to carry vectors which cause a variety of diseases including Lyme Disease and spotted fevers. The knowledge of what species of ticks are present in the area can aid in more accurate diagnoses in both human and veterinary medicine. Ticks were collected from Allegheny, Cameron, Clarion, Elk, and Westmoreland counties using tick drag cloths, removal from pets, and by submissions from volunteers. Ten collected specimens were sent to Jonah Ventures for metagenomic DNA sequencing. The presence of the Lyme Disease-causing bacteria, *Borrelia burgdorferi* was identified along with a large amount of a strain of *Rickettsia monacensis*. This bacterium has been linked to a Mediterranean Spotted Fever-like illness in parts of Europe. Further investigation into the characterization of this bacterium and its pathogenicity is necessary.*

### **An investigation of social isolation and its PTSD inducing effects on the behavior, alcohol consumption, and Allopregnanolone levels in mice**

Scott Meyers, Joseph Rudzinski

Faculty Sponsor(s): *Fr. Shawn Anderson O.S.B.*

Discipline(s): Biology, Psychological Science

*A.J. Palumbo Student Research Endowment*

*Healthcare professionals and researchers are currently in the early stages of establishing clear parameters of mental disorders. Current diagnostic strategies have a lack of definitive associated biomarkers. Throughout phase one of the experiment, we sought to identify bioindicators of PTSD to improve upon diagnostics. Allopregnanolone is an allosteric modulator of GABA, the major inhibitory neurotransmitter of the CNS. We attempted to derive a correlation between Allopregnanolone levels in mouse blood plasma, and PTSD inducing conditions. Alcoholism was explored, which is another debilitating disease which has a substantial correlation of incidence in people who suffer from PTSD. During phase two of the project, we sought to demonstrate this connection by analyzing alcohol consumption and associated anxiety related symptoms via the marble bearing test. We found a statistical relevance between certain binge drinking tendencies and anxiety like behavior exhibited by marble burying tests.*

## Oral Presentations

### **Assessment of Novel Cocktail and Delivery System in Murine Regeneration**

Taylor Hatchet, Jennae Popelas

Faculty Sponsor(s): *Dr. Bruce Bethke*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Mammals are poor models of regeneration compared to salamanders, newts, and lizards. A regenerative response in mammals requires the presence of extracellular matrix, and bone and collagen stimulation. Bone morphogenic proteins (BMPs) are known to lay down the scaffolding of cartilage and collagen needed for joint and bone formation. Nutmeg extract has been reported to activate the mTOR pathway which leads to muscle generation. The protease family, calpains, impede muscle development but the corticosteroid dexamethasone is reported to inhibit calpains. Consequently, this experiment evaluated the efficacy of a cocktail consisting of BMP- 2 and 9, dexamethasone, and nutmeg extract, in a dimethyl sulfoxide (DMSO) carrier to initiate digit regeneration in young mice. Data collected in the form of interval imaging of the digit stumps and Real-Time PCR assessment *Cola2* and *Myh8* expression did not yield reliable data due to challenges associated with imaging live mice and poor RNA recoveries.*

### **Assessment of the Effects of Ractopamine Supplementation on Stress Levels, Anxiety-like Behavior, Cardiac Hypertrophy and Cardiac Muscle Damage in Male Swiss Webster Mice**

Lauren Diamond

Faculty Sponsor(s): *Fr. Shawn Anderson O.S.B.,*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Ractopamine is a non-selective Beta-adrenergic agonist that is used in supplements given to livestock in order to promote lean muscle growth and reduce body fat. Ractopamine use has been linked to increased stress and cardiovascular issues in animals being fed the supplement. This study proposes to investigate the effect of ractopamine on changes in stress levels and cardiovascular function in male mice. It was predicted that mice given ractopamine would show increased levels of anxiety-like behavior in the open field test, elevated fecal corticosterone levels, and left ventricular hypertrophy compared to the control mice. The hypothesis was tested by treating mice with ractopamine for four weeks and conducting behavioral and cardiovascular testing. The Open Field Test and fecal corticosterone samples were used to determine the effect of stress. By examining left ventricular hypertrophy, damage to cardiac muscle was determined.*

## Oral Presentations

### **Competitive Behaviors at Food Patches among Feeder-Visiting Birds in Southwestern Pennsylvania**

Michael Kardos

Faculty Sponsor(s): *Dr. James Kellam*

Discipline(s): Biology

*Birdfeeders draw multiple bird species to share space and resources, often inciting competition. In this study, it was hypothesized that larger species would be more successful (able to displace other species) more often than smaller species. Competition was also expected to intensify as winter weather arrived and temperatures dropped, straining energy stores among birds. In this study, feeders at Winnie Palmer Nature Reserve were observed for two hours weekly from October to January, as species abundance and displacement events were recorded. The results supported the hypotheses in that larger birds were shown to displace other species more often than they were driven from the feeders themselves. Also, species abundance and competition increased as the season progressed and temperatures declined. Blue Jays participated in far more displacement events than any other species while others, like the Northern Cardinal, were less competitively effective than their size predicted.*

### **Examining the Impacts of Sunscreen Filters on Mithraculus crabs**

Margaret Hines

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Sunscreen pollution is a growing concern for the conservation of tidal areas. Often introduced via recreational beachgoers, UV filters can negatively impact marine life through a variety of pathways. Mineral filters like zinc oxide (ZnO) are considered more environmentally friendly than organic UV filters, but metal oxides are known to produce free radicals that may overwhelm an organism's antioxidant capacity and cause lethal DNA degradation. This experiment examines the response of two crab species, *Mithraculus sculptus* and *Mithraculus forceps*, to varying concentrations of ZnO. Crabs were exposed to 0  $\mu\text{g/L}$ , 10  $\mu\text{g/L}$ , or 100  $\mu\text{g/L}$  of ZnO over 14 days. I will present results on how ZnO concentration affects the activity of the antioxidant enzyme glutathione peroxidase and the level of DNA degradation within crab tissue and discuss the implications these results may have for marine conservation.*

**Identification and Treatment of Lipopolysaccharide induced Inflammation Via Butyrate and Lactobacillus plantarum**

William Keough, Savanah Gerstnecker

Faculty Sponsor(s): *Fr. Shawn Anderson O.S.B.*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*In today's society, many people fall victim to inflammation, specifically muscular and neurological inflammation. Effective treatment and control of inflammation can increase overall health, as well as decrease rehabilitation time. We hypothesized that treatment with butyrate and Lactobacillus plantarum would significantly decrease the levels of muscular and neural inflammation induced, as well as overall weight loss induced by i.p. injections of lipopolysaccharide (LPS) in male Swiss Webster mice. The experiment was tested using a timed hang test, a timed weighted force swim test, and a Von Frey filament test. Levels of NFkB and IL-6 expressed in a sample of the temporal cortex, blood plasma, and the tibialis anterior were determined using appropriate ELISA kits. The data suggest a non-significant trend that treatment of L. plantarum and butyrate decreased overall muscular and neurological inflammation.*

**Influence of Docosahexaenoic Acid in the Presence or Absence of Estradiol on Amyloid-Beta Induced Programmed Cell Death in Human Neuroblastomas**

Jared Ackerman

Faculty Sponsor(s): *Dr. Bruce Bethke*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Alzheimer's disease (AD) is the leading cause of dementia worldwide, with millions stricken each year. While there is no cure for AD, certain compounds have shown therapeutic promise. The omega-3 fatty acid docosahexaenoic acid (DHA), for example, exhibits neuroprotective effects. However, it is uncertain how the ovarian hormone estradiol influences the neuroprotective effects of DHA. To test the neuroprotective effects of DHA and estradiol, human neuroblastoma SH-SY5Y cells were exposed to amyloid-beta peptide (A $\beta$ ) aggregates and then treated with either DHA, estradiol or DHA in combination with estradiol. Cell viabilities and apoptotic frequencies were assessed, as were the activation or repression of the target genes, TXNP1, PI3K, and GSK3. DHA treatment had an unexpected neurotoxic effect on the cells resulting in quick death, and consequently little data from the DHA treated cells. However, estradiol treatment protected cells from A $\beta$  aggregation related death.*



## Oral Presentations

### **Metagenomic and Gel Electrophoresis Qualitative Analysis of Bumble Bee Gut Microbiomes**

Graham Merlin

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Bees inhabit every continent on earth outside of Antarctica, but in recent decades, sharp population declines have been observed unilaterally. This is the result of various factors, both anthropogenic and otherwise, and it poses an explicit threat to global agricultural stability. One of the most recognized and understood of these threats is widespread infection by microsporidian parasites within the genus *Nosema*. *Nosema* infects the hindgut of both honeybees and bumble bees, causing dysentery-like symptoms, sterility, and death. I collected hindgut samples from commercially-raised bumble bees which had been treated with various essential oils as part of a colleague's research. I then sent a subset of the samples to Jonah Ventures for metagenomic screening for various types of microorganisms and conducted PCR on another subset in the lab. The resultant data from both of these sample groups were analyzed to determine the genetic contents of these bees' guts.*

### **Muscle Regeneration of *Micropterus salmoides* Comparison to Substrate Setting.**

Zachary North

Faculty Sponsor(s): *Br. Albert Gahr O.S.B.*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Muscle regeneration has been a relevant study for hundreds of years looking into the very fine elements of myogenic factors. The purpose of this research is to study the *Micropterus salmoides* (Largemouth Bass) and how a gravel, sanded, and wooded substrate would affect the muscle regeneration and expression of specific of these regulatory factors. The *Micropterus salmoides* test specimens were caught using angling techniques and they were placed in tanks of a specific substrate for a two-week acclimation. Following acclimation, the cryo-injury method was used as a simulated injury, and regeneration phases begun. After two weeks, the fish were euthanized, and the muscle site was extracted and analyzed. Using multiple points of significance, conclusions could be made that these substrates have a direct effect on specific myogenic regulatory factors. Using these results, environmentalist can look towards improving the health of the *Micropterus* genus during the transition into breeding.*

**Neutralization of Free Radicals Formed Through Strenuous Physical Exercise Using Antioxidative Properties of Red Dragon Fruit Powder**

Devon McCarty, Conrad Pearson

Faculty Sponsor(s): *Dr. James Kellam*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*When an athlete is performing a strenuous task, the metabolic demand of the locomotive muscles increases drastically resulting in a higher demand for oxygen through the bloodstream. Upon becoming heavily strained, the muscle experiences oxidative stress, a state in which an inadequate supply of energy is produced by the muscle as a result of a lack of oxygen being delivered to the cells. The muscle then begins to produce energy through anaerobic respiration, where free radicals such as lactate begin to flood the bloodstream. Dragon Fruit contains antioxidative properties that may be capable of neutralizing these free radicals, hindering the toxicity around the muscle and potentially providing the muscle a higher supply of oxygen. In this study, participants were provided with Dragon Fruit powder and a placebo over the course of 10 weeks where they were blood tested and analyzed for a concentration of lactate within the blood.*

**Probiotics Effect on Tryptophan Metabolism and Serotonin Production within the Gut**

Isabella Molinaro

Faculty Sponsor(s): *Dr. Jennifer Koehl*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*The health of the intestinal microbiota is essential to ensure proper communication along the gut-brain axis. Dysbiosis of the microbiota due to stress and inflammation can cause a dysfunction in tryptophan metabolism resulting in decreased production of serotonin. This decrease can negatively affect communication along the gut-brain axis, resulting in depressive symptoms. To correct the stressful state of the gut, this study looked to see if a probiotic supplement can restore proper gut microbiome in vitro through biofilm growth and levels of tryptophan and serotonin. Probiotic supplementation increased and enhanced biofilm growth even when stressed; however, the molecular levels of tryptophan and serotonin were unable to be detected for a conclusive analysis. Further assessment of probiotic's restorative function will need to be done to determine if probiotics can restore proper gut-brain communication.*

