

GRADUATE STUDIES

Eleventh Annual Graduate Research Conference

March 29, 2024

Poster Presentations

1. Title: 1R-1C WBO circuit: Theory and Measurement

Principal presenter: Thomas Chu Major: Physics Faculty mentor: Dr. Pengqian Wang

Abstract: The oscillations in analog circuits have been much studied, and a whole class of circuits which are produced electrically are labeled as oscillators. In this study the oscillations in a single LM 741 op amp with one resistor and capacitor for the network function T(s) are studied and the signal output is predicted with a Matlab simulation. The simulated result predicts a output which varies with time and the maximum output has some variability with time.

The circuit implementation using a single 741 op amp is a analog circuit with positive feedback with network function T(s) and negative feedback through a resistive divider circuit. The demonstration of oscillations is verified with a digital scope measurements made at Vo, V+ and V- and indicate a nearly constant signal value at the + terminal but oscillatory behavior at the output and - terminals.

2. *Title:* Radio Continuum Consistency and Modeling of Molecular Lines in High-Mass Star-Forming Regions

Principal presenter: Punya PaudelMajor: PhysicsOther presenters or co-authors: Esteban D. Araya, Amisha Jagdish RaneFaculty mentor: Dr. Esteban Araya

Abstract: High spectral and angular resolution Very Large Array observations at 1.3 cm of three radio continuum sources previously detected in excited methanol and ammonia lines were made by our group to investigate the kinematics of molecular gas associated with ionized jets in regions of high-mass star formation. In this work, we present results from two objectives in the analysis of the dataset: 1) consistency of the continuum measurements within the data and with respect to published measurements, and 2) modeling of the methanol spectral lines detected in our observations. Regarding the first objective, the dataset consists of a total of 17 spectral windows (SPWs), 14 with a narrow frequency bandwidth of 16 MHz (to detect spectral lines), and the remaining 3 with a broad bandwidth of 128 MHz to detect radio continuum, i.e., the emission from ionized gas. We imaged the continuum of the three sources using one of the narrow SPWs as well as three broadband SPWs and compared it with previous continuum measurements reported by Rosero et al. (2016) to check for consistency in the flux density calibration. We found that the continuum flux density measurements using the narrow-band spectral window agreed with the continuum measurement from Rosero et al. (2016) for all three sources, although a discrepancy was found between the continuum obtained from the broad-band spectral

windows and the Rosero et al. (2016) measurement for one source, possibly due to extended emission not well sampled in the data. Regarding the second objective, we developed a Jupyter notebook interface to use the non-LTE radiative transfer code RADEX to model the line ratios of the different detections. In the case of spectrally broad and weak methanol lines, models with kinetic temperatures above 20 K and densities greater than 10^3 hydrogen molecules per cm³ begin to match the observed line ratios for molecular column densities in the transition between maser and thermal emission regimes, suggesting that the broad spectral lines are not fully thermalized. In the case of masers, our data resulted in the detection of one site where two different methanol quantum transitions were detected as narrow and bright lines (consistent with stimulated emission), while two other methanol transitions were not detected. We found models that can reproduce the line ratio of the two maser lines, as well as one of the non-detections, but cannot explain the other nondetection. This shortcoming of the model could be caused by excitation conditions not included and/or explored in the Radex code, including an incorrect background radiation field used in the model. This research is partially supported by NSF grants AST-1814063 and AST-1814011, NSF-ACCESS Jetstream2 IU - PHY220136, and computational resources donated by WIU Distinguished Alumnus Frank Rodeffer.

3. *Title:* A Comparative Analysis of Link Functions in Binomial Regression Models with Applications to Bioassay Data

Principal presenter: Tinuade Dawotola Major: Applied Mathematics

Faculty mentor: Dr. Feridun Tasdan

Abstract: Classical linear regression proves inadequate when dealing with the response variable representing the number of successes in a series of experiments. In contrast, binomial regression is deemed more appropriate, particularly within the context of bioassay data.

Binomial regression, analyzed within the framework of the Generalized Linear Model (GLM), employs specific link functions. Common link functions for binomial regressions include logit, probit, and complementary log-log (cloglog). Both logit and probit are symmetrical link functions, while cloglog is asymmetrical.

This research aims to compare these three link functions and assess their performance using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) indices. By extending the analysis to the specific application of bioassay data, the study provides insights into the effectiveness of these link functions in modeling responses with a binary outcome in the field of bioassays.

Additionally, the study incorporates the dose-response model that is frequently used in bioassay investigations. This approach examines the link between administered dosages and

observed reactions during a set time period by exposing various groups to varying quantities of toxins or drugs.

When evaluating the effects of various dosage levels, the dose-response model provides a methodical framework that is especially helpful in determining the toxicity or efficacy of a chemical. It assists in finding appropriate dose regimes and detecting possible dangers associated with exposure, acting as a crucial tool in pharmacology and toxicology.

The findings contribute not only to the refinement of statistical modeling approaches but also offer practical guidance for researchers and practitioners working with bioassay datasets in the field of drug development.

4. *Title:* Analysis of structural properties of Bismuth Boro-Tellurite glasses by Raman Spectroscopy

Principal presenter: Amy AungMajor: PhysicsOther presenters or co-authors: P.K. Babu and Saisudha B. MallurFaculty mentor: Dr. Saisudha Mallur

Abstract: In this study, the structural properties of Bismuth Boro-Tellurite glasses doped with Praseodymium have been analyzed by Raman Spectroscopy. The structural properties of glasses are of vital importance in commercial, industrial and research applications. The glass samples of the following compositions(xBi2O3:(89-x) B2O3:10TeO2:1Pr2O3) are prepared by melt quenching technique. This technique involves melting raw materials followed by rapid quenching to solidify molten materials into non- crystalline solid glass, and annealing to remove thermal strains. Analyzing the detailed structure of glass samples clarifying their unique properties and behavior. Raman spectroscopy measures a shift in frequency of scattered light when monochromatic light from a laser interacts with the samples. The molecular vibrational and rotational information of the structural groups in the samples can be deducted from the Raman shift. In our glass samples, the Raman peaks corresponding to 135-372 cm-1, 655-740 cm-1 and 930-1250 cm-1 are identified with the vibrational frequency of bismuth groups, tellurite groups are under study.

5. Title: Antioxidants in Hot-Brewed and Cold-Brewed Teas

Principal presenter: Olivia Brinker

Major: Chemistry

Faculty mentor: Dr. Brian Bellott

Abstract: It has been postulated that individuals exposed to free radicals have a higher likelihood of developing diseases such as cancer, hypertension, and Alzheimer's. Free radicals are highly reactive species that are naturally produced as a result of normal

metabolism and cellular respiration, but they have also been known to enter the body through sources like fast food, air pollutants, and pesticides. Free radicals lack an electron and attack healthy cells in the human body to compensate for their electron deficiency. Antioxidants can neutralize the reactivity of free radicals through electron transfer, at which a single electron from an antioxidant is transferred to a free radical species. Black and green teas have been studied as antioxidant sources, and they can be prepared in different ways. The hot-brewed method is the most common method used for preparing tea and entails soaking tea leaves in hot water for a few minutes. Cold-brewed teas are prepared by soaking tea leaves in cold water for several hours. In this study, the antioxidant capacity of hot-brewed teas and cold-brewed teas will be compared. Both black and green teas will be tested using a method called the ferric-reducing ability of plasma (FRAP) assay. In this method, antioxidants are used to reduce an iron complex; this reaction mimics what happens when antioxidants neutralize free radicals. The reduction of the iron complex results in a color change that can be monitored with a spectrophotometer. The kinetics of the reaction are currently being investigated, with the next step being determining which brewing method produces a healthier tea.

6. Title: Assessing the Socioeconomic Impacts of Flooding in Ghana

Principal presenter: Prince Kwaku Asamoah

Major: Applied Statistics & Decision Analytics

Faculty mentor: Dr. Adee Athiyaman

Abstract: Ghana is susceptible to a range of natural disasters. Some of the common natural disasters in Ghana include floods, storms, wildfires, and landslides. These events are often caused by a combination of factors, including climate change, deforestation, and poor urban planning.

Floods are a frequent occurrence in Ghana, especially during the rainy season, which runs from April to September. On June 4, 2015, in what is known in Ghana as the June-fourth disaster, Accra was hit by a flash flood that left 150 people dead and destroyed around US\$100 million worth of property. In the last 20 years, an estimated four hundred people have been killed and around four million people have been displaced by flooding.

The study evaluates the economic impacts of floods using a Social Accounting Matrix (SAM) for the nation. In addition, the characteristics of Ghana households and news stories of flooding are explored to uncover social impacts of flooding.

Empirical analysis suggests that during the period 2013-2023, floods have affected at least 110,813 households and caused economic losses of US\$1.7 billion (20 billion Ghana Cedis). On a household basis, flood-induced contraction to GDP works out to \$15,630 US (184,434.00 Ghana cedis).

7. *Title:* Biodegradation of Chlorpyrifos Insecticide by Bacillus Cereus ST06 and Chryseobacterium SP 6024 Isolated from Agricultural Soil in Nigeria

Principal presenter: Chiemeka Emeribe Major: Biology

Other presenters or co-authors: Samuel Onuorah

Faculty mentor: Dr. Richard Musser

Abstract: Indigenous soil bacteria have the potential to degrade the harmful chlorpyrifos insecticide, this identifies the importance of biodegradation as an eco-friendly method for chemical pollutant cleanup. To compare the potential of Bacillus cereus ST06 and Chryseobacterium sp 6024 in biodegrading chlorpyrifos insecticide singly or as a consortium in a liquid medium. Enrichment culture technique was used to evaluate the bacterial potential in biodegrading chlorpyrifos insecticide. Agricultural soil sample containing chlorpyrifos degrading bacteria was obtained from Ukukwa village Amansea Nigeria (6016' 30" N and 70 07'30"E) from depths of 15cm. Experiment was conducted from January till March 2022. In this study, previously isolated and characterized Bacillus cereus ST06 and Chryseobacterium sp 6024 by standard microbiological method based on their phenotypic test, biochemical test, cultural morphology and 16S rRNA sequencing was used for the experiment. Their growth response to 20mg/l and 60mg/l chlorpyrifos in mineral salts medium singly and as a consortium was compared and determined by monitoring the optical density at 600nm at the optimum condition of pH 6.5 and 30°C temperature for 28 days. The residual chlorpyrifos concentration after 28 days was also compared and determined using Gas Chromatography- Electron Cathode Detector (GC-ECD). The result showed a significant difference (P<.001) as Bacillus cereus ST06 and Chryseobacterium sp 6024 responded differently to different concentration of chlorpyrifos. Bacillus cereus ST06 and Chryseobacterium sp 6024 reached maximum growth in medium containing 20mg/l chlorpyrifos with a mean OD of 0.23±0.20 and 0.42±0.02 respectively on 16th day than 60mg/l chlorpyrifos with a mean OD of 0.47±0.02 and 0.81±0.02 respectively on 20th day. The bacterial consortium also reached maximum growth on 20mg/l and 60mg/l of chlorpyrifos with mean OD of 0.21±0.31 and 0.29±0.02 on 20th day respectively. The result of residual chlorpyrifos concentration shows that the bacteria consortium degraded 79 per cent and 78 per cent of 20mg/l and 60mg/l chlorpyrifos respectively, while Bacillus cereus ST06 and Chryseobacterium sp 6024 degraded 63 per cent and 57 per cent of 20mg/l chlorpyrifos and 61 per cent and 37 per cent of 60mg/l chlorpyrifos. The study shows that bacteria consortium possessed potential to be used in biodegradation of 20mg/l and 60mg/l Chlorpyrifos than the individual isolates. It is therefore recommended that further studies on RNA profiling of each bacterium and synergistic interaction of the bacterial consortium be studied to better understand regulation of genes and individual bacterial roles in degradation chlorpyrifos efficiently.

8. *Title:* Broadband Spectral Line Survey Toward Ultracompact and Hypercompact HII Regions

Principal presenter: Alaric Evans Major: Physics

Other presenters or co-authors: Atharva Kapale (high school student)

Faculty mentor: Dr. Esteban Araya

Abstract: Molecular gas in high-mass star forming regions can be excited to energy levels above the ground state, which results in emission from different quantum transitions. During the process of star formation, when a protostar is starting to become a fully fledged star, it ionizes the surrounding gas, creating an HII region. Depending on the size and density, HII regions are classified as hypercompact, ultracompact, or classical. In Yang et al. (2021), observations from a wide variety of sources were taken to characterize the ionized gas in the sample. Expanding on an idea developed by Sanchez-Tovar et al. (2023), we began to explore whether ammonia, methanol and water may have been serendipitously detected in the broad-band continuum observations of Yang et al. (2021). In this presentation, we report preliminary results of the project, particularly focusing on a search for high-velocity water masers in the sample. In particular, we report results on the search for H2O masers in the regions of star formation: G010.4724, G024.7898, G030.0096, and G045.4656. Additionally, the sources G010.4724, G024.7898, and G030.0096 were surveyed for CH3OH and NH3. We used resources from the National Science Foundation Advanced Cyberinfrastructure Coordination Ecosystem: Service & Support (NSF ACCESS). The data were analyzed in a virtual machine in the JetStream2 computer cluster. We used Jupyter-Lab and the Common Astronomy Software Applications (CASA)-both Python-based programs-to check the calibration and create images and spectra of the sources. Of the above sources, G010.4724 and G024.7898 had candidates for CH3OH emission, with the latter having two regions of detection. G010.4724, G024.7898, and G030.0096 have NH3 detections. Water masers were detected toward G010.4724, G024.7898, and G045.4656. This project is the beginning of a large search for highvelocity H2O maser that could be present in the interaction between expanding ionized jets and the circumstellar medium. This research is partially supported by NSF grants AST-1814063 and AST-1814011, NSF-ACCESS Jetstream2 IU - PHY220136, and computational resources donated by WIU Distinguished Alumnus Frank Rodeffer.

9. Title: Consequences of Binge Eating Episodes or "Pigging Out"

Principal presenter: Hamza RabiuMajor: CommunicationOther presenters or co-authors: Hannah Butler and McPaul BrouFaculty mentor: Dr. Nathan Miczo

Abstract: Binge eating disorder (BED) is characterized by recurrent episodes of excessive food consumption, often accompanied by negative emotional consequences. While previous research suggests women experience more intense emotional distress after binge eating

compared to men, this study aimed to re-evaluate this claim in a more nuanced context. We conducted a survey among 56 college students, assessing their binge eating experiences, associated emotions, and communication patterns related to binge eating. Although our initial hypothesis of gender-based differences in emotional responses was not statistically supported, our findings revealed several noteworthy insights.

