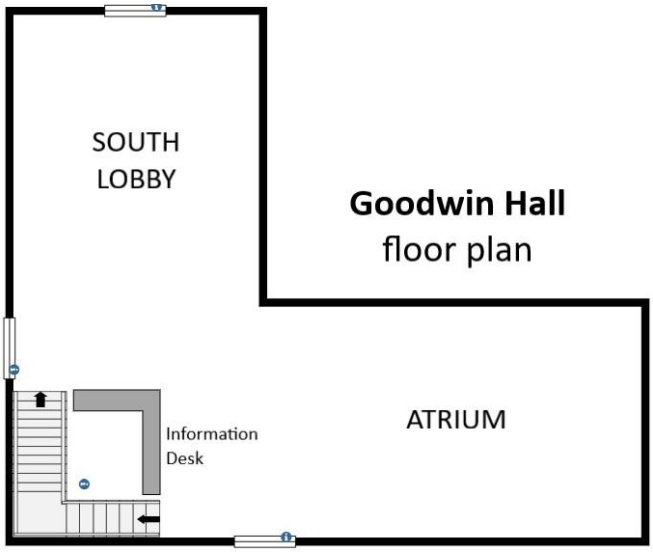
URSA
Undergraduate, Research, Scholarship and Arts
Benedictine University

2026 Poster Session Program

April 16, 2026 ❖ 12:30-2:30 pm ❖ Goodwin Hall Lobby



► **An index of URSA poster session participants can be found at the end of this program.**

SOUTH LOBBY (posters 1-43)

(1) **The Impact of Endocrine-Disrupting Chemicals on PCOS**
Samanvi Singampalli

Polycystic Ovarian Syndrome (PCOS) is a metabolic and endocrine disorder that leads to excess androgen levels in women. This excess androgen can cause eggs to become cysts, resulting in serious health effects such as infertility, an increased risk of Type 2 Diabetes, high blood pressure, and cardiovascular diseases associated with obesity. PCOS among women is rising, mainly due to exposure to Endocrine-Disrupting Chemicals (EDCs), which are commonly found in plastics, food packaging, personal care products, pesticides, and industrial chemicals. Although previous research has shown this connection, there is currently little regulation regarding the use of EDCs. In this study, I will measure EDC levels in blood and urine of women with and without PCOS. I expect to find that women with PCOS have higher levels of EDCs in their blood and urine than women without PCOS. Results may encourage policymakers to implement stricter regulations on products that have Endocrine-Disrupting Chemicals (EDCs) so that, ultimately, PCOS in women is less common.
Faculty sponsor: Jean-Marie Kauth

(2) **Addressing Collections Accessibility: Natural History Digitization**
Adiba Asad, Karan Shetty, Fatima Akhoon, Samanvi Singampalli

Natural history museums require significant work behind the scenes to preserve specimens through digitizing, photographing, and cataloging the objects. These methods increase accessibility of specimens and support collaborative studies of global biodiversity. Benedictine University's Jurica-Suchy Nature Museum (JSNM) houses thousands of specimens that provide unique datasets for zoology, botany, paleontology, geology, and anthropology fields. Much of the collection was donated or gathered by founders Fr. Hilary and Edmund Jurica, O.S.B., with many specimens dating back to the mid-1800s that remain undigitized. The goal of this research is to improve accessibility and digitally preserve the JSNM collection. This semester, small mammals were catalogued by creating data sheets, taking museum-quality photographs, and reorganizing specimens for easier access. Additionally, because arsenic was historically used in taxidermy to preserve specimens from damage and decay, and is now known to be toxic, all specimens were tested. Data, including arsenic levels, were recorded in a detailed spreadsheet to enhance digitization and accessibility.
Faculty sponsor: Karly Tumminello

(3) **Implementing Standard Addition in Flame Atomic Absorption Spectroscopy (FAAS) Undergraduate Lab**
Kara Jandacek, Karan Shetty

Standard addition is a commonly used technique for determining the concentration of samples with an unknown composition. It can be useful in detecting concentrations of essential trace minerals such as zinc and magnesium in consumer products. And with wide applications in fields such as toxicology or clinical chemistry, college students can benefit from practicing this technique in the lab. The purpose of this research is to trial a potential standard addition lab activity that students can complete in a couple of 3-hour lab periods. Students will time themselves as they perform this technique on 111 Red Blend 2023 wine samples to determine the initial concentrations of 4 trace elements (zinc, magnesium, copper, iron). This includes sample preparation and using Flame Atomic Absorption Spectroscopy (FAAS) for calculating concentrations. The results of the trials showed that the full experiment can be completed within two 3-hour lab periods. This means the lab activity serves as a practical, beneficial introduction to the technique for undergraduates.
Faculty sponsor: Niina Ronkainen

(4) **Analysis of Zinc in Powdered Nutritional Supplements**
Kara Jandacek

Zinc is a trace element commonly found in nature that has many purposes, especially for biological functions such as DNA metabolism, enzyme functions, and boosting the immune system. The body cannot produce zinc, so it must be obtained from zinc-rich food such as beef, oysters, cashews, and dairy products. Not consuming enough zinc can lead to zinc deficiency, which has been linked to many harmful effects like dermatitis and decreased immune function. Zinc deficiency can be reversed by increasing zinc intake. For example, powdered nutritional supplements such as Liquid IV contain zinc that can add to daily zinc intake. Powdered nutritional supplements were analyzed using Flame-Atomic Absorption Spectroscopy to determine the exact concentration of zinc in the sample.
Faculty sponsor: Niina Ronkainen

(5) **Turn the Page: Empowering Minds Through Reading & Literacy**
Kinley Roberson, Isabela Alvarado

Access to age-appropriate books is a critical component of literacy development and academic success for both elementary and high school students. However, many schools and communities lack sufficient resources to provide students with the books they need to support learning and foster a love for reading. "Turn the Page" was created to address this need by collecting gently used books for elementary and high school students and donating them to an organization that redistributes books to schools with limited resources. As aspiring educators, we recognized the importance of equitable access to educational materials and were motivated to take initiative in supporting students beyond the classroom. Through organizing, collecting, and donating books, we strengthened our

leadership, collaboration, and communication skills while gaining a deeper understanding of educational inequities. This project highlights how community involvement and proactive leadership can positively impact student learning and reinforce the role of educators as advocates for educational access.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(6) **Scrolling into Politics: How Social Media Shapes Beliefs and Voting**
Meshal Fatima

Political content on social media has a substantial impact on voting behavior. Various types of content, messages, and tools influence people's political views and voting. The study examines platforms such as Facebook and Twitter and how they shape views and participation in elections. These platforms often spread misinformation during elections and influence voting patterns and engagement. The study addressed how different social media platforms use tools and algorithms to influence people's views and create political polarization. I studied how social media and misinformation affect voting behavior and political engagement and reviewed findings from earlier scholarly studies in the United States and other countries to identify common themes and patterns. To analyze the study, I conducted qualitative interviews with college students, allowing participants to discuss their views on political content online and its effect on their viewpoints and voting decisions. I analyzed responses for repetitive patterns and themes related to voting behavior and political views. The study found that social media increases political engagement among young people but has a limited effect on voting behavior. I hypothesized that social media shapes people's beliefs and online activity more than voting behavior and contributes to polarization and the spread of misinformation during elections, especially among highly partisan individuals.
Faculty sponsor: Patrick Polasek

(7) **Molecular Detection of *Wolbachia* and Host DNA in *Polistes fuscatus***
Ali Elabsi

This research aims at identifying the presence of *Wolbachia* bacteria and the host DNA in Northern Paper Wasp (*Polistes fuscatus*) which is a member of the Hymenoptera order. *Wolbachia* bacteria is one of the most common and widely distributed bacteria which infect various arthropods. The research was conducted to determine whether the Northern Paper Wasp was infected by *Wolbachia* bacteria or not. DNA was extracted from the abdomen of the insect, followed by Polymerase chain reaction (PCR) was conducted to amplify the target sequences. Gel electrophoresis was conducted to determine the presence of the DNA, and BLAST was conducted to determine and confirm the bacteria identity. Gel electrophoresis revealed the presence of *Wolbachia* bacteria. However, the DNA of the host insect was not amplified. This could be attributed to errors in the preparation of the sample. This study has shown that *Wolbachia* bacteria was detected in the Northern Paper Wasp insect species. It has also shown the importance of the use of DNA in the study of *Wolbachia* bacteria.
Faculty sponsor: Philip Novack-Gottshall

(8) **Preservation and Restoration Methods for Coral Reefs**
Sofia Araneta

Climate change and water pollution have continued to kill off the population of coral species and reefs across the world at a relentless rate. Research shows that the Frag-n-Fly method has been successful in cultivating coral by taking coral pieces and growing new coral from fragments. Another method includes 3D printing foundations and has been an effective way to assist coral growth in natural habitats. I propose a modified version of the Frag-n-Fly method that combines 3D printed structures. 300 samples will be collected from species found within the reefs of Sicogon Island in the Philippines. Coral will be acclimated in a lab using treated ocean water for a week. Samples will be placed into gardens in a set reef area and cultivated with concrete bases attached. If some species do not grow well, then custom 3D printed foundations will be made to accommodate those varieties. Growth and health of the coral, alongside the water quality, will be documented over a 5-year timespan. After 5 years, I expect increases in the growth of the coral, including population growth and health. A combination of these techniques

could be used to improve the cultivation of coral in oceans worldwide.
Faculty sponsor: Jean-Marie Kauth

(9) **Evaluating Cryogenic Treatment for Wear Reduction in Shredder and Yoke Plates**
Matthew Wild, Tommy Roath, Ali Sughayar, Trey Frost

Two industrial partners asked the University to study how cryogenic treatment could improve the wear resistance and durability of machine parts. We investigated two industrial parts and their wear patterns during normal use. The two parts were a rotating shredder plate from a garbage disposer (Whirlpool, InSinkErator Division, Racine Wisconsin), and a yoke plate used in piston pump systems (Blackhawk Technology, Carol Stream, Illinois). For both parts, samples were divided into treated and untreated groups. Cryogenic treatment was performed by Unit Step-Joliet using their procedure to enhance material properties. Abrasive wear testing of treated and untreated shredder plates will be conducted in collaboration with Falex Corporation (Sugar Grove, Illinois) using method ASTM G65. This method measures material loss under controlled conditions. For the treated and untreated yoke plates, a custom testing apparatus was built to simulate real operating conditions and evaluate wear behavior. After testing, samples from treated and untreated parts were evaluated based on mass loss. The goal of this research was to determine whether cryogenic treatment can reduce wear and extend the lifespan of mechanical parts. These findings could help improve performance and reduce maintenance for mechanical parts operating under harsh conditions.
Faculty sponsors: William Schubert, Andrew Wig

(10) **Bringing Gratitude to Life: A Thanksgiving Outreach Initiative for Senior Residents**
Liorah Barbosa

Thanksgiving is often a time centered on family and gratitude. However, many older adults living in senior care communities may not always experience those connections during the holiday season. Service projects that focus on outreach can provide comfort and remind residents that they are valued and remembered so I organized a Thanksgiving Outreach service project to create and deliver holiday baskets to residents of The Cottages of New Lenox. The baskets included seasonal items that were intended to bring warmth and joy while helping residents feel included in the spirit of Thanksgiving. Through thoughtful planning and coordination, I personally distributed the baskets while connecting with members of the community and practice servant leadership through intentional giving. This project highlighted the importance of empathy and support, especially during a holiday that emphasizes the importance of family. Ultimately, the Thanksgiving Outreach project strengthened my leadership skills by allowing me to serve others with compassion and create meaningful community connections.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(11) **The Influence of Lifestyle and Socioeconomic Background on Tipping Behavior**
Dekoda Verdeyen

This study aims to identify predictors of tipping behavior by examining how lifestyle factors influence tipping practices at restaurants in the United States. Over the last several years, tipping has become an important practice in American society, and while most people accept it as a customary component of dining out, some argue that it is not necessary. This study considers variables such as gender, age, ethnicity, socioeconomic status, and parental socioeconomic background. A sample of 30 students at Benedictine University will be randomly interviewed to assess how these lifestyle factors shape tipping behaviors and attitudes toward gratuity. By analyzing these patterns, this research seeks to better understand whether personal background and upbringing play a role in financial decision-making in social settings. The findings may provide insight into broader cultural and generational differences in attitudes toward tipping, as well as inform discussions about equity within tipping culture and the influence of social expectations on financial behaviors. It is expected that individuals with higher socioeconomic status and those from higher parental socioeconomic backgrounds will report more consistent and higher tipping behaviors, with additional variation across demographic groups such as age and gender.
Faculty sponsor: Patrick Polasek