## Oral Presentations

### **Saint Vincent Fields Teams for the World Series of Birding**

Alyssa Baker, Francis Boehm, Rachel Dudek, Luke Geiger, Maggie Hines, Michael Kardos, Joseph LaForest, Sarah Maidment, Lauren Makovics, Olivia Moore, Sarah O'Tool, Rachael Schiafone, Moira Sullivan, Thomas Syphan, Leah Weimerskirch

Faculty Sponsor(s): *Dr. James Kellam*

Discipline(s): Biology

*Saint Vincent College has been sending student teams to New Jersey Audubon Society's "World Series of Birding" competition since 2017. The event is a 24-hour contest to find the most bird species within Cape May County (NJ) on the first weekend of May. The time and place of the contest is based on the fact that it is peak migratory season for birds at that time of year, and Cape May is an important stopover site for birds using the Atlantic Flyway route along the coastline. In May of 2020 during the COVID-19 pandemic lock-down, travel to New Jersey was disallowed, and students were sent home. Our presentation tells how we persevered in 2020 despite the virus, and what our plans are for the next World Series, slated for May 8, 2021.*

### **Stress in Mice With and Without Enrichment**

Caitlin Bridge, Andrea Pancurak

Faculty Sponsor(s): *Dr. Michael Rhodes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Our experiments determined the influence of predatory pheromones in male and female laboratory mice, and resulted in an increase in abnormal behaviors, as well as an increase in corticosterone release from the HPA-axis. An increased release of corticosterone from our experimental groups indicated an increase in the stress response when presented with predatory pheromones. We hypothesized that the control mice would have a limited stress response, while our experimental groups would show an increased response. The control groups were not exposed to any pheromones and in the second week were presented with enrichment items while our experimental groups experienced pheromone exposure both weeks with the addition of enrichment items the second week of testing. Our results indicated an increased stress response in our experimental mice, as well as a more prominent stress response in both experimental and control female mice.*

## Oral Presentations

### **The Affects of Climate Change on Plant Development and Pollen Production**

Madelyn Cornman

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*The effects of climate change have shown changes to plant reproduction timelines, pollen composition, and flowering. For this experiment, I grew squash plants under four different conditions and measured how their flowers and pollen changed under each of the conditions. Their height, buds, and flowers were measured and counted, and pollen was obtained from each of the plant samples. The plants under drought and heat conditions were predicted to have less flowers, smaller flowers, and less pollen compared to the plants grown with regular watering and no added heat. The plants that were grown under drought with no added heat were predicted to have smaller flowers and less pollen compared to the plants grown with regular watering and no added heat. By comparing these plant environments, future experiments can determine how the effects of climate change on plants can be harmful to ecosystems and other species.*

### **The Antimicrobial and Antibiofilm Activities of Essential Oils on the Oral Microbiome**

Courtney Mattucci, Michael Cella

Faculty Sponsor(s): *Dr. Jennifer Koehl*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Scientific studies have shown that essential oils possess antimicrobial properties. It is hypothesized that oregano, rosemary, lemongrass, and coriander will inhibit bacterial growth and biofilm formation of the opportunistic cariogenic pathogens *S. mutans*, *S. pneumoniae*, and *A. viscosus* individually and in combination because each of these oils have presented antibacterial properties. A Kirby Bauer test and Minimum Inhibitory Concentration (MIC) test were run to analyze the quantitative and qualitative antimicrobial properties of the oils. Lemongrass and oregano showed significant inhibition of bacterial growth against the three bacteria compared to rosemary and coriander. Lemongrass and oregano showed no significant inhibitory effects against biofilm formation. With further research, essential oils like lemongrass and oregano show promise in the fight against oral diseases and may be an alternative to traditional oral hygiene products.*

**The Effect of Dietary Changes on the Behavior of Zebrafish**

Olivia Zulisky

Faculty Sponsor(s): *Br. Albert Gahr O.S.B.*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Food sources have an effect on the behavior and cortisol production. Three groups of 10 zebrafish were given a diet of either TetraMin flakes, brine shrimp, or mixture of both for three weeks. The group receiving both was alternated between food sources every other day. The Novel Tank Test was used to examine the behavior of the fish. After euthanization, the bodies were used to determine cortisol levels using a Cortisol Assay. The results supported the hypothesis in that diet affected the behavior of the fish. The results indicated that the zebrafish on the natural (brine shrimp) diet produced less cortisol than those on the commercial (TetraMin) diet. The fish given TetraMin had higher levels of cortisol and exhibited more stressed behaviors. The mixed diet group displayed a moderate number of stressed responses and decent cortisol level. Zebrafish fed a natural diet showed more natural behavior and reduced cortisol production.*

**The effect of Mechano-Growth factor (MGF) knockdown on Muscle regeneration in Zebrafish.**

John Martin

Faculty Sponsor(s): *Br. Albert Gahr O.S.B.*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Zebrafish are often used in the scientific study of gene expression due to the ability to compare their results to those of humans. Within this field of research, Mechano-Growth Factor's (MGF) role in muscle regeneration is not well characterized. This research project is focused on uncovering the mechanisms of MGF during muscle regeneration and understanding the effects of using a knock-down morpholino antisense oligomer (MO). Using cryo-injury to damage muscle tissue and administering the MO, changes in the rate of muscle regeneration were analyzed via morphological and gene expression analyses. Comparing the injury scale scores and gene expression showed little significance in the difference in the rate of muscle regeneration. The implications from these analyses is that the knock-down effect from the MO on the gene responsible for the production of MGF was not effective in changing muscle regeneration in the zebrafish, contrary to results shown in other species.*

## Oral Presentations

### **The Effects of Donepezil on Anxiety Prior to Sleep Onset**

Nicollae Crawford

Faculty Sponsor(s): *Dr. Michael Rhodes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Sundown syndrome is perhaps the least understood form of dementia. Because it is understudied, the goal of this research was to test the effects of donepezil on anxiety prior to sleep onset. Donepezil (a cholinesterase inhibitor used for dementia patients) was administered to one group of mice and saline to another group (the control group). To measure the effects of donepezil, mice performed marble displacement tests prior to sleep onset; these were used to determine anxiety levels corresponding to the number of marbles displaced. Additionally, certain behaviors indicative of stress were observed, like fighting. Corticosterone assay kits were used to measure stress responses in feces and blood samples. Corticosterone concentrations showed a trend suggesting that donepezil was effective at lowering stress, whereas the marble tests generally refuted the hypothesis. This experiment offers insight on whether donepezil can be used as an effective treatment for sundown syndrome patients.*

### **The Effects of Environmental Enrichment on Rehabilitated Owls in Captivity**

Mary Person, Gabriella Petruccelli

Faculty Sponsor(s): *Dr. James Kellam*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Many wild animals live in captivity and their enclosures can lack resemblance to their natural environment, which often has detrimental consequences on their physical and mental health. This study explored the effects of providing enrichment for three rehabilitated and non-releasable owls. We predicted that their varying degrees of tameness would influence how they respond to novel stimulation. Our research method involved using trail cameras at a wildlife rehabilitation facility to observe the owls' behavior. We also collected fecal samples for corticosterone metabolite assessment, both before and after the addition of enrichment. The corticosterone assay yielded marginally significant data for only the intermediately socialized owl, revealing a decrease in corticosterone post-enrichment. Footage of all three owls showed increased movement once enrichment was introduced. We conclude that implementation of appropriate enrichment could improve the quality of life for captive wildlife.*

## Oral Presentations

### **The Effects of Oxytocin and Bonding on the HPA Axis of Male and Female Rats Through Stereotaxic Surgery Methods**

Taylor Tritapoe, Stephanie Weinskovich

Faculty Sponsor(s): *Dr. Michael Rhodes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Oxytocin (OXT), associated with social bonding, reduces the concentration of glucocorticoids. This study examined the effect of OXT on CORT in male and female rats by injecting OXT intraperitoneally (IP) and by microinjection into the lateral ventricle in addition to stimulating OXT release through dorsal tickling. It was hypothesized that IP, microinjections, and dorsal tickling would reduce the concentration of CORT, while experimental rats were hypothesized to bury less marbles than control rats. Due to COVID-19, the original sample size was reduced; thus, no statistically significant conclusions were achieved. However, IP injections neither reduced the number of marbles buried, nor reduced CORT compared to the control. Although bonding had no effect on marble burying, it appeared that CORT was reduced in rats that were tickled. Additionally, the surgical results suggested that microinjected OXT may be inversely related to CORT.*

### **Tracking Spring Queen Bumble Bee Emergence and Nest Founding on Campus**

Taylor Hatchet

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*Bumble bees are important native and commercially-available pollinators worldwide. In the fall, queen bumble bees are produced from underground colonies and they mate with males. Shortly after mating, the queens burrow into the soil to hibernate for the winter. Upon emergence from hibernation in the spring, they feed on nectar and pollen from flowers and search for suitable nest sites to start their new colonies. To understand the seasonality of bumble bee species present in Pennsylvania, we conducted a non-lethal mark-recapture survey of spring queens as they emerged from hibernation on campus. We present data we collected on species abundance, species emergence timing, nest-searching and nest-founding behavior, and floral visitation. We make recommendations for providing food and habitat for early spring bumble bee queens to ensure success during this vulnerable period of their life cycle. This is the beginning of a long-term study of bumble bee seasonality at SVC.*

**Investigation of the Polyethylene Microparticle Protein Corona in a Simulated Human Gastric Microbiome.**

Madeline Mutinelli

Faculty Sponsor(s): *Dr. Matthew Fisher*

Discipline(s): Biochemistry

*When microparticles come into contact with biological fluids, biomolecules such as proteins and lipids adsorb to the particle surface. This “biocorona” has implications on the particle within the body, influencing the surface properties of the particle and, thus, governing the fate and cellular interactions of the particle. The present study aimed at characterizing the protein biocorona of polyethylene microspheres within a simulated human gut microbiome using *Lactobacillus plantarum*. With growing evidence supporting the accumulation of plastic microparticles in the environment, this question is important to understanding health risks associated with plastic particle ingestion. After incubation of the particles, isolation of the particle-protein complex, and protein analysis, no protein was detected. These negative results suggest that protein corona formation may be a function of several different variables, some of which will be examined in this presentation.*

**Synthesis and testing of Cu(II)-binding peptoid monomers for use in amphipathic antimicrobial drugs**

Thomas Syphan

Faculty Sponsor(s): *Dr. Daryle Fish*

Discipline(s): Biochemistry

*One solution to the problem of antibiotic resistance is to utilize peptoids as targets in drug development. These are a family of foldamers structurally related to peptides whose unique structure offers superior synthetic and clinical potential.*

*This research project investigated potential synthesis pathways for selected peptoid monomers using previously described methods. Novel substrates for synthesis were chosen to give the final structure the ability to form a strong multidentate coordinate bond with Cu(II) ions. This has been shown to enhance potency of peptoid drugs via selective oxidation of bacterial membrane lipids.*

*The success of the procedure was assayed at each step using a combination of TLC, GC-MS, IR, and HNMR analysis. Each monomer was also qualitatively assayed using UV-Vis Spectrophotometry, where increased absorption at 380 nm was correlated to enhanced Cu(II)-binding.*

