



C01. "From the Bank of the River"

Time: 10:30 - 10:50 | **Location:** ISC 201

Student Author(s): David Kelm

Mentor(s): W. Scott Olsen

This is a work of creative nonfiction that unpacks the dynamics of guilt and saviorism when the narrator interacts with poverty along the Red River. It paints a picture of someone trying to understand their own privilege in contrast with the other person in the story; it stretches over five months and is told through sporadic dates as it follows the narrator's train of thought and consciousness. It develops on the themes of guilt, saviorism, privilege, and poverty within the Moorhead community, as the narrator seeks to better understand the situation he has found himself in, and how to approach it appropriately.

C02. "Climate Anxiety Response, Engagement, and Support"

Time: 10:50 - 11:10 | **Location:** ISC 201

Student Author(s): Lydia Durrett, Grace Halvorson, Megan Blatti

Mentor(s): Dr. Jonathan Steinwand

Eco-anxiety, or ecological grief, is a term used to describe fear about current and future environmental harm caused by anthropogenic climate change. The purpose of this project is to educate individuals on the impacts climate change has on mental health. Eco-anxiety is a concern for students, communities, and the world, though it is overlooked in discussions regarding sustainability, environmental justice, climate change, activism, and mental/physical health. Ecological grief must be better understood in order to help those who are affected, find ways to reduce its demoralizing effects, and work towards individual and systemic change. Through gaining knowledge about eco-anxiety, we will become equipped to channel the energy created by working together towards significant change. We compiled sources on the topic as well as various approaches to dealing with the effects of eco-anxiety on individual and community levels. Information was organized based on eco-anxiety definitions, impacts on individuals and the environment, and steps towards both personal and climate health. A toolkit will be developed based on this framework to further educate young adults on the impacts of ecological grief and climate change, along with including ways to become engaged in environmental activism. We anticipate that by working to equip Concordia students, staff, and faculty with tools to relieve the maladaptive impacts of eco-anxiety, we will build a more adaptive community that prioritizes mental health through working for sustainability and environmental justice.

C03. "Immunotherapy and Cancer: A Brief Glimpse into an Exciting New Treatment"

Time: 10:30 - 10:50 | **Location:** ISC 260

Student Author(s): Matt Rohleder

Mentor(s): Dr. John Flaspohler

Cancer has historically and currently demonstrated the highest mortality rate amongst major diseases. An extensive amount of research has sought to treat and in some cases cure cancer. While traditional chemotherapy and radiation can be effective, they can have negative side effects. In the field of immune-oncology there is a growing body of research using immunotherapy to help the immune system fight off cancer. Under the direction of Dr. John Flaspohler, I will present research on different forms of immunotherapy utilizing bacteria, the body's own macrophages, and natural killer cells. I will also present research on the history of immunotherapy and why it can prove to be an effective treatment of some cancers. I hope to demonstrate that immunotherapy is an effective and increasingly common tool with room for improvement. I will present several specific forms of immunotherapy and how they harness our increasing knowledge of the immune system to battle cancer. I will compare these different approaches against each other and against traditional methods of cancer treatment to determine their feasibility and their impact on cancer treatment and prevention of cancer recurrence. I expect to demonstrate that immunotherapies in many cases deliver a safer and more effective treatment compared to traditional methods, while still recognizing that they have limits and require more research in order to be most effectively used in the medical field.

C04. "Determination of the Efficacy of Chitosan-Alginate Bioplastics as a Delivery System of Ibuprofen and Acetaminophen"

Time: 10:50 - 11:10 | **Location:** ISC 260

Student Author(s): Lauryn Hinckley

Mentor(s): Dr. Graeme Wyllie

How an analgesic is released from a pill or similar delivery system is critical in alleviating pain, with recent studies showing that slow release gel caps have the same release rates as fast acting analgesics. Chitosan-alginate bioplastics have been investigated as a potential drug as a biocompatible and inexpensive release system for acetaminophen and ibuprofen. Chitosan is the soluble derivative of chitin, a structural material which is extracted from the exoskeleton of crustaceans. Alginate is extracted from brown seaweed, which introduces more durability to the chitosan-alginate bioplastic. Bioplastics were prepared, impregnated with acetaminophen and ibuprofen, and the extent of the pharmaceutical which is incorporated in the bioplastic was determined. Pieces of these bioplastics were then immersed in a series of solutions to measure release rate. Analysis was carried out using High-Performance Liquid Chromatography (HPLC) after a suitable method was developed for the separation and quantification of the two drugs. Individual release rates of acetaminophen and ibuprofen were determined separately from a series of chitosan-alginate bioplastics containing these drugs. Differing release rates of the pharmaceuticals were found in different conditions, such as volumes of water and acid. In addition to investigating release, the physical changes in the bioplastics, such as swelling following immersion was investigated. Thank you to Sigma Zeta for funding this project through a research grant. Additional thank you to Analytical Instruments, of Minnesota, for the generous donation of the HPLC system for use in the teaching lab and undergraduate research.

C05. "Characterization of Pyridine and Perfluoropyridine Products"

Time: 10:30 - 10:50 | **Location:** ISC 301

Student Author(s): Matthew Locklear, Colin Schuller

Mentor(s): Dr. Darin Ulness, Dr. Mark Gealy

The purpose of our research was to explore the reaction of Pyridine and Perfluoropyridine. The reaction appears to be driven by interaction between Pyridine and a "pi-hole" created by the Fluorines in Perfluoropyridine. The focus of our summer research was on characterizing the optical properties of the solid products formed in this reaction. Research was also done on separation and solvent interaction to better understand the mechanism behind the reaction. This presentation will be the first of three that will be presented by our research group, the focus of this presentation is on the background and early research on this reaction. Solvent analysis and further work with sublimation experiments are also discussed.

C06. "Generating All b-Prime Fully Augmented Links"

Time: 10:50 - 11:10 | **Location:** ISC 301

Student Author(s): Leah Mork

Mentor(s): Dr. Rolland Trapp, CSUSB

In a effort to enumerate fully augmented links that are not belted-sum decomposable (b-prime), this work will present an operation, called complete augmentation, on prime links that will produce all b-prime fully augmented links (FAL). A lemma proven by Jorge Calvo in 1985 will be vital in order to prove all completely augmented prime links will result in a b-prime FAL.