(12) **The Screen Divide: Multi-Generational Impacts of Digital Connectivity**
Nuriza Saidinbekova, Umar Haque, Ayham Imran, Simranjit Kaur

This study focuses on patterns of social media consumption and their behavioral impacts across four primary generations, which are the Baby Boomers, Gen X, Millennials and Gen Z. As the digital environments evolve the psychological and social outcomes of usage vary significantly based on a cohort's developmental stage and digital literacy. To gather data, we used an online survey that we posted on social media and that targeted participants across these four age groups. The survey asked questions about which apps people use most, how many hours they spend online, and how social media makes them feel. We specifically looked for behaviors like "digital dependency" (feeling like you can't leave your phone) and comparing one's life to those they see online. After collecting the answers, we compared the averages of each generation to see where the biggest differences were. The results would show us that younger generations, especially Gen Z, spend the most time on social media and feel more pressure to look perfect online. On the other hand, Baby Boomers and Gen X use platforms like Facebook mainly to stay in touch with family or read the news. Our study demonstrates that generational identity fundamentally dictates the psychological impact of social media usage. While younger users face significant risks like social comparison, older generations successfully leverage these tools for meaningful connection with minimal stress.
Faculty sponsor: Carolyn Liesen

(13) **Developing Fossil Boxes to Educate about the Fossil History of Illinois**
Milo Caravello

This poster describes my partnership with Dr. Phil Novack-Gottshall to create fossil boxes for children of ages five-thirteen. These boxes include informational cards I designed, prioritizing understandability and relevance. Research included reporting on the Ordovician-Pleistocene, including key species, their climates, and where Illinois was in each era. Vocabulary words and the fossilization process were also included on their own card to aid students learning on their own. As the fossil boxes can be used by elementary-age students, I made sure to design visually appealing, easy, and comprehensible cards. Not all students who use the fossil boxes will learn the same. Visual learners, for example, will find the specimens from the different prehistoric eras useful in learning to understand what life was like. The fossilized species are brought to life with detailed explanations of how prehistoric animals moved, ate, and lived. Each specimen was specially hand-picked with students' enjoyment in mind. Benedictine's Jurica-Suchy Nature Museum will include these fossil boxes in their Discovery Boxes, which are able to be loaned by the public as an educational outreach resource. Note: This project has been supported by NSF grant #2322080.
Faculty sponsor: Philip Novack-Gottshall

(14) **Making Pets' Days: A Donation Drive for South Suburban Humane Society**
Milo Caravello, Hailey Szrom

During the holiday season, animal shelters often experience a significant increase in animals that need care due to pet returns after holiday adoptions, increased strays, and owner surrender. This sudden influx can be challenging to manage as shelter staff and resources are frequently stretched thin. Our Arthur J. Schmitt service project, Making Pets' Days, partnered with the South Suburban Humane Society, a large-scale animal shelter, to support animals during this critical time. We raised awareness and increased community engagement in leading a donation drive aimed at meeting the shelter's most immediate needs. By creating promotional materials and actively using social media, we encouraged donations both in person and through the shelter's Amazon wish list, making it more accessible for community members to contribute. As a result, the shelter received essential food and supplies for puppies and kittens, while also helping provide comfort and security for animals experiencing stress and uncertainty. Overall, this project demonstrated how community involvement can directly support shelter operations and ensure animals receive the care and compassion they deserve.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(15) **Generative Artificial Intelligence in an Educational Setting**
Katherine Olson

Generative artificial intelligence (GAI) is more accessible now than ever before with every search resulting in a generated response. The use of GAI in academic settings is becoming more prevalent, and in some cases encouraging the replacement of critical thinking for the student, procrastinative study habits, and academic dishonesty in some cases. The question then becomes, how can we effectively integrate AI into the curriculum? Using it to students' advantage instead of shying away from new technology. I propose to implement a school curriculum to teach about AI and possibly go a step further to implement an AI that can help students instead of doing it for them so that they can explain to AI how subject answers work and understand it better. This AI would help students through problems by asking questions, so the student would then need to teach the AI the process to calculate the problem, enabling them to understand how the answer is derived.
Faculty sponsor: Steven Day

(16) **Two-Step Synthesis of Isoamyl Benzoate via Grignard Reaction and Fischer Esterification**
Gabriela Rasheed, Mohamed Helal

Esters are naturally occurring organic compounds that give many fruits and plants their unique flavors and scents. Papaya contains isoamyl benzoate (3-methylbutyl benzoate), which is frequently used as a flavoring and fragrance ingredient. The low efficiency of natural extraction methods makes laboratory synthesis more practical even though it can be extracted from natural sources. This project's goal is to create isoamyl benzoate using a two-step process that starts with bromobenzene. First, a Grignard reaction is used to create benzoic acid. Phenylmagnesium bromide is created when bromobenzene and magnesium react in anhydrous diethyl ether. It is then hydrolyzed with 6M hydrochloric acid and carboxylated with dry ice. Melting point, TLC, and infrared spectroscopy are used to characterize the benzoic acid, which is extracted using sodium hydroxide and re-acidified before being purified by recrystallization. The second step uses sulfuric acid as a catalyst to Fischer esterify benzoic acid with isoamyl alcohol. Liquid-liquid extraction will be used to purify the product, and TLC, IR, and ^{1}H-NMR spectroscopy will be used to characterize it and calculate the yield percentage.
Faculty sponsor: Debbie Mulhearn

(17) **Bile Acid Cytotoxicity in Human Dermal Fibroblasts: Mechanistic Insights into Effluent-Induced Peristomal Skin Damage**
Amaan Faruqi, Ishaa Jain, Monika Pawlikowski, Emaan Faruqi

Bile acids in intestinal effluent may play an underrecognized role in peristomal skin injury, yet their effects on dermal fibroblasts—cells essential for wound repair—remain undefined. As amphipathic detergents, bile acids disrupt membrane integrity and promote cell death. Our previous work showed that chenodeoxycholic acid (CDCA) increases protease activity and cell death in colonic epithelial cells, providing rationale to examine whether dermal fibroblasts exhibit similar vulnerability. We hypothesized that bile acids induce dose- and time-dependent cytotoxicity in primary human dermal fibroblasts, with CDCA causing the greatest loss of viability. Primary normal human dermal fibroblasts (passages 3–6) were treated with CDCA, ursodeoxycholic acid (UDCA), or lithocholic acid (LCA) at 50–500 µM for 0.5–24 h. LDH activity quantified membrane damage and Annexin V-FITC/propidium iodide staining assessed apoptosis and necrosis. LDH release increased dose- and time-dependently, rising sharply at 100 µM across all three bile acids ($p < 0.01$). Morphologic disruption occurred rapidly, with complete cellular detachment at higher concentrations by 24 h. Annexin V/PI staining confirmed a progression from apoptosis to necrosis with increasing dose and exposure. These findings establish that dermal fibroblasts are highly susceptible to bile acid–induced injury, providing a mechanistic link between effluent composition and peristomal skin breakdown.
Faculty sponsor: Jayashree Sarathy

(18) **Effects of Long-Term, Low-Dose Bisphenol A Exposure on Development and Cytotoxicity in *Xenopus laevis***
Ishaa Jain

Bisphenol A (BPA) is a chemical found in everyday products and throughout the environment. BPA acts as an endocrine disruptor by binding to estrogen and thyroid hormone receptors, potentially leading to various abnormalities. Our study investigated the effect of long-term, low-dose BPA exposure on the development of *Xenopus laevis* (African Clawed Frogs) tadpoles and the physiological status of froglets. Tadpoles were housed from Day 3 post-fertilization in water containing DMSO (control), 0.15µM, 1.5µM, 5.0µM, or 10µM BPA. For 6 months, development was measured weekly via snout-to-tail length and developmental stage. After 6 months, physiological status was assessed using plasma glucose (metabolic regulation) and lactate dehydrogenase (LDH) activity (cytotoxicity). Results showed that 0.15µM and 1.5µM BPA groups exhibited accelerated growth and development to NF Stage 66. No significant differences in glucose levels were observed ($p=0.08$; $n\leq10$). However, LDH activity was significantly elevated in the 1.5µM group ($p = 0.04$; $n=9$) and positively correlated with snout-vent length ($r=0.36$, $p=0.023$). These findings demonstrate that low-dose BPA exposure can accelerate development and induce cytotoxicity in *Xenopus laevis*. Further studies aim to examine the physiological and reproductive consequences of chronic BPA exposure.
Faculty sponsors: Leigh Anne Harden, Mark Poch, Jayashree Sarathy

(19) **Application of Lean Manufacturing Concepts to Precast Concrete Industry**
Ruben Coss, Amer Tikriti, Andres Marroquin

A local precast concrete manufacturer, DuKane Precast, asked the university to evaluate the operational efficiency of its metal fabrication shop in Aurora, Illinois. DuKane Precast identified 3 strategic objectives that they desired to achieve which align with their key strategic and organizational goals: (1) increased efficiency, (2) increased productivity, and (3) a focus on automation. There were two immediate areas of opportunity based on initial site visits, including reducing labor-intensive product handling and improving the efficient use of processing space. We applied lean manufacturing tools such as Value Stream Mapping (VSM), inventory assessment, circular process flow, and kanban pull systems to evaluate existing conditions and make improvement recommendations accordingly. We expect that our recommendations will lead to the implementation of Lean Daily Management (LDM) principles, such as tracking daily production, which will enhance the company's progress in achieving strategic goals stated above.
Faculty sponsor: William Schubert

(20) **Ethical Challenges and Industry Responses in Continuous Glucose Monitoring Technology: An Analysis of Dexcom's Innovations and Mission Driven Practices Through the Lens of CST Principles**
Aafreen Ahmed

The medical device industry particularly the market for Continuous Glucose Monitoring (CGM) systems plays a vital role in supporting individuals with diabetes. Despite their benefits, CGMs present several ethical dilemmas, including privacy and data security concerns, unequal access, cost barriers, Bluetooth connectivity issues, and challenges related to device size and wearability. Companies such as Dexcom have taken steps to address these concerns through their policies, product design, and mission driven practices. Dexcom's newer models demonstrate efforts to improve performance, expand user options, and enhance overall patient experience. CGM technologies have transformed diabetes management, especially for individuals with type 1 diabetes, by enabling continuous glucose tracking through user friendly mobile applications. Dexcom's approach reflects key principles of Catholic social teaching, including human dignity, the common good, and responsible stewardship. By advancing device capabilities and taking accountability when issues arise, CGM manufacturers aim to act in the best interest of patients. Although ethical dilemmas remain a growing concern within the medical device industry, companies like Dexcom continue to develop practical policies and safeguards that prioritize patient safety and wellbeing. These efforts not only support the common good but also reinforce the fundamental purpose of CGM technology: protecting and promoting human dignity.
Faculty sponsor: Robert Rebman

(21) **Investigating *Wolbachia* Infection in *Bombus impatiens*: Evidence for Absence Using Molecular Analysis**
Mariya Moinuddin, Zayna Misbahuddin, Eishaal Sodager, Ayesha Sami

Wolbachia is a widespread intracellular bacterium known to infect a diverse range of insect species; it negatively influences reproduction, evolution, and population dynamics through maternal transmission. While *Wolbachia* is prevalent across various insect taxa, its presence in Common Eastern Bumblebee (*Bombus impatiens*) remains less consistently observed and is often reported as *Wolbachia* absent. However, it is unclear whether *Bombus impatiens* specimens have the *Wolbachia* bacterium, which encourages investigation into the potential presence of *Wolbachia* within *Bombus impatiens*. In this research, we demonstrate the absence of *Wolbachia* in the Eastern Bumblebee by applying molecular techniques such as DNA Extraction, PCR Amplification, gel electrophoresis, Sanger Sequencing, and BLAST analysis to detect bacterial gene sequences and confirm presence of *Wolbachia*. Our sequencing results displayed high-quality insect DNA, and our BLAST analysis confirmed the species because it displayed a high percent similarity, and showed no *Wolbachia* bacterium sequence detection. These findings support the hypothesis that *Bombus impatiens* may commonly lack *Wolbachia* infection. The reliability of the results are supported by the successful amplification of DNA, sequence quality, and accurate phylogenetic placement. Overall, our study emphasizes the uses of various molecular techniques to identify *Wolbachia* and understand its impact in species.
Faculty sponsor: Arij Najeeb

(22) **Cultivating Environmental Stewardship on Campus: A Service-Learning Initiative Centered on Sustainability Education and Conservation**
Marium Hussain