Firstly, a substantial majority (67.3%) of respondents reported experiencing negative emotions after binge eating, highlighting the broader emotional impact of this behavior regardless of gender. Secondly, 87.5% of participants perceived a societal stigma surrounding the emotional effects of binge eating, suggesting a potential barrier to open communication and help-seeking. Interestingly, gender differences emerged in communication patterns, with women reporting more negative experiences when discussing binge eating with others compared to men. These findings suggest the need for further research to explore the complex interplay between gender, emotional vulnerability, and communication around binge eating. Additionally, investigating the potential influence of societal stigma on help-seeking behaviors and emotional well-being in individuals with binge eating tendencies is warranted.

10. *Title:* Culture-dependent analysis of microbial diversity in the rhizosphere of healthy and diseased Solanum lycopersicum

Principal presenter: Afeez A Adedayo Major: Biology

Other presenters or co-authors: Ayomide E. Fadiji, Western Sydney University, Australia, and Olubukola O. Babalola, North-West University, South Africa

Faculty mentor: Dr. Richard Musser

Abstract: Tomato is an important fruit that contains essential vitamins, antioxidants, lycopene, and minerals. Both humans and animals consumed tomatoes contributing to their well-being. The microbes inhabiting the rhizosphere soil of plants perform specific functions including plant growth improvement, improving nutrient availability, as well as the health status of the plants. Employing a culture-dependent method, this study presents the interaction of plants and microbes in the soil samples of healthy and diseased tomato plants. It divulges various bacteria and fungi species dwelling in the rhizosphere of the plant. For identification of the isolates, the morphology and biochemical characterization of the microbes were observed which revealed their features while growing on the media plates for fungi species (macroscopic) and observation under the microscope for bacteria species (microscopic). From the isolated microbes, DNA samples were extracted and a Polymerase Chain Reaction (PCR) of the DNA sample was carried out after which Sanger sequencing (16s rRNA gene and ITS) was conducted on the amplicon product of PCR. Our result presented various microbial species including bacteria (Bacillus and Streptomyces) and fungi (Trichoderma, Purpureocillium, Mortierella, Chaetomidium, and Mortierella). There are abundant microbes in the healthy rhizosphere compared to the diseased

rhizosphere of tomato plants. This research unveils how the microbes affect the health status of tomato plants by improving plant growth, disease-resistant ability, and prevention from abiotic stresses. Further study should be conducted on the potential of these microbes on agricultural fields, hypothesizing that they contribute to the abundant production of tomatoes for sustainable agriculture.

11. Title: Density Measurements of Borate Glasses

Principal presenter: Mehbuba Rashid Mouri Major: Physics

Other presenters or co-authors: P.K. Babu and Saisudha B. Mallur

Faculty mentor: Dr. Saisudha Mallur

Abstract: Glass is an amorphous solid with a non-periodic arrangement of atoms. Because of its unique property to refract, reflect, and transmit light, glasses are widely used in optical devices, electronics and laser technology. In this study, we prepared binary lead borate glass (35PbO: 65B2O3), ternary europium doped lead borate glass (35PbO: 64B2O3: 1.0 Eu2O3), binary bismuth borate glass (35Bi2O3: 65B2O3), and ternary europium doped bismuth borate glass (35Bi2O3: 64B2O3: 1.0 Eu2O3) by melt quenching techniques. The density of the glass sample is measured by the Archimedes method. When a body is immersed in a fluid, either completely or partially, an upward buoyant force is exerted on the body which will be equal to the weight of the fluid displaced by the body. By using this principle, the densities of the glass samples are measured. Densities of binary and ternary lead borate glasses are 3.892 g/cm³ and 3.889 g/cm³, respectively. Densities of binary and ternary bismuth borate glasses are 1arger due to the presence of heavy bismuth oxide groups in the glass samples. Molar volume and rare earth ion concentration in these glasses are calculated from the density values.

12. *Title:* Discover PTSD diagnosis intricacies by evaluating widely used tools: CAPS-5, PCL-5, C-Mississippi, and PSSI-5

Principal presenter: Cloud Chang Major: Clinical/Community Mental Health Other presenters or co-authors: Kayla Rollings, Eunice Asanoh, and Bhavika Faculty mentor: Dr. Qingqing Zhu

Abstract: PTSD is a complex mental health disorder requiring several diagnostic criteria, which share many characteristics with other mental health disorders. For a clinician to make an accurate PTSD diagnosis, they must have access to highly reliable and valid diagnostic measures. This study aims to evaluate and compare the psychometric properties and utility of widely used PTSD diagnostic instruments. The CAPS-5 (Weathers et al., 2018), PCL-5 (Blevins et al., 2015), C-Mississippi (Lauterbach et al., 1997), and PSSI-5 (Foa et al., 2016) were evaluated using the rubric created by Hunsley and Mash (2008) and later extended by Youngstrom et al. (2017) to establish evidence-based assessment instruments. Using this

rubric, a variety of properties were evaluated for each measure, including its reliability, validity, diagnostic sensitivity, and clinical utility. Each property received a rating from Adequate (lowest) to Excellent (highest) based on the level of available evidence. To gather evidence, a comprehensive literature review was performed by searching google scholar and psychological databases (i.e., PsychINFO, PsychArticles, PubMed) using a combination of key terms including the measure names/acronyms, "psychometric", "reliability", "validity", "validation", as well as other key words in the evaluated properties. The results show the measures demonstrated different strengths and weaknesses. Overall, the PCL-5 appeared to have the strongest psychometric properties as it receives a score above adequate for each category aside from Interrater reliability where no data was found to provide a rating. The C-Mississippi appeared to have the weakest psychometric properties as seen by its lack of data in two categories (interrater reliability and content validity).

13. Title: Effect of Clove Oil on Escherichia coli

Principal presenter: Oluwaseyi Omodiminiyi Major: Biology Other presenters or co-authors: Calyn Dupuis

Faculty mentor: Dr. Sue Hum

Abstract: The inability of commercially available antibiotics to solve the problem of antibiotic-resistant bacteria increases the need for research and development of alternative forms of treatment, particularly from natural products like plants. Hence, this research examined the antibacterial effect of clove oil on Escherichia coli 25922 ATCC. Antibiotic susceptibility tests were done using clove oil and commercially available antibiotics for comparative study. Gene expression assays were also done using real-time quantitative PCR to check for the effect of the oil on gene expression of genes. Clove oil was found to be effective against Escherichia coli. There were differences in the expression of several genes in E. coli in response to treatment with clove oil. These results provide information on the mechanism of action of clove oil against E. coli.

14. Title: A Hotspot Analysis of Disaster Risk, Social Vulnerability, and Resilience in Iowa

Principal presenter: Jefferson Ikediuba

Major: GIScience and Geoenvironment

Other presenters or co-authors: Ebenezer Grant-Biney and Dennis V. Debi

Faculty mentor: Dr. Sunita George

Abstract: In the face of escalating climate-related disasters, understanding the spatial dynamics of disaster risk, social vulnerability, and resilience becomes crucial for effective disaster management and mitigation strategies. In the past 40 years, the worst disasters that have occurred within the Midwestern-with metrics including impacts on human lives and destruction of properties in millions of Dollars- have had greatest impacts in the state of

Iowa.

This research employs Hotspot Analysis using the Getis-Ord Gi* tool in ArcGIS Pro to unravel the intricate spatial patterns and interplay between disaster risk, social vulnerability, and resilience across the diverse landscape of Iowa. By pinpointing statistically significant clusters of high and low values-hot spots and cold spots-this study illuminates the areas within Iowa that are most susceptible to disasters and those that exhibit robust resilience or heightened vulnerability.

The expected findings for this proposed research include the identification of spatial patterns and trends as far as the occurrences of natural disasters is concerned-this would shed light on the counties most affected across the 99 counties of Iowa. There is also the expectation of identifying areas most affected by these disasters and establishing a link between areas affected (vulnerability), their social and economic status, and their ability to recover quickly (resilience). Additionally, the hotspots of these variables would indicate where there should be additional focus to mitigate the impacts of natural disasters in Iowa. These expected findings will be vital in influencing policies and ensuring the equitable distribution of adaptive mechanisms for natural disasters, especially for low-income neighborhoods.

15. *Title:* Evaluating Commonly Used Interventions to Inform MTSS in Rural Districts *Principal presenter:* Hollan Wright

Major: School Psychology

Other presenters or co-authors: Cierra Johnson

Faculty mentor: Dr. Leigh Ann Fisler

Abstract: This study focuses on evaluating the effectiveness of commonly used interventions in rural school districts to inform the implementation of a Multi-tiered System of Support (MTSS). The study reviews 10 literacy intervention programs and three math interventions using empirical studies that report student outcomes. The interventions are evaluated based on study design, targeted skill domains, target age/grade, outcome measures, and effect size or research results. The study aims to help school systems understand the effectiveness of various reading and math interventions and maximize resources in rural districts. The results of this study will guide the school district in making informed decisions about evidence-based interventions to improve the MTSS service delivery across the K-8 setting.

16. Title: Gender and Belief about Menstruation and Academic Performance

Principal presenter: Destiny OdahMajor: Public HealthFaculty mentor: Dr. Lora WallaceAbstract: Menstruation is a natural physiological phenomenon in women that shows a

healthy reproductive system, yet women are stigmatized during this experience. Notably, women's physical, mental, and social well-being are significantly impacted by several variables of menstrual symptoms, of which premenstrual syndrome is more prevalent and most studied because it is associated with painful physical and psychological changes before and during menstruation. Thus, menstrual disorders are widespread and are a major social problem. Despite several physiological and psychological stresses that women undergo before and during menstruation, there have been variations in people's perceptions of menstruation and gaps in research comparing gender and beliefs about menstruation and its impact on academic performance. This study explores gender and beliefs about menstruation and how it affects academic performance and social life using a selfadministered online questionnaire that inquires about general knowledge of menstruation, participants, beliefs and experiences with menstruation, participants' academic performance and demographic questions amongst Western Illinois University students. First, the Western Illinois University Institutional Review Board (IRB) approved the study, after which an email solicitation was sent to students with the survey links. Students aged 18 and above interested in proceeding to the questionnaire provided online informed consent, and their identity was not gathered. Data analysis was carried out using SPSS, and a chi-square statistical test was used to examine the correlation between gender perceptions of menstruation. A total of 264 students participated in the online survey, of which 261 revealed their race and ethnicity and 262 revealed their gender identity. Participants' knowledge of menstruation was accessed using a 5-point Likert scale, which revealed that 40.44% of the respondents' knowledge and understanding of menstruation had been influenced positively over the years by reading books and listening to family members and siblings. Furthermore, a higher number of men (49.2%) agree that tiredness seen in women during menstruation could be associated with dysmenorrhea, and a significant number of male participants do not agree that women's fatigue could be related to menstruation (47.62%). On the other hand, an increased number of women participants (47.37%) agreed that menstruation complications could be related to tiredness seen in women during menstruation, suggesting that men might be unaware of the exhaustion associated with women's menstruation. The chi-square analysis revealed an association between men's and women's perceptions of menstruation. Interestingly, women stated that menstruation has no effect on their academic performances, but on the other hand, men were indecisive about its impact on women's intellectual tasks. Also, 28.72% of respondents reported that they find studying and excelling during menstruation uneasy; however, a significant number of participants (45.13%, n=88) reported that menstruation does not affect their academic performance. The result shows that women can excel at any task, even during menstruation. However, menstruation could be associated with women turning social plans down. Knowledge of menstruation is essential to understanding women's health better, demystifying menstruation myths, and advancing the social well-being of this gender. Future studies should examine menstruation knowledge of men and disembark information to fill the knowledge gap.

17. *Title:* Glass Sample Preparation and Refractive Index Study of Borate Glasses Doped with Rare Earth Ions

Principal presenter: Md Khokon Miah Major: Physics

Other presenters or co-authors: P.K. Babu and Saisudha B. Mallur

Faculty mentor: Dr. Saisudha Mallur

Abstract: Glasses are transparent, non-crystalline materials. They are widely used in applications such as vacuum flasks, barometers, thermometers, microscopes, telescopes, solar panels, and camera lenses. Lead and bismuth borate glasses have broad range of glass formation and are promising candidates for technological applications due to their high transparency in the visible and near-infrared ranges. For this investigation, we prepared lead borate/bismuth borate glasses doped with europium ions using appropriate amounts of lead monoxide (PbO), bismuth oxide (Bi2O3), analytical-grade boric acid (H3BO3), and high purity (99.9%) europium oxide (Eu2O3). Glass are made using the melt-quench method followed by an annealing process close to the glass transition temperature to eliminate thermal stresses. Refractive index (RI) of a material is crucial in understanding various optical phenomena such as refraction, reflection, dispersion, and diffraction. RI can be measured by the Brewster's angle method. From the Brewster's angle measurements, we determined the RI for binary and ternary lead borate glasses to be 1.80 and 1.78, respectively. The corresponding values and for binary and ternary bismuth borate glasses are 2.03 and 1.89, respectively. Our measurements show that the bismuth borate glasses have a higher refractive index compared to lead borate glasses. This is due to the highly polarizing nature of heavy bismuth ions.

18. Title: Growth Trajectory of Religiosity from Adolescence to Adulthood

Principal presenter: Katie Hernandez
Major: School Psychology
Other presenters or co-authors: Qingqing Zhu
Faculty mentor: Dr. Leigh Fisler
Abstract: The reason for the research is for creative activity and to present it to NASP(
National Association of School Psychologists)

Data and Measures

Wave I data from the National Longitudinal Study of Adolescent to Adult Health (Add Health; Harris & Udry, 1994-2008) will be used. Data was collected between 1994 and 1995 on school-attending youths. There were a total of 6,504 participants aged 11-21 (mean = 15.57). All measures used in this study were self-reports.

Analysis Plan

To compare the various outcome variables across religious and non-religious groups, two-

tailed independent-sample t-tests will be performed. Results will indicate whether mean scores on these variables are significantly different across religious and non-religious groups.

Among adolescents with a religious affiliation, relationships between their religious participation/ religious salience and the outcome variables will be examined. Specifically, partial correlations will be calculated between religious participation and each of the outcome variables, with age and gender as control variables. Similarly, partial correlations will be calculated between religious salience and each of the outcome variables. Correlation coefficients with their 95% confidence intervals will be reported.

Conclusion

While looking at the data all the variables were noted to be clinically significant. The different religiosity affiliations were clinically significant with compared to other religious groups within different variables, those differences were highlighted in the poster presentation. A T-test was also conducted to see if identifying as being born-again Christians impacted them in the variables results, it did for most variables except expulsion and unset of substance usage.