C07. "Effect of Vivaldi Music Enrichment on Anxiety and Memory in Wild-Type Zebrafish"

Time: 10:30 - 10:50 | **Location:** Jones A

Student Author(s): Brook Tilahun, Kate Loidolt, Eunice Kayitare

Mentor(s): Harshana De Silva Feelixge, Dr. Krys Strand

Our lab studies zebrafish as a model organism for multiple sclerosis (MS). Our aim is to evaluate the effects of environmental enrichment on myelin repair and behavioral symptoms of MS. In our pilot study over the summer, we focused on Vivaldi music enrichment in wild-type zebrafish using behavioral tasks that measure anxiety (novel tank test) and memory (novel object recognition). The novel tank test is straightforward and records the amount of time fish spend at the bottom of the tank and the latency for them to explore the middle and top zones. Fish who spend more time at the bottom of the tank display increased anxiety compared to fish exploring all zones of the tank. The novel object recognition test is more complicated in that the design of the objects is crucial to obtaining reliable data. Zebrafish can see colors in the visible light spectrum and have some baseline level of anxiety; therefore, designing objects that are recognized as different, but not threatening is key. We tested three different designs of Lego objects using a variety of colors and patterns in this experiment. Our results helped us establish a baseline for novel object recognition in wildtype zebrafish, and we will use the most effective object designs to study the effect of music enrichment on memory in remyelinating fish in the future. In our

presentation, we will describe our study design and discuss the results of the behavioral tests in enriched and non-enriched wild-type zebrafish.

C08. “Artificial Intelligence in Today's World”

Time: 10:50 - 11:10 | **Location:** Jones A

Student Author(s): Rita Adejudge

Mentor(s): Dr. Ahmed Kamel

Artificial intelligence (A.I.) is the science of writing programs that mimic human behaviors. Since the development of artificial intelligence in 1935, there have been advancements in professions that focus on cyber security, psychology, machine learning, music, and natural language processing, among many others. In this context, intelligence can be defined using Sternberg's Triarchic Theory of Intelligence; Sternberg's theory substantiated the belief that there are three abilities that intelligent beings can possess: the ability to be analytical, creative, and practical. This study aims to consider the scope of artificial intelligence in our contemporary society and the potential for artificial intelligence systems to meet the criteria for Triarchic intelligence.

C09. “La adquisición del vibrante múltiple en español”

Time: 10:30 - 10:50 | **Location:** Jones B

Student Author(s): Aaron Noble

Mentor(s): Dr. Alexander Aldrich

El vibrante múltiple es uno de los sonidos más difíciles de adquirir en español. Puesto que no existe ningún sonido similar en inglés, los angloparlantes que desean aprender español pueden tener dificultades con la pronunciación. El enfoque de este estudio es el proceso y las prácticas comunes que se utiliza para adquirir el vibrante múltiple, para que puedan alcanzar la pronunciación correcta los que estudian español. Además, la meta es mostrar que requiere tiempo y paciencia para lograr este sonido. Una reseña bibliográfica fue llevada a cabo para investigar. El vibrante múltiple en español se representa fonéticamente por /r/ y típicamente consiste en tres rollos de la lengua, o aperturas, durando entre 58 y 103 milisegundos. Para analizar la aprehensión del sonido, varios investigadores han estudiado la pronunciación del vibrante múltiple de los niños. Se encontró que a menudo es el último sonido que se aprende, entre las edades de tres y seis años. Es común que se sustituye otros sonidos en lugar de lo actual, un proceso llamado “economizar.” Muchas personas típicamente economizan con el vibrante simple, un golpecito contra el techo de la boca, u otras sustituciones. Algunos errores que se cometen incluyen usar menos aperturas, duraciones de aperturas más largas y la forma o posición de la lengua. Estos descubrimientos muestran que el vibrante múltiple es difícil de adquirir para tanto los angloparlantes como hispanoparlantes. También demuestran los hábitos de evitar para perfeccionar la pronunciación.

This presentation will be given in Spanish.

C10. "Reducción vocálica: Qué es y su efecto en diferentes niveles de dominio del habla hispanohablantes"

Time: 10:50 - 11:10 | **Location:** Jones B

Student Author(s): Emma Hagemeyer

Mentor(s): Dr. Alexander Aldrich

La reducción de vocales es el cambio del sonido de la vocal de una palabra en español. Puede ser un cambio de cantidad, o duración, de una vocal en una palabra, o puede ser un cambio de calidad, o sonido, de una vocal en una palabra. En el idioma inglés, el ejemplo más popular de esto es el "schwa", el sonido que hace una vocal cuando está en una sílaba no está acentuada. Los dos son fenómenos que ocurren en dialectos diferentes de español, y con personas bilingües de inglés y español. Hay muchos estudios que investigan diferentes niveles de habla hispana y explican por qué ocurre este fenómeno. El método de investigación que utilicé fue la revisión de fuentes primarias. La investigación encontró que la reducción de vocales puede resultar en una barrera de idioma diferente. Reducción de la cantidad puede ser difícil para los estudiantes de español, que no son tan rápidos para comprender la palabra. También, el uso del "schwa" en hablantes bilingües puede resultar en un "acento extranjero".

This presentation will be given in Spanish.

C11. "'A Streetcar Named Destruction': The Role of Destruction in A Streetcar Named Desire"

Time: 10:30 - 10:50 | **Location:** Olin 124

Student Author(s): Laura Jensen

Mentor(s): Dr. James Postema

A Streetcar Named Desire, by Tennessee Williams, is considered one of America's most well-known plays. Its notoriety only grew after the 1951 film adaptation starring Marlon Brando and Vivien Leigh hit theaters, bringing Williams' story about the intersections of love and hate to audiences around the world. *A Streetcar Named Desire* remains memorable for its shocking storylines, genuine characters, and unforgettable writing. It tests what we think we know about people by bringing destruction to the forefront of the action. In the characters of Blanche, Stanley, and Stella, Williams shows the complexity of human behavior through their patterns of internal and external destruction. By reviewing the hard realities of this destruction, my paper seeks to bring to light the real stories behind the quotable lines and unbelievable characters. When you dig into these characters, removing the exaggerated drama that makes the play entertaining to audiences, what remains is humanity, the idea that we are all just creations of the world around us, for better or worse.