Environmental stewardship is essential for protecting natural ecosystems, reducing human impact on the environment, and promoting long-term sustainability particularly within college campuses, where lifelong habits and values are formed. Higher ed institutions have a unique responsibility to educate students on environmental responsibility while providing opportunities for hands-on engagement. This project addressed that responsibility through a multi-component service initiative designed to increase awareness, encourage sustainable behaviors, and protect a key natural resource on campus with three main components. Sustainability Week engaged students through interactive programming, table events with local and campus organizations, a guest speaker on harmful ecochemicals and the importance of sustainable practices, sustainable knitting workshops, a documentary screening of Plastic Wars, and a week-long recycling competition focused on aluminum cans and glass bottles. The second component involved a campus clean-up of Lake St. Benedict. The final component was the installation of an educational plaque near the lake that highlights local flora and fauna emphasizing the importance of environmental protection beginning at the local level. Together, these efforts aimed to foster a culture of environmental stewardship, promote sustainable decision-making, and create a lasting educational impact on campus.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(23) **A Novel Mechanism for Preventing Mis-spliced mRNA from Accumulating in Cytoplasm**
Katherine Brill, Sofija Tunkevicius, Aarti Patel, Sophia Sokhi

Improperly spliced mRNA can result from gene mutations, cancer therapies, or randomly. To prevent improperly spliced mRNA from being translated, cells have devised several mechanisms for degrading mRNAs that fail to pass certain quality control tests. Naturally occurring alternative splicing variants of the tumor suppressor gene *BRCA2* include a frequent isoform that lacks exon 3 (Δ3). This variant has been shown to be functionally defective and is associated with breast and ovarian cancer risk. Our earlier work has shown preliminary evidence for a previously undescribed mechanism of mRNA quality control. We have observed that one non-cancer cell line (MCF 10A) allows *BRCA2* Δ3 precursors to accumulate in the nucleus but prevents it from accumulating to high levels in the cytoplasm, thus limiting its ability to translated. However, a non-cancer cell line (MCF7) does not prevent *BRCA2* Δ3 from accumulating in the cytoplasm. In our current work, we are repeating these results by separating nuclear and cytoplasmic fractions of RNA and using an isoform-specific quantitative PCR assay to validate earlier results. We will extend these findings using transcription inhibitor assays to determine whether the differences in cytoplasmic

accumulation result from differences in rates of transport or RNA stability.
Faculty sponsor: James Fackenthal

(24) **Comparative Experiment and Analysis of 2° Amines, Piperidine and Morpholine, in Lidocaine Synthesis**
Sophia Sokhi, Zoya Abid

Lidocaine is an essential medicine for local anaesthetics and heart rhythm regulation. Research into analog synthesis is necessary to understand formation mechanisms and increase pure experimental yield. Two lidocaine analogs were synthesized through a two-step reaction. An aniline derivative, 3,5-bis(trifluoromethyl)aniline, was reacted with an acid chloride, 2-chloroacetyl chloride, to form an amide intermediate, N-[3,5-bis(trifluoromethyl)phenyl]-2-chloroacetamide. The amide intermediate was reacted with two different 2° amines, piperidine and morpholine, dissolved in toluene, to produce crude lidocaine analogs. Both amines are 6-membered cyclical structures, however where piperidine has a carbon at position 4, morpholine has an oxygen. The crude lidocaine analogs were isolated and purified via extraction and recrystallization, respectively. Overall yield for purified lidocaine from the synthesis amide intermediate was 64.082% with piperidine and 32.477% with morpholine. Product purity and structure formation were confirmed with TLC and ^{1}H NMR spectroscopy and characterized with melting point and IR spectroscopy. Overall, the lidocaine piperidine analog, N-[3,5-bis(trifluoromethyl)phenyl]-2-(piperdin-1-yl)acetamide, had a higher purification percent yield of 97.150% and a more purified product, as confirmed by TLC, than the lidocaine morpholine product, N-[3,5-bis(trifluoromethyl)phenyl]-2-(morpholin-4-yl)acetamide.
Faculty sponsor: Debbie Mulhearn

(25) **Design, Synthesis, and Characterization of Lidocaine Analog via Sequential Amide Formation and Nucleophilic Substitution**
Matthew Zambrano, Angelika Kadan

Lidocaine was synthesized to make 2-(4-chlorophenyl)-N-morpholin-4-ylacetamide and N-4-chlorophenyl)-2-[4-(pryimidin-2-yl) piperazin-1-yl] acetamide. Nucleophilic acyl substitution was used to form an amide intermediate from an aniline and an acid chloride. This was followed by a nucleophilic substitution (SN_2) in which a secondary amine displaces a chlorine atom on the intermediate to produce the lidocaine analog. Acid-base reactions were used to separate and isolate the final product through protonation and deprotonation steps. The products were obtained in 60.82% and 90.47% yields, and their structures were confirmed by NMR spectroscopy.
Faculty sponsor: Debbie Mulhearn

(26) **Prenatal Environmental Factors and Their Role in Autism Spectrum Disorder**
Yusra Shakaib

Autism is a neurological disorder that affects communication and social interactions. Throughout history, there have been many hypotheses behind its cause, ranging from poor parenting to vaccines. There has since been an increase in Autism diagnoses from 1 in 10,000 in the 1980s to 1 in 31 children in the present day. This increase is likely in part due to improved screening tools and greater awareness in the healthcare system. However, research suggests that environmental factors, like endocrine disruptors and pesticides, may also contribute to this increase. This study aims to further analyze the correlation between organophosphates and autism. I plan to measure the amount of organophosphate insecticides in prenatal maternal urine samples 19 weeks into the gestation period of 300 pregnant women in the Ohio River Valley and the Paris Basin in France. Using a longitudinal study, each child will be given the “Childhood Autism Spectrum Test” (CAST) parent questionnaire to screen for autistic traits at age 11. I hypothesize that the Ohio region will have a stronger organophosphate-autism correlation because of its higher levels of contamination. This research may be important in persuading the public to minimize pesticide use and exposure.
Faculty sponsor: Jean-Marie Kauth

(27) **Resource Inequality in Land and Water: A Doughnut Economics Perspective**
Amena Khan, Safoora Mairaj

Although most countries center GDP growth as the guiding principle of macroeconomic policies and goals, this growth-centric approach does not account for growing inequalities, imbedded inequities, and the destruction of our natural environment. Alternative measures emphasize a different economic goal: enhancing prosperity and happiness, while simultaneously protecting our environment and natural ecosystems. Using this alternative framework, our research focuses on land and water usage, exploring how limited access to these resources creates challenges that interfere with the ability to meet basic human needs. We discuss potential solutions aimed at protecting environmental systems while also ensuring equitable access to these essential resources.
Faculty sponsor: Florina Salaghe

(28) **Data Science Internship with the Office of Advancement**
Afrah Zahid

This poster focuses on summer research I conducted last year during which I worked with the Office of Advancement to research potential donors for the school. I was provided a list of prospect donors and began my project by manually looking through public information such as public LinkedIn profiles, Google searches, etc. However this method was too time-consuming, so I turned to serpAPI to automate the search. After numerous trials and errors, I came to the realization that the results were rather inconsistent, based on Google search results. After further digging, I discovered a Google sheets add-on that followed guidelines and seemed to be the most effective method to gather large numbers of Linkedin profiles. With this data, I created a heat map and different clustering algorithms, including k-means and hierarchical.
Faculty sponsor: Ellen Ziliak

(29) **Campus CleanUp: A Student Sustainability Initiative**
Genevieve Jones

A sustainable campus is not defined solely by policy statements or environmental commitments, but by the daily practices that shape its physical and cultural landscape. This campus cleanup initiative advanced environmental stewardship by mobilizing students to enhance the safety, cleanliness, and overall sustainability of shared university spaces. Conducted in early December, the project strategically targeted high-traffic outdoor areas—including sidewalks, streets, parking lots, and waste-adjacent zones—to prevent debris accumulation and environmental degradation. Beyond removing visible waste (two full bags of refuse), the initiative generated heightened awareness of recurring litter patterns and underscored the collective responsibility required to maintain a sustainable campus environment. The project fostered civic engagement, strengthened community bonds, and reinforced the principle that environmental sustainability extends beyond ecological preservation to include the creation of welcoming, well-maintained spaces that support the well-being of all campus stakeholders.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(30) **Synthesis of Isopropyl Benzoate through Grignard and Fischer Esterification Reactions**
Genevieve Jones, Yara Jabri

Esters are widely used to produce flavoring and fragrances due to their naturally pleasant aromas. Due to their availability and these natural properties, esters are extracted from a variety of sources in large quantities to be able to keep up with mass production. Isopropyl benzoate specifically is a colorless liquid that has a low toxicity and comes naturally from cocoa beans. Commonly utilized for its fruity aroma, it is used in beauty products, such as lip gloss, moisturizers, fragrances, and perfumes. It is also so widely used because of the few restrictions placed on it, allowing its presence in many everyday products. With the goal of maximizing the yield of isopropyl benzoate, first a Grignard reaction was done in the lab to synthesize a benzoic acid, which is then further purified. Later, the benzoic acid is combined with alcohol and acids in a Fischer Esterification procedure. The crude compound produced is then distilled in order to purify as much as possible. The melting point, IR, and H-NMR are then taken

to assess the physical properties of the purified product. To increase the yield, the reactions were pushed in a forward direction during equilibrium to maximize the product formed.
Faculty sponsor: Debbie Mulhearn

(31) **Accuracy of Direct-to-Consumer DNA Testing**
Amalie Askar

As commercial DNA testing grows in popularity, questions about accuracy and reliability have become more relevant. This study aims to assess the accuracy of direct-to-consumer genetic testing services by analyzing how results compare to existing studies, articles, and data, with a focus on how genetic testing works using genetic markers, reference population impact, and a questionnaire of individual bias and perspective. To conduct this, 500 participants will submit their DNA to commercial testing companies. Private participation individuals will receive $250 and results. Accuracy will be evaluated using reported genetic markers—including autosomal and haploid DNA—and Ancestry Informative Markers, with a focus on how companies use reference populations to determine ancestry. Qualitative data will be collected by comparing ancestry breakdowns between companies, and a questionnaire taken before the test and after they receive their results to analyze individual bias and perspective. The study also accounts for potential limitations such as reference bias, misinterpretation of genetic data, and company differences in methodology. Expected outcomes include identifying inconsistencies across services, understanding influence of reference populations on accuracy, and impact of ancestry results on participants' self-perception. This research will contribute to the broader conversation about how accurately commercial DNA tests reflect genetic heritage.
Faculty sponsor: Jean-Marie Kauth

(32) **My Mission at Mission Church: Service, Song, and Spiritual Growth**
Cana Jones

In Biblical scripture, Jesus commands Christians to sing over 50 times. Singing to the Lord is one of the most powerful acts of worship, due to the environment it creates for those around us. Singing alone releases endorphins which are used for our own benefit, but singing in a group releases the bonding hormone oxytocin, which is highly involved in social and emotional bonding. When we sing together, it builds unity and trust. Singing unites diverse believers, strengthening our communal faith for all walks of life. For this project, I had the opportunity to begin serving at Mission Church in Bloomingdale, IL, where I am a part of the praise and worship team and I help lead people in finding and following Christ. This experience has been monumental in my growth and development as a leader. I viewed leadership as knowing all of the answers, but I found myself only having questions at the beginning. Learning new equipment, meeting new people, and singing in front of a crowd of almost a thousand people forced me to step back and learn. Now, I have gained new confidence through leading worship at Mission Church, and I am able to help others by stepping up and leading.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(33) **Investigating the Presence of *Wolbachia* in *Gyponana amara***
Mohammed Shehayber

Wolbachia is a global bacterium that exists in various forms of insects. It is recognized for its capacity to manipulate an insect's reproductive system. Research was conducted to examine the existence of *Wolbachia* in the species *Gyponana amara*, which is also referred to as the leafhopper. This insect is originally from Illinois but can also be found in other states. DNA was obtained from an insect specimen and later examined using various processes such as Nanodrop and PCR to examine the purity of the DNA and amplify the sample. Later, gel electrophoresis was conducted, and this technique enables us to detect the existence of arthropod DNA and *Wolbachia* DNA. Overall, the findings show that *Gyponana amara* are able to carry *Wolbachia*. This supports that this bacterium is extremely prevalent among insects. This research aims to make a contribution to understanding what *Wolbachia* is and how it has an impact on different insects.
Faculty sponsor: Philip Novack-Gottshall