**Varying macronutrient ratios in the ketogenic diet for type 2 diabetes treatment in animals**

Danielle Chorba

Faculty Sponsor(s): *Dr. Matthew Fisher*

Discipline(s): Biochemistry

*My research aims to determine the best macronutrient ratio within the ketogenic diet that provides the best glycemic control of animals with Type II Diabetes Mellitus. Preliminary research shows a benefit in the use of the ketogenic diet as a form of diabetic management; however, the precise chemical composition of the diet as not yet been explored. Treating Type II Diabetes in animals is often costly, as pet owners must provide insulin injections to their pets 1-3 times a day. Adjusting a pet’s diet may be a safer alternative form of treatment than insulin injections and other diabetic medications. To see the effects of this diet on the diabetes, glucose concentrations in the blood were measured using an over-the-counter glucometer and glycated albumin levels were determined by the use of an ELISA. Preliminary research results show unusual behavior in glucose measurements.*



## Oral Presentations

### **Analysis of a Technique for Synthesis of Size-Controlled Colloidal Bismuth Nanoparticles**

Max Planchon

Faculty Sponsor(s): *Dr. Jason Vohs*

Discipline(s): Biochemistry, Chemistry

*Research was performed to analyze and attempt to modify a pre-existing bismuth nanoparticle formulation. This method involved a metal salt precursor, a carbonyl-containing polymer for size control, a solvent suitable to all solutes, and a reducing agent. Initially, the research sought to modify the polymer used previously in the literature, though solubility issues prevented this exploration. Thus, analysis of the efficacy of the previously investigated technique in yielding a nanoparticle product and analysis of the size-control relationship between polymer and metal salt ions in solution was performed. IR Spectra confirmed the interaction between the carbonyls of the polyvinylpyrrolidone and Bi<sup>3+</sup> ions. UV-Visible spectra were used to confirm that light-scattering characteristics of the product were consistent with that of a nanoparticle product. A size-controlled nanoparticle product was confirmed to have been synthesized.*

### **Effect of UV Light Exposure on Surface Characteristics and Sorption Capacity of Microplastics**

Hannah Schilpp

Faculty Sponsor(s): *Dr. Matthew Fisher*

Discipline(s): Biochemistry

*Microplastics, particles less than 5 mm in diameter formed from the breakdown of plastic debris, are prevalent environmental pollutants. They have the potential to enter the human body and have relatively unknown effects on health. Little is known about the impact of environmental conditions such as UV light exposure on sorption capacity of potential pollutants by microplastics. This study tests the effect of UV light exposure (0, 1, 2, 24, and 96 hours) on the surface texture and sorption capacity of polystyrene microplastic spheres. Scanning electron microscopy and stereo optical microscopy were used to assess surface texture. Sorption capacity was assessed by measuring phenanthrene or hexachlorobenzene concentration over time. No significant difference in surface texture was observed. Phenanthrene concentration showed a steady decrease for 0, 1, 2, and 24 hour light exposed plastics, but this trend was not consistent for 96 hour light exposed plastics or hexachlorobenzene trials.*

### **Investigation of curcuminoids as novel inhibitors of matrix metalloproteinase-13 for treatment of osteoarthritis**

Mary Anand

Faculty Sponsor(s): *Dr. Matthew Fisher*

Discipline(s): Biochemistry

*Osteoarthritis is a degenerative joint disease affecting 32.5 million Americans that leads to progressive loss of mobility. One of the defining features of osteoarthritis is the degradation of articular cartilage, which is accelerated by overexpression of matrix metalloproteinase-13 (MMP-13), an enzyme which cleaves type II collagen. Currently, there are no FDA-approved drug inhibitors of MMP-13 to treat the disease process of osteoarthritis. Curcumin, demethoxycurcumin, and bisdemethoxycurcumin are curcuminoids, molecules derived from the rhizome of the Curcuma longa plant, and are inhibitors of some enzymes. The purpose of this study was to determine whether curcumin, demethoxycurcumin, and bisdemethoxycurcumin are novel inhibitors of MMP-13. Results suggest that bisdemethoxycurcumin may be a promising MMP-13 inhibitor and it does not seem to be a competitive inhibitor.*

### **Electronically Controlled Delivery of Kynurenic Acid via PEDOT Functionalized Carbon Nanotube Coatings**

Nicholas Driscoll

Faculty Sponsor(s): *Dr. I. Mitch Taylor*

Discipline(s): Chemistry

*Kynurenic Acid is a known antagonist to glutamate receptors in the brain, which allows for the regulation of dopamine. However, in order to deliver KYNA into the brain, large probes have to be employed which can unfortunately result in a great deal of harm. The field of controlled drug release has promise as an answer to this problem. A coating of poly(3,4-ethylenedioxythiophene) functionalized carbon nanotubes has been shown to increase selectivity and sensitivity for detection of resting DA. We are interested in the ability of the PEDOT/CNT coatings to be loaded with KYNA, which can then be released. We successfully optimized the PEDOT/CNT coatings on glassy carbon electrodes, as shown by a decrease in impedance and increased charge storage capacity. KYNA loading is performed via copolymerization as a new, PEDOT/CNT-KYNA coating is synthesized. Controlled release will be performed via voltage stimulation and then quantified using high performance liquid chromatography.*

### **Synthesis of an adamantyl substituted N-heterocyclic carbene**

Anmarie Misterkiewicz

Faculty Sponsor(s): *Dr. Jason Vohs*

Discipline(s): Chemistry

*Sterically hindered N-heterocyclic carbenes (NHCs) have shown impressive flexibility despite their extreme steric demands. NHCs are strong electron donors, perfect for use in catalysis. So far, research on substituents on carbene ligands has mostly been two-dimensional, flexible structures. This experiment targets the synthesis of an imidazolium salt NHC with three-dimensional substituents. Adamantane was chosen as a bulky, three-dimensional substituent. The imidazolium salt was synthesized in three steps, beginning with p-toluidine and 1-adamantanol. The resulting imidazolium salt was coordinated to silver and copper. A novel NHC-ligand possessing large, adamantyl based substituents has been prepared. Herein are reported its synthesis and subsequent attempts to form transition metal coordination complexes.*

## Oral Presentations

### **Synthesis of Bulky Copper Carbenes in a Copper Click Reaction to Determine the Impact on the Yield of Triazoles**

Joel Taylor

Faculty Sponsor(s): *Dr. Jason Vohs*

Discipline(s): Chemistry

*Triazole have many applications in medicinal chemistry as antifungal medications and fungicides in crop protection. Utilizing a known copper click reaction, we plan to attach copper to a series of increasingly bulky carbenes and react them the click reaction to determine their impacts on the yield of triazoles. This can determine the potential applications of different carbenes in the copper click reaction, broadening the amount of available carbenes that are able to be used as copper catalysts to create triazoles. We have confirmed that two separate methods must be used to attach copper to specific carbenes depending on the nature of the carbene. The same method of attaching copper to the carbenes cannot be used for all carbenes and not every carbene was able to accept the copper ion. Not every copper catalyst was able to react in the click reaction to synthesize triazoles.*

### **A Critical Analysis of Social Bond Theory on the Recidivism of Gang Members**

Olivia Williams

Faculty Sponsor(s): *Dr. Bruce Antkowiak, Dr. Eric Kocian*

Discipline(s): Criminology, Law and Society

*The purpose of this presentation is to further examine the practice of social bond theory as a means to reduce recidivism among gang members in prison, on the streets, and towards at-risk youth. Gangs are the result of a societal problem and therefore need a social theory to aid in a solution. The effectiveness of this method is evident through the success of specific correctional treatment, community-based prevention/intervention, supportive re-entry themes, and more. A critique of deterrence-based policies surrounding this issue will be paired with future recommendations, which will primarily be a continuation of already effective social methods.*

### **Examining the Effects of Marijuana Legalization in the United States**

Ashley Baker

Faculty Sponsor(s): *Dr. Bruce Antkowiak, Dr. Eric Kocian*

Discipline(s): Criminology, Law and Society

*This analysis addresses the legalization of marijuana in the United States and the effects it has on the criminal justice system, the healthcare system, and the youth across the country. This analysis includes theoretical and legal components as well as policy recommendations. Marijuana is being legalized for medical or recreational purposes and the specific policies differ by state. As of April 2021, thirty-six states have legalized medical marijuana while seventeen of those states have legalized recreational marijuana; marijuana remains illegal at the federal level (Marijuana Policy Project, 2021). Ultimately, since the majority of existing research is conflicting, more data needs to be collected to determine if the legalization of marijuana has an overall positive or negative effect on society.*

**Fatal Shootings and Body Camera Footage: An Analysis of Context in Law Enforcement Activity**

Derek Fether

Faculty Sponsor(s): *Dr. Sarah Daly, Dr. Bruce Antkowiak*

Discipline(s): Criminology, Law and Society

*In the United States there are growing concerns of police misconduct and racial issues when deadly force is used by law enforcement officials. Current research of police shootings lack insight into the context of the use of deadly force. The research discussed within this paper involved selecting body camera footage from 2019 in which officers use of deadly force resulted in a fatality. The context of these shootings resulted in a series of questions in the form of a checklist that was used to analyze a total of 58 cases that were randomly selected from 2019. The study has shown that one major pattern within these fatal shootings involved failure to comply from the individual encountered by police.*

**Human Trafficking Enforcement: The Need for Change**

Thomas Franey

Faculty Sponsor(s): *Dr. Bruce Antkowiak*

Discipline(s): Criminology, Law and Society

*Human trafficking within the United States is often an overlooked issue. What many believe to be a distant, foreign issue happens frequently within American borders. That lack of attention from the public is reflected in the way human trafficking laws are enforced. How law enforcement, as well as other governmental agencies, approach the issue is ineffective. That conclusion was the result of a thorough review of the literature that demonstrates that traffickers are rarely punished for their crimes, and victims are often not properly assisted. This paper offers several different policy recommendations based upon classical criminological theory which maintain a balance between assisting victims and punishing offenders.*

**Mental Health Effecting Crime: Social Bond Theory and Minority Communities**

Gretchan Baker

Faculty Sponsor(s): *Dr. Bruce Antkowiak, Dr. Sarah Daly*

Discipline(s): Criminology, Law and Society

*Juvenile delinquency research attempts to fill the gap between the transition from adolescence to adulthood. Gained knowledge on the topic will help those struggling with multiple pressing factors while providing effective prevention and rehabilitation methods. This specific article aims to fill the gap in research by considering juveniles with mental health disorders, the mental health rates of European American juveniles compared to African American juveniles, and how large the criminal justice system affects the rate at which juveniles offend. Through theory and policy, the article answers if social bonds produce positive mental health and less deviancy. Based on the research provided, a juvenile having a mental health disorder increases the probability of them participating. Further, the article supports that African American juveniles experience higher poor mental health rates than European Americans which directly affects reoffending rates.*

## Oral Presentations

### **Sex Offenders and Recidivism Rates**

Michael Stasko

Faculty Sponsor(s): *Dr. Sarah Daly*

Discipline(s): Criminology, Law and Society

*There are many groups that are targeted by sex offenders from a sex, race, and age standpoint. Therefore, the topic is very applicable and something that all categories of people could be educated on. The crime itself can have drastic changes on the victim's mental health, and if one imagines their relative being a potential victim, they would want to know why a sex offender behaves in such a manner and what makes them motivated to commit such an act. They would also like to know if the sex offender reoffended, which will point to how effective treatment was in deterring the sex offender. This study attempts to provide more clarity on those issues. The central thought of this study is to address sex offender recidivism rates. There has been an abundance of research performed on sex offenders, and policy and treatment have not reached their potential when reducing it. There are also additional factors that can increase the probability that a sex offender will re-offend.*

