

Oral Presentations

Session A: 4:00-5:00

Beck 201

Impact of Chromosome 3 and 6 Trisomy on Fluconazole Resistance in *Candida albicans*

Clara Billings '23

Advisor: Laura Burrack, Biology

Time: 4:00-5:00

One of the most common fungal infections, Candidemia, is caused by the spread of a mucosal yeast infection into the bloodstream. This life threatening disease has an extremely high mortality rate when not effectively treated. Antifungal drugs, such as Fluconazole, are the main agents to fight this disease. Mutations in the pathway that Fluconazole works to target are just one way fungal pathogens can acquire drug resistance. Another means of becoming resistant to antifungals is through a process called aneuploidy. Additional chromosomes (a form of aneuploidy) can sometimes mean additional production of proteins corresponding to that chromosome and, if those proteins aid in becoming resistant to antifungals, could mean the cells grow better in the presence of the drug. We aim to explore the effects of a specific combination of trisomy (having an extra copy of a chromosome) on chromosome 3 and chromosome 6 in *Candida albicans*. The genes that will be analyzed have a specific function related to drug export in fungal cells. Our preliminary results show that this combination of trisomy increases the expression of 3 of the 4 genes analyzed. Using qPCR, we found the expression of CDR1, CDR2, and MDR1 increased after fold change calculations. The fourth gene, MRR1, did not have as large of a fold change compared to the other three genes. As antifungal resistance becomes increasingly common in patients, our results will hopefully provide valuable insight for the continued development of improved antifungal drugs.

Natural Product Isolation of Buckthorn

Jemma Koenigs '24, Marlys Michaud '24, Kelsi Rygg '25

Advisor: Kennedy Nyongbela-Dohjinga, Chemistry

Time: 4:00-5:00

Natural products from plants have been a bedrock of drug discovery and development for many decades and have provided more than half of all cancer medications. Throughout January 2023 the common buckthorn or *Rhamnus cathartica*, an invasive plant that is common in Minnesota, was investigated for the presence of emodin, an anthraquinone, and subsequent testing on *E. coli* and *C. albicans* for antibacterial and antifungal activities. Extracts of the stem bark and berries of the plant were prepared using hexane, ethyl acetate and methanol by means of a Soxhlet extractor. The methanol extract was further subjected to a total alkaloid extraction. HPLC-MS

was taken for each extract to determine if emodin was contained within any of them and to determine how complex the extracts were. Overall, the HPLC-MS chromatogram showed that the extracts of both the stem bark and berries contained multiple peaks in addition to that for emodin. Moderate antibacterial activities were observed for the extracts, while only the total alkaloid fraction showed a significant antifungal activity. These results have opened a window for further investigation on the properties of the invasive buckthorn.

Impact of a Cockroach in the Rubber Hand Illusion

Brady Chisholm '26

Advisor: Lauren Hecht, Psychological Science

Time: 4:00-5:00

The Rubber Hand Illusion (RHI) is a psychological phenomenon where people take ownership of a rubber hand after seeing it touched in the same way that they feel their hand touched out-of-sight. Experiencing this illusion has been shown to reduce implicit attitudes (i.e., racial bias) and alter how people perceive pain (e.g., flinching when the rubber hand is hit with a hammer). We are seeking to extend our understanding of how RHI can impact attitudes and sensory perception by placing a live Madagascar hissing cockroach (*Gromphadorrhina portentosa*) on the rubber hand during the RHI. By comparing this experience to two other RHI experiences (placing a cockroach model on the hand; and no additional intervention), we hope to demonstrate that people will continue experiencing the illusion with the addition of the bug and then seek to understand how they react - in attitude and in how they perceive touch - to the presence of the live cockroach. Specifically, we will collect a variety of self-report measures (e.g., surveys measuring animal attitudes and experience of the RHI) and objective measures (e.g., heart rate). We predict that participants' heart rate will increase when the cockroach is introduced and decrease as the illusion continues, indicating a lessening of anxiety and a level of increased comfortability with the cockroach. We also anticipate that participants may experience a "phantom" feeling as the bug is introduced to the rubber hand, even though they are not actually being touched. These results would not only contribute to our knowledge of how the mind interprets body sensations, but they would also apply to clinical settings, providing an alternative method for exposure therapies commonly used to treat specific phobias, like entomophobia (the fear of insects).

Secrets from the Basement: Rediscovering Gustavus' Artifact Collection

Olivia Norquist '24, Emma Deyo '24

Advisor: Colleen Stockmann, Art History

Time: 4:00-5:00

In the basement of Beck Hall, hundreds of artifacts sit in the dark awaiting attention. Among the artworks donated to Gustavus from around the world are mukluks and ivory carvings from

Alaska Cup'ig Natives from Nunivak Island. With an emphasis on the Native Alaskan and Native American items within the vast collection, we are working to tell the full story of these objects including reconciling Gustavus's missionary past and contemporary commitment to justice. Our research spotlights the incredible depth of archival evidence we have uncovered that explains how these items were created, by whom, and for what purpose in detail including historic photographs, letters, and samples of the materials used. These objects are valuable teaching tools and we want to share them with the Gustavus community. This presentation reflects the nuance required of historical storytelling for ethical display and interpretation of artworks from Native North Americans. We are working to make these objects visible and reconnect these pieces of Gustavus history with current issues including repatriation, representing diversity in museum collections, and Indigenous reconciliation.

Was Mars once habitable? A pebble survey of Jezero Crater, Mars.

Federico Fiorda '23

Advisor: Julie Bartley, Environment, Geography, Earth Sciences

Time: 4:00-5:00

Understanding the processes that formed the martian surface in Jezero Crater is key to interpreting the geology and past habitability of the planet. Future Martian exploration projects are tied to the discoveries that are made in today's missions. As part of its geological investigation, the Perseverance rover acquires surface images during each Sol (martian day) that it travels, obtaining valuable information about local bedrock, nearby analogous rock sources and transport mechanisms for surface pebbles. Images acquired along Perseverance's traverse, from sol 350 to 399, were examined to characterize surface pebbles larger than 5.25 mm (25 pixels; Yingst et. al 2016). Grain size, shape, and texture were then analyzed to determine whether systematic changes in grain size, shape, or composition occurred along the traverse, and so that inferences about pebble transport mechanisms on the Martian surface can be made. Preliminary results and analysis indicate that median grain size varies between 6 and 10.5 mm but displays no clear spatial trend over the traverse. Angularity shows an overall decrease across the studied traverse sols. These preliminary results suggest some variation in local bedrock, sediment source, and/or mechanism of sediment transport within Jezero Crater. Preliminary analysis of the relationship between pebble size (long axis) and shape (angularity) shows that angular pebbles are, on average, larger, and pebbles exhibiting some degree of rounding tend to be smaller. In order to resolve the possible reasons for this relationship, our next step is to classify pebble types according to their textures and possible lithologies.

Session B: 4:00-5:00

Beck 301

Late Cretaceous and early Paleocene paleosol morphology and geochemistry of the southwestern U.S.

Morgan Mellum '23

Advisor: Erik Gulbranson, Environment, Geography, Earth Sciences

Time: 4:00-5:00

While a lot is known about the extinction of the non-avian dinosaurs during the Cretaceous-Paleogene (K-Pg) mass extinction, less is known about the impacts of this extinction on climate. Previous research indicates that the Late Cretaceous paleoclimate was warmer and more humid relative to the modern, with an inferred million-year scale global cooling that preceded the extinction. This change in climate was interrupted by the Chicxulub impact, resulting in rapid climate effects in the Paleogene. This study addresses how the processes that acted on pre-extinction paleolandscapes affected the climate response of these environments in the aftermath of the impact. The experimental design includes three study areas over a northwest-southeast trending region that ranges from 1,000–2,500 km from the impact site. Sedimentary strata preserved in the study region are Late Cretaceous and early Paleogene in age. The strata, which include paleosols (fossil soils), river deposits, and wetland deposits, are preserved and exposed over 10s of km in all three field locations. Paleosol morphology, when controlled for landscape variability, indicates that the most prominent effect of the K-Pg impact was: 1) a decrease in chemical weathering; and 2) the balance of erosion and depositional processes in the study area. Preliminary paleoatmospheric CO₂ concentrations display a pronounced increase during the Maastrichtian to ~4x pre-industrial concentrations (PAL), followed by a decline to 2.4xPAL. No significant change in pCO₂ is observed across the extinction. These observations likely reflect the combined influence of ecosystem restructuring of soil formation and depositional processes.

