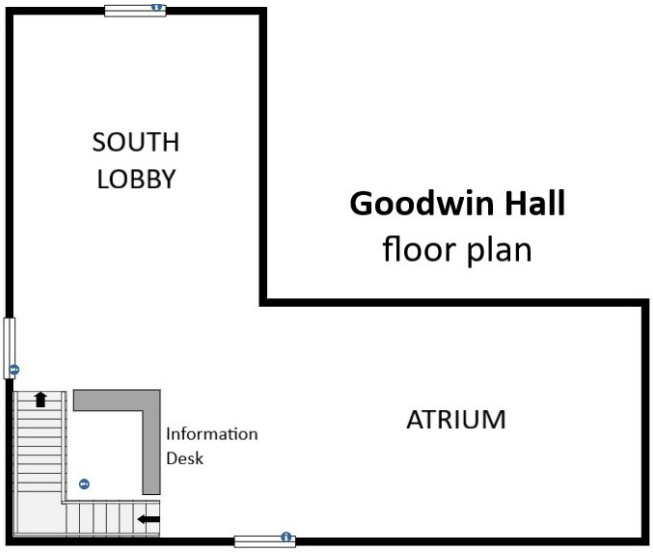
URSA
Undergraduate, Research, Scholarship and Arts
Benedictine University

2025 Poster Session Program

April 17, 2025 ❖ 12:30-2:30 pm ❖ Goodwin Hall Atrium



Poets in Person at URSA

Poets in Person is a student group of creative writers committed to imagining, typing, and sharing poetry in public spaces around campus. Stop by our table and request a typewritten poem!

in the South Lobby

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

SOUTH LOBBY | Outer Wall

- **"Scaroused Revisited: Examining the Effects of Haunted House-Induced Physiological Arousal on Romantic Attraction"**
  Abigail Koloze-Morgado

  This study extends Dutton and Aron's (1974) misattribution of arousal research using a professional haunted house as a fear-inducing environment. Participants completed a survey and rated attractiveness after exiting the haunted house or a controlled setting. Preliminary results suggest fear increases arousal, potentially influencing attractiveness ratings. Data collection continues.
  Faculty sponsor: Carolyn Liesen

- **"Providing Menstrual Resources for Women in Need: Support and Care"**
  Sofija Tunkevicius, Abigail Koloze-Morgado

  Female menstrual resources are often unavailable, scarce, or too costly for those who need them. These materials are essential for female hygiene, comfort, and emotional health, especially when a woman is living independently. To provide needed supplies to women who may struggle to obtain them, donations were gathered and purchased. Donations included menstrual pads, tampons, and wet wipes, along with a personal handwritten note all incorporated in a sealed bag. These supplies were then delivered to Together We Cope, a homeless prevention center in Tinley Park. By spreading love and donating meaningful materials to women, this project's mission was to provide comfort for those women who are less fortunate. In hopes of establishing a sense of care, cleanliness, and hospitality, it is through courses of action such as this one, that aid, specifically public health care aid, can be appropriately delivered.
  An Arthur J. Schmitt Future Leaders Project
  Faculty sponsor: Julie Bjorkman

- **"Adhesion-Dependent Toxicity of 5-Azacytidine on Epithelial Cells and Fibroblasts"**
  Jordan Werner, Daleigh Johnson-Pawlak, Sofija Tunkevicius, Katherine Brill, Osman Khan, Nidhi Dubey, Jazmin Rojas, Inayah Rizvi

  The drug 5-azacytidine (5-AzaC) is a demethylating agent used to treat several types of cancer. While it was proposed as a therapy aimed at derepressing expression of tumor suppressor genes, it has been found to be associated with several cytotoxic effects, including genomic instability, DNA damage, and aberrant RNA structure. Different events in cancer progression may be more sensitive to these effects than others and may therefore have different levels of sensitivity to 5-AzaC dosages. The epithelial to mesenchymal transition (EMT) is one such event, characterized in part by loss of cell adhesion and gain of migratory properties. In order to characterize the potential detachment-dependent sensitivities of cells to 5-AzaC, we are treating breast epithelial cancer cells (MCF7) and breast fibroblasts (MCF10A) to varying doses of 5-AzaC either before or after cells have adhered to a plastic substrate. Using a colorimetric assay and four-parameter regression to determine various IC50 levels, we have observed cell type-specific differences in drug sensitivity that suggest 5-AzaC may be more effective in killing cells that have lost their ability to attach to the substrate.
  Faculty sponsor: James Fackenthal

- **"Synthesizing and Analyzing the Cyclization Activity of a 2-Formylpyrrole Produced by the Maillard Reaction"**
  Teresa Puchalski, Katherine Brill

  A variety of 2-formylpyrroles have significance as medicinal compounds. While 2-formylpyrroles may be synthesized in biological systems, commonly found in nature, they can also be produced via organic synthesis. To produce a 2-formylpyrrole derivative via organic synthesis, the Maillard reaction of glucose and a primary amine may be utilized. In this research experiment, we created a 2-formylpyrrole derivative product using the Maillard reaction of glucose and 5-aminopentanol. The alcohol group of this derivative was converted to a chloride. The product was analyzed for evidence of the formation of a nine-membered ring through substitution. Results of this experiment will be presented and further discussed.
  Faculty sponsor: Brooks Maki

- **"Burnout or Brain Freeze? How Temperature Affects Working Memory"**
  Sarah Beyler

  Despite its effects on cognitive processes, environmental factors concerning working memory are often not accurately quantified. Temperature affects brain activity and sensory perception by altering cognitive resource allocation. The brain cannot process all incoming information simultaneously, so it prioritizes and allocates resources in response to external conditions. In extreme temperatures, the brain sends more resources to regulate internal body temperature, which alters attention, processing power, and working memory. This study uses that understanding to investigate how hot and cold ambient temperatures affect working memory and task performance

accuracy. We predict that participants in hot and cold conditions will perform more poorly in working memory tasks than in neutral environmental conditions. We also consider that performance and accuracy will vary between the functions due to each memory type and the corresponding demands and mental processes. If the results align with the hypothesis, this would suggest that thermal discomfort may inhibit cognitive resources, making tasks that require sustained attention, focus, and memory more challenging and indicate that milder temperature ranges in workplaces and educational settings could significantly improve learning outcomes and reduce error rates, thereby enhancing the quality of work and education.
Faculty sponsor: Carolyn Liesen

- **"The Coffee Sector and Its Negative Effects on Climate Change"**
  Adrianna Pope

  The coffee sector produces nine billion kilograms of coffee each year. Unfortunately, it keeps increasing. The coffee sector is being destroyed by rising temperatures and is destroying certain species of coffee plants due to climate change and damage to the land. Prime coffee-growing land is being destroyed by climate change, which is producing inadequate yields of coffee to keep up with demand. Coffee is also being affected by pest and disease outbreaks. Coffee farmers are using heavy agrochemicals to fertilize the coffee plants, but these chemicals are very harmful to the environment. The coffee sector is increasing deforestation and climate change. This white paper will assess farmers' ability to produce coffee sustainably or not, and which coffee people would prefer to purchase. Generally, people would prefer to buy more sustainably grown coffee, and many companies are switching to more sustainable practices. With the coffee sector growing, it is contributing to the loss of forests and increasing climate change.
  Faculty sponsor: Jean-Marie Kauth

- **"Lake St. Benedict Phosphorus Reduction Program"**
  Rehma Qazi, Mohammed Hussain, Michael Nawas, Ernesto Carlton

  This research addresses the water quality challenges due to phosphorus accumulation in Lake St. Benedict. The accumulation of phosphorus has led to eutrophication and low dissolved oxygen levels in the lake. This project addresses these issues through a two-phase strategy. The first phase consists of a solar-powered aeration system to release and deactivate the flux of the trapped phosphorus from sediments. Internal to the lake, phosphorus is released from sediments under low oxygen levels. To combat this, two solar-powered aerators will be installed on Lake St. Benedict to increase oxygen levels and prevent phosphorus flux. Modeling in 2024 demonstrated that aeration reduced the phosphorus release by 45%. The second phase consists of a laser-based goose deterrent system. The system aims to reduce phosphorus input from avian sources, primarily geese. Canadian geese contribute directly to the excess phosphorus in Lake St. Benedict through fecal deposits. To mitigate this, we will implement a non-harmful laser deterrent system. This aims to reduce goose presence and decrease external phosphorus input. By addressing both external and internal phosphorus sources, this project provides a sustainable and scalable model for campus-based water resource management.
  Faculty sponsor: William Schubert

- **"Sustainability Showcase: Environmental Awareness and Impact"**
  Landen Johnston

