URSA
Undergraduate, Research, Scholarship and Arts
Benedictine University

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Art

- **"Calpal: The Perfect Quarantine Scheduling App Created Using UI/UX Design"**
  Nida Ali

  UI/UX design, also called user interface design, involves designing how a product works and looks while maximizing usability. It is making the product function in a way that would satisfy users. The Calpal app is targeted to students and workers that have been working virtually because of quarantine. People have to adjust to a home environment instead of a school or workplace environment, where they'd usually feel more motivated to get work done. Calpal eases this transition. It organ"zes your day so that you can get your work done and allow yourself to relax as well. Calpal includes three main features. The first is a scheduling feature that not only sets alarms, but constructs a checklist to keep the user on track. Calpal also includes a feature where an activity is suggested daily to make the user's day more exciting. Finally, Calpal allows you to type in a short reflection so you can end each day happy. The app is simple and straightforward and will quickly become any user's best friend. This project was created in GAD 4393 (Senior Portfolio) in Spring 2021.
  Faculty sponsor: Hairi Han

- **"Care-19: A Public Health Mobile App for COVID-19"**
  Abigail Ang

  There were many individuals who had a hard time during lockdown. People had increasing amounts of anxiety, depression, etc. I created an app for prioritizing mental health and practicing self-care during the pandemic. My app is named Care-19 for a play on words for COVID-19. Care-19 provides a safe space for individuals to calm their overwhelming emotions. This app will guide users who have trouble coping with the ongoing pandemic and will help with finding peace in stressful situations. I chose a cool color scheme because I found that cool colors are more relaxing than warm colors during my research. I also included clouds to my design to help with the calming feeling. Mental health conditions such as depression and anxiety can start at the age of 14 years old. Therefore, users 14 years old and above will find this app beneficial. This app highlights self-care as well as productivity and includes features such as habit tracking, journaling, and mind exercises.
  Faculty sponsor: Hairi Han

- **“Coffanatic: Logo, Brand Identity, and Packaging Design”**
  Nida Ali

  In this project, we worked on logo creation, brand identification, and packaging. Branding and packaging are a significant part of selling a product because they help determine if the purchase takes place. As visual creatures, we’re captivated by the attractiveness of products. Branding and packaging is thus a critical step in ensuring the product looks its best. My product was called Coffanatic and the main products were coffee drinks. The process started by creating a mood board, deciding on what message we wanted to send with our product. For Coffanatic, I wanted something modern, but still giving the feeling of warmth. After finalizing a color palette, I started experimenting with logos using different shapes and lines. Once I developed my logo, I started designing the packaging. This was a detailed process because we had to ensure it included all the necessary elements a real product label would. The last step was to complete the packaging. Here, we had to showcase the products in a realistic way by pasting them onto 3-D models. After placing the background and setting the lighting, the final design was completed. This project taught me the importance of detailing and being patient throughout the design process in order to reach a good finishing piece. From forming the mood board to packaging on the models, in retrospect, every step was necessary because they all played a hand in helping me arrive at the final design. This piece was created in GAD 4300 (New Media & Design) in Fall 2020.
  Faculty sponsor: Hairi Han

- **“Community Foods: A Public Health Mobile App Design”**
  Artemas Ray

  This prototype mobile app is designed to promote public health by bringing people ease during the COVID-19 pandemic. My thoughts for this app are to provide healthy food to those in need. Selections range from small stores to super markets, with a bundle of healthy options. No money is needed to obtain these meals. My goal is to serve Chicagoland’s West Loop area, in Cook County, IL. I also want to provide additional resources for those facing unfortunate circumstances. Most of all, I want to provide beneficial advice related to healthy foods. With my mobile app, I aim to build and strengthen positivity to get through the pandemic. Designed in Senior Portfolio (GAD 4393) in spring 2021, this project demonstrates the standards for a beginner in the Graphic Design field, as well as how to convey an effective message through various design methods.
  Faculty sponsor: Hairi Han

- **“Counting Crows: CD Jacket and Music Graphics Design”**
  Anna Nothnagel

  In this project, I present a rendition of CD packaging that I created for the Counting Crows album *August and Everything After*, including the elements that go into the jewel case for the graphics, as well as a design for the cd inserts. I chose to listen to the music and sketch some artwork for each of the songs. I then painted a background in ink, trying to hold onto the real and raw emotions that their music inspires, and made a collage of the artwork in Adobe Photoshop before compiling it all into the packaging with the lyrics. This project was an opportunity to combine art, design and music. It also helped me develop composition skills necessary to working in the design industry, as well as develop a better understanding of typographic elements and how to use them appropriately in CD design. This project was made in Graphic Design II (GAD 3360) in spring 2020.
  Faculty sponsor: Hairi Han

- **“Kinetic Typography: ‘When Will My Life Begin?’”**
  Abigail Ang

  This kinetic typography project uses the song “When Will My Life Begin?” from the Disney Princess movie *Tangled*. I chose this song because the lyrics refer to various activities that I thought would be fun to recreate in an animation: “start on the chores, sweep ’till the floor’s all clean, polish and wax, do laundry, and mop and shine up.” Since the song is from a Disney movie, I was inspired to make my animation get the attention of younger kids. I chose to incorporate graphics with the lyrics to add more an entertaining feeling as well as emphasize certain lyrics of the

song. I wanted my design to reflect the movie, so my color palette was based on Rapunzel's blonde hair and purple and pink dress. The purpose of my design is to be fun, cheerful, and bubbly.
Faculty sponsor: Hairi Han

- **"Life is Beautiful: A Social Action Campaign Poster Series"**
  Maria Hilby

  In this project, I create a social action campaign poster for the non-profit organization American Life League, as they are an excellent foundation that is working towards building a culture of life and ending the horrific act of abortion. Since our society today takes great interest in entertainment, I chose to draw the singer Celine Dion, who has said, "I was almost aborted." If this had happened, we would never have gotten to witness her amazing talent. I painted her lifting her arm with her eyes shut to express her passion and emotion as she sings. Since it is not only celebrities' lives that are valuable but indeed all human life, my second poster uses the story of an ordinary person. I wanted my posters to be shocking but also heartfelt. Creating a heart out of the umbilical cord around the fetus helped to accomplish this feeling. I chose red in my design because it represents the pro-life position, while roses have great meaning in the pro-life movement. To keep both posters unified, I repeated the red and gold color scheme, roses, the font, the use of linework behind the figures, and the illustration of the figures. This series of social justice posters were created in GAD 3360 (Graphic Design II) in Spring 2021.
  Faculty sponsor: Hairi Han

- **"Secondsale: A UI/UX Mobile Application Design"**
  Anna Nothnagel

  Our assignment was to create a User Experience/User interface using design that would be utilized in a mobile app for a company. This is an important focus in the design industry since it helps App developers in designing the website, since their focus is making an app work correctly. Designers create a friendlier atmosphere for customers as they browse through an app. This helps the business because a customer is more likely to utilize a app that has a good balance in design and function. In this assignment we had to research the industry standards used by other companies that are similar to our company to present a solid design that is both user friendly in design and intuitive to use. This project was interesting since it requires a minimalist approach to design. This challenged me to make more precise decisions on the design elements in order to provide an environment for the user that is both calm and easy to stay focused on the product. Comparing this project to other design projects in print design, it is just as fun and engaging but requires more attention to merging product information while maintaining a good visual balance. It is also necessary to focus on movement in considering composition since the user is scrolling while finding their product. This was a project in GAD 4300 (New Media and Design) in Fall 2020.
  Faculty sponsor: Hairi Han

- **"Social Justice Posters: Dyslexia Awareness Series and Smoking Kills"**
  Emma Minelli

  A social justice poster calls the viewer to action, with the artist bringing a social issue to viewers' attention and asking them to change. The purpose of my Dyslexia Awareness poster series is to raise awareness of dyslexia, a reading disability. My posters use the International Dyslexia Association (IDA), a non-profit organization dedicated to helping people with reading disabilities, as a backdrop and inspiration. My goal for the series was to create unity throughout the poster and to creatively represent the difficulties of reading with dyslexia. I used elements of design like motion and color. Smoking Kills, my second social justice poster, refers to the public health issue of smoking. My audience is current smokers and people who know current smokers. By using facts and elements of design, I ask the viewer to break the deadly smoking habit. These posters were made in Graphic Design II (GAD 3360) and Typography (GAD 2230) in Spring 2021.
  Faculty sponsor: Hairi Han

- **"Typeface Experiment in 2D and 3D Space: Donald Duck"**
  Maria Hilby

  In this typeface design project, I chose letters that make up the popular and fun character, Donald Duck. This Disney character tends to have an angry temperament in cartoons which gave him his notable trait and appearance. To capture a mad expression, I made the eyes' fonts bold and stand out more than the other fonts around the face. Also, the use of a variation of bold fonts helped bring about a strong feeling rather than a calm one. Since Donald Duck is a classic character, I tried to incorporate older and "classy" fonts such as Rage Italic and a vintage font like Rinse Regular. I tried to be playful with the letters and type I selected. Most of the letters I chose were intentional. I included all the letters from the words, Donald Duck, Quack, Angry, and Mad in my composition. For my 2D typeface poster, blue is the background color because Donald Duck wears blue and because he is a sailor. For the 3D typeface project, I tried to give each letter a texture and material that seemed practical such as a shiny metallic texture for the beak. Lastly, to create a sense of aggravated emotion I placed an image of rough waves behind the figure. This typographic poster was created in GAD 2230 (Typography) in Spring 2021.
  Faculty sponsor: Hairi Han