Curcumin, a Dietary Supplement, Could Trigger Drug-Induced LQTS in Some Vulnerable Individuals

Annabel Smith '24

Advisor: Jeff Dahlseid, Biochemistry and Molecular Biology

Time: 4:00-5:00

Long QT syndrome (LQTS) is a genetic disease where there is a disorder in electrical conductance required for proper functioning of heart muscle cells, or cardiomyocytes. For most LQTS patients, symptoms such as fainting or cardiac arrest are caused by specific triggers like a reaction to a drug. The dietary supplement curcumin, found in turmeric, has been previously shown to block a potassium channel involved in repolarizing cardiomyocytes. Our research

investigated the potential of curcumin to aggravate dysfunction in a particular cardiomyocyte cell line (iPSC-CM cells), specifically by lengthening the action potential duration (APD) in these cells. These iPSC-CM cells are derived from a LQTS patient with the genetic variant KCNE1-D85N and a known history of drug induced symptoms. We used a variety of experimental methods to measure the APD of iPSC-CMs with and without 10 nM curcumin. Additionally, isogenic control iPSC-CMs, with the genetic mistake that causes symptoms in this patient corrected, were measured for a baseline. After the addition of curcumin, iPSC-CM cells demonstrated significant lengthening of APD compared to without. In comparison, the isogenic control iPSC-CM cells showed no difference in APD. This study suggests that curcumin may be able to lengthen APD in patients with proarrhythmic variants. Individuals having the D85N-KCNE1 genetic variant, present in about 1% of caucasian populations, may be at an increased risk of curcumin-induced LQTS.

Characterization of *Candida albicans* ERG251 mutation strains and the effect of ERG251 on ERG3, ERG6, and ERG11

Tessa Bierbaum '23

Advisor: Laura Burrack, Biology

Time: 4:00-5:00

Candidemia is a disease in which mucosal yeast infections spread to the bloodstream. This results in yeast infection spreading through the body and can result in death if essential organs become infected and if sepsis occurs. Candidemia can be treated by antifungals that target the ergosterol biosynthesis pathway. The ergosterol biosynthesis pathway produces ergosterol, a compound similar to cholesterol in fungi that maintains the fluidity and permeability of the cell membrane. Antifungal resistance can result from changes in the ergosterol biosynthesis pathway genes, which limits the ability of antifungals to prevent the spread of yeast infections. By observing the changes in ergosterol gene expression as a result of changing conditions such as temperature and the presence of Hsp90 function, conclusions can be made regarding the role of these genes on antifungal resistance. Investigating the role of ergosterol biosynthesis pathways such as ERG251, ERG3, ERG6, and ERG11 and how these genes interact may provide insights into understanding how antifungal resistance develops, which could lead to the discovery of improved antifungal drug treatment approaches.

The Use of Daily Symptom Tracking as a Tool for ADHD Management

Haley Lukes '23

Advisor: Lisa Ortmann, Education

Time: 4:00-5:00

Task initiation and executive functioning can be challenging academic skills for students of all ages diagnosed with ADHD and other neurodivergent disorders. As of 2019, 6 million K-12

students are diagnosed with ADHD (CDC, 2023), and it is estimated that while 62% of K-12 students take medication to manage ADHD symptoms, 23% of K-12 students diagnosed with ADHD receive no treatment and no medication to help with their symptoms. The use of symptom tracking tools have been used by parents and professionals to monitor ADHD symptoms and medication. This self-study looks at the use of a daily symptom tracking tool to explore changes in responses while on medication for ADHD with regards to task initiation and executive function for one college student. This study investigates the impact of medication and symptom tracking tools in people with ADHD to gain further insight on what can be done to assist students with ADHD in the classroom. Results from a self-study show an unexpected finding in a difference in ADHD medications based on symptoms tracked in the first half of the data collection period versus the second half. The results also provide data on what is regularly impacting someone with ADHD in an academic setting along with what can be done to mitigate symptoms in the classroom for students.

Effect of Mobile Phase Preparation Methods on Acidic and Alkaline Pharmaceutical Analyte Retention using Reversed-Phase High-Performance Liquid Chromatography

Nathan Cole-Dai, Trevor Kempen

Advisor: Dwight Stoll

Time: 4:00-5:00

Gradient elution retention data used to train predictive algorithms for reversed-phase high-performance liquid chromatography separations must be accurate so that commercial medication manufacturers can reliably purify, identify, and isolate compounds used in their products. While compiling experimental results for multiSim, one such HPLC algorithm, we recently changed our protocol for preparing a buffer solution used in our mobile phase. Resulting inconsistencies in retention factors and selectivity values for numerous organic compounds, whose data is incorporated into our online predictive model, signify our need to repeat some retention measurements. This study assesses the effect of preparing a 25 mmol/L ammonium formate buffer using the solid compound, as opposed to aqueous formic acid and ammonium hydroxide as before, on the selectivity (α) values of 59 different analytes. While holding constant the stationary phase of the column (Agilent Zorbax SB-C18) and the various buffer-acetonitrile proportions of our mobile phase, we discovered that a 0.6-unit decrease to a pH of 2.6 observed in our fully aqueously prepared buffer significantly affects the retention of most of our analytes. Specifically, we found that 58 analytes experienced an increase or decrease in selectivity greater than one percent when eluting with our new 3.2-pH buffer, in contrast to our old solution. Attributing this pattern to frequent losses of ammonia vapor caused by repeatedly opening a bottle of aqueous NH_4OH , with respect to our experiment's results, we resolve to prepare our buffer using ammonium formate salt in the future, thereby keeping multiSim accurate for its users.

Session C: 5:00-6:00

Beck 201

Nonsense-mediated Decay of CEP3 mRNA

Annie Corbett '23

Advisor: Jeff Dahlseid, Biochemistry and Molecular Biology

Time: 5:00-6:00

The appearance of a genetic trait depends on whether the corresponding gene is “expressed”, a phenomenon that involves multiple molecular steps and DNA, RNA, and protein molecules. Messenger RNAs (mRNAs) are enzymatically synthesized and are copies of the genetic information stored in DNA that code for the synthesis of proteins, which provide structure, support, and facilitate movement for a cell. In addition to the synthesis of RNA and proteins, degradation of RNA also plays a role in gene expression, ultimately influencing the amount of protein and thus the degree of genetic trait that is apparent. For mRNA degradation, one important mechanism includes deadenylation-independent decapping (also called nonsense mediated decay, or NMD). NMD is a cell surveillance mechanism that accelerates the decay for many aberrant, and some non-aberrant mRNAs. In this study, we analyzed CEP3, a naturally occurring, non-aberrant mRNA degraded by NMD. We will present results testing and describing the enzymes involved and RNA features responsible for NMD recognition of CEP3. Overall, our goal is to understand the determinants of molecular recognition for NMD.

Measuring Carbonate-Associated Sulfate in Small Sample Sizes

Madelyn Banks '23

Advisor: Julie Bartley, Environment, Geography, Earth Sciences

Time: 5:00-6:00

This project focuses on the development of a method to analyze carbonate-associated sulfate (CAS) concentrations in limestones and dolostones in very small (~10 mg) sample sizes. Previous methods required larger sample sizes (~40 g), in order to obtain sulfate concentrations large enough to analyze. In the standard technique, CAS was determined by dissolving large samples of carbonate and quantifying sulfate via precipitation of BaSO₄. The new methodology would measure sulfate concentrations directly from mg-size dissolved carbonates via ion chromatography. If this new method of analyzing CAS at a smaller scale is successful it will allow for measurement of CAS concentration within individual carbonate phases within a complex rock, rather than relying on whole-rock analyses that combine many phases of the rock's petrographic structure together. The challenging aspect is to locate the (very small) sulfate peak at a far enough distance away from the (very large) chloride peak, such that the chloride ion signal does not interfere with the sulfate ion signal. Once this methodology is established, we will examine differences in CAS concentration across individual phases in ancient stromatolites

that have been hypothesized to have formed in seawater with significantly different compositions. To evaluate this, we use a small drill to create powder from individual stromatolite layers/phases, dissolve those samples in HCl, and analyze via ion chromatography.

