



URSA

Undergraduate, Research,

Scholarship and Arts.

Benedictine University

2024 Oral Presentation Schedule

April 11, 2024 ❖ 12:00-4:30 pm ❖ Goodwin Hall 211 and 212

SESSION 1: Goodwin 211 (12:00-1:30 pm)

◆ **Zoya Faiz-Balagam, Rahil Khan, Fareeha Syed**

“Exploring the Media Coverage of the COVID-19 Vaccine Controversy”

The COVID-19 vaccine has been a hot topic in the media since the pandemic began in 2020. There have been many opinions regarding the safety, global impact, effectiveness, and longevity of the vaccine produced by different companies. The media, which are frequently regarded as essential information sources, have had a big influence on how the public felt and what policies were implemented. In our research, we will explore the complex issue surrounding the debate, which includes issues with vaccine efficacy, safety, accessibility, and distribution. A complicated interaction between false information, public opinion, and scientific proof is at the core of the dispute. Certain groups have experienced vaccine hesitancy due to misinformation spreading over social media and other means, which has stoked skepticism and reluctance towards COVID-19 vaccines. Concerns about the quick research and approval process of vaccines, along with worries about possible adverse effects, have added to the dispute. Conversely, proponents of vaccination argue that vaccination plays a vital role in halting the virus’s transmission and establishing herd immunity. To resolve the vaccine dispute, a strategy including open communication, outreach, and equal distribution methods is needed. To overcome vaccination hurdles and achieve broad immunization, it is imperative that the global community comprehends and addresses the vaccine dispute as it navigates the challenges posed by the COVID-19 pandemic. Our research will use the Westley-Maclean model as the paradigm for understanding the complex interactions among the various advocates, the media gatekeepers, and the public.

Faculty sponsor: Luigi Manca

◆ **Marielle Vestuto-Langford**

“The Death Penalty Is Our Crime, Too: How the Death Penalty Hurts Its Victims and the Country”

This presentation argues against the death penalty in America as a justifiable punishment for a convicted criminal. I investigate how the death penalty simply responds to violence with further violence by examining true accounts of members of death teams from various prisons. Grief is already caused to the family of the victim by the criminal’s actions. This form of legal punishment only creates more grief for those who execute the criminal. Statistical evidence also suggests that the death penalty has no effect in preventing or reducing the problem of crime in our country. Altogether these studies and firsthand accounts pose important questions. Are we creating the right message when we punish killing with killing? Is the suffering of our actions worth it in any way? The aim of this presentation is to persuade the audience to firmly say, yes, the death penalty must be abolished.

Faculty sponsor: Luigi Manca

- ◆ **Anella Willis**

“Probing Pharmaceutical Marketing and Disease Mongering”

The manipulation of perceptions of diseases by pharmaceutical companies is known as disease mongering. By exploring how these companies exaggerate problems and mild symptoms into serious diseases to expand their market, this research examines the complexities and ethical challenges faced by healthcare professionals. By widening the boundaries of treatable illnesses, pharmaceutical companies are able to target consumer insecurities and promote unnecessary medical interventions. The control pharmaceutical companies have over drug research complicates efforts to obtain unbiased information and questions the reliability of pharmaceutical-sponsored studies. Pharmaceutical marketing has shifted from promoting drugs as treatments to positioning them as products that create ease in the life of consumers. Giving consumers more authority to self-diagnose and self-prescribe undermines the function of medical professionals. This shift challenges the patient-doctor relationships and raises concerns about the over medicalization of society. My research will include an interview with a healthcare professional to gather insights into their perspective and will explore specific examples of conditions that have been manipulated and marketed. This research emphasizes the importance of regulatory measures to prevent unethical pharmaceutical marketing and protect public health interests given the complex relationships between pharmaceutical interests, healthcare practices, and consumer attitudes.