- **"Typeface Experiment in 2D and 3D Space: Patrick"**
  Tyreese Ray

  This project uses different 2D and 3D typefaces and limited typeface distortions to represent a chosen picture. I first chose a picture to work from, then made a 2D model using letters. I arranged them to resemble the picture as best I can, without making just a trace of the picture with letters. I wanted to find good typefaces that would fill the space well, while trying not to use so many as to make the design too noisy. I spaced them out so that one could also see clearly the different letters and symbols used to make the whole composition. Next was to bring this model to life by making each individual letter a 3D object. I arranged them in a way that would not look 2D, but would give some sense of depth. To do this, I brought the bow and head toward the viewer and positioned the letters to show the dimensional perspective. What I've learned through this project is how to use balance and hierarchy to express the main idea. I also learned that much detail isn't needed to get a point across if you can well develop unity with simple things, and that way the viewer doesn't get lost in the work.
  Faculty sponsor: Hairi Han

- **"Typeface Experiment in 2D and 3D Space: Sonic"**
  Liam Clancy

  The goal of this project was to create a 2D image using a typeface that could be transitioned into a 3D space. The image needed to remain simple in design while defining the key feature and characteristics of a character's face. Since cartoons are designed with very intentional shapes, I used the image of Sonic the Hedgehog. I needed to find letters that appropriately fitted the overall shape of the character. I began by breaking down Sonic's key features such as his spiked hair and curvy brow line. Cursive letters were better for curves while a more plain and bold typeface was better for spiked sharp edges. I then began transitioning each letter into the 3D space. I kept the overall style and shape of my type face and focused on adding backgrounds and items to help represent Sonic. The last image took all the elements from the 2D image and added more depth to them. The added elements of a background and gold rings help bring features of the Sonic games to the 3D world. 3D images are good at giving added depth while 2D images can easily focus on minimalist features.
  Faculty sponsor: Hairi Han

- **"Typeface Experiment in 2D and 3D Space: The Joker"**
  Umama Ayaz

  The purpose of this project was to create a face using typeface, starting from a 2D design and then further developing it into a 3D space. I chose to recreate The Joker because he has very distinct features that I thought would translate nicely to letters. I started by analyzing which typefaces would capture the chilling appearance of The Joker's face. For his wavy hair, I chose letters with curves and loops to resemble this texture. The Joker is known for

the cut-up smile on his face and crazy makeup around his eyes, and to best resemble this, I used sharper letters and typefaces to capture his maniacal look. After finishing the 2D design, I transitioned to the 3D space. I began working on not just the positioning of the letters but also the angles and depth. Since I wanted the character's head to be tilted, I chose to make the letters on the right further ahead than the others. I also had the "J" that represented his shoulder to be prominently in the front to show that the character is at an angle. Lastly, I chose the background to be a gradient of green and purple because these colors are associated with The Joker.
Faculty sponsor: Hairi Han

- **"Typeface Experiment in 2D and 3D Space: Tolstoy"**
  Phanitha Meka

  This project shows the process of experimenting with 2D and 3D typefaces in order to create a specific feeling, thought, or idea. These posters are modeled after the writer Leo Tolstoy. In the 2-dimensional poster, different types of script typefaces are used in order to replicate the elegance which is typically associated with writers. Additionally, extra care was taken to ensure there are not too many letters being used in order to prevent visual noise. Rather than replicating lines exactly as seen in the photograph, I decided to shift my focus on how parts of the face existed within space. As a result the poster has little symmetry but still remains visually balanced. The colors used, are calm in order to invoke that feeling within the viewer. The 3-dimensional poster uses blue silk and a sky background in order to show the creativity writers possess as their heads may be said to be "in the clouds."
  Faculty sponsor: Hairi Han

- **"Typeface Experiment in 2D and 3D Space: Waluigi"**
  Emma Minelli

  A typographic poster mainly uses type characters to create an interesting design. This poster is inspired by Waluigi, an evil character in Nintendo's video games. He is seen as a ruthless racer in Mario Kart who uses a purple race car. The poster is primarily fashioned out of characters with some additional shapes and images to complement the design. The poster breaks through the two-dimensional restrictions of average typographic posters, as Waluigi is placed into a three-dimensional world. Two-dimensional poster can be flat and dull. Three-dimensional posters create more depth and interest. To create the embodiment of the character, I used typefaces and elements of design. Harsh lines, angles, space, color, movement, and depth define Waluigi's chaotic personality. This typographic poster was created in GAD 2230 (Typography) in Spring 2021.
  Faculty sponsor: Hairi Han

- **"Uncage the Voices: A Typographic Social Justice Poster"**
  Maria Hilby

  This social action campaign poster highlights the issue of censorship using typography. More specifically, my poster explores the problem of Google having control over who gets to share their thoughts with the public and allowing only access to certain information on the internet. I find this problematic because it is not allowing the practice of freedom of speech. It can also be dangerous when Google or any big tech companies have a monopoly over the media and the use of information because only certain viewpoints are being shared or the truth could be hindered. I made the second letter "g" in Google into the shape of a bird cage. Then I made an eagle out of the words "Freedom of Speech, Voice, First Amendment, Thoughts" to represent all the ideas and information of those being censored. I chose an eagle to represent the people of the United States and the First Amendment although the U.S. is not the only place being censored by Google. I made the background dark and the corners of the composition even darker to create a confined and eerie feeling. This typographic poster was created in GAD 2230 (Typography) in Spring 2021.
  Faculty sponsor: Hairi Han

Biology

- **"Building a Microbiology Agar Art Bank for Future Outreach Events"**
  Sophia Sami, Nashwah Memon, Ahsan Adil

  Soil bacteria are diverse in how they respond to their environment and competing microorganisms. Through the microbiology laboratory Tiny Earth projects at Benedictine University, we can observe how soil bacteria produce antimicrobials when exposed to selected bacterial controls. However, these antimicrobial producers can be used in different ways outside of the laboratory. In this work, we focused on soil bacteria that produced surface pigments and reallocated them to create a color bank for future microbiology art and science (MAS!) outreach events. Up to 18 colonies were characterized in this project to determine the best bacterial pairings. We determined color, pattern, and fluorescence in diverse media. We characterized them through Gram stains, motility, and antimicrobial cross-reactivity tests. Preliminary data shows our isolates maintain and enhance their pigments and textures in different media. Most have activity against Gram-positive organisms and minor cross-reactivity against each other. We have observed 5 isolates with selective fluorescent activity depending on the interacting partner with or without antimicrobial production. Lastly, we have sequenced the 16s rRNA to identify our soil isolates and create informational cards about each microorganism. Our future work will include protocols for agar art patterns and handling of soil microorganisms during MAS! outreach events.
  Faculty sponsor: Tiara Pérez Morales

- **"Determining the Toxicological Effects of DDT Utilizing CRISPR Screening"**
  Jason Peart

  CRISPR screening is a large-scale genetic loss-of-function experimental approach that facilitates the discovery of genetic sequences responsible for specific functions. The utility of this approach is that it vastly reduces the amount of effort required to identify the genes responsible for a given physiological effect. Recently, CRISPR screening has been used by Yue Liu et al. (2020) to determine the mechanism of action of various pollutants in *Bombyx mori*. While the first and most important defense against these pollutants is to control their release, that is not always a realistic option. Furthermore, some pollutants persist in the environment long after their release. Therefore, it is vital to be able to determine the toxicological mechanisms of these pollutants to understand the effect of their release into the environment. Although the potential health risks of dichlorodiphenyltrichloroethane (DDT) are widely known, it is still used due to its effectiveness in controlling mosquito populations. Utilizing CRISPR screening to investigate the effects of DDT exposure on human pluripotent cells may provide a novel approach to investigate the toxicological mechanisms of DDT exposure. Second, CRISPR screening will potentially identify more genes and pathways that cannot be determined through traditional methods. While many studies report similar health effects of DDT, the data are not definitive. The proposed research will utilize CRISPR screening of human pluripotent stem cells to investigate and determine the toxicological mechanisms of DDT in human cells.
  Faculty sponsor: Anne Marie Smith

- **"The Effects of Air Pollutants on Human Eye Disease"**
  Minnat-Allah Elhannouny

  This proposal asks for a grant to pay for research into the impact of air pollution on ocular health. Emission of pollutants into the air has been one of the major aspect of changes in not only the climate, but human health, causing various ocular diseases. Many scientists have confirmed prominent effects on respiratory health; however, eye health has been overlooked as vulnerable to effects of air pollution. The most serious air pollutants, $PM_{2.5}$, PM_{10}, and ozone, have been shown by several studies to be the most harmful and severely correlated with eye diseases such as dry eye syndrome (DES) and conjunctivitis. However, little is known about the severity and specific effects each pollutant has. If awarded the grant, I will conduct a study using rats' eyes *in vivo* with control and experimental groups; one will be exposed to $PM_{2.5}$ and PM_{10} and one to ozone, in order to assess which pollutants result in more severe symptoms of DES and conjunctivitis. I hypothesize that the group that will be exposed to $PM_{2.5}$ and PM_{10}, known to cause gland damage, will experience symptoms of DES, while those exposed to ozone, known to cause

inflammation, will experience more severe symptoms of conjunctivitis.
Faculty sponsor: Jean-Marie Kauth