19. *Title:* How well self-regulated learning strategies work to improve student grades in college courses

Principal presenter: Hamza Rabiu

Major: Communication

Faculty mentor: Dr. Peter F. Jorgensen

Abstract: In higher education, deploying self-regulated learning (SRL) strategies has emerged as a crucial element impacting student achievement. Theoretical considerations stress SRL's dynamic character, which includes cognitive, metacognitive, behavioral, and motivational components that can contribute to successful learning. Theoretical frameworks like Zimmerman and Schunk's (2011) SRL model provide a conceptual foundation for comprehending the intricate interplay between self-regulation and academic performance. This literature review focuses on identifying successful implementation tactics such as explicit instruction, modeling, scaffolding, and differentiation, that can help college students develop SRL abilities. By employing successful SRL practices, instructors may help students become self-directed learners who achieve academic achievement and flourish in the ever-changing higher education context.

20. Title: Identification of Probiotic Lactic Acid Bacteria Isolated from Goat Milk

Principal presenter: Mary Olorunkosebi Major: Biology Faculty mentor: Dr. Richard Musser Abstract: Goat milk is recommended for the elderly

Abstract: Goat milk is recommended for the elderly and individuals recovering from illness

because of its reduced fat content and elevated levels of polyunsaturated fatty acids, offering an alternative to cow milk in fermented milk beverages. Many fermented milk products in Africa are produced through spontaneous fermentation by lactic acid bacteria, leading to inconsistent product quality. Some lactic acid bacteria have been observed for their inability to survive the gastrointestinal tract and inhibit foodborne pathogens due to limited or absent production of bioactive compounds. The primary goal of this project was to isolate and characterize lactic acid bacteria (LAB) from goat milk and assess their probiotic potential. Raw goat milk samples were collected from Sokoto Red and West African Dwarf goats, then transported to the laboratory in ice packs. LAB were isolated and identified using standard techniques and subjected to various probiotic assays, including tests for bile salt and acid tolerance. Additionally, their lipolytic and proteolytic activities, antimicrobial effects against specific pathogens, and their capacity to produce lactic acid, and hydrogen peroxide were determined. Safety assessment tests were conducted to ascertain their ability to produce haemolysin, gelatinase, DNase, and lecithinase. The isolates underwent further testing with various antibiotics. A total of 34 LAB strains were isolated and identified, representing 10 species: Lactobacillus plantarum (26.5%), Lactobacillus casei (14.7%), Pediococcus spp. (8.8%), Streptococcus thermophilus (8.8%), Lactobacillus acidophilus (8.8%), Lactobacillus helviticus (14.7%), Lactobacillus brevis (5.9%), Lactobacillus delbrueckii (5.9%), Lactobacillus bulgaricus (2.9%), and Lactobacillus fermentum (2.9%). From the findings of this project, only three strains of LAB from goat milk, specifically Lactobacillus acidophilus (S5), Lactobacillus plantarum (S6), and Lactobacillus acidophilus (M15) demonstrated favorable probiotic characteristics along with commendable technological attributes. Therefore, these strains have the potential to serve as probiotic candidates for utilization as starter cultures in fermenting various dairy products or other food products.

21. *Title:* Knowledge, Attitudes, Practices and Behaviour of Type II Diabetes Mellitus in Ghana

Principal presenter: Nana Ama Aduma Amankwah Major: Masters of Public Health Faculty mentor: Dr. Mei Wen

Abstract: Globally, about 537 million people are living with diabetes and about 2.4 million of these people live in Ghana which is approximately 7.5% of the adult population. This study aims to describe the diabetes-related knowledge, attitudes, behavior and practices among Ghanaians. PubMed and Google Scholar were used for the search, as well as the information from government and non-government sites. The study explores the knowledge of diabetes and its complications among the Ghanaian populace and finds out that gender, socioeconomic status and level of education played a role when it comes to knowledge about diabetes and its complications. Also, some diabetic patients through the process of healer shopping seek ethnomedical treatment at the expense of their medical management which eventually leads to complications. In fighting the menace of diabetes in Ghana, the

National Health Insurance Scheme needs to be strengthened, and health workers should be trained and empowered to screen for diabetes in rural areas and refer them to the appropriate level of care.

22. *Title:* Methanol and Ammonia Lines Detected in VLA Broadband Continuum Observations towards Ionized-Jet Candidates

Principal presenter: Amisha Jagdish Rane Major: Physics Other presenters or co-authors: Esteban D. Araya and Punya Paudel Faculty mentor: Dr. Esteban Araya

Abstract: High sensitivity observations at microwave frequencies are a key tool to investigate whether ionized jets and molecular outflows transfer angular momentum outwards to allow accretion. Sanchez-Tovar et al. (2023) reported detection of CH3OH and NH3 in a sample of young high-mass stellar objects based on broadband VLA continuum observations. However, due to the broad spectral channels of the observations, they were unable to disentangle the nature of the emission. We present results of follow-up observations of three regions (IRAS 20126+4104, IRAS 18089-1732 and G34.43+00.24) from the Sanchez-Tovar et al. (2023) sample to confirm the detections and investigate their nature. Our high spectral resolution data confirm all detections above 4σ reported by Sanchez-Tovar et al. (2023) toward the three sources. The lines were observed to be spectrally broad and trace extended sources. In addition, we found a methanol maser site offset by 6.5 arcsec in two methanol transitions with respect to the ionized jet candidate in IRAS 18089-1732. To explore whether the lines are tracing quiescent gas or velocity gradients related to outflows or disks, we stacked the ammonia and methanol data per source to increase the signal to noise ratio. Velocity gradients are detected in all sources, possibly tracing disks associated with the ionized jets. We found an empirical relation between the flux density that we observe and the flux density measured at low spectral resolution. Using this equation, we can estimate the expected flux density peak based on detections from low spectral resolution data. This work validates the use of VLA continuum observations as broadband low velocity resolution spectral line surveys. This research is partially supported by NSF grants AST-1814063 and AST-1814011, NSF-ACCESS Jetstream2 IU - PHY220136, and computational resources donated by WIU Distinguished Alumnus Frank Rodeffer.

23. *Title:* Habitat type determines patterns of divergence and migration among Chicago raccoon populations

Principal presenter: Sarah Obregon
Major: Biology
Other presenters or co-authors: Shawn Meagher, Jean Dubach, and Trent Santonastaso
Faculty mentor: Dr. Shawn Meagher
Abstract: Urbanization of the landscape causes fragmentation of wildlife habitats, making

population interbreeding difficult and producing small, isolated wildlife populations. Small populations inevitably lose genetic diversity (e.g., heterozygosity) through random genetic drift. Reduced genetic diversity leads to lower individual survival or reproduction known as inbreeding depression, which can increase the risk of population extinction.

In this study, we assess raccoon (Procyon lotor) populations from an urban landscape for genetic diversity, population structure, and migration patterns. 382 raccoons were collected during the summers of 2004, 2005, and 2008-2019 from 10 populations in three habitat types, including urban (U), and two more natural habitat types: forest preserve (P) and rural (R), in Chicago, IL, and adjacent Cook and McHenry counties. Blood and tissue samples were genotyped at 13 microsatellite loci. Within-population genetic diversity measures were calculated, including overall and private allelic richness, expected and observed heterozygosity, and the inbreeding coefficient (Fis). We tested for differences in genetic diversity among populations and habitat types using nested one-way ANOVA, Kruskal-Wallis, and exact tests for goodness-of-fit to Hardy-Weinberg equilibrium (HWE). Patterns of genetic differentiation among populations were measured several ways. Population structure information was calculated using STRUCTURE, which uses bootstrapped kmeans clustering of individual genotypes to infer the most likely number of distinct randomly mating groups (i.e., in distinct HWE). Genetic divergence among populations was estimated by calculating Fst, which reflects differences in allele frequencies between pairs of populations. To determine if population differentiation was correlated with geographic distance, a Mantel test comparing geographic (Haversine) distances to Fst values was performed using Vegan v2.6-4. To determine if genetic differentiation was affected by movement between habitat types (urban [U] and natural [P and R]), we performed one-way ANOVA on three groups of Fst values based on whether population pairs were from the same habitat type (U-U and P/R-P/R) or different habitat types (U-P/R). Finally, migration patterns (i.e., the proportion of each population are estimated to be resident or immigrant) were determined using BAYESASS v3.

There were no significant differences in genetic diversity among 10 populations, nor among habitat types. Four populations exhibited heterozygosity deficiency, but this was not restricted to any habitat type or geographic area. K-means clustering revealed two genetically distinct groups occurring in NW and SE/Lake Coast Chicago. There was no correlation between Fst and geographic distance between raccoon populations. However, Fst values were significantly higher between urban-urban (U-U) and urban-natural (U-P/R) populations than between pairs of natural (P/R-P/R) populations. Migration data showed little migration out of urban populations, but substantial migration from rural and preserve areas into urban populations.

In conclusion, while raccoons in the Chicago area have not lost genetic diversity, urban populations are more differentiated from those in naturalistic habitats (preserve and rural)

and more differentiated from each other. Furthermore, migration is primarily from forest preserves to urban populations. Overall, the urbanization of the landscape seems to create isolated populations that show increased differentiation and reliance on forest preserves for immigrants.

24. Title: Patterns of Tick Infestation on Illinois White-Footed Mice

Principal presenter: Ebby Ayaegbunam

Major: Biology

Faculty mentor: Dr. Shawn Meagher

Abstract: Zoonotic diseases are infections that can pass from animals to humans. Vectors, or blood-sucking arthropods, transmit many microscopic zoonotic diseases to people. Ticks are the primary vectors of zoonotic illness in the USA, and various tick-borne diseases (TBDs) are important public health threats. Since ticks acquire TBDs from wild hosts (i.e., 'reservoirs') before transmitting them to humans, it is critical to determine tick infestation patterns in reservoir hosts. White-footed mice (Peromyscus leucopus) are important reservoirs for several TBDs, including viruses, bacteria (e.g., Borrelia spp,), and protozoans (Babesia microti). In order to better understand TBD risks for humans in western Illinois, we investigated patterns of tick infestation on white-footed mice in Hancock County, IL. Mice were collected over two years (2022 and 2023) in forest habitats at WIU's Kibbe Life Science Station (KLSS), near Hamilton, IL. Mice were trapped using Sherman live traps from 16 long-term plots, then were taken to the laboratory and euthanized. Mouse mass and sex were measured, and each host was thoroughly examined for ectoparasites. Ticks were collected and preserved in 80% ethanol, and later identified to species based on morphological features using tick identification keys. To date, we have identified 978 tick individuals recovered from 135 P. leucopus. Larvae from two tick species were identified: 755 of them were Dermacentor variabilis (American dog tick) and 223 were Ixodes scapularis (black-legged, or deer tick). We performed a series of bivariate (2-variable) statistical tests to examine the effects of host sex and mass, habitat (plot) and year of capture on tick abundance (counts on each host). Sex had a significant effect on D. variabilis abundance (p = 0.021), with males having higher tick counts than females, but there was no difference in abundance between males and females in I. scapularis (p = 0.24). Mouse mass had a significant effect on D. variabilis abundance (p < 0.01), with larger mice having higher abundances than smaller mice, but mass had no effect on I. scapularis abundance (p = 0.08). There was a significant effect of plot on the abundance of both D. variabilis (p<0.05) and I. scapularis (p<0.05), with both tick species having the highest abundances in the plot PNDG2. Year had a significant effect on D. variabilis abundance (p < 0.001), with mice having higher abundances in 2023 than in 2022, but there was no difference in larval abundance between the two years for I. scapularis (p = 0.66). To our knowledge, this is the first description of infection patterns of D. variabilis and I. scapularis on IL rodents. Our results show that these two tick species respond very differently to host characteristics (sex and size) and environmental variables, such as year-to-year variation in

weather, but they seem to respond similarly to habitat differences (both most abundant on the same plot). Future analyses should include multivariate statistical models to evaluate the relative importance of different determinants of tick infestation on Illinois P. leucopus, as well as whether these ticks have ecological interactions on their hosts.

25. *Title:* Quantification of Cannabichromene among Nineteen Cannabinoids in Key Lime Pie Hemp Flowers by Liquid Chromatography Ultraviolet Detection

Principal presenter: Emily Jovanovich Major: Chemistry

Other presenters or co-authors: Jillian Mulholland

Faculty mentor: Dr. Liguo Song

Abstract: A liquid chromatography ultraviolet detection (LC-UV) method was developed for the quantification of cannabichromene (CBC) in key lime pie hemp flowers among nineteen cannabinoids. The quantification was achieved using external standard calibration between 0.02 and 25 μ g/mL. The limits of quantitation (LOQ) were determined to be 0.04% CBC in hemp flowers. To recover CBC, the sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 50 μ g/mL and analyzed by LC-UV. The CBC content in key lime pie hemp flowers was measured to be 0.59% with relative standard deviation (RSD) of 1.6% in triplicate The method was not interfered by other cannabinoids present in hemp flowers.

26. *Title:* Quantification of Cannabicitran among Nineteen Cannabinoids in Lucky Leaf Hemp Cigarettes by Liquid Chromatography Ultraviolet Detection

Principal presenter: Jake Provis Major: Chemistry

Other presenters or co-authors: Brocke Bain

Faculty mentor: Dr. Liguo Song

Abstract: A liquid chromatography ultraviolet detection (LC-UV) method was developed for the quantification of cannabicitran (CBT) among 19 cannabinoids in lucky leaf hemp cigarettes. The quantification was achieved using external standard calibration between 0.02 and 12.5 μ g/mL. The limits of quantitation (LOQ) were determined to be 0.04% CBT in hemp cigarettes. To recover CBT, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 50 μ g/mL and analyzed by LC-UV. The CBT content in the lucky leaf hemp cigarettes sample was measured to be 0.11% with 9.8% relative standard deviation in triplicate. The method is not interfered by other cannabinoids present in hemp cigarettes.

27. *Title:* Quantification of Cannabidiol among Nineteen Cannabinoids in Hemp Infused Water by Liquid Chromatography Ultraviolet Detection

Principal presenter: Lindsey LeBlanc

Major: Chemistry

Other presenters or co-authors: Maddy Kotler

Faculty mentor: Dr. Liguo Song

Abstract: A liquid chromatography ultraviolet detection (LC-UV) method was developed for quantification of cannabidiol (CBD) among nineteen cannabinoids in hemp infused water. The quantification was achieved using external standard calibration between 0.02 and 25 μ g/mL. The limits of quantitation (LOQ) was determined to be 0.0008% CBD in hemp infused water. To recover CBD, hemp infused water was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was diluted to 2.5 mg/mL and analyzed by LC-UV. The relative standard deviation (RSD) of the measurement in triplicate was 1.9%. The method is not interfered by other cannabinoids present in the sample.