(34) **Metformin in Medicinal Chemistry: A Pharmacological Analysis**
Maaz Zaidi

Metformin is a first-line oral therapy for Type II diabetes mellitus. A pharmacological analysis was conducted to examine the historical discovery, chemical synthesis, pharmacodynamics, and pharmacokinetics of how molecular structure can influence the therapeutic function of Metformin. Metformin is a hydrophilic biguanide that is synthesized using a one-pot condensation reaction using dimethylamine and 2-cyanoguanidine. Mechanistically, metformin indirectly activates AMP-activated protein kinase (AMPK) by inhibiting mitochondrial Complex I, thereby increasing intracellular AMP levels. AMPK activation reduces hepatic gluconeogenesis, enhances fatty acid oxidation, and improves peripheral insulin sensitivity by increasing glucose uptake in skeletal muscle. Pharmacokinetic analysis shows that metformin is absorbed via organic cation transporters (OCT-1 and OCT-3), is not metabolized by the liver or cytochrome P450 enzymes, and is excreted unchanged by the kidneys with a half-life of approximately 5 hours. These findings from the literature show how metformin's chemical properties, transport mechanisms, and cellular targets contribute to its efficacy and clinical relevance in managing diabetes.
Faculty sponsor: David Rubush

(35) **Investigating Microplastic Exposure in U.S. School Lunch Programs**
Aiyaan Aziz

Microplastic contamination has been an emerging issue in environmental science and health studies due to the ubiquity of microplastics in our ecosystems and food chain. Several studies have reported the presence of microplastics in food items, drinking water, and food packaging materials, indicating that ingestion is one of the main ways for humans to be exposed to microplastics. The existing body of knowledge has established the presence of microplastics in various food items, such as fruits, vegetables, processed foods, and human stool samples, indicating that ingestion is indeed occurring. Other studies investigated the ways microplastics can be toxic to humans, such as inflammation, oxidative stress, and the entry of harmful chemicals into our bodies. Other studies have indicated that children are more exposed to environmental pollutants than adults due to their small body size, developing biological systems, and higher consumption rates of food and water in comparison to adults. Knowledge has been developed regarding how institutional food systems can be involved in microplastic exposure in children's diets. This paper will discuss existing knowledge regarding microplastic contamination in our food systems and children's exposure to environmental pollutants, and will recommend practices that may minimize children's exposure.
Faculty sponsor: Jean-Marie Kauth

(36) **Two Step Synthesis of Lidocaine Analogs from a 2-Chloro-N-(2,6-dimethylphenyl)acetamide Intermediate with Pyrrolidine and Piperidine**
Sumayyah Khan, Vennela Vakati

Two lidocaine analogs were synthesized in a two step reaction, starting with an addition-elimination reaction of 2-chloroacetyl chloride and 2,6-dimethylaniline, forming the intermediate 2-Chloro-N-(2,6-dimethylphenyl)acetamide. In the second step, a nucleophilic substitution reaction (SN_2) was performed to produce N-(2,6-dimethylphenyl)-2-(piperidin-1-yl) acetamide and N-(2,6-dimethylphenyl)-2-(pyrrolidin-1-yl)acetamide, with the intermediate reacting with piperidine and pyrrolidine, respectively. The overall percent yields obtained for the synthesis were 5.34% for N-(2,6-dimethylphenyl)-2-(piperidin-1-yl)acetamide and 24.30% for N-(2,6-dimethylphenyl)-2-(pyrrolidin-1-yl)acetamide. The products were analyzed via thin layer chromatography, melting point analysis, infrared (IR) spectroscopy, and ^{1}H-NMR spectroscopy to evaluate their purity as well as confirm the synthesized structures.
Faculty sponsor: Debbie Mulhearn

(37) **How Safe Are Your Online Transactions? A Cryptanalysis of RSA**
Farwah Mirza

The world is increasingly moving online and relying on technology to relay information from one point to another.

This information could be anything from transferring money to sending a text message. To ensure that these transactions cannot be seen by anyone except the intended recipients, they are encrypted using the RSA algorithm. This algorithm takes the message and encrypts it using a very complex math equation that is nearly impossible to resolve. Because of its complexity, it is very difficult for any human or computer to uncover the message that is encrypted using this algorithm. Our goal this summer was to see how difficult it really was to uncover that message. We ran a series of attacks on the encryption-decryption scheme provided by the RSA algorithm. Each time our computer was able to uncover the secret message, we investigated where the vulnerability in our system lay and how it could be improved. We then further secured the system and increased the complexity of our attack, targeting different variables of the RSA scheme. For each of these variables, we ran multiple attack tests and collected data to reveal patterns that the computer may be taking advantage of to find the secret message. Next summer, we will continue this research with the goal of securing our system against quantum computing which poses a major threat to cryptosystems today.
Faculty sponsor: Ellen Ziliak

(38) **Endocranial Volume Estimates for the Sts 25 Parietal Bone**
Sana Haque

Hominin evolution contributes to a biological understanding of humans' place in nature and relationships to other species. Brain size increase is a major trend within hominin evolution. One early hominin species, *Australopithecus africanus*, is known from a sample of only 6 complete crania and a selection of incomplete fossils. Sts 25 is a relatively complete *A. africanus* specimen partly encased in limestone. Previous estimates for this specimen are unusually small and have not been used in other studies. The main purpose of our research is to create new estimates for Sts 25's endocranial volume (EV). We used polynomial regression to predict EV using parietal variables in chimpanzees and other hominins. New estimates for Sts 25 (412- 501 cm^3) and other early hominins help resolve questions about *A. africanus* and brain evolution.
Faculty sponsor: Robert C. McCarthy

(39) **The Impact of Green Marketing on Consumer Purchase Intention: The Role of Transparency, Trust, and Authenticity**
Valentina Serna

This white paper will examine the relationship between consumer purchase intention and different green marketing strategies that different companies take on with a focus specifically on the impact that sustainability marketing has on modern buying behavior trends. Concern for the environment continues to grow, and, as a result, businesses are incorporating eco-friendly claims to their branding and products. However, the effectiveness of these claims is heavily dependent on consumer trust, brand reputation, and authenticity of the claim. This paper synthesizes current research that analyzes whether green marketing actually has an impact on consumer intention. It analyzes the impact that negative aspects such as greenwashing have on it. Research findings show that even though sustainability initiatives can have a positive impact, green marketing is efficient when transparency, consistency, and honesty are shown by the company. Demographic factors such as education, age, and environmental awareness also play a role in impacting consumer response to green marketing. Ultimately, this white paper argues that green marketing is a powerful tool in influencing consumer behavior, but only when it comes to authentic business practices. These insights are useful if companies are looking to balance profitability with sustainability practices.
Faculty sponsor: Jean-Marie Kauth

(40) **Beliefs, Bullets and Backgrounds: Attitudes Toward Guns on a Private College Campus**
Miranda Garcia

In this study of attitudes toward guns on college campuses, I observed college students, analyzed any correlation between individuals' religion, political identity, or previous exposure to guns that impact the attitude individuals have towards guns. I studied attitudes on campus towards guns by doing in person interviews. I hypothesized that religion, political ideology, and previous exposure to guns do impact attitudes towards guns. My findings showed

that school shootings in the U.S. had a large impact on students being more for stricter gun control. Political ideology such as identifying as more liberal proved to have an impact on gun attitudes for example those who identified as liberal showed to be more against stricter gun regulation. Religion was not a determining factor as much as the other factors that were analyzed in my interviews. Exposure to guns had various results depending on whether the exposure had a positive or negative impression on the individual. Exposure to violent video games seemed to cause a more positive attitude towards gun use whereas watching crime themed shows are expected to cause individuals to want stricter gun reform.
Faculty sponsor: Patrick Polasek

(41) **Faculty Panel: The First Generation College Experience**
Julia Alch, Arifa Ridah

First-generation college students often encounter academic and social barriers that can make success in higher education feel daunting or unattainable. This service project was designed to challenge that narrative by proving that the first-generation identity is not a limitation, but a source of resilience and potential. As first-generation students ourselves, we organized a First-Generation Faculty Panel that brought together first-generation professors from Benedictine to share their personal and academic journeys, emphasizing that success in academia is achievable despite obstacles. We crafted questions that addressed self-doubt, navigating unfamiliar academic environments, overcoming setbacks, and redefining success. By highlighting real stories of faculty members who once faced similar challenges, the panel provided evidence that long-term academic and career success is possible. This project illustrates the impact of representation and mentorship in reshaping first-generation students' perceptions of their own potential. The panel served as a tool to inspire confidence, persistence, and ambition within the first-generation student community.
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Faculty sponsor: Julie Bjorkman

(42) **From Volunteering to Understanding: How Work at St. Cletus Parish Revealed the Importance of Food Access, Reduced Waste, and Consumer Choice**
Gabriela Quintana

Although there is enough food produced overall, many people still experience food insecurity. This problem is not caused by a lack of food, but by issues like low income, rising food prices, and limited access. Food pantries help solve this problem by redistributing extra food to those who need it. They also reduce waste and support communities during times of economic hardship. In addition, research shows that the way food pantries are designed can influence the choices people make, especially when it comes to healthier foods. By applying economic ideas like budget constraints, resource allocation, and behavioral economics, this paper shows that food pantries play an important role in improving food access and reducing inefficiencies in the market.
Faculty sponsor: Florina Salaghe

(43) **Advancing Client Dignity, Service Efficiency, and Community Care Through Client-Choice Food Pantry Innovation: A Volunteer Reflection from St. Cletus Parish During the Thanksgiving Holiday Outreach Season**
Gabriela Quintana

Community-based food pantries play a critical role in promoting food security, particularly during high-demand periods such as the week preceding Thanksgiving. This reflection examines my volunteer experience at St. Cletus Parish Pantry during one of its busiest service weeks, highlighting how organizational design and volunteer coordination shaped the client experience. Unlike traditional distribution models, the pantry utilized a grocery store–style layout that allowed families to select items within designated limits, fostering dignity, autonomy, and a sense of normalcy. Volunteers accompanied families with small shopping carts, guiding them through clearly labeled sections and assisting with product selection and transport to their vehicles. This structured yet relational approach streamlined operations while preserving personal connection. The experience underscored the impact of thoughtful spatial design, process clarity, and teamwork in community service settings. It demonstrated how intentional organizational practices can enhance efficiency while simultaneously affirming the humanity of those

receiving assistance during critical times of need.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

ATRIUM (posters 44-91)

(44) **The Effects of Food Desertification on Minority Communities**
Makayla Chism

As food deserts continue to expand, research shows that college students and minority communities, particularly African Americans, are among those most affected. Many low-income neighborhoods already face limited access to affordable and nutritious food because major companies often choose not to locate stores in these areas. With rising food prices and the growing prevalence of food deserts, it has become increasingly difficult for residents to obtain whole and healthy foods. This lack of access contributes to higher risks of chronic health conditions such as high blood pressure, high cholesterol, and diabetes. Existing studies suggest that patterns of discrimination and persistent stereotypes can influence where businesses choose to operate, ultimately shaping community health outcomes. Limited availability of nutritious food can significantly affect an individual's overall well being and quality of life. These findings highlight how systemic inequities, including racism, can impact daily living conditions and long-term health. This white paper will examine Walmart's current practices and make recommendations for improving its healthy offerings, building its commitment to the environment and social responsibility, and integrating with the communities in which they operate.
Faculty sponsor: Jean-Marie Kauth

(45) **Analysis of *Wolbachia* in *Formica pallidefulva* and *Tineola bisselliella***
Charitha Jyoti, Ayesha Waheed

This poster discusses an analysis of *Wolbachia* in *Formica pallidefulva* (field ant) and *Tineola bisselliella* (cloth moth). The goals of this experiment were to determine if our insects have *Wolbachia* (a type of bacteria that lives inside the cells of many insects and other arthropods), and determine the identity of our arthropods. Methods included DNA isolation and extraction (separating DNA from other cellular components such as proteins and RNA, which keeps DNA pure), PCR (polymerase chain reaction, used to rapidly make many copies of a specific DNA segment), gel electrophoresis (allows for visualization/separation of DNA, as well as analyzation of macromolecules based on size/charge), and DNA sequencing (process of determining exact order of nucleotides, used to understand what genes are present and how they vary between individuals). The results concluded that the field ant did not have *Wolbachia*, while the cloth moth did. Because *Wolbachia* could not be obtained from the field ant, there was also no way to see the interaction between *Wolbachia* and the arthropod. On the other hand, the presence of *Wolbachia* in the cloth moth allowed for examining its impact on moths across various environments.
Faculty sponsor: Philip Novack-Gottshall