- **"The Effects of Light and Noise Pollution on Human Health and Sleeping Patterns"**
  Jacob Pipowski

  Light and noise pollution are among the most common forms of pollution. Similar to all forms of pollution, these exposures can lead to severe health issues, like mental illness and heart and metabolism issues, possibly stemming from sleep disruptions and other sleep problems. Some research claims that the signaling pathways that lead to significant health and sleeping issues are unknown. However, other research claims that melatonin concentration is the link between these significant health issues—such as the heart and metabolism issues mentioned earlier—and sleeping problems. From this research, I hypothesize that increased sensitivity to light and/or noise during the nighttime leads to decreased melatonin and sleeping hours, thus causing health issues to appear. In order to test this hypothesis, people would be exposed to varying levels of light and noise over a period of time, such as a month. The concentration of melatonin within the body would then be tested to determine how different kinds of exposure to light and/or noise affected melatonin levels and whether or not sleep quality was affected by it. The expected result of this research would be to prove whether melatonin is the link between light and noise pollution and significant health issues related to sleep.
  Faculty sponsor: Jean-Marie Kauth

- **"Healthcare Sector Analysis of Kirksville, Missouri"**
  Moatasim Baig

  The city of Kirksville, Missouri, currently faces several challenges due to its rural location that hinder its community's overall well-being. This project aims to examine the strengths, weaknesses, opportunities, and threats in the healthcare sector of Kirksville. The primary objective is to identify healthcare needs and develop recommendations that can address these needs. The data presented in this poster has been acquired from the district, city, state, and federal websites. Data was also collected from hospitals, clinics, nursing homes, and universities. After analyzing existing resources and those that are absent, I was able to formulate an action plan that includes the creation of new services, community health partnerships, and education outreach. Most important of them all is the introduction of new university opportunities to enable students to pursue a higher level of education, thereby increasing the number of qualified healthcare professionals who would be willing to reside and practice there. Kirksville has the potential to become a city that can provide opportunities to its residents as well as other rural cities near it.
  Faculty sponsor: Theresa Hunziker

- **"Hereditary & Environmental Risk Factors in Asthma Development: A Detailed Look at Epigenetic Contributions to Asthma Etiology"**
  Mohammed Ansari

  Pediatric asthma is one of the biggest epidemics that face children today. In recent decades, there has been a stark rise in incidence of pediatric asthma and an increase of deaths in children relating to this disease. Researchers have noted that an increase in air pollution levels are a significant reason for a rise in pediatric asthma rates. Air pollutants are dangerous for youth, who are especially susceptible due to their physical immaturity. However, these epidemiological studies do little to note the possible delayed epigenetic consequences that these harmful pollutants may have, and how possible DNA damage to parents and their children may also be a factor in asthma development, alongside the immediate effects of air pollution. I propose a comprehensive study of a retrospective cohort of children, their personal development or non-development of asthma, their family history, and their surrounding environmental conditions to provide an insight as to which of the two previously mentioned factors is more causal in the development of pediatric asthma. Results may reveal if differences of significance exist between these factors and give insight as to how damaging current environmental conditions may be to the well-being of millions.
  Faculty sponsor: Jean-Marie Kauth

- **"How Exposure to Light at Night (LAN) May Cause Diabetes"**
  Moustafa Elghor

  Lighting is important in today's modern society, but it can have an impact on health when humans are exposed to it for a very long time at night. For example, exposure to light at night (LAN) affects the biological clock in the body known as the circadian rhythm. Exposure to LAN also causes problematic sleeping habits and imbalance in people's metabolism. In recent studies on mice and night shift workers, Kooijman et al. (2015) and McHill et al. (2014) suggest that the more people are exposed to artificial light, the more they experience increases in body mass and are at risk of developing diabetes. The proposed research will use previously used methods on a much larger sample size of humans to determine if the correlation is statistically significant.
  Faculty sponsor: Anne Marie Smith

- **"The Impact of the Air Pollutant NO_2 on Type 1 Diabetes"**
  Manal Syeda

  Type 1 diabetes (T1D) is a genetically-related illness in which insulin-producing cells, beta cells, are attacked by the immune system, resulting in the body's inability to process glucose. Recently, there has been a rise in cases of T1D which cannot be explained solely by genetics. Therefore, researchers have directed their attention towards environmental factors as a trigger for causing T1D. Research conducted in the past has concluded that environmental factors like air pollutants, such as NO_2 (Paul et al. 2020) and O_3 (Elten et al. 2020), and viral infections, such as enteroviruses (Beverlein et al. 2016) and viral respiratory tract infections (Ali et al. 2017), show a strong correlation with T1D. However, this study aims to observe the specific ways the immune system becomes comprised when an individual is exposed to NO_2 since little is known about the effects of the pollutant on T1D. The study will be conducted by exposing both male and female non-obese diabetic mice to the air pollutant, NO_2, and by observing how T cells of the immune system are affected.
  Faculty sponsor: Anne Marie Smith

- **"The Impact of Graphene Quantum Dots on the Brain in Treatment of Glioblastomas"**
  Kaley Sheehan

  Glioblastomas are the most common form of brain cancer in adults, creating fatal tumors in the brain with little chance of survival. Glioblastomas form when a genetic abnormality occurs in neural stem cells. Since the brain has low levels of therapeutic agents, it is more able to acquire mutations. Besides exposure to ionizing radiation and a few complex heredity syndromes, there are no known causes for glioblastomas (Connelly & Mark 2007). However, a little is known about the environmental factors or lifestyle choices that may contribute to glioblastoma cases. Glioblastomas are protected by the blood brain barrier and do not allow cancer treatments to be very effective. Inorganic lead is known to be a human carcinogen and is highly poisonous with the ability to shut down the central nervous system. Review of medical records and levels of occupational lead exposure indicates that lead showed a significance in incident rate in brain tumors associated with glia cells and is associated with the blood brain barrier (Bhatti et al. 2009). Exposure to lead changes the chemistry of the brain, allowing tumors to grow and thrive. Graphene quantum dots (GQDs) are reported to have the ability to cross the blood brain barrier and positively affect the brain when a tumor is present (Perini et al. 2020). By observing mice with GDQs and doxorubicin, the synergistic effects of GDQs can be seen. GDQs will be paired with radiation and chemotherapy to determine whether effectiveness can be improved. Given the ability of GDQs to permeate the blood brain barrier and its binding properties, glioblastoma treatments may have hope. These nanoparticles may be an innovation in therapy for brain tumors.
  Faculty sponsor: Anne Marie Smith

- **"Impact of Mixed Acid Rain on Soil pH and Chloroplasts of Plants"**
  Mohammed Rahman

  Acid rain is a major environmental issue about which scientists have done an immense amount of research. It is deemed by scientists to be the severest global environmental problem, apart from climate change, global warming,

and nitrogen deposition. Acid rain is created due to the emissions from fossil fuels, which releases heavy amounts of nitrates and sulfates into the air. The major effect of acid deposition into the environment is on soil as it lowers the pH of soil components, damaging many plant species. Not only does it affect soil and plants, it poses a threat to many animal species due to increased acidity in the environment. Many parts of the world experience two main types of acid rain which have different effects on the mechanisms of soil and plants: sulfuric acid rain (SAR) and nitric acid rain (NAR). Scientists predict that increasing fossil fuel emissions of fossil fuels will intensify the acidity of the rain, though the precise effect on the mechanisms of soil and plants remains unclear. This proposed research will examine a mixed version of acid rain with components of both SAR and NAR to evaluate its effects on soil pH and assess how it alters the mechanisms of the chloroplast within plants.
Faculty sponsor: Anne Marie Smith

- **"Impact of Realistic Concentrations of NTP on the Early-Life Stages of Zebrafish (*Danio rerio*)"**
  Chris Anthony Aguilar

  Increasing amounts of pharmaceuticals are being disposed of into the water. Antidepressants are commonly used today to treat a wide variety of symptoms such as anxiety and depression. However, their metabolites are known to inhibit locomotive behavior, fertility, and development in aquatic organisms. The effects of several antidepressants' metabolites have been tested, including the tricyclic antidepressant nortriptyline (NTP). This proposed research will further investigate the adverse effects of *in situ* concentrations of NTP on the early-life stages of zebrafish (*Danio rerio*), but at lower concentrations than previously tested. By doing so, the safety of waters with similar levels of NTP can be determined.
  Faculty sponsor: Anne Marie Smith

- **"Impact of Triphenyl Phosphate on Nail Technicians' Endocrine Systems"**
  Imelda Flores Morales

  Triphenyl phosphate is an ingredient used in nail cosmetics that can be detected in human urine. High traces of triphenyl phosphate have been linked to abnormal thyroid function, difficulties in pregnancy, and even effects at the cellular level. These effects can be seen amongst nail salon clients and home users. However, the effects on nail technicians have not been thoroughly investigated. Expanding on existing work (Estill 2020), this proposed research aims to collect urine and blood samples from nail technicians and test them for triphenyl phosphate. There will be a larger sample by recruiting nail technicians from six different salons in each of six countries. Unlike the research done previously, this proposal will have the nail technicians' thyroid function be assessed as a measure of any reproductive difficulties. Statistical analysis will determine whether there is a statistically significant correlation between the two variables.
  Faculty sponsor: Anne Marie Smith