Python as a Computational Tool for Physical Chemistry Lab

Caden Gunnarson '23

Advisor: Amanda Nienow, Chemistry

Time: 5:00-6:00

Computational and programming skills are becoming increasingly important for the average scientist to learn and using programming as a tool has several advantages. First, data analysis with programming can be used to analyze multiple and large data sets easily. This is especially useful with the more complicated analysis done in the physical chemistry lab. Second, reproducibility is quicker and easier when the analysis is in code instead of instructions. Having a script for analysis makes it easier for other researchers repeating the work. Third, the skills in this lab can be translated to other areas of computational chemistry. Python is a general purpose programming language popular in academia and industry because it is easy to learn and has a large ecosystem of scientific and numerical tools. This project created a series of scaffolded assignments to introduce students to performing calculations, creating graphs, conducting linear regression, and fitting curves with various packages in Python. These skills will serve students who go on to industry or graduate school, as otherwise most are self-taught. Future work could introduce advanced topics such as machine learning for cheminformatics or automating computational chemistry workflows. This project will be introduced to students in the next few years.

Analysis of Landslides in Southern Minnesota

Rebecca Eslinger '23

Julie Bartley, Environment, Geography, Earth Sciences

Time: 5:00-6:00

Mass Wasting events are well-studied in high-relief environments, but low-relief areas like the Minnesota River valley have not received the same attention. A statewide landslide inventory for Minnesota was released in 2021 USGS (U.S. Geological Survey) in collaboration with colleges across the state. The study revealed an average of one past or current landslide every 24 square miles in the state of Minnesota, with context, many landslides are much more frequent in high-relief areas and near sources of water. The high frequency of landslides in these areas makes it likely that landslides are an important mechanism of sediment transport into rivers. The resulting effects of landslides and the mass wasting events themselves are also likely important drivers shaping Minnesota's topography in these areas. Recent studies of the southeastern part of the state (Dean, 2019) and the Minnesota River valley (Kohout, 2019) examined the relative

importance of several factors that influence mass wasting. Both studies concluded that slope and geologic material were important, but disagreed regarding the importance of aspect. This study uses the USGS inventory to examine the contributing factors of slope, aspect, geologic material, and slide class in five locations along the Minnesota River between Brown and southern Hennepin counties.

Poster Presentations
Session D 4:00-5:00
Beck Atrium

The Charmides Conundrum: Exploring Oscar Wilde, Plato, and Greek Homoeroticism

Lindsey Kohlhasse '23

Advisor: Yurie Hong, Greek, Latin, and Classical Studies

Time: 4:00-5:00

In 1881 Oscar Wilde published one of his longest and most controversial poems, Charmides. This 666-line poem focuses on a young Greek man, Charmides, who travels to Athens and spends a night in the Parthenon. Here, he undresses and assaults the statue of Athena, who later causes him to drown at sea.

This story is unique to Wilde, though it seems to draw inspiration from Plato's work of the same name. To some, the themes of these texts do not overlap beyond their namesakes. However, through my research I explore why Oscar Wilde purposefully references this Platonic dialogue and the reception of Hellenic ideas of masculinity and sexuality within Wilde's works.

In this paper, I argue that Oscar Wilde specifically references this Platonic dialogue in order to adapt Hellenic notions of identity and sexuality as part of his fantasizing of the Greek past within his Victorian present. I draw these conclusions based on thematic and linguistic similarities between Plato's Charmides, and Oscar Wilde's poetry and prison letters.

This work was submitted as an Honors Thesis and successfully defended to the Greek, Latin, and Classical studies department. It is currently in the process of being published through the Yale undergraduate journal, Helicon, and will be officially published in late 2023.

Lead Poisoning in MN Wildlife: A Literature Review

Anna Lundeen '23

Advisor: Jon Grinnell, Biology

Time: 4:00-5:00

Lead poisoning is a prominent issue in Minnesota ecosystems. This review addresses the biochemical trajectory of lead, the symptoms, testing, and treatment of affected organisms, and how lead is introduced to the environment. Hunting and fishing practices have been determined as a primary source of lead contamination, leading to significant population effects on wildlife

that inhabit contaminated ecosystems. While Minnesota lead bans exist in Waterfowl Production Areas, the evidence suggests that moving to lead-free alternatives in hunting and fishing practices would result in decreased population effects and mortality rates in Minnesota ecosystems.

A New South? Analyzing generational voting shifts in the Deep South

Ari Bradley '24

Advisor: Jill Locke, Political Science

Time: 4:00-5:00

In 2020 and 2022, we saw Georgia flip blue for both the presidential and Senate races, along with shifts towards the Democratic Party throughout the South. This project aims to discover the reasons for this political shift as well as its potential impacts on future elections in the South and the country as a whole. My research question is: Is this a generational shift after decades of Republican dominance or is it an outlier based on the controversial tenure of Donald Trump? Starting from the 2008 presidential election, analyzing these youngest voters and seeing how they are voting in comparison to older generations. Some are rebelling against their parents, while others are sharing the same political beliefs. This latest generation is ultimately going to redefine the South politically, or keep it the same. The political issues of today like climate change, LGBTQ+ rights, and racial justice are affecting this newest generation of voters. Have these and other issues pushed them away from their parents' beliefs permanently, or are they less impacted than we might think? Ultimately it depends on each person, but generally these younger voters are tired of inaction against issues that matter to them, and are rebelling against the generation of politicians and policies their older generations have pushed for decades.

The Endeavor of The Youth

Anh Vu '23

Advisor: Jill Locke, Political Science

Time: 4:00-5:00

The purpose of this project is to highlight three different struggles that the youth have been suffering from, which are gun violence, sexual assault, and immigration laws. Since young people have not received enough recognition for what they have been through, it is crucial for not only the adults to acknowledge the importance of the youth but it is also our responsibility, as a young generation, to defend ourselves, to advocate for what we think is righteous, and to reclaim what we have been deprived of. The reason why I chose these three issues to draw a connection with young people is because there is an increasing number of children being killed in mass shooting events. Moreover, there is an escalation in the amount of young women being harassed in public places and college campuses. Last but not least, no children at a very young age have to

experience early separation and this creates a negative impact on children's development. This project will point out key factors in each issue and portray it in a comprehensive format. The main goal of this project is to deliver a message of how resilient young people are and the power of a downtrodden group when they assimilate their power to resist oppression and exploitation.

Structural Probing of the Small RNA RyhB with SHAPEmapper and DREEM

George Giannou '24, Caden Gunnarson '23

Advisor: Janie Frandsen, Biochemistry & Molecular Biology

Time: 4:00-5:00

The central dogma of molecular biology is the flow of information from DNA to mRNA to proteins and is used to define all life. While mRNA gets the spotlight in the central dogma, RNAs can also serve other roles. Small RNAs (sRNA) are short RNA products that serve regulatory roles by interacting with mRNAs and proteins to control their function. sRNA structure is crucial to its function, but structure determination is difficult and limited work has been done. In this study, we used two different computational tools to determine structure from chemical probing data. RNA chemical probing is a method used to assess structure based on the location and frequency of chemical modifications to the RNA. Highly structured regions are sheltered from the reagents and are less modified, while places of low structure are more modified. SHAPEmapper analyzes sequence data to predict the structure based on a population average, which has been standard practice in the field. In contrast, DREEM uses clustering algorithms to determine multiple possible structures and their comparative abundance. Analyzing the RyhB sRNA, SHAPEmapper and DREEM predicted different overall structures; however, there were some similarities between them and with previously published predictions. DREEM found 2 structures at a 1/10 ratio. These multiple structures might be active and inactive forms of the sRNA, and by changing the conditions, the factors that influence sRNA regulation can be learned. The next steps are to compare more sRNAs and examine the changes in the population due to stress conditions.