C12. "Utilizing Cognitive Dissonance to Examine Breaking Commitments in Undergraduate Romantic Relationships"

Time: 10:50 - 11:10 | **Location:** Olin 124

Student Author(s): Micah Christiansen, Carmen Krueger

Mentor(s): Dr. Anna Semanko

Commitments are an integral part of romantic relationships. What happens when individuals in dating relationships do not follow through on the commitments they make? The Theory of Cognitive

Dissonance (Festinger, 1957) posits that when a dating partner breaks commitments, an uncomfortable tension could result. The tension results from having dissonant cognitions: knowing that one should follow through on commitments yet breaking them anyway. With this research, we sought to further understand the magnitude of dissonance experienced in these situations - something that is not well-examined in the literature or within this context. To examine the magnitude of dissonance, we qualitatively coded participant essays (N=134) describing instances in which they did not follow through on commitments to their dating partners. We coded our findings by labeling the dissonant cognitions (instances when the partner did not follow through with commitments), consonant cognitions (instances when the partner did follow through on commitments), and justifications (reasons why the participants did not follow through on their commitments). In addition, we coded overarching themes about types of commitments and the 'love languages' the commitments are associated with (words of affirmation, physical touch, receiving gifts, quality time, acts of service; Chapman, 2009). In doing so, we can gain critical insight into how romantic relationships, specifically undergraduate dating relationships, function and operate. We predict that individuals with more dissonant cognitions and fewer consonant cognitions/justifications will have a higher magnitude of dissonance. We anticipate that our hypothesis will be supported. Our final results associated with this research will be presented.

C13. "Exotic Animal Care and Husbandry: Paludarium, Web Design, and Outreach"

11:25 - 12:05 | ISC 260

Student Author(s): Emma Ericksen, Zimy Le

Mentor(s): Dr. Krys Strand

During the summer of 2021, we focused on expanding our knowledge about the care, habitat requirements, and husbandry of the live animals we house in the Integrated Science Center. Special projects included researching, designing, and building a 40-gallon paludarium habitat for our fire-belly toads, along with the introduction of small fishes and a variety of plant species to the paludarium. The goal of this project was to better represent the natural environment of the fire-belly toads. A second aim of our work was to create a website for the Exotic Animal Care and Husbandry (EACH) student organization and courses that would provide resources for critter care, habitat creation, outreach opportunities and campus involvement. During our presentation, we will share information about our individual projects and then invite the audience to interact with some of the animals we have on campus. Live animals, including snakes, may be present at this presentation. Interaction with animals is encouraged but not required of audience members attending this presentation.

C14. "Development of a Cyclic Voltammetry Simulation and DIY Potentiostat for Undergraduate Analytical Chemistry"

11:25 - 12:05 | ISC 301

Student Author(s): Leo Smith, Wai Than, Aaron Oakes

Mentor(s): Dr. Mark Jensen

It is important for undergraduate students to develop a strong understanding of electrochemistry from analytical chemistry courses, and cyclic voltammetry is one way to introduce students to practical electrochemistry. However, potentiostats for cyclic voltammetry can be expensive, and buying a pre-

built potentiostat for cyclic voltammetry can inhibit students' abilities to learn the inner workings of potentiostats. This presentation therefore describes how a simple potentiostat can be assembled in-lab with 9-V batteries and other common items in undergraduate laboratories. Additionally, cyclic voltammetry simulations can further aid in students' learning by providing real-time feedback on the effects of changing parameters, as well as the ability to couple simulated data to experimental data. Another focus of this presentation is therefore the development of a cyclic voltammetry simulation in LabVIEW and Python based on previous work by Dr. Jay H. Brown of Southwest Minnesota State University. This program includes the ability to simulate cyclic voltammetry data with several parameters, overlay data on top of simulated data, optimize parameters, and model the effects of a rotating disk electrode. For demonstration, cyclic voltammetry experiments using $K_3Fe(CN)_6$ and benzophenone were conducted with the assembled potentiostat, and the results were compared with simulated data for two different electrochemical mechanisms. The results suggested that more work is needed to improve the accuracy of the simulated cyclic voltammetry data. Nonetheless, this simple, inexpensive potentiostat and cyclic voltammetry simulation can assist with furthering students' understanding of electrochemistry when used in undergraduate analytical chemistry courses.

C15. "Social Emotional Learning in the Classroom"

11:25 - 11:40 | Jones A

Student Author(s): Bailee Larson

Mentor(s): Dr. Teri Langlie

Social emotional lessons build the skills a person develops to behave appropriately in social settings and adequately process their emotions. It is imperative for a students' success in an elementary classroom setting to have these social emotional lessons. The purpose of this study is to see what impact a teacher's classroom management abilities have on the social emotional learning of their students. To better understand the relationship between classroom management and social-emotional learning, data were collected through observations of 20 classrooms and discussions with school counselors and elementary teachers. The results of this study suggest that elementary teachers' classroom management and use of social-emotional learning techniques has an effect on their students' social-emotional learning. The teachers' words, actions, and presence of mind have an immense effect on their students' social and emotional well-being, which indicates that teachers need to have a good understanding of the relationship of social-emotional learning and classroom management.

Discussion with the audience of topics covered in presentations C15 and C16 will immediately follow presentation C16.

C16. "American Gold Wellness PEAK"

11:40 - 11:50 | Jones A

Student Author(s): Ariana Grollman

Mentor(s): Dr. Jeff Meyer, Dr. Shauna Pickens

My PEAK experience this spring involves coaching at American Gold Gymnastics, a recreational and competitive non-profit gym located in Fargo, North Dakota. I will be collaborating and teaching classes

with several experienced coaches who have had experience teaching kids or being gymnasts themselves. I plan to research and gather insights about how and why we create different level progressions depending on the motor skills and kinesthetic development of children ages 2-18. Additionally, I will be addressing multiple disciplines during this PEAK. These include gymnastics pedagogy, physical education/wellness, some music, and social emotional learning. Some research methods I will use during the experience include drawing upon coursework I have done at Concordia regarding childhood development (EDUC 212, EDUC 425, EDUC 221, PSYC 111, PSYC 212), taking an IDI assessment ("Intercultural Development Inventory") to assess my intercultural competence before and after the experience, journaling, and reading the book Classroom Management for Art, Music, and PE Teachers by Michael Linsin. I will present conclusions on my experience and invite the audience into discussion about my coaching and PEAK experience.