  The Sustainability Showcase was an interactive fair designed to promote environmentally friendly behaviors, encourage sustainable practices, and strengthen community engagement. This event served as a preview for Sustainable Saturday by bringing together organizations dedicated to environmental efforts. Through hands-on displays and educational outreach, attendees explored sustainability efforts and learned actionable steps to contribute to a greener future. The showcase aimed to foster collaboration, encourage changed behavior, and deepen the community's commitment to sustainability. Organizing this event allowed me to develop leadership skills in planning, coordination, and advocacy while making a meaningful impact on campus. Its success was measured through attendee engagement, organization participation, and promotion of sustainable practices. Following the event, I reflected on my leadership experience and assessed the effectiveness in promoting

environmental awareness and action.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

- **"*Arthrobacter globiformis* B-2979 CookieBear Lysogens Exhibit Mixed Immunity to Known Temperate Phages"**
  Rida Ali

  Viruses are infectious particles that replicate within specific hosts. We focus on bacteriophages, which infect bacterial cells. Bacteria can be infected by phages through two mechanisms: the lytic cycle, which leads to cell lysis, or the temperate cycle, which results in host genome integration. Our research aims to characterize a potential temperate phage, CookieBear, which infects the soil microorganism *Arthrobacter globiformis* B-2979. Genome sequencing identified CookieBear as a member of Cluster AY, with its closest relatives being Raphaella, Auxilium, and Richie. Based on genome annotation, we hypothesized the presence of temperate (*integrase*) and lytic (*endolysin*) genes. To determine whether CookieBear can undergo the temperate cycle, we attempted to isolate a lysogen, a bacterium with the phage genome integrated. We successfully recovered three stable lysogens and confirmed through phage release assays. Immunity assays demonstrated that CookieBear lysogens resist self-infection. An expanded immunity panel revealed that the lysogens permit infection by Cluster FE phages but prevent infection by temperate phages from Clusters AS1 and FL. Notably, another Cluster AY phage infected the lysogen at levels comparable to the control. Future work will focus on comparative genome analysis to identify factors involved in immunity and provide insights into Cluster AY temperate phage infections.
  Faculty sponsor: Tiara Pérez Morales

- **"Increases in the Yield of a Maillard Reaction by Increasing Temperature and Order of the Addition of Reactants"**
  Julia Alch, Karlee Stuiber

  Pyrroles, a five-membered ring with two pi bonds and a nitrogen atom, are common structures found in various folk medicines and herbal teas. Pyrroles are credited for the medicinal properties of traditional medicines. The purpose of this project was to increase the yield of a Maillard reaction that results in a pyrrole by increasing the temperature the reaction is performed at. A typical procedure would have the reactants all heated together simultaneously at 90 degrees Celsius, but the procedure was modified to have the amine and solvent heated to 120°C. At this point the glucose and oxalic acid was added to the heated mixture. The product was then purified to extract the produced pyrrole. Purity was confirmed through thin-layer chromatography and 1H NMR spectroscopy. Results will be examined in later parts.
  Faculty sponsor: Brooks Maki

- **"Effects of Bisphenol A (BPA) on *Xenopus laevis* Plasma Glucose"**
  Ishaa Jain

  Endocrine-disrupting chemicals such as Bisphenol A (BPA) are prolific in today's environment, and there is ongoing concern over their impacts on human health. The proposed experiments utilized fully aquatic African-clawed frogs (*Xenopus laevis*) as a model organism. We aim to investigate the relationship between long-term, low-dose BPA exposure and possible existence of pre-diabetes syndrome. The frogs were monitored throughout development from embryo to froglet. Blood samples were taken from the frogs, and plasma glucose levels were measured using a glucometer. It was found that frogs unaffected by BPA (DMSO and adult controls) mostly exhibited low to normal sugars. The averages for all concentration groups (0.15 µM - 10 µM) were higher, with the 1.5 µM having the greatest and most erratic values. Our future experiments will focus on lipid analysis of these BPA-affected frogs using stored liver samples to determine presence of non-alcoholic fatty liver sisease.
  Faculty sponsors: Jayashree Sarathy, Leigh Anne Harden

- **"Analysis of Nuclear Power as a Form of Sustainable Energy"**
  Nathaniel Leininger

  Nuclear power is an energy source that presents a potential solution to the need for clean-burning, sustainable

energy; however, there is uncertainty surrounding the viability of this industry, with many critics distrusting the safety and value of nuclear power. There have been many studies into this industry, parsing the risks, safety, and economic background of atomic energy, with most results supporting the industry. I have found that nuclear power, as an energy source, presents a much smaller threat to society than fossil fuels, is fiscally viable, and can effectively function as an alternative to carbon-based energy. Therefore, I propose that greater emphasis be placed on the Nuclear Regulatory Commission (NRC) in managing the creation and upkeep of nuclear reactors. Further, I suggest that an educational, digital forum on nuclear energy be established by the Department of Energy, with the goal of providing the public with reliable information on nuclear power. Finally, I advise the creation of an economic model that blends renewable and nuclear energy, by encouraging growth and cooperation between these two energy industries.
Faculty sponsor: Jean Marie Kauth

- **"Using Alaninol in a Maillard Reaction: Effect of an Alcohol Functional Group"**
  Kulsum Ali, Ruzaina Syeda

  This study aims to examine the formation of a 2-formylpyrrole derivative containing an alaninol functional group. Combining glucose and alaninol in a Maillard reaction results in the production of a pyrrole derivative. The reaction is carried out in acidic conditions and will be analyzed to determine the impact of the alcohol group on the yields of the Maillard reaction. The results of this reaction and comparison to other related reactions will be reported. Moreover, since 2-formyl pyrrole is found in many products today, this experiment can be used to analyze the real-world consequences of this change in the derivative of the molecule.
  Faculty sponsor: Brooks Maki

- **"*Arthrobacter globiformis* B-2979 Eesa lysogens Are More Resistant to Infection by Lytic Phages than by Temperate Phages"**
  Sandra Labib

  Bacteriophages are viruses that specifically infect bacterial hosts. They can replicate through either the lytic or temperate cycle. While lytic phages cause bacterial cell lysis, temperate phages integrate their DNA into the bacterial genome, allowing them to replicate with the host. This study focuses on *Arthrobacter globiformis* B-2979 phage Eesa. Previous work showed that Eesa formed 1 mm cloudy plaques, which became more apparent after several days of incubation. Attempts to increase its viral concentration were challenging, leading us to hypothesize that Eesa was a temperate phage. Genome sequencing placed Eesa in the phage subcluster AS1. Its genome contains genes involved in lytic and temperate infection cycles, supporting laboratory observations. Given Eesa's temperate plaque morphology, we attempted to generate lysogens and assess their immunity. Two lysogens were confirmed using phage release and reinfection assays. A panel of lytic and temperate phages was used to assess lysogen sensitivity. Of eight lytic phages, only one, was able to infect the lysogen. The lysogen was resistant to infection by temperate phages in Cluster AZ but sensitive to Cluster AY and FL. Future work will expand sensitivity assays and perform comparative genomic analyses to identify genes potentially involved in immunity against specific phage clusters.
  Faculty sponsor: Tiara Pérez Morales

- **"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 McCarthy

- **"Delving into the Source and Analysis of *Wolbachia* in *Lestica confluenta*"**
  Faizan Ahmed, Taha Ashqeen, Arya Patel

  When analyzing bacterial infections in insects, *Wolbachia*, which is found in the reproductive tissues of insects, is a common concern. The research conducted by our team investigated the rate at which *Wolbachia* bacterial infections were occurring across various insect populations. Our results showed that *Wolbachia*-induced infections occurred at a highly varied range. Analysis of this range is important since it illustrates the complex relationship between the transmission of *Wolbachia* throughout various insect populations, as well as the impact that high rates of *Wolbachia* transmission can have on the environment.
  Faculty sponsor: Phil Novack-Gottshall

SOUTH LOBBY | Inner Wall

- **"Isolation and Characterization of a *Peribacillus sp.* Rhizobacterium from Forest Soil at Benedictine University"**
  Lucia Fernandez Mato

  Microorganisms have long been studied for their potential to produce novel antimicrobials effective against bacteria, parasites, and fungal pathogens, due to their constant interactions within diverse environmental niches. In the microbiology laboratory, we focus specifically on isolating and characterizing soil bacteria that may produce antibiotics. In this study, a soil sample was collected from a forest trail at Benedictine University in Spring 2025. We hypothesized that the site's diverse flora and fauna would support a wide range of bacterial species with antimicrobial potential. Ten bacterial colonies were isolated, and one was selected for further characterization using classical and molecular techniques. Phenotypic characterization revealed the isolate to be a catalase-positive, Gram-positive, rod-shaped bacterium. Antimicrobial testing showed no activity against the Gram-negative bacteria *Acinetobacter baylyi* and *Pseudomonas putida*. 16S rRNA sequencing indicated that the isolate is closely related to the genus *Peribacillus*, with 96.1% similarity to *P. frigoritolerans* and 96.3% similarity to *P. simplex*. The genus *Peribacillus* is known to produce narrow-spectrum antimicrobials. Future work will expand characterization studies to include antimicrobial production assays against a panel of known Gram-positive bacteria. This work contributes to our understanding of microbial interactions and the diversity of environmental microorganisms beyond the traditional classroom.
  Faculty sponsors: Tiara Pérez Morales, Mark Poch