Faculty sponsor: Luigi Manca

SESSION 2: Goodwin 212 (12:00-1:30 pm)

- ◆ **Hiba Siddiqui, Samiha Syed, Jordan Werner**

“DNA Demethylating Agents Have Cell-Type Specific Effects on Viability and *BRCA2* Alternative Splicing”

BRCA2 is a tumor-suppressor gene associated with breast/ovarian cancer. Some inherited *BRCA2* mutations cause defects in splicing of the *BRCA2* mRNA. Mutations that cause efficient skipping of exon 3 are pathogenic, yet other mutations that cause less efficient exon 3-skipping are not. The role of *BRCA2* exon 3 in tumor suppression is thus dose dependent, so it is important to determine what else affects the frequency of exon 3-skipping. It has been noted that cancer therapies designed to demethylate DNA have a genome-wide effect on alternative mRNA splicing, so we are determining whether they affect *BRCA2* exon 3 specifically. We have used two such drugs on cancer and non-cancer cell lines to followed by structural analysis of mRNA and found there may be a cell type-specific splicing response to demethylation therapies.

Faculty sponsor: James Fackenthal

- ◆ **Michael Wulffe**

“Enthesopathies of the Upper Limb in Captive Western Lowland Gorillas (*Gorilla gorilla gorilla*)”

“Bushman,” a western lowland gorilla from Cameroon, was the first gorilla to be held in a zoo west of the Mississippi. He died in 1951, after spending 21 years in captivity at Lincoln Park Zoo. His taxidermized pelt is currently on display at the Field Museum of Natural History, but his skeletal remains are at the Jurica-Suchy Nature Museum at Benedictine University. Despite the long history of gorillas in captivity, little is known about how captive conditions affect skeletal morphology. In this study, we focused on enthesopathies, pathologies that affect areas of bone where tendons, ligaments, and muscles insert. We hypothesized that mechanical stresses and other factors associated with a captive lifestyle promote the development of enthesopathies in large-bodied captive animals like gorillas. To test this hypothesis, we compared observations of enthesopathies on Bushman’s skeleton to enthesopathies on upper extremity bones (scapulae, clavicles, humeri, radii, ulnae) of six wild and six captive male western lowland gorillas at the Field Museum. Heightened incidence and severity of enthesopathies in captive gorillas (in particular gorillas held in captivity before improvements in animal husbandry) highlight the role of zoo environments on skeletal morphology and animal welfare.

Faculty sponsor: Robert McCarthy

◆ **Jordan Werner**

“Ionic Strength Effects on Charge-Transfer-to-Solvent Transitions”

Simple aqueous inorganic anions such as OH^- , NO_3^- , SO_4^{2-} , and halides display a broad, intense ultraviolet absorption band arising from electron ejection into the water solvent upon photoabsorption. However, the surrounding water solvent lacks the unoccupied orbitals necessary to stabilize the ejected electron, so these excited states are supported by many solvent molecules as a collective. Because of this means of the solvent supporting the excited states, they are dubbed charge-transfer-to-solvent (CTTS) states. These states are markedly sensitive to the surrounding local solvent environment, making CTTS spectroscopy an excellent tool for exploring single ion solvation. In these studies, CTTS spectroscopy is being performed on aqueous I⁻ in the presence of added inert ionic solute to explore the ionic strength effect on perturbing these electronic states.

Faculty sponsor: Tim Marin

SESSION 3: Goodwin 211 (1:30-3:00 pm)

◆ **Ghazala Ahmad, Mitchell Garcia, Julia Sakowicz**

“The Code War”

World War II was a time of tremendous loss—from loved ones to territory to even knowledge. However, it was also a time of great technological and mathematical development. Before the war, encoding important government messages was common, but the use of mathematics to decrypt messages flipped the script during this time. The German Enigma machine was a clever technique to encrypt messages and allowed the Axis powers to communicate securely, putting a strain on Allied forces as they didn't know their enemy's next move. This all changed when Polish mathematicians discovered a pattern and created the Bombe machine. Cooperating with British forces in Bletchley Park, the Allied Powers were finally able to decipher Nazi messages. This paper will focus on how mathematics aided in cracking this seemingly unbreakable code and helped bring World War II to an end.