28. *Title:* Quantification of Cannabidiol among Nineteen Cannabinoids in Key Lime Pie Hemp Flowers by Liquid Chromatography Ultraviolet Detection

Principal presenter: Keszia Fabien

Major: Chemistry

Other presenters or co-authors: Maggie Schoener

Faculty mentor: Dr. Liguo Song

Abstract: A liquid chromatography ultraviolet detection (LC-UV) method was developed for the quantification of cannabidiol (CBD) among nineteen cannabinoids in key lime pie hemp flowers. The quantification was achieved using external standard calibration between 0.02 and 25 μ g/mL. The limits of quantitation (LOQ) were determined to be 0.04% CBD in hemp flowers. To recover CBD, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 50 Ng/mL and analyzed by LC-UV. The measurement precision in triplicate was 0.7%. The method is not interfered by other cannabinoids present in hemp flowers.

29. *Title:* Quantification of Cannabigerol (CBG) among 19 Cannabinoids in Δ8-THC (Tetrahydrocannabinol) fortified White Whale CBG Hemp Flowers by Liquid Chromatography Ultraviolet Detection

Principal presenter: Olalekan Ogunsola

Major: Chemistry

Other presenters or co-authors: Nayali Licea

Faculty mentor: Dr. Liguo Song

Abstract: A liquid chromatography ultraviolet detection (LC-UV) method was developed for the quantification of cannabigerol (CBG) in delta 8-THC (Tetrahydrocannabinol) fortified white whale CBG hemp flowers among nineteen cannabinoids. The quantification

was achieved using external standard calibration between 0.02 and 25 mg/mL. The limits of quantitation (LOQ) were determined to be 0.04% CBG in hemp flowers. To recover CBG, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation, and filtration, the extract was serially diluted to 50 mg/mL and analyzed by LC-UV. The measurement precision in triplicate was 7.6%. The method is not interfered with by other cannabinoids present in hemp flowers.

30. Title: Quantification of Δ9-Tetrahydrocannabinol (THC) among Nineteen Cannabinoids in Lucky Leaf Hemp Cigarettes by Liquid Chromatography Ultraviolet Detection

Principal presenter: Ayowole Owolabi

Major: Chemistry

Other presenters or co-authors: Ammar Mohammad Al-Bataineh and Erin Johnson Faculty mentor: Dr. Liguo Song

Abstract: A liquid chromatography ultraviolet detection (LC-UV) method was developed for the quantification of Delta 9-THC among 19 cannabinoids in Lucky Leaf hemp cigarettes. The quantification was achieved using external standard calibration between 0.02 and 25 μ g/mL. The limits of quantitation (LOQ) were determined to be 0.04% Delta 9-THC in hemp cigarettes. To recover Delta 9-THC, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation, and filtration, the extract was serially diluted to 50 ug/mL and analyzed by LC-UV. The measurement had a relative standard deviation (RSD) of 4.5% in triplicate. The method is not interfered by other cannabinoids present in hemp cigarettes.

31. Title: Quantification of Δ9-Tetrahydrocannabinol (THC) among 19 Cannabinoids in Δ8-THC fortified White Whale CBG (Cannabigerol) Hemp Flowers by Liquid Chromatography Ultraviolet Detection

Principal presenter: Ammar Al-Bataineh Major: Chemistry

Other presenters or co-authors: Ayowole Owolabi and Kate Dosch

Faculty mentor: Dr. Liguo Song

Abstract: A liquid chromatography ultraviolet detection (LC-UV) method was developed for the quantification of $\Delta 9$ -THC among 19 cannabinoids in $\Delta 8$ -THC fortified white whale CBG hemp flowers. The quantification was achieved using external standard calibration between 0.02 and 25 µg/mL. The limits of quantitation (LOQ) were determined to be 0.04% $\Delta 9$ -THC in hemp flowers. To recover $\Delta 9$ -THC, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 50 µg/mL and analyzed by LC-UV. The measurement precision in triplicate was 10.5%. The method is not interfered by other cannabinoids present in hemp flowers.

32. *Title:* Relationship Between Relative Gape Size and Body Condition in Four Piscivorous Fishes

Principal presenter: Joshua Oyeboade Major: Biology

Other presenters or co-authors: Abby Roussin and Vaskar Nepal

Faculty mentor: Dr. Vaskar Nepal

Abstract: Piscivorous fishes play a vital role in regulating the populations of their prey species, thereby maintaining ecosystem balance (Emiroğlu et al., 2023). Most piscivorous fishes are gape limited. Fish with larger mouth can eat larger, more energy-rich prey. For any fish, we hypothesize that larger gape size should increase the body condition and potentially fitness of the fish. We compared the relationship in gape size and body condition in 4 piscivorous species: Emerald Bowfin (Amia occellicauda), Largemouth Bass (Micropterus salmoides), Flathead Catfish (Pylodictis olivaris), and Northern Pike (Esox lucius). We used morphometric measurements to fit Linear regression models between Le Cren's relative condition factor (Kn) and relative gape size. Largemouth Bass exhibited a strong positive correlation between gape size and body condition, while other three species did not. These findings suggest that the relationship between gape size and body condition is species-specific and may be influenced by ecological and evolutionary factors. Understanding these relationships can inform predator-prey interactions, trophic dynamics, and conservation efforts in aquatic ecosystems for these species.

33. Title: Synthesis and application of macrocyclic aromatic tellurides

Principal presenter: Egzona Tahiri

Major: Chemistry

Faculty mentor: Dr. Shaoshong Zhang

Abstract: Macrocyclic compounds are of considerable interests due to their construction of molecular-recognition and ion-binding systems. There are many well-known examples of macrocycles such as crown ethers, cyclodextrins aromatic diimides, etc.

Cycloparaphenylenes (CPPs) are macrocyclic molecules with 5 to 20 units of benzene rings joined together at the para position. They have attracted much attention from researchers in various perspectives. Their applications in electronic materials and as the building blocks for the preparation of p-expanded and p-layered materials have been investigated. Cycloparaphenylene (CPP) is the shortest repeat unit of carbon nanotubes. The recent synthesis of CPP represents an opportunity to explore bottom-up nanotube synthesis and once produced, these additional features might be used to arrange the nanotubes into a device. The objective of this research is to explore a method to make macrocyclic aromatic tellurides. The macrocyclic aromatic tellurides will then undergo detelluration reaction (removal of the tellurium atom from the ring) with a palladium catalyst to give CPP. The synthesis of macrocyclic aromatic tellurides starts from 1,4-diiodobenzene or other dihalides compounds, reacting with a nucleophile sodium telluride. Once the macrocyclic aromatic tellurides are synthesized, they will be proceeded with the detelluration reactions

to remove tellurium atoms and lead to the final target CPPs. Compared to the previous methods to synthesize CPPs, our synthetic route will be much shorter and easier to operate.

34. Title: Synthesis and study of novel macrocycles containing S/Se and Si

Principal presenter: Marlena Gabriel

Major: Organic Chemistry

Faculty mentor: Dr. Shaozhong Zhang

Abstract: Macrocycles, as important and powerful ligands, are applied in many areas such as ion and molecular sensing, metal ion protection in biomedical imaging, treatment of heavy metal waste streams, drug delivery and increase of drug efficacy, etc. Considerable effort has been directed towards the design and synthesis of sulfur and selenium containing macrocyclic ligands. The objective of this research is to synthesize novel macrocycles containing sulfur, selenium and silicon atoms and study their coordination chemistry with metal ions. The incorporation of the Si atom is to increase the coordination ability of the ligand due to the beta-silicon effect. The target molecules are 12 to 16 membered cyclic thioethers or selenoethers containing silicon. A small molecule bis(chloromethyl)dimethyl silane was used as the starting material. Several macrocycles containing S/Se and Si were synthesized through multi-step synthesis and purified by column chromatography. The products are characterized by 1 H NMR and 13 C NMR spectroscopy. The obtained macrocycles will further react with various metal ions since it is a tetra-dentate ligand with four soft donor selenium atoms in the ring. These sulfur and selenium containing ligands should bind easily to many metals.

35. *Title:* The Association of Mood States & Personality Traits with Attentional Difficulties *Principal presenter:* Amariah Seely

Major: General Experimental Psychology

Other presenters or co-authors: Eunice Opoku Asanoh, Bhavika, Cole Dale, and Kristy Keefe

Faculty mentor: Dr. Jonathan Hammersley

Abstract: Attention deficit-hyperactivity disorder (ADHD) is a childhood neurodevelopmental disorder that affects executive function, attention regulation, and emotional control (Krieger et al., 2020; Kiani et al., 2023). Many individuals with ADHD also experience emotional dysregulation, characterized by excessive, contextually inappropriate, and/or maladaptive emotionality. However, this symptom has not been included as a diagnostic marker in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (Nigg, 2022). In addition, personality traits such as low conscientiousness, low agreeableness, and high trait anxiety were shown to be significantly correlated with inattentive-type ADHD symptoms, while high trait anger and low conscientiousness were significantly associated with hyperactive/impulsive-type ADHD symptoms (Hammersley et al., 2023). Thus, personality is a major predictor of ADHD diagnosis and prognosis, while emotional dysregulation is a potential symptom or side effect of ADHD.

Seventy college student participants were recruited from a Midwestern university. Participants self-reported ADHD symptoms with McCarney-Anderson's Adult Attention Deficit Disorders Evaluation Scale, Self-Report Version (A-ADDES), completed a Five Factor Model personality measure (NEO-Five Factor Inventory), a State-Trait Personality Inventory (STPI), and were given a computerized cognitive performance task (Posner's Covert Orienting of Attention Task; COAT). Stepwise linear regressions were conducted to examine the association between task performance or self-reported attention difficulties, combined emotional dysregulation and personality traits. Trait curiosity was significantly associated with attentional task performance, and the combination of state anger and trait anxiety were significantly associated with self reported ADHD symptoms/attentional difficulties. Interestingly, a follow-up analysis revealed that trait curiosity was correlated significantly and inversely with both inattention and total ADHD symptoms. Further research should focus on such issues as how emotional dysregulation can be integrated within diagnostic criteria or how fluctuations in mood might accompany or co-occur with attentional dysregulation.

36. Title: The Effect of Neem and Clove Oils on Escherichia coli

Principal presenter: Calyn Dupuis

Major: Biology

Other presenters or co-authors: Oluwaseyi Omodiminiyi and Sue Hum

Faculty mentor: Dr. Sue Hum

Abstract: Antibiotic resistance creates a threat to international public health, with antibiotic resistance emerging as a major concern. This research project examines the capability of neem oil, obtained from seeds, as an alternative antimicrobial substance against Escherichia coli. The antimicrobial characteristics of neem oil were assessed using the disk diffusion method on Mueller Hinton agar plates, alongside clove oil and a comparative study using commercial antibiotics. While E. coli displayed sensitivity to the increasing concentrations of clove oil, neem oil did not demonstrate significant antimicrobial activity under the conditions tested. Additionally, liquid culture assays verified the lack of growth inhibition by neem oil. Further research using real-time quantitative polymerase chain reaction (qPCR) and targeted primers investigated the impact of clove oil on E. coli gene expression in key metabolic pathways. These results emphasize the need for continued investigation of alternative antimicrobial substances and mechanisms to address the increased prevalence of antimicrobial resistance in bacteria.

37. *Title:* The effectiveness of Cryptolepine and Xylopic acid in the treatment of malaria in diabetes-malaria co-morbidity in Sprague-dawley rats

Principal presenter: Abdual Latif Penddah

Major: Biology

Faculty mentor: Dr. Richard Musser

Abstract: Background: Cryptolepine, an indoloquinolone alkaloid isolated from Cryptolepis sanguinolenta, exhibits both antihyperglycemic and antimalarial properties. It significantly lowers glucose levels when administered orally in a rat model of diabetes. This antihyperglycemic effect is accompanied by a significant decrease in plasma insulin concentration, suggesting enhanced insulin-mediated glucose disposal. Cryptolepine also increases glucose uptake by 3T3-L1 cells. The antimalarial mechanism of Cryptolepine appears to involve a quinine-like action. Xylopic acid has shown efficacy in the treatment of malaria, demonstrating both curative and prophylactic effects against Plasmodium berghei-induced malaria in mice.

Methods: Plasmodium berghei parasites were isolated from reservoir animals at the University of Cape Coast. The animals were sedated, dissected, and blood was collected via cardiac puncture. The infected red blood cells were isolated through centrifugation. Rats were intraperitoneally inoculated with 0.2 mL of infected erythrocytes containing 1×10^6 parasitized red blood cells to induce malaria. Insulin-dependent diabetes mellitus was induced in overnight-fasted rats by a single intraperitoneal injection of 60 mg/kg Streptozotocin, preceded by 120 mg/kg Nicotinamide. Blood glucose levels were measured using a glucometer.

Results: Treatment with xylopic acid alone for malaria (MOXA) resulted in a 79% efficacy, while treatment with cryptolepine alone (MOCRYP) showed 62% efficacy. The efficacy was lower in the co-morbidity groups: co-morbidity treated with cryptolepine (CMCRYP) had 55.32% efficacy, and co-morbidity treated with xylopic acid (CMXA) had the lowest efficacy at 29.21%. Both haemosiderosis and hemozoin were observed in the liver, but hemozoin was more prominent in the spleen of the co-morbidity group treated with cryptolepine.

Conclusion: Xylopic acid is more effective in treating malaria alone, but its efficacy is significantly reduced in the co-morbidity setting. Cryptolepine, on the other hand, remains effective in treating malaria in both the malaria-only and malaria-diabetes co-morbidity conditions.