- **"Temperature vs. Tyramine Yield in Maillard Reaction"**
  Izhan Baber, Bilal Uddin

  Tyramine is a derivative of the polar tyrosine amino acid that plays an important role in biological processes and is a key part of nervous and digestive system hormones. This amine can be used in conjunction with D-Glucose to undergo a Maillard reaction to produce the tyramine 2-formyl pyrrole derivative. Throughout the course of this experiment, the impact of temperature on the yield of the product was observed. Reactions were conducted at the temperatures of 20°C, 60°C, and 90°C. Through this, the impact of temperature on the production of the derivative was clearly determined. Understanding this is key for chemists to produce efficient Maillard reactions in order to maximize percent yield.
  Faculty sponsor: Brooks Maki

- **"Analyzing the Impact of Family Relationships on Ethical Decision-Making"**
  Krystian Chlebek

  Research has indicated that siblings can play a crucial role in familial relationships while also influencing ethical decision-making. This correlational study investigates whether being an only child or having siblings can change

one's ability to morally decide on ethical scenarios such as the trolley problem and decisions involving truth and honesty. The study also examines other factors, such as sibling age, family dynamics, parenting styles, and household income, which could all influence decision-making independently. We hypothesize that having siblings increases the care for others and their perception of certain moral scenarios.
Faculty sponsor: Carolyn Liesen

- **"Development of a More Environmentally Friendly Photobromination Reaction"**
  Zach Johnson

  Alkyl halides are important organic functional groups that contain a carbon halogen bond. They are present in many anticancer and antiviral pharmaceutical drugs. An alkyl bromide is a type of alkyl halide that has a carbon-bromine bond. It can be synthesized from a reaction of bromine with hydrocarbons using light to initiate a radical reaction in which a hydrogen atom is replaced with a bromine. This reaction traditionally uses halogenated solvents such as dichloromethane. The problem with using a halogenated solvent is that it will need to be disposed of at the end of the reaction and solvents like this are dangerous to the environment, are carcinogenic, and can negatively affect the central nervous system. The purpose of this experiment was to find a more environmentally friendly solvent that could perform this reaction. The new solvent that was tested was acetonitrile, which is a non-halogenated, non-carcinogenic solvent. After testing a variety of compounds, it was discovered that acetonitrile was able to do this photobromination reaction with organic molecules such as toluene, ethyl benzene, cumene, and tert-butylbenzene just as effectively. This new organic chemistry reaction procedure will now be used in the Organic Chemistry I laboratory curriculum. Students in this lab course will conduct the photobromination reaction to learn more about radical halogenation reactions and reactions using more environmentally friendly solvents.
  Faculty sponsor: David Rubush

- **"Diversity of Sediment-Dwelling Bacteria in Lake St. Benedict: Insight into Their Role in Internal Phosphorus Cycling"**
  Lyric Jones

  Lake St. Benedict (LSB) is a shallow, man-made freshwater slough that experiences water quality deficiencies such as warm waters, low oxygenation and water flow, and excess nutrients.These water quality deficiencies often lead to eutrophication, where excess nutrients (e.g., P, N) cause rapid algal growth, decomposition, and subsequent depletion of dissolved oxygen (DO) required for aquatic wildlife. Previous LSB studies have shown that the excess phosphorus is due to internal cycling between sediment and water column. Phosphate-solubilizing bacteria (PSBs) are main contributors to this internal P cycling, particularly during low oxygen conditions, when they release phosphates into the water column to be produce needed energy (ATP). Metrics were measured at the following sites: Dock, East, Center, and West. Physicochemical metrics obtained from sediment and water media across differed across the four sites. Specifically, at deeper Dock site, DO was much lower (~0 mg/L) than other shallower sites, while average P was greater. DO < 3 mg/L is considered below EPA recommended levels and thus can trigger PSBs to release their phosphates into the water column. The excess phosphates in the water column can elevate P levels above those recommended by EPA (< 0.02 mg/L). This known phenomenon is supported by the PSBs isolated from Dock sediment; however, diversity of sediment-dwelling bacteria will provide further insight into this relationship.
  Faculty sponsors: Leigh Ann Harden, Mark Poch

- **"Characterization of the Cluster FE Lytic Bacteriophage Utopia"**
  Ayat Hafeez

  Viruses are infectious agents that infect hosts such as humans, animals, and microorganisms. In our laboratory, we focus on phages, viruses that replicate inside bacteria. Phages have two main infection cycles: the lytic cycle, in which the phage lyses host cells, and the temperate cycle, in which the phage integrates into the host chromosome. This study focuses on Utopia, a phage isolated using the host *Arthrobacter globiformis* B-2880. Prior research determined that Utopia's viral structure is similar to Siphoviruses, which typically have isometric capsids and flexible tails. Utopia infects effectively at lower temperatures (22°C to 30°C), with fewer plaques observed at 37°C. In

addition to its temperature sensitivity, Utopia exhibits a narrow host range as it is unable to infect other *Arthrobacter* species. Utopia forms 1 mm clear plaques leading us to hypothesize that it follows a lytic cycle. To investigate this, we sequenced and analyzed its genome using bioinformatics programs. Utopia's genome was assigned to Cluster FE and shares the highest similarity with Yavru and Piku. Genes for host cell lysis were identified supporting our lytic cycle hypothesis. Future work will include comparative genome analysis and infection studies, particularly in comparison with Piku, due to their differing infection profiles.
Faculty sponsor: Tiara Pérez Morales

- **"*Wolbachia* Bacterium Found in Species *Dolichovespula maculata*"**
  Nafeesa Khan, Malaika Vimawala

  The *Wolbachia* Project aims to explore the presence and effects of the bacterium *Wolbachia* in arthropod populations. To investigate this, DNA extraction, PCR, and bioinformatics analysis were used to detect and analyze *Wolbachia* in collected specimens. The study successfully identified *Wolbachia* in various samples, providing insights into its potential role in host biology and disease control. Given *Wolbachia*'s ability to reduce the transmission of insect-borne diseases, these findings contribute to global efforts in sustainable disease prevention and vector control.
  Faculty sponsor: Phil Novack-Gottshall

- **"The Maillard Reaction of Glucose and Cyclohexanamine"**
  Khadijah Halim, Hafsa Pervez

  The Maillard reaction is the fundamental non-enzymatic reaction between reducing sugars and amines widely studied for its role in food chemistry and the formation of complex organic molecules. In this study, a 2-formylpyrrole product is synthesized and organic chemistry techniques are explored by utilizing a modified Maillard reaction procedure beginning with glucose as the reducing sugar and cyclohexanamine as the primary amine. The modified Maillard reaction was initiated by the condensation of the carbonyl group on the glucose with the amino group of cyclohexanamine to produce an N-substituted glycosylamine intermediate before forming the 2-formylpyrrole derivative. The product was then extracted and purified by silica gel flash column chromatography. ^{1}H NMR spectroscopy was used to confirm the purity of the 2-formylpyrrole product.
  Faculty sponsor: Brooks Maki

- **"Long-Term Effects of Air Pollution on Cardiovascular Health: A Decade-Long Longitudinal Study"**
  Layana Amra

  Air pollution is increasingly recognized as a major public health hazard, particularly for its chronic impact on cardiovascular health. $PM_{2.5}$, PM_{10}, NO_2, and VOCs contribute to oxidative stress, inflammation, and blood vessel damage—key in cardiovascular disease development. While prior studies link pollutant exposure to adverse cardiovascular outcomes, the cumulative long-term effects of mixed pollutants remain unclear. No research has examined the chronic, simultaneous action of all pollutants as a group, leaving a major gap in understanding. This study proposes a decade-long follow-up of adults in industrial and urban regions with higher pollution. Personal exposure will be monitored with advanced devices, while clinical tests (e.g., inflammatory markers, endothelial function, blood pressure) will be conducted. Genetic screening will assess gene-environment interactions. A control group from suburban/rural areas with lower pollution will be included. Long-term exposure may be linked to increased cardiovascular hazard, influenced by lifestyle, genetics, and socio-economic status. We hypothesize a dose-response association between long-term pollutant exposure and cardiovascular risk. This study seeks to clarify biological mechanisms, inform public health policy, and provide dynamic insights on chronic pollution exposure, thereby surpassing past research focused on short-term or single-pollutant effects.
  Faculty sponsor: Jean-Marie Kauth