- **"Lake Saint Benedict Ecological Evaluation"**
  Candice Ahlstrand, Nia Young, Ahmad Malik

  The purpose of this study is to provide effective recommendations for decreasing algae growth and eutrophication in Lake St. Benedict, on the Benedictine University campus. These improvements will help to avoid periodic fish die off, as observed in recent years. Information for the study builds upon a previous evaluation of Lake St. Benedict in 2019 by the Illinois Department of Natural Resources Division of Fisheries. This study provides additional information such as lake and sediment depth, and the composition of the lake sediment, which were not measured in previous studies. The bathymetric survey revealed features of the lake bottom that would provide favorable locations for the installation of a system of aerators and mixers. The aeration system would provide dissolved oxygen to the lake water and limit the growth of duckweed at the water surface. Other techniques to limit nutrient loads to the lake and provide healthy fish habitat are also recommended. Overall, this investigation has allowed for a more comprehensive set of recommendations that include techniques for mechanical oxygenation, sediment management, and vegetation management.
  Faculty sponsor: William Schubert

- **"A Novel Case Study Approach to Undergraduate Research in Post-COVID Times: Mayhem in May"**
  Gerda Simkeviciute, Daniyal Mehmood

  To engage undergraduate students in research projects remotely during the COVID-19 pandemic, a systematic literature review of publicly available articles regarding SARS-CoV-2 was performed. Detailed qualitative information from relevant articles in peer-reviewed journals and quantitative data from family members who were infected were used to compile a case study to narrate a story simplifying the complexities of COVID-19 infection which would otherwise be difficult and sensitive to discuss. This pedagogical research enhanced students' critical thinking skills in preparation for entry into the healthcare profession. This directed patient case study was designed using data from real life situations and applying it to fictitious patients to maintain anonymity. The storyline follows three individuals and their families during the 2019–2020 coronavirus outbreak in the United States. The timeline of patients' infections, testing, interventions, and outcomes are discussed. Additional sections on COVID-19 gender disparities and atypical symptoms are also provided. Using this case we were able to research the symptoms, susceptibility, mechanism of action, progression of the infection, opportunistic infections, extrapulmonary complications, and treatments. This novel and innovative technique circumvented original project goals and traditional research methods, and engaged undergraduate students to create a scientific product that ultimately serves the common good.
  Faculty sponsor: Jayashree Sarathy

- **"Outbreaks of Hepatitis Due to Fecal Water Pollution in India"**
  Marya Shamas

  Hepatitis A (HAV) and E (HEV) are usually caused by ingestion of contaminated food or water. However, there has been little investigation on the correlation between HAV/HEV and fecal water pollution in India, which has one of the worst cases of fecal water pollution in the world. Across India, more than half a billion people defecate freely, often in pits that leak into water sources. It contributes to numerous types of illness, affecting a person's ability to develop, function or go to school. The objective of this study is to assess the risk of exposure to contaminated fecal water in Rajasthan state areas and to determine the association between HAV and HEV in the outbreak of waterborne hepatitis. With this study we expect to see a correlation between water pollution and hepatitis A and E.
  Faculty sponsor: Jean-Marie Kauth

- **"The Potential Correlation Between PM2.5 and Increased Risk of Breast Cancer"**
  Subohi Fatima

  It has been previously observed that an increasing amount of pollution is being released into the atmosphere and the environment in general. This ongoing pollution is affecting the health of humans and overall well-being of organisms. Since pollution is universally considered to be harmful, long-term adverse effects can cause potential human health complications such as cancer. $PM_{2.5}$ (particulate matter sized 2.5 microns) is one of the most common type of air pollutants. Recent studies on the insertion of $PM_{2.5}$ extractions within breast cancer tissues, done by Cheng et al. (2020) and DuPre et al. (2020), indicate that breast cancer cells exposed to the particulate matter have the potential to grow further and ultimately affect the regulation of normal breast cells. The proposed research will implement similar methods of research on more female breast cancer tissue. This proposal aims to establish a greater understanding of the possible correlation between adverse effects of higher levels of $PM_{2.5}$ and the potential increase in the risk of breast cancer in women in the United States.
  Faculty sponsor: Anne Marie Smith

- **"Presence of Phenazone Metabolites in Water Sources Throughout Spain"**
  Miles Mann

  The incomplete dissolution of the anti-inflammatory drug Phenazone produces nonbiodegradable metabolites causing water pollution in aquatic ecosystems throughout Spain. Gong et al. (2020) and Ho et al. (2012) have concluded that multiple countries have banned the drug from the market due to its ability to harm aquatic life and contaminate drinking water. Previous studies have attempted to solve this issue by degrading the metabolite once it

has reached the water source. Sieira et al. (2021) found that these approaches include different forms of chlorination but fail to find a permanent resolution as toxicity is often increased. However, another possible approach is to alter the structure of the medication prior to its consumption. This creates the potential to eliminate the production of nonbiodegradable metabolites entirely. By enhancing the solubility of the non-polar benzene ring, the medication can dissolve and produce harmless metabolites. El-Haj et al. (2018), Ye et al. (2020), and Cramer et al. (2019) evaluated how the addition of hydroxyl groups to a benzene ring results in an increase in polarity, ultimately improving solubility. Moodley et al. (2018) predicted the solubility of similar medications such as Paracetamol through the different models. In the proposed research, a solubility profiler will be used to test the solubility of Phenazone after the hydroxyl groups are added.
Faculty sponsor: Anne Marie Smith

- **"The Race to Normalcy During COVID-19: Facilitating Undergraduate Research Using a Case Study Approach"**
  Daniyal Mehmood, Gerda Simkeviciute

  The COVID-19 pandemic has changed things in ways unimaginable, including by disrupting in-person activities. Thus, to facilitate undergraduate research remotely, our lab switched from a traditional, hands-on approach to a pedagogical one. We reviewed current literature and, using that information, we constructed a case study focusing on the most relevant topic in the news, COVID-19 vaccines and variants. With the arrival of the vaccines, health professionals are confident in the world's ability to curb the virus. However, there is a growing concern globally about the differences in molecular composition, efficacies between the vaccines offered, and the emerging variants. Our case study follows 3 fictitious characters living in the USA with family members abroad. One of the subjects is immunocompromised; the other has elderly family members living in India and the third has family members living in the UK. Using this scenario, we were able to discuss the types, efficacies, and distribution of COVID-19 vaccines globally, as well as emerging variants. The case study research model provides an alternate way to involve students in the scientific process to evaluate, identify, and critically evaluate research. Further, timely dissemination of reliable facts helps our community address the myths and navigate the quagmire of information.
  Faculty sponsor: Jayashree Sarathy

- **"The Role of Biochar in Forest Remediation in Pesticide Treated and Untreated Land"**
  Nina DiNardo

  Soil composition is a major factor to consider while analyzing the effects of deforestation and lack of stability in the environment. Harmful aspects in soil include toxic chemicals such as cadmium and lead, which are detrimental to root growth and photosynthesis as well as polluting the air. The organic matter in soil where deforestation has occurred has also been affected because of pesticides and artificial planting. However, measuring how to restore our soil economically is quite a challenge. Many methods have been tried to remediate agricultural land to sustain the soil. It was discovered that the use of biochar and artificial planting in the damaged areas will, over time, bring back natural vegetation and restore organic matter. I propose a study to measure tree growth and soil quality, including NPK, organic matter, pH, and micronutrients. This will be done in degraded agricultural land, untreated and treated with pesticides, in Wisconsin. I expect that the use of biochar will improve tree growth and measures of soil quality in both pesticide treated and untreated areas. In addition, I expect to see differences between the two areas, with the pesticide treated land still falling behind. Using biochar to enhance reforestation could be done on a national scale, if successful.
  Faculty sponsor: Jean-Marie Kauth

- **"Seasonal Variation in Aquatic Behavior of Female Diamondback Terrapins (*Malaclemys terrapin*) in Southeastern North Carolina"**
  Allison Dickman

  Turtles are one of the most imperiled vertebrate taxa with regards to conservation efforts because the status of many species remains largely unknown. The status of the estuarine diamondback terrapin (*Malaclemys terrapin*) varies, and the majority of populations are undocumented due to the challenges of population surveys. More rapid population assessment techniques have been explored for terrapins, but more information on the aquatic ecology is

needed to refine these survey methods. We radio tracked 10 female terrapins in North Carolina and recorded their aquatic behavior during their active seasons (April-October 2008 and 2009). Using correlation analyses, we explored the relationships between the following aquatic behavioral patterns: surface time, dive time, proportion of time at surface, proportion of time diving and the following environmental factors: air temperature, water temperature, cloud cover, day of year, wind, tide, turtle size. A linear mixed model that predicted female terrapin aquatic behavior found that mean dive time varied negatively with day of year and air temperature, and also showed a positive parabolic (seasonal) trend over time. This study provides new information about seasonal aquatic ecology of terrapins and behavioral information that can be used in the refinement of rapid terrapin population surveys.
Faculty sponsor: Leigh Anne Harden

- **"Sequence Conservation of *BRCA1* and *BRCA2* Intron-Exon Junctions"**
  Talia Ishfaq, Maryam Salik, Uzma Jafry