### **Sexual Assault and Bystander Intervention**

Debra Pietranico

Faculty Sponsor(s): *Dr. Bruce Antkowiak*

Discipline(s): Criminology, Law and Society

*Numerous studies in the past have been conducted regarding the issue of sexual assault on college campuses. Findings have distributed that this problem is very prevalent and continues to occur. Particular campuses may see higher case numbers based on population, the college atmosphere affiliated with the institution, presence of greek life, and or more reportings. The purpose of this study is to provide information on sexual assault on college campuses by utilizing a series of secondary data that has previously been reviewed, analyzed, and distributed. This study will investigate the likelihood of bystander intervention when witnessing a sexual assault scenario and mention various barriers to why individuals may hesitate to intervene.*

### **Sovereign Citizen Movement**

Christopher Miller

Faculty Sponsor(s): *Dr. Bruce Antkowiak, Dr. Eric Kocian*

Discipline(s): Criminology, Law and Society

*The United States of America faces a current issue known as the Sovereign Citizen Movement. Sovereign Citizens are classified by the Federal Bureau of Investigation as a terrorist threat. Unlike other forms of extremist groups, limited research is known about Sovereign Citizens Movement. Since little information and research is known, secondary data will be used to illustrate the severity of this issue. The concern is that Sovereign Citizens challenge the legal system and identify themselves as "sovereign" or independent from United States laws. The purpose of this project is to review all pertinent literature concerning the movement, and discuss how sovereign philosophies affect law enforcement officers. The analysis shown above serves as the groundwork for future research concerning this topic.*

### **Theoretical Analysis on Juvenile Gang Involvement**

Jesse Gillespie

Faculty Sponsor(s): *Dr. Bruce Antkowiak, Dr. Sarah Daly*

Discipline(s): Criminology, Law and Society

*Juvenile delinquency and youth gang involvement is a problematic phenomenon in the United States that poses present problems in the criminal justice system and adverse effects in the future. Secondary data is utilized to provide empirical support for criminological theories explaining why juveniles join gangs as well as engage in gang-related offenses. This article will provide a general explanation of what theories are used to explain juvenile gang recruitment and involvement. An assessment of past and present policies will be made along with recommendations based on criminological theories that have gained empirical support.*

### **Underage Drinking Understood by Social Learning Theory**

Luke Thomas

Faculty Sponsor(s): *Dr. Bruce Antkowiak*

Discipline(s): Criminology, Law and Society

*This project explores the connections between underage drinking and Aker's social learning theory. The project will examine how learning behaviors involving alcohol from influential people can mold an adolescent's relationship with alcohol. There will be an examination of the crime as well as the components of the theory and its application to peer, romantic, and parental influence on alcohol consumption. Policy recommendations will also be made to offer avenues to inhibit underage drinking.*

### **Effect of Diet on COVID-19 Severity by Country**

Christina Sible, Kimberly Horn

Faculty Sponsor(s): *Dr. Sarah Dumnich*

Discipline(s): Data Analytics, Biology

*We investigated the effect of diet on COVID-19 severity by country. We used data collected by Food and Agriculture Organization of the United Nations, the USDA Center for Nutrition, the Population Reference Bureau, and the Johns Hopkins Center for Systems Science and Engineering. We created multiple linear regression models to determine if there is a correlation between specific food intake and COVID-19 1) Confirmed cases, 2) Deaths, 3) Recovered cases, and 4) Active cases. We found the top significant variables for each COVID-19 metric and compared these variables to the recommended daily amount for their food group.*

### **Predicting Happiness**

Zack VonStein, Jessica Guesman

Faculty Sponsor(s): *Dr. Sarah Dumnich*

Discipline(s): Data Science

*We investigated whether certain variables are related to the general happiness score reported by various countries. Variables that were included to predict the happiness score were GDP per capita, healthy life expectancy, social support, freedom to make life choices, generosity, and corruption perception. This data was collected by the Gallup World Poll. We used multiple linear regression to build a regressor to predict happiness. We will use this regressor to predict what the happiness score will be in the US in 2022.*

## Oral Presentations

### **Predicted Strokes**

Kethrie Heasley, Kimberly Weinman

Faculty Sponsor(s): *Dr. Sarah Dumnich*

Discipline(s): Data Science

*We investigated whether there is an association between basic life factors and health factors, and having a stroke. The data we used is from the World Health Organization, obtained through Kaggle Datasets. We trained multiple classifiers and evaluated them to see which worked with our data the best. Out of the machine learning algorithms used, logistic regression was found to be the best classifier. Through backwards elimination, we found three significant variables (age, hypertension, and average glucose level) to predict an individual's chance of having a stroke.*

### **The Relationship Between Baseball Statistics and First Year Arbitration Salary**

Tom Bash, Conor Keating

Faculty Sponsor(s): *Dr. Sarah Dumnich*

Discipline(s): Data Science

*This study will attempt to find a relationship between a Major League Baseball player's hitting and fielding statistics and their first year arbitration salary. We will be constructing a multiple linear regression model to find which statistics are the best and most accurate when it comes to predicting a baseball player's salary. Upon conclusion of the study, we will have a better understanding of what the most influential variables are for predicting MLB salaries and what part of a player's game they should focus on to make the most money.*

*Via BaseballReference, Spotrac, MLB.com, and MLBTradeRumors.*

### **Student Performance Data Science Project**

Dominic Ulicne, Kyle Persin

Faculty Sponsor(s): *Dr. Sarah Dumnich*

Discipline(s): Data Science

*We investigated how student alcohol consumption, family characteristics, free-time activities, and other factors are correlated with student grades. The data that we studied was collected from a mathematics class taught in Portugal. Using multiple linear regression, we found that a student's health and whether or not the student goes out have the strongest relationship with a student's grades. We also trained and evaluated several classifiers that were able to predict whether a student does well in school without any information about intelligence. This demonstrates that intelligence is not the sole factor in determining a student's academic performance.*

## Oral Presentations

### **All Tied Up: A Trash Bag Tying Design Process**

Ethan Yant, Vee Guillaume, Matt Byrne, Toni DeBastiani

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*Group Member: Ethan Yant, Vee Guillaume, Matt Byrne, Toni DeBastiani*

*The process of tying trash bags can be a very difficult task for many Bearcat B.E.S.T. students. For this project, we worked with Elayna who needed a solution that was portable, easy to use, and durable. The two different design alternatives that were found to be the most promising for aiding Elayna had been "The Hollow Tube" and "The Zip Tie Tube". The Hollow Tube consists of a plain hollow tube with grooves that help keep the bag in place during use. The Zip Tie Tube similarly has a ring type design, but has slots for pre-primed zip ties to be inserted in the center of the tube and a hole for the zip tie end to protrude from. These promising designs will be evaluated based on how well they meet the above criteria but also on how well the design aids Elayna in tying a trash bag.*

### **Campus Composting**

Kelly Sokol, Amanda Michel, Kyle Pope

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*Sustainable practices used on campus can help with decreasing our school's carbon footprint, reduce waste and pollution, and contribute to increased air quality. Through composting, waste is being reused and recycled, while also reducing costs of transportation to landfills, contributing to a sustainable lifestyle. Currently on campus, is a deteriorating, unappealing, and labor-intensive aeration processed 6 bin system holding compost. To advance the original bin, a new bin was created that is 12 x 5 ft, self-aerated, appealing, and withstanding to all weather conditions. Through analysis and design processes, the 3 bin system was made from cedar wood on all sides, with chicken wire placed on the inside of each bin, and poles drilled into the front for a stronger support.*

### **Capacitive Deionization (CDI) Water Desalination Electrode Production**

Bruce Johnson, Nicholas Pietrusinski, Lauren Serafin, Killian Timko

Faculty Sponsor(s): *Dr. Adam Wood, Dr. Derek Breid*

Discipline(s): Engineering

*A.J. Palumbo Student Research Endowment*

*Capacitive Deionization (CDI) water desalination systems are a relatively new field of study and have some promising characteristics. From previous work, waste bread can be used as an inexpensive source for electrode material. The goal of this project was to create a fabrication method where larger electrodes can be produced, thus creating a larger CDI water desalination system. The electrode was created in a larger volume, at a high temperature, and with no oxygen present in the atmosphere. Therefore, a kiln was used and modified to allow the flow of argon gas into the control volume, allowing an oxygen free atmosphere. Next, to create these electrodes as inexpensively as possible, a variable study was conducted. Changing the amount of gas flowrate or the heating rate can produce electrodes of different structure. Using a lower flowrate and a faster heating rate saved production cost, while having good quality.*



## Oral Presentations

### **Concrete canoe capstone team**

Danielle Koehler, Reese Capo, Jonas Wudkwych, Eric Pennella, DJ Rossi, Michael Moresea

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*The ASCE Concrete Canoe competition is a competition created by the American Society of Civil Engineers to provide engineering students an opportunity to gain hands-on, practical experience and leadership skills by working with concrete mix designs and project management. The goal of the competition is to design a concrete canoe that can hold passengers and navigate a water course. The task the team had to perform was conduct research on all aspects of the project, test material compositions, design a canoe, decide the concrete mixture, construct a canoe mold, pour the canoe with our concrete mixture, and test the canoe on the obstacle course that ASCE provides. The canoe design chosen is an 18-foot canoe with a round hull shape. The concrete mixture is a mixture of perlite, basalt fibers, and cement. This mixture allows us to be strong to support passengers but light enough to float on water.*

### **Engineering Capstone – Soft Material Tester**

Hannah Rudy, Nathaniel Rizza, Brandon Reno

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*Soft material testing is done to discover material properties for research and commercial purposes. Our team undertook the goal of building a soft materials tester that has a variety of functions and features. The tester is rigorously designed to perform a variety of material tests for versatility and comprehensive material data. It is capable of inducing a ten-kilogram load on a sample and can read in twenty force samples per second to ensure accuracy. Our team is able to accomplish this through the use of a ball screw driven by a three-amp motor that is run by a micro controller. The tester is controlled by any windows-based computer when provided the custom program. By the end of the semester, we expect the tester to be fully functional and ready to be used in the lab by future students and researchers.*

### **Skoupídia Inc.'s Trash Bag tying Device**

Nico Molnar, Kyle Pope, Josh Hoffman, Hunter Cindric

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*Tying garbage bags can be a difficult task for people, especially if a person were to have some sort of disability, whether it is a physical or mental one. The purpose for our project is to design and create a trash bag securing device that will provide functional and effective work experience for members of the Bearcat B.E.S.T community. Our goal is to provide our stakeholders with a device that they will be able to use for the rest of their lives. We have prototyped multiple ideas and have started using them in testing. Being able to use a software such as SolidWorks allows for the recreation of the majority of our designs here on campus. Proper scheduling and constant communication allow our project team to work efficiently and productively. We believe that our product can assist the students of the Bearcat B.E.S.T program and people all around the world.*