- **"Modulating Enzymes: How pH and Bile Acids Influence Skin Health in Ostomy Care"**
  Iman Hamid, Amaan Faruqi, Alexander Leininger, Monika Pawlikowski, Zohaib Farooq

  Each year, over 100,000 ostomy surgeries are performed in the U.S., with over 40% of patients experiencing Peristomal Skin Complications (PSC) due to prolonged exposure to enzymatically active effluent. Pancreatic proteases (trypsin, chymotrypsin, elastase) and bile acid (CDCA) contribute to skin damage, especially in altered pH conditions. We hypothesized that CDCA modulates protease activity in a pH- and dose-dependent manner, and may influence epithelial damage. Protease activity was measured across pH 4.0–8.3, showing maximal activity at pH 8.3, decreasing significantly at lower pH. CDCA dose-dependently inhibited protease activity (~70% reduction at pH 4.0, 250 µM). Enzyme kinetics revealed mixed, non-competitive inhibition. In human colonic T84 cells, CDCA induced dose-dependent apoptosis, exacerbated by proteases at neutral pH but slightly mitigated in acidic conditions. These findings suggest that bile acids could contribute to a mildly acidic environment and thus reduce PSC risk by lowering protease activity. pH-lowering strategies for the peristomal area may offer a novel approach to improving skin health and quality of life in ostomy patients. Further studies in skin models will refine targeted interventions.
  Faculty sponsor: Jayashree Sarathy

SOUTH LOBBY | Monitor

GRAPHIC ART & DESIGN PROJECTS

Faculty sponsor: Hairi Han

- **"Visual Voices: Motion, Meaning, and Everyday Impact"**
  Nida Hasan

  "Visual Voices" is a cohesive body of work that explores motion design, branding, and visual storytelling that resonates emotionally. Each piece reflects a unique perspective while contributing to a broader conversation about the role of creativity in everyday life and social awareness. The collection features a playful logo animation for "Batter 'B' Ready," a bakery that makes the freshest bread in town. A motion graphic representing the event "Universal Children's Day" incorporates vibrant open-source illustrations and a child's voiceover emphasizing the value of outdoor play and learning in a playful environment. Kinetic typography addresses "Social Inclusion," using animated text to express unity and belonging. The collage animation titled Life is paired with the tagline "There is always something to be grateful for" as a gentle reminder of everyday gratitude. Additionally, the packaging design for "Hue Eco" presents a sustainable approach to art supplies, while the social poster "Healthy Mind, Body, and Soul" encourages proactive well-being. Together, these works highlight the power of design to amplify voices, spark conversations, and deliver meaningful messages. By blending aesthetics with purpose, "Visual Voices" showcases the diversity and impact of visual communication across multiple formats and audiences.

- **"The Power of Visual Storytelling: Engaging, Informing, and Transforming"**
  Dana Lopez

  Design has the power to inform, engage, and inspire action. Whether through motion, interactivity, or typography, visuals can shape perspectives and encourage deeper reflection. Each of these projects explores how design can be used to raise awareness and spark conversation. "ShoweRush," an app design, turns water conservation into an interactive experience, making shorter showers a fun and rewarding habit. The "Unmasking Emotional Abuse" poster series sheds light on manipulation in relationships, using layered typography to reveal the emotional weight of an abuser's words. "Fantasy Land" brings storytelling to life through motion graphics, transporting viewers to a surreal world of wonder and imagination. The "Spread Kindness" AR typographical poster transforms static design into an immersive experience, allowing typography to interact with its audience in new and unexpected ways. While each project takes a different approach, they all share a common purpose: using design to encourage awareness, engagement, and meaningful change.

- **“Nature’s Gift: Raising Awareness of How It Provides for Us and Our Obligation to Protect It”**
  Guillermo Rios

  We sometimes forget how helpful and supportive nature really is, not only for ourselves as individuals, but for the entirety of the human species. It provides for us and gives us life. We also often overlook that the natural environment is in danger and at risk of being completely wiped out from our planet due to pollution, natural and man-made disasters, and the overkilling of animals. With this in mind, I used this idea of protecting and bringing awareness of nature and brought to life two projects dedicated to the importance of nature and how it provides for us. My animation “World Water Day: Save Our Glaciers” showcases the cycle of water as it comes from the glaciers and brings life throughout natural ecosystems, and then finally reaches our homes as clean drinking water, as well as serving our essential needs. I also created a logo animation for a fictional tea company, “BloomLeaf Tea.” I want to deliver the message of the company to the audience about how this tea brand aims to provide natural and healthy tea. I used illustrated images and sound effects to better display the emotions and to articulate the message behind it. I believe that motion graphics and animation as a whole are a great way to share stories and express emotions, as well as delivering a powerful meaning, especially to bring awareness to issues affecting our planet.

- **“Mind and Body on Display: The Impact of Health Poster and App Designs”**
  Sencere Talley

  Posters can communicate a variety of messages. The posters presented here focus on mental and physical health—both of which are often neglected in today’s world. I designed these posters to resonate with youth and young adults, as it’s easy to lose focus and hope while pursuing personal goals. The main purpose of the mobile app is to motivate individuals to get off the couch or bed and start working out either to get in shape or maintain their fitness. The album cover was created for young adults struggling with self-confidence and identity, featuring a new Rod Wave album. As an artist, he produces music that listeners can relate to, ensuring that everyone can find a song or lyric that speaks to them. The peer pressure awareness posters are designed to discourage young teens and adults from falling victim to smoking and drinking. These negative influences can lead individuals down a path that prevents them from reaching their full potential and becoming the person they aspire to be.

- **“Design as a Voice of Focus: Recognizing Brand Identities and Social Issues Among the Chaos of Media”**
  Marielle Vestuto-Langford

  We live in an age of technology and smartphones, where our society is constantly surrounded by social media, advertisements, and news. With so much information at our fingertips, design is more important than ever in creating a clear focus on the most important names and causes through intentional, emotional work that draws our attention. Through playful storytelling, the animation “All Presidents’ Day” emphasizes the need for society to honor not only President Washington on this holiday, but all the other presidents in history who have contributed to our country. The animation “Don’t Forget Our Trees” uses symbolic visual narration of the text to convey both urgency and hope for making a change in the issue of global deforestation. “Lucky Dog,” another animation, brings recognition to the local dog daycare business by shaping an energetic personality for the logo. The brand identity “Carnevale Cannoli” identifies a family-owned Italian bakery through its distinct logo character, which conveys the history and mission of the business. The editorial design “Yearning” communicates a collection of poetry with emotive imagery, inspiring deeper interpretation. “Change Through Type,” a typography poster, displays an inspiring Robin Williams quote and encourages creative thinkers through a story told by the figures integrated in the words.

- **“Shaping Experiences Through Web, App Innovation, and Design to Raise Awareness of Social Issues”**
  Pavlo Vovk

  Design has the power to shape experiences, communicate stories, and raise awareness of critical issues. This work seamlessly blends web development, branding, and social impact by crafting intuitive digital platforms and thought-provoking print designs that evoke emotional responses. The “Naperville Electrician” website prioritizes a user-centered design, ensuring clear navigation and effective service presentation while instilling a sense of trust and reliability. “Virro,” a task management app, encourages accountability and motivation through a unique verification

system that balances rewards and penalties, fostering a sense of accomplishment and discipline. The "Silent Depression" poster series uses a minimalist design and symbolic imagery to capture the emotional weight of financial struggles faced by young adults, allowing viewers to connect with the silent burden of economic hardship. Finally, "Dollar" magazine explores editorial design through innovative layouts, typography, and visual hierarchy, engaging the audience by immersing them in a visually rich and emotionally compelling print experience.