38. *Title:* Transforming a third-party Delivery Service Provider's warehouse into a Smart fulfillment center: Adapting strategies for e-commerce business leverage

Principal presenter: Ahamed Ismail Hossain

Major: MBA

Other presenters or co-authors: Tawakalit Ibiyeye

Faculty mentor: Dr. Mohammad Shamsuddoha

Abstract: Small and medium e-commerce businesses maintain their inventory in a traditional warehouse and depend on third-party service providers for delivery. On the other hand, parcel or goods delivery service providers maintain warehouses for short-term storage of upcoming goods for consolidation purposes. This traditional practice puts a few bottlenecks in the supply chain management of e-commerce business. According to research, 51% of e-commerce businesses reported that their fulfillment cost has grown over the last few years. Two warehouses, one for the business and another for the delivery service providers are time-consuming, expensive, labor intensive, and a hindrance to providing proper customer satisfaction. The question, 'How to develop a supply chain model to overcome this problem?' is important in this context. To solve this problem, we propose a supply chain model in this poster for using a single warehouse and converting it into a Smart fulfillment center. Our proposed concept integrates e-commerce, and thirdparty delivery service providers by using only the delivery service provider's warehouse as a fulfillment center. Several technological adaptations for this fulfillment center operations, such as Blockchain technology for integrating all stakeholders in a common platform for real-time data visualization, analytics for warehouse management and customer services, and automation for fulfillment are proposed in this poster. These smart technologies eventually converted a simple warehouse into a smart fulfillment center. Due to the immeasurable growth of e-commerce businesses worldwide, the pressure to explore sophisticated supply chain management strategies for customer satisfaction and profit maximization is rising. According to Forbes, the global e-commerce market will be \$8.1 trillion by 2026. So, an efficient supply chain model for small and medium e-commerce businesses is highly required as this portion is snowballing and offers multiple economic benefits. In our proposed model, a Smart fulfillment center, enabled by Smart technologies will help the business achieve efficiency by focusing on only its core business operations and development. Existing research shows that 64% of businesses can reduce their logistics costs by partnering with a 3PL provider and some businesses have already reduced their logistics costs by up to 80% after integrating multichannel fulfillment services into their operations. However, our model offers solutions to e-commerce businesses using their webbased platform, fulfillment facilities as well as depend on third parties for product delivery. The business scaling opportunity will support delivery service to invest capital to integrate Smart technologies into their warehouse management operation, and facilitate B2B, B2C, and drop shipping business opportunities. This model also benefits effective handling of point delivery, cash on delivery, return handling, integrating delivery service's API into an e-commerce platform, and other strategies for e-commerce businesses to gain efficiency,

transparency, traceability of product, information, and money flow.

Key words: E-commerce, Third Party Delivery Service Providers, Fulfillment center, Smart Technologies

39. *Title:* Advancements in Deep Learning: Implications in Cybersecurity - Research to be presented at MBAA 2024, Chicago, IL

Principal presenter: Richie Imafidon Major: Computer Science Other presenters or co-authors: Anjum Razzaque Faculty mentor: Dr. Anjum Razzaque

Abstract: Within the realm of cybersecurity, deep learning is pivotal for its dynamic nature to detect malware threats. This initial research, transitioning from its literature review to experimental research phase, explores the role of deep learning in detecting malware. It reviews architecture, strengths, and limitations, laying out a robust foundation for probing the application of Convolutional Neural Networks (CNNs) in image-based detection, focusing on fundamental concepts. Additionally, it outlines a proposed future research plan, serving as a guiding beacon for readers new to this discipline, offering a structured top-down research approach.

Keywords: Architecture; Deep Learning; Malware; Neural Networks.

Podium Presentations

1. *Title:* The influence of international non-governmental organizations (INGOs) "Naming & Shaming" on states for their environmental Compliance

Principal presenter: Tarannum Rashid Major: Political Science Faculty mentor: Dr. Ghashia Kiyani

Abstract: This paper critically examines the impact of International Non-Governmental Organizations (INGOs) naming and shaming on the compliance of states with environmental regulations. In the face of urgent global environmental challenges, the role of INGOs in shaping state behavior and ensuring adherence to regulatory frameworks becomes crucial. The central research question guiding this study is:

To what extent are INGOs successful in engaging with states to influence the formulation of environmental policies and ensuring compliance with regulations?

The increasing need for robust environmental regulations to address sustainability concerns is evident worldwide. States, acknowledging the urgency of these issues, have implemented comprehensive regulatory frameworks. Acknowledging as influential entities, INGOs play a pivotal role in advocating for environmental protection and influencing states to comply with these regulations. This research aims to critically analyze the impact of INGOs on state compliance, focusing into both positive contributions and potential challenges within international environmental governance.

Relying on existing scholarly literature, scholars like Marcelo Dias (2013) underscore the significant advocacy role of INGOs in shaping environmental regulations. Studies by Thomas and Mirko (2023) conduct comparative analyses across regions, evaluating the varied influence of NGOs over INGOs in contributing to environmental regulations. Faradj Koliev's work (2023) explores prospective future directions for INGO-state collaborations in advancing environmental regulation. This literature review emphasizes the multifaceted role of INGOs in shaping state compliance and identifies challenges, offering a comprehensive understanding of the dynamics between INGOs and states in environmental governance.

Acknowledging a research gap about the long-term effects and sustainability of INGOdriven initiatives, this paper aims to address this deficiency. While existing research provides valuable insights, there is a prevalent focus on short-term impacts and immediate policy changes. The research design adopts a comparative case study approach, examining a chosen sample of countries representing diverse geographical regions and regulatory contexts. Employing a blend of qualitative and quantitative methods, the study leverages primary and secondary resources, including documents, reports, policy materials, and interviews.

In summary, this research proposal presents a critical analysis of the role of INGOs in influencing state compliance with environmental regulations, guided by a central research question. The study seeks to contribute insightful perspectives, filling gaps in existing research and offering valuable knowledge for policymakers and environmental advocates. By scrutinizing the intricate dynamics between INGOs and states, the research aims to enhance our understanding of effective strategies for promoting global environmental governance.

2. Title: Impact of US Military Training on Recipients States Military Expenditure

Principal presenter: Yinka Yinka Ogunlana

Major: Political Science

Other presenters or co-authors: Seth Kwasi Obiri, Agyapong Dorothy (History), and Purushottam Subedi

Faculty mentor: Dr. Ghashia Kiyani

Abstract: International security has become a crucial discourse in the global system due to the volatility of state relations, necessitating the need for military training. The United States has a rich history of engaging in military assistance and training initiatives worldwide. However, a comprehensive understanding of the consequences of such programs on the defense budgets of partner nations remains elusive. This exploratory research delves into the intricate relationship between U.S. military training programs provided to African and Asian countries and the resulting impact on the recipient nations' military expenditure.

Employing an exploratory research design, this study aims to uncover the nuanced dynamics underlying the link between U.S. military training and the financial commitments of recipient countries to their defense sectors. The research draws on a diverse range of quantitative data sources, including the U.S. military aid and training dataset, and military expenditure datasets. By adopting an exploratory lens, the study seeks to identify patterns, trends, and potential causal relationships between the U.S. and the recipient nations.

The research addresses key questions such as the extent to which U.S. military training influences recipient nations' defense policies and the feedback loops between training effectiveness and subsequent military expenditure. The findings aim to provide a foundational understanding of the complexities inherent in the relationship between military training assistance and the financial commitments of foreign nations to their defense capabilities.

3. Title: Indian blocked and its Impact on Nepal-China Relationship

Principal presenter: Purushottam Subedi Major: Political Science

Faculty mentor: Dr. Jonathan Day

Abstract: Though Nepal, a Himalayan country, is sandwiched between India and China, its trade dependency has been largely with India. Despite a six-decade-long formal relationship, and 1400 kilometres long border sharing with China, traditionally Nepal has had fewer political, diplomatic and trade interactions with this northern neighbour. However, in the latest years, there has been some significant diplomatic dealing with China, including transit and transport agreements. Since the Indian economic blockade in 2015, there has been a narrative suggesting that the coercive diplomacy of its southern neighbour, India, has pushed Nepal towards its northern neighbour, China. Many academics and scholars think that Nepal's relationship with China is positively impacted by the turbulence in its relationship with India. When more than 90 percent members of the Nepalese Constituent Assembly approved the country's new constitution in 2015, India not only revealed its dissatisfaction but also responded by imposing an economic embargo on the country that lasted six months. The blockade resulted in a brutal human crisis in Nepal. A severe shortage of food, medicine, fuel, and other necessities imported from India, heavily disrupted the daily lives of common people. As a result of a fuel shortage that stalled transportation, schools were closed, and the scarcity of necessary medications and gasoline caused a total disruption in healthcare services. Due to a lack of fuel such as LP Gas, common civilians are compelled to cook food on wooden fires. In this context, my study examines the reality of that narrative. I have compared the data regarding foreign direct investment (FDI), aid import-export trade and tourism between Nepal-India and Nepal-China, before and after blockade. I have used the secondary data of the Nepalese Government from 2013 to 2018. Unlike that narrative, the study finds out that the after Indian blockade as well; there was no significant increase in trade interactions between China and Nepal, and a Himalayan country is still largely dependent on its southern neighbour. The study suggests that governments of Nepal should pay more attention to China to diversify its dependencies.

4. Title: Understanding Academic Resilience in International Students

Principal presenter: Maame Esi Assafuah

Major: Psychology

Faculty mentor: Dr. David Lane

Abstract: The landscape of higher education has witnessed a significant shift towards internationalization, with a surge in students from diverse cultural backgrounds pursuing academic endeavors far from home. Despite the popularity of studying abroad, international students often face multifaceted challenges that test their adaptability and academic success in unfamiliar environments (Salleh, 2019). To address these challenges, cultivating academic resilience becomes paramount. Academic resilience refers to individuals' capacity

to effectively navigate academic challenges, setbacks, and adversities while maintaining their well-being and performance (Liew et al., 2020). In the context of international students, academic resilience encompasses excelling academically and coping with social, cultural, and academic adjustments demanded by studying abroad. Despite its importance, standardized approaches to assess academic resilience in international students remain scarce, highlighting the need for methodological consistency and inclusivity (Rudd et al.2021).

International students' key challenges include culture shock, language barriers, homesickness, and financial stressors, which can significantly impact their academic performance (Rathakrishnan et al., 2021). Culture shock, resulting from adjusting to unfamiliar surroundings and customs, can lead to feelings of disconnection and distress. Language barriers pose challenges in communication and academic tasks, while homesickness and social isolation can impact overall well-being and focus on studies. Financial stressors further exacerbate these challenges, affecting access to resources and opportunities for academic success.

However, amidst these challenges, international students demonstrate remarkable resilience. They exhibit adaptability, intercultural competence, and personal growth in navigating academic and social complexities. Mentorship programs have emerged as effective strategies for fostering resilience and helping students overcome language barriers and cultural differences. Additionally, educational aspirations and social connectedness are pivotal in motivating students to persevere despite obstacles (Martin & Marsh, 2006).

The current study delves into academic resilience among international students, considering factors such as homesickness, language barriers, financial stressors, social connectedness, mentorship, and educational aspirations. This study explores the predictors and mechanisms underlying academic resilience among international students. Hypotheses suggest that resilience will moderate the negative impact of adversity variables (language barriers, homesickness, and financial stressors) on academic performance. Higher levels of resilience are expected to buffer the adverse effects of these challenges, allowing students to navigate academic demands more effectively.

The methodology involves surveying college students and collecting data from diverse international students using convenience sampling to ensure representation across various cultural backgrounds and academic disciplines. Through regression and moderation analysis, this study seeks to provide empirical evidence supporting the relationships between mentorship, educational aspirations, social connectedness, resilience, and academic performance among international students. Findings will contribute to a deeper understanding of the nuanced interactions among variables influencing academic resilience. Ultimately, insights from this study may inform interventions and support systems to

enhance the academic success and well-being of international students in higher education contexts.

5. Title: Root finding algorithms with higher computational efficiency

Principal presenter: Maral Tajova
Major: Mathematics
Other presenters or co-authors: Dinesh B.Ekanayake
Faculty mentor: Dr. Dinesh Ekanayake
Abstract: Householder methods provide higher order numerical algorithms to solve f(x)=0.
However, an increase in order necessitates the evaluation of derivatives of increased order.
Subsequently, these methods are not widely utilized due to the increased number of
function evaluations with the increased order. Generally, Hayleys method (order 2
Householder method) is considered the optimal. In this presentation, we discuss fourth
order methods with a parameter that can be utilized to increase the rate of convergence.
Using finding roots of a number as an example, we compare the proposed methods with the first three Householder methods.

6. *Title:* Comparative Analysis of Classical and Quantum Cryptography: Assessing Performance and Adaptability in a Simulated Environment

Principal presenter: Ekene Adim

Major: Computer Science

Other presenters or co-authors: Teslim Aminu and Tahir Khan

Faculty mentor: Dr. Tahir Khan

Abstract: The landscape of cryptography and data encryption is evolving rapidly, driven by advancements in quantum computing [1]. In an era where information security is paramount, cryptography plays a crucial role in protecting sensitive data. Encryption techniques serve as vital tools for data security, ensuring privacy, integrity, protection against cyberattacks, and compliance with the law [2]. While businesses can harness quantum computing to optimize investments, improve encryption, and explore new opportunities, the associated costs are significant-quantum computing expenses surged from \$30 million in 2012 to \$450 million in 2019 [3]. Developers must be adept at employing various encryption algorithms, as these will become increasingly essential with technological progress [4].

This research systematically compares classical and quantum cryptographic algorithms to address escalating security concerns amidst advancing technologies.

This research conducts a comprehensive comparative analysis of Classical and quantum cryptographic algorithms, assessing their strengths and weaknesses regarding speed (referring to the time taken for encryption and decryption) and efficiency (effectiveness of a specific algorithm across the different inputs data provided). This research investigates four

Classical cryptographic algorithms, including ChaCha20, Advanced Encryption Standard (AES), Lai-Massey, and Blowfish, which were examined within the scope of this study. Employing a simulation framework, three distinct scenarios are evaluated: (1) behavior with limited lines of plaintext, (2) performance with extensive text, and (3) handling of both numerical and symbolic data. The primary objective of the research is to elucidate the adaptability and resilience of Classical and quantum cryptographic approaches across various input types. The findings show that while classical approaches maintain robustness and efficiency for small datasets, they exhibit varying performance levels when handling larger volumes and diverse data types. While not immune to vulnerabilities, Quantum approaches exhibit enhanced speed contingent on the key size of the algorithm and data characteristics referring to data of plain texts and/or data including numbers, symbols, etc. This paper underscores the contextual advantages of Classical and quantum cryptographic approaches, emphasizing the necessity for well-informed decisions in cryptographic applications as technology evolves.

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7. *Title:* Quantum Zeros and Ones: Leveraging Quantum Entanglement for Game Strategy Optimization

Principal presenter: Md Nazmul Haque Nihad Major: Physics

Faculty mentor: Dr. Kishor Kapale

Abstract: In the realm of competitive gaming, achieving a consistent winning streak is not possible due to inherent classical limitations. This project aims to revolutionize game strategy by harnessing the power of quantum entanglement.

The game involves two teams and a referee, operating within a 3x3 grid. Each team is tasked to fill either one of the rows or columns of the grid, adhering to specific rules: the row team must maintain an even number of ones, while the column team must fill an odd number of ones. The referee randomly assigns choices of rows and columns to the teams for each round. To win against the referee the digits put in the overlapping square are needed to match. This leads to a dynamic and unpredictable gameplay experience. The classical

strategy, because of the parity differences between row and column choices, works only 8 out of 9 in each try. Thus, the probability of winning diminishes rapidly with multiple tries.

The proposed strategy exploits quantum entanglement to synchronize the choices made by both the row and column teams. Due to the entanglement in the specially prepared initial state, the teams ensure that despite not being aware of each other's decisions, their picks (which result from quantum measurement) inevitably coincide, resulting in victory. This game, which we call 'Quantum Zeros and Ones', demonstrates how quantum entanglement can be harnessed to go beyond what is classically achievable. This new approach to classical games, using predefined quantum strategy, may have practical implications in the field of game theory.