## Oral Presentations

### **Trash Bag Tying Design**

Erin Eichelberger, Tyler Condrasky, Thomas Hedgepeth, Griffin Prinkey

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*The process of tying a trash bag happens to be quite difficult and frustrating for our Bearcat Best student Shane. While interviewing Shane we concluded that he understands the idea of tying the bag and how to do it correctly but because of his shakiness, it is very hard for him to complete the tying the bag, usually getting caught up in the loop making. General solutions do not offer the support that Shane needs and because of this, it requires creating a new design that could possibly work towards helping him. To help remedy this problem, our design is intended to help make the loop for Shane so that he can finish tying the bag without struggling at the loop making process. This design is also intended to take away Shane's major frustration and allows him to tie a trash bag much more easily than before.*

### **Trash Bag Tying Solution for Bearcat B.E.S.T. Students**

Kelly Sokol, Cara Luallen, Patrick Hoover, Killian Timko

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*Individuals with intellectual disabilities have difficulty with tasks such as tying trash bags, which can become frustrating when at work. The Bearcat B.E.S.T. program works with these students to prepare them for employment and increase independence. The goal of this project was to design a device to assist the user, Brandon, with tying trash bags more easily. The difficult part of the tying process for Brandon was creating a loop to make a knot. Using this information, three design alternatives were made. The Doughnut/C design adjusts the length of each of side of the bag and forms a properly tied knot. The Balloon Stick design ties a trash bag by wrapping it around a rod and pulling it through a notch. The Cone/Cylinder peg design stabilizes the center of the bag, allowing the user to form two sections to tie together. Of the three, the Cone/Cylinder peg design was chosen. Further testing was conducted to finalize the design's functionality.*

### **Black Lives Matter Vs. All Lives Matter**

Jaron Green

Faculty Sponsor(s): *Dr. Julia Cavallo*

Discipline(s): Liberal Arts

*Black Lives Matter (BLM) Vs. All Lives Matter (ALM) are both movements that try to provide justice for those who have been mistreated by higher ups. Both movements began in 2013. BLM really started after the death of Trayvon Martin. This is the beginning of a movement that is trying to get equal rights for African Americans. Since the start of these movements each have grown an many different ways whether that be for the good or the bad.*

## Oral Presentations

### **Concrete Jungle**

Shawn Rutherford

Faculty Sponsor(s): *Dr. Julia Cavallo*

Discipline(s): Liberal Arts

*While statistical evidence does hold value in the overall argument, I believe the best way to fully capture the magnitude and effects of low SES ( socioeconomic status) is through personal testimony via interviews and or even confessions. Realizing that I would need a large sample size to accurately measure these effects, I decided to use my own past experiences using a couple different models from Brofrenbrenner and Maslow.*

### **Diet Mediated Dilated Cardiomyopathy in Canines**

Maria Hood

Faculty Sponsor(s): *Julia Cavallo, Br. Albert Gahr O.S.B.*

Discipline(s): Liberal Arts, Biology

*Dilated cardiomyopathy, otherwise referred to as DCM, is a prevalent and often fatal disease that can occur in canines. Dilated cardiomyopathy in canines is commonly characterized by ventricular chamber enlargement and systolic dysfunction which often leads to congestive heart failure. The heart's ability to pump blood is then reduced due to an enlarged and weakened left ventricle. Although there are various causes of dilated cardiomyopathy known to date in canines, diet-mediated cases of dilated cardiomyopathy are on the rise. From a veterinary standpoint, this is a very important topic to investigate.*

### **Those who face death: How America betrayed Syrian freedom (senior thesis)**

Jonathan Meilaender

Faculty Sponsor(s): *Dr. Jason Jividen*

Discipline(s): Politics and Political Science

*"Keep the oil"—that's how President Trump described his decision to leave several hundred US troops in Syria's oil-rich east. But is that a good reason to deploy American troops? And why did America get involved there in the first place? America's intervention in the Syrian Civil War rarely permeates the consciousness of the American public, despite its tremendous impact on the stability of the Middle East. Our intervention, which began as an attempt to defeat the Islamic State, has since become inextricably linked to the fate of our Syrian partner force, a group called the "Syrian Democratic Forces," or SDF. This project, the first comprehensive, English, book-length account of our campaign in northern Syria, lays out the history of our intervention, analyzes the governance system established by the SDF, explains President Trump's partial withdrawal from Syria, and argues that our willingness to promote democratic ideals abroad is closely connected to our own national identity.*

**Birth, Death, and Rebirth: Creation Imagery and Old Testament Echoes in Matthew 24:15-31**

Elizabeth Elin

Faculty Sponsor(s): *Dr. Christopher McMahon*

Discipline(s): Theology

*Apocalyptic texts have long fascinated readers of the Jewish and Christian scriptures, promising a heavenly hope that contrasts with earthly suffering and providing encouragement to the faithful. The climactic Olivet Discourse in Matthew's Gospel, while not strictly cohering to the bounds of the apocalyptic genre, brims with a similar optimism. Rich with insight for both the Matthean community and for modern Christians, the evangelist presents urgency-laden exhortations that spark a majestic theophany. Latent in the entire discourse are subtle allusions to the Old Testament. Even as Jesus, the didactic speaker, introduces eschatological themes, he does so as a continuation of traditional Judaic beliefs, which engendered apocalyptic hopes. In composing Matt 24:15-31, Matthew interweaves Markan and Q texts but creates a uniquely Matthean passage. He utilizes Old Testament imagery of creation and birth and molds it anew, thereby nurturing the identity of his emergent Christian community.*

**Davidic Typology and Inclusivity in Matthew 2:1-12: An Exegesis**

Madison Powell

Faculty Sponsor(s): *Dr. Christopher McMahon*

Discipline(s): Theology

*The traditional house blessing said by scores of devout Christians every year on the Feast of the Epiphany exalts the glory of the newborn Christ, declaring, "The Gentiles shall walk in thy light and kings in the splendor of thy rising." The sentiments expressed in this prayer are not unfamiliar to Matthew's Gospel; after all, they find their root in his Epiphany narrative. However, the true meaning of the text holds a much greater theological significance than one prayer indicates. Guided by Old Testament themes and imagery, the significance of Matthew 2:1-12 is twofold: first, the pericope's Davidic typology explicates Christ as the New David and the true heir to his throne; second, the revelation of Christ's birth to the Gentile magi pronounces the inherent inclusivity and universality of the church community both in Matthew's time and in the present age.*

**The Road to Emmaus**

Katarina McCaffrey

Faculty Sponsor(s): *Dr. Christopher McMahon*

Discipline(s): Theology

*The distinct narration style of Luke's writing is present in the unique narrative of The Road to Emmaus. Showing rather than telling, Luke illustrates the role and teachings of Jesus through the dramatic imagery of hospitality, breaking of bread, and themes of the Old Testament. With the focus of Gentile inclusivism, Luke displays Christological and Eucharistic truths throughout his gospel. In Christological themes, Jesus is depicted as the renewed Messiah who reiterates Jewish preconceptions and welcomes the outsiders. In Eucharistic themes, the role and significance of breaking bread unfolds after the Passion of Jesus; Jesus reveals His presence as the Body of Hosts. Luke connects New Testament themes of Jesus as the 'Great Reversal' and the importance of hospitality through The Road to Emmaus passage. The welcoming hospitality Luke frequently depicts Jesus and His followers to have establishes the overarching theme of societal inclusivism.*

### **Evaluating the Gene Targets of microRNAs Associated with Parkinson's Disease**

Kimberly Horn

Faculty Sponsor(s): *Dr. Michael Sierk*

Discipline(s): Bioinformatics

*Almost 10 million people in the world's population are living with Parkinson's disease and can only be officially diagnosed by symptoms. Parkinson's disease is a neurological disorder that does not display symptoms until significant nerve damage is done. There is a need for biological testing to allow an earlier diagnosis. MicroRNAs are involved in messenger RNA translation to protein as they control gene regulation. Abnormal levels of some microRNAs have been found in Parkinson's patients but the genes they regulate were unknown. This list of microRNAs was entered into several gene target prediction databases and the results were sorted by prediction accuracy scores. Several microRNAs were predicted to regulate the same gene and numerous gene target predictions relate to nerve cell function. The results suggest several of these microRNAs are strong candidates for Parkinson's disease testing and for gene therapy.*

### **Gene Evolution in Coronaviruses**

Mary Andreola, Alyssa Baker, Michael Cella, Jacob DeSchepper, Nicola DiPaul, Jessica Gibson, Robert Gigliotti, Kolby Hanan, Margaret Hines, Zoe Leasock, Grace Leonard, John Martin, Courtney Mattucci, Adam Meneses, Graham Merlin, Isabella Molinaro, Shane Moran, Madison Nuttall, Mary Person, Kaitlyn Schiffer, Georgia Sherry, Kelsey Tobin, Stephanie Weinskovich, Olivia Zulisky

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*For Evolution and Systematics Laboratory this semester, student groups used publicly available genetic sequence data from GenBank to construct evolutionary trees of each gene in the coronavirus genome. They used 15 recent human SARS-Cov-2 sequences and 15 of the oldest available human SARS-Cov-2 sequences in addition to outgroup sequences from other viruses within the Coronaviridae family to understand the evolutionary origins of SARS-Cov-2 and strain variation during the pandemic. We present our evolutionary trees for each of the 12 genes in the coronavirus genome in addition to a more extensive phylogeny of full genome sequences from hundreds of samples. We discuss variation in gene evolution, possible differential selection pressures on each gene based on their function, as well as possible origins for the current human pandemic.*

**Inhibiting Parthenogenesis in Marmorcrebs, *Procambarus virginalis* (Lyko, 2017)**

Alyssa Baker

Faculty Sponsor(s): *Br. Albert Gahr O.S.B.*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Procambarus virginalis, a species of all-female freshwater crayfish, is triploid and reproduces via obligatory parthenogenesis. Reproduction and molting are controlled by GSF, GIH, and MIH, with GSF stimulating ovarian development, GIH blocking vitellogenesis, and MIH inhibiting growth and stimulating vitellogenesis. The objective was to inhibit parthenogenesis by knocking-down the expression of IGF-I. Individuals at molt Stages 2 and 3 (S2, S3) were treated with either lipofectamine and Morpholino or solely lipofectamine (control). Treated groups showed altered expression of GIH and MIH and mature treated groups did not exhibit a reproductive cycle. Low relative expression of GIH indicates immature ovarian development in the S3-treated group. One S3-treated individual had altered coloration from and grew more rapidly than the natural phenotype. These results have applications in producing non-reproductive adults with fast growth for safe laboratory use, aquaculture, and the pet trade.*

**Protecting Our Pollinators: A Study Regarding the Effects of Traditionally Medicinal Plants as Nutraceuticals in Bumble Bees**

Sydney Ball

Faculty Sponsor(s): *Dr. Michelle Duennes*

Discipline(s): Biology

*A.J. Palumbo Student Research Endowment*

*Pollinators are crucial in maintaining life as we know it, especially in the eyes of the agricultural industry. However, bumble bee species are declining at an alarming rate in part due to their infection with a microsporidian fungus called *Nosema bombi*. In this study, *Bombus impatiens* bumble bee workers and males were treated with three essential oils derived from traditionally medicinal plants (eucalyptus, summer savory, and stinging nettle) orally in a sucrose solution over a two-week treatment cycle. My experiment tested the effects these treatments had on the expression of immunity-related proteins in the gut of bumble bees. I will discuss differences in consumption by the bees for each treatment. I will also present results on the effect of the treatments on lysozyme and peroxidase activity in the gut of the bumble bees and discuss their potential use as treatment for *N. bombi* infection in commercial bumble bee colonies.*