ATRIUM | Inner Wall

- **"Prototype Refinement for Recycled Polystyrene Products"**
  John Creviston, Brendan Truett, Vasilios Katsambas

  The increasing consumption of single-use plastics, including Styrofoam (aka expanded polystyrene or EPS), continues to have adverse effects on the environment and human health. If EPS is not disposed of properly, it can damage terrestrial and aquatic ecosystems. This project extends research from the last couple of years to develop prototypes for construction products, using recycled EPS from the manufacture of insulated concrete wall panels. In our recent work, we have introduced the use of flyash and microfiber to reduce the density and improve the flexural strength of the recycled product. Testing indicates that the recycled matrix in the wet casted prototypes meets specifications for construction products, such as box beam core insulation and geofoam. Steam molding has also been used to develop alternatively manufactured prototypes for recycled lightweight insulation boards. Cornstarch has been introduced to lessen the cost and create boards with more similar properties to virgin EPS. Additionally, tests are ongoing to determine the suitability of our recycled EPS product for use in highway sound barriers.
  Faculty sponsor: William Schubert

- **"Women in Business Discourse: A Platform for Community Discussion"**
  Mahnoor Fatani, Megan Janik

  As business students, we recognized the underrepresentation of women in our upper-level business courses and sought to create an affinity group that fosters inclusivity and empowerment for our service project. Our Women in Business initiative aimed to equip aspiring businesswomen (and men) with resources to support their professional growth. Through leadership discussions, workshops, mentorship programs, and networking events, we hoped to provide students with opportunities they might not otherwise access. To launch this initiative, we hosted the event Women in Business Discourse: A Platform for Community Discussion, which featured four guest panelists from diverse backgrounds. The event attracted over 25 attendees, fostering valuable conversations and connections. By developing leadership skills, building networks, and enhancing access to opportunities, we strive to bridge the gender gap in business and inspire the next generation of leaders. This initiative is a step toward a more equitable and supportive business environment on campus.
  An Arthur J. Schmitt Future Leaders Project
  Faculty sponsor: Julie Bjorkman

- **"Environmental Exposures during Prenatal Period and Early Life to $PM_{2.5}$ and Risk of Childhood Asthma"**
  Kathryn Ann Araneta

  As air pollution continues to be a problem, especially for rapidly developing countries, there are concerns about the effects on the human respiratory system. Many studies have been conducted in order to identify significant relationships between maternal and early life exposure to air pollution and how the infant's respiratory system is affected. To date, these studies have shown inconsistent results and failed to identify the biggest contributor to PM distribution in the area of where the study was conducted. The goal of my study is to perform a comparative epidemiological retrospective cohort study in which the major sources of PM distribution in different Chinese cities are identified and relations between exposure and development of childhood asthma are observed. Many sources have correlated traffic-related air pollution (TRAP) to $PM_{2.5}$. I hypothesize that a community surrounded by roads will yield results of a higher rate of $PM_{2.5}$ related asthma diagnoses. With the results of the study, sources of PM that are more harmful than others can be identified and addressed. This can then bring to light how changing practices

that emit harmful PM should be changed in order for citizens to be less concerned about respiratory issues due to poor air quality.
Faculty sponsor: Jean-Marie Kauth

- **"Development of a Synthetic Pathway for the Bioactive Alkaloid Sinopyrine B"**
  Youstina Mikhail

  Sinopyrine B is a naturally occurring chemical in the Chinese plant *Sinomenium acutum*, which is known for its medicinal activity as a pyrrole alkaloid. Pyrrole alkaloids are usually isolated from plants, fungi, and bacteria and used in existing medicines such as Atorvastatin (lowers cholesterol levels) and Tolmetin (anti-inflammatory drug). In this research, we aim to synthesize Sinopyrine B using a multistep synthesis approach. The first step is the bromination of isovanillin which produces a bromine group on the carbon that is para to the alcohol group. We focused on obtaining a higher quantity and quality yield of this reaction to carry out the full synthesis. Reactions used include the Henry reaction to form a nitroalkene, and a zinc reduction of that product to obtain a primary amine. Furfuryl alcohol is oxidized in an Achmatowicz Rearrangement. The product can be reacted with the primary amine previously synthesized, which results in 2-formylpyrrole. The final step in the synthesis is cyclization to afford Sinopyrine B. The formation of the final ring structure represents a new step in 2-formylpyrrole synthesis and will allow further investigation of the chemistry of these medicinally active compounds.
  Faculty sponsor: Brooks Maki

- **"Evaluating the Impact of EDC Exposure on Thyroid Hormone Levels in Children"**
  Sofia Afreen

  Endocrine-disrupting chemicals (EDCs) are environmental substances that interfere with hormone regulation and can cause long-term health issues. Thyroid hormones are essential for childhood development, and any disruption in their function may have lasting effects. While previous studies have linked EDC exposure to thyroid dysfunction, the long-term effects on children remain unclear. Here we propose assessing the influence of EDC exposure on thyroid function from birth to age five. We will monitor 200 children, 100 from a high-EDC exposure environment and 100 from a low-EDC exposure environment, with an equal distribution of boys and girls. Blood samples will be collected at birth and age five with parental consent to analyze thyroid biomarkers and EDC levels. Additionally, parental surveys will provide information on environmental exposure. Only children without hypothyroidism will be included in the study. This research will explore how environmental factors, alongside genetic and lifestyle influences, affect thyroid function. We hypothesize that continuous EDC exposure from birth to age five disrupts normal thyroid function, leading to measurable differences in thyroid hormone levels between children from high- and low-exposure environments. The results may offer valuable insights into the long-term effects of EDCs on childhood thyroid health.
  Faculty sponsor: Jean-Marie Kauth

- **"Antibiotic-Producing Bacteria: *Pseudomonas syringae*"**
  Maaz Zaidi

  Antibiotic resistance is a growing global health concern, emphasizing the importance of the discovery of antibiotic-producing bacteria. This study aimed to isolate and characterize antibiotic-producing bacteria from soil collected near Van Horn Woods in Plainfield, Illinois. The soil sample underwent serial dilution, plating on Emerson-cycloheximide agar, and incubation at 22°C. Eight different bacterial colonies were isolated and characterized using gram staining, microscopy, and biochemical tests, including catalase and oxidase assays. Antimicrobial activity was tested against ESKAPE pathogen relatives, *Staphylococcus cohnii*, based on the zones of inhibition observed was the ESKAPE pathogen relative. One bacterial isolate showed significant antibiotic activity with a 2mm zone of inhibition. DNA sequencing and BLAST analysis identified the strain as *Pseudomonas syringae*. However, there were differences in the oxidase and catalase results, which showed that some errors had occurred during the experiment. This study emphasizes the potential of soil bacteria as a source of discovering new antibiotics against emerging antibiotic-resistance bacteria.
  Faculty sponsor: Mark T. Poch

- **"Cluster FL *Arthrobacter globiformis* B-2979 Phage Hirko Can Generate Stable Lysogens"**
  Hajira Choudry

  Bacteriophages are viruses that specifically infect bacteria and have gained interest as potential therapeutics due to their host specificity. They can lyse host cells through the lytic cycle or integrate into the host genome through the temperate cycle. In this study, we investigated phage Hirko, isolated in 2022 using the soil bacterial host *Arthrobacter globiformis* B-2979. Structurally, Hirko belongs to the *Myoviridae* family, possessing a long contractile tail. During infection, Hirko produced 1.5 mm plaques with large cloudy halos. Preliminary data indicated that its infection rate was affected by temperature and was concentration-dependent at 22°C and 30°C. Based on these findings, we hypothesized Hirko was a temperate phage and selected it for genome sequencing. Its genome showed the highest similarity to Cluster FL phages and although we identified lytic genes, we did not detect a known *integrase*, used for the temperate cycle. To determine whether Hirko could undergo a temperate cycle, we attempted lysogen isolation and successfully recovered one at 30°C, confirming it through phage release assays. Future work will focus on immunity studies using a collection of phages with known clusters. Our findings provide insights into a small but diverse phage group with yet to be determined infection cycles.
  Faculty sponsor: Tiara Pérez Morales

- **"Defining a Living Museum: Establishing a Campus Arboretum"**
  Karan Shetty, Hajira Choudry

  Benedictine University established a level 1 accredited arboretum to raise awareness of trees and their benefits to both humanity and the environment. Thirty-seven different species of trees have been identified, cataloged, and tagged. This includes unique cultivars and hybrids. Serving as an educational resource, it provides opportunities for students and the public through programs, classes, and workshops. In addition, all arboretum trees were sampled to preserve plant specimens within the Jurica-Suchy Nature Museum Herbarium. This will further support research in plant diversity on campus. These initiatives reflect the institution's dedication to the Benedictine Hallmarks of stewardship, hospitality, stability and community.
  Faculty sponsor: Karly Tumminello

ATRIUM | Center

- **"Quantification of Essential Elements in Zamzam Water Using Flame Atomic Absorption Spectroscopy"**
  Zahra Naeem, Arifa Ridah

  Flame Atomic Absorption Spectroscopy (Flame-AAS) is a widely used instrumental technique for quantifying metal concentrations in aqueous samples with high precision and ease of use. This study applies a serial standard addition method with Flame-AAS to measure levels of Zinc, Iron, Manganese, and Potassium in Zamzam water. These trace elements play a crucial role in determining water taste, providing potential health benefits, and contributing to daily nutritional intake. Zamzam water, sourced from the sacred Zamzam well in Mecca, Saudi Arabia, holds cultural and religious significance due to its believed miraculous origin. Its distinct mineral composition sets it apart from regular water, contributing to its unique taste and resistance to bacterial growth. By quantifying essential elements in Zamzam water, this study provides insights into its composition and potential health implications. The findings can enhance understanding of mineral intake from Zamzam consumption and contribute to broader research on water quality and nutrition.
  Faculty sponsor: Niina Ronkainen