  Clinical sequencing of the exons and intron-exon boundaries of the tumor suppressor genes *BRCA1* and *BRCA2* reveals sequence variants of uncertain clinical significance (VUSs). Some variants are potentially pathogenic by disrupting normal splicing patterns while others are benign polymorphisms. To determine which variants might be pathogenic, we performed phylogenic analysis of intron-exon boundaries of *BRCA1* and *BRCA2* to (1) determine whether VUSs near intron-exon boundaries disrupt conserved sequences, and (2) determine whether sequences flanking exons involved in alternative splicing events are conserved. Sequence strings representing intron-exon junction regions were prepared for 21 *BRCA1* exons and 25 *BRCA2* exons for several primate species and mouse. The strings were aligned using the MUSCLE multiple sequence alignment method. Splice junction sequence conservation was from 68%-100% conserved (mean % conservation, 92.7%; median, 95%). We observe that alternative splicing events occur in nearly perfectly conserved splicing environments, suggesting they may occur in other species as well and possibly contribute to gene function. Several clinically identified VUSs that fall within the human *BRCA1* splice junction region are wild type base differences in other primates, suggest these VUSs are likely to be benign polymorphisms and not pathogenic variants.
  Faculty sponsor: James Fackenthal

- **"Twitch Mycobacteriophage Genome Annotation by BIOL 1195 Undergraduates"**
  Nabiha Ismah, Mahdia Amatullah, Mirelly Rivas Soriano

  SEA-PHAGES is a program that promotes undergraduate research. Benedictine University is one of three schools in Illinois to be part of this program and it is being piloted within our freshmen biology sequence. It is divided in two semesters, a wet laboratory, and bioinformatics. The projects revolve around mycobacteriophages, viruses that infect mycobacteria. Mycobacteria have relevant species including *Mycobacterium tuberculosis* and *M. smegmatis*. In Fall 2020, we worked as a class to annotate the genome of Phage Twitch. The goals were to determine gene potentials, starts, product functions, and conservation. We utilized the DNA Master platform to annotate the genome and bioinformatic programs to propose functions. We trained in research writing, presentation, and teamwork skills. The initial genome was predicted to have 96 genes. Based on our data, we proposed 1 Tryptophan tRNA, deleted 1 gene, created 3 new genes, and edited 8 genes starts. The resulting genome will have 98 genes with 55 of unknown function. We would like to study phage Twitch in the laboratory and characterize its gene products. We thank SEA-PHAGES for their support, the BIOL 1195 students for their contributions, and Benedictine University for allowing us the opportunity to be part of this program.
  Faculty sponsor: Tiara Pérez Morales

- **"Ulnar Trochlear Notch Morphology in Great Apes"**
  Dalya Kanani

  The ulnar trochlear notch of great apes is often described as smooth, in contrast to the condition in many modern humans, who have a transverse trochlear ridge at the location where the olecranon and coronoid growth plates fuse together. We observed transverse grooves and "plugs" of non-articular bone in the trochlear notch of great apes which have been mentioned in one paper previously, but have never been fully described or analyzed. The functional purpose of these features is not clear and needs to be further investigated. We collected 14 landmarks on

3D laser scan reconstructions of the proximal ulnae of 6 gorillas (*Gorilla beringei*), 8 orangutans (*Pongo abelii*), and 6 chimpanzees (*Pan troglodytes*) from Morphosource using the program MorphDig, We compared centroid sizes of specimens with and without grooves and plugs to determine if the presence of any of these features is correlated with overall size of the proximal ulna or trochlear notch. Preliminary results seem to indicate that the presence of grooves and plugs is related to size. Only male gorillas exhibited a plug of bone associated with a transverse trochlear groove, whereas female gorillas, 2 large male chimpanzees, and one orangutan exhibited a transverse trochlear groove without a plug. We are currently investigating trochlear notch morphology in early Pleistocene hominins and assessing the relationship between these features and biomechanical properties of the proximal ulna related to knuckle-walking and other locomotor behaviors.
Faculty sponsor: Robert McCarthy

Chemistry

- **"Chemical Analysis of Acidosis During Strenuous Exercise"**
  Samia Douedari

  Identifying the reason behind muscle fatigue during high intensity exercise can be explained through a series of equations and principles, such as the Henderson-Hasselbalch equation and Le Chatelier's Principle. The Henderson-Hasselbalch equation helps portray the metabolic process that the body undergoes during strenuous exercise into a numeric format. The normal pH of blood is 7.4, and the metabolic process decreases the pH of blood. After quantifying the change in pH of the blood, Le Chatelier's Principle is used to determine how the body returns to homeostasis through a shift in reactants and products in the carbonic acid-bicarbonate buffer reaction. The carbonic acid-bicarbonate buffer regulates the pH of blood during intense exercise, along with the help of the lungs and kidneys. Once the buffer and the organs regulate the pH of the blood, the body returns to homeostasis and acidosis is no longer the cause of the athlete's muscle failure.
  Faculty sponsor: Casey Larsen

- **"Fluorometric Analysis of 7-hydroxy-4-methylcoumarin under Acidic Conditions"**
  Uzair Mohammed

  Hymecromone (7-Hydroxy-4-methyl-coumarin, 4MU) is a synthetic coumarin and aromatic chemical compound in the benzopyrone chemical class. Studying fluorescent properties and fluorimetric quantification of 4MU has become pertinent due to its possession of a range of diverse pharmacological properties. Both natural and synthetic coumarins are extensively used as medication and analytical reagents. Hymecromone can be taken orally and is found in many plant-derived pharmaceuticals. When taken as an oral substance the molecule will initially be exposed to low acidic pH levels of 1-4 in an individual's stomach. Hymecromone has been noted to be an excellent fluorophore with high quantum yields. Two forms of 4MU, the ionic and neutral species, are considered to be the main structures at which it fluoresces with maximum emission wavelengths ranging from 380-445 nm. An FP 6500 JASCO Fluorescence Spectrophotometer was used with 1 cm quartz cell to measure limit of detection, quantum yields, and room temperature emission intensities of 4MU under varying pH conditions in aqueous solutions. From the data collected, it appears that the emission intensity of 4MU under increasingly acidic conditions results in a decrease in emission intensity and a shift to a different emission wavelength. Investigation into the emission intensity and emission wavelength of 4MU under basic conditions will be the next step.
  Faculty sponsor: Niina Ronkainen

- **"Synthesis of Bile Acid Derivatives: Tools to Understand the Structural Basis for Differences in Bile Acid Action"**
  Emily Zimel

  Bile acids are created within the liver and can move through the body and build up in the digestive tract. The build of up these bile acids can lead to symptoms in those diagnosed with Irritable Bowel Syndrome (IBS). By synthesizing bile acid derivates and refining the yields for these compounds, methylated chenodeoxycholic acid (Me-CDCA) will

help strengthen research of bile acids and their purpose in the body. The addition of the methyl to the chenodeoxycholic acid (CDCA) molecule will give evidence as to whether hydrogen bonding properties are the difference between the "good" secondary bile acid lithocholic acid (LCA) and the "bad" primary bile acid CDCA.
Faculty sponsor: David Rubush

Communication Arts

- **"An Analysis of Greta Thunberg's United Nations Climate Summit Speech"**
  Ali Ebraheemi

  The failure of political leaders to take action to limit CO2 emissions has led to an increase in global temperatures, causing activists like Greta Thunberg to speak out. This presentation examines Thunberg's speech at the United Nations climate action summit in relation to the rhetorical model of Logos, Ethos, and Pathos. Logos is the appeal to reason; Ethos is about establishing credibility for the argument; and Pathos is the appeal to the emotions.
  Faculty sponsor: Luigi Manca

- **"'Natural' Does Not Exist: A Misleading Term in Makeup Advertising"**
  Samantha Jendreas

  According to Forbes, the global beauty industry is worth 532 billion dollars, with the United States as its largest market. In fact, the United States alone makes up 20 percent of the global market of cosmetics and beauty market. The market is estimated to keep growing 5-7 percent at a compound-annual-growth-rate. The beauty industry is also more likely to hold up than any other discretionary product industry. Women spend an average of $3,756 a year on their personal appearance. Marketing tactics are a large part of the reason why women spend so much on their appearance. One way that makeup companies lure consumers is by marketing cosmetics as "natural." In this project, I will analyze makeup ads and campaigns to show how the cosmetic industry uses this term in a misleading fashion. The FDA does not regulate the "natural" label on cosmetics, but marketing products as "natural" nevertheless pulls in "green consumers." The usage of this term thus tricks many consumers into purchasing products that they believe are the better alternative, but this is not the case. The term "natural" in the cosmetics field therefore needs to be regulated to prevent false advertising and the deception of consumers.
  Faculty sponsor: Jean-Marie Kauth

- **"The Role of Technology in the Transition from In-Person to Virtual Education in 2020"**
  Angela Plys, Rutvi Parikh