Discussion with the audience of topics covered in presentations C15 and C16 will immediately follow presentation C16.

C17. "Expanding Diversity in Music"

11:25 - 12:05 | Jones B

Student Author(s): Alexander Smith, Abigail LaDuke

Mentor(s): Dr. Jeff Meyer

Lack of diversity is a widespread issue in academic institutions, and Concordia College's Department of Music is no exception. Diversity in music continues to be a chronically under-researched field. Our research goal is to expand the musical and cultural interactions that students and faculty at Concordia have while exploring new repertoire and models of musicking and teaching. In exploring more diverse methods, we have developed three categories - context, content, and impact - to evaluate the potential outcomes of studying/performing musical works outside of our own traditions. With this in mind, specific criteria can be utilized to evaluate these works - including (but not limited to) authenticity, exploration and preservation of culture, variety of form and technique, and audience engagement. We intend for these criteria to be malleable throughout the research process; this is an initial step in an ongoing process that will hopefully continue in the years to come. We maintain that it is not only important that students study music from underrepresented composers and groups, but to understand and appreciate wider cultural frameworks. These cultural frameworks will increase our own cultural self-awareness and provide insights into our unspoken norms. This research will culminate in the criteria and their various applications for the department - including a bibliography of articles for educators and students, and a list of repertoire that exemplifies those criteria.

C18. "Remote Learning's Effects on Communication Apprehension and Course Involvement"

11:25 - 12:05 | Olin 124

Student Author(s): Madelynn Schumacher

Mentor(s): Dr. Kirsten Theye

Many college students had their classes moved to online platforms in the wake of the COVID 19 pandemic. This move to a computer based learning environment may have affected students differently

than an in-person education. This study examined two hypotheses. 1.) Diverse students will report higher levels of communication apprehension (CA). 2.) Students who report higher levels of CA will report less course involvement. The study was conducted using the PRCA-24, a commonly used survey to measure CA. The survey also included a second portion to measure levels of course involvement in different aspects of the student engagement experience. Due to a homogeneous sample size no correlations with categories of diversity were found. The study found that individuals with high CA engage less with aspects of course involvement such as classroom discussions but engage with the working hard elements the most. Low CA individuals reported active engagement in all class aspects. This may be due to the lack of barriers that apprehension can present.

C19. “Optical Characterization of a Pyridine and Perfluoropyridine Product Using Column Chromatography, Fluorescence, and Absorption”

13:45 - 14:05 | ISC 201

Student Author(s): Colin Schuller, Matthew Locklear, Alexander Hetland

Mentor(s): Dr. Darin Ulness, Dr. Mark Gealy

We have employed several experimental techniques to study an unknown solid substance formed in the mixture of 1mol:1mol pyridine and perfluoropyridine. First, optical characteristics of the substance in various solvents including methanol, acetone, water, and piperidine were measured and studied. Second, we obtained spectra of the reactants versus the stoichiometric ratio of their mixture with respect to time. The third method used was column chromatography. Two different length columns were used with research-grade silica sand, which were packed with HPLC grade methanol. Optical data of the samples from the column were collected to isolate individual compounds from the unknown substance in the spectra.

C20. “Analysis of a Known Protein with Unknown Function: 4Q7Q”

14:05 - 14:25 | ISC 201

Student Author(s): Hunter Colby, Ethan Johnson

Mentor(s): Dr. Julie Mach

Enzymes are biological catalytic proteins, and without them, life as we know it would not be possible. Bioinformatics is an in silico field of study that can be utilized to analyze the structure and function of an unknown enzyme. 4Q7Q is one such enzyme; found in *Chitinophaga pinensis*, 4Q7Q has a reported structural weight of 60.48 kDa with 266 residues. We seek to discover the function of 4Q7Q through the usage of bioinformatic tools such as ProMOL, BLAST, Pfam, Autodock Vina, and DALI, as well as through wet lab experimentation. In our paper, we underwent five stages of bioinformatics to hypothesize that 4Q7Q is a lipase from the Lipase_GDSL_2 family within the SGNH hydrolase superfamily. Through ongoing wet lab experimentation we have collected and purified 4Q7Q, and will continue to express and expose 4Q7Q to various substrates in order to confirm our hypothesis. Our presentation will feature our bioinformatics results as well as our discoveries about 4Q7Q's structure and function in relation to other hydrolytic and lipolytic proteins.

C21. “Assessing Magnitude of Dissonance Related to Not Exhibiting Appreciation in Romantic Relationships”

13:45 - 14:05 | ISC 260

Student Author(s): Carmen Krueger, Micah Christiansen

Mentor(s): Dr. Anna Semanko

Exhibiting appreciation is an important component of healthy romantic relationships. When we neglect to exhibit appreciation, whether it is by forgetting an anniversary or not appreciating romantic gestures, we may end up feeling guilty or uncomfortable. This uncomfortable feeling can be considered cognitive dissonance. According to Festinger's (1957) theory, cognitive dissonance is the psychological discomfort that arises from encountering two or more conflicting beliefs or behaviors (i.e., knowing we should exhibit appreciation but neglecting to do so). When we experience cognitive dissonance, we are motivated to decrease or eliminate the discomfort by striving for consistent cognitions. In this research, we aim to assess the magnitude of dissonance that results from participants (N=134) writing about times in which they did not exhibit appreciation to their dating partners when it would have been appropriate to do so. This method of assessing the magnitude of dissonance is not well-examined and is novel within this context. In our qualitative analysis examining magnitude of dissonance, we coded for the number of consonant and dissonant cognitions, as well as justifications that the participants provided for their actions. We further noted the overarching themes of the responses, along with the love languages associated with the type of appreciation mentioned (words of affirmation, physical touch, receiving gifts, quality time, acts of service; Chapman, 2009). We hypothesize that the participants with more dissonant cognitions and fewer consonant cognitions will have higher magnitudes of dissonance. We anticipate our results will support this hypothesis. The results associated with this study will be presented.