(46) **Addressing Parent Vehicle Idling and Air Pollution Exposure in Elmhurst School Zones**
Amarah Syeda

Lung cancer is one of the leading causes of cancer-related deaths in the United States. Research has increasingly shown that air pollution is also a significant contributing factor. Major pollutants such as PM2.5 and PM10 are able to penetrate deep into the lungs and bloodstream, contributing to cancer risk. These pollutants come from many sources, including vehicle exhaust. This study aims to examine how car idling during school pick-up and drop-off contributes to localized air pollution exposure in children, and whether an educational intervention can reduce idling behavior among parents. Many parents who pick up and drop off their children at schools idle their cars, emitting toxic fumes that can negatively impact their children's health. By randomly selecting two grade schools in the city of Elmhurst, we will measure harmful gas emissions from idling vehicles before and after educating the families about the health effects of air pollution. We hypothesize that families in school districts who receive

educational intervention will demonstrate a measurable reduction in idling time compared to a control group. Findings from this study could inform school district policy and broader community awareness efforts aimed at reducing children's exposure to vehicle emissions.
Faculty sponsor: Jean-Marie Kauth

(47) **Formation of Propyl Benzoate Through a Two-Step Synthesis**
Ayesha Tayyab, Faryal Imtiaz

Propyl benzoate, an ester with a pleasant aroma commonly used as a flavoring agent, was formed through a two-step synthesis. First, a Grignard reaction was performed from solid magnesium heated with a bromobenzene and anhydrous diethyl ether solution to produce phenylmagnesium bromide. This product was then reacted with solid carbon dioxide to form a carboxylate intermediate. Acidic workup was conducted to produce benzoic acid, which was isolated through extraction and crystallization. The crude product was recrystallized and used as the starting material for esterification. Reaction progress was monitored through melting point, TLC, and IR on the benzoic acid product. In the second step, benzoic acid underwent Fischer esterification with 1-propanol in the presence of a catalytic amount of sulfuric acid to produce propyl benzoate. To form this ester, the reaction was performed under reflux conditions. The crude ester was isolated through liquid-liquid extraction, dried, and purified. Purity and product identity were assessed using IR spectroscopy, TLC, and ^{1}H-NMR spectroscopy.
Faculty sponsor: Debbie Mulhearn

(48) **Steps Toward Sustainability at The Home Depot**
Leonidas Gamino

Retail businesses have contributed to climate change through transportation of goods, deforestation, and excessive packaging waste. The Home Depot, a large retail business whose operations have a negative impact on the environment, is utilizing green practices that can minimize that impact. How can The Home Depot maintain sustainable eco-friendly operations through marketing, practices, and teaching, and become an eco-friendly leader in their industry? Customers are more likely to buy eco-friendly products from a business who actively uses and promotes green practices. The Home Depot works directly with ocean freight carriers like the International Maritime Organization (IMO) to measure and improve carbon emissions released through transportation of goods. The Home Depot also purchases most of their wood from sustainably managed forests in North America to protect unsustainable forests. The Home Depot utilizes sustainable packaging where they avoid using hard-to-recycle materials to package goods. Through marketing, retail businesses can teach customers and promote green products. By using popular influencers, large audiences can become aware of the problems in our environment and learn what they can do. The Home Depot can operate sustainably through their marketing, practices, and teachings and still reach financial targets, all while becoming a leader in the industry.
Faculty sponsor: Jean-Marie Kauth

(49) **Synthesis and Characterization of Lidocaine Analogs: Utilizing Piperidine & Pyrrolidine**
Victoria Halon, Daniela Bojovic

A two-step synthesis was performed to create lidocaine analogs from 2,6-diisopropylaniline and 2-chloroacetyl chloride. In the first step, an intermediate, N- [2,6-bis(propan-2-yl)phenyl]-2-chloroacetamide,1 was produced, which was a grey chalky solid. In step two of the reaction, this intermediate was reacted with two chosen amines, piperidine and pyrrolidine, which underwent reflux to form the final analogs. Purification and isolation were attained through a series of events including water extractions, HCl and NaOH acid-base extractions, and recrystallization using hot heptane. The overall percent yield for the piperidine analog, N-[2,6-bis(propan-2-yl)phenyl]-2-(piperidin-1-yl)acetamide,1 was 60.5% and the pyrrolidine analog, N-[2,6-bis(propan-2-yl)phenyl]-2-(pyrrolidin-1-yl)acetamide,1 was 67.3%. Using the found melting point, thin-layer chromatography (TLC) performance, and NMR data, the identities and purities were analyzed and confirmed.
Faculty sponsor: Debbie Mulhearn

(50) **How Mindfulness Training Correlates to Empathic Listening**
Nelson Julio Polanco

The purpose of this study is to show how mindfulness training correlates to improving one's empathic listening skills. It investigates whether mindfulness exercises can enhance empathic listening or not. Research shows that mindfulness increases empathy, prosocial behavior, and present-moment awareness, all of which are essential for effective listening. Undergraduate students will be randomly assigned to either a mindfulness condition or a control (active relaxation) condition. Participants in the mindfulness group will complete a brief 30-second exercise focused on awareness and intention setting, while the control group will perform a neutral relaxation task. Afterward, all participants will complete a self-report scale measuring empathic listening, attentiveness, and emotional attunement. The anticipated results are individuals who engage in regular mindfulness practice will manifest significantly higher empathic listening, selflessness, and pro-social skills than those who do not engage in mindfulness exercise.
Faculty sponsors: Carolyn Liesen, Joy Matteson

(51) **It's Not Just Peer Pressure: The Hidden Social Forces Behind Risky Choices in College**
Angelica Valenzuela

Risky and illegal behaviors on college campuses, such as substance use, unsafe social choices, or participation in high-pressure group activities, are often created and maintained through peer relationships. However, little qualitative research has examined how students themselves understand the role of peers in their everyday decision-making. This study investigates how Benedictine University students interpret peer influence both in social and digital environments and how belonging, pressure, and group dynamics shape their choices. I completed a total of 20 semi-structured interviews with undergraduate students. These interviews covered questions about their daily routines, peer groups, decision-making moments, and emotional experiences of inclusion or exclusion, alongside the role of communication platforms such as group chats and social media. Students described influential peers not only in terms of direct pressure but also in subtler processes such as the desire to fit in, fear of social exclusion, emotional contagion, and online visibility. Students reported risky and questionable decisions that occurred often in group contexts in which norms, expectations, or friendships shaped their behavior. The results from this study serve universities well in striving to comprehend how campus culture and peer dynamics influence the choices students make and provide further awareness of effective prevention and support strategies.
Faculty sponsor: Patrick Polasek

(52) **How Do College Students Think Crime Can Be Reduced?**
Mia Giammarese

This study tackles the need to understand how crime might be decreased and which strategies young adults believe are most effective. Crime continues to impact societies, including college campuses, and students frequently hold strong opinions on safety, prevention, and justice. Since college students are both impacted by crime and constitute future leaders, their perspectives provide vital insight into which initiatives could gain traction in the future. This study is looking at what college students believe to be successful in reducing crime, which includes social services, financial options, mental-health assistance, schooling, community involvement, and law enforcement strategies. To investigate this, I conducted 30 interviews that included multiple-choice questions and open-ended answers. The interview was administered to students of various majors and grade levels to find out whether their previous education or experiences affect what strategies they prefer. The feedback is assessed for prevalent themes, trends, and significant variations in opinion, which will help show what strategies students find realistic or successful. I looked at the majority of undergraduates who believe that preventive tactics are more successful than penalized ones. I saw that many students discussed mental-health resources, support from the community, schooling, and financial security as the most successful ways to avoid crimes.
Faculty sponsor: Patrick Polasek

(53) **The Influence of Attachment Style, Socialization, and Media Exposure on Romantic Relationship Beliefs**
Eshah Khalid

This study examines how early relational experiences and social influences shape beliefs about romantic relationships in adulthood. Grounded in attachment theory, it explores how attachment style, family dynamics, peer relationships, and media exposure influence perceptions of trust, intimacy, and emotional security. Participants (N = 100–200) will be recruited from Benedictine University and the surrounding community through social media, flyers, and word-of-mouth, and will complete an online survey. Independent variables include attachment style, family and peer influences, and media exposure, while the dependent variable is individuals' interpretation of romantic relationships. Data will be analyzed using descriptive statistics and correlational analysis to identify patterns between variables. It is hypothesized that individuals with secure attachment styles and positive socialization experiences will report more realistic and emotionally healthy relationship beliefs, whereas greater exposure to idealized romantic media will be associated with less realistic expectations. This research aims to clarify how developmental and social factors contribute to relationship beliefs and expectations.
Faculty sponsors: Brian Patterson, Carolyn Liesen

(54) **Sustainable Collegiate Athletics: Reducing Travel and Supply Chain Emissions in the NACC**
Jacob Getman

Climate change affects ecosystems, economies, infrastructure, and public health, creating multiple challenges for industries worldwide, including sports. The sports industry generates significant carbon emissions through event operations, transportation, and global supply chains. While many organizations focus on reducing direct emissions, research shows that most environmental impact comes from Scope 3 emissions, made up of indirect sources such as spectator travel and outsourced production. These emissions are often the largest contributors to an organization's carbon footprint, yet they are the most difficult to measure and manage. Studies identify transportation, especially fan and team travel, as a primary source of emissions. Research also shows that individual environmental awareness alone does not lead to major behavior change. This white paper examines how major sports organizations measure and address Scope 3 emissions and applies these findings to the Northern Athletics Collegiate Conference (NACC). Drawing on academic research and case studies, the analysis highlights gaps in carbon accounting and institutional responsibility and argues that conferences can influence emissions through decisions about scheduling, transportation options, and supplier requirements. The paper concludes by recommending that the NACC improve emissions tracking and adopt strategies to reduce travel and supply chain impacts.
Faculty sponsor: Jean-Marie Kauth

(55) **Re-estimation of Stature for *Australopithecus afarensis* Specimen A.L. 288-1 ("Lucy")**
Simal Mansoor

The hominin fossil specimen A.L. 288-1 is a remarkably preserved 3.5-million-year-old partial skeleton of *A. afarensis* from the Hadar region of Ethiopia. Previous estimates of A.L. 288-1's stature ranging between 100–130 cm (3'3"–4'3") have been generated using different comparative samples (short-statured humans, chimpanzees), methods (linear regression, ratios, anatomical reconstruction), and regression models (ordinary least squares, major axis, standardized major axis). Anatomical reconstruction in particular shows promise but methods to estimate the sizes of missing parts have only recently been refined. We anatomically reconstructed Lucy's stature by adding the dimensions of preserved skeletal elements (cranium, six vertebrae, the first sacral body, femur) to estimates for missing elements (other vertebrae, tibia, foot, soft tissues) that are based on living human comparative samples. We also developed a new standardized major axis regression equation for estimating total vertebral length from the six vertebrae A.L. 288-1 preserves in a modern human female cadaveric comparative sample. Our new estimates (~109–113 cm) are slightly larger than previous widely-cited regression estimates (~105–106 cm) based on femur length. Improved estimates of Lucy's stature can help refine our understanding of *A. afarensis* body proportions, sexual dimorphism, behavior, and life history.
Faculty sponsor: Robert C. McCarthy

(56) **The Conditional Profitability of Environmental Sustainability: Leadership, Strategy, and Corporate Performance**
David Kaminsky

Environmental sustainability has become a major topic within corporate business as companies are facing pressure from government agencies and stakeholders to reduce their environmental impact due to growing environmental awareness. Environmental, Social, and Governance (ESG) initiatives are leading the way in addressing sustainability issues within business, with the introduction of sustainability initiatives that often require the restructuring of operations, creating costs and unpredictability. Some studies suggest sustainability has negative impacts on finances, whereas other research demonstrates positive outcomes. This white paper dives into three major perspectives on corporate sustainability: the financial trade-offs associated with implementation, research suggesting improved company performance, and evidence that strong leadership and strategy can make or break the process. Evidence suggests that improvements can be made in efficiency and a company's long-term value. Sustainability cannot be classified as profitable or unprofitable; rather, it is contingent on a company's core beliefs. Profitability is fundamentally built on a strong leadership commitment and a strategic plan aimed at long-term success. This research is intended for corporate leaders in industries with significant environmental impact. As environmental regulations continue to evolve, corporate success will be defined by a company's ability to align sustainability goals with financial performance.
Faculty sponsor: Jean-Marie Kauth

(57) **The Cost of Disconnection: The Mental and Physical Health Effects of Social Isolation**
Emily Puentes