A Study of Epigraphs: Women in Hispania

Margaret Lucas '23

Advisor: Matt Panciera, Greek, Latin, and Classical Studies

Time: 4:00-5:00

For my honors' thesis for my Classics major, I chose to examine the Roman presence in the provinces of Hispania between the 1st C. BC and 1st C. AD through the examinations of epitaphs (Roman funeral stones) of Hispania women. My thesis discusses the Latinization of Paleohispanic Languages and Romanization of local Iberian names and erasure of local names

and how that altered local natives identities, as well as how local women adapted to Roman values/standards, appearances, and roles. Overall, my goal in this thesis is to illustrate how the Romans influenced local Iberian's to abandon their own culture in favor of Roman culture in order to be better received in a growing Roman society.

COVID-19's impact on the well-being of Healthcare and Quality of care

Briana Canesi '23, Toria Dyer

Advisor: Barb Zust, Nursing

Time: 4:00-5:00

Myself and Toria Dyer did a joint research project collecting data from isolated groups of healthcare individuals ranging from bigger healthcare facilities to standalone clinics using a snowball approach to explore COVID-19's impact on the well-being of Healthcare and Quality of care.

The Effectiveness of Highlighting Instruction and Feedback on Student Recall

Emma Rossow '23, Tait Erickson '23

Advisor: Jennifer Ackil, Psychological Science

Time: 4:00-5:00

Highlighting is a commonly utilized study strategy, yet has not been identified as highly effective in improving student recall. This study examined the effectiveness of highlighting as a study strategy when participants are taught how to highlight effectively and given feedback after practice. Participants were randomly assigned to one of 4 conditions: instruction + feedback, no instruction + feedback, instruction + no feedback, and no instruction + no feedback. We hypothesized that when students are taught how to highlight and are given feedback about their highlighting performance, they will correctly recall more main ideas and supporting details from the text than if they are not provided with highlighting instruction and feedback. There were no significant differences between any of the conditions, although the means of main ideas and supporting details recalled for the instruction groups were higher on text 1 than text 2. Additionally, for the feedback groups, participants who did not receive feedback had higher means of main ideas, supporting details, and total words recalled than participants who did receive feedback. Although these were not significant findings, they demonstrate possible instances of fatigue and/or cognitive burden that occurred in the experiment. Still, our results do not support our hypothesis that instruction and feedback can increase highlighting effectiveness, and contribute to the literature suggesting that highlighting is not an effective study strategy.

Peacebuilding in Colombia

Bryn Swinston '25, Benji Huff '24

Advisor: Loramy Gerstbauer, Political Science/Peace Studies

Time: 4:00-5:00

The decades-long Colombian civil conflict claimed the lives of hundreds of thousands of its citizens, not to mention the many more displaced and “disappeared” during the periods of violence. Throughout a month of research during a January Term course, we were given the opportunity to explore not only the history and context behind the conflict but glimpse a small amount of Colombia’s current reality. Most importantly, however, our course focused on the process that is bridging Colombia’s past and future. Peacebuilding in Colombia has taken many forms with a wide range of scales, from interpersonal forgiveness to a governmental truth commission. Through time spent observing and participating in the work of a religious non-governmental organization (Paz y Esperanza Colombia), we learned about standards for ethical engagement as outsiders. In addition to this, our research focused on the importance of community programs, both to heal through dialogue (Las Señoras de Memoria) and provide opportunities for young people to grow their leadership skills to create a bright future for themselves and their communities. Overall, the J-Term highlighted the steps that Colombia and the people who live and work there have taken in the peace-building process, as well as providing an opportunity to engage in learning about the experiences of displacement and dialogue.

Analysis of mRNA Structure and Its Role in Gene Regulation by sRNAs

Rachel Trebesch '25

Advisor: Janie Frandsen, Biochemistry and Molecular Biology

Time: 4:00-5:00

Antibiotic resistance remains a public health problem because bacteria continue to develop ways to overcome the effects of antibiotic treatments. This rise in resistance is a result of antibiotics only targeting a single cellular process. By developing antibiotics that target alternative processes, the increase in antibiotic resistance may be reversed. Small RNAs (sRNAs) may be a solution as they determine the response of the cell through binding with mRNAs. The focus of this research is on *Escherichia coli* and how their small RNAs regulate bacterial homeostasis through direct binding interactions with mRNAs. Each sRNA can bind to multiple mRNAs; however, it is unknown which features of these interactions dictate the order of binding. One feature that may affect binding order is the structure of the mRNA. Analysis of mRNA structure is done by using a technique called RNA structure probing which quantifies the structure of the mRNA by finding the frequency of chemical modifications at each position. The more modifications at a position, the less structured and more accessible it is for sRNA binding. Gini indexes are a measure of uniformity that can be calculated using the structure probing data to further determine how structured the sRNA binding site is. Unstructured regions are expected to

have a low Gini index, indicating high uniformity in accessibility. Looking at both the Gini indexes and DMS-seq reactivity data, may further affirm that sRNA binding is dependent on the structure of the mRNA and give insight into mRNA binding order.

The Obligation to be Vulnerable in Youth Activism

Tessa Yeager '24

Advisor: Jill Locke, Political Science

Time: 4:00-5:00

Obligatory vulnerability, a term coined by scholars Shani Orgad and Rosalind Gill, refers to the forced vulnerabilities that come along with attempting to be successful in policy reform. An example of this can be seen by looking at X González, a young survivor of the Parkland shooting. One of the founders of the March for Our Lives movement, they felt like they had to continually expose and discuss the traumas that they had gone through in order to make change in gun reform, while they were still trying to process what had happened internally. In addition, significant trauma can come with being an activist in the public eye and exposing oneself to criticism. González's PTSD was heightened by attending protests, marches, et cetera. They also were constantly criticized for aspects of their life other than their activism, such as their identity and expression. This vulnerability leaves long-lasting effects on the activists that it plagues, and is seen in all aspects of activism, not just gun reform. Other cases addressed in this project will be climate activists Greta Thunberg and Vanessa Nakate, Malala Yousafzai, and the activism of undocumented youth. This research shows obligatory vulnerability manifests itself in youth activism, and the harms that it places on the sphere of activism and the activists themselves.

Lot-to-Lot Variations in Stationary Phase Chemistry

Ezedin Seid '24

Advisor: Dwight Stoll, Chemistry

Time: 4:00-5:00

Despite the improvement of liquid chromatography instrument technology over the years, some of the troubleshooting issues still persist. Lot-to-lot variability is one of the most common issues that results in deviations from expected retention times. Column manufacturers struggle with batch-to-batch reproducibility of LC stationary phases as it can depend on potentially hundreds of experimental variables, resulting in different retention times for lots with the same stationary phase. Retention factor should be independent of the column length since it is a thermodynamic property of the mobile and stationary phases. In this project, we run columns with the same stationary phases but from two different manufacturing lots. We observed differences in retention times on the order of 15% for some compounds which could result in coelution or even an inversion of elution order. This result is indicative of variation in the chemistry of the stationary phase of the two batches of columns used.

An Interactive Approach to Displaying Ecological Extinction Mechanics in a Museum Exhibit

Sarah Genet '23

Advisor: Julie Bartley, Environment, Geography, and Earth Science

Time: 4:00-5:00

A newly installed exhibit within the Geology Museum aims to highlight the Cretaceous-Paleogene (K-Pg) extinction and the drastic shift in the terrestrial ecology following the extinction of the non-avian dinosaurs by using comparative food web analysis and interactive learning. The comparative food web analysis approach is necessary to document the shift in niche occupation and body size distribution across the boundary. Additionally, utilizing science communication tactics to integrate interactive learning within the exhibit adds to the audience engagement and works to make these technical topics accessible to the general community. The board game Evolution: Climate is included within the exhibit as it focuses on catastrophic ecological dynamics similar to those exhibited during the K-Pg extinction, and dinosaur teeth specimens and replicas alongside fossil mammal teeth specimens are included to highlight the morphologically different dentition by displaying the contrast between feeding mechanics and size disparity during the end of the age of dinosaurs and the beginning of the age of mammals. This exhibit was created with particular attention to conveying technical scholarly concepts in a way that is accessible to an audience of college students across disciplines. With this challenge therein lies the problem of determining how an audience thinks about things on an epistemological level, which prompted the inclusion of interactive elements within the exhibit.

