## Investigation of water softener efficiency in different conditions

*Hanaa Alhosawi ’21, Ashley Engstrom ’22, Alhaji A Jalloh ’22*

Advisor: Anna Volkert, **Chemistry**

Hard water is characterized by an increased amount of minerals and ions in them. Water softeners are used by many households across the US to remove ions that contribute to water hardness such as Mg2+, Ca2+, and Fe2+ with ion-exchange resins. However, many homes use passive systems which can take a long time. It is hypothesized that active stirring during the softening process will be more efficient and remove more ions at the same time when compared to passive softening conditions. Hard water from Hortonville, Wisconsin was obtained, softened, and finally titrated with EDTA to measure the resulting water hardness. The results showed that active stirring during softening significantly reduced the water hardness. In the future, comparing the softener efficiency in alternative conditions like stirring and shaking will be explored.

## Post-War Japan: The Course of Memories Changed Through Film

*Elias Antes ’19*

Advisor: David Obermiller, **Japanese Studies**

The era immediately following WWII was a turbulent time for Japan transitioning from the war dominant culture that formed the core of Japanese society from the early 1930s up until the end of the war. The Japanese had to form of a new image both for themselves and the world around them. Through the progression of Japanese film during this period I will express the steady paradigm shift of the perceptions perpetuated by these films. Films, particularly war films, popular during this time show a steady shift towards the Japanese being victims of the system that they had created. These films became curated over the years to further this message with the industry building upon itself with this new perception of the war. Becoming eventually filtered by factors including but not limited to content, censorship, and popular consciousness.

## Depicting a Monarch: Connecting the Secondary Sources to Popular Culture Depictions of Henry VIII

*Hannah Armstrong ’19*

Advisor: David Obermiller, **History**

Henry VIII became a prominent historical figure mostly for his six wives, but also his break with Rome. Ruling from 1509 to 1547, Henry caused many events that would also become important in plays and, eventually, movies and television shows. Over the twentieth and twenty-first century several movies and television shows were produced focusing on Henry VIII or one of his contemporaries. These films depicted the king in three main ways that are both concurrent, yet different from the secondary works on the (in)famous monarch. The depictions of Henry often showed that, although the directors had the ability to be as historically accurate as possible, they often chose to cherry pick events that would suit their desires. This cherry picking often led to missing context or events that may have made the primary sources match up with the secondary works.

## Ready To Learn About Intercultural Communication In Education?

*Mallory Arnold ’19, Katelyn Yee ’20*

Advisor: Patricia English, **Communication Studies**

This research is an intercultural communications study based off of the semester-long volunteer program, Ready to Learn through YWCA Mankato. The program prepares children under five years of age for kindergarten through education and social support. These children come from immigrant families and are often a part of low-income households. Researchers Mallory Arnold and Katelyn Yee volunteered for this program and were paired with a child to visit them in their homes once a week. From daily journal entries, they found emergent themes through their observations, including adaptation strategies, intercultural relationship patterns, identity formation, use of popular culture, and dialectics. These findings prove relevant in the changing demographics of society, especially within the education system. Immigrant children face more disadvantages than their peers even before they enter the education system, which highlights the importance of building strong parent-child relationships to support their learning. Main limitations to this research include participant-observer bias, time constraints, and other program restrictions.

## The Cultural Phenomenon of Media Fasting

*Mallory Arnold ’19*

Advisor: Martin Lang, **Communication Studies**

An emerging group of media consumers have begun to wonder whether people are in control of the media, or if the media is in control of them. There is a growing realization that media capitalism creates and enforces hegemonic power and dominant ideologies that oppress its consumers in various ways. Using Stuart Hall’s decoding theory and Karl Marx’s theories of capitalism and alienation, I will study media fasting on both a micro and macro scale in order to identify how consumers use media resistance as a tool of agency against media hegemony and its constructed ideologies. This essay will introduce the historical context of uprising negative impacts of media and how they have led to the phenomenon of media fasting. It will explain what media fasting is and the power dynamics within the media system. The essay will review Stuart Hall’s theory of decoding, Karl Marx’s theory of capitalism and alienation, and discuss media resistance and disconnectivity. Hegemonic power and dominant ideologies will emerge as supporting themes. These theories will then be demonstrated in two samples: Tim Revell’s individual media fasting experience and the #DeleteFacebook movement. Implications will then be discussed. Finally, I argue that media fasting increases awareness of the control media has over individuals’ lives in contemporary culture and could in the future, help media consumers regain control over their own media.

## Enfranchising Youth: How the Voting Age Changes and Why

*Adam Bakken ’19*

Advisor: Jill Locke, **Political Science**

Setting a voting age within a democracy creates a gateway to citizenship. The right to vote is given only to those who are perceived as worthy and capable, so whether the voting age of a country is higher or lower is a reflection of that society's values at a certain point in time. With many countries across the globe either implementing or considering a voting age of 16, it is more important than ever to understand how and why these movements to extend the range of the ballot come to be. I will examine three cases of successful movements for a lowering of the voting age in order to aid in my analysis: The United States (1972), Austria (2007), and Scotland (2015). Much of political scholarship has studied young people only to the extent that they exist as potential future voters, however, 16-17 year olds do not exist apolitically, so my project is to unearth the extent to which disenfranchised youth have been able to effectively advocate for their own right to be members of the electorate.

## Dasani Water: Should We Drink It?

*Tyra Banks ’21, Rachel Butzer ’22, Tenzin Yangzom ’22,*

Advisor: Anna Volkert, **Chemistry**

For many years, the advertisement of the addition of potassium chloride in Dasani brand water for taste has been a controversial issue. Using data from the FDA and scientific journals, critics have argued that this furthers dehydration, prompting consumers to buy more Dasani water. To assess the water quality, levels of the chloride concentration in Dasani brand water and St. Peter City water (tap) were measured by titrating silver nitrate (AgNO3) against both water samples in three separate trials. Supporting the hypothesis, the concentration of chloride ions was 2.75x higher in Dasani water compared to the St Peter city water. In future works, additional trials over a larger range of water samples would be performed to establish a more quantitative measurement.

## The Police Debate: Pros and Cons of Abolition

*Rachel Belvedere ’20, Theodore Blenkush ’20, Julia Isberner ’19, Parker Lindberg '20, William Ristow '20*

Advisor: Joaquin Villanueva, **Geography**

Policing of bodies and communities within urban spaces has a complex history in America. As an enforcement mechanism for state legislation, police seek to control citizen behavior and maintain law and order. In this presentation we will explore the context and rise of police in urban America and the pros and cons of abolishing the police as an institution. We will examine pros, including deterring and punishing criminal activity and ensuring safety (for some) and cons, including militarized policing, racial profiling, and excessive targeting of immigrants.