C22. “The Varieties and Complexities of Ceceo, Seseo, and Distinction in Southern Spain”

14:05 - 14:25 | ISC 260

Student Author(s): Amanda Edwards

Mentor(s): Dr. Alexander Aldrich

Spoken language is a diverse, complex, and always changing phenomenon. Even within one isolated language, the dialects, diction, and personal styles vary considerably. The relationship between the ceceo and seseo (in which the Spanish word “casa” may be pronounced “casa” and “catha” respectively) and distinción (in which the speaker would pronounce “casa” and “caza” differently), creates significant linguistic and sociolinguistic discourse and can provide insight into the complexities of Spanish language and culture. Language is politically and culturally important in Spain and plays a role in identity and nationality. Through a literature review of primary sources, I gathered information and investigated the ways in which the speech difference between seseo, ceceo, and distinción is impacted by etymology, gender, class, education, and generation in southern Spain. Results indicate that the differences and the uses of ceceo and distinción (both exclusive to Spain) as well as seseo in this region are complex and demonstrate the ways in which seemingly small linguistic differences can provide rich insight into the sentiments of culture and individuals within that culture. This research further supports that it is important to pay attention not only to what is said, but also how it is said.

C23. "The Prevalence of Microplastics in North Dakota Waterfowl"

13:45 - 14:05 | ISC 301

Student Author(s): Duong Nguyen, Luke Young

Mentor(s): Dr. Jennifer Sweatman

The United States Environmental Protection Agency (EPA) recognizes microplastics (less than 5mm in size) to be a growing threat to many organisms in ecosystems due to its high toxicity risk and the current lack of regulation. Therefore, studies focusing on the prevalence of microplastics have become more relevant and prevalent, and this study is one of only a few to investigate the presence of microplastic debris in waterfowl populations. Waterfowl gastrointestinal samples (N=102) were donated by a hunting guide operating out of Devil's Lake, ND, from the Fall 2020 season. To understand microplastic abundance and distribution within the gastrointestinal tract of waterfowl, we separated samples by organ (proventriculus, gizzard, and intestine) and analyzed the gut contents under a microscope. Identified microplastics were enumerated and characterized by color, type, and length. We identified a total of 460 microplastics, 69.57% (320 particles) and 30.43% (140 particles) of which were found in dabblers and ground foragers, respectively. Waterfowl species varied; however, dabblers were dominated (77.5% of samples) by Mallards, and ground foragers were dominated (22.5% of samples) by Canada Geese. Microplastic abundance was significantly higher in ground foragers than in dabblers. Furthermore, within the ground foragers, microplastics were found to be more abundant in the proventriculus than the gizzard, with no significant difference between other organs. Within the subgroup of dabblers, the abundance of microplastics was significantly higher in the intestine than the proventriculus and gizzard. Findings of this study can be used not only to guide future research focused on the impacts of microplastics on waterfowl but also to establish foundation for conservation and policy making regarding microplastics.

C24. "Micro to Macro: Sediment and Environmental Injustices along the Mississippi River"

14:05 - 14:25 | ISC 301

Student Author(s): Megan Parkinson

Mentor(s): Dr. Tess Varner

During my semester away in the fall of 2021, I participated in the River Semester program through Augsburg University. While I, along with a group of other students and friends, meandered through the great Mississippi river, I took geological samples of the sediment in order to evaluate how the river has evolved over time, the quality of the river itself, and the relation to the major cities along the river. By utilizing the geological data information collected, I looked into some of the environmental injustices, such as pollution related illness, gentrification, and spread of urbanization, located along the river and see if there is a correlation between them, and how they may evolve in the coming years due to climate change, human impact, and varying views of the purpose of the river itself. I took samples of the sediment along the river's banks in different locations as we progressed through the flow of the river. By taking these samples, I evaluated different aspects of the sediment itself as I work in congruence with Dr. Catherine Russell and her team of researchers on the geology found in the samples. Along with these sediment samples, I also did an evaluation of the amount of human impacted objects that are found in the river such as plastics, glass, and trash items. The field research data that I collected works in congruence with the research I did of the environmental injustices that are present in the major cities

along the Mississippi river in order to illustrate how environmental injustices exist on the micro and macro level.

C25. "The Tragedies and Triumphs of Rural Immigration: A Study of Pelican Rapids, Minnesota"

13:45 - 14:05 | Jones A

Student Author(s): Anna Kronbeck

Mentor(s): Dr. Lisa Twomey

The immigration experience to the United States is often tainted by the media and politics, a narrow lens of focus, and even the romanticizing of the "American Dream". The fullness of that dream lies in a multitude of factors that differ from one environment to the next, including industry, housing, social integration, cultural contact, and a sense of belonging, all of which can be explored in the history, tragedies, and triumphs of the rural immigrant experience. Rurality often presents struggles that are underrepresented in the rhetoric surrounding immigration, and in some cases further marginalizes individuals who have already faced significant adversity. In this study of Pelican Rapids, an immigration hotspot in rural Minnesota, immigrants' triumphs and tragedies melded together to form a bigger picture and demonstrate what leads to failure or success in an instance of extreme cultural diversity. Through a literature review of rural immigration throughout the country and a greater focus through many personal interviews with Pelican Rapids residents, this study paints a picture of one city's experience with the journey of becoming a diverse home for immigrants from across the globe. Factors such as housing shortages, a lack of resources, and negative rhetoric inhibit the complete integration of immigrants to rural American towns like Pelican Rapids. However, many successes arose from this research, showing that small towns offer what metropolitan areas often cannot, such as a greater sense of belonging and small business opportunities. This paper will discuss these factors with specific examples from Pelican Rapids.

C26. "Emotional Health and Intelligence for Academic, Personal, and Professional Development"

14:05 - 14:25 | Jones A

Student Author(s): Uyanga Naranbaatar

Mentor(s): Dr. Angel Carrete Rodriguez, Dr. Jorge Eduardo Scarpin

Many around the world are suffering from mental health issues. One of the assumptions is that it is due to lack of open and authentic emotional discussions. Another, more important, contributing factor is lack of proper education for the youth on how to deal with both pleasant and unpleasant emotions in a healthy manner. Since the issue is highly embedded within today's social culture, many don't see the impacts and implications as seriously as they ought to. The project objective is to introduce the idea of Emotional Health and Intelligence (EHI) to college students in the Fargo-Moorhead community, and help them get started on their emotional journey. As there are various ways to improve Emotional Intelligence (EI) and methods work differently for each individual, I chose to focus on mindfulness. I hypothesize that the progress towards becoming more mindful helps college students succeed in their academics, personal, and professional development. With a better mood and clear mind, the students would be more focused and be more intentional about the decisions they make. For the project, I am organizing three series of EI workshops on Healthy Mind, Clear Mind, and Critical Mind. The qualitative

and quantitative metrics from the workshop interest and feedback surveys will be analyzed. There were 185 students that participated in the workshop interest survey. About 58% of them are interested in learning more about EI, and about 72% showed interest in learning how to care for self and others, which is the basis of mindfulness. The comments from the first workshop feedback survey demonstrates the strong need for more open discussions and educational resources on EHI.