8. *Title:* Assessing Access and Use of Oral Healthcare in LGBTQ+ and Undocumented Immigrants in the United States

Principal presenter: Grace Keziah Dadala Major: Public Health Other presenters or co-authors: Paul Jemimah Dadala Faculty mentor: Dr. Maureen Bezold

Abstract: Oral healthcare is defined as the healthy maintenance of gums, teeth, and mucous membranes. Regular dental check-ups, cleanings, restorations, extractions, and oral infection treatments come under oral healthcare services. Due to racial, ethnic, sexual, economic, and educational barriers, some communities are marginalized and face challenges accessing oral healthcare. This research study focuses on two communities including LGBTQ+ and undocumented immigrants in the United States and aims to address challenges in accessing oral healthcare.

Significance of the study: This study outlines factors influencing two marginalized populations' access to and use of oral healthcare services. The study aims to compare this populace with other groups in the United States including non-LGBTQ+ and U.S. residents. Results of this study will help with the planning and allocation of resources for oral health policies, programs, and services. The study will also enlighten public health and dental healthcare professionals about the provision of equitable services for these communities.

Literature review: A study conducted with LGBTQ+ community members in Indiana and Michigan found that 71% of LGBTQ+ patients regularly attended dental appointments, 43% reported feeling uncomfortable, and 34% were treated unfairly during appointments due to sexual orientation. Another study reports that because of barriers like discrimination or harassment, a decline in mental health, increased stress levels, or complex medical history, transgender patients are at increased risk of poor oral health. As for undocumented immigrants, one study revealed that more than 50% suffer from periodontal diseases and approximately 40% have cavities. Unfortunately, many undocumented immigrants are uninsured and are afraid to seek treatment. Poor oral health can negatively impact overall health leading to worsening various cardiovascular, and metabolic diseases in addition to pregnancy complications and cancers.

Methodology: A questionnaire consisting of 25 questions with a combination of Likert scales, multiple choice, and open-ended questions will be sent out to 50 individuals from the LGBTQ+ community and 50 undocumented immigrants. The first section consists of demographic details and the second section consists of questions regarding access to oral healthcare. The data will then be analyzed to determine if there are any differences in accessing and using oral healthcare for these two marginalized communities.

Expected outcomes: There are several outcomes that will come out of this study. First, we will gain additional knowledge of the difficulties LGBTQ+ and undocumented immigrants face that impact access and utilization of dental healthcare services. An assessment of the efficacy and significance of current or suggested policies, programs, or interventions aimed at enhancing marginalized communities' access to oral healthcare. We will be able to recommend policies that can ensure access and utilization of oral healthcare. It is our hope that professionals will build fair, tolerant, and culturally aware oral healthcare systems for LGBTQ+ and undocumented immigrants.

9. Title: Beyond the Field: Making the Case for Teenage Employment

Principal presenter: Nathaniel Hines Major: Master of Science: Recreation Administration Other presenters or co-authors: Megan Owens Faculty mentor: Dr. Megan Owens

Abstract: Employee recruitment is a challenge across all industries. More difficult, is finding employees aged 16-18 due to their involvement in different extracurricular activities. Research suggests that teens, specifically in Gen Z (1996-2009), desire to participate in activities and work, but are conflicted on which to choose (Lasson 2022). Only 7% of young people are not engaged in some form of education, employment, or training (Lasson, 2022). Low employment rates have become problematic for public recreation agencies, as they try to fill summer seasonal positions. As a result, some agencies have reduced facility hours or closed facilities altogether.

The purpose of this professional project was to learn and identify high-quality methods to engage with and encourage teens to apply for summer seasonal positions, and identify, and design a recruitment and marketing package to utilize with area teen activity leaders to describe the mutually beneficial experience of summer employment for their participants. Four questions guided this professional project:

*What are the primary motivators for high school teens to apply for seasonal jobs within

the recreation sector?

*What are the key life skills related to seasonal work and teen activity involvement? *What information is necessary for travel coaches to support their teen participants' summer jobs?

*What is the perception of season jobs to travel league coaches?

The focus population was Illinois parks and recreation practitioners. University IRB approval was obtained, and participants consented prior to completing their survey and subsequent interview. Data was gathered through online self-administered surveys and interviews conducted over Zoom. The online survey questions centered on the types of available positions for teens, recruitment methods for teen employees, and the life skills gained through employment. Survey respondents were invited to participate in follow-up interviews which focused on gaining a deeper understanding of the teens' involvement in their activities in relation to their seasonal position and how those newfound skills and experiences can be brought back to improve their teams/activity groups. Interviews were recorded with participants' permission, and then transcribed verbatim for analysis. The analysis involved descriptive statistics of survey data, thematic coding of open-ended questions, and interview transcripts. Overarching thematic connections were identified across the data.

Results suggest that practitioners believe teens gain a variety of life skills from seasonal work including teamwork, responsibility, and time management. Practitioners believe these skills can also benefit teens' teams or activities. These skills are not exclusive to a specific sport or job, and both a part-time job and a sport can benefit the teen and the community.

The combination of athletics, external activities, and seasonal employment could provide teens with deeper, more enriching experiences. This project suggests that coaches and parks and recreation practitioners may play a vital role in the teen developmental process. Through the conclusion of this project, I would recommend that parks and recreation employers and youth leaders work collaboratively to support teens' development. To assist the teens' life trajectories, we should be striving to work collaboratively, going beyond the field, making the case for teenage employment.

10. *Title:* GIS Based Accessibility Analysis for Neighborhood Parks, The Case of McDonough County, Illinois

Principal presenter: Taiwo Agbaje Major: GIS Faculty mentor: Dr. Christopher Sutton

Abstract: This study sought to examine the accessibility of park services in McDonough County by analyzing travel distances, spatial distribution, and the size of neighborhood park areas. Furthermore, the objective was to pinpoint parcels in close proximity to parks and illustrate the tool's ability to optimize the utilization of neighborhood parks. The primary criteria for assessment included the distance between parks and surrounding homes, and a GIS-based network analysis tool was employed to map the service area.

11. Title: Modeling CO2 emission in South Asian countries

Principal presenter: Md Zobayer Bin Amir

Major: Mathematics

Faculty mentor: Dr. Dinesh Ekanayake

Abstract: The average world temperature has increased steeply in recent decades, primarily due to the significant emission of carbon dioxide and other greenhouse gases. From 1990 to 2014, global carbon emissions surged from 1.6 billion tons to over 36 billion tons. Here we explore the impact of economic growth on CO2 emissions in South Asian countries over the 2003-2021 period. We assess the moderating role of renewable energy in reducing CO2 emission related to industrialization. We further explore the impact of the COVID-19 pandemic during 2020-2023. To analyze the association between economic growth and CO2 emission, we use per capita GDP (PPP), industry value added, annual urban population growth, renewable energy consumption, trade, air passenger transport (APT), and air freight transport (AFT) as predictor variables. While most of the variables are chosen to quantify the economic growth, APT and AFT are chosen as proxy variables to model the impact of the COVID-19 pandemic. We demonstrate that per capita GDP, renewable energy consumption, and air transportation alone can fully characterize the emission in south Asian countries.

12. Title: It's a Femininomenon: Chappell Roan and the Creation of Sapphic Genre

Principal presenter: Madalyn Pridemore

Major: Musicology

Faculty mentor: Dr. Anita Hardeman

Abstract: Sapphic musicians have created their own space within indie pop, revolutionizing the genre through their amalgamation of mainstream and queer culture while narrating their youthful experimentation with personal identity. One such artist, Chappell Roan, manipulates a series of intertwined personas in The Rise and Fall of a Midwest Princess while queering traditional pop musical signifiers, continuously altering her construction of a playfully feminine, campy style, and reflecting a shared sapphic experience through her discovery of personal identity. In this paper, I will examine two songs from Chappell Roan's The Rise and Fall of a Midwest Princess, "Pink Pony Club" and "Red Wine Supernova," and the personas she creates in each to better understand Chappell's own queer experience as one account of sapphic culture.

Chappell Roan's selection of a feminine, drag queen-inspired appearance allows both characters to navigate the liberation of female sexuality and disrupt gender roles through her conscious use of camp and elements of drag. Her characters demonstrate her subversion

of gender roles through allowing herself agency as a young woman both as an object of desire and the active pursuant, with one character performing in a typically heteronormative space and the other portraying an unmistakably queer narrative. By exploring these themes and creating personae within each song and video, Chappell Roan opens a space for herself within indie pop, placing herself amongst the creations of other sapphic-identifying artists, further expanding the group and defining a modern sapphic musical culture. Examination of Chappell Roan's artistic and musical practices presents a possible methodology to better understand the methods by which queer women have created a space for themselves within the larger popular music landscape.

13. Title: Our Tax Code is Misogynist

Principal presenter: Selina Mannion Major: MBA

Faculty mentor: Dr. Brett BogenSchneider

Abstract: The tax code is misogynist: Single women make up the largest growing demographic. 25% of women in the United States age 40 or older have never been married. This excludes women that have been divorced or widowed. Yet, they are expected to make less while being penalized by our tax code. The tax code favors one high earner with one stay at home parent. The high earner to this day is usually a man. The majority of workers with a stay at home spouse are men.My project will try to prove that today's patriarchy and male denomination is reinforced by the tax code. A single woman will pay way more in taxes despite the fact that she is usually the one taking care of her eldery relatives.

14. Title: Women's Rights in Africa: The CEDAW and ACHPR in the 21st Century

Principal presenter: Ebenezer Kojo Gyesi Mensah

Major: Sociology

Faculty mentor: Dr. Ghashia Kiyani

Abstract: The struggle for women's rights in Africa has been characterized by pervasive gender-based violence, systemic discrimination, and limited access to economic, healthcare, and educational opportunities. However, despite these challenges, advancing women's rights is imperative due to women comprising about half of the continent's population. The Universal Declaration of Human Rights and the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) uphold women's rights to equality and non-discrimination. Regional protocols like the Maputo Protocol and legal frameworks such as the African Charter on Human and Peoples Rights (ACHPR) provide additional protections for women's rights in Africa. These international agreements and legal frameworks serve as crucial tools for advocacy, policy development, and legal reform to address gender-based discrimination and advance women's empowerment. Yet, integrating these instruments effectively into African domestic settings to combat violence against women pose challenges due to inherent weaknesses and difficulties. Thus, prioritizing the protection and progress of women in regional human rights instruments is vital for

addressing gender inequality in Africa. This article critically examines the successes and challenges of advancing women's rights in Africa using international conventions and regional legal frameworks. It looks at the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) and the African Charter on Human and Peoples' Rights (ACHPR). This paper explores the significance, limitations of these conventions, and also looks into the difficulties in incorporating these global and regional frameworks into national contexts to address gender-based violence (GBV) and intimate partner violence (IPV). Importantly, it proffers pragmatic strategies in advancing gender equality and women's rights in Africa. The relevance of this article could be seen from the fact that as observed by the United Nations, Africa has a high incidence of violence against women. Hence, this article succinctly delves into women's rights issues thereby adding it voice to the call for non-discrimination and gender equality which is a great tenet and designation of WIU.

15. *Title:* Etruscans in Museums- Ethics, Looting, and The Protection of Cultural Heritage *Principal presenter:* Sarah Tapper

Major: Museum Studies

Other presenters or co-authors: Tate Drennen

Faculty mentor: Dr. Heidi Lung

Abstract: The Etruscans are a civilization shrouded in mystery and have had an interesting lore surrounding them since antiquity. Etruscans were a powerful and respected population that influenced the Greeks and Romans and, from those influences, created an intricate and fascinating culture that is often misunderstood. My research aims to evaluate why the Etruscans matter and how their fate as a "lost civilization" has brought their objects to the center of many controversies in the museum space. Specifically, the criminal acts that the Etruscans are often victims of, which many museums have been the perpetrators of. In order to achieve this, I will be looking at the looting of cultural sites, such as the burial grounds in Cerveteri and Tarquinia, and the illicit trade of Etruscan antiquities. This is to educate about the problematic past of museums that have disregarded ethics of cultural heritage in order to showcase fascinating items and how many cultures are victims of this because of lack of protection. Then, I will go into how some organizations are working towards rectifying this issue and some solutions on how to work towards a better understanding of these issues. Finally, I will go more specifically on how these issues affect not only the Etruscans but also how people can educate themselves to help in the prevention of these crimes.

The steps taken to complete this project will include closely examining what we know about Etruscan culture. This includes a base-level history of the Etruscans and their relationship with the world around them in Etruria. An important step then is to view the sights where a lot of cultural looting is taking place and what pieces are usually taken.

16. *Title:* Facing Forward, Looking Back: The Transmission of Chinese Culture in Singapore Through Music

Principal presenter: Ethan Schuller Major: Master of Music, Musicology Faculty mentor: Dr. Anita Hardeman

Abstract: Singapore's population is unique in that it is made up almost entirely of various immigrant groups, with the major four ethnic groups being Chinese, Malay, Indian, and Eurasian-the descendants of the unions between Europeans and Asians during Singapore's period as a British colony. Each ethnic group brought with them to the island their native customs, cultural practices, and music. Singaporeans today take pride in their nation being one of diverse peoples, religions and ideas. This distinctive aspect of Singapore's population makes it a ripe subject for study on cultural preservation within diasporic communities, and how they adapt to the steady march of modernism and generational drift from the originating culture. As the broader culture moves closer to this globalized ideal, intergenerational tensions have arisen within localized ethnic groups as some traditional cultural practices lose ground to a more cosmopolitan, globalized lifestyle. In this modern cultural setting, successive generations of Chinese Singaporeans have very different relationships with traditional Chinese cultural practices, and there seems to be little agreement even within the Chinese community of what it means to be a "Chinese Singaporean."

This presentation will explore the issue of music and cultural identity in diasporic populations by investigating huayue, or traditional Chinese music, in the Singapore Chinese community. Using data that I collected from doing fieldwork in Singapore during the summer of 2023, I will examine several capacities in which it manifests in Singapore, both in public performances and in the classroom. These different elements of the Chinese musical ecosystem of Singapore have very different missions and philosophies. My goal is to explore what huayue means to Chinese Singaporeans, and through this investigation determine what function music can serve in building and defining a community's cultural identity. As the cultural identity of Chinese Singaporeans shifts and grows to accommodate our globalized world, their relationship with traditional Chinese music and its function changes to accommodate new ideas of what it means to be part of the Chinese diaspora. I will investigate the spaces between which musical practices go from strictly Chinese to Singaporean Chinese, to uniquely Singaporean.