The purpose of this paper is to review the impact of social isolation on mental and physical health in different age groups of adults. According to the literature, loneliness is associated with anxiety, depression, cognitive impairment, and higher mortality rates. While loneliness is a subjective feeling of lack of companionship, social isolation is characterized by decreased social contact, leading to severe physiological and psychological effects. Research supports that social isolation worsens mental health by increasing anxiety and depression, exacerbates cognitive impairment by raising dementia and altering brain characteristics, and reduces physical health through increased inflammation and cardiovascular diseases. This study adopts a qualitative research method using in-depth interviews with students on campus, based on developed questions exploring their experiences and perspectives. Approximately thirty students were selected and interviewed to gather detailed data. The data was analyzed to identify recurring themes and insights while considering demographic factors. Common themes include the lasting effects of Covid, athletic and group environments, and technology as both a bridge and a barrier. This study aims to fill gaps in understanding how social isolation affects well-being and to help design interventions for susceptible groups, supported by literature on social connectedness and neurophysiology.
Faculty sponsor: Patrick Polasek

(58) **The Impact of RF-EMF Radiation On Human Health: Investigating Oxidative Stress**
Rabiyah Syed

As a society that has become increasingly reliant on technology, the expansion of telecommunication infrastructure has become common. Radiofrequency (RF) and electromagnetic field (EMF) radiation is now part of the environment, like noise or light pollution. In 2011, RF radiation was classified as a possible carcinogen by the World Health Organization's International Agency for Research on Cancer. As a result, further research has been conducted on the biological effects of RF-EMF radiation. Earlier research found neurological and cognitive effects, while recent research has shown cellular effects, including oxidative stress. Current research presents mixed conclusions, mainly relying on controlled laboratory experiments or animal models. The limited human studies are observational, focusing mainly on measuring environmental exposure. This project aims to integrate previous research using methodologies from observational and biological studies. Measuring radiation levels in apartments, combined with periodical biological testing for oxidative stress over 6 months, should provide further insight into the overall long-term effect of RF-EMF radiation in humans. I expect to find that the greater the measured radiation and the longer the reported exposure, the greater the indicators of oxidative stress. This is important because it is

necessary to understand biological repercussions due to growing technological infrastructure.
Faculty sponsor: Jean-Marie Kauth

(59) **Intergenerational Trauma and Neurobiological Links to Mental Illness**
Shifa Kaleemuddin, Simrah Qadri

Childhood trauma and maltreatment have long-term effects on brain development, behavior, and mental health outcomes. Research shows that traumatic experiences during early development can alter brain structures involved in emotional regulation, stress response, and social functioning, increasing the risk of anxiety and depression. However, the ways these neurobiological and psychological changes contribute to the intergenerational transmission of trauma remain complex. This paper examines neurobiological research, psychological theories, and behavioral patterns associated with childhood maltreatment to explain how trauma is passed across generations. Evidence suggests that chronic stress can disrupt neurological systems, including neurotransmitter activity and the hypothalamic-pituitary-adrenal (HPA) axis, leading to long-term changes in stress responses. In addition, children exposed to trauma may learn maladaptive behaviors through observation and reinforcement, influencing future relationships and parenting practices. These biological and psychological processes contribute to cycles of abuse and increased risk of mental illness, highlighting the importance of early intervention and prevention strategies.
Faculty sponsor: Rachel H. Karaskiewicz

(60) **A Gender-Based Biological Perspective: The Effect of Pesticides on Parkinson's Disease**
Sara Vergara Hernandez

Although pesticides are widely used in agriculture and household spaces, they pose a danger to the neurological health of humans. More specifically, pesticide usage has shown correlation to the development of Parkinson's disease (PD). Current research has shown specific pesticides like paraquat, rotenone, and organochlorines damage biological systems in the human brain. Mitochondrial dysfunction, neuroinflammation, and oxidative stress are common in participants who were exposed to pesticides. Additionally, there has been a global rise in PD since cases rose from 3.15 million in 1990 to 11.7 million in 2021, with predicted increases in the future. However, gaps remain in understanding how gender-specific biological mechanisms influence the development of PD with pesticide exposure since males are disproportionately represented in current data. This proposal aims to isolate the gender-specific biological factors by expanding the blood-sampling methodology to a larger gender-focused sample of approximately 200 participants and to identify biological factors that lead to differing rates of PD in men and women. I hypothesize that differences in effects between genders are caused by varying biological vulnerabilities between male and females. This would provide insights into which specific biological factors are vulnerable in either gender, giving data for possible future treatments and prevention.
Faculty sponsor: Jean-Marie Kauth

(61) **Molecular Analysis of Insect Species and Associated *Wolbachia***
Joud Zeitoun, Hala Mallah

The *Wolbachia* project investigates how molecular techniques can be used to identify insect species and detect the presence of intracellular bacteria such as *Wolbachia*, which was specifically examined in this experiment. To address this, insect specimens of choice were examined morphologically, genomic DNA from both the insect and associated bacteria was extracted and amplified using PCR, and the resulting sequences were analyzed with bioinformatics tools in order to construct phylogenetic trees. The genetic data generated allowed evaluation of species identity and evolutionary placement, illustrating how integration of anatomical and molecular methods enhance the understanding of biodiversity and evolutionary relationships with insect species.
Faculty sponsor: Philip Novack-Gottshall

(62) **Temperature Tipping Points: A Multi-City Analysis of Non-Linear Temperature Effects on Violent Crime**
Payton Knox

Climate change presents escalating challenges to public safety, with rising temperatures associated with a range of

social consequences. The relationship between ambient temperature and criminal activity has been consistently documented in the literature. Numerous studies have demonstrated that crime rates increase along with rising temperature up to a certain threshold, beyond which the relationship diminishes. The proposed research builds on the literature by identifying the specific range of the correlation and where it plateaus. Daily crime will be obtained from the FBI's Uniform Crime Reports. Daily maximum temperatures will be obtained from NOAA weather stations. The study will examine 12 cities across distinct climate zones in the United States based on the Köppen-Geiger climate classification, allowing for an assessment of whether temperature changes shift thresholds. It is hypothesized that the numerical values of the temperature range will be stable across the cities, while the threshold at which the positive correlation plateaus will vary according to the regional climate. These findings will inform the regional law enforcement agencies, enabling a more proactive approach and better resource allocation during high-risk temperature periods.
Faculty sponsor: Jean-Marie Kauth

(63) **Characterization of MohammedSpec (Amaya): A Potential Lytic Phage that Infects the Soil Bacterium *Arthrobacter atrocyaneus***
Mohammed Naseeruddin

SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) is a research program that aims to isolate and characterize viruses that infect bacteria. I isolated phages that infect the soil bacterium *Arthrobacter globiformis*. The soil I collected was slightly moist, dark, and crumbly. I hypothesized that the plant diversity near the isolation site would likely yield phages for this bacterial host due to the isolation site being near a highly populated area. I characterized one phage named Amaya through many steps and procedures. In this laboratory, I isolated a potentially lysogenic phage, named Amaya, that infects the host *Arthrobacter globiformis* specifically at 22°C. Through TEM, I concluded that phage Amaya is likely a Siphovirus, a bacteriophage with a long non-contractile tail with a double stranded DNA genome. In the future, I would like to repeat the genome analysis with a different enzyme to see if another area would result in a different bacteriophage to be researched. Lastly, I would like to sequence its genome to corroborate restriction sites and compare other phages to Amaya.
Faculty sponsor: Michael J. White VanGompel

(64) **Deadly Similarities: Global Patterns in Infectious Disease Mortality**
Izhan Baber

This research examines the sources and distribution of mortality caused by infectious diseases worldwide using online data for the past forty-one years. The data was gathered through the Institute of Health and Metrics Evaluation, processed through Python, and then analyzed through the network analysis platform, Gephi. Our findings are fourfold: (1) Respiratory and diarrheal diseases are the most common sources of mortality, along with, more recently, COVID. (2) Wealthy countries and Sub-Saharan African countries are the least alike in disease profiles. (3) Marked changes in profile similarities occurred during the AIDS/HIV and COVID outbreaks. (4) The disease profiles of wealthy countries like the US are converging on global averages, possibly from increased travel and migration.
Faculty sponsors: Preston Aldrich, Jeremy Nadolski, James Fackenthal

(65) **Unique Branching Pattern for the Lateral Thoracic, Thoracodorsal, and Circumflex Humeral Arteries**
Zuhair Syed

The axillary artery is divided into three parts based on its position relative to the pectoralis minor muscle. Normally, the lateral thoracic artery branches from the second part of the axillary artery (deep to pectoralis minor), the thoracodorsal artery is a branch of the subscapular artery along the third part (distal to pectoralis minor), and the anterior and posterior circumflex humeral arteries arise independently from the third part of the artery. During routine dissection, we discovered an atypical arrangement of the lateral thoracic, thoracodorsal, and circumflex humeral arteries in the cadaver of a 72-year-old male. On the right side, the lateral thoracic and thoracodorsal arteries originated from a common trunk on the second part of the axillary artery and the circumflex humeral

arteries formed branches of the subscapular artery. A previous study found that the thoracodorsal artery branched off the subscapular artery in 94 cases but formed a common trunk with the lateral thoracic artery in only 1 case (out of 100). The individual variations we observed have been described previously, but are rare, and to our knowledge have never been observed in combination. We discuss the evolutionary and developmental implications of this unique case.
Faculty sponsor: Robert C. McCarthy

(66) **Hidden Antibiotics in Everyday Soil: Isolation of a Bacillus megaterium with Antimicrobial Activity**
Rida Khan

The rise of antibiotic-resistant bacteria has increased the need to discover new antimicrobial compounds from environmental microorganisms. Soil is a major source of antibiotic-producing bacteria which makes it an important focus for discovery efforts such as the Tiny Earth program. In this study, a soil sample collected from a landscaped residential area in Carol Stream, Illinois was analyzed to isolate bacteria with potential antibiotic activity. Serial dilution and plating on Emerson agar produced six distinct bacterial colony types. These isolates were screened for antimicrobial activity against safe ESKAPE relatives, Staphylococcus cohnii and Pseudomonas putida. One isolate produced a clear zone of inhibition against S. cohnii, indicating antibiotic activity. Gram staining and microscopy revealed Gram-positive, rod-shaped cells with large endospores and no observed motility. Oxidase and catalase tests were done and came out to be negative. 16S rRNA sequencing followed by BLAST analysis showed approximately 94% similarity to Bacillus aryabhattai and Bacillus megaterium. Based on sequencing results and the large endospore morphology observed microscopically, the isolate is most consistent with Bacillus megaterium, which is a common soil bacterium known for producing antimicrobial compounds.
Faculty sponsor: Mark Poch

(67) **PCR and Sequencing Analysis of *Wolbachia* in Three Arthropod Species**
Sarah Sarfraz, Andriana Vishka, Zara Hussain

This semester-long study investigated the presence of *Wolbachia*, a bacterium, in three arthropods: a European Paper Wasp, a Pill Bug, and a Fungus Gnat. The objective was to determine whether these organisms were infected with *Wolbachia* using molecular and sequencing techniques. It was hypothesized that at least one specimen, particularly the wasp, would test positive since *Wolbachia* is known to infect a wide range of insect species. DNA was extracted from each organism and analyzed through PCR amplification and DNA sequencing to detect *Wolbachia* specific genetic markers. Despite expectations, results showed that none of the specimens tested positive for *Wolbachia*. These findings did not support the initial hypothesis. The results suggest that *Wolbachia* infection is not universal, even in species where it has been previously reported, and may vary by population or environmental factors. This study highlights the importance of molecular techniques in confirming whether certain bacteria are actually present inside an organism.
Faculty sponsor: Philip Novack-Gottshall

(68) **Self-Healing Biofilms for Safer Nuclear Waste Storage: Engineering Radiation-Resistant Bacteria to Seal Micro-Cracks**
Ashleen Mukande

Long-term nuclear waste storage remains a major challenge because containment systems must remain stable for thousands of years. Over time, storage containers can experience stress from radiation, temperature changes, and corrosion, which may lead to the formation of micro-cracks. Even small cracks can allow moisture to enter, speeding up damage and increasing the risk of environmental contamination. This project proposes a new approach that uses radiation-resistant bacteria to create a self-healing coating on storage containers. In particular, the bacterium Deinococcus radiodurans is known for its ability to survive extreme radiation and form biofilms. These biofilms could potentially respond to micro-cracks by producing materials that help seal and repair damage. This proposal brings together ideas from biology and engineering to explore a more sustainable and long-term solution for nuclear waste storage. If successful, this approach could improve safety, reduce maintenance needs,

and increase the lifespan of storage systems.
Faculty sponsor: Mark Poch

(69) **Estrogen as a Potential Amplifier of Circadian Rhythm Disruption from Pervasive Environmental Factors**
Mohammad Nawaz