- **"Corporations' Management of Solid Waste Production"**
  Kaylee Ludwig

  The responsibility of addressing Solid Waste Management (SWM) continues to transfer from the government to corporations. The effects of improper management of solid waste are becoming a critical issue, relating to fears of contamination, consumption of microplastics, and emissions released from construction and demolition materials,

which contribute to global warming. Solid Waste is classified as physical materials produced by corporations in production processes including glass, metals, food waste, paper, plastics, construction and demolition materials, and many more. In identifying the effects of the United Nations (UN) policies in corporations' SWM, the current waste production on a global scale compared to national scale encourages collaboration in policy making in order to help reduce high contributing corporations waste management production. Corporations' implementation of waste management policies sets them ahead of market competition and of the newest movement, environmentalization. This movement, similar to modernization, focuses on environmentally-friendly technological development. It is recommended that companies begin to recognize this shift in movements, taking action before they fall behind competitively. This white paper further provides insights into realistically implemented policies to be replicated, the consequences of what policies are not being implemented, and highlights the responsibility of different entities in continuing long-term development of SWM.
Faculty sponsor: Jean-Marie Kauth

- **"Enhancement of Microbial-Mediated Biodegradation of Microplastics via UV Pre-Treatment"**
  Marium Hussain

  Many plastics are improperly disposed of, left to accumulate in the environment and break down into microplastics. Organisms that can naturally degrade these microplastics, such as fungi and bacteria, have been studied to eliminate these harmful polymer particles. Microbial organisms undergo fragmentation, assimilation, and mineralization to turn microplastic monomers into useful carbon sources to generate energy. These organisms benefit from UV radiation pre-treatment of polymers, allowing them to decompose easily. By improving the conditions for biodegradation, UV pretreatment offers a promising way to accelerate the breakdown of microplastic waste. My research aims to use three types of UV radiation, UV-A, UV-B, and UV-C, as a pre-treatment for petri dishes containing polyethylene, polypropylene, polyethylene terephthalate, and polystyrene. After two days, I will then introduce a bacterial consortium and determine which pretreatment had the most success via the weight difference of microplastics before and after. I hypothesize that UV-A will be most efficient as a pre-treatment due to its less energetic nature, aiding microbes in attaching and metabolizing microplastics more efficiently. Research on UV radiation pre-treatment is necessary in hopes of finding the optimal intensity for bacterial-mediated biodegradation in removing microplastics from our environments while reducing toxic by-products.
  Faculty sponsor: Jean-Marie Kauth

- **"Steric Effects in the Maillard Reaction: Implications for Medicinal 2-Formylpyrrole Synthesis"**
  Nicholas Oleksyn, Nicholas Citari

  The Maillard reaction results in the formation of 2-formylpyrroles, which are found in many natural products traditionally known for their medicinal properties, such as Chinese moon seed, Chaga mushrooms, and Persian walnuts. The organic synthesis of 2-formylpyrrole is being studied by examining the steric repulsion between the reacting amine and glucose and its impact on reaction yield. The investigation focuses on increasing steric repulsion with α-methylbenzylamine and comparing the results with previous Maillard reaction studies involving benzylamine. Results will be analyzed and confirmed with ^{1}H NMR spectroscopy.
  Faculty sponsor: Brooks Maki

- **"CREO DuPage: Creating a More Equitable Path to Education"**
  Stephany Mondragon

  As a dedicated advocate for first-generation students, I collaborated and volunteered with CREO DuPage to help underrepresented students navigate the college application process, access financial resources, and overcome systemic barriers to higher education. Drawing from my own experiences as a first-generation student born in Mexico, I provided mentorship, guidance, and advocacy to empower students in achieving their academic and career aspirations. My work included connecting students with scholarship opportunities, and college visits and offering personalized support to ensure they have the tools necessary for success in higher education. Through this initiative, my goal was to create a more equitable path for future generations, ensuring that education is accessible, regardless of a student's socioeconomic background.

An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

- **"CookieBear Is a Temperate Phage that Infects the Soil Microorganism *Arthrobacter globiformis* 2979"**
  Kanza Hussain

  Bacteriophages (phages), viruses that infect bacteria, are gaining increased attention due to their host specificity and potential as alternatives to antibiotic treatments. Phages replicate within host cells through either the lytic (cell lysis) or temperate (genome integration) cycle. This study aims to characterize soil phages, which are influenced by various environmental factors. Here, we describe the isolation and characterization of a phage, CookieBear, from soil using *Arthrobacter globiformis* 2979 as its host. CookieBear was identified through the Direct Isolation protocol and produces 2 mm cloudy plaques at 22°C. Infection studies demonstrated an optimal temperature range of 22°C–37°C, with minimal changes in plaque diameter. Based on these findings, we hypothesized that CookieBear is a temperate phage. To further investigate, CookieBear's genome was sequenced and annotated using various bioinformatics tools. Its genome contains 93 predicted open reading frames (ORFs) and 1 tRNA. It is most similar to Cluster AY phages Raphaella (99%) and Auxilium (99.2%). The genome includes genes associated with both temperate (*tyrosine integrase*) and lytic (*endolysin*) life cycles, confirming its temperate nature. Ongoing research focuses on characterizing potential lysogens and comparing CookieBear's genome to another Cluster AY phage, Anekin, which was isolated at Benedictine University.
  Faculty sponsor: Tiara Pérez Morales

- **"Perceptions of Policing: Examining the Influence of Demographics on Public Attitudes Toward Law Enforcement"**
  Demya Dixon

  Perceptions of the police can vary significantly among individuals, often influenced by demographic factors such as age, cultural background, socioeconomic status, and gender. In addition, they can be influenced through exposure to media, including social media. This study investigates how observing videos of police interactions on social media may affect people's perceptions of law enforcement. The two videos will depict police encounters in which the same crime is being committed; however, one video will present a negative police interaction, while the other will portray a positive police interaction. The primary objective of this study is to assess whether individuals' perceptions of the police can be influenced or altered after they view these differing videos. By analyzing their responses, the study aims to gain deeper insight into how media representations of law enforcement impact public opinion, trust, and attitudes toward policing.
  Faculty sponsor: Carolyn Liesen

- **"The Role of Endocrine-Disrupting Chemicals in the Development of Diabetes"**
  Rayyan Khan

  Endocrine-disrupting chemicals (EDCs) are pollutants found in everyday items including plastic, pesticides, and personal care products, which affect metabolic and hormone functions. Recent studies show that exposure to EDCs is linked to the development of diabetes. EDCs may affect insulin production, pancreatic function, cellular energy processes, and the immune system. EDC exposure is concerning during pregnancy and early childhood, as this can increase the chances of developing diabetes early. It's expected that higher EDC exposure will be linked to having a greater chance of developing diabetes. However, current research has limitations, including reliance on animal studies, lack of long-term studies, and inconsistently measuring EDC exposure. To address these concerns, a 10-year prospective cohort study with 200 participants of varying age groups will be conducted. The study will include taking blood samples from participants to determine their EDC exposure levels, and they will be grouped according to high or low exposure. The study will include monitoring blood sugar levels, insulin production, and lifestyle choices. We expect to find that prolonged EDC exposure affects the risk of diabetes in different age groups, and across varying exposure groups. The results will help us better understand the connection between endocrine-disrupting chemicals and diabetes.
  Faculty sponsor: Jean-Marie Kauth

- **"Characterization of Soil Bacteria from Backyard Samples for Antibiotic Production"**
  Huda Fatima, Jannah Papa

  Antimicrobials are produced by microorganisms in response to environmental conditions and have been harnessed to treat a variety of infections. We are specifically interested in naturally produced antibiotics, which target bacteria. As part of the Tiny Earth program, our project aims to isolate antibiotics produced by soil microorganisms. To explore this, we selected two garden soil samples, hypothesizing that the plant diversity present would promote the growth of antimicrobial-producing bacteria. Out of 19 bacterial isolates, we selected two (TE1 and TE2) for further characterization. Initial observations revealed that both isolates are Gram-positive rod-shaped bacteria. Antimicrobial production assays showed that TE1 did not produce antimicrobials against *E. faecalis* and *P. putida*, while TE2 was ineffective against *E. faecalis* and *E. aerogenes*. To better understand their identities, 16S rRNA sequencing was performed and identified TE1 as closely related to the genus *Priestia* and TE2 as a close member of *Paenarthrobacter sp.*, consistent with phenotypic laboratory results. Currently, we are conducting differential tests to identify the closest species for each isolate and to determine whether known biosynthetic clusters are associated with each genus. In the future, we hope to repeat the antimicrobial production assays using a larger collection of known bacterial samples.
  Faculty sponsors: Tiara Pérez Morales, Mark Poch