17. Title: Monophonic Harmony: Analysis of plainchant through the harmonic series. Principal presenter: Kaylin Vos Major: Master of Music in choral conducting Faculty mentor: Dr. Anita Hardeman Abstract: In our Western musical culture, deeply entrenched in tertian harmony, monophonic vocal music may hardly seem a significant contributor to the discussion of tonality. However, research by Richard Parncutt proposes a theory of pitch relations within the harmonic series which are foundational to the construction of plainchant, and could be understood as a system of implied harmony. This work suggests that the scope of functional tonality present in plainchant is wider than previously thought. Additionally, recent work in the realm of voice science debunks the idea that vocal music is monophonic at all. The vocal folds themselves produce both a fundamental frequency and an entire harmonic series, and in a phenomenon known as "vocal sonance" the voice constantly oscillates between a higher and lower pitch, even when the ear perceives only one. Between these two functions of the voice, the assumption that the voice is a monophonic instrument becomes questionable. If the voice is not capable of producing a merely monophonic line, then it must have some innate harmonic dimension. The use of the harmonic series as a harmonic analytical tool represents a new framework for understanding a capella vocal music, particularly plainchant. Currently, such analysis has only been done on the corpus of common practice Gregorian chant, which is modally stable and stays within a narrow oneoctave range. When applied to the wide-ranging and modulatory music of post-Gregorian composer Hildegard von Bingen, notable points of consistency and discrepancy with Parncutt's predictions for chant composition surface.

18. Title: Individual Differences in Enjoyment of Horror Experiences

Principal presenter: Juan Ramirez

Major: Psychology

Faculty mentor: Dr. Kristine Kelly

Abstract: Every year many individuals line up to experience the thrill of going through a haunted house. It can seem paradoxical to engage in an activity that purposely places one in a heightened state of fear. The current literature on the psychology of horror lists the experiences of creepiness, disgust, horror, and fear as existing on a spectrum (Taylor & Uchida, 2022). Each of these experiences are related but are their own distinct experiences. Creepiness is usually thought of as the anxiety that builds up when one is placed in a novel situation and isn't sure how to react (McAndrew & Koehnke, 2016). Taylor and Uchida (2022) define the experiences of disgust, horror, and fear as follows. Disgust is the sense of revulsion toward a person or thing that violates social rules or norms. Breaking these norms damages one's community or individual's purity, leading to the feeling of disgust. Fear is observed by threats to oneself, an emotional response to personal danger. Horror is the emotional response to danger upon others.

Many studies have focused on studying only one of these experiences in relation to other factors, usually examining the relationship between horror and haunted houses (Anderson et al., 2020; Scrivner et al., 2023). However, few studies examine the broader spectrum of horror experiences as a whole. Further, much of the current literature is focused on creating personality profiles of horror enjoyers in relation to the big five personality traits (Clasen et al., 2020; Scrivner et al., 2023). Few are creating profiles with other personality traits

indexes. This study aims to explore the wider spectrum of horror-related experiences (Creepiness, Disgust, Fear, and Horror) to create a personality profile for enjoyers of these experiences using the HEXACO Personality Inventory. The HEXACO measures an additional trait that I am interested in studying: Honesty-Humility. Since most research focuses on the big five traits, Honesty-Humility is often overlooked.

Participants will be 100 undergraduate college students who complete an online survey. The survey consists of an 8-item questionnaire measuring enjoyment of creepiness, disgust, horror, and fear. The second questionnaire is the HEXACO Personality Inventory (Ashton & Lee, 2009), which contains 60 items that comprise six subscales (Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to New Experiences. We are currently collecting data and will conduct statistical analyses at the end of March. We will be using correlational analyses to examine the relationships between the six personality factors and enjoyment of the four horror-related experiences. The potential findings of this study are important because they will provide more literature to the small body of research on horror experiences.

19. *Title:* Anti-Cancer Activity of Novel Cobalt, Copper, Manganese, Iron, and Silver Benzothiazole and Benzoimmidazole Complexes

Principal presenter: Tolulope Bolarinwa

Major: Chemistry

Other presenters or co-authors: Temitope Olalekan

Faculty mentor: Dr. Mette Soendergaard

Abstract: In the United States, pancreatic carcinoma stands as the fourth leading cause of cancer-related deaths for both genders. It is responsible for a little over 7% of all cancer-related fatalities and approximately 3% of all cancer cases. Despite the advancements in medical therapies and surgical techniques, the 5-year survival rate for this disease remains below 2%, and the median survival time after diagnosis is less than six months. Regrettably, several chemotherapeutics exhibit adverse side effects and fail to treat the patient long-term, thereby necessitating the pursuit of novel, effective, and non-toxic therapies.

The present research aims to examine the anti-cancer effectiveness of nine synthetic compounds {2-(2-benzothiazolyl)-5-methoxyphenol (2HA), Tri(2-(2-benzothiazolyl)-5-methoxyphenol)cobalt(III) (2HA-Co), Di(2-(2-benzothiazolyl)-5-methoxyphenol)copper(II) (2HA-Cu), (2-(2-benzothiazolyl)-5-methoxyphenol)silver(I) (2HA-Ag), 1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2-thione (J1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2thione)manganese(III) (MnJ1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2-thione)iron(III) (FeJ1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2thione)cobalt(III) (CoJ1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2thione)cobalt(III) (CoJ1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2benzimidazole-2-thione)nickel(III) (NiJ1)} on the Mia-Paca-2 cell line derived from human pancreatic ductal adenocarcinoma. Dimethyl sulfoxide (DMSO) was utilized as a solvent to prepare the nine synthetic compounds {2-(2-benzothiazolyl)-5-methoxyphenol (2HA), Tri(2-(2-benzothiazolyl)-5-methoxyphenol)cobalt(III) (2HA-Co), Di(2-(2benzothiazolyl)-5-methoxyphenol)copper(II) (2HA-Cu), (2-(2-benzothiazolyl)-5methoxyphenol)silver(I) (2HA-Ag), 1,3-Dihydro-5-[(E)-[(2hydroxyphenyl)methylene]amino]-2H-benzimidazole-2-thione (J1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2-thione)manganese(III) (MnJ1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2H-benzimidazole-2thione)iron(III) (FeJ1), Di(1,3-Dihydro-5-[(E)-[(2-hydroxyphenyl)methylene]amino]-2Hbenzimidazole-2-thione)cobalt(III) (CoJ1), Di(1,3-Dihydro-5-[(E)-[(2hydroxyphenyl)methylene]amino]-2H-benzimidazole-2-thione)nickel(III) (NiJ1)}. Mia-Paca-2 cells were cultured overnight and then treated for 48h with 1 µM and 10 µM of each compound using 100 µM paclitaxel and DMSO as controls. The anti-cancer activity was examined by measuring the cell using MTT (3-[4, 5-dimethylthiazol-2-yl]-2, 5diphenyltetrazolium bromide). The result for each treatment was compared to the DMSO control using one-way ANOVA statistical analysis with a Dunnett post-analysis for multiple comparisons. 2HA-Cu showed a reduction in cell viability at 1 µM, while 2HA, 2HA-Cu, 2HA-Ag, FeJI, CoJI, and NiJI decreased cell viability at 10 µM (p-value

20. Title: Persistence of Resident Data Record in Master File Table

Principal presenter: Christiaan Masucci

Major: Computer Science

Other presenters or co-authors: Tahir Khan

Faculty mentor: Dr. Tahir Khan

Abstract: Digital devices, including computers, smartphones, and servers, store data for a multitude of purposes, such as preserving memorable photos, vital documents, financial records, and personal information. Users have the ability to create and delete data on these devices. When data is deleted from a device, it may become unrecoverable, remaining lost forever. However, if a user is a suspect and deletes evidence from a device recovered from a crime scene, it has significant implications. To prosecute a suspect in court, all evidence related to the case, including deleted data, must be attempted to extract from the device and presented. Every operating system utilizes a file system to organize the data created by users, the operating system itself, or other devices interacting with the system. In a Windows client operating system, such as Windows 11, all files and folders' metadata, including the content of the resident file, are stored in a Master File Table (MFT). The MFT is a crucial file in the NTFS file system, storing metadata such as file and folder creation dates, entry modified dates, access dates, last written dates, physical and logical file size, and Access Control Lists (ACLs) of the files, as well as the actual content of the resident data [1]. In this study, the New Technology File System (NTFS) was used to examine deleted resident files on a Windows 11 operating system, running on an AORUS 15P laptop

with a Solid-State Drive (SSD). The focus of this research is on the resident data record, which stores the actual content of the file along with the metadata in the MFT. Non-resident files store metadata but not the file content in the MFT; instead, they record an offset value pointing to the content's location on the disk. The research focuses on resident data and NTFS, aiming to determine how long it takes for an operating system using NTFS to overwrite deleted resident records from the MFT file and identify factors influencing the persistence of deleted data. Users can delete files through various methods, including sending them to the recycle bin by selecting and pressing the delete key, bypassing the recycle bin by holding down the shift key and pressing delete, deleting via command line using commands like rm, or employing a customized script. In this study, resident files were deleted using a customized script to assess their persistence in the MFT and understand influencing factors. The results show that file systems automatically overwrite deleted file records, even without any further user involvement after deletion. Rebooting the system after file deletion increases the likelihood of overwriting the previously used record in MFT. The study's findings indicate that resident data is rapidly overwritten on a machine using NTFS and operating from an SSD. This underscores the significance of investigating the persistence of resident data records in the MFT within the realm of digital devices and file systems.

Reference: [1] Gurkok, C. (2017). Cyber Forensics and Incidence response. In Elsevier eBooks (pp. 603-628). <u>https://doi.org/10.1016/b978-0-12-803843-7.00041-7</u>

21. *Title:* Raman study of Binay Bismuth Borate glasses doped with Praseodymium ions *Principal presenter:* Kushal Dahal

Major: Physics

Other presenters or co-authors: P.K. Babu and Saisudha B. Mallur

Faculty mentor: Dr. Saisudha Mallur

Abstract: Glass is a supercooled liquid that lacks long-range order. Raman spectroscopy is a powerful technique for studying structures and structural changes following the inelastic light scattering of photons. Extensive research has been done to study the structural properties of glasses using Raman spectroscopy. We prepared a series of glass samples of bismuth borate doped with praseodymium ions [x Bi2O3: (100-x) B2O3 where x: 30, 40, 50, and 60] by varying the glass composition. Sample preparation is carried out using the following steps: composition collection, weighing & mixing, melting, quenching, annealing, and smoothing & polishing. The Raman data were taken using a Nano-photon Spectrometer. Different Raman peaks can be seen in the graph for intensity versus wavenumber. We deconvoluted the peaks by the Gaussian fitting method. Once the peaks are resolved, the functional groups corresponding to different peaks are identified by comparing them with prior studies in similar glasses. A preliminary analysis indicates that peaks between 100- 500 cm-1 correspond to different vibrational frequencies of bismuth oxide (Bi - O) groups, and peaks > 500 cm-1 correspond to borate groups (B-O). The

compositional effects on the intensity of the peaks are being studied.

22. *Title:* The Anti-Cancer Effect of Eyeball Plant (*Acmella spp*) Extracts in Ovarian Cancer

Principal presenter: Femi Egbeleke Major: Biology

Other presenters or co-authors: Shelby Henning and Mette Soendergaard Faculty mentor: Dr. Mette Soendergaard

Abstract: Ovarian cancer is the fifth leading cause of cancer death in females in the United States. Annually, approximately 19,710 new cases and 13,270 deaths caused by the disease are estimated by the American Cancer Society. Treatment options for ovarian cancer are surgery, chemotherapy, radiotherapy, immunotherapy, and combination therapy, which are inefficient for many patients with about 32% succumbing to the disease. These dire statistics emphasize the need for new and efficient therapies. Plants are a rich source of natural products that may show anti-cancer activity. In fact, approximately 50% of the Food and Drug Administration approved chemotherapeutic drugs have origins in natural compounds.

This study investigates the anti-cancer effect of Acmella alba, Acmella oleracea, and Acmella calirrhiza plants on the SKOV-3 cell line of ovarian cancer. The leaf, stem, root, and flower of the three Acmella species were harvested, freeze-dried, crushed into fine powder, and extracted using water, methanol, and ethanol. After evaporation at 50°C, the extracts were resuspended in dimethyl sulfoxide (DMSO). The SKOV-3 cells were grown overnight and then treated for 48 h with 0.2 mg/ml of each extract, using 100 µM paclitaxel, and DMSO as controls. The anti-cancer effects of the Acmella extracts were investigated using the 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) cell viability assay. The results were subjected to one-way ANOVA statistical analysis with a Dunnett post-analysis for multiple comparisons to the DMSO treatment. Of the water extracts, the leaf, stem, and flower (Acmella alba), the leaf and flower (Acmella oleracea), and the leaf, stem, flower, and root (Acmella calirrhiza) showed a statistically significant (p<0.05) reduction in the cell viability. The methanol extracts of the flower (Acmella alba), the leaf, stem, flower, and root (Acmella oleracea), and the leaf ((Acmella calirrhiza) significantly lowered the cell viability. Finally, the ethanol extracts of the leaf, stem, flower, and root (Acmella alba), the leaf, stem, flower, and root (Acmella oleracea), and the leaf, stem, and flower (Acmella calirrhiza) were found to significantly reduce the cell viability. These results reveal that the Acmella extracts exhibit anti-cancer activity, which indicates that there may be compounds in these plants that may be utilized in the development of new treatments of ovarian cancer.

23. *Title:* An Exploration of Self-Determined Motivation, Diversity Climate, and Organizational Commitment

Principal presenter: Leo Ofili Major: General Experimental Psychology Faculty mentor: Dr. David Lane

Abstract: With increasing attention to diversity and inclusion in organizations, it is essential to understand how diversity climates influence employee attitudes and behaviors. This study focuses on how perceived diversity climates influence intrinsic motivation and organizational commitment. The current study uses Self-Determination Theory (SDT) as a foundation and proposes that a positive diversity climate which is characterized by inclusivity and respect for diversity leads to higher levels of intrinsic motivation, organizational commitment, and greater fulfillment of the three basic psychological needs (autonomy, competence and relatedness). The study employs a randomized betweensubjects design, in which participants will be provided with a characteristic definition of a positive or neutral diversity climate before being asked to engage in a reflection task. The current study will assess their motivation, organizational commitment, and basic psychological needs fulfillment levels using the Work Extrinsic and Intrinsic Motivation Scale (WEIMS), the Work-Related Basic Need Satisfaction Scale (W-BNS), and the Organizational Commitment Questionnaire (OCQ). A manipulation check will verify the effectiveness of the climate portrayal. The expected results indicate that creating a supportive environment for diversity is crucial for boosting intrinsic motivation and commitment. It also provides valuable insights for enhancing workplace dynamics and managing diversity effectively.