Honor Culture and Mass Shootings: Insights from Greek Literature

Gretta Wood '25, Taylor Johnson '24, Quoc Cuong Pham '25

Advisor: Séan Easton, Greek, Latin, and Classical Studies

Time: 4:00-5:00

Mass shootings in America have been increasing since 2000, with many people calling for gun reform or improvements in mental wellbeing. The emotions that the assailant falls victim to are always called into question by experts who are trying to understand why the mass shooting occurred and how these acts can be prevented in the future. It is common for the shooter to feel a sense of entitlement, stemming from a perceived grievance or a desire to restore their honor, similar to the culture of honor in ancient Greek and Roman societies. To better understand the assailant we will be analyzing character emotions amongst one another in the Iliad and Thebaid. Within the books, many of the characters seek revenge towards someone who wronged them or shamed them publicly and the outcomes of the revenge are often brutal.

Shame in relation to Ancient Greek literature and cancel culture

Aurora Schelmeske '24, Mackenzie Bergen '25, Nelson Herrera '25

Advisor: Séan Easton, Greek, Latin, and Classical Studies

Time: 4:00-5:00

Shame is a pivotal emotion that drives actions both in Ancient Greek literature and modern day society. We are attempting to explore the connections between shame and “cancel culture” in the present day with relation to works such as the epics. Our poster will visualize a deeper dive into our research, which emphasizes the relationships of shame to honor societies and dignity societies, as well as highlighting the differences.

Unwanted Esterification of Acidified Solvents

Soren Grant '24

Dwight Stoll, Chemistry

Time: 4:00-5:00

High-performance liquid chromatography (HPLC) is a powerful method for separating, identifying, and quantifying biomolecular analytes, is employed in various fields, including pharmaceutical and biological product manufacturing, medical research, and legal applications. The popularity of HPLC is attributed to its high sensitivity, precision, and increasing utilization in pharmaceutical R&D and drug approval processes. Unwanted esterification reactions occurring in acidified solvents present a significant challenge that affects the accuracy and consistency of HPLC separations. These esterification reactions introduce variability and compromise the reliability of HPLC results, necessitating further research to address this issue. Reverse-phase HPLC, a specific subtype of HPLC, involves the use of hydrophobic stationary phases and acidified solvents for modulating mobile phase pH. However, undesirable esterification reactions can occur when formic or trifluoroacetic acids are stored in methanol or ethanol solvents, leading to unpredictable alterations in the acid content of the solution. Consequently, these reactions adversely affect chromatographic baseline quality, retention time, and selectivity.

This research aims to address the challenges posed by these esterification reactions in two ways: (1) by investigating the kinetics of these reactions, and (2) by using the kinetics data to offer practical experimental design suggestions to minimize the reactions' magnitude. Addressing these issues will greatly enhance the accuracy of HPLC experimental results, ultimately benefiting the field of liquid chromatography as a whole. Success in this research endeavor will result in a valuable contribution to the discipline of analytical chemistry, with implications for both academic and industrial applications.

Exploring the Perceptions of Pre Health Students who Engage in an Interdisciplinary Approach to Learning

Hannah Hubbart '23, Ella Ruble '23

Advisor: Heidi Meyer, Nursing

Time: 4:00-5:00

Background/Significance

Interprofessional education involves two or more health professions that collectively create and cultivate a collaborative learning environment with the goal of creating skills and attitudes that result in desired team behaviors (Buring et al., 2009). Minimal opportunities exist for interdisciplinary collaboration between pre-health students at liberal arts institutions, particularly nursing and athletic training. This may potentially hinder creativity and skill development essential for successful patient care. Creative pedagogical strategies that develop interprofessional collaboration abilities are needed at institutions where there is limited opportunity for actual interprofessional collaboration.

Purpose

The purpose of this research study was to explore the perception of pre-health students who engaged in an interdisciplinary approach to learning.

Methods

This qualitative study utilized Elo and Kängas' (2007) descriptive content analysis approach to complete a secondary analysis of group exam reflections from an unfolding case study. Ninety three pre-health student responses were analyzed at one rural, liberal arts college in the Midwest. The reflections consisted of two open ended questions about working in groups, focusing on the effectiveness of the group, behaviors, and application to future professional roles. This study was exempt from IRB oversight.

Findings

Preliminary findings indicate that open respectful communication, open mindedness, and working with a team with different skills/perspectives were behaviors that positively impacted collaboration. Students indicated the need to integrate these behaviors when working with other health care professionals to maximize learning resulting in comprehensive patient care.

Optimization of Anion-Exchange HPLC Separation of Lipoproteins

Isabella Aase '24, Ezedin Seid '24

Advisor: Dwight Stoll, Chemistry

Time: 4:00-5:00

Lipoproteins play many roles in the brain and may be associated with Alzheimer's disease. The separation of these cholesterol (HDL, LDL, and VDL) is necessary to study this possibility. Traditionally, this was achieved through ultracentrifugation. Anion-exchange HPLC has previously been successfully used for this separation, discriminating the lipoproteins by size and charge. This method is faster and uses less sample than other fractionation methods.

Additionally, it can be used to measure the levels of different subtypes of LDL (e.g., “bad cholesterol” often associated with increased risk of developing Alzheimer’s). Thus, separation via anion-exchange HPLC is an important tool to study the relationship between lipoproteins and Alzheimer’s disease. However, the state-of-the-art anion-exchange separation takes more than 30 minutes per sample and is prone to frequent breakdowns due to obstruction of instrument components by plasma components. The goal of our research is to shorten this fractionation and improve the reliability of the method. To this end, we will study the impact of flow rate, temperature, and pressure on separation performance. Automation of HPLC operation and troubleshooting the column clogging issues will also increase sample throughput. In this presentation, we will present preliminary results from the study of the effects of system parameters on separation performance.

The Myth of Choice: A Comparative Analysis of Child Soldiers in Nepal and Uganda

Warsan Cumar

Advisor: Jill Locke, Political Science

The official definition of a child soldier is “a child associated with an armed force or armed group”, who is under the age of eighteen. The use of children in armed conflict has grown steadily over the last two decades, and has disproportionately affected children that live in regions prone to violence and where poverty and lack of education and work opportunities prevail. Moreover, children play different roles in armed conflict based on factors such as gender and geographic location. My paper examines two case studies: Uganda where children are abducted and coerced into armed conflict and Nepal where children are covertly convinced to join the People’s Revolution. Due to the egalitarian beliefs of the Maoist Movement, girls in Nepal aren’t systemically subject to gender based violence, which is a stark contrast to their Ugandan counterparts. As a whole, child soldiers are recruited or used by both armed groups and armed forces in many capacities, including but not limited to serving as a scout, cook, guard, or messenger. Regardless of what role children are coerced into, international and local authorities disagree about how best to reintegrate children back into civil society. Ultimately, through this research, we uncover successful methods of reintegration both by local and international organizations, while also viewing conflict through the lens of gender and geographic location.

Systemic Racial Inequality in the Public School System

Noah Dyer ‘23

Advisor: Jill Locke, Political Science

Time: 5:00-6:00

Systemic school inequalities experienced on a racial basis have been, and continue to be, an unfortunate norm for many non-white students in the public school system. This research project is focused on analyzing the root causes of racial inequality in public schools, and proving that

they are directly caused and perpetuated through political actions undertaken by private and governmental actors. This project utilizes an analysis of historical educational policies, Supreme Court decisions, and gender roles in advocacy. With this analysis, the modern inequalities, which take the form of the black-white achievement gap, disproportionate distribution of public funds and resources based on demographics and districts, and curriculum inconsistencies, particularly in regards to critical race theory and Black history, can be proven to be consciously enacted by political bodies and agents. With this research, the root causes of racial inequalities in the public school system can be addressed, and some pathways to a more equitable system of education can be revealed.

Session E: 5:00-6:00
Beck Atrium

Impact of ploidy on antifungal resistance

Kimberly Hareland '24

Advisor: Laura Burrack, Biology

Time: 5:00-6:00

Approximately 1.5 million people die from fungal infections every year, despite the current treatment methods. One cause of treatment failure is antifungal drug resistance where mutations in the fungal genome reduce susceptibility to antifungal drugs.