## Digital Posters

### **Pest Control: Utilizing Goats Against the Invasive *Lespedeza cuneata* at a Marcellus Shale Drilling Site.**

Ian Tracey

Faculty Sponsor(s): *Dr. James Kellam*

Discipline(s): Biology

*Combatting invasive plants is one of the greatest challenges of the modern era. Invasive species can outcompete, outproduce and dominate other native plants. This threat, coupled with the effects of habitat destruction through fracking, may prove very dangerous indeed. Methods of control include pesticides and mechanical removal; but pesticides cause undue harm, and human labor is expensive. Utilizing goats may prove to be a satisfactory union of these concerns. This experiment will use three plots of the invasive *Lespedeza cuneata* at a Marcellus shale drill pad. One will have no goats or native seedlings, the second will have only seedlings, and the third will have goats and seedlings. By undertaking this research project, we may better understand how to control invasive species whilst simultaneously prioritizing the health of native plants.*

### **The DaVinci Man Project**

Ally Cochrane, Levente Kiss, Keila Lobos-Hernandez, Maddy Montefour, Rebecca Preston, Kyle Watson, James Wheeler

Faculty Sponsor(s): *Mr. Thomas Octave*

Discipline(s): Digital Photography & Post-Production

*A visual project (of the students of the AR-330 Digital Photography & Post Production course) combining Leonardo da Vinci's iconic Vitruvian Man image representing the sciences, blended with the beauty of their personal photography and imagery.*

### **The Visual Presentation of the Fibonacci Sequence & Golden Ratio**

Ally Cochrane, Levente Kiss, Keila Lobos-Hernandez, Maddy Montefour, Rebecca Preston, Kyle Watson, James Wheeler

Faculty Sponsor(s): *Mr. Thomas Octave*

Discipline(s): Digital Photography & Post-Production

*The students of the Saint Vincent College Digital Photography & Post-Production Course present their interpretation of: "Fibonacci & Mathematics presented in the Beauty of Nature & Imagery: A Blending of the Arts & Sciences.*

### **Soft Lithography**

Hannah Rudy

Faculty Sponsor(s): *Dr. Derek Breid*

Discipline(s): Engineering

*Soft lithography is a technique used for fabricating and replicating structures using elastomeric, soft materials. The main purpose of this research is to measure the relationship between force and the width of a printed feature on a microscale. The goal for this project was to test and analyze the effect of octadecyltrichlorosilane (OTS) and other solutions on surfaces when stamped by a wrinkled surface. Using samples made by silicone, the surface properties of glass slides will be analyzed. We expect the results to show that the regions where the toluene comes into contact with the glass slides, the glass will change from hydrophobic to hydrophilic. The width of the regions that are hydrophilic will correlate with the force that was used to press the sample onto the slide. The experimental set up includes the silicone, a Futek load cell and measuring device, as well as a micrometer and microscope.*

### **An investigation on iron-reducing bacteria impact on iron assimilation in plant tissue**

Natalie Lamagna

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*A.J. Palumbo Student Research Endowment*

*A widespread problem faced by many plant species is iron deficiency. Most soils contain high concentrations of iron in the form of ferric iron ( $Fe^{3+}$ ), which must be reduced to ferrous iron ( $Fe^{2+}$ ) before it can be assimilated into plant tissue. This reduction depends on different soil conditions, such as the presence of iron-reducing bacteria in soil. The purpose of this research was to test the impact that iron-reducing bacteria have on iron assimilation in spinach plants, which was done by stimulating the soil microbial community through the addition of wastewater, organic matter, or barley. There were no significant differences in the iron concentrations measured in the spinach leaves across all treatments, which may be attributed to the lack of diversity or abundance of iron-reducing bacteria detected across the treatments. Future work should examine if particular type of bacteria aid in iron assimilation for crops impacted by iron deficiency.*

### **Effects of Microplastics and Pharmaceuticals on Zebrafish Fitness**

Keith Kalp

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Environmental Science

*Studies seem to suggest the addition of both microplastics and doxycycline together in a body of water increases the toxicity of the microplastic causing an increase in stress among aquatic fish. Although, the science community views this combination as being toxic, few studies have shown the effects this combination has on freshwater fish. Fish exposed to these microplastics and pharmaceuticals should have a decreased fitness than microplastics and pharmaceuticals alone. The experiment took place by using 4 different tanks with 5 *Danio rerio* (zebrafish) being introduced to each tank. A fitness test was then conducted by timing how long each fish could swim against a water current. No statistical difference between the variables took place, although a trend was observed. More testing with microplastics and pharmaceuticals must take place to understand the effects humans are having on aquatic ecosystems.*



### **Effects of Roadway Salt Runoff on Aquatic Ecosystems**

Kelly Linsenbigler

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*Salt is commonly used on roadways to ensure public safety during winter weather conditions. A mixture of salt water (brine) and sodium chloride (NaCl) is the most common methods for treating roadways in the United States. This salt can have harmful ecological effects on the waterways, ground water, and plant life surrounding the roadways. This research examined the effects that the salt used on the roadways has on the surrounding environment. The physical and chemical effects of salt runoff on ground water, waterways, and plant life were evaluated. It was found that the salt runoff from the roadways has a negative effect on every aspect from the roadway to nearby streams. The effects include stunted plant growth due to higher salt concentration in the soil, groundwater contamination, and increased salinity of local aquatic ecosystems.*

### **Holding up the bank! An investigation of factors that affect streambank erosion**

Natalie Lamagna

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*In streams, there will always be flowing water, which is important for the transport of clean water and nutrients. When flow exceeds the resisting force of the bank material, erosion occurs. Though erosion is a natural process, it is often intensified through various anthropogenic factors. This project assessed the impact that specific streambank characteristics, particularly vegetation cover and soil type of bank material, have on the erosion rates of stream banks. The results showed that there was a positive correlation between the amount of vegetation present and the level of channel bank stability. In addition, weak trends were seen between the soil type and channel stability index. Although there are other factors to consider when assessing erosion rates, it is important to note the impact that these bank characteristics have on streambank erosion rates so that accurate predictions for bank degradation could be made in the future.*

### **How does different concentrations of microplastics affect the growth of Zebra Fish (Danio rerio)?**

Jacob Bender

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Environmental Science

*As an emerging field of study, there is little known about microplastics and the effects they can have in marine environments. They can easily pass-through filtration systems which then end up in oceans and lakes posing threats to aquatic life. This experiment tested how does different concentrations of microplastics affect the growth of Zebra Fish (Danio rerio)? The concentration in the first microplastic tank was about 150 mg/L. The concentration in the second microplastic tank was about 75 mg/L. Length, width, and weight of each fish was measured. There was no statistical difference in the change in length, and width between the fish exposed to the microplastics and the control group. There was a statistical difference in the change in weight between fish exposed to the microplastics and the control. The MPs were too large for the fish to actually ingest which could have affected the length, width, and weight of the fish more.*

**The Effects of Precipitation on the Salinity of the Amazon River's Discharge**

Allie Shreffler

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*The Amazon River has the greatest discharge on the planet. The Amazon forest provides the Earth with oxygen and the forest cleans the air. Variations in the Amazon River relate to what is happening to the Amazon such as deforestation or changes in precipitation. This research examined the salinity in the Atlantic Ocean near the mouth of the Amazon River. The salinity relates to the discharge of the Amazon River. Data of the salinity within the discharge area of the Amazon River were compared over the wet months from April to July. There is a correlation between the wet months and the level of salinity in the discharge area. The salinity in the discharge area decreased during wet months because high levels of freshwater from precipitation empties out into the discharge area. This seasonal variation will be affected by variations in precipitation driven by climate change, with potential impacts on the coastal ecosystem.*

**Assessing Spatial and Temporal Variations in Surface Water Availability Among Four Major Rivers in PA**

Wyatt Stouffer

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*The increase in frequency of extreme weather events has made it imperative to continue monitoring the behavior of our state's waterways. Flooding has become an increasing threat to our communities, making the proper monitoring and implementation of flooding mitigation practices essential to minimize the destructive impact flooding events can have. This study examined four major river systems within Pennsylvania to determine how water quantity varies spatially and temporally within the Susquehanna, Ohio, Delaware, and Allegheny Rivers. To do this, data regarding the average annual discharge rate, the length, and the relative oceanic proximity of each river was collected to establish relationships between these three variables. While no observable trends were present between the rate of discharge within a river and the rivers distance to the ocean, correlations between the size of the drainage basin, the length of the river, and the average discharge were identified.*

### **Investigating the Ability of Riparian Buffer Zones to Filter Nonpoint Pollution Sources**

Wyatt Stouffer

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*Erosion and nonpoint pollution degrade water quality within watersheds globally. One method to reduce these pollutants is the use or improvement of riparian buffer zones. Two stream sections with different riparian buffers within Monastery Run (Latrobe, PA) were examined to determine how the presence and characteristics of a riparian zone impact pollutant introduction and transport. Geologic characteristics of a riparian buffer zone were expected to impact pollutant and sediment removal. A tracer dye (rhodamine WT) and sodium nitrate (NaNO<sub>3</sub>) were combined to simulate a runoff pollutant at two different riparian zones to determine how the riparian buffers impacted the time to detection, concentration, and residence time of these simulated pollutants. Land slope and soil infiltration rate of the riparian buffer zone were linked to increased pollutant concentration and decreased time to detection. Further studies should examine the impact of streamflow on pollution transport and retention*

### **Wind Energy on Saint Vincent Campus**

Sydney Weaver

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Environmental Science

*The study I explored over the fall semester of 2020 was determining the best location on Saint Vincent Campus to add a wind turbine to team with the solar energy on campus to make the college a greener campus as well as save the college money on their electricity bill. Using an anemometer, I measured wind speed of the four locations on campus: the fields behind the dorm rooms, along the construction route in the back of the science center, at the top of the cemetery by the tennis courts, and next to the basketball courts. These wind speeds were then analyzed and triangulated with data from Arnold Palmer Airport to know what the best location on campus for a possible addition of a wind turbine.*

### **Does increased Precipitation Affect Pollution Levels in South Central Pennsylvania Waterways?**

Rachel Dudek

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*Chemicals used in farming, such as fertilizers and pesticides, can be detrimental to local ecosystems. This project examined how increased rates of precipitation relate to pollution output (specifically agricultural runoff) in South Central Pennsylvania Waterways. This region is heavily agricultural, and so it is important to understand how natural phenomena affect surrounding waterways. The natural layout of the land has rolling valleys and hills that lead to many streams used by both wildlife and humans, which is another reason to monitor these pollution levels. Data was collected from local recordings and culminated into one large dataset with multiple areas within a region. Results show that after significant rainfall, more pollutants associated with farming were found in the local waterways. Increased collaboration with farmers in this area would be helpful and should be put in place to help reduce these harmful pollutants from agricultural runoff.*

### **Effect of Mushroom Growth on Runoff of Nitrates and Phosphates**

Richard DeTesta

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Environmental Science

*This experiment aimed to assess the absorption capabilities of mushrooms by observing, compared to a control soil set, how the presence of mushrooms affected the presence of phosphate and nitrate concentrations after spiked water passed through a soil set containing mushrooms, it was hypothesized that the mushrooms would absorb both nitrate and phosphate in order to limit its presence in the runoff water. Rainfall events also have variability in intensity; therefore, the second element of this experiment was to assess how rainfall intensity affects the runoff concentrations. There was a statistically lower concentration of phosphates in the experimental group, with mushrooms, than there was with the base control soil. However, this one finding does not suffice to uphold the hypothesis that mushrooms act as an adequate bioremediation method for solving the nitrate and phosphate runoff issues.*