24. *Title:* Channel Preference in the Workplace in a Post Covid-19 Era: Face-to-face or Email

Principal presenter: Zaynab Yusuf

Major: Communication

Faculty mentor: Dr. Christopher Carpenter

Abstract: This study examined respondents' channel preference for reducing uncertainty and resolving equivocality in task-related messages between face-to-face and email. The study aimed to discover if the fact that the post-Covid-19 era has ushered in a wave of high usage of emails might cause people's preferences to change. Hinged on Daft and Lengel's Media Richness Theory, which posits that people would prefer to use face-to-face than email, the study surveyed 153 student employees in a University environment. Findings show that participants prefer to use e-mail in uncertainty-reducing situations than face-to-face. However, they would still prefer to use face-to-face with equivocality resolving situations.

Key terms: media richness theory, channel preference, face-to-face, email, reducing uncertainty, resolving equivocality.

25. *Title:* Integrating Artificial Intelligence in Managing Communication Apprehension: Best Practices Moving Forward

Principal presenter: Zaynab Yusuf

Major: Communication

Faculty mentor: Dr. Christopher Carpenter

Abstract: Over the years, scholars have proposed different approaches to managing communication apprehension, aiming to support students in developing practical communication skills (McCroskey, 1984). However, the evolution of technology and the integration of artificial intelligence (AI) in education have sparked a need for innovative strategies to address communication apprehension. This paper aims to provide a concise overview of communication apprehension and the existing methods to manage this issue. In addition to discussing established techniques, the paper delves into scholars' perspectives on incorporating AI technology to enhance public speaking skills and alleviate apprehension. By leveraging AI capabilities, such as natural language processing, real-time feedback, and simulation-based learning environments, researchers believe there is an opportunity to transform apprehension management and provide tailored support to students. Furthermore, this paper offers suggestions for future directions in research and practice, urging communication scholars to explore the possibilities of integrating AI technology into existing apprehension management approaches and to continuously explore innovative approaches to addressing communication apprehension in foundational communication courses. By integrating AI into apprehension management, communication scholars have the potential to revolutionize public speaking education, enabling students to develop their skills and confidence while minimizing anxiety.

26. *Title:* Replication of Ironic Message Production: How and Why We Produce Ironic Messages

Principal presenter: Md Shahedur Rahman

Major: Communication

Faculty mentor: Dr. Josh Averbeck

Abstract: The reason for replicating the 2008 study on how people produce messages and use irony in conversation to each other is based on the fact that the way we communicate with each other keeps changing. Irony, as a multifaceted tool, plays a significant role in communication, serving various purposes from sarcasm and insults to compliments. Its impact on interpersonal relationships is profound, making it a vital area of study in communication research. Given that the original study was conducted 15 years ago, it is imperative to reassess its findings in the context of considerable societal, political, and technological changes that have occurred since then. These changes potentially influence how irony is used in communication, especially among college students who are often at the forefront of adopting new communication styles and technologies. The substantial interest in the topic of ironic messages is underscored by the considerable academic attention it has garnered. The original study, a pivotal piece in this field, has been cited 57

times, reflecting its influence and relevance in academic discourse. Furthermore, a search on Google Scholar reveals an impressive tally of 18,200 results related to ironic messages since 2019 alone. This high level of scholarly engagement signals the significance and ongoing relevance of this topic in the realm of communication studies. Replications, as McEwan et al. (2018) assert, are crucial in reinforcing the confidence in research findings within the field of communication. By replicating the original study with the same variables, hypotheses, measurement methods, procedures, and population, this study aims to provide a contemporary perspective on the use of irony among college students. As Hunter (2001) emphasizes, such replications are not only vital for confirming the findings of original studies but also for contributing to the collective knowledge in communication research. Replication is central to the scientific process in communication studies, as it strengthens the reliability of theories and knowledge claims, as noted by Chaffee & Berger (1987). This replication study, therefore, serves to either reaffirm or revise our understanding of the role of irony in communication, reflecting current societal contexts and technological advancements.

The GPA model, widely recognized for its insights into message production, has evolved to include various aspects like goals (Dillard, 1990a), plans (Berger, 1997), and the broader process context (Dillard, Segrin, & Harden, 1989). While this model traditionally starts with goal activation, the situation is often the initiating factor, suggesting a shift to an SGPA framework. This study employs the SGPA model to delve into the intricacies of irony, moving beyond the basic definition of irony as the expression of a sentiment contrary to one's true intention. Instead, it explores irony's deeper connections with saving face, arguing, social aggression, and overall social interaction, offering a more comprehensive understanding of this pervasive social phenomenon (Gibbs, 2000; Averbeck & Hample, 2008). In this replication work, the SGPA model's application to irony underscores its pervasive role in communication, revealing the complex motivations and strategies behind ironic expressions.

27. Title: Work-Climate and its Relationship with Officer Performance

Principal presenter: William Paveleck

Major: Public Safety Administration

Other presenters or co-authors: Christopher Bitner (LEJA), Glenn Daugherty (LEJA), Niyazi Ekici (LEJA), and Patricia Walton (LEJA)

Faculty mentor: Dr. Christopher Bitner

Abstract: Organizations, like people, can be healthy or not. Case studies and experiences show healthy organizations resist unreasonable pressure, provide dynamic leadership, supports employees, and provide direction for achievable goals. The concept of work-climate helps us determine the health of an organization. Work-climate is the aggregate of employees' perceptions of the work relationships, leadership practices, motivation, job satisfaction, innovation, morale, and trust. The work-climate construct provides

considerable opportunities for understanding the health of an organization and employee performance in the workplace. In this current study, we've taken the concepts of healthy organizations and work-climate and applied them to law enforcement. The purpose is to discover if a relationship exists between the work-climate of law enforcement agencies and officer performance. Law enforcement agencies are similar to most other public organizations, because they include people, workspace, resources, work-structure, systems, procedures, and relationships. We want to examine the work-climate of police departments because we see a quickening to improve police services and officer performance. What we do not know is how work-climate can be leveraged to meet the emerging service demands of the people. To investigate this, we used a rigorous quasi-experimental cross-sectional survey to gather data that allowed for hypothesis testing through aggregation, scaling, counter-balancing and tabulation. Our findings came into view when we examined data through correlations, regression, ANOVA, and coefficient models. We discovered officers become detached from the importance of their work and put in less effort when they feel dissatisfied in their workplace. This examination tells us law enforcement agencies need a focus on work-climate, because it affects how officers carry out their duties and interact with citizens. We reveal a focus on work-climate in law enforcement agencies can enrich relationships between officers and the societies they serve.

28. *Title:* Working Memory Capacity and Task-Demand: Spontaneous Mind-Wandering Revisited

Principal presenter: Amariah Seely Major: General Experimental Psychology Faculty mentor: Dr. Jonathan Hammersley

Abstract: Individuals who have lower working memory capacity are found to spontaneously mind-wander more than those whose working memory capacity is higher (Robison & Unsworth, 2018). According to the cognitive flexibility hypothesis proposed by Rummels & Boywitt (2014), individuals with greater working memory are able to adapt their attentional resources to the task demand placed upon their mental processes. Those who have higher working memory capacity will deliberately mind-wander on tasks that require low task demand, while those with lower working memory capacity will have more instances of spontaneous mind-wandering that are dependent on task demand. The present pilot study was designed to test methodology and statistical analysis procedures in examining mind-wandering during task performance. After conducting an initial pilot study, some methodological concerns were discovered and new ideas on how to better proceed are being proposed. Such unanswered questions and future directions will be discussed in the current presentation.

Performance Presentations

1. Title: Waiting for Godot: A Purgatory of The Self

Principal presenter: Sara BenBella
Major: MFA Acting
Other presenters or co-authors: Scene Partner: Travis Griffin
Faculty mentor: Dr. Hadley Kamminga-Peck
Abstract: The presentation will begin with a brief introduction of the play 'Waiting for
Godot' as well as an exploration of the themes listed below. This will be followed by a
performance of a cut from Act 1, performed by Sara BenBella and their scene partner
Travis Griffin.

'Waiting for Godot' written by playwright Samuel Becket, primarily follows two characters, Vladmir and Estragon, as they spend a seemingly endless amount of time waiting for the never-seen 'Godot'. The play itself is bare in its setting and specificity, lending itself to countless interpretations and analyses. At its core, Estragon is constantly asking to leave the barren place they've found themselves in, either through death or travel. While Vladimir reminds him that they can't leave yet, as eventually Godot will come for them. While other characters occasionally float in and out of the play, these two are our protagonists. They are always waiting for Godot and always saying he will come despite the fact that he never does.

While Beckett himself was against the idea that Godot symbolized God, in this performance my scene partner and I will explore this idea. We will play with the concept that the two characters are two sides of the same being, two voices in the same brain, being kept in a purgatory of indecision. Halted by the promise of God, but tortured by the waiting of an entity who will never come. Beckett, when asked what the play was about, said that it was about 'Symbiosis'. I would like to explore this to the extreme in movement and storytelling. What does it mean if hell is just yourself, paralyzed by the fear of 'what if' and the unknown, where you spend the majority of time talking yourself around in circles instead of actually doing anything substantial?

'Waiting for Godot' is ultimately a criticism of waiting for meaning and the answers to come to you. It is better to make any choice even if it is the wrong one because to choose is to be active, without it we are just waiting for death. There is no question of the relevance of that idea in today's society, where it is common to live by proxy via social media. But we also live in a time seeped in the fear of making a choice because society feels so unstable and unreliable. It seems much easier just to wait for 'Godot' to come and tell us what to do. But there is just as much, if not more misery, in waiting for something that is not certain. As actors, these are the themes my scene partner and I will explore in the rehearsal process. To curate a performance that executes these ideas and prompts discussion between performer and audience.

2. Title: Scab for Hire

Principal presenter: Wesley Tilford Major: Theatre - Acting

Faculty mentor: Dr. Hadley Kamminga-Peck

Abstract: Scab for Hire is a one person show about a factory worker who unknowingly becomes a scab after crossing a picket-line. The story examines the harsh conditions that blue collar workers face in today's America along with the importance of workers' rights and unions in our country today. I will play both the scab and the supervisor in the factory. I performed a version of this solo performance for my final in my play analysis class, and based on the positive feedback I got, I would like to develop this idea further. I am currently working on devising the piece and putting together a script. Once I have a script written, I will rehearse and block the performance with the assistance of my faculty mentor, Dr. Hadley Kamminga-Peck. In the piece, the scab is completely silent up until a certain point. He is a mime of sorts, although I prefer to compare him to comic stock characters such as Charlie Chaplin's tramp or a Buster Keaton character. After my first performance of this piece. It emphasizes the lack of voice that unrepresented and non-union workers have. I'm looking forward to explore these ideas and flesh them out more throughout the process.

3. *Title:* Sociability, Connection, and Communication in Clara Schumann's Piano Trio in G minor

Principal presenter: Madalyn Pridemore

Major: Musicology

Other presenters or co-authors: Denzel Abarquez, Piano Pedagogy, and Kieran McClain, Cello Performance

Faculty mentor: Dr. Anita Hardeman

Abstract: Situated during the blossoming of chamber works in the early Romantic era, Clara Schumann's Piano Trio in G minor, Op. 17 presents a series of interpretative challenges for the ensemble members, demonstrating the composer's talent toward creating highly virtuosic and emotional compositions. Although active in domestic music spaces during the mid-1800s, Schumann's activity in the musical world consisted primarily of her performances as a concert pianist, playing many of the monumental works popular in her era. Her writing for piano highlights her mastery of keyboard virtuosity and proficiency in idiomatic writing for the instrument. In addition to her widespread exposure as a concert pianist, Schumann dedicated a large portion of her musical life toward domestic chamber music genres, crossing paths with many of the top instrumentalists and vocalists of the time. These interactions impacted her compositional technique for strings as she allows their

individual lines to meander meaningfully around each other and the piano.

The challenges this work presents lie within the difficulty of the individual parts as well as within the sociability of the ensemble. Sociability, in the case of the chamber group, requires constant nonverbal contact with the other members of the ensemble, including eye contact, physical movements, and musical gestures. Schumann choreographs these moments of contact through moments of melodic unison, conversational imitation between parts, and individual flashes of virtuosity, all utilized by the performers as moments for musical ideas to be shared during the performance. The final difficulty presented for the performers comes with the decision of interpretation - Schumann's score merely represents a glimpse into the composer-performer's own musical directions, leaving musicians of today to decipher and decide on a convincing musical presentation of this complex work.

4. *Title:* Cultivating the Sound of New China: The 20th Century Evolution of the Erhu *Principal presenter:* Ethan Schuller

Major: Master of Music, Musicology

Other presenters or co-authors: Denzel Abarquez (MM Piano Pedagogy)

Faculty mentor: Dr. Hong-Da Chin

Abstract: Since ancient times, China has integrated many foreign musical styles into its own music traditions. The overland and maritime Silk Roads saw many musical instruments, songs and dances introduced over hundreds of years from Persia, Tibet, India, Korea, Cambodia, and the countless peoples in between. Recentlyâ€"within the last centuryâ€"the current most prominent influence on Chinese music has been Western musical traditions from continental Europe. In the wake of the 1919 May 4th cultural movement, Chinese intellectuals deemed Confucianism and other traditional philosophies unfit for the modern world, and turned towards Western culture to inform the cultural values of "new China". Since then, Chinese musicians have become increasingly aware of and interested in Western music. The following decade saw the birth of a number of Chinese music societies and institutions of music education that taught the theory and application of Western music. As they had for thousands of years, Chinese musicians incorporated many of these ideals and practices into their compositions and performances of Chinese national music, or Guoyue. In this presentation, I will investigate several effects that Western music has had on the performance of Chinese national music by examining the violin's influence on the erhu over the last century, in terms of status, repertoire, and technique.

The erhu is a bowed, two-stringed instrument native to China. It comes from the huqin family of instruments, which are found throughout China and share similarities with the bowed instruments native to many Asian cultures. During the 1920s, the status of the erhu changed drastically, and it was elevated from a folk instrument to a solo instrument by Liu Tianhua, an erhu musician, composer, and pedagoge. Influenced by the May 4th movement, he sought to create a new identity for the erhu that combined Western musical philosophies

with traditional Chinese music. Liu Tianhua was a founding member of the Society for the Improvement of Chinese Music, and drew much inspiration from Western classical music-specifically, the violin. The reforms he made to the erhu in the 1920s in an effort to make it more violin-like have been monumental in defining the erhu's modern identity, and can still be heard echoing throughout Chinese music today. After Liu Tianhua's reforms to the erhu, it has continued to be shaped by the evolving political and cultural landscape of China, mirroring the people's own development of modern Chinese identity.