  During the 2020-2021 academic year, laptops, cellphones, microphones, and quiet places have all been required for students and professors. It must be noted that digital learning is not something that is entirely new. For example, universities have had classes that are fully online in the past. Nevertheless, current digital learning is different with the use of Zoom. Instead of having in-person courses, with the occasional online course, this year the majority of classes are being taught via Zoom. Due to the unexpected circumstances wrought by the COVID-19 pandemic for students, the education system has switched out the traditional classroom instruction of face-to-face education between teachers and students, by adapting to a digital learning environment, which predominantly utilizes Zoom. As a result of COVID-19, Zoom is the only means for students to get real instruction(s) from their teachers; in other words, students during COVID-19 would be forced to educate themselves through online readings and the internet, if Zoom were not available. On the other hand, some students' experiences with Zoom have not been positive. Therefore, it is necessary that the pros and cons of Zoom be assessed, as the present situation of education will inevitably affect the future.
  Faculty sponsor: Luigi Manca

English Language and Literature

- **"'And Thus I Thought That I Could Write': The Ethics of Reading Barrett Browning's 'The Runaway Slave at Pilgrim's Point'"**
  Muhammad Qamar

  Elizabeth Barrett Browning contributed greatly to the abolitionist movement with her poem "The Runaway Slave at Pilgrim's Point." This poem was included with the works of other abolitionist writers in an 1848 edition of *The Liberty Bell*. These works drew everyone's attention to the horrors that enslaved people endured. At the same time, though, the potentially problematic structure of the poem must be considered: Barrett Browning was a white woman of privilege writing a first-person narrative about a runaway female slave. This paper will look at the ethics of reading this poem and any disconnect the poem itself has from the reality of slavery: How accurately does Barrett Browning capture the voice of an enslaved person? How much are we able to separate the voice of the poet from the voice of the narrator? Does her voice overshadow the voices of actual enslaved people who also wrote slave narratives? How do they compare?
  Faculty sponsor: Zubair S. Amir

- **"Engendering the Proletarian Novel: Female Working-Class Subjectivity in Le Sueur's *The Girl*"**
  Morgan Weber

  In 1929, the proletarian literary genre began to take shape in America—a genre that was conceived of as men writing about working-class life. In this paper, I examine how Meridel Le Sueur's 1939 novel *The Girl* adapts this genre by creating a space for both female writers and female working-class subjectivity in proletarian fiction. In particular, Le Sueur recasts the genre to depict the lives of female working-class protagonists as they attempt to survive in the patriarchal capitalist society of the Depression era. Ultimately, this emphasis on female working-class subjectivity enables Le Sueur to re-engender proletarian literature, in turn expanding the possibilities of the genre to include women.
  Faculty sponsor: Zubair S. Amir

- **"The Institutionalization of Containment: *Jane Eyre*'s Lowood School as a Reflection of Victorian Era Psychiatry"**
  Alexis Michalak

  The Victorian era saw two major psychiatric revolutions, identified by Elaine Showalter as Victorian psychiatry and Darwinian psychiatry. Both psychiatric trends centered their treatment of mental illness on separation and containment, but did so very differently. Victorian psychiatry emphasized moral rehabilitation whereas Darwinian psychiatry rejected the possibility of a cure and embraced eugenics. This psychiatric landscape can be seen in Charlotte Brontë's 1847 novel *Jane Eyre*, in which the Lowood School for orphaned girls largely functions as a Victorian asylum that emphasizes morality. However, the school also subtly engages in practices associated with Darwinian eugenics, foreshadowing the transition to Darwinian psychiatry. This paper suggests that Lowood reflects the slowly shifting nature of English psychiatry at the time of the novel's publication.
  Faculty sponsor: Zubair S. Amir

- **"The Presentation of Christianity and the Native American in *A Narrative of the Captivity and Restoration of Mary Rowlandson*"**
  Norbertha Mlowe

  A Narrative of the Captivity and Restoration of Mary Rowlandson describes her experiences during and after her captivity. She was captured by the Native Americans in 1676. In this work, Mary Rowlandson discovers more about her faith; however, her discourse of Christianity is undermined by the conflict between races, which prevents her from developing a good relationship with the Native Americans. Yet, Rowlandson shares her experience according to her positive and negative views. She grows her faith, but cannot connect her faith to the natives. She takes some steps toward understanding the Native Americans, but still pulls back with anger and sees the natives as her enemy.

However, for Rowlandson, exchanges of material goods lead to a kind of relationship with the Native Americans.
Faculty sponsor: Zubair S. Amir

- **"Young Love: The Results of Impulsive Decisions in Shakespeare's *Romeo and Juliet*"**
  Hannah Trumpis

  Impulsive behavior is depicted throughout *Romeo and Juliet* within the dynamics of young love. Young love provokes the impulsive decisions of neglecting family ties, obligations, and responsibilities. The acts of leaving their families, avoiding arranged marriages, and useless fighting become a disaster waiting to happen. This project highlights the negative effects of young love. I suggest that adult relationships eliminate most impulsive behaviors. The impulsive decisions triggered by young love results in the emotional death of Romeo and Juliet.
  Faculty sponsor: Zubair S. Amir

Environmental Studies

- **"The Correlation of Air Quality and Lung Cancer: A Chicago Analysis"**
  Samantha Zurawski
  Fine particular matter with a diameter of 2.5 micrometers or less that can be inhaled ($PM_{2.5}$) has been drastically decreasing life expectancy all around the world. Many studies have affirmed the link between fine particles ($PM_{2.5}$) and deaths because of long-term exposure (Andreao 2021), as well as the connection between $PM_{2.5}$, lung cancer, and mortality. However, no studies have been conducted to assess the correlation between $PM_{2.5}$ and mortality in Chicago. This research is imperative to the people in Chicago because in Illinois the lung cancer rate is rising much faster than in other places globally.
  Faculty sponsor: Anne Marie Smith

- **"Effects of Microplastics from Personal Protective Equipment Pollution in Marine Environments"**
  Sidrah Zuberi

  Personal protective equipment (PPE) is essential to stopping the spread of the COVID-19 pandemic and is being used worldwide. With everyone wearing disposable PPE, including masks and gloves, a great deal of waste is being created. Unfortunately, this waste is creating plastic pollution in the oceans. The plastics PPE is made from can break down and release chemicals into the environment. Most PPE is made from microplastics and nanoplastics, characterized by their small size, which are able to adsorb large amounts of chemicals from their environment and then release it into the oceans. Although there are studies on the impact of such pollution on marine life, there is still a lot of research to be done on the factors that affect how PPE, specifically, breaks down in oceans and what kinds of chemicals it may absorb and release into the environment.
  Faculty sponsor: Anne Marie Smith

- **"Effects of Plastic Waste Generated By the COVID-19 Pandemic on our Environment: A Proposed Management Solution"**
  Salaam Nahhas

  The ongoing COVID-19 pandemic has had a significant impact on our planet, forcing people to remain at home, requiring the use of PPE, and ultimately, increasing the usage and improper disposal of plastic. According to Zambrano-Monserrate, et al. (2020), studies proved that there was also some positive impact, one of them being the reduction of nitrogen dioxide (NO_2) and particulate matter (PM) in the air. This is due to fewer cars being driven on the streets recently, with most of the population learning through a screen and working from the comfort of their own makeshift home offices. Although this pandemic did improve the quality of our air due to the decrease in human activity, it unfortunately also created severe negative consequences. My research proposal seeks to explore these negative effects of the current global issue of plastic waste, and proposes a research method to potentially manage this seemingly everlasting problem. After reading many studies and evaluating their different research

methods, I posit that the waste will slowly decrease as we advance further into the pandemic because (1) we are now more adapted to the increased use of plastics than when the virus first hit, (2) more people are realizing the urgency of the situation and are staying at home, decreasing COVID cases all around the globe, and (3) the message that plastic pollution has significantly increased is spreading, causing more people to become involved.
Faculty sponsor: Jean-Marie Kauth

- **"Effects of Unregulated E-Waste Recycling on Toxic Load in Future Generations"**
  Alia Alramahi

  Unregulated e-waste recycling sites in China, India, and African countries release heavy metals and brominated flame retardants (BFRs) into the environment, causing them to be ingested by adults and children living nearby. Existing research shows that prolonged exposure to these chemicals can damage cardiovascular, nervous, and reproductive systems. These studies suggest that children are disproportionately affected, but neglect to examine children in areas outside of Southeastern China. My research proposal explores how the length of exposure to these chemicals affects body burden in children. I propose a prospective cohort study in India to include three groups: children born and raised near e-waste recycling sites, children not born but raised near e-waste recycling sites, and children neither born nor raised near e-waste recycling sites (i.e., live in a neighboring rural area). Direct measures will include blood and urine samples taken every six months to track toxic load until participants reach the age of 18. I hypothesize that longer exposure earlier in life significantly increases the body burden of heavy metals and BFRs in children. Understanding the impacts that this issue has on the next generation may provide solid evidence for more stringent restrictions regarding e-waste recycling worldwide.
  Faculty sponsor: Jean-Marie Kauth

- **"Environmental Impacts on General Pediatric Health"**
  Nathan Klimisch

  There is a need for further education of pediatricians on pediatric environmental health impacts. Children are more vulnerable to these health risks since they do experience more immature physiological developments. I would recommend, then, for pediatricians to take the step forward and increase their education on this topic. Gaining a more developed education on the health impacts environmental changes have on children will enable pediatricians to properly discuss this topic with their patients' families. Pediatricians are well-respected by many people, so their opinion matters when it is shared. The increase in environmental health impact education will validate the opinions and suggestions pediatricians provide their patient's families. Many pediatricians are confident in their knowledge of various aspects of pediatric health, and that knowledge will continue to increase with further education on how environmental changes affect the health of children. Therefore pediatricians, after gaining proper education, should share their findings on the health impacts of environmental changes so people can change their behavior to provide a safer environment for children. However, pediatricians are not the only ones who need to take these steps, for everyone can acquire and share knowledge to create a more sustainable planet and raise healthier children.
  Faculty sponsor: Jean-Marie Kauth