## Quantification of DNA Binding by Kinetochore Proteins via an Electrophoretic Mobility Shift Assay (EMSA)

*Gretchen Boeckman ’19, Michael Gutman ’20*

Advisor: Jeff Dahlseid, **Biochemistry and Molecular Biology**

During cell division, the duplicated copies of each chromosome, called sister chromatids, have a kinetochore that aids in chromatid separation by creating a binding site for spindle microtubules. These spindle microtubules are responsible for moving chromatids to opposite poles to achieve chromosome transmission. A lack of full kinetochore function may cause an error in chromosome transmission that can result in aneuploidy, a characteristic of some cancers and genetic conditions. The kinetochore is a complex that is comprised of numerous proteins and approximately 125 nucleotides of centromere DNA in Saccharomyces cerevisiae. However, the critical part of the structure consists of proteins Ctf13p, Cep3p, Cbf2p, and Skp1p. Ctf13p has been found to have a major role in kinetochore function based upon the observed decrease in chromosome transmission fidelity that results from mutations that lead to a partial loss of function. An electrophoretic mobility shift assay (EMSA) is used to quantify DNA:protein interactions involving ctf13-30p, which carries a mutation that impairs ctf13p and kinetochore function. EMSA quantifies these interactions through protein-dependent shifts of fluor-labeled DNA migration in polyacrylamide gel electrophoresis. Our research will examine which of the previously mentioned proteins, when present in excess in yeast with ctf13-30p, will produce more kinetochore complexes. Greater fluorescence in the area where the DNA-protein complex migrates on the polyacrylamide gel indicates more kinetochore assembly. With the knowledge and understanding of how to restore kinetochore function for cell division, research being conducted on how to treat disorders that result from aneuploidy will benefit greatly.

## Synthesis and Characterization of Sn-Beta Zeolite and Its Catalytic Activity for the Isomerization of Glucose

*Gretchen Boeckman ’19*

Advisor: Ian Hill, **Chemistry**

Zeolites are a class of high-surface area, crystalline aluminosilicates that contain nanopores with diameters on the order of small molecules. While these materials are mainstays of the chemical industry for the gas-phase catalytic conversion and separation of commodity chemicals, stable catalytic conversion using zeolites has not been reliably achievable in aqueous media until recently with the introduction of Lewis acidic tin atoms in place of aluminum in the crystalline framework. This project exchanged the aluminum for tin in samples of synthesized and purchased zeolite beta. Confirmation of crystal structure retention was determined using X-ray diffraction (XRD). Catalytic activity of the exchanged samples was verified by determination of aqueous glucose isomerization kinetics using synthesized samples, monitored using Gas Chromatography-Mass Spectrometry (GCMS). From the results, a mechanism of glucose isomerization to fructose is described with possible applications toward the chemistry of other alkanols.

## Strengthening the Rotator Cuff Muscles in Bull Riders. A Critically Appraised Topic

*Chanah Brandt ’20, Alexis Petite ’20*

Advisor: Liz Drake, **Health and Exercise Science**

Focused Clinical Question: Does strengthening the rotator cuff muscles in the free arm of bull riders decrease the incidence of SLAP tears in the free arm? Search Strategy: Databases searched included PubMed, CINAHL, SPORTDiscus, Academic Search Premier, and Google Scholar. Inclusion criteria included studies in Australia, Canada, and the USA; patients between ages 20-30 years old; and studies no more than 15 years old. Results and Summary of Search: During our search we found 159 articles relating to our search terms. Through analysis of our inclusion and exclusion criteria we were able to find five articles relating to our critically appraised topic. The retrospective epidemiological review article resulted in 2,305 injuries with 11% being shoulder injuries. Sprains were the second highest injury type accounting for 13.6%. The NATA position statement included post-surgical and nonsurgical outcomes of SLAP lesions. The primary goal is to restore the symmetry in internal rotation, horizontal adduction, and the total arc of motion. A case series article found that stretching the shoulder using the “sleeper stretch” and cross-body adduction stretches were beneficial. Strengthening exercises included a core strengthening program, periscapular muscle strengthening exercises, and a rotator cuff strengthening program. The patients were also prescribed a nonsteroidal anti-inflammatory drug treatment (NSAIDs). Clinical Bottom Line: The majority of the available best evidence selected supports the use of rotator cuff strengthening in the free arm of a bull rider to prevent future SLAP lesions from occurring.

## Computational Study Of The Effectiveness Of Using Heated Solvent For Solute Focusing In HPLC

*Tyler R. Brau ’19*

Advisor: Charles Niederriter, **Physics**

Improving resolution in high performance liquid chromatography (HPLC) is an important aspect of analytical chemistry. The analysis of complex mixtures can lead to peak overlap, making identification and quantification of compounds difficult. The use of a mobile phase gradient is a commonly used method to increase resolution. However, an orthogonal option available is to use a temperature gradient during the separation. Previous research has focused on heating a pre-separation column directly. A simpler method is to heat the mobile phase before it enters the column, which also establishes a temperature gradient along the column length. Using COMSOL to build a computational model of a HPLC column, the temperature as a function of time and distance was calculated. These data were then used inside a MATLAB program to simulate chromatographic separations and calculate the retention times and peak widths for several compounds. Presented here is a comparison of the peak widths of several compounds both with and without temperature focusing. Also presented is a comparison of the magnitude of the focusing effect as a function of flow rate, mobile phase composition, heating temperature difference, and temperature transition time.

## Effect of ccr4 and caf1 Mutants on Nonsense-Mediated Decay of CTF13 mRNA

*Noah Carlson ’19, Cody Weisel ’19*

Advisor: Jeff Dahlseid, **Biochemistry and Molecular Biology**

DNA encodes messenger RNAs (mRNAs) made of nucleotides, the intermediate genetic structures which code for proteins. mRNAs are used by ribosomes to create proteins. Degradation of mRNA is one way the cell can regulate the production of any particular protein. There are two common pathways for degrading mRNA 5’ to 3’; normal, deadenylation-dependent decapping and nonsense mediated decay (NMD). NMD is similar to normal decay, but proceeds independent of deadenylation. CTF13 is a gene that encodes a kinetochore protein in Saccharomyces cerevisiae. During the cell division cycle, a high quantity of mRNAs that encode for CTF13 are needed. After these mRNAs are not needed anymore, the mRNAs must be degraded. In order to be degraded more quickly, CTF13 mRNA is degraded by NMD. Ccr4p and Caf1p have previously been shown to be key proteins involved in deadenylation of mRNAs in normal decay. For this investigation, we measured the decay rates of CTF13 mRNA in two separate strains of Saccharomyces cerevisiae: one with a loss-of-function mutation of CCR4 and one with a loss-of-function mutation of CAF1. Since nonsense mediated decay is independent of the deadenylation event, we hypothesize that the degradation rate of CTF13 mRNA will be unaffected in strains lacking the ability to remove the poly-A tail.

## War, Memory, and Photography: Examining Visuals in Second Generation Vietnamese American Stories

*Kasandra Carranza ’19*

Advisor: Sun Hee Lee, **English**

In this project, I study recent second-generation Vietnamese American memoirs, in particular, the authors’ incorporation of, and references to, photographs. Some of the questions I will explore are what kinds of photos the authors use, and why they choose these specific photos. I will also look at how the second-generation Vietnamese writers contribute to archival history in piecing together and understanding their families’ histories through these photographs. As a result of the high visibility of the Vietnam War, the second-generation Vietnamese American stories use both written and visual mediums. Doing so allows the authors to reconstruct their families’ journey to the U.S. They further expand on the second generation's experience with assimilation, trauma, and identity. Photographs in the second-generation Vietnamese stories allow the audience to understand the authors’ and their families’ perspectives. These photographs provide an intimate context to the overarching conflict that is the Vietnam War.