C27. "Robots, Aliens, and Freud: Forbidden Planet and Shakespearean Adaptation"

13:45 - 14:05 | Jones B

Student Author(s): Miah Sandvik

Mentor(s): Dr. Jonathan Steinwand

"Shakespeare in space" might sound like a stunt pulled by a bored billionaire, but it's actually an apt description of *Forbidden Planet* (1956), a classic science-fiction film based loosely on William Shakespeare's *The Tempest*. As such, *Forbidden Planet* maintains the basic character archetypes and plot structure of *The Tempest*, including a magus figure and his virginal daughter. However, the mechanisms by which the plot is advanced—including robots, alien technology, and Freudian psychoanalysis—differ drastically from Shakespeare's text. This paper analyzes *Forbidden Planet* in the context of Shakespeare scholarship (including writings by Harold Bloom and Marjorie Garber) and the 1950s zeitgeist in order to contrast the themes present in both the original work and its adaptation. In part, this analysis concludes that *Forbidden Planet*'s mimicry of, and deviation from, the source material mirrors the two main purposes of its use: to ground the audience in something familiar as the film pushes the boundaries of its genre and to readdress Shakespearean themes for a 1950s worldview. Overall, *Forbidden Planet* reflects themes and tensions unique to the era in which the movie was created, demonstrating both the versatility of Shakespeare's work and the creative potential of adaptation. This study reinforces the importance of reinterpreting literature, and seeks to undermine the idea that an adaptation must reach the same conclusions as the original work. Instead, the reuse of Shakespearean plots and devices can allow for expansion on his themes, or be used to express ideas beyond the Bard's imagination.

C28. "Underrepresented Composers"

14:05 - 14:25 | Jones B

Student Author(s): Lavonte Smith

Mentor(s): Dr. Jeff Meyer

The topic I would like to discuss is representation in the western musical canon. The problem that I would like to address in this topic is that there are composers that are in a category called underrepresented composers. Those are the composers that are not well represented in the western musical canon due to their race, gender, and sexuality. My argument is that these composers should be well represented in the western music community and should be programmed more often in our professional orchestras, college/military concert bands, and chamber music groups regardless of their race, gender, and sexuality. The reason is that those composers' music is just as good or even better than the standard repertoire in the western musical canon. Not only are they historically excluded due to their race, gender, and sexuality but they wrote high-quality and diverse music. They also have made

a lot of accomplishments in their lifetime including Pulitzer prizes, awards, grammies, etc. The most emphasis I want to make is that western musical canon should these composers in the repertoire because their music is high quality and great not just that their African American, Latin American, female, homosexual, etc. My brief research method is looking for information to answer the question of the extent of their cultural background, western music/art music, and historical events that have influenced and/or affected their music. My anticipated result is to expose listeners to a diversity of composers that are diverse of race, gender, and sexuality.

C29. "Modeling Housing Prices in the Fargo-Moorhead Area"

13:45 - 14:05 | Olin 124

Student Author(s): Jake Peters, Alexander Voigt

Mentor(s): Dr. Gregory Tanner

It is vital to homebuyers, sellers, and realtors alike to be able to accurately appraise the value of a home. There are many applications and websites that model the sales price of houses across the entire United States; however, due to the broad scope of these models, they may not be able to fully capture the intricacies of local markets. This presentation examines real estate submarkets within the Fargo-Moorhead area using hierarchical linear modeling and hedonic valuation. Using a dataset of houses sold on the market in the Fargo-Moorhead area within the last twenty years, the data was analyzed with R and RStudio to generate hierarchical models that predicted the sold price of houses using a test set. These findings were then deployed on a website using a feature of RStudio called RShiny. On the website at link https://fargo-moorhead-housing.shinyapps.io/fm_market_shiny/, users can filter through a small dataset of houses that were on the market in late summer 2020. On the next tab on the page, users can select what features they want for the house, then click a button to display what our model's prediction of the house would be.

C30. "Virtual Knots and Zero Crossing Weights"

14:05 - 14:25 | Olin 124

Student Author(s): Nathan Kawlewski, Abigail Voronyak

Mentor(s): Dr. Sarah Seger

Knot theory is a subfield of low-dimensional topology that studies knots and links using combinatorial, geometric, and algebraic techniques. Virtual knot theory is a generalization of the classical theory that rapidly expands the number of objects of study. For example, there is only one unique classical knot with 4 crossings, but there are over 500 unique virtual knots with 4 crossings! We can represent virtual knot diagrams by Gauss codes, from which we can extract the "weight" of each crossing. It is well known that for classical knots, every crossing has weight zero, but there also exist nonclassical knots with this property. Our research involved sifting through large datasets of knots and looking at those knots that had zero crossing weights. We were able to find several local diagrammatic moves and prove that they preserve crossing weights. All virtual knots with six or fewer crossings and all zero crossing weights are related to a classical knot by these moves that we found!

C31. “Ideal Spider Web Locations throughout Time Considering Proximity to Human Structures in Moorhead, MN”

14:40 - 14:50 | ISC 201

Student Author(s): Olivia Daniels

Mentor(s): Dr. Elijah Bender

The culture found in Moorhead, MN relies on long-lasting infrastructure. It is not uncommon to see a spider web built in the corner of a brick building or within the cracks in cement. This project is being conducted by culminating multiple types of academic sources, extrapolation and compiling information from these sources, and formatting and writing a review-style research paper in order to answer the question; How has human infrastructure impacted where spiders choose to locate their webs? And what does this altering of the environment mean for arachnid species that live in the same locations? This research is being done to identify the ideal web building locations in regards to proximity to permanent human structures in and around Moorhead, Minnesota. With this project I plan to research native spider species of the Moorhead area, the prey those spiders consume, the conditions those spiders need to survive, and how local spider populations have changed over time. I will need to conduct historical research on the infrastructure and expansion of Moorhead as a city, and what building materials are commonly used in the area throughout different points in time. I will be using this research to get a better understanding of local spider communities and to identify the relationship between human societies and spiders. This information can then be used as a way to further knowledge on the ideal web building locations for spiders and help humans and spider species coexist in the shared habitat.