- **"Exploring How Well Walmart Preserves the Environment"**
  Trevor Montiel

  Everyone who goes shopping knows about Walmart and their extreme influence over the shopping industry. However, when it comes to environmental preservation and sustainability practices, most people are not aware of the story behind Walmart's rise and transformation into a company that emphasizes environmentalism and influences others to be more environmentally friendly. As a company that was once heavily criticized for their environmental practices and even shamed for greenwashing when they first began going green, Walmart now serves as a model for other corporations that are looking to increase profitability while going "green." Through this analysis of Walmart's journey towards environmental preservation, I suggest that other corporations in the retail industry can learn from Walmart's successes and failures with environmental initiatives and apply what they learn to their own business practices.
  Faculty sponsor: Jean-Marie Kauth

- **"How Biden's Presidency Will Impact America's Farmers"**
  Kaitlyn Brunken

  As the people of this world expand their technological knowledge, climate change and pollution have become more pressing issues. Global climate change has increased, and with it the number of people trying to find solutions to the impending world crisis. One would think that we would have gone towards these solutions by now. However, this is not yet the case, but with new leadership in the United States, change is within sight. The Biden administration has put forward a plan that would slow down and potentially reverse the impact that people have had on earth. Another crucial stakeholder in Biden's action plan for that change is the agricultural community. Farmers are an important part of this change because they are necessary to stop air and land pollution, much of which poor agricultural practices add to. They also are needed to help bring better quality food to families. This white paper will discuss the Biden administration's plans to change the government's approach and how this change will impact the agricultural community. I will further discuss how farmers will need to address the changes that the government plans to make.
  Faculty sponsor: Jean-Marie Kauth

- **"Potential Applications of Environmentally Sustainable Infrastructure in Chicago"**
  Sean Haney

  This presentation aims to detail efforts that could be pursued in transitioning the public transportation system of Chicago away from the traditional energy grid to an independent and renewable based energy grid. Solar technologies, wind technologies, battery technologies, microgrid technologies, and funding options will be discussed. Based on this discussion, recommendations will be made for each sub-heading. A final proposal will then be made for creating a hybrid system of renewable technologies used to power an independent microgrid with funding. This little-known concept of a microgrid will be defined, as well as the less known concept of swarm electrification as a means for powering the microgrid.
  Faculty sponsor: Jean-Marie Kauth

- **"Understanding Variations in Indifference to Climate Change Between High- and Low-Risk States"**
  Anella Willis

  In the time that climate change has been a problem, relatively little has been done to change direction in which the world is moving. Many people are unconcerned about the impacts of climate change. Research has shown that many people do not think of this as a moral problem and helping the environment does not fall within everyone's basic human values. Psychological distancing thus allows people to continue their current behaviors with little to no consideration for the environment. However, most research surrounding this topic is centered on one specific area. My research will examine how people's values and indifference to climate change from some of the most high risk states (Florida, California, and Texas) to some of the lowest risk states (Vermont, Colorado, and Illinois). I predict that people in the low risk states will be more concerned about climate change and have values that reflect caring about their environment. For those who live in the high risk states, I predict that they will be less concerned with climate change and their values will reflect indifference to the state of their environment. I will recruit students from state universities. If any of the professors in these universities will allow it, the survey could count for extra credit. In addition, each student will receive a reusable climate change awareness water bottle for participating.
  Faculty sponsor: Jean-Marie Kauth

History

- **"Post War America (1945-80): Maintained, Perpetuated, and Prolonged Police Brutality Through Systemic Racism"**
  Angela Gallinati

  America claimed it fought World War II for freedom and democracy. Yet in Post War America (1945-1980), police brutality was maintained, perpetuated, and prolonged through systemic racism. This project will help explain and contextualize the true nature of police brutality in Post War America from a historical context. Research shows that

throughout the Post War period, police brutality was rampant, perpetuated by the systemic racist practices of both law enforcement and the government.
Faculty sponsor: Vincent Gaddis

- **"A Review of Black Pioneers in the Biomedical Sciences"**
  Naailah Aaishah

  Black scientists have contributed to various scientific fields as early as the nineteenth century. Black pioneers in science have developed revolutionary technology, discovered new disease treatments, and have launched astronauts into space. There are numerous Black scientists who have had a significant impact in the field who often go unnoticed. Unfortunately, due to systemic racism, Black people in science, engineering, and technology are not recognized nearly enough and it is crucial to acknowledge these individuals as the world of science would not be the same without these brilliant pioneers. This project focuses on the lives of Charles Drew, Daniel Hale Williams, Rebecca Lee Crumpler, Jane Cooke Wright, Leonidas Berry, and Marilyn Gaston, Black pioneers who changed the face of medicine while challenging institutionalized and structural racism. This poster describes the obstacles that these individuals faced and how they battled racism while devleoping groundbreaking techniques that future scientists have since built upon.
  Faculty sponsor: Vincent Gaddis

Jurica-Suchy Nature Museum

- **"Safeguarding Our Specimens: Digitization of Museum Collections"**
  Tanya Rasha, Sarah Jablonski, Rachel Carlson, Sajina Jacob, Ruta Jackevicius

  The Jurica-Suchy Nature Museum cares for thousands of specimens from locations worldwide. The initiative to digitize the collection was made to provide virtual access to the images and data of the museum collection, and to preserve the collection digitally to decrease the risk of damage to its fossils and eggs. This project enables the museum to produce viewable and accurate information regarding the specimens in the collection as well as exhibit the objects to the public for educational uses. The undergraduate students involved in the project have been preserving the collection through data entry and digitization. Every week student researchers are provided with photos of fossil or egg specimens and use Excel to categorize various aspects of each object, including its scientific name, where it was found, and its condition. Once the initial work is completed, the data is reviewed by museum staff and uploaded to the Arctos data portal. Through this process, 2448 fossils and 100 eggs have been cataloged over the first year of the grant project. This project will allow researchers, educators, families and individuals the opportunity to view our digitized specimens in the database in order to further their knowledge and communicate the significance of the past. It allows the museum to increase public exposure and provides more learning opportunities for patrons worldwide.
  Faculty sponsor: Karly Tumminello, Colleen Filipek

Nutrition

- **"An Evaluation of Cancer-Related Mobile Nutrition Apps in the United States"**
  Kendall Pozulp

  Cancer survivors have been using cancer-related mobile health (mHealth) apps to seek out nutrition information related to their cancer as they try to improve their diets. Despite the availability of commercial cancer-related mobile nutrition apps in the Apple App store, there is limited research on the quality of these apps and whether they could be used in clinical practice. The objectives of this study are to (1) identify currently available commercial cancer-related mobile nutrition apps and (2) determine the quality of these apps and whether they could be used in clinical practice to facilitate healthy diet behaviors for cancer survivors. Methods: Five dietitians with at least 3 years

of oncology experience, will rate the quality of 10 publicly cancer-related nutrition apps using the validated App Quality Evaluation (AQEL) scoring system, a validated tool for evaluation of apps' educational quality and technical quality. Findings from this study will contribute to understanding about whether current commercial cancer-related nutrition apps should be incorporated into practice.
Faculty sponsor: Annie W. Lin

Philosophy

- **"Carbon Trading for Climate Change: A Strategy for More Efficiently Allocating Resources"**
  Dominic Senese

  Climate change is a serious problem in the modern world. This study will argue that emissions trading plays a role in fighting climate change. Through a more efficient allocation of carbon emissions based on supply and demand, climate change can be fought effectively. This is in contrast to a simple egalitarian approach which lacks the efficiency of emissions trading. Furthermore, there have been claims that emissions trading promotes the environmental status-quo for affluent countries. This is not true due to the catch-up effect and the ability of affluent countries to more efficiently help non-affluent countries. In fact, emissions trading will help the economically disenfranchised while encouraging those reluctant to adopt climate change policies to contribute in some manner. This properly balances the rights of people to live as they wish with the right of people to live in a world free of climate change.
  Faculty sponsor: Martin Tracey

- **"Climate Change, Individual Responsibility, and 'Wasteful Driving'"**
  Milana Ergarac

  This study aims at answering the question: is it morally wrong to take your car out (e.g., GHG-emitting car) on a Sunday afternoon for fun? I will argue that it is not morally wrong to do so. If there is an individual that is stressed out, are they putting others in danger because they chose to go on a Sunday afternoon drive for fun? What if that Sunday afternoon drive helps them from a psychological standpoint? Sinnott-Armstrong was not able to find a plausible principle to explain coherently the wrongness from a philosophical viewpoint of wasteful driving. In my discussion, I follow Sinnott-Armstrong, amongst others, and will dispute the ideas of Avram Hiller on this issue. I will focus in particular on the harm principle and what it suggests about supposedly wasteful driving.
  Faculty sponsor: Martin Tracey

- **"Feeding People or Saving Nature? Our Moral Obligations"**
  Alexander Zleczewski