Circadian rhythms (CRs), one of the most important regulatory processes in all living organisms, are responsible for a plethora of physiological and behavioral processes, most notably the sleep-wake cycle, body temperature, and hormone release. Environmental zeitgebers, such as artificial light, shift work, and irregular sleep schedules, disrupt CRs, contributing to various health risks, including metabolic disease, mood disorders, neurodegeneration, immune dysfunction, and cancer. Recent studies have shown that female mice experience higher levels of health complications due to environmental CR disruption compared to male mice. However, the reason for this disparity is still underexplored. This study aims to determine whether estrogen amplifies the deleterious effects of environmental circadian disruption. By conducting a controlled experiment in which four groups of mice—each representing distinct estrogen conditions (intact female, estrogen-deficient female, estrogen-replaced female, and male)—undergo identical light-dark cycle shifts to induce circadian disruption, one can determine whether estrogen directly amplifies, mitigates, or has no effect on circadian-related physiological outcomes such as hormone levels, metabolism, inflammation, and cardiovascular function. Findings from this study will provide insight into the hormonal basis of sex differences in circadian disruption and may inform future research on sex-specific vulnerability to environmental stressors.
Faculty sponsor: Jean-Marie Kauth

(70) **Cosmology with Gravitational Waves and Merging Galaxies**
Bradly Phoulavong

Studies in cosmology, particularly around the Hubble tension, were conducted with the modelling and simulation of gravitational waves (GWs) and identification of merging galaxies. Leveraging the Perlmutter computing cluster at the National Energy Research Scientific Computing Center (NERSC), simulations of gravitational waves from three types of binary systems, Neutron Star-Black Hole (NSBH), Binary Neutron Star (BNS), and Binary Black Hole (BBH) systems. In addition, the detection effectiveness of current and future GW observatories were performed over the summer of 2025 with the Python GWFAST software package. During the fall of 2025, galaxy merger candidates were found with with the DP.01 data product and Photo-Z estimates from the recently operational Rubin Observatory in Chile. Both projects were preparatory work for future studies, with the overlap being that GWs and galaxy mergers are potential tools in resolving the Hubble tension, a disagreement between measurements of the rate of expansion of the universe that has so far resisted all attempts at resolution.
Faculty sponsor: Matthew Wiesner

(71) **The Evolutionary Patterns of Body Size in Decapods**
Nour Albanna, Alana Lockett, Isabel Gonzalez

Decapoda is a class of crustaceans which inhabited several marine environments throughout history. Decapods appeared as early as the Devonian period, and were fairly common during the Mesozoic era, specifically the Jurassic and Cretaceous time periods. Due to the incredible diversity of decapods they are a critical class which is severely understudied. A vast amount of body sizes were analyzed after collecting data from published literature. Using R studio, along with the data collected, size trends of decapods were identified and compared to other known trends.
Faculty sponsor: Philip Novack-Gottshall

(72) **The Effects of Socioeconomic Status on Air Pollution Exposure and Birth Weight**
Syeda Ahmed

Air pollution is one of the most harmful issues affecting us today, and its effects on quality of life are incredibly

important to understand. The most defenseless members of our society seem to be receiving the worst of these effects; fetuses are impaired the most in several ways, and these issues affect them in every aspect after birth. Previous research has collected data regarding increased pollution and birth weights of babies born in that area. However, more research is required to determine if impoverished areas are more affected than others. In the proposed study, air pollution and birth weight will be measured in areas of varied socioeconomic status. I hypothesize that areas of increased poverty will exhibit decreased blood oxygen levels as well as decreased fetal birth weight. This experiment will allow for us to better understand which areas need to be helped and how these factors are harming early development.
Faculty sponsor: Jean-Marie Kauth

(73) **Hybridization of Rural Economic Geography: E-Commerce Logistics and the Reorganization of Supply Chain Space**
Anna Lakomiak, Mahnoor Fatani

The explosive growth of e-commerce has contemporaneously reshaped the spatial organization of global supply chains. In the United States, one visible manifestation of this transformation presents itself in the proliferation of large distribution centers and logistics warehouses. This phenomenon, often dubbed as logistics sprawl, signifies the heightened influence of transportation accessibility, land availability, and lower operational costs in determining facility location. As companies expand their fulfillment networks to meet rising consumer demand for rapid delivery, rural landscapes are increasingly integrated into global economic systems. This research examines how globalization and e-commerce logistics infrastructure are transforming rural land use, labor markets, and regional development patterns. By analyzing the intersection of globalization, transportation infrastructure, and rural development, this study seeks to better understand how global supply chain networks are reshaping the economic geography of rural regions.
Faculty sponsor: Florina Salaghe

(74) **Investigating the Spatiotemporal Interplay between Sediment-Dwelling Bacteria and Lake St. Benedict Water Quality**
Inaaya Baig

Many aquatic ecosystems experience eutrophication, in which excess nutrients cause algal growth, decomposition, and subsequent depletion of dissolved oxygen (DO) required for wildlife. Phosphorus-solubilizing bacteria (PSBs) in lake sediment can play a role in internal cycling of nutrients such as phosphorus (P) by solubilizing under low oxygen, thus mobilizing algal blooms and exacerbating eutrophication. This study investigates the internal cycling of P in Lake St. Benedict, a shallow, man-made freshwater slough that experiences high water temperature, low DO and water flow, and excess P. To better understand the role microbes play in aquatic ecosystem functioning of our campus lake, we characterized the microbial abundance and diversity in the sediment and measured physicochemical properties of water and sediment at three different seasons (July, Nov, Mar) in 2025-2026. We hypothesized that summer conditions, with its higher temperatures, lower dissolved oxygen (DO), and elevated phosphorus (P), would support a greater abundance of phosphorus-solubilizing bacteria (PSBs) and anaerobic microbial communities. Thus far, we have analyzed sediment from July 2025 and found that there is a dominance of anaerobic, nutrient-cycling taxa like Bradyrhizobiaceae, suggesting summer conditions promote phosphorus mobilization and eutrophication. Further studies will compare microbial shifts in different seasons.
Faculty sponsors: Leigh Anne Harden, Mark Poch

(75) **How Microplastics Affect Teeth: Exploring The Impact of Clear Aligners and Composite Fillings on Enamel Wear, Material Breakdown, and the Oral Environment**
Albina Sadiku

Microplastics have become an industrialized material commonly found in everyday products. The effect of microplastics on teeth has become a new area of study as a result of the degree of unknowing exposure involved in traditional oral health. Exposure to microplastics occurs both in office and at home during oral care from toothbrushes, toothpastes, resin, composites, clear aligners, etc. Many findings conclude that exposure to microplastics can cause plaque buildup and gingivitis due to the rough surface that the microplastics create on

teeth. Although the initial exposure effects are subtle, they are enough to cause build-up of biofilm, leading to later periodontal disease. I propose an intervention study using biodegradable options in dental care, both at home and in office care. I expect to find a correlation between high levels of exposure and the prevalence of cavities and other gum and teeth problems. Such research is important because oral health allows people to continue the daily functions of chewing and speaking and acts as a doorway for a person's overall health.
Faculty sponsor: Jean-Marie Kauth

(76) **Assessing *Wolbachia* In *Ceratina calcarata* and *Uroleucon leonardi***
Arfah Khaled, Aaliya Imtiyaz

Insects play essential roles in ecosystems, and many harbor symbiotic bacteria that influence their biology and reproduction. The bacterium *Wolbachia* is commonly found in arthropods and is known to alter host reproductive processes, which makes it an important system for studying evolution. Species such as *Ceratina calcarata* (pollinator) and *Uroleucon leonardi* (plant-feeding aphid) represent ecologically distinct insect hosts. However, it is not known whether both of these insect species host *Wolbachia* or how its presence differs between a pollinator and an aphid. We identified the presence of insect DNA in both species and detected *Wolbachia* infection in *Ceratina calcarata* by extracting DNA, amplifying COI and 16S rRNA genes using PCR, and confirming results through gel electrophoresis and BLAST analysis. The amplification and sequencing of COI genes confirmed species identity for both insects, with 100% query coverage and 100% identity. *Wolbachia* was found only in *Ceratina calcarata*, suggesting that species vary in whether they carry the bacterium. This supports the hypothesis that *Wolbachia* distribution isn't uniform across insect taxa. These results help us understand how microbes interact with their hosts and contribute data to the global *Wolbachia* Project. This research highlights the importance of molecular techniques in evolution and applications in biological control for invasive species.
Faculty sponsor: Philip Novack-Gottshall

(77) **Rumi Kang: A Psychiatric Diagnosis of Major Depressive Disorder with Suicidal Ideation**
Phuwin Kabeer

This project examines the fictional character Rumi Kang from *KPop Demon Hunters* as a case study of major depressive disorder (MDD) with suicidal ideation through a biopsychosocial and neurobiological perspective and framework. By utilizing qualitative character analysis, Rumi Kang's behaviors, thoughts, and experiences are compared to diagnostic features/symptoms of major depressive disorder which are outlined in the DSM-5, alongside recent empirical research on depression, anxiety, and suicidality. After reviewing articles and cross-referencing scenes from the movie, findings suggest that Rumi demonstrates key symptoms of MDD, such as persistent feelings of worthlessness, social withdrawal, excessive guilt, and an active suicidal ideation, and research indicates that comorbid moderate-to-severe anxiety significantly increases suicide risk in individuals with MDD (Ren et al., 2025), which aligns with Rumi's chronic fear, hypervigilance, and internalized shame. Along with that, neurobiological studies show that abnormalities in the amygdala contribute to heightened emotional reactivity and more impaired cognitive control in depressed individuals (Li et al., 2025; Jing et al., 2025). Rumi's experience reflects these patterns, particularly in her distorted self-perception and difficulty regulating emotional responses. The project will include lyric analysis taken from songs in the movie to get an insight of how Rumi's symptoms were portrayed as the movie is song-heavy.
Faculty sponsors: Carolyn Liesen, Jennifer Stewart

(78) **Educational Intervention as a Strategy for Mitigating Air Pollution-Related Oral Disease**
Sulaiman Saeed

A growing body of research links environmental air pollutants to an increased chance of oral diseases, including periodontitis and oral cancer. Dentistry currently focuses on the personal hygiene of the patient, but the inclusion of environmental health assessments into the standard care of dental patients will increase the overall success of treatment outcomes, as it addresses external risks to oral health, including fine particulate matter (PM2.5) and indoor smoke. This white paper aims to demonstrate to the reader the effects of environmental pollutants on the body, leading to localized inflammation and complications in overall health. In order to bridge the gap currently

found in dentistry, it is proposed that the American Dental Association (ADA) implement continuing education courses on environmental dentistry, which will allow the dental community to move towards a more holistic preventative care model, addressing not only personal risks but also environmental risks to oral health.
Faculty sponsor: Jean-Marie Kauth

(79) **Filling Benedict's Basket: Raising Awareness and Encouraging Community Support for Students in Need**
Paulina Ulinskas

Food insecurity on college campuses is often an unseen barrier to student success, affecting academic performance, well-being, and persistence. Recognizing that meaningful service begins within one's immediate community, this project focused on addressing food insecurity at Benedictine University through strategic communication and awareness-building efforts. In collaboration with Campus Ministry, I drove a new promotion of the university's on-campus food pantry, Benedict's Basket, with the goal of increasing visibility and reducing stigma associated with its use. The initiative emphasized clear messaging that the pantry is free, open to all students without registration, and conveniently located in Lownik Hall. Through the development of targeted flyers, signage, and social media content, the project sought to normalize pantry utilization while encouraging voluntary donations to sustain the resource. This service initiative demonstrates how intentional communication strategies can strengthen campus support systems, foster inclusivity, and contribute to a culture of care within the university community.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(80) **Blame Game: Looking at How Personality Traits Relate to Social Deduction Games**
Ameena Siddiqui