C32. “The Elsie Welter Natural History Museum: Expanding the Museum's Role in the Local and Global Community”

14:50 - 15:00 | ISC 201

Student Author(s): Kayla Adamek, Emma Ericksen

Mentor(s): Dr. Joe Whittaker, Dr. Joy Lintelman

In the midst of a global pandemic with an animal origin, widespread habitat loss, and a changing climate, an understanding of natural history is increasingly important. Natural history collections can help identify zoonotic pathogens, changing species distributions, and increase public environmental education. The Elsie Welter Natural History Museum at Concordia College contains over 45,000 specimens that Concordia College students and faculty can use for research and teaching. However, the museum is largely unknown and inaccessible on campus. To increase accessibility to the campus community, online outreach efforts were undertaken. Online outreach efforts include the creation of a website, social media page, and the continual creation of a public collection catalog via SharePoint. Increasing the online presence will hopefully result in more use of the collections and further research opportunities. The museum shows potential as being a useful resource for advancing biological knowledge and interdisciplinary projects between departments and with other institutions, as well as being a unique feature of Concordia College.

Immediately following our presentation, audience members will be invited to briefly tour the museum.

C33. “Bioplastics Investigation Unit Strikes Again!: A Systematic Investigation of Release and Uptake from Chitosan-Alginate Bioplastics”

14:40 - 15:00 | ISC 260

Student Author(s): Joshua Weber, Hannah Olson

Mentor(s): Dr. Graeme Wyllie

Results initially suggested the release of food dye trapped in the bioplastic at formation was dependent on ionic strength, a fact that recent results have suggested is too simplistic. In this study that took place over the summer of 2021, we systematically investigated the uptake and release of various materials, such as food dyes and pharmaceuticals, from chitosan-alginate bioplastics. Dyes and drugs were added to the bioplastics during their formation so their release could be studied, while other bioplastics samples were manufactured containing none of these to serve as removal systems. Samples of these various bioplastics were immersed in a range of solution environments and the extent of release or uptake was measured by either UV-Vis spectroscopy or HPLC. Our studies revealed that while the structure and polarity of the analytes play a significant role in release and uptake, the effect of solution environments is also critical. We will share our results and discuss future directions.

C34. “Exploring the Impacts of Racial Unconscious Bias in Healthcare”

15:00 - 15:20 | ISC 260

Student Author(s): Innocent Nsengiyumva

Mentor(s): Dr. Julie Rutherford

The aim of this research project is to investigate the prevalence of racial unconscious bias in healthcare along with its impacts on minority health. In addition to exploring the impacts of racial bias in healthcare, the project seeks to identify causes that have limited the number of minority healthcare providers in the U.S. This research project was completed as an extension to the Fall 2021 medical internship course, and the research conducted includes analyzing literature related to the topic and conducting interviews with various leaders in the healthcare industry.

C35. “Separation Analysis of Pyridine and Perfluoropyridine Reaction Products”

14:40 - 15:00 | ISC 301

Student Author(s): Alexander Hetland, Colin Schuller, Matthew Locklear

Mentor(s): Dr. Darin Ulness, Dr. Mark Gealy

Pyridine and Perfluoropyridine are both rather interesting chemicals that have little information about the reaction that takes place when reacted with one another. The resulting product is a black solid with different characteristics. With reason to suspect that the resulting product is a mixture of products due to different events in the initial reaction pertaining to pi-interaction with Meisenheimer Intermediates. Experiments were done to determine how many products there were with hopeful intentions to identify the products as well. High performance liquid chromatography was used in combination with column chromatography to separate the black unknown and determine how many products there are.



C36. “Learning in Artificial Intelligence Planning Through Teleoreactive Logic programs”

15:00 - 15:20 | ISC 301

Student Author(s): John Krueger

Mentor(s): Dr. Ahmed Kamel

Hierarchical task networks are an approach to planning in artificial intelligence that uses a hierarchy of predefined tasks which are decomposed into concrete actions in a problem domain. While HTNs have proven effective in a variety of fields, these systems are held back by a reliance on the complex and time consuming task of manual network creation. This research examines the use of CircuitHTN, a recently created algorithm that operates by analogy to electric circuits, to learn a special class of HTNs called teleoreactive logic programs which are geared towards operating in multi-agent and other complex domains. This approach enables the use of expert demonstrations to create an HTN, rather than manual creation which significantly decreases the time for creation and could potentially increase the scope of applicable tasks for HTN planners. The approach will be tested against several example domains and the results will be compared to the existing state of the art algorithms. We conclude with a theoretical discussion of potential applications with special attention paid to strategy games as a synergistic domain for further research.

C37. “S-Nitrosylation of Palmitoyl-Protein Thioesterase 1 (PPT1) in Neurodegenerative Diseases”

14:40 - 15:00 | Jones A

Student Author(s): Reilly Mach

Mentor(s): Dr. Tomohiro Nakamura and Dr. Stuart Lipton, Scripps

Physiological nitric oxide (NO) contributes to the maintenance of normal neuronal activity and survival, which serves as an important regulatory mechanism in the central nervous system. Excessive production of NO due to environmental toxins or normal aging contributes to the etiology of several neurodegenerative diseases. Specifically, the S-nitrosylation reaction is an effector of NO signaling in both health and disease conditions. The S-nitrosylation reaction is a redox-dependent post-translational modification featuring a covalent attachment of a NO group to a cysteine thiol of a target protein. Elevated NO levels lead to an increase in S-nitrosylated proteins, which can lead to protein misfolding, ER stress, and mitochondrial impairment. In a study of human brain tissues, a target protein called PPT1 was identified in high-risk patient groups. PPT1, or Palmitoyl-Protein Thioesterase 1, is a depalmitoylating enzyme. Palmitoylation is the post-translational, reversible covalent linkage of a 16-carbon fatty acid, palmitate, to proteins. Importantly, palmitoylated proteins require depalmitoylation prior to lysosomal degradation, demonstrating significance of this process in protein sorting and turnover. PPT1 removes palmitate from modified cysteine residues in proteins during lysosomal degradation. As such, PPT1 was identified as a protein that could represent an important component in disease development. This research project involved characterizing PPT1 and attempting to understand its role in pathological conditions. Findings include: confirmed localization of PPT1 to neurons, astrocytes, and microglia; confirmed presence of free cysteine in PPT1; and, confirmed S-nitrosylation of PPT1. Preliminary findings include PPT1 activity assays to determine effect of S-nitrosylation on enzymatic activity and mutagenesis experiments to identify site of S-nitrosylation.