- **"Synthetic Toxicants in Drinking Water and Birth Defects"**
  Dunia Elghor

  Around the world, water sources are contaminated with toxic and synthetic chemicals due to human activities. The polluted water is ingested by everyone, including pregnant mothers. With these synthetic toxicants circulating in the bloodstream, an infant is at risk of developing long-lasting birth defects that can forever harm them. Testing water sources is crucial to learning more about synthetic toxicant contamination in drinking water and understanding how they can affect infants. Possible birth defects and health concerns associated with the toxicants include spina bifida, cleft lip, limb deficiencies, blue baby disease, respiratory, nervous, and immune system defects and more. The study that I plan to conduct will measure the cord blood samples and urine samples of infants collected by clinics in one developed and one underdeveloped country. The Caragh River in the developed country of Ireland will be tested alongside the Buriganga River in developing Bangladesh. The levels of toxicants (low to high) found in drinking water sources and birth defect incident rates (per 100,000) in these two countries will be measured. I expect that the developing country, Bangladesh, will show higher levels of birth defects than the developed country, Ireland, because of higher exposures to synthetic chemicals in drinking water from human activity and irresponsible disposal.
  Faculty sponsor: Jean-Marie Kauth

- **"Maillard Reaction of the Amino Acid Alanine with Glucose"**
  Tyler Sarna, Alisha Zehra

  Alanine was used to create a 2-formylpyrrole that has a carboxylic acid to analyze whether the carboxylic acid has any significant medicinal benefit. Pyrrole is a ubiquitous starting material to scaffold synthesis reactions due to its ability to create a reactive compound with active functional groups. Compared to a previously synthesized compound, our research adds a carboxylic acid group to be used as a potential site for further added functionality to the natural compound. One of these potential reactions is the conversion of the carboxylic acid to an acid chloride. The synthesis of this product was carried out by the Maillard reaction of alanine and glucose.
  Faculty sponsor: Brooks Maki

- **"Youth Rugby Skills Development Camp: Enhancing Athletic Growth and Mental Health Awareness"**
  Jakob Saunders

  This project involved organizing a youth rugby skills development camp on the turf field, with a registration fee of $10 per participant. The primary objectives were to foster the growth of the Benedictine Rugby program and to contribute to mental health awareness by donating a portion of the proceeds to LooseHeadz, a global organization dedicated to promoting mental well-being within rugby communities. The camp curriculum emphasized

fundamental rugby skills and techniques, culminating in a structured scrimmage to reinforce learned concepts. Additionally, a post-camp social gathering was held in the basement of Krasa, aligning with the rugby tradition of fostering camaraderie beyond the field. This event included food and beverages provided by the Arthur J. Schmitt fund, as well as an announcement of the total funds raised and their allocation to the mental health charity. Through this initiative, we aimed to enhance youth engagement in rugby while simultaneously advocating for mental health awareness within the sporting community.
An Arthur J. Schmitt Future Leaders Project
Faculty sponsor: Julie Bjorkman

- **"A Taxation Case Study: The Importance, Impact, and Ethical Dilemma of Tax Avoidance and Tax Evasion"**
  Mariam Sudhir

  Despite its unpopularity, taxation is a fundamental part of our economy. It plays a foundational role by providing our government with the funds it needs to support crucial services, infrastructure, education, and healthcare. Without taxes, nations would struggle to provide citizens with basic public goods and maintain the stability of their economy. This project focuses on the role of taxation in economic stability and examines its impact on individuals and businesses. I also explore the fine line between illegal tax evasion and legal tax avoidance, examining the ethical and financial implications of each. Using case studies, I analyze common tax avoidance strategies that individuals and businesses use to minimize their tax liability yearly. Although tax avoidance is legal, it leads to an unfair distribution of tax burdens. I argue that the presence of legal loopholes and unethical avoidance strategies compromises the fairness of the tax system. For that reason, it's necessary to closely monitor regular reforms to ensure compliance and address tax loopholes while maintaining economic growth.
  Faculty sponsor: Robert Rebman

- **"Genomic and Biological Characterization of the Cluster AY Temperate Bacteriophage Anekin"**
  Mohammed Khan

  Viruses are infectious particles that infect all forms of life. We are particularly interested in bacteriophages (phages), viruses that infect only microorganisms such as bacteria. Phages can infect their hosts through two main cycles: the lytic cycle, which results in cell lysis, and the temperate cycle, which involves genomic integration. Our laboratory focuses on phages that infect environmental microorganisms. In this study, we investigate Anekin, a phage isolated from enriched samples in 2022 that infects the soil bacterium *Arthrobacter globiformis* B-2979. Preliminary results indicate that Anekin infects across a range of temperatures (22°C–37°C), and its infectivity is concentration-dependent. Anekin produces 2 mm plaques with clear centers and cloudy edges, leading us to hypothesize that it follows a temperate cycle. To characterize Anekin, its genome was annotated by Oregon Coast Community College. Based on sequence similarity, Anekin was assigned to the *Arthrobacter* Cluster AY and shares 94% identity with phages Aikyam and Sakai. Genes required for the temperate cycle were identified, supporting our initial hypothesis. To further investigate its temperate nature, we isolated two lysogens and confirmed them through phage release assays. Future studies will focus on comparative genomic analyses to better understand lysogeny within Cluster AY Arthrobacter phages.
  Faculty sponsor: Tiara Pérez Morales

- **"Communication from Healthcare Professionals to Families on Pesticide Exposure"**
  Hailey Bachmann

  Children are highly susceptible to the drastic health effects of pesticides and many parents are unaware of the devastating link between pesticide exposure and disease. Pesticides have been shown to cause children to have a higher chance of developing cancer, cognitive and behavioral disabilities, and ASD. Healthcare professionals must learn the best way to communicate to the public on the issue of pesticides. I will randomly poll parents from Whitnall Middle School district and give them two different modes of education, implementing pre- and post-surveys to determine the most effective mode of communication. The forms of education will include electronic forms of education, paper handouts, electronic copies, and an information session discussing the dangers of pesticides. The messages in the emails and the paper copies will be the same, and the informational sessions will be

offered multiple times per month to give parents more options for attendance.The purpose of this study is to figure out the best way of communication to parents so families can make healthy decisions. I hypothesize that the best form of communication will be the parents who receive electronic copies and attend informational sessions on pesticides.
Faculty sponsor: Jean-Marie Kauth

- **"Maillard 2-Formylpyrrole Reaction of Glucose and Tyramine at Room Temperature"**
  Shazib Zaheer, Chirag Desor

  The Maillard reaction is a reaction that involves sugars reacting with amino groups that form complex structures. One compound that is part of the Maillard reaction is known as a 2-formylpyrrole. The purpose of this procedure is to analyze the effect of temperature on the formation of 2-formyl pyrrole when adding a specific amine. The chosen amine for this procedure is tyramine and the temperature proposed is room temperature. The purpose of this procedure is to investigate the percent yield of the final compound at room temperature so that it may be compared to a similar procedure with higher temperatures (60°C and 90°C.) Due to the reaction having less energy (heat), the reaction will require a longer time in order to fully react if the reaction goes through. Reactions can have a high percent under the proposed conditions, so this procedure aims to explore that possibility with glucose and tyramine.
  Faculty sponsor: Brooks Maki

ATRIUM | Outer Wall

- **"*Wolbachia*'s Evolution: Its Origin and Host Influence"**
  Sitara Sayeed, Sarah Shams, Mohammed Shams, Muhammed Sayeed

  This research project analyzes the evolutionary history of insects and their parasitic partners, *Wolbachia*. To investigate this, our group collected a range of insects to evaluate the evolutionary impact of the bacteria. The procedure consisted of collecting DNA samples from an arthropod and sequencing them with a reliable scientific database to confirm *Wolbachia*'s presence. *Wolbachia* is a genus of bacteria that affects its arthropod hosts primarily in the reproductive region. Historically, the bacterium has been seen to play several roles in reproductive rates. Now studies have shown that *Wolbachia* has a wide range of biological effects within its hosts. Depending on the insect, their evolutionary relationships differ from species. It is essential to understand the evolutionary history of and relationships between hosts and bacteria to gain further insight into microbial ecology, host adaptation, and medical and disease research.
  Faculty sponsor: Phil Novack-Gottshall

- **"Sports Stadiums' Impact on Environmental Health and Why All Owners Should Go 'Green'"**
  Jack Ryan