Social deduction games like Mafia, Among Us, and Secret Hitler require players to figure out who the hidden "impostors" are, which often leads to quick accusations, emotional reasoning, and pressure to follow the group. These games create a natural setting to study how personality traits and social psychological processes, such as the bandwagon effect, attribution bias, and emotional projection, influence group judgment and behavior. Since players have to make fast decisions with limited information, defend themselves, and respond to others, these situations allow us to observe social behavior in real time. The purpose of this study is to examine how the Big Five personality traits and MBTI personalities relate to in-game behaviors, especially how often and how quickly players make accusations. It is predicted that individuals higher in agreeableness or conscientiousness will accuse others less often, while those higher in extraversion or neuroticism will make faster and more emotionally intense accusations. Participants will be placed in groups of six and will play multiple rounds of these games. Before playing, they will complete a demographic survey and a short 10-item Big Five personality questionnaire. During gameplay, behaviors such as accusation frequency, communication style, responses to group influence, and visible emotional reactions will be observed.
Faculty sponsor: Carolyn Liesen

(81) **AI-Driven Non-Lethal Laser System for Goose Deterrence**
Ernesto Carlton, Fuat Celikel

The dissolved oxygen (DO) levels in Lake St. Benedict are vital for sustaining aquatic life. A multitude of sources deplete the water of DO, with a significant contributor being the fecal matter of Canadian geese. This research aims to decrease the presence of geese around the lake with an automated, non-lethal deterrent system. The system employs an AI-based object detection model to distinguish geese from humans in real time, enabling safe, targeted operation. The system projects rapidly moving laser patterns near the animals without making direct contact. This scares the animals and effectively removes them from the area. The prototype integrates computer vision, servo controlled laser motion, and near infrared imaging for improved detection performance in varied lighting conditions. Prototype testing is still underway. Initial evaluations have confirmed the system successfully distinguishes between humans and geese. Additional accuracy validation and system-response testing are in progress as new hardware components arrive. A new prototype is currently being assembled which will be used for

full outdoor field testing.
Faculty sponsors: William Schubert, Andrew Wig

(82) **Using AI to Optimize the Aeration Schedule for Lake St. Benedict**
Kaitlin Citari, Ernesto Carlton, Maritza Diaz

Maintaining adequate dissolved oxygen (DO) levels is critical for sustaining aquatic ecosystems. This is particularly important during summer months when elevated temperatures increase the rate of oxygen depletion. Lake St. Benedict has historically experienced periods of critically low DO, resulting in fish kills and significant ecological stress, highlighting the need for improved management strategies. This project applies artificial intelligence to optimize aeration scheduling. The aim is to balance ecosystem health with energy efficiency. Historical datasets, including DO concentration, water temperature, and related environmental variables, were analyzed using a Python-based machine learning model to estimate oxygen depletion rates under varying conditions. Building on these predictions, the model is designed not only to forecast critical DO declines but also to generate an optimized aeration schedule for peak summer conditions. By activating aerators only when necessary, this approach reduces energy consumption while maintaining safe DO levels for aquatic life. This work demonstrates how data-driven tools can enhance sustainability, prevent ecological damage, and simplify lake management practices.
Faculty sponsor: William Schubert

(83) **The Impact of Endocrine-Disrupting Chemicals on Thyroid Function**
Aisha Saeed

Evidence suggests that endocrine disrupting chemicals (EDCs) have a deleterious effect on thyroid functions. While some argue that the effect is minimal, the majority of research shows that it does have a large effect on hormone synthesis, regulation, and signaling. EDCs that affect thyroid are found in industrial chemicals, plastics (such as bisphenol A), pesticides, and personal care products, making exposure both widespread and difficult to avoid. These chemicals can mimic or block hormones, disrupting normal thyroid activity and potentially contributing to conditions such as hypothyroidism or hyperthyroidism. Healthcare practitioners should be aware so they can diagnose and educate about prevention. Increased awareness can help to diagnose thyroid-related disorders and promote patient education on prevention strategies, including reducing exposure to harmful environmental chemicals.
Faculty sponsor: Jean-Marie Kauth

(84) **WINGS: Winter Clothing Drive for Domestic Violence**
Habiba Siddiqui, Kaylee Ludwig

According to the World Health Organization, nearly one in three women have experienced partner or sexual violence during their lifetime. Domestic violence is one of the most underreported crimes in the United States. The access to different organizations assisting domestic violence survivors provides opportunities for individuals to receive rehabilitation and support in vulnerable times. WINGS Program Inc. is the largest domestic violence provider in Illinois. They provide housing and integrated services to adults and children who are in need. Our volunteer project was partnering with WINGS to host a two-week clothing drive on campus. The goal was to bring awareness to domestic violence and how it affects us locally within our community while providing support to the organization. Our clothing drive provided resources to the WING's resale facilities, supporting their goals to encourage aid for women who were victims of domestic violence and promote commitment to achieving this goal nationally.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(85) **Evaluation of the Presence of *Wolbachia* in *Harmonia axyridis***
Aiza Shuttari, Nourah Khandaker

Wolbachia is a genus of a bacteria known for its ability to infect a wide range of organisms, particularly arthropods,

and manipulate their reproductive systems. This research project aims to collect more data regarding *Wolbachia* and investigate the effects of infection in host organisms using various molecular techniques. DNA was extracted from *Harmonia axyridis*, amplified through polymerase chain reaction (PCR), sequenced, and analyzed to detect *Wolbachia*-specific genes. The results indicated that *Harmonia axyridis* was infected with *Wolbachia*. These findings support that *Wolbachia* infection is present in various arthropods, highlighting the potential to reduce their spread of vector-borne diseases, like malaria and dengue, positively impacting public health. Overall this study contributes to research on host-microbe interactions and the significance of microorganisms shaping the ecosystem.
Faculty sponsor: Philip Novack-Gottshall

(86) **The Neurotoxic Effects of Microplastics on the Brain**
Ayesha Salman

Synthetic polymers have evolved from ecological concerns into a threat to human neurological health. Recent evidence indicates that nano- and microplastic bioaccumulation within the central nervous system (CNS) triggers specific cellular mechanisms of toxicity. This study addresses issues regarding the lack of longitudinal data on plastic-induced neurodegeneration. We will utilize 120 male and female APP/PS1 transgenic mice and model chronic exposure over a 12-month period. The mice will receive nanoplastic-contaminated drinking water to simulate environmental ingestion while the control groups receive ultra-pure water. To investigate the role of collagen signaling in exacerbating cognitive deficits, the DDR1 collagen pathway inhibitor TC-1 15 will be administrated through injection abdominally. This intervention aims to determine if the suppression of glial-derived collagen signaling can mitigate the neuroinflammatory response and cognitive decline associated with plastic infiltration. We hypothesize that chronic ingestion of nanoplastics exacerbates neuroinflammation in APP/PS1 mice by upregulating glial-derived collagen signaling; this causes the inhibition of the DDR1 pathway by TC-115 which will significantly increase cognitive decline in the experimental group compared to the control group. Ultimately, we should classify microplastics as a primary environmental neurotoxin, raise clinical awareness of its effects, and enforce regulations for this emerging health crisis.
Faculty sponsor: Jean-Marie Kauth

(87) **Mapping SR Protein-Binding Sites and Clinically Identified Spliceogenic Mutations to *BRCA* mRNA Splicing Junctions**
Toleen Abdelrahim, Bailey Soto

Accurate splicing of mRNA requires correct placement of the multi-component spliceosome. These factors are guided to intron-exon junctions and splicing branchpoints by serine-arginine-rich (SR) proteins bound to exonic splicing enhancer sequences (ESEs). While the nucleotide sequences that define the intron-exon junctions are strongly conserved, the sequences that bind SR proteins are highly divergent. Moreover, there are many different SR proteins with nearly identical functions that bind to different RNA sequences. However, mutations in ESEs may disrupt correct splicing and thus gene function. *BRCA1* and *BRCA2* are tumor suppressor genes associated with breast and ovarian risk, and individuals with family histories of cancer are counseled to seek *BRCA1* and *BRCA2* gene sequencing. It is therefore clinically important to determine whether sequence variants fall within ESEs. A matrix-based algorithm (ESEFinder) has been developed to identify potential candidate ESEs within RNA sequences. To identify ESE consensus sequences that may function as splicing enhancers we are mapping potential ESEs to the splice sites in *BRCA* genes and determining which clinically identified spliceogenic mutations listed in ClinVar map to the candidate sequences. Future work will test ESE identities using site-directed mutagenesis and reporter assays.
Faculty sponsor: James Fackenthal

(88) **Synthesis and Discussion of Two Novel Lidocaine Analogs Consisting of Elongated Acid Chloride Carbon Chain and Addition of Benzene Ring on the Secondary Amine**
Kathryn Ann Araneta, Toleen Abdelrahim

Lidocaine is an anesthetic often administered for its antinociceptive, antiarrhythmic, anti-inflammatory, and antithrombotic effects. Derivatives of lidocaine are important in pharmaceutical research due to their addressed effectiveness, yield, selectivity, and even safety. In this research, two novel lidocaine analogs were synthesized

using a two-step mechanism. The first step focuses on the formation of an amide using a nucleophilic acyl substitution reaction, with the second step utilizing a nucleophilic substitution reaction, $SN2$. Analog A, N-(2,6-dimethylphenyl) -4-(1,2,3,4-tetrahydroisoquinolin-2-yl) butanamide, was found to have an overall percent yield of 12.23%. On the other hand, analog B, N-(2,6-dimethylphenyl)-4-(piperidin-1-yl) butanamide, was found to have an overall percent yield of 6.32%. The distinction between the structures of the two analogs includes the addition of an aromatic ring (for analog A) to study how increasing lipophilicity affects the overall percent yield and, eventually, the drug's efficiency and efficacy. Confirmation of the production of the two novel lidocaine analogs was performed by calculating the melting point range, infrared (IR) spectroscopy, nuclear magnetic resonance (NMR) spectra, and thin-layer chromatography (TLC).
Faculty sponsor: Debbie Mulhearn

(89) **Designing Our Stories: Creative Contributions to the Benedictine Community**
Marielle Vestuto-Langford

Institutions tell their stories not only through words, but through the visual artifacts that shape communal experience. This project examined how graphic design functions as a form of narrative-building within a university setting. This service project encompassed seven original design works developed to enhance visibility, engagement, and participation in community-centered initiatives at Benedictine University. Projects included promotional materials for the Dumi Dumi Nongey Art Show in Komechak Art Gallery, concert posters and programs for the Fall 2025 and Spring 2026 Music Department performances, the cover design for the Lent 2026 Reflection booklet produced by Campus Ministry, and the 2026 Commencement ticket design. Each piece was intentionally crafted to reflect the identity, mission, and cultural character of its respective event while reinforcing a cohesive institutional voice. Collectively, these designs demonstrate how strategic visual communication can strengthen community identity, elevate campus traditions, and contribute meaningfully to the shared narrative of a university.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

(90) **Silence, Fear, or Action? Inside the Mind of Crime Reporting**
Taylor Oppenhuis

Understanding what drives individuals to report or not report a crime is essential for improving public safety and ensuring that offenses are properly addressed. Despite its importance, many crimes go unreported, suggesting that decisions to come forward are influenced by a complex mix of psychological, social, and/or environmental factors. These can range from fear of retaliation, perceived severity of the incident, and even confidence in authorities. This study examines those factors within a college population to better understand how young adults navigate reporting decisions. I conducted interviews with 30 college students who go to Benedictine University in Lisle, Illinois. The participants were asked about their own accountability, views on crime reporting, and the conditions under which they would or would not report a crime. The interviews were examined to discern three themes that enhance the comprehension of students' decision-making processes. The goal of this study was to figure out what makes people report crimes and what stops them from doing so by looking at how psychological and environmental factors affect reporting behavior. This data could help us understand how college students report crimes and help us plan future efforts to get more people to report crimes.
Faculty sponsor: Patrick Polasek

(91) **HLA Treatment Resistance as a Potential Mechanism Behind the Development of PTLDS**
Vee Kubiak

Tick-borne diseases have exponentially increased in the past decade due to global warming, creating a global public health concern. In the United States, Lyme disease is the most common tick-borne disease. The increase in Lyme disease cases has demonstrated a co-occurring increase in Post Treatment Lyme Disease syndrome (PTLDS). While the exact cause of PTLDS is unknown, many genetic factors have been identified in the association between Lyme disease infection and the development of PTLDS. Of these genetic factors, variations in the Human Leukocyte Antigen (HLA) have been found to have a strong association with post-infectious Lyme disease susceptibility and

immune response to treatments. There is little research on the connections between treatment resistance in the HLA and the development of PTLDS. This research will use genomic sequencing of HLA loci in order to identify genetic variation, and next-generation sequencing to analyze genetic variations. I hypothesize that genetic variation on HLA loci causes treatment resistance leading to the development of PTLDS. This will allow for further biomarker identification and improved treatment methods for PTLDS.
Faculty sponsor: Jean-Marie Kauth

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