Faculty sponsor: Manmohan Kaur

◆ **Maaz Haque**

“Analyzing the Utilization of DNA in Applications of Computation and Cryptology”

DNA is the molecule in all cells that governs the structure and function of countless proteins through variable patterns of the four nucleotide bases. While this level of utility in determining all biological life is unquestionably valuable, mathematicians and cryptologists have been employing DNA in more communicative and computational applications since the 1980s. In this project, the use of DNA in cryptology will be examined by analyzing its utilization in the OTP cipher, chip technology, and cosets. Since these methods have minimal energy costs, the potential utility and versatility of DNA in cryptosystems justifies future research and development in this field.

Faculty sponsor: Manmohan Kaur

◆ **Halie Ryan**

“A Polarized Epidemic? Examining Whether Political Ideology Shapes Individuals' Opinions about the Fentanyl Crisis”

The opioid crisis, exacerbated by synthetic opioids like fentanyl, presents a pressing public health concern, underscored by a surge in overdose deaths. Understanding the interplay between political ideology and public perceptions of fentanyl use, abuse, and policy responses is crucial. This study aims to investigate how political ideology influences concerns about fentanyl by conducting a survey among Benedictine University students. Drawing on previous research emphasizing the influence of political ideology on public attitudes, the study hypothesizes that political ideology does affect concerns about fentanyl-related issues and U.S. policies. A 14-question research instrument will be administered, focusing on demographic information, political beliefs, awareness of fentanyl, perceived risks, concerns, personal experiences, and opinions on government intervention. Utilizing a convenience sampling method, participants will be recruited through collaboration with the University's

Political Science professors. By exploring the relationship between political ideology and fentanyl concerns, this study seeks to provide insight into how political factors shape public attitudes and responses to the opioid crisis. The findings will contribute to a deeper understanding of the complexities surrounding drug-related policies and inform efforts to address the fentanyl epidemic effectively. Preliminary results will be presented as the study is still ongoing.
Faculty sponsor: Phil Hardy

SESSION 4: Goodwin 212 (1:30-3:00 pm)

◆ **Ayesha Fatima**

“Variance in miRNA Expression Across Multiple Databases in Primary and Recurrent Glioblastoma Tumors”

Glioblastoma (GBM) makes up to 80% of aggressive forms of brain cancer and it is often associated with lethal prognosis with median survival ranging from 12 to 18 months. Gliomas have a heterogeneous origin consisting of various genetic mutations and can recur multiple times after the primary instance. miRNAs are small non-coding RNAs that function to cleave and silence targeted miRNA transcripts that contain prominent oncogenes or anticancer genes and therefore influence glioma recurrence. In this research, we conducted a computational meta-analysis across nine different datasets to analyze significant miRNAs that are expressed in primary tumors that did not recur compared to other glioma tumors that did recur. We used RNA-seq data of glioma patients from the following databases: Cancer Genome Atlas (TCGA), database of genotypes and phenotypes (dbGaP), and European Read Archive (ERA) databases and inputted the sequences into useGalaxy, a bioinformatics software. The preliminary Principal Component Analysis (PCA) plot showed that there was significant variance and clustering between the TCGA database compared to the rest of the databases that may influence the differential miRNA results. Ultimately, the external factors of method collection, various patient demographics, and location of biosamples may play a significant role in the overall differential analysis of miRNAs that influence glioma recurrence.
Faculty sponsor: Lindsey Mao

◆ **Musab Shaikh**

“Dysregulation of miRNAs Drives Glioma Recurrence: An Analysis”

About 25% of primary brain tumor diagnoses made each year in the U.S. are categorized as gliomas, encompassing a broad range of aggressive tumors that develop in the brain and spinal cord. Despite conventional treatments, survival rates are low, and tumors often recur, which is associated with a worsened prognosis. miRNAs are implicated in many cancers via gene regulation, but they are poorly understood in glioma development and recurrence. We found many overexpressed tumor-inhibiting and underexpressed tumor-promoting miRNAs in Primary compared to PriToRec samples, indicating that the same miRNAs are inversely expressed in PriToRec samples. This could explain later recurrence, as oncogenes and tumor-promoting mechanisms would be more active in PriToRec tissues, driving the growth of cancerous cells. Initially, we also found overexpressed members of the let-7 family, which are widely implicated in many cancers and well-known tumor suppressors. However, after running a more comprehensive differential expression analysis, we found no significant members. Interestingly, when compared to Secondary Recurrent tumors, many members were shown to be significantly overexpressed. A better understanding of miRNA functions in glioma may explain why they typically recur and are often more lethal with each successive recurrence.