### **Effects of Climate and Streamflow on Nutrient Pollution in the Chesapeake Bay Watershed**

Sarah O'Toole

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*As the nation's largest estuary, the Chesapeake Bay is ecologically and economically significant. It is being impacted by nutrient pollution, which can lead to the harmful algal blooms that deplete the water of dissolved oxygen and make the habitat unsuitable for aquatic life. These impacts have degraded benthic communities and disrupted natural processes that regulate nutrients. Warmer stream temperatures can cause more nutrients to be released from the sediments of rivers that flow into the bay, which worsens the problem. Data from the Susquehanna and Potomac Rivers was used in this study to analyze the relationship between water temperature, precipitation, and nitrogen nutrient content. Trends in the rivers during the past year were compared. The most significant trend observed was the increase of nitrate and nitrite content in both rivers during the winter months. This may have implications for harmful algal blooms in Chesapeake Bay.*

### **Rebound of Land Subsidence as Shown by the Subsidence Index**

Richard DeTesta

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*The overexploitation of groundwater has serious detrimental effects on land subsidence. However, with recent research, it has been found that the level of land subsidence can be defined by three different layers defined by a 'subsidence index' that is used to describe soil compressibility during groundwater withdrawal. If the subsidence index shows a correlation between a land's ability to rebound from subsidence and the compression of the soil then the subsidence could be used to evaluate regions more susceptible to land subsidence and areas more resistant to land subsidence. The location of aquifers compared to layers of compression could also show how certain depths of aquifers are affected more by the overexploitation of groundwater. After analysis of subsidence indexes in different regions, it was found that both depths of aquifers and compression of soil affect the rebound ability of land after subsidence has occurred.*

### **The Importance of Poison Ivy (*Toxicodendron radicans*) in Overwintering Birds Visitation Frequency**

Rachel Dudek

Faculty Sponsor(s): *Ms. Angela Belli*

Discipline(s): Environmental Science

*A 3-month experiment took place looking at the frequency of bird visitation to patches of fruiting poison ivy plants. The purpose of this was to prove or disprove the existing importance of the plant to overwintering bird species. This is important due to the preservation of native plants to aid in wildlife conservation. This is especially important for plants that are seen as “nuisances” that usually get removed. Over the course of the autumn and winter months in 2020, several quadrants with variable amounts of mature poison ivy were observed on a weekly basis for frequency of bird visitation through point count technique as well as drupe counts. What was discovered was that while poison ivy drupes were not a preference, as the temperature dropped, they became more important of a resource to birds residing in the area after migration.*

### **How do humans influence water quality in streams?**

Shane Piper

Faculty Sponsor(s): *Dr. Peter Smyntek*

Discipline(s): Environmental Science

*Over one third of rivers in the United States are considered polluted, and surface runoff is a key contributor to this. Every day, substances enter streams due to human activities. Some examples include pesticides, fertilizers, road salt, mine drainage, and even organic matter. Urban areas can have a larger effect on the amount of pollution entering a stream simply because there are more people living in an area compared with rural areas. Fertilizers provide nutrients for algal blooms to form within streams or lakes, which can decrease the amount of oxygen in a stream significantly. Large amounts of salt in streams are toxic to aquatic life. Higher amounts of iron from mine drainage are also toxic to fish and plants in streams. The examples demonstrate how humans impact streams, and how much needs to be done to address these problems.*

### **The Productivity of Aquaponic Growth in *Lactuca sativa* as a Means to Reduce Commercial Runoff**

Andrew Scott

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Environmental Science

*Aquaponics, as a closed loop system consisting of a blend between hydroponics and aquaculture, could contribute to addressing the effects of many environmental problems. The question that was tested in this study was whether plants grown from one-hundred-percent fish wastewater will grow as large as plants grown with a store-bought hydroponic solution, or will nutrients need to be added to the fish wastewater to make it as productive as the store-bought solution? To test this, three groups of romaine lettuce plants were grown hydroponically using three differing solutions of water. There was no statistical significance in the growth of plants between each of the three groups. The lack of statistical significance between the growth of any one group is a positive sign that crops can be grown effectively in any of the three mediums tested.*

### **Alternate Treatments for Childhood ADHD from a Holistic Perspective**

Katherine Cramer

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Integrated Science

*Attention-Deficit/Hyperactivity Disorder is commonly diagnosed in children who show high levels of hyperactivity, inattention, and low impulse control. It is argued whether treating this disorder with medication during childhood development can cause potential harm that outweighs the benefits. In this paper, I will discuss the drugs used as treatment and delve into possible holistic treatments that can be used to treat ADHD without the addition of any pharmaceutical medication. The two main holistic treatments of focus are diet changes and EEG biofeedback. Based on the research presented, both options present as beneficial alternatives for treating Attention-Deficit/Hyperactivity Disorder. Diet change with a focus on elimination was proven to give the most statistical improvement in treating a child's ADHD symptoms.*

### **Cryotherapy vs. Whole-Body Vibration Therapy in Regard to Rehabilitation in Patient's Post Anterior Cruciate Ligament Surgery**

Carlee Kilgus

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Integrated Science

*Anterior cruciate ligament injuries are one of the most common knee injuries due to the biological nature of humans as well as physical activity. The ACL is one of the four major ligaments that hold the knee joint in place. The purpose of this research paper is to determine what type of secondary therapy is best to accompany standard physical therapy after ACL surgery, specifically comparing the effects of cryotherapy verse whole-body vibration therapy. The research that was conducted showed that both of these rehabilitation techniques are beneficial to the recovery process and accelerate recovery time. These techniques all aid in accelerating the recovery process after ACL surgery. Although the research has not allowed a definite conclusion of whether whole-body vibration therapy or cryotherapy is more beneficial in increasing muscle strength or flexibility, there are a multitude of research studies that exposes equal benefits to each.*

### **Effective Reversal of Epigenetic Alterations**

Emily Prencipe

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Integrated Science

*Epigenetics is the study of heritable changes that occur in DNA without altering its sequence. These changes are often the result of a significant experience, particularly traumatic responses. Modification of the epigenome leads to physiological and psychological alterations that can significantly impact one's quality of life. While this field is relatively new, much can be understood about the treatment of such modifications when methods of alteration are comprehended. I studied the association of trauma with epigenetic modifications, and how to reverse modifications that were either passed on or developed by the experiencer themselves. Two branches that are discussed are the direct reversal of the modification through pharmacological intervention or indirect reversal through behavioral therapy. Through a comprehensive analysis of current primary and secondary literature, it was hypothesized that behavioral therapies are the most effective at reversing the effects of epigenetics.*

### **Therapy and Treatment options for REM Sleep Behavior Disorder**

Courtney Maslanka

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Integrated Science

*REM Sleep Behavior Disorder is not a well-known disorder and very little is known about the treatment and therapy options. REM Sleep Behavior Disorder (RBD) is commonly known as dream enactment disorder, awakening during REM sleep and acting out violent dreams which may be harmful to the patient or bed partners. In this paper, I will discuss two medication treatments and one therapy option for treating RBD. Overall, we will see that there is no significant treatment option when it comes to treating RBD. The drugs and therapy will reduce symptoms but will not fully treat RBD.*

### **Electrical Therapy vs Low Level Laser Therapy in Terms of Pain Relief for Patients with Shoulder Impingement Syndrome**

Brianna Carter

Faculty Sponsor(s): *Dr. Caryl Fish*

Discipline(s): Integrated Science

*Shoulder impingement syndrome is the narrowing that can cause the acromion to rub against the tendon and bursa causing irritation and pain that is known as shoulder impingement. The treatment for shoulder impingement syndrome has both surgical and non-surgical options. This paper will focus on the non-surgical treatment of physical therapy and which one of its types will help with pain relief for patients who suffer shoulder impingement syndrome. The purpose of this paper is to determine whether or not Low-level laser therapy or electrical stimulation is better for pain relief for a patient with shoulder impingement syndrome. Throughout the primary literature reading the two physical therapy techniques that were most common in treating any type of chronic pain were electrical therapy, TENS, and low-level laser therapy. The sources also point out that the best form of treatment for shoulder impingement syndrome patients is any kind that includes exercise therapy.*

### **The Study of the Medical Illustration of the Human Anatomy**

Placid Sellers, Angelo Celani, Clair Sirofchuck

Faculty Sponsor(s): *Krista Jobe*

Discipline(s): Medical Illustration

*The purpose & design of this course is to provide the Medical Illustration/Fine Arts student with a realistic medical operating room scenario; in which a physician requires photographic and/or illustrative documentation of surgical procedures. Krista Jobe the professor of the Human Anatomy/Physio. Lab II course, is our client.*

*This course provides needed visual documentation of dissections, that often replicate surgical procedures; allowing the student to discover the importance of documenting various anatomical structures during surgical procedures essential for medical instruction.*

*This course provides the student with an understanding that a pristine & anatomically accurate illustration of a surgical procedure is essential for clear & concise instruction; as well as in the identification of a medical anomaly or unique anatomical structure that may not be easily visible during the often spontaneous scenarios encountered in a real life & sometimes messy surgical procedure.*

### **Earth's Field NMR Thermometry**

Connor Thropp

Faculty Sponsor(s): *Fr. Michael Antonacci, O.S.B.*

Discipline(s): Physics/Physics Education

*A.J. Palumbo Student Research Endowment*

*Nuclear magnetic resonance (NMR) thermometry is a way to non-invasively measure the temperature of a sample. In this work, a method for collecting T1-based Earth's field NMR thermometry measurements of phantoms with magnetic properties similar to tissue is validated. The time it takes for a sample's net magnetization to return to equilibrium is characterized by T1, and T1 is temperature dependent. A homebuilt Earth's Field NMR spectrometer was used to measure the T1 of pure water and agarose gel samples at temperatures between 20°C and 40 °C. The temperature dependence of measured T1 for the 0.5% agarose sample and pure water sample agreed within 1 standard error with published results. The temperature dependence of measured T1 for the 0.25% agarose sample was in partial agreement with published results. Future work includes applying EFNMR thermometry to samples of beef as surrogates for human tissue.*

### **Modeling increased impacts of Nor'easters due to sea level rise in coastal New England Parks**

Louis Borrelli

Faculty Sponsor(s): *Dr. Daniel Vanden Berk*

Discipline(s): Physics/Physics Education

*National Park Service agreement P18AC01406*

*In New England, the primary storm impacts are from Nor'easters rather than hurricanes, which are the major concern further south, and are better understood. While research on how climate change is affecting hurricanes is an active area of research, there is limited information on how the impact of Nor'easters may be amplified under a changing climate. In this study, we simulate the storm surge and inundation induced by a 2018 Nor'easter in two New England Parks using the Advanced Circulation Model with winds based on the European Centre for Medium Range Weather Forecasts model. The Model results were validated using a variety of weather stations. The impact of the projected sea level rise on storm predictions were investigated using sea level rise scenarios. This project will help park managers be better prepared to make the park safer for the public and plan for adaptation strategies to protect the park resources.*



### **Preliminary testing and analyses of time synchronization across separate Scintillating Muon Detectors**

Lucas Kearns

Faculty Sponsor(s): *Dr. Daniel Vanden Berk*

Discipline(s): Physics/Physics Education

*A.J. Palumbo Student Research Endowment*

*We performed analysis of the recorded time difference between separate particle detectors with synchronized input signals as part of the Saint Vincent College cosmic shower detection array project. We have started developing and utilizing more sophisticated and precise methods of collecting large sets of data from the devices. This is needed to verify the detection of cosmic rays from the same shower and to filter out other unwanted noise and sources that can trigger the devices. We found that the average time difference between same-time detections using a clock synchronized over the internet to be 2.03 ms. Cosmic showers trigger several detectors over an area at the same time; therefore, the lowest possible time difference between detections will allow us to eliminate non-synchronous events which are commonly caused by unwanted background radiation. We are also developing a new method of collecting timestamps with GPS data to lower the time difference between simultaneous detections.*