Mutator alleles introduce mutations at higher rates in organisms. In this work, we focus on MLH1 which encodes a protein required to fix errors during DNA replication. Previous research has shown that haploid cells can develop resistance due to mutator alleles, such as mutations that cause loss of MLH1 function, but the effect of mutator alleles in diploid cells remain unknown. The main goal of this project is to determine the effect that ploidy has on the evolution of antifungal resistance by comparing haploid and diploid strains of the model fungus *Saccharomyces cerevisiae*, with and without deletion of MLH1. Our prediction is that mutator alleles will promote the evolution of drug resistance in haploids, but not diploids. To test this prediction, we conducted an in vitro evolution experiment to see if haploids with mutator alleles develop resistance to fluconazole, the most prescribed antifungal drug, at a higher rate than other strains. Preliminary results show higher levels of growth in the haploid strains than in the diploid strains in 128 $\mu\text{g/mL}$ fluconazole, suggesting higher levels of resistance mutations in the haploid strains. MIC (minimum inhibitory concentration) assays will be used to compare the resistance of the evolved populations, and whole genome sequencing will be done to determine where mutations occurred.

An Analysis of Latin American Student Movements

Sophia Artley '23

Advisor: Jill Locke, Political Science

Time: 5:00-6:00

Latin America has a deep-rooted tradition of student movements in its history and culture. Again and again, generations of young secondary and university aged students break the mold of the “apathetic youth” older generations describe. Students across the continent repeatedly use tactics of strikes, occupation of spaces, and the formation and use of national congresses to fight for both student-related and broader social issues.. Yet scholars often overlook or fail to mention this important category of movement. My analysis of the last 105 years of student movements in Latin America discusses these repeated themes of protest methodology that have led to political and social change. This study includes case studies from four cycles: student movements in 1918, the 60’s: Student Movements in the Face of Authoritarianism, the ‘80’s and 90’s: Post Dictatorship and Pro-Democracy, and Student Movements in the 21st century. Through a further exploration of specific case studies from each cycle of movement, this paper argues that Latin American student movements have had and continue to create social and political change

The Legal Rights of Youth to a Stable Climate

Emily Davison ‘23

Advisor: Jill Locke, Political Science

Time: 5:00-6:00

Climate change is one of the greatest threats to humanity in the 21st century and youth have a unique position in the problem. Youth have done very little to contribute to climate change and yet they will have to live the longest with its effects. Many youths around the world are taking their own governments to court. Youth are suing their governments for not ensuring their rights to a clean and equitable environment, and also actively contributing to the intensification of climate change. For example, *Juliana v. United States*, *Kanuk v. Alaska*, and *Rabab Ali v Federation of Pakistan*. My research question is: How well do these court cases advance the fight for a stable climate and protection of youth's rights to a clean environment? I argue that it may seem inefficient to take a government to court in a legal system that they control, the benefits of these cases outway any barriers the plaintiffs experience. The youth bringing forward these cases allows for a level of hope and acceptance of the case that may not be there with adults. Furthermore, these cases stand up to the rhetoric of older generations that they can sit back and let youth deal with the problems of climate change. These cases can make them legally responsible for their actions that perpetuated the climate instability. Lastly, these cases uplift human rights movements related to climate change.

Neglect Thy Past: The Persistent Genesis Folklore of Gustavus Adolphus College, the Emerging Counternarrative, and its Current Impacts to the Institution

Mad Chase ‘23

Advisor: Ursula Lindqvist, Scandinavian Studies

Time: 5:00-6:00

Since its beginnings in 1862, Gustavus Adolphus College has boasted an identity of Lutheran Swedish-American immigrants. This story reverberates throughout nearly every aspect of the college from marketing, to buildings, and most importantly in official histories on the foundation of Gustavus. Thus this narrative becomes a genesis folklore that is upheld as scripture, influencing the college in nearly every aspect. The genesis story of Gustavus Adolphus College has a lineage that traces back to Conrad Peterson's *Remember Thy Past*, from which my title is derived. This foundational work creates the framework for the rose-colored reflective past that Gustavus holds for itself, as it paints the picture of the institution known today, from its founding documents to the early 1900s. In this history the genesis folklore of Gustavus is established which continues to be promoted in Gustavus' literature; however, this allows Gustavus to exonerate itself from its history with the Indigenous Dakota people of the area. Thus understanding the counternarrative built from cross-analysis of official Gustavus histories and identity, Minnesota Indigenous history, and primary founding documents becomes essential in the holistic story of Gustavus Adolphus College. The topic of this paper addresses how this genesis folklore of Gustavus came to be, how the institution can begin to decolonize or "un-settle" this myopic history, and how this pervasive narrative continues to shape how the college perceives and promotes itself. Despite a growing want for Indigenous conciliation from many Gustavus students, professors, and staff, there is only the very beginnings of decolonization work being done to reevaluate the genesis folklore of Gustavus. This paper seeks to create a counternarrative to the Gustavus genesis folklore by deconstructing it through the comparative study of Swedish-language meeting minutes regarding the founding of the college, official histories of the college, Minnesota settler-colonialist history, and Minnesota Indigenous histories. Without an understanding of how ahistorical and myopic this genesis story of Gustavus is, there is no room for the more important works that corroborate Indigenous Dakota history with the history of Gustavus Adolphus College. Although this paper is only part of the beginning of this process, it seeks to be a foundational source for future scholarship.

Lina Sandell and the Hymnody of the Evangelical Covenant Church

Sophie Martinez '23

Advisor: Samuel Kessler, Religion

Time: 5:00-6:00

The Evangelical Covenant Church is a prominent example of a Protestant denomination in America whose hymns merit renewed research interest. The purpose of this project is to provide a history of the theology of the Covenant Church, and of the Church itself, through the lens of hymnody. The focus of this project is especially on the hymns of Lina Sandell (1832-1903), a prominent Swedish hymn writer. Sandell here acts as an access point to Covenant theology as

well as Church history. The hymnals of the Evangelical Covenant Church, especially those of 1950, 1973, and 1996, will be central to a study of the relation between Sandell's hymns and the Church over time.

A study of Sandell's hymnody tells the story of the theological and historical evolution of the Covenant Church, as well as of Protestant Christianity in America more generally. The consistent inclusion – and exclusion – of Sandell hymns across editions of the Evangelical Covenant Church hymnal, spanning nearly 100 years, provides insight about the theological concepts most valued throughout the Church's history. Thus, one woman's personal theology gives invaluable insight into the Covenant as a whole both at its beginning and in its current state. The position taken by this thesis is that Sandell hymns, since they are widely recognized as central to Covenant hymnody, have provided a kind of theological snapshot of what the Church has valued the most - or differently - at various points throughout its history.

The Rage of Women in the Ancient World and in Today's Prisons: The Connection Between Euripides' Medea and The Medea Project

Caroline Southworth '24, Isabella Delwiche '25

Advisor: Seán Easton, Greek, Latin, and Classical Studies

Time: 5:00-6:00

When one thinks about emotions, their first thought is probably not how gendered they are; society informs people about the socially appropriate times, places, and emotional responses that one can have, and these standards vary between societies and within them. Through examination of Euripides' Medea and The Medea Project founded by Rhodessa Jones, we will look at the connections between gender and rage. Rhodessa Jones founded the Medea Project in 1989 after spending time with women in prisons. The goal of the project is to use Greek tragedies to help incarcerated women express and process their emotions. Medea was chosen as the name behind the project because of her violent and emotional responses in Euripides' Medea. She is a representation of a woman who has experienced intense difficulties and therefore someone who incarcerated women might be able to relate to. Through our illustration of the rage of Euripides' Medea and incarcerated women today, we will show the continuity of emotion and its importance in the literary exploration of the ancient world.