Faculty sponsor: Lindsey Mao

◆ **Arman Svoboda**

“A Solar-Powered Aerator System for Lake St. Benedict”

Lake St. Benedict on the Benedictine University campus has recurring issues with high concentrations of phosphorus building up at its bottom, which negatively affects wildlife and the health of the lake. One remedy for this situation is the installation of a solar-powered diffused aerator at the lake. This aerator will release air from the bottom of the lake, circulate the water, and remove the trapped phosphorus, thereby improving the health of the lake’s

ecosystem. The electrical power of the aerator and the associated components was one of the input parameters for the sizing process, which entailed calculating the number of solar panels needed. Since solar panels produce DC power and the aerator runs on AC power, sizing an appropriate inverter was also necessary. Two separate systems were considered and properly sized: one that required an energy-storage medium, such as batteries, and a second one where the system was connected to the utility grid. A detailed budget for the project was provided and the interconnection agreements and regulations were reviewed. The expected project completion date is summer 2024.
Faculty sponsor: Stefan Stefanoski

SESSION 5: Goodwin 211 (3:00-4:30 pm)

◆ Sean Hancock

“Can Imperfect People Create a Perfect Society? Examining Lois Lowry’s *The Giver* and the Feasibility of Utopia”

Lois Lowry’s *The Giver* is a source of differing opinions, some of which revolve around the book’s social message. Many scholars disagree on the meaning behind the book as Lowry herself claims to not “make political statements.” At the same time, the novel is filled with allegory, messages, and different points of view that seem to express an opinion on society. While the novel may not be making statements on any specific policies, it is commenting on values and human dignity in society at large. The novel presents a utopia turned into a dystopia, but it has been further argued that *The Giver* is actually an anti-utopian book. This theory suggests that Lowry is making a statement against utopia and the means society takes to become utopian. In this presentation, I clarify that the novel, while commenting on the futility of pursuing a perfect society, is still advocating for the pursuit of a better society. Utopian idealism is shown to be futile and destructive, but the betterment of society is still a recognized goal.

Faculty sponsor: Wilson Chen

◆ Danielle Holtz

“*Panem et Circenses*: Oppression and the Commodification of Violence in *The Hunger Games*”

Suzanne Collins wrote *The Hunger Games* (2008) as social commentary critiquing the normalization of violence in American society and utilized a historically politicized genre—dystopian fiction—to send the message to an adolescent audience. This presentation examines the three major methods the government uses to oppress the citizens of Panem: military/police violence, the weaponization of hunger, and the commodification of violence into a celebrated spectacle. Each of these methods mirror aspects of modern-day America, warning readers of the danger that occurs when the people are denied basic civil rights like freedom of speech and privacy. With four books and five movies, the series achieved widespread success and popularity that many could only dream of; but ironically, the novel’s themes and critiques were minimized in the marketing of the sequels and movies. This essay ultimately highlights the dangers of willful ignorance for profit.

Faculty sponsor: Wilson Chen

◆ Jason Querubin

“*Dígame Mami, Talk To Me*’: How Games Build Sanctuary and Mold Identity in Justin Torres’s *We the Animals*”

This presentation explores the profound significance of games and play during childhood, which serve as a useful tool for building resilience and healing amidst life’s traumas. It delves into how Justin Torres incorporates this concept in his 2011 novel *We the Animals*, with play offering a sanctuary for Manny, Joel, and the narrator—the three brothers who struggle with living in an abusive and broken home environment. I elucidate how games provide an outlet for emotional expression, coping mechanisms, and the construction of identity, particularly in the case of the narrator’s evolving gender identity. The principal source will be Torres’s *We the Animals*, along with several psychological journals that will help explain the effects of playing games for children. Through the portrayal of the complex relationship between the boys and their parents, the union of the brothers becomes a central theme. As they share the same violent experiences, they seek solace through play. This presentation explains the symbolism behind their games, which molds every part of their character.

Faculty sponsor: Wilson Chen