### **The Attenuation of Muons through Lead Shielding**

Andrew Klein

Faculty Sponsor(s): *Fr. Michael Antonacci, O.S.B., Dr. Daniel Vanden Berk*

Discipline(s): Physics/Physics Education

*A.J. Palumbo Student Research Endowment*

*In this work the effect of lead shielding on the count rate and energy levels of muons is studied. Muons are subatomic particles created when cosmic radiation impacts the Earth's upper atmosphere. Muons have the same charge as electrons, but are over a hundred times heavier and travel at a significant fraction of the speed of light when created by the impact of a cosmic ray. Lead was chosen as a material to shield the muon detector setup due to its high density. At thin thicknesses of lead shielding (on the order of millimeters) the measured average count rates show a large amount of scatter versus shielding thickness. Further trials will attempt to determine the reason for these inconsistent rate measurements. If a less uncertain relationship between energy deposited in the detector and thickness of shielding is able to be established, it will allow for the energy of muons passing through the shielding to be better characterized.*

### **The Effect of Race, Gender, and Similarity on Juror Decisions**

Sofia Sicignano

Faculty Sponsor(s): *Dr. Devin Fava*

Discipline(s): Psychological Science

*A.J. Palumbo Student Research Endowment*

*Previous research about juror behavior demonstrated that race of the defendant is significant compared to the length and severity of punishment. Researchers overlooked gender in previous studies about juror behavior and defendant sentences. The purpose of this study is to expand on research regarding the effect of race and gender of the defendant on their sentence in an experimental design. Participants' emotional state was assessed by the Brief Mood Introspection Scale (BMIS). Participants read a summary of a trial and the similarity-lenience effect was tested by manipulating defendant race and gender. Participants answered questions about the case, then selected their confidence in the guilt of the defendant, and were asked to indicate an appropriate sentence. Our findings do not support previous research regarding the similarity-lenience effect regarding race. The experimental nature of this study may account for the deviation in results compared to previous studies.*

### **The Assumed Relationship Between Asexuality and Trauma**

Lucien-Lee Strauss

Faculty Sponsor(s): *Dr. Devin Fava*

Discipline(s): Psychological Science

*A.J. Palumbo Student Research Endowment*

*The present study investigated the idea that asexuality is a result of trauma. Participants (N=106) were given three scales to measure their asexual identification, sexual desire, and trauma history. A significant majority of asexual participants had not experienced trauma, and there was no significant difference in asexual identification or sexual desire scores between those who had and had not experienced trauma. Among the minority who had experienced trauma, there were no differences in asexual identification or sexual desire between those who identified as asexual before trauma compared to those who identified post-trauma. Results and limitations are discussed.*

### **The Influence of Afrocentricity and Gender in Sentencing Length**

Juliana Donaldson

Faculty Sponsor(s): *Dr. Mark Rivardo*

Discipline(s): Psychological Science

*A.J. Palumbo Student Research Endowment*

*Stereotypes are widely shared beliefs about attributions of a social group. The effects of Afrocentricity (a combination of darker skin, coarse hair, wider nose, and fuller lips) and gender on sentence length, perceived dangerousness, and social distance were examined. Five hundred and sixty-two Amazon Mechanical Turk employees and 104 students at a small, Catholic, liberal arts and sciences college in Western Pennsylvania completed this study on Qualtrics. Participants were randomly assigned to a photograph attached to the description of a criminal case. Afterwards, they were asked to recommend a sentence, answer social distance questions, and to rate how dangerous they perceive the defendant. Three 3 x 2 Factorial ANOVAs with the dependent variables revealed no significant effects. These findings were inconsistent with previous literature that individuals with more Afrocentric features received higher sentencing lengths, were perceived as being more dangerous than other racial groups.*

### **The Predictive Power of Depression, Immoderation, and Anxiety for Actual-Ideal Weight Discrepancy and Maladaptive Eating Behaviors**

Julie Reichert, Nicole Olson, Abigayle Ginter, Riley Assalone

Faculty Sponsor(s): *Dr. Mark Rivardo*

Discipline(s): Psychological Science

*Neuroticism has been identified as a significant predictor for negative body image and maladaptive eating behaviors. In this study we sought to determine which lower-order facets of neuroticism served as better predictors for actual-ideal weight discrepancy, and which were better predictors for maladaptive eating behaviors. We also sought to examine the relationship between actual-ideal weight discrepancy and maladaptive eating behaviors. The sample consisted of 235 undergraduate students (150 women, 85 men) who answered questions based on their body image, neuroticism, and eating behaviors. Depression and immoderation were significant predictors for actual-ideal weight discrepancy and anxiety was a significant predictor of maladaptive eating behaviors. There was no significant correlation between actual-ideal weight discrepancy and maladaptive eating behaviors. The findings provide support for pre-existing theories regarding body image, maladaptive eating, and facets of neuroticism.*

### **Helping Behaviors in College Students**

Josie Knopsnyder, Shyan Yahner-Golby, Adam Petrovich, Emily Taylor

Faculty Sponsor(s): *Dr. Mark Rivardo*

Discipline(s): Psychological Science

*We examined the effects of gender of a person in need and the cost of the situation on likelihood of helping and if this varied by gender of participant and their level of empathy. A total of 174 participants completed an online experiment where they were randomly assigned to a series of low and moderate cost situations that varied by the gender of the person in need. After reading each vignette, participants reported their likelihood of helping in each situation. We expected that the likelihood of helping would be greater for low than high cost situations and for participants who reported higher levels of empathy. We expected that likelihood of helping would be greater for men than for women and that women would be more likely to receive help than men.*

### **Self-Perception and Personality**

Aimee Siecinski, Brooke DiLascio, Katelyn Waugh, Katherine Cramer, Peyton Feathers

Faculty Sponsor(s): *Dr. Mark Rivardo*

Discipline(s): Psychological Science

*Imposter phenomenon can be defined as having doubts about your skills and fraudulent feelings, such as feelings of inadequacy, constant comparison to other people, and a lack of self-confidence in one's abilities and intuition. It occurs more often in high-achieving individuals. Previous studies show correlations between this phenomenon and certain Big Five Personality Traits. Undergraduate students completed the Big Five Personality Test and the Leary Impostor Scale. We anticipate that as neuroticism increases, the score on the Leary Impostor Scale will increase. We also anticipate that as conscientiousness decreases, the score on the Leary Impostor Scale will increase. Finally, we predict that openness, agreeableness and extraversion will not be correlated with scores on the Impostor Scale.*

## Artist Biographies

### **TH346 - Thomas Merton: Monk, Writer, Spiritual Master**

Joseph Choby, Zachary Choby, Elise Debrot, Madison Hill, Ethan Krammerer, Colten McCutcheon, Kristin Neely

Faculty Sponsor(s): *Dr. Patricia Sharbaugh, Mr. Andrew Julo*

Discipline(s): Theology

*The Spring 2021 Honor's course, TH 346H-01: Thomas Merton: Monk, Writer, Spiritual Master explored Merton's life and thought primarily through his writing but was enhanced by an interdisciplinary approach that included the study of Merton's artistic practices. Merton's photography, like his writing, reveals his contemplative vision of the world. This assignment is designed to give students the opportunity to express the contemplative vision that studying Merton's art and writing have inspired. As the COVID-19 pandemic affects millions throughout the world, Merton's reverence for often overlooked beauty and the monastic practice of solitude take on new relevance. The photographs and writing displayed here are the fruit of a semester-long study and reflection on Merton's contemplative vision of life as meaning hidden in plain sight.*

## Artist Biographies

### **Hannah Devine** | Studio Art and Graphic Design Major

My works are outward expressions of the inner experiences that depict places I wish to always remember. There are both memories we all want to relive, and ones we wish we could forget. Using photographs of places with which I am intimately connected, I create paintings to help me remember the emotional experience of the space. Creating these works provides me with a sense of comfort knowing I have captured the memory forever, and now others can see it too.

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Hannah Devine is an Erie-based artist that currently resides in Latrobe, Pennsylvania. She anticipates a B.A. in graphic design and studio art from Saint Vincent College, graduating in May 2021. Specializing in watercolor and acrylic painting, she draws inspiration from the places she has been and intends on remembering.

### **Madison Starliper** | Art Education Major

Much of my life has happened outside of my control. As a child, I found solace in books, movies, and other realms of make-believe. These worlds were safe-havens, where I had absolute control over my own environment. I grew older and began to feel compelled to express some of my fantastical imaginings through the creation of visual art. Now as an adult, I have developed coping mechanisms for stressful situations outside of the pretend play and escapism I relied on as a child, but I still retain a deep affection for magic, mystery, and worlds of fantasy. I find that expressing this reverie in my art is a love letter to my inner child, where I'm able to say,

“See how much you have grown? Look at the beauty and magic that you are able to bring into the world through your drawings and paintings. This is the future you have created for yourself.”

My work is an exploration of the childhood daydreams and nightmares that still dart around my brain, and the imaginings of my young adult mind, both realistic and fantastical in nature.

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Madison Starliper is an emerging artist and educator. She is from Chambersburg, Pennsylvania, and will receive a B.A. in Art Education from Saint Vincent College upon her graduation in May 2021.

### **Connie DiFrancesco** | Studio Art Major, Psychology Minor

My work bridges the beauty of nature and its landscapes and sensual, surreal depictions of the human figure. My subject matter is informed by a combination of immediate surroundings and an exploration of subconscious thoughts.

From painting, to drawing, to throwing pottery on a wheel, my interests are divided between working in realist and surrealist styles. Focus moves between calm, tranquil landscapes, and bizarre human-like subjects. I have long been drawn to the human body's ability to attract with a single element – such as one's lips - often at a subconscious level. Nature in my work emerges from its ability to nourish, not only our bodies in consumption, but also our minds in feeling the warmth of viewing a warm toned sunset or a restfulness among the fallen leaves at the end of October.

I invite viewers to engage their conscious mind, while also exploring their subconscious when reflecting upon my composed landscapes and uncanny depictions of human anatomy.

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Connie is a visual artist based in Southwestern Pennsylvania. Raised in Somerset County and a 2017 graduate of Greater Latrobe High School, she is a current undergrad student at Saint Vincent College working towards a B.A. in Studio Art with a minor in Psychology. Specializing in multiple mediums, her works encompass themes of nature and human anatomy.

## Artist Biographies

### **Angelo Celani | Studio Art Major**

As an artist, I consider my work as a culmination of skills gathered from continuously experimenting and refining my methods and tools. My preferences include a variety of fine point markers and pens as they have the potential to be extremely precise. I also enjoy many subjects and lately have been exploring a deep seeded interest in the natural world. With my recent work I have been busy attempting to call attention to subjects that are often overlooked whether they be buried or submerged. I believe I have been able to do this by adding engaging color to unsightly subjects while still producing a clean image.

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Angelo is an artist who was encouraged to draw from a young age, a time when he took great interest in the natural world. As he developed as an artist, he took inspiration from the graphic art and illustration in popular media like comic entertainment. At the college level and beyond Angelo takes all of his past influences into consideration as he works.