Development of a T7 RNA Polymerase Purification Method Using Novel iCapTag Technology

Sophia Nelson '23, Haley Jostes '23, George Giannou '24, Nick Whiteman '24

Advisor: Jeff Dahlseid & Janie Frandsen, Biochemistry and Molecular Biology Program

Time: 5:00-6:00

At Gustavus, purified T7 RNA polymerase (RNAP) is typically purchased for the Molecular Biology laboratory course and research labs at a high commercial cost. It is possible to purify T7 RNAP using a His-tagged version of the enzyme and a technique known as immobilized metal affinity chromatography. The His-tag causes the polymerase to stick to the nickel column as all other components are washed out. While this method produces a moderately high yield, there are concerns of decreases in the enzymatic activity of T7 RNAP, due to the His-tag. The aim of this project is to utilize novel iCapTag purification technology to isolate a tagless version of the T7 RNAP. This technique takes advantage of inteins, which are segments within the protein that can remove themselves through a protein splicing process. We designed and constructed a DNA plasmid with the T7 RNAP and iCapTag sequences that was expressed in an *E. coli* strain using a transformation process. We then purified the DNA and used sequencing to ensure we were successful. The sequenced plasmid could then be transformed into a different cell line better suited for protein expression, grown as cultures, the protein extracted, and the purification completed using iCapTag technology. The interaction of the iCapTag column and the tagged T7 RNAP allows the full intein assembly to excise itself, thereby yielding purified tagless T7 RNAP. The success and viability of this cost-effective in-house purification could be evaluated by comparing the enzymatic activities of our purification and the commercially purchased product.

Optimizing Cell Culture Conditions for Overexpressing Hfq in *E. coli*

Ashley Ley '23, Sarah Carr '24, Cyemone Nusser '24, Isabella Aase '24

Advisor: Jeff Dahlseid & Janie Frandsen, Biochemistry and Molecular Biology Program

Time: 5:00-6:00

Gene expression occurs when information from a gene is used to synthesize a product such as a protein or a non-coding RNA. These polymers affect phenotypes and cellular functions. It's important to regulate gene expression due to the relevance of its products and to maximize energy conservation. Expression can be regulated through binding or chaperone proteins. Hfq is an essential RNA chaperone protein that induces RNA-RNA complex binding during stress response in order to regulate genes. This protein is found within bacterial cells and allows for the stabilization of non-coding RNAs. To examine the Hfq protein, a self-replicating circular piece of DNA, called a plasmid, specific for overexpressing histidine-tagged (His-tag) Hfq was previously transformed into *E. coli* cells. The His-tag added to Hfq is a tail consisting of six histidine residues that allow the proteins to bind to metal columns, in this case, nickel. This allows for the isolation of tagged proteins from cellular material using immobilized metal affinity chromatography (IMAC). The goal of this work was to use *E. coli* cells transformed with the Hfq plasmid to create a standard operating procedure for cell growth and Hfq purification using the AKTA system and technology at Gustavus. Electrophoresis, a method of protein identification based on size, was used to confirm that Hfq was properly purified. Through this method development, we will be able to provide Gustavus research students with a standard operating

procedure for culturing *E. coli* cells and purifying Hfq for any future research endeavors they choose to pursue.

Development of an Internal Control to Characterize Suppressor Mechanism in an EMSA

Blake Rose '24, Alex Meger '23, Soren Grant '24, Jacob Just '23

Advisor: Jeff Dahlseid & Janie Frandsen, Biochemistry and Molecular Biology Program

Time: 5:00-6:00

The *CTF13* gene encodes a structural protein of the kinetochore that assembles at the centromere of a chromosome during cell division. This assembly binds the centromeric DNA and spindle microtubules to facilitate chromosome segregation during cell division. *CTF13* has a temperature-sensitive mutation in the *ctf13-30* allele. We hypothesize that suppression by dosage suppressor genes is because their overexpression promotes increased kinetochore assembly in the *ctf13-30* mutant yeast strains. To test this hypothesis, we employed an electrophoretic mobility shift assay (EMSA), a technique used to study protein-DNA interactions by observing the mobility of DNA fragments in an electric field. In this assay, we used two double-stranded DNA (dsDNA) probes: a centromere-specific (CEN probe) and a DNA sequence (Abf1 probe) bound by Abf1, a DNA-binding protein involved in gene regulation. These DNA probes have attached fluorophores readable at 700 and 800 nm respectively, allowing us to use both probes simultaneously to assess a single sample in the EMSA. The Abf1 probe serves as an internal control to normalize the results of the CEN probe. This allows us to determine changes in centromere expression detected by the CEN probe while accounting for potential variations in the assay conditions. We aim to characterize the mechanism of dosage suppressors on the *ctf13-30* temperature-sensitive phenotype by examining the effects of suppressor gene overexpression on kinetochore assembly, and by exploring how these interactions modulate the *ctf13-30* mutant's behavior. The completion of this project will confirm the EMSA as an effective method for monitoring kinetochore assembly experimentally.

Regulation of the yeast copper-resistant gene CUP1 by the Sok2p protein

Annabel Smith '24, Tristan Poeschel '23, Jessica Schwartz '23

Advisor: Jeff Dahlseid & Janie Frandsen, Biochemistry and Molecular Biology Program

Time: 5:00-6:00

Gene regulation is the process by which cells turn genes "on" or "off" and is important for cells to properly develop and respond to their environment. Gene regulation in yeast can occur through the binding of proteins within or nearby the promoter region. Evidence suggests the Sok2p protein regulates the CUP1 gene, which promotes copper-resistant growth. Previous research suggests that Sok2p may bind to the CUP1 coding region, downstream from the promoter, unlike what is typically observed. This phenomenon is observed in higher eukaryotes such as mammals but has not yet been well documented in yeast. We aimed to confirm that

Sok2p regulates CUP1 and determine if the binding of Sok2p in the coding region of CUP1 promotes a copper-resistance phenotype. Yeast expressing both the CUP1 gene and Sok2p were compared to yeast expressing only CUP1 when grown in the presence of copper. Upon confirmation that the expression of Sok2p results in increased copper resistance, we plan to test whether Sok2p acts through the CUP1 coding region. If so, we aim to determine which of three potential CUP1 binding site(s) in the coding region Sok2p binds. Yeast genetically modified to lack each binding site will be grown on copper media. We anticipate that yeast strains lacking the correct binding site(s) will not exhibit normal levels of copper resistance. Because the binding of gene regulators in the coding region has not yet been widely observed in yeast, this result would increase our understanding of gene regulation in yeast and would open a new avenue of genetics research.

How Social Media Influences the Political Beliefs and Actions of Young Adults

Patrick Harrison '23

Advisor: Jill Locke, Political Science

Time: 5:00-6:00

The past ten years have seen a popularity explosion in the medium of social media. Today, the majority of Americans use some form of social media in their day to day lives, and many aspects of social media are filled with content related to political matters. This paper argues that the political content of social media affects young adults and children by influencing pre-existing beliefs and encouraging higher rates of political participation. To do so, different forms of social media will be discussed, as will be the types of content found within. Content generated from different sides of the political spectrum will be held under an analytical lens, to examine the effect that it is meant to have on its viewers. The analysis determines what deeper messages are conveyed through typically simple content, such as politically charged memes, blogs, and podcasts, and will explore the cognitive and social impact that concentrated exposure has on young adults' political beliefs. Research found online finds that social and political movements are enhanced by the presence of social media, as content found on the platform helps disperse societal messages across a larger area, molds political beliefs en masse towards a certain angle, and encourages increased participation through motivational figures and social groups.

Acquisition of Aneuploidy to Promote Fluconazole Drug Tolerance in *Candida albicans*

Kade Copple '24

Advisor: Laura Burrack, Biology

Time: 5:00-6:00

Invasive fungal infections caused by *Candida* species, including *Candida albicans*, have high treatment failure rates due to the development of antifungal drug resistance and tolerance. Drug

tolerance is a distinct subpopulation of slow-growing cells in the presence of a drug. Rapid genomic changes, notably the acquisition of aneuploidy, are a common mechanism for drug resistance and contribute to the activation of stress response pathways associated with drug tolerance. However, it is unknown whether acquiring aneuploidy prior to fluconazole exposure is sufficient to establish drug tolerance. A diverse putative aneuploid strain library of 989 isolates was constructed from three different starting tetraploid strains by plating on stress conditions known to induce chromosome loss and then screened for fluconazole tolerance. Forty strains were selected for minimum inhibitory concentration analysis. Nine putative aneuploid progeny had a higher level of resistance and tolerance than their parental strain. Ploidy analysis of twenty putative aneuploids using flow cytometry revealed various levels of ploidy ranging from near diploid to near tetraploid among the isolates with increased growth in fluconazole. Nine near-diploid strains were selected for whole genome sequencing to identify chromosomal events associated with fluconazole resistance and/or tolerance. Subsequent experiments will include characterizing the stability and adaptability of the aneuploid strains.