C38. "COVID-19 and Parkinson's Disease: A Case Report on the Impacts of the Pandemic on the Progression of Parkinson's Disease"

15:00 - 15:20 | Jones A

Student Author(s): Lauryn Hinckley

Mentor(s): Dr. Krys Strand

The goal of this case study was to explore how COVID-19 impacted the progression of Parkinson's disease (PD) in John Doe (JD). Before COVID-19, JD, a 73-year-old male, had been coping with PD for three years. JD explored multiples therapies, including medications, to slow the progression of his symptoms from the neurodegenerative disease. JD suffered from many side effects, including rigid movements, soft speech, and stiffness without the hallmark symptom of muscle tremors. Therapies for PD include physical therapy, occupational therapy, exercise classes, and Big and Loud speech therapy. Taking one PD medication, going to therapy, and using the gym regularly were a part of JD's routine until March of 2020. After lacking access to therapies and the gym for nine months, JD quickly declined and experienced symptoms that he had never experienced before. However, once access to therapies and the gym were re-gained, JD's health has marginally improved and he is still coping with residual symptoms from the start of the pandemic. JD is currently experiencing a faster decline now after the pandemic than he was before.

C39. "From Arrival to Acclimation: A Data Analysis of Resettled Refugees in the Fargo-Moorhead Area"

14:40 - 15:00 | Jones B

Student Author(s): Alexander Voigt

Mentor(s): Dr. Gregory Tanner

Refugees have been a controversial topic in the United States in recent years, and particularly in North Dakota, where only 3 of the state's 53 counties opted to take in refugees in 2020. This, coupled with the closure of Lutheran Social Services of North Dakota in 2021, which handled all refugee resettlement in the state for over 70 years, has placed local resettlement policy in a precarious position. This project, developed as part of the Barry Scholars Program, examines the economic and social roles of refugees who were resettled in the Fargo-Moorhead area. It attempts to measure the economic impact of recently-resettled refugees by exploring local-economy interactions and patterns of labor. It also uses aims to quantify improvements in education and English proficiency for refugee groups through the utilization of programs such as Adult Basic Education. This study was conducted using a cross-sectional, close-ended questionnaire of the local refugee community, and findings seem to be in accordance with similar studies done elsewhere in the country: on aggregate, refugees become self-sufficient within a year of resettlement and offset the cost of their resettlement through taxes alone. Moreover, refugees play a key role in the local economy, filling labor shortages and spending their earnings locally.



C40. "Taiwanese Food Culture"**15:00 - 15:20 | Jones B**

Student Author(s): Stella Pin Tsen Shih

Mentor(s): Dr. Gay Rawson

This session will introduce attendees to Taiwanese food culture in order to understand the Taiwanese people and culture more deeply. Food is essential to people's lives in Taiwan. From our greetings to our fancy names for everyday dishes, food is at the center of daily life. This session will showcase several Taiwanese dishes, explaining the meaning and origins of our unique expressions, giving participants a glimpse into the Taiwanese mentality. As a native of Taiwan here on a Fulbright Language Teaching Assistantship, I will share stories from my culture and family and I will also tell you how to make some easy Taiwanese dishes by yourself. We will look at the ingredients, cooking methods, and cultural references to understand better daily Taiwanese life. There will be opportunities for participants to compare Taiwanese food culture to food culture in their own countries. By the end, participants will learn a few words in Chinese and walk away with a new appreciation for many of Taiwan's classic dishes and Taiwanese people.

C41. "When Mercy Seasons Justice: A Critical Inquiry Into The Merchant of Venice"**14:40 - 15:00 | Olin 124**

Student Author(s): Brogan Ludwig

Mentor(s): Dr. Jonathan Steinwand

This presentation investigates the impact that mercy has on justice as set forth in Shakespeare's *The Merchant of Venice*. The mercy shown to the Jewish character of Shylock—he is spared his life—is weaponized by the Christian character, Antonio, and is anything but merciful. While justice is served, mercy, in the Christian meaning of love thy neighbor, is absent and not shown to Shylock. Expanding on the scholarly idea of the symbolic reading of the play as proto capitalism, the financial quality of mercy is also analyzed in conjunction with the Christian version of mercy. I conclude that Shakespeare wants the audience to reject the idea of justice without mercy through analyzing Portia's famous speech in Act 4 Scene 1 about the nature of mercy, as well as other textual evidence. This cold justice is detrimental society as a whole and especially harmful to marginalized individuals such as Shylock. Shakespeare shows the civil injustice that arises due to a society governed by the blunt justice that Shylock eventually comes to crave. He becomes victim to the very thing he advocates on behalf as he does not deserve the hate that is thrust upon him. This hate is taught to Shylock by the Christian characters, and therefore he is a victim of an underlying societal issue that Shakespeare uncovers to show that when we lack merciful justice, we are unable to show compassion.



C42. "Decentralizing Democracy: The Threat Of Climate Change and Authoritarianism and How Democratic Reform Could Stop Them"

15:00 - 15:20 | Olin 124

Student Author(s): Brayden Hafner

Mentor(s): Dr. Eric Schmidt

Despite the seeming failure of democracy to meaningfully address the existential threat posed by climate change, it cannot be assumed that democratic means are insufficient in addressing the issue. Instead, we ought to assume that democratic institutions as they exist must face a meaningful level of reform to better represent the interests of the voters. This article purports that in order for democracies to address these issues and issues like them, political power must be decentralized. To establish this, I summarize the threat of climate change and show that voters are not highly uneducated, but aware of the existential nature of the threat climate change poses. Further, I show that voters do not wish for less intervention but more, showing not that democracy is inherently at fault, but that democratic institutions need to better coincide with the true desires of voters. To do so, I argue that political power must be decentralized, leaving collectives to solve common pool resource problems along with the issue of climate change. After establishing these positions, I go on to address that despite vocal support for authoritarian solutions from some scholars, authoritarian governments tend to address the issue in worse ways and often exacerbate the problem.