## The Relationship Among Activity Levels And Postural Scores In College Students

*Vanessa Case ’19, Jenna Latham ’19*

Advisor: Bruce Van Duser, **Health and Exercise Science**

A study emphasized the significance of low physical activity and a sedentary lifestyle, which caused a “decrease in stability” and the need for postural adaptations (Wyszyńska et al., 2016). The purpose of this study is to investigate the relationship among activity levels and postural scores in college students. Poor posture throughout life caused possible concerns about spinal issues involving kyphosis, lordosis, slipped and/or herniated discs. Eighteen Division III college students participated in this study. This experiment was a correlational design (Figure 1). The dependent variables were postural and activity scores. Postural scores were measured via the plumb-line method (Singla and Vegar, 2014) by the researchers in the Department Human Performance Laboratory. Scores were determined by the distance from midline of posterior and lateral standing views. Lower postural scores indicated better posture. A 5-Likert scale survey with 10 responses measured activity scores. Higher scores indicated higher activity levels. A Pearson chi-square coefficient (α = .05) analyzed significant relationships among activity and posture. Results indicate no significant relationship between of activity levels and posture (Figure 2). Based on the results, engaging in physical activity has no significant impact on posture. IRB Approval #1819-0110

## Identifying lipid pathways to classify different cancer types using Machine Learning approaches

*Linh Chu ’19*

Advisor: Sanjive Qazi, **Biology**

Cancer is the second leading cause of death globally, with an estimate of 9.6 million deaths in 2018 and about 1 in 6 deaths is caused by cancer (World Health Organization). Since Otto Warburg hypothesized the altered metabolism was specific to cancer cells (Warburg, O. (1956). Science, 123, 309-314.), various aspects of metabolic alteration have been studied such as immunometabolism, redox metabolism, and novel therapy derived by metabolic reprogramming. Machine learning (ML), using algorithms to make prediction based on data, has played an important role in bioinformatics. In recent years, the increasing size and number of curated and organized using standard protocols for biological datasets allows for implementation of ML approaches to gain novel insights into pathological mechanisms of cancer progression (Larrañaga (2006). Briefings in Bioinformatics, 7(1), 86–112). The goal of this study is to provide extensive review of current ML methods to determine role of lipid metabolism in cancer. In addition, an evaluation on the capability of R to implement ML to analyze gene expression profile is performed. Last but not least, the study will provide an approach to apply different ML algorithms to identify lipid pathways to categorize different types of cancers and use these pathways to evaluate current cancer treatments from clinical trial data. This potentially helps find a better cancer therapy that targets lipid metabolism.

## Investigating the correlation between recognition regions of CTF13 mRNA and its association with Upf1p in Saccharomyces cerevisiae

*Linh Chu ’19, Jordan Grovum ’20, Sam Hezeil ’19*

Advisor: Jeff Dahlseid, **Biochemistry and Molecular Biology**

Nonsense-mediated RNA decay (NMD) is a post-transcriptional regulatory mechanism that degrades aberrant mRNAs, and thus prevents translation of abnormal proteins. Evidence suggests that NMD regulates expression of CTF13 and CEP3 mRNA, which encode centromeric proteins. CTF13, CBF2, CEP2, and SKP1, which encode proteins for the centromere-binding factor 3 complex, play an important role in chromosome segregation and movement of centromeres during mitosis. Past work has shown that the stability of CTF13 mRNA is regulated by NMD and established that there are two key regions of CTF13 mRNA that are involved in recognition by NMD: the 5’ untranslated region (UTR) preceding the protein-coding sequence and the 3’ UTR. The objective of our study was to investigate whether these two regions responsible for recognition correlate with those that promote association with Upf1p. We hypothesize that mutations in both these regions are necessary to abolish interaction between CTF13 mRNA and Upf1p. To test this, plasmids containing different CTF13 mutations were transformed into yeast and total protein were extracted. Upf1p will be isolated from the total protein extract using immunoprecipitation confirmed by Western blot. RT-qPCR will be used to quantify CTF13 mRNAs associated with Upf1p. Understanding this relationship helps us understand how the recognition region in CTF13 is regulated by Upf1p and will be useful in studying overall binding of Upf1p to other mRNAs.

## Instability and complexity of polycyclic musk galaxolide

*Amy Crawford ’20, Devin Makey ’20*

Collaborators: David Harmes Chemistry, Kristine Wammer, University of St. Thomas, Dwight Stoll, Chemistry

Advisor: Dwight Stoll, **Chemistry**

Galaxolide (1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta[γ]-2-benzopyran, or HHCB) is a member of a family of polycyclic musks used as a fragrance in many consumer products. There have been numerous reports describing detection of galaxolide in wastewater treatment plant (WWTP) effluents and surface waters. It is suspected to interfere with the MDR/MDX defenses of aquatic life, ultimately affecting their ability to protect themselves from other toxins present the environment. It is also suspected to be an endocrine disrupting compound and been labeled as a contaminant of emerging concern by the Environmental Protection Agency. Although there is a fair amount of work published on studies of the fate of galaxolide in the environment and wastewater treatment streams, in our own work we have encountered a number of difficulties that have not been reported previously, to the best of our knowledge. In this presentation we will describe the results of a number of lines of inquiry related to these peculiarities. To the best of our knowledge, a highly pure analytical standard for galaxolide is not commercially available. We will describe results of different approaches to produce highly pure galaxolide on a semi-preparative scale. We also find that different species present in commercially available galaxolide materials exhibit very different detector responses when using liquid chromatography coupled with UV absorbance or electrospray ionization mass spectrometry. Finally, we find that highly purified galaxolide is prone to rapid (timescale of minutes) transformation when exposed to water. Implications of these findings for future environmental fate studies of galaxolide will be discussed.

## Weight Lifting At A Young Age Is Beneficial And Is Potentially Helpful For Growth Plate Injuries

*Leah Dargis ’20, Caitlin Kammerer ’20*

Advisor: Liz Drake, **Health and Exercise Science**

Title: Findings have found that weight lifting at a young age is beneficial and can potentially be helpful to prevent growth plate injuries. A Critically Appraised Topic

By: Leah Dargis & Caitlin Kammerer

Sponser: Liz Drake

Focused Clinical Question: Would having middle school female gymnasts start an upper extremity weight lifting program help prevent humeral growth plate injuries?

Search Strategy: Sources of evidence searched, academic search complete, SPORTDiscus, CINAHL, pubmed. Inclusion criteria was...studies identified as OCEBM level 3 evidence or higher, studies were chosen if outcome measures of growth plate injuries were present, limited to publications within the last 10 years, young female athlete, articles in English, studies were chosen if weight lifting or resistance training were present, human subjects.

Results and Summary of Search: There were articles that gave details on resistance training but none on the specifics of humeral growth plate injuries. However, most articles that were found focused on different types of strength training and whether or not it was a good idea in general to start adolescents off early. The strongest article were relevant to the focused question because they explain ways to prevent the injuries and give other previous studies that showed the outcome of the experiment.

Clinical Bottom Line: Beneficial for validating treatment and prevention studies. SORT rates the supporting references at a level 2 to the limited quality of patient-oriented evidence. Each article stated a fact within it talking about how weight resistance at a younger age can be beneficial to bone growth in adolescents over time. The bottom line is starting them off with smaller weights and limited repetitions can be useful over time for adolescent athletes.

## Exploring Subsistence Living in Inupiaq People in the North Slope Borough, Alaska

*Jessica Dirks ’19*

Advisor: Barbara Zust, **Nursing**

Subsistence hunting is both a cultural identity and the main source of food for the Inupiaq people in the North Slope Borough, Alaska. This includes but is not limited to hunting for whale, caribou, moose, seal, waterfowl, walrus, and fishing. Subsistence living is endangered due to environmental changes, influences of other cultures on the Inupiaq people, governmental regulations on fishing and hunting, and potential health risks of eating subsistence food due to contaminated habitat of the animals. The reason Inupiaq people continue to practice subsistence living has not been explored in depth. Ethnographic data was collected during a three week emergence experience with the Inupiaq people in Utqiagvik and Wainwright, Alaska. The purpose of this study is to explore the meaning of substance living among the Inupiaq people. Analysis is in process. The findings may shed light on why the Inupiaq people continue to use subsistence hunting while being exposed to higher rates of disease caused by environmental and cultural influences. The findings may lead to the need for further research to reduce risk factors that impact their wellbeing, and explore the importance of sustaining subsistence living in the Inupiaq culture.

## The Lived Experience Of Nursing Students Immersed In The Inupiaq Culture: An Exploration Of The Social Determinants Of Health

*Ann Dornon ’19, Laura Wilberts ’19*

Advisor: Barbara Zust, **Nursing**

Utqiagvik (Barrow), Alaska is the northernmost city in the United States. It is located in the arctic circumpolar region of the world in the North Slope Borough region of Alaska. The Institute of Medicine (IOM) and the American Association of Colleges of Nursing(AACN) strongly recommend medical students and nursing students have diverse, cultural experiences in preparation of caring for a diverse patient population as professionals. For seven years, nursing students from the Midwest have had an immersion clinical experiences among the Inupiaq in Utqiagvik and surrounding villages in the North Slope Borough in Alaska. The purpose of this qualitative research study was to explore the lived experience of nursing students in this immersion public health clinical. Students journaled their experiences and observations living and working with the Inupiaq people in villages, schools, and agencies. All journals were read as a collective whole and analyzed using van Manen’s interpretative phenomenology. Preliminary analysis indicates a strong theme of cultural preservation. Findings of this study may shed light on future immersion clinicals.

## Production Of Informative Lab Videos For Students Through Use Of Visual Media

*Benjamin Easter ’19*

Advisor: Darsa Donelan, **Physics**

Video content serving as “Pre-Lab Videos” was developed to prepare students enrolled in General Chemistry and General Physics. The videos sought to aid students in visualizing: experimental set-ups, new techniques, and anticipated results. Students were able to access pre-lab videos outside of lab time, allowing for more time during lab for other pedagogical applications like post-lab discussions. Having dedicated time at the end of a lab period to discuss thoughts and observations while the lab is fresh in the student’s mind allowed them the opportunity to think critically about its application, benefiting future engagement with academic content.

## Ny i Danmark: Analyzing What it Means to be Danish

*Megan Eide ’19*

Advisor: Glenn Kranking, **Scandinavian Studies**

The Danish people are revered as one of the happiest populations in the world, and the Danish welfare system and way of life are emulated globally. While being Danish and pursuing the Danish lifestyle are idealized by many, the questions remain who can be Danish, and what does it mean to be Danish? In this presentation, I approach these questions and examine Danish nationality through three primary lenses: Danish media, politics, and personal testimonies from Danes and “New Danes.” Using a unique variety of data, including journal entries from my semester-long internship in Denmark and my interviews with a Syrian refugee in Denmark and a Danish journalist, I work to define what it means to be Danish and who can call oneself or another a Dane. Overall, I argue that being Danish is a matter of perception and claiming a Danish identity means navigating a convoluted battle of numerous perceptions including political, social, racial, religious, mediated, and, of course, self perceptions. Furthermore, I show how the key to winning this battle is infinitely more complex than the issue itself and depends upon the unique situation and intersectionality of each individual Dane and New Dane. By breaking down and demystifying the intricacy of what is means to be Danish, I expose flaws in the Danish ideal, and I illuminate the complex socio-political layers that comprise one’s senses of nationality, identity, and home.

## Shoulder Strength Comparison Between Free Weight and Manual Resistance

*Troy Ektnitphong ’19, John Krohn ’19*

Advisor: Bruce Van Duser, **Health and Exercise Science**

Lennon, Mathis, & Ratermann (2010) reported that one of the most popular approaches to resistance training is free weights which require an individual to control the weight while applying force throughout the full range of motion. Additionally, manual resistance training has been widely used in the field of physical therapy (Chulvi-Medrano, 2017). The purpose of this study is to examine the effects of manual resistance training versus free weight training on shoulder strength.The study included ten men and six women out of season athletes. The study utilized the parallel group design. Independent variables were the types of training performed either manual resistance training or free weight training. The dependent variable was shoulder strength. Prior to testing and training sessions, subjects were instructed on proper form and technique. A pre-program rep max was given so subjects had a baseline. Following pre-test, subjects we randomly place in either the manual resistance or free weight training groups. After subjects were assigned to their groups, they underwent five weeks of their respective training program twice a week. After the five weeks of the program, subjects then performed the same test to see which training method was most effective. Statistical analysis included a paired sample t-test comparing shoulder strength pre and post testing A paired-sample t test reported no significant difference (p > 0.05) in shoulder strength between the MR (pre: 45.3 Ibs± 5.2; post: 48.1± 3.4) and Free weight (pre: 46.2 ± 5; post: 50.4 ± 4.8) groups. However, groups significantly improved their strength (p = 0.008). The results of the study indicated that manual resistance and free weight training are both effective modes of resistance training. Further research would include a larger pool of participants and potentially evaluate a specific population. IRB# 1718-0102

## The Effect Of Shoulder Range of Motion On UCL Damage

*Thomas Fischer ’20, Breckan Ebnet ’20*

Advisor: Liz Drake, **Health and Exercise Science**

Focused Clinical Question: Does shoulder range of motion and strengthening exercises decrease the likelihood of UCL injuries in baseball athletes? Results and Summary of Search: Elbow injuries will always be prevalent among baseball athletes. The continuous throwing motion puts pressure and stress on the elbow joint, especially if throwing mechanics are not correct. Throwing causes high varus force produced by tension in the UCL and compression in the radiocapitellar joint.5 Along with correcting throwing mechanics, shoulder range of motion and strengthening exercises are the most effective way to reduce UCL injuries in baseball athletes. Athletes with UCL tear displayed greater deficits in range of motion than athletes without injury.2 This shows that completing strengthening and range of motion exercises will decrease the likelihood of a UCL injury. Clinical Bottom Line: Based on articles reviewed, shoulder range of motion and strength deficits lead to a higher likelihood of a UCL injury. Therefore, the answer to our clinical question would be that shoulder range of motion and strengthening exercises would lead to reduced UCL injuries among baseball athletes. Implications: The research shows it would be worth the baseball players time to complete a shoulder strengthening exercises throughout the season and off-season to decrease the risk of a UCL injury.

## Minimum Wage and Employment Growth

*Shaun Gilyard ’19*

Advisor: Marta Podemska-Mikluch, **Economics and Management**

This research examines the consequences of the local, state, and federal minimum wage increases on employment growth for teenagers within the food services and drinking places subsectors. Existing literature shows that minimum wage affects these two demographics the most, though findings on the resulting impact tend to be mixed. Using a distributed-lag model, we find that a 10% increase in the minimum wage negatively affects employment growth by 1.26% for teenagers within this subsector. These findings suggest that the effects of minimum wages within this demographic are most strongly felt over a period of three years.

## Most Effective Shoulder Strengthening Exercises to Prevent Supraspinatus Strains: A Critically Appraised Topic

*Emma Gnotke ’20, Sable Knochenmus ’20*

Advisor: Liz Drake, **Health and Exercise Science**

Focused Clinical Question: What are the most effective shoulder strengthening exercises to prevent supraspinatus strains in collegiate male tennis players? Results and Summary of Search: There are many different exercises that can be implemented to prevent supraspinatus strains. The repetitive motion of internal rotation during a tennis serve may predispose tennis players to injury, unless they strengthen the external rotator muscles. Concentric isokinetic exercises were found to be more beneficial for strengthening the supraspinatus muscle than eccentric isokinetic exercises. According to the articles, external rotation exercises are the most effective in strengthening the supraspinatus, along with prone horizontal abduction. In order to better strengthen the supraspinatus, it must be isolated. Maximal isometric external rotation exercises elicit supraspinatus activity while minimizing deltoid activity. Empty can and full can exercises were also shown to have a better effect on supraspinatus strengthening than horizontal abduction. However, strength training using prone horizontal abduction was effective for maintaining fiber bundle length and facilitating increases in strength. Clinical Bottom Line: There are many exercises that can be beneficial in preventing supraspinatus strains; however, the most effective is concentric external rotation. Implications: All of the evidence researched supports that concentric external rotation exercises are the most effective in preventing supraspinatus strains in sports that rely heavily on overhead activities.

## Photochemical degradation of the dicamba in aqueous solutions and on plant surfaces

*Kaitlyn Gruber ’21*

Advisor: Amanda Nienow, **Chemistry**

Abstract: Most herbicides are sprayed onto fields during application. As the droplets dry, non-volatile lipophilic herbicides spread into the epicuticular waxes present on the leaves and any fruit or vegetables present. Herbicides accumulate in these wax layers before migration to the active biological site, but the herbicides accumulated in or adsorbed on the epicuticular wax are subjected to solar light and may undergo photochemical transformation while in/on this layer. In our study of the photolysis of dicamba on corn and soybean plants, we removed the epicuticular wax from plant leaves to study the waxes separately. Plants were grown in the Gustavus Adolphus College greenhouse. Adjuvants in commercial herbicide mixtures, namely surfactants such as ethoxylated isodecyl ether, cause dicamba to spread more fully across the surface of epicuticular waxes and may increase the rate of reaction. To establish the role adjuvants play in the photochemical degradation of dicamba on epicuticular waxes, side-by-side experiments with dicamba-only solutions and dicamba solutions with adjuvants were conducted. HPLC and LC-MS were used to record photolysis rate constants and identify photoproducts. For comparison and as controls, experiments were also conducted on glass petri dishes and in aqueous solution. Pesticide reactivity is rarely examined on plant surfaces. This study examines the importance of photochemical reactions on crops after pesticide application, and could impact how researchers and regulators adjust lab conditions to better replicate field conditions.

## Photochemical degradation of the dicamba in aqueous solutions and on plant surfaces

*Kaitlyn Gruber ’21*

Advisor: Amanda Nienow, **Chemistry**

Abstract: Most herbicides are sprayed onto fields during application. As the droplets dry, non-volatile lipophilic herbicides spread into the epicuticular waxes present on the leaves and any fruit or vegetables present. Herbicides accumulate in these wax layers before migration to the active biological site, but the herbicides accumulated in or adsorbed on the epicuticular wax are subjected to solar light and may undergo photochemical transformation while in/on this layer. In our study of the photolysis of dicamba on corn and soybean plants, we removed the epicuticular wax from plant leaves to study the waxes separately. Plants were grown in the Gustavus Adolphus College greenhouse. Adjuvants in commercial herbicide mixtures, namely surfactants such as ethoxylated isodecyl ether, cause dicamba to spread more fully across the surface of epicuticular waxes and may increase the rate of reaction. To establish the role adjuvants play in the photochemical degradation of dicamba on epicuticular waxes, side-by-side experiments with dicamba-only solutions and dicamba solutions with adjuvants were conducted. HPLC and LC-MS were used to record photolysis rate constants and identify photoproducts. For comparison and as controls, experiments were also conducted on glass petri dishes and in aqueous solution. Pesticide reactivity is rarely examined on plant surfaces. This study examines the importance of photochemical reactions on crops after pesticide application, and could impact how researchers and regulators adjust lab conditions to better replicate field conditions.

## The Effect Of Kinesio Taping On Care And Prevention Of Medial Epicondylitis

*Jacob Gunderson ’20, Nicholas Jacques ’20*

Advisor: Liz Drake, **Health and Exercise Science**

Focused Clinical Question: In patients with medial epicondylitis and referred pain, is there a benefit in prevention or treatment through the use of kinesio tape?

Search Strategy: When looking for articles, two different databases were used. The databases used were SportDiscuss and CINAHL. Search terms included, “medial epicondylitis”, “golfer’s elbow”, “taping”, “kinesio taping” and “college athletes”.

Results and Summary of Search: After observation of the information, most of the research proposed that kinesio tape was beneficial in the prevention and treatment of medial epicondylitis. Several studies also showed that there was a decrease in pain and increase in force sense through the use of kinesio tape. However, the studies stated that these correlations were not large.

Clinical Bottom Line: The information provided determined that kinesio taping had a positive effect on medial epicondylitis. However, it could not be determined if the positive effect was caused by actual supportive intervention or placebo effect.The articles also discussed a need for further research to determine the legitimate effect on the support kinesio tape provides for the ulnar collateral ligament. In conclusion, most of the research proposed that kinesio tape was beneficial in the prevention and treatment of medial epicondylitis.

Implications: Future research on this topic should study the effect of kinesio tape on muscle fatigue and endurance, especially on the muscles surrounding the elbow. Also, research should use a larger randomized control group and look at the possible placebo effect of using kinesio tape.

## Connectivity Space Analysis Of Living Neural Network Avalanches

*Kathryn Hagen ’19, John Beggs, Indiana University*

Advisor: Michael Ferragamo, **Neuroscience**

Incredible progress has been made concerning macroscopic study of connectivity between brain areas, but microscopic brain connectivity on the network scale remains little understood. Recent technical innovations have made it possible to analyze neural networks on the spatial and temporal scale of individual neurons and action potentials, allowing us to elucidate microscopic network mechanisms. We used a novel 512-microelectrode array to record action potentials in a network of rat cortical tissue and examine avalanches, which are single propagating bursts of electrical activity. Statistical physics determined significant connections between individual neurons. We analyzed information flow in connectivity space, which filtered out insignificant connections, and sorted neurons by physical parameters to determine whether patterns exist or information propagates randomly. Frequency of action potentials, or firing rate, and number of outgoing connections seem to be significant parameters. On average, neurons fire to higher firing rate and lower outgoing connection neurons. Thus far, these results seem consistent with previous theories concerning information flow through different layers of the cortex. This unique view of neural networks in connectivity space may provide great insight to information flow in the brain.

## The Effects of Positive and Negative Stimuli Conditions on Free-Throw Perfomance of Male and Female Collegiate Basketball Players

*Olivia Hass ’19*

Advisor: Bruce VanDuser, **Health and Exercise Science**

As reported by Bertrams et al.(2015) basketball players with depleted and worrisome thoughts said to them paid more attention to the distracting stimuli and displayed worse performance in the free throw task. Being able to make free throws can be an important part of a basketball competition. According to Vast, Young and Thomas (2011) directing attention towards positive emotion was been beneficial in basketball performance. The purpose of this study examined the effects of positive and negative stimuli on free throw performance. Nine basketball players from the Gustavus men’s and women’s basketball teams, seven men and two women, volunteered to participate in this study. This was a one-sample design. Participants were assigned randomly to be in either the positive or the negative stimuli group first or second via a coin toss. They listened to/watched either positive or negative stimuli depending on the group they were in. Participants performed 20 free throws and the data was collected. The participants switched groups and listened to/watched the other stimuli and performed 20 more free throws and data was collected. The free throws were counted as either a make or a miss. The independent variables of this study were positive and negative stimuli, and the dependent variable was free throw performance. Positive stimuli was predicted to have a positive correlation to free throw performance and negative stimuli was predicted to have a negative correlation to free throw performance. Means and standard deviations were reported for the data. A paired sample t-test analyzed significant differences in the positive and negative stimuli groups across all participants. The paired sample t-test indicated  no significant difference (p< 0.05) in free throw performance between the positive and negative stimuli conditions t(8) = .543, p=.602. Results indicated no statistical difference between positive and negative stimuli on collegiate basketball player’s free throw performance. The results of this study provided a better understanding of how negative and positive stimuli impact free throw performance.

## Remote sensing of deforestation in the Amazon rainforest

*Sydney Hedberg ’20, Oliver Frempong ’20*

Advisor: Anna Versluis, **Geography**

The use of satellite images has become increasingly useful in monitoring land use and land cover change. This study uses satellite imagery to monitor land cover change within the Amazon Rainforest, located in South America. This rainforest is one of the most biologically rich ecosystems, holding about half of the world’s remaining rainforests, and is an area highly threatened by deforestation. Specifically, this study aims to describe the extent and pattern of deforestation and urbanization within the Amazon Rainforest in Pucallpa, Peru between the years 1987 and 2017. It was found that between the years 1987 and 1999, dense deforestation and urbanization occurred within the area, before deforestation and urbanization rates slowed down around 2005. Following 2005, deforestation continued to occur at a slower rate, whereas urbanization has continued to expand at a quicker rate, especially in recent years.

## The Relationship Between Interprofessional Collaboration Competencies and Emotional Intelligence Nursing Students

*Elizabeth Her ’19, Hannah Lemke ’19, Sabrina Smith ’19*

Advisor: Jessica Stadick, **Nursing**

Two important concepts pertinent to nursing are emotional intelligence (EI) and interprofessional collaboration (IPC). EI is defined as a cluster of traits or abilities that one utilizes in regards to the emotional side of life (Vishavdeep et al., 2016) and interprofessional collaboration is defined as a “partnership between a team of health providers and a client in a participatory collaborative and coordinated approach to shared decision making around health and social issues” (Bridges et al., 2011, p. 2). Research suggests that EI is a precursor to IPC, hence nurses must possess interprofessional collaborative competence and emotional intelligence skills as team effectiveness increases when everyone is emotionally secure (Miller et al., 2008). In order to better prepare students for professional practice, this descriptive correlational study examined the relationship between EI and IPC in nursing students.

Following IRB approval, the Interprofessional Education Collaborative Competency Self-Assessment Tool (IPEC) was used to assess nursing student’s self-reported interprofessional collaborative competencies. This tool has 16 Likert style statements with a scale of one to five from strongly disagree to strongly agree. The Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF) was used to measure EI. This self-report tool has 30 items. Participants agreed or disagreed with the statements on a one to seven Likert scale.The demographic survey included the following: year in nursing school, race, gender, self-reported cumulative GPA, leadership roles, and extracurricular nursing experiences. Data was collected using a convenience sample and participation was voluntary. The data is currently being analyzed.

## Exploration of Undergraduate Nursing Student’s Interprofessional Collaborative Competencies

*Hunter Hiemstra ’19*

Advisor: Jessica Stadick, **Nursing**

Purpose: The purpose of this study was to explore the interprofessional collaborative competencies of junior and senior nursing students and to examine if there is a difference between junior and senior nursing student’s interprofessional collaborative competencies.

Methods: For this descriptive study, the Interprofessional Education Collaborative Competency Self-Assessment Tool (IPEC) was used to assess nursing student’s interprofessional collaborative competencies. Descriptive and inferential statistics were completed.

Results: Fifty-three students from a small liberal arts college participated in the study; twenty-nine juniors and twenty-four seniors. The total mean score on the IPEC tool was 67.68 (6.39) and 31.75 (3.90) and 35.92 (3.10) for domains one and two respectively. Significant differences between the junior and senior’s total mean scores (t = -2.127, p = 0.038) and interprofessional value scores (t = -2.298, p = 0.026) was found. Additionally, significant differences on the following individual items were also found: eight (t = -2.452, p = 0.015), nine (t = -2.192, p = 0.033), 10 (t = -2.698, p = 0.009), 14 (t = -2.405, p = 0.016), and 15 (t = -2.531, p = 0.014).

Conclusion: Overall, the results from this study indicate that these junior and senior students report adequate interprofessional collaborative competencies. Because the lowest scoring items for both groups were related to interprofessional interaction and communication, it may be of value to examine these items further to better develop these competencies. Future studies should focus on examining what factors contribute to the development of student’s collaborative competencies as they progress in their education.

## Red Nostalgia: The Return of Communism's Popularity

*Ha Vu Thu Huynh ’19*

Advisor: Jill Locke, **Political Science**

Red nostalgia, or nostalgia for socialism or communism, is a peculiar phenomenon in post-socialist societies in Europe that has attracted the attention of a sizable number of social scientists. Popularizing the idolization of iconic Communist figures and the consumption of communist-styled spaces, red nostalgia is an appeal to the cultural aspect of a society's communist history. Studies have shown, however, red nostalgia is beyond the realm of culture, as it reflects the modern generation lost in transition's desire to negotiate between the past and present dramatic changes to envision a utopia of fairness and solidarity. Never been studies before, red nostalgia in the context of being endorsed by urban Vietnamese youth is an emerging phenomenon that evokes an intriguing intersection between the rapid cultural liberalization and the omnipresent and omnipotent communist regime that cohabits with that realm. The intersection, therefore, raises questions about the political attitudes of urban Vietnamese youth growing up under the reign of the Communist Party of Vietnam.

## Abolishing Prisons: What Would the United States Look Like?

*Alicia Johnson ’21, Alijah Nelson ’19, Ha Huynh ’19, Krishna O’Brien '20, Thais Altenberg-Vaz '19*

Advisor: Joaquin Villanueva, **Geography**

Prisons today are used as a means of discriminating people based on race, ethnicity, sex, sexuality, and other demographics. Prisons are used to isolate and discipline those that defy social order, a social order that often reinforces the practices of white supremacy. They are used as a means of profit and work to benefit those who can make a market out of them, creating a system of injustice that leads to the incarceration of most vulnerable people who have committed nonviolent crimes mostly out of desperation. This system makes it near impossible to escape a life of crime. The current incarceration system is failing, not only criminals but all citizens of the United States. How could the system be changed to create a better community that attacks the problem of crime at the source and does not only hold the individual accountable? Can we imagine a world without a prison system?

## The Effects Of TRX And Powerlifting On Soccer Performance Drills In Collegiate Female Soccer Players

*Katie Johnson ’19, Ashley Becker ’19*

Advisor: Bruce Van Duser, **Health and Exercise Science**

A performance variable that has been strongly correlated to athletic success is muscle power. To maintain a high success level for sports or athletic events it is crucial for the athlete to incorporate various training loads on the body to help optimize muscle power (Heltne, Welles & Riedl, 2013, Chui, 2007; Wisloff et al. 2004). PURPOSE: To examine the effects of muscle training (TRX) and powerlifting (PL) on soccer performance drills in collegiate female athletes. METHODS: Ten Division III female athletes with previous knowledge of lifting participated as subjects in this study. The subjects were assigned into a TRX or a PL group. A parallel-group experimental design examined the difference in the dependent variable of soccer performance (SP) determined by the level of success on the soccer drills that the athletes completed between the independent variables (TRX and PL). Performance scores (pre and post) were determined by timed t-test, 30-yd dash, figure eight, and shooting drills. The training period consisted of three weeks in which the subjects performed their designated programs two days per week. Both groups completed exercises that primarily target muscles of the lower body, since soccer requires stability and agility from those muscles. A paired t-test and an independent sample t-test are used to analyze significant differences (p < 0.05) in SP between the TRX and PL groups. RESULTS: Results of paired t-test and an independent t-test indicate no significant difference (p > 0.05) in improvement of SP in the TRX (39.87 ± 27.15) group compared to the PL (40.50 ± 28.35) group. CONCLUSIONS: Based on the results of this study, neither type of training, TRX nor PL, are a better means of training than the other to improve SP. The results of this study may also help to provide soccer coaches and athletes with a greater understanding that both types of training are beneficial for improving SP. Further research may use a training period longer than three weeks and /or compare powerlifting to endurance training. IRB 1718-0133.

## Global Surface Temperatures and Ice Cover Change Detection in Superior Bay, Lake Superior, 1995 - 2015

*Bri Jol ’20*

Advisor: Anna Versluis, **Geography**

Remote sensing - observation of the earth and various processes via terrestrial, airborne, or spaceborne sensors - is increasingly used for monitoring environmental change, often in conjunction with field-based ground measurements and comparisons. This project investigates the changing ice coverage of Superior Bay in western Lake Superior, near the ports of Superior, WI and Duluth, MN using LandSat satellite images captured between 1995 and 2015. The data collected, preprocessing, image analysis, change detection, and accuracy assessment processes are detailed. The results are reviewed in the context of total ice coverage over the Great Lakes, other influential variables/factors (weather patterns, geography), and global surface temperature fluctuations. Furthermore, the usefulness and applicability of the overall project method is analyzed and critiqued.

## On Economic Growth, Capital Inflow and Productivity Spillover: Does Economic Freedom Matter?

*Bryan Khoo ’19*

Advisor: Sheng Yang, **Economics and Management**

This paper examines the dynamics among economic growth, FDI inflow, and productivity spillovers in countries with different levels of development. We attempt to explore complex interplays of FDI inflow and economic growth in economies that are subject to different degree of economic freedom. We further identify possible productivity spillovers generated in this process. Using a sample of 71 countries over the period 2000 to 2014, we first apply panel causality test and utilize two-step difference GMM and system GMM to estimate the impact on economic growth.

## Cosmic Ray Muon Detector Construction and Characterization

*Shelby Klomp ’20*

Advisor: Chuck Niederriter, **Physics**

For the purpose of detecting cosmic ray muons in the upper atmosphere, a pair of detectors was built that will be flown using a high-altitude balloon. The detectors were built, based on previous methodology, by soldering components onto printed circuit boards, constructing detection systems from plastic scintillators and silicon photomultipliers, and uploading code to microcontrollers. The detectors have been tested at ground level and accurately detect many high-energy particles including alpha, beta, and gamma radiation from local sources. A coincidence circuit has been set up to allow for removal of these background counts to detect muons which are particularly penetrative. The detectors will be sent on a high-altitude balloon flight to record the count rates and energies of muons at various altitudes. From this, it will be possible to ascertain a precise location for the creation of the muons and observe their energy loss through the atmosphere to better understand how they decay. If the balloon has been flown, I will be reporting on the resulting data in addition to the construction process and characterization.

## MWAMI ET MOI

*Ingrid Kubisa ’21, Reidun Kubisa ’21*

Advisor: Jeremy Robinson, **Modern Languages, Literatures, and Cultures**

We work in the Culpeper since our First year and part of our work study job was to create a game. Mwami et Moi is a visual novel-based game teaching about village culture in Eastern Congo, while also helping players develop their French skills. The player makes choices as the Mwami (tradition keeper of the village) with the goal to lead the village to prosperity. Additionally, the player is introduced to Mashi, the local language. With a lack of games with African narratives, this game is likely the first to look at this particular culture. Additionally, there will be video and other pedagogical supports for this game to be used individually, or in a traditional classroom setting. Development and publishing this game allows us, Ingrid and Reidun to expose the world to our culture and our country. Growing up in Congo and going to College in the United States we have noticed that many people are not familiar with African culture(s). In this regard, the game provides a great opportunity to bring a fuller, more authentic perspective to the world. We both desire to return to our home country of DR Congo, with goals to help move the country forward in positive ways. Ingrid is interested in International Relations and Reidun in Nursing. This game gives an opportunity to share and advocate positively for our country, and may serve as a resource in our future work. In May, we will present this game to other undergraduate students in Canada.

## Exploring Test Anxiety In Undergraduate Business Students

*Brittany Luethmers ’19, Jill Farniok ’19, Anna Neeser ’19,*

Advisor: Heidi Meyer, **Nursing**

Test anxiety decreases student focus and can have negative implications for test scores. Aromatherapy has been found to decrease test anxiety, resulting in better student performance (Fernández & Caurcel, 2015; Johnson, 2014). However, this research has been limited to the nursing education literature and limited evidence exists with business students. The purpose of this study is to better understand test anxiety in undergraduate business students and to determine the effect of aromatherapy on their test anxiety. It is intended that the results of this study will provide information to educators on the impact of aromatherapy and test anxiety. This exploratory research study includes male and female undergraduate business students, recruited from a rural 4-year baccalaureate college in the Midwest United States. This quasi-experimental study investigates test anxiety by using a self-report multiple choice survey administered before and after two separate exams. Aromatherapy was administered during the second exam. IRB approval was obtained and data collection is in process.

## Effect of Maternal Age on Egg Production and Protein Content in the Pomace Fly, Drosophila Melanogaster

*Cristhian Martinez ’19*

Advisor: Margaret Bloch Qazi, **Biology**

Life is full of trade-offs. For many organisms, a common trade-off is between making more offspring or making healthier offspring. As organisms age and have fewer resources to use, the trade-off between offspring number and quality may become more acute. In this project, we used the model organism, Drosophila melanogaster, to examine the possible effects of age on egg production versus protein investment in those eggs. Previously, a positive relationship between egg numbers and total protein invested in those eggs was observed. However, as females age, they consume less food and have higher increasing resource demands to maintain homeostasis. We examined the effect of maternal age on the number of mature eggs she could make and whether or not there was a trade-off between egg number and protein investment. While older females made fewer eggs, the protein content invested per egg as females age did not change. This provides evidence that older females are unable to maintain egg production, but does not reflect a trade-off with protein investment. It may be that egg number is reduced to maintain sufficient protein investment per egg.

## 2-D Solar Tracker

*Madison McMurray ’19*

Advisor: Charles Niederriter, **Physics**

Solar panels produce the greatest power output when the panel is oriented directly at the sun and with stationary solar panels this is rarely the case. The goal of this research is to create a solution to this problem by creating a tracking solar panel that continuously tilts with the changing angle of the sun throughout the day. Two different approaches are used to achieve the desired outcome. The first approach utilizes a light sensor to determine the direction of the most intense light source. The second employs GPS coordinates, date, and time data to calculate the theoretical position of the sun in the sky and automatically orient the panel. A moveable solar panel mount consisting of a steel frame and two linear actuator motors is constructed to achieve north-south and east-west rotation. For the first approach, a four-way light sensor is mounted on the surface of the solar panel to detect light intensity. An Arduino Mega is coded to move the solar panel until it is directly facing the light source. A second approach is being developed which uses a code written for an Arduino Mega to use GPS coordinates, date, and time readings to calculate the altitude and azimuth of the sun and continuously orient the panel to those angles. Once the second approach is complete, both approaches will be tested to determine which is the most effective and the outcomes will be reported.

## The Historical Roots of Infantilization: Political Maturity Then And Now

*Chaselyn Miller ’19*

Advisor: Jill Locke, **Political Science**

Often the term ‘child’ is used to describe people or politicians who may act rash or seem unstable in their decision making. By comparing a person to a child, it works to devalue their status as a respectable contributor to society and infantilize their life or accomplishments. Through my research, I will study the political significance of using the term ‘child’ as an insult by answering the question of how have the historical roots of infantilization in the United States worked as a tool of oppression against different groups of people as well as against youth today? Specifically looking at the cases of women, African American males, and Native Americans, I will show that during the Antebellum period, certain groups were denied citizenship and their status of adulthood leading to continued notions that allow infantilization to occur for marginalized groups of people or politicians who do not fit the mold of a successful adult. By looking into the difficulty that overcoming something like infantilization requires, it can tell us how this has affected the country’s openness to political voices and civic engagement by youth activists today.

## The Impact of a Defendant’s Mental Health Diagnosis on Jurors’ Criminal Sentencing Decisions.

*Kayla Mortenson ’19*

Advisor: Lauren Hecht, **Psychological Science**

Mental health diagnoses have been associated with many forms of bias and stigma by laypeople, clinicians, and even the individual with the diagnosis. This research intends to explore one form of bias, sentencing disparities, that may occur due to the juror’s awareness of a Defendant’s mental health diagnosis. Faculty, staff and students from a midwestern liberal arts college participated in this study by completing an online survey that included information about an individual convicted of a capital offense and acted as mock jurors to determine their confidence in the Defendant’s guilt. By including varying degrees of detail regarding the Defendant’s mental health diagnosis, as well as the potential cause and treatment, it is anticipated that individual's responses to questions of culpability and appropriate sentencing lengths will vary across conditions.

## The Backbone of the Vietnamese Nationalist Victory: The Motivations and Effectiveness of Vietnamese Women in the American War in Vietnam

*Morgan Muldoon ’19*

Advisor: David Obermiller, **History**

William Duiker argued in Sacred War: Nationalism and Revolution in a Divided Vietnam that the Vietnamese fought a “sacred war” against the Americans. According to the Vietnamese Nationalist view, the “sacred war” means that the Vietnamese fought for the sacred issue of national independence and unity. Scholars often research the Vietnam War from an American viewpoint and recently in research the Vietnamese perspective has becomes more apparent, yet is still limited. The underrepresentation of the Vietnamese female perspective dismisses an important piece of historiographical evidence. The inclusion of women supports the “sacred war” thesis which states women who fought in the war were also motivated by nationalism, country unity, and independence. This argument contributes to the growing, yet currently sparse, research on Vietnamese women’s roles and motivations during the Vietnam War for independence. The motivations of Vietnamese women who fought in South Vietnam revolved around nationalist ideas, country independence, and unity; they were essential to Vietnamese Nationalist victory through their roles as mother and protectors, spies, and combatants.

## Learning To Teach And Teaching To Learn

*Megan Nipe ’21, Anya Menk ’22, Lisbeth Magdaleno-Garcia ’22*

Advisor: Sidonia Alenuma, **Elementary and Secondary Education**

For the word TEACH, we created a taxonomy. For 'T', we used the word Tailored. We did this because students learn in different ways and schools. Charter, Magnet, and Virtual are examples on how schools are adapting. For E, we used the word Empowering. We did this because students should always feel valued and important in the classroom. For A, we used the word A-culture. This is because schools are adapting to people with different cultural backgrounds. For the letter C, we used the Creativity. This is because we want the students to explore options besides academic classes. Lastly, the letter H. The letter H represents History. The history of how education has become accessible and shaped for the students individual needs.

##  Low Frequency Sound Waves Effect on Pain Perception Generated by the Cold Pressor Task

*Hannah Nolte ’19*

Advisor: Mark Kruger, **Psychological Science**

The medical community is trying to identify alternative ways to treat chronic pain because the current treatment, opioids, is very addictive (Volkow & Collins, 2017). One viable alternative to medication would be the utilization of low frequency sound wave therapy. Low frequency sound waves have been used to treat a variety of ailments, most commonly chronic and acute pain. There have been many different forms of low frequency sound wave therapy including vibroacoustic therapy, physioacoustic intervention, vibrotactile stimulation, and many others. Due to the many different forms of presentation, it is currently unknown which presentation of sound is the most effective. Low frequency sound waves are thought to reduce pain by simulation of the Pacinian corpuscles or through relaxation effects. This study examined four different presentations of sound, haptic (touch), auditory (hearing), both haptic and auditory, and silence to determine how sound waves affect pain perception (through Pacinian corpuscles or effects of relaxation) and what method of presentation is the most effective. Pain was induced through cold-water immersion (i.e. the cold pressor task) and the duration of time the participant was in the task determined the amount of pain a participant was able to endure. No significant results were found.

## Determination of Chloride ions concentration in water samples

*Trang Phan ’22, Olivia Bruse ’22*

Advisor: Anna Volkert, **Chemistry**

In cold weather climates, excessive usage of chloride for deicing roads poses a danger to the surrounding bodies of water. The chloride ions can leach into the bodies of water which irreversibly disrupts the ecosystem. It was hypothesized that melted snow samples would have the highest chloride ions concentration as compared to the tap and well water samples. Silver nitrate was titrated into water sample and the compounds reacted with chloride ions to form precipitate silver chloride to quantify the chloride concentration. The melted snow samples contained almost 6X the chloride ion concentration when compared to the other two water sample. For a future experiment, testing samples from an untreated body of water in comparison to previously collected data would bring an interesting application and analysis of chloride concentration in naturally occurring water reservoirs.

## Relationship Between Dominant and Non-dominant Hand Grip Strength and Pole Vault Performance

*Jenna Rieth ’20, Nelson Finne ’19*

Advisor: Stephanie Otto, **Health and Exercise Science**

There are many physical parameters that may affect pole vault performance. Sullivan et al. (1994) found that grip height was strongly correlated to pole vault performance. The study also found that grip height was correlated to upper body muscular endurance. Wind et al. (2010) concluded that grip strength is a major determinant for total body strength. However, there is a lack of evidence to suggest that grip strength is directly related to pole vault performance. The purpose of this study was to examine the relationship among handgrip strength and pole vault performance. Twenty male and female collegiate pole vaulters from the Division III, Minnesota Intercollegiate Conference participated in this study. This study used a correlational research design. The independent variables in this study were each participant’s dominant grip strength and non-dominant grip strength, while the dependent variable was pole vault performance. Data collection occurred during the 2018 Spring track and field season. A Lafayette Hand Grip Dynamometer was used to measure dominant and non-dominant hand grip strength; one measurement was taken per hand prior to competition. Maximum bar height each participant cleared during competition was recorded. A Pearson-Product moment correlation analysis indicated a positive, significant correlation (r=0.80; p<0.05) between dominant hand grip strength and pole vault performance, and a positive, significant correlation (r=0.87; p<0.05) between non-dominant hand grip strength and pole vault performance. In conclusion, among this group of athletes, as dominate hand grip strength increased, so did pole vault performance. Based on the results of the study, it seems reasonable to suggest that hand grip strength could be an important training component for pole vaulters. Future research might look at the potential impact a grip strength training program might have on pole vault performance. IRB # 1718-0088

## Quantifying glacier volume change using a Unmanned Aerial Systems (UAS)-derived imagery and TanDEM-X data on Volcán Cayambe, Ecuador

*Chloe Shaw ’19, Hanna Albers ’19*

Advisor: Jeff La Frenierre, **Geography**

Tropical glaciers are indicators and recorders of a warming climate. Assessing this change is important to understanding the future water supply in local communities. In this study we assess volume change on the Hermoso Glacier on Volcán Cayambe, Ecuador. We use data from two different sources compare Digital Elevation Models (DEM