“Keeping it Real”: Young Hip Hop Artists and Social Movements

Mariah Kranz '23

Advisor: Jill Locke, Political Science

Time: 5:00-6:00

This paper argues that young hip hop artists draw their political power from three key forces: authenticity as expressed in the phrase “keeping it real,” economic power gained through the music industry, and a long history of youth activism and vulnerability in terms of civil rights and Black freedom. I show how this power is expressed by drawing on the work of Pierre Bourdieu and Karl Marx, music scholars Jeffrey Ogbar and Loren Kajikawa, and political scientists Allison Gash and Daniel Tichenor. Bourdieu and Marx display the power of economic elites in capitalism, while Ogbar and Kajikawa demonstrate the history of hip hop rooted in a race and class consciousness. Gash and Tichenor demonstrate how Black youth have organized around anti-racist and anti-discrimination policy.

Optimizing automated curve fitting of HPLC chromatograms

Amber Simon '23

Advisor: Dwight Stoll, Chemistry

Time: 5:00-6:00

High-performance liquid chromatography (HPLC) is a method of separating and analyzing the chemical components of a mixture. There are many factors that affect how quickly a certain analyte may elute, and because of the complexity of the system, there currently exists no model for accurately predicting the elution time of a given analyte under a given set of conditions. One method of creating a model is to obtain vast quantities of data and determine elution times by fitting the data to curves. Fitting large quantities of HPLC data by hand can be a tedious and

inefficient task, so it is desirable to automate this process. However, in automating this process, it is crucial to ensure that erroneous chromatograms, such as those that contain high levels of impurities or those that resulted from a malfunction of an instrument, are excluded from analysis. Therefore, the purpose of this research is to determine the minimum criteria for which a chromatogram may be fit to a curve while still maintaining the integrity of the results. In this presentation we will present preliminary results for data collected previously that will inform more reliable processing of chromatograms that will be collected in the future.

Shame and Honor: Sophoclean Suicide and Its Interpretation

Bailey Wagner '24

Advisor: Sean Easton, Greek, Latin, and Classical Studies

Time: 5:00-6:00

This presentation analyzes and interprets the original language used to describe the action and victim of suicide in Sophoclean tragedy in terms of the shame or honor accompanying the action dependent on circumstance. The circumstantial nature of Sophoclean suicide interpretation is reflected in the original vocabulary of 'Antigone' and 'Ajax', which shed light on how the victim's gender, cause of action, and the induced emotions felt by others influence the overall reception. Suicide is a phenomena employed by the Ancient Greek tragedian Sophocles four times across the two tragedies. These deaths, in respect to cause or circumstance of completion, are interpreted by enemies and loved ones alike in terms of shame and honor. This binary classification of actions is not limited to suicide and was in fact a cultural standard reflected across ancient Greece. Ancient Greek society operated on shame culture, having actively differentiated between shame and honor. A soldier having fallen defending his homeland is granted immediate glory for his bravery and nationalism, whilst a man evading the battle is regarded as shameful, disgracing not only himself but his family. The prevalence of this distinction between shame and honor was not lost on Sophocles, and he provided a great cache of information regarding the interpretation of suicide in Sophoclean tragedy across 'Antigone' and 'Ajax.'

Gustavus: Student Political Organizations and Political Socialization

Garion Hall '23

Advisor: Suzanne Wilson, Sociology/Anthropology

Time: 5:00-6:00

I have studied 5 student organizations with political roots at Gustavus over the course of the spring semester. Through these groups I have attempted to understand the perspectives of individual students as they join, learn, lead, and strive for excellence in their group goals. Through ethnography, or field research, I have interacted with these students in their natural groups and reflected on their public interactions. Additionally interviews have been utilized to

cut to the heart of their individual beliefs and American priorities so as to explore the patterns of beliefs among our students as well as what drives them to join and work alongside others to achieve their politically-based goals.

The Influence of Social Media Use on Cognitive Control

Tait Erickson '23

Advisor: Lauren Hecht, Psychological Science

Time: 5:00-6:00

Researchers have found that the increase in accessibility and overall use of social media is associated with decreased wellbeing. Social media can also be addictive. Altogether these findings raise questions about the influence that social media could have on cognitive performance, in particular cognitive control. The current research aims to explore the influence of social media use on certain facets of cognitive control: sustained attention, inhibitory control, and task switching performance. In particular, this study tests the hypothesis that increased social media use is predictive of impaired performance on cognitive tasks. Each aspect of cognitive control was assessed using a corresponding cognitive task selected from the Dual-Mechanisms of Cognitive Control framework. To measure their usage, participants reported their social media screen time and completed two self-report questionnaires on their social media use habits. Accuracy and reaction time were analyzed to assess cognitive task performance. The participant responses were analyzed to explore the predictiveness of overall social media usage on cognitive task performance. ****Data is currently being analyzed****

Acculturation and Help-Seeking Beliefs in Latinx Americans: Cultural Values and Stigma as Mediators

Lindsey Westerberg '23

Advisor: Patrick Heath, Psychological Science

Time: 5:00-6:00

Sixty percent of Latinx-identifying Americans meet diagnostic criteria for mood disorders, but only one in 11 individuals actually seek psychological help (Alegria et. al., 2004; US Surgeon General, 2001). Levels of acculturation (i.e., cultural and psychological change occurring due to contact between cultural groups) are believed to influence psychological help-seeking attitudes in Latinx populations in the United States (Leong et. al, 1995), but more research is needed on potential mediating factors. Latinx cultural values and help-seeking stigma have been uniquely linked to Latinx help-seeking attitudes (e.g., Lorenzo-Blanco et. al, 2012; Dueweke, 2017), but their potential as mediating variables between acculturation and help-seeking attitudes has not been examined. This study addresses the gap in literature by examining the mediating effect of six Latinx cultural values (Familismo, Fatalismo, Marianismo, Machismo, Personalismo, and

Folk-Illness Belief) and self-stigma of seeking mental health for the relationship between acculturation and help-seeking attitudes.

Optimizing Chiral Separation of Trans-Stilbene Oxide Enantiomers Using High-Performance Liquid Chromatography

Jack Vukovich '24

Advisor: Dwight Stoll, Chemistry

Time: 5:00-6:00

Trans-stilbene oxide (TSO) is a chiral molecule commonly used in organic synthesis and pharmaceutical industries. Separation of TSO enantiomers is important as they exhibit different biological activities. In this study, we optimized the conditions for separation of TSO enantiomers using a long chiral column and reverse-phase isocratic high-performance liquid chromatography (HPLC) with acetonitrile and aqueous buffer as the mobile phase. The effects of temperature and percentage of acetonitrile on the resolution of enantiomers were then studied in more detail using a short chiral column. In a comparison of results from the long and short columns we found that the two columns exhibited very similar selectivities. This comparability of results enables optimization of such separations in much shorter time using the short columns. This in turn provides the foundation upon which we expect to develop a framework that enables more rapid development of separations of chiral molecules compared to what has been possible historically.

Take It Seriously: Unearthing the Literature Within Interactive Fiction Games

Jariya Goerwitz '23

Advisor: Sun Hee Lee, English

Time: 5:00-6:00

From the over-dramatized to the startlingly realistic, narrative video games are on the rise and developing an increasingly diverse, immensely captivating, and altogether innovative mode of storytelling. Interactive fiction is a video game genre that allows the player a degree of autonomy. This can be in the form of examining or influencing the environment and dialogue, allowing players to “discover” the game world on their own. Any choices a player makes can also affect the delivery of the story, sometimes revealing more information or shifting the outcome of the game entirely. Additionally, depending on the project, the writing for these games can rival the length of a traditional novel, with recurring themes, subplots, and literary devices to match. Moreover, many games build off the work of traditional authors like H. P. Lovecraft and Edgar Allen Poe, cultivating an interesting intersection between virtual and classic literature. Thus far, games have not been considered an academic medium, but perhaps that’s because we haven’t considered them critically. Now, given their ever-extending reach, maybe we should

start. If games were analyzed and discussed seriously the way novels are, we might find value in them beyond simply killing time.