  Stadiums that are not up to date with new green standards have a profound impact on climate change and their local community. The facilities consume large amounts of nonrenewable resources and do not reuse rainwater and recyclable items. During construction, trucks and machines release thousands of carbon emissions throughout the building process. Due to the recency of this issue, not all owners and fans know the consequences of allowing the problem to continue. In order to fix this, people must be informed of the impacts that these stadiums have on the environment. Owners can fix this by either rebuilding a new stadium or renovating an existing stadium with recycling bins, LED lights, solar panels, and more. From travel alone to a college basketball tournament game, each person on average is responsible for approximately 500 kg carbon emissions. Another important factor, in-game operations, also highly impacts the amount of carbon emissions that are released. With these issues beginning to become more dangerous, will sports owners continue to exacerbate global warming or make a change? This white paper will assess the importance of "green stadiums" and make recommendations on how to make these structures sustainable.
  Faculty sponsor: Jean-Marie Kauth

- **"Characterization of *Flavobacterium sp.* Isolated from Lake St. Benedict at Benedictine University"**
  Kailyn Knudson

  Bacteria can respond to environmental cues through a variety of cellular processes, including spore formation, production of pheromones or antimicrobial. In the microbiology laboratory, we focus on studying soil bacteria that may produce antibiotics as part of the Tiny Earth program. In this study, we selected a soil sample from Lake St. Benedict. We hypothesized that the area's fluctuating wet/dry soil conditions would support a broad bacterial diversity and increase the likelihood of antimicrobial-producing organisms. From this sample, twelve bacterial colonies were isolated, and one was selected for further study. Using classical microbiology and molecular techniques, we identified the isolate as a gelatinase-positive, Gram-negative, rod-shaped, motile bacterium. Initial antimicrobial production assays did not show inhibitory activity against *Escherichia coli* or *Staphylococcus cohnii*. 16S rRNA sequencing identified the isolate as closely related to *Flavobacterium*, with 96.9% similarity to *F. saccharophilum* and *F. gelidiluteum*. Our laboratory findings are consistent with the DNA results, as several *Flavobacterium* species are known to inhabit soil and freshwater environments. In future studies, we would test bacterial isolates recovered from Lake St. Benedict to better assess its antimicrobial potential. This work highlights the value of applying a range of microbiological techniques to characterize microorganisms from natural environments.
  Faculty sponsor: Tiara Pérez Morales

- **"The Paleoecology of El Chango lagerstätte in Cretaceous Mexico"**
  Isabel Gonzalez

  El Chango Quarry is a newly discovered locality from Cretaceous Mexico. This was once a shallow lagoon that is now the Sierra Madre Formation. Current literature focuses on the more significant fossils from this locality. However, while valuable fossils, they do not give insight into what ecology would have looked like during that time. Here, we show how twenty-three species interacted with the environment in Mexico during the Cretaceous period. The three main classes were Actinopterygii, Cephalopoda, and Malacostraca, all carnivores. This means there were no animals from the foundation of the food chain, such as bivalves or snails; we believe it is because researchers are not writing about them. While we have information on twenty-three new species, we cannot complete the ecological story of El Chango until further research is done on herbivores.
  Faculty sponsor: Phil Novack-Gottshall

- **"The Evolutionary History of Body Size in Decapods Over Time"**
  Alana Lockett, Isabel Gonzalez

  Decapoda is a class of crustaceans that inhabited marine habitats throughout evolutionary history. They were extremely common during the Jurassic and Cretaceous periods but were present as early as the Devonian period. Considering the vast amount of diversity that decapods exhibit, they make up an essential class to study. A total of 168 body sizes were collected 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: Phil Novack-Gottshall

- **"Evaluating the Impact of Ecotherapy Interventions on Psychotropic Medication Dependency in Patients with Depression and Anxiety"**
  Vennela Reddy Vakati

  Misdiagnosis, under-/over-prescribing, and failure to consider consequent drug interactions are only among a few issues that occur in psychiatry, many of which result in long-term addiction and substance abuse issues in patients. In contrast, ecotherapy is a branch of ecopsychology that utilizes a natural setting instead of a hospital clinic to conduct psychotherapeutic (counseling) activities such as community eco-therapy, wilderness therapy, green exercise, and animal-assisted therapy. I propose a study where structured ecotherapy interventions will be implemented in addition to prescribed medications and psychotherapy in a treatment to reduce the risk of dependency in specifically patients with depression and anxiety. I will conduct a Longitudinal Cohort Study that will

consist of a Psychotherapy-plus-Medication group and a Psychotherapy-plus-Medication-plus-Ecotherapy group with data being collected over one year. Consequent mental health assessments—the Hamilton Depression Rating Scale (HAM-D by National Palliative Care Research Center) and the Hamilton Anxiety Rating Scale (HAM-A by American Thoracic Society)—will identify patients' responses to varied mental health interventions. I hypothesize that the side effects/withdrawal symptoms will be more positive for the Psychotherapy-plus-Medication group than the Psychotherapy-plus-Medication-plus-Ecotherapy group. It is time for mental health treatments to become as diverse as future psychiatric populations.
Faculty sponsor: Jean-Marie Kauth

- **"Breaking Barriers: Empowering Students Toward a Legal Education"**
  Kaya Dreger

  In collaboration with the Political Science Student Association, I organized a free Law School Admissions Panel open to Benedictine students and the community. This event was designed to support and guide pre-law students in their journey toward legal education. Recognizing the challenges and uncertainties surrounding the law school admissions process, the panel aimed to provide students with direct access to admissions representatives from Northern Illinois University College of Law and the University of Illinois Chicago School of Law. The panel allowed students to ask questions, gain insights into the application process, and understand the priorities of both NIU and UIC law schools. The representatives outlined specific details that help applicants get admitted to law schools, the timeline for preparing for and taking the LSAT, how to workshop necessary documents such as a personal statement and resume, the importance of recommendation letters, how to navigate LSAC, and when and how to apply to law schools. Most importantly, by facilitating this engagement, the event helped break down barriers to legal education, equipping students with the knowledge and resources needed to navigate their path to law school successfully.
  An Arthur J. Schmitt Future Leaders Project
  Faculty sponsor: Julie Bjorkman

- **"Separation of Powers and Supreme Court Judicial Review: An AI-Assisted Study"**
  Kaya Dreger, Madison Schramka

  We used artificial intelligence to study changes in the separation of powers between the branches of federal government arising from judicial review opinions of the US Supreme Court from 1791 to present. Most power changes occurred in the twentieth and twenty-first centuries. The rate at which the Supreme Court modified the powers of the other branches increased notably in three periods: circa 1920-1940, 1970-1990, and 2000-2020. Power dynamics differ across branches. Legislative changes remain relatively balanced over time. The Executive Branch shows a net positive trend since US v. Nixon (1976), while the Judiciary demonstrates the most asymmetric growth. Through its own rulings, the Judicial Branch has significantly increased its power over the past century, with positive changes far outpacing negative ones.
  Faculty sponsors: Preston Aldrich, Jeremy Nadolski, Joel Ostrow

- **"Weekend Activities and Their Impact on Athletic Performance"**
  Leif Sigmond III

  This study examines how weekend activities—specifically sleep patterns, diet, and social interactions—affect the physical and mental performance of Division III student-athletes during the following week. The hypothesis is that these lifestyle choices significantly influence athletic readiness and overall performance. A sample of 25–35 student-athletes will complete two brief self-report surveys each week over a three week period. Monday surveys will assess weekend behaviors, while Friday surveys will measure perceived mental and physical readiness during practices and competitions. All data will be collected anonymously using participant generated ID codes to maintain confidentiality. The goal is to identify patterns between weekend choices and athletic performance, offering insight into how student-athletes can optimize their routines for improved outcomes. This research may contribute to better awareness among athletes, coaches, and support staff regarding the external factors that influence performance.
  Faculty sponsor: Carolyn Liesen

- **Alessandro Mazzeo**
  "Just Distribution of the Atmospheric Sink: Ethics of Emissions Allocation"

  My presentation explores the ethical dimensions of allocating limited atmospheric capacity to absorb greenhouse gases. Comparing Peter Singer's equal per capita shares approach with Fausto Corvino's forward-looking polluter pays principle, I demonstrate how different frameworks for distributing emissions rights reflect varying conceptions of justice. While Singer argues for equal emissions shares but dismisses historical responsibility as impractical, Corvino's approach incorporates emissions patterns, consumption habits, economic development levels, and ability to pay. I argue that Corvino's framework offers a more nuanced and effective model for achieving equitable distribution of the atmospheric sink, providing practical pathways for addressing both historical injustices and future emissions while remaining compatible with other principles of climate justice.
  Faculty sponsor: Martin Tracey

Index of Poster Session Participants