  The effects of anthropogenic climate change are already significant and the amount of time the world has to react is shortening by the day. This is a relatively mundane statement but one that goes beyond a simple call to understanding or action. Standards of living in the developed world are only increasing, and both the need for industrial products and consumer usage of technology that creates greenhouse gases are on the rise as well. While the campaigns and international agreements of the world surrounding climate change may solve the issue of anthropogenic contributions to climate change, they will not take effect quickly enough. Subsidizing technological progress to create alternative and carbon-neutral ways of maintaining current standards of living is clearly the way to approach this issue.
  Faculty sponsor: Martin Tracey

- **"The Total Effect of Climate Change: How the Hyperobjectivity of Climate Change Affects Our Experiences and Values"**
  Seth Hopkins

  Popular ontology grounds ethics and politics in forms of process thinking that may contribute to our inadequate

approaches to the climate crisis. This work sets to detail how shifting towards a more object-oriented ontology, which considers objects in the environment as having greater ontological significance, influence, and interrelation than what is typically thought, may help to make the climate crisis more imminent and comprehensible. Aspects of climate change will be considered as a "hyperobject," an object so immense that it extends across vast spatial area and time, and analyzed to give validity to this concept by displaying how it affects politics, society, ethics, and aesthetics.
Faculty sponsor: Martin Tracey

- **"Why Race, Class, and Gender Should be Considered in Environmental Policy and How We Can Account for These Differences in an Egalitarian Emissions Approach"**
  Rachel Carlson

  Climate change is a largely unifying experience for the human species. It must be noted, however, that not everyone will face the same degree of hardship. The debate at hand is whether identifying features such as race, class, and gender should be considered in environmental policy–specifically, in an adjusted per capita (egalitarian) emissions approach. In this paper, I will address both how and why identity is essential in determining the overall fairness of a climate change action plan, as well as whether it is even possible to account for these differences in an egalitarian way. In the standard egalitarian policy supported by Peter Singer, a simple head count is used to determine the emissions budgets for residents in a given country. I contend that the basis of this policy is fair, but it would prove to be more inclusive if it incorporated at least one additional identifier. Income, I argue, is morally significant in the context of climate change and can be used to represent both race and gender in conjunction. By proposing a differentiated emissions tax, I will show how we can adjust egalitarian policy to account for a great deal of disparity within the United States.
  Faculty sponsor: Martin Tracey

Physics

- **"Mini Kilonova Data Challenge Preparation"**
  Marcelo Avila

  Throughout this semester we will be using PhoSim and SAOImage to create and observe cosmic events. This is in preparation for a summer project where we will create a mini kilonova data challenge so that we can test our ability to locate and analyse gravitational wave-related events in the Legacy Survey of Space and Time (LSST). The goal of this semester is to prepare for a Kilonova Data Challenge for the LSST. A data challenge is used to test and prepare scientific analysis pipelines. Through these preparations and the data challenge it is our hope to learn more about dark energy since kilonova observations provide means to constrain dark energy.
  Faculty sponsor: Matthew Wiesner

- **"Sound Waves and Seashells: A Study of the Acoustic Properties of Nautilus Shells"**
  Marcelo Avila

  In this study we are focusing on the acoustic properties of seashells and how their physical properties could be used to manipulate the sound frequencies inside the shell. Applications of this research include the architectural design of concert halls and theaters where specific noises could be magnified and others negated, and the creation of a less conspicuous cochlear implant due to a nautilus shell's similar shape to the cochlea. Using 3D printed shells we can study resonance frequencies by varying the shapes and sizes of the shells. The goal of this study is to build a mathematical model connecting the acoustics properties of a shell and its physical shape and size.
  Faculty sponsor: Darya Aleinikava

Arthur J. Schmitt Future Leaders Projects

- **"Addressing Educational Inequalities in Chicago Public Schools through Advocacy and Fundraising"**
  Ramla Khalid

  The Chicago Public School (CPS) system has always been at a systemic disadvantage and victim to educational inequalities. Currently, four in five students enrolled in a Chicago Public School are from a low-income household. In fact, 76% of CPS students qualify for the free meal distribution program that is offered. Already underresourced, CPS has been further affected by the COVID-19 pandemic. For instance, moving classes to an online platform was difficult as most students do not have access to high-speed internet. The purpose of this project was to advocate for CPS and fundraise for the Compassion Fund. A general body meeting with Benedictine UNICEF was held where attendees were able to learn about the detrimental effects of the pandemic on CPS students. Mr. Jason Curry, an assistant special education teacher with CPS who is currently teaching in person, attended this meeting to share his experiences. A virtual fundraiser was conducted with BenU UNICEF, BenU American Red Cross, and other community members on social media to raise money for the Compassion Fund.
  An Arthur J. Schmitt Future Leaders project.
  Faculty sponsor: Sandra Gill

- **"Keys to Lead Emerging Leader Workshop"**
  Katelyn Beamish, Kristian Santiago

  The Keys to Lead Emerging Leader Workshop is a revitalization of the previous BenU Leadership Series, BOLD and Leadership 101. Throughout the Benedictine experience, there are many opportunities to get involved in leadership roles with clubs, organizations, groups and activities. Keys to Lead is a leadership workshop that focuses on teaching BenU students how to be leaders on their campus through a program on understanding yourself, learning how to work with others, and turning knowledge into practice with setting goals. Students received a Keys to Lead Emerging Leader Certificate upon completion. Students completed a pre-assessment and post-assessment to track their growth in their understanding of themselves as leaders. We collected data and responses to share in our presentation on the effect of this workshop and how learning about yourself as a leader will inspire you to be more involved on your campus.
  An Arthur J. Schmitt Future Leaders project.
  Faculty sponsor: Sandra Gill

- **"Leo High School Clothing Drive: Helping Southside Chicago Residents During the Pandemic"**
  Damari Owens, Grace Ballas, Justin Chang

  Thirty-three percent of the residents on the Southside of Chicago are hungry or facing food insecurities. On top of this, 32% of households are below the poverty line, meaning they have trouble affording basic needs such as food, clothing, and shelter. While commuting to the southside of Chicago on February 21, 2021, project "Clean-Ed Clothing Giveaway" brought together the Leo High School community, Southside of Chicago residents, and Benedictine University students Damari Owens, Justin Chang, and Grace Ballas. We collaborated and distributed clothing and food for a four-hour period to the residents in the community who needed it most. The principal, Mr. Rawls, allowed us to learn the history of Leo High School, and he showed us that giving back to the community can ultimately change the world. This project also allowed us to earn new contacts for future service projects. Our goal was to uplift and provide to people during this global pandemic. We were able to issue 250 face masks to protect the Southside community and Leo High School students from COVID-19. We understand how these troubling times have affected people, especially marginalized groups, and we wanted to do our part and help transform lives.
  An Arthur J. Schmitt Future Leaders project.
  Faculty sponsor: Sandra Gill

- **“Recipe for a Healthy Lifestyle: Sustainable Health Tips and Raising Food Insecurity Awareness”**
  Haley Warren

  Food insecurity is not just in countries far away; it can be present in your community. The question here is how we can help our neighbors. Some people are unaware of what they can do to get more nutrients in their diet. Upon that realization, I wondered what other aspects of health community members would benefit from knowing more about. In December 2020, I started my “Recipe for a Healthy Lifestyle” Facebook page to make health information more accessible and posted easy health tips that could improve the health of members of our community; this page now has 157 followers. To help with food insecurity, I ran a food drive with the West Suburban Food Pantry in Woodridge, IL, from February 1st to March 8th, 2021, with 536 lbs. of goods delivered.
  An Arthur J. Schmitt Future Leaders project.
  Faculty sponsor: Sandra Gill

- **“The Eagle Dispatch Project: Supporting Our Neighbors In Need”**
  Blake Adkins

  This service project involved partnering with Benedictine University residence life staff to assemble one hundred care bags containing donated hygienic items and cards containing Bible verses for individuals residing in local homeless shelters. The goals of this project were to provide encouragement through Bible verses and to promote health and safety through hygienic supplies for those residing in homeless shelters. All care bags were boxed and delivered to Morning Star Mission Ministries in Joliet, Illinois, to be distributed to the residents of Morning Star’s sheltered housing. These efforts were successful and will be continued by the Benedictine University residence life staff.
  An Arthur J. Schmitt Future Leaders project.
  Faculty sponsor: Sandra Gill

- **“ReClaim the Power of Our Voice: Transforming Traditional Infrastructures”**
  Jennifer Griffin

  In light of the George Floyd protests and continued demands for justice, this project aimed to understand the historically racist systems embedded in our modern institutions, and how those systems intersect with and are perpetuated in the language we use. This work builds upon existing research that calls for a variety of solutions, all of them with the foundation that Black English needs to be recognized in classroom and writing environments. We aspire to create more support systems to help meet the needs of underserved and underrepresented student demographics. By doing so, this work expresses the will of segments of the student body population to feel more represented in the curriculum and the staff. It also provides actionable steps to create more inclusive classroom environments and engage students’ authentic voice through untraditional methods, such as the inclusion of hip/hop and R&B, dance, and democratic circles as classroom tools. Conducted in collaboration with Mariyam Alam, this research was first presented to about 30 participants at Benedictine University's annual Teach-In on Social Justice on March 1, 2021, to about 30 participants.
  An Arthur J. Schmitt Future Leaders project.
  Faculty sponsor: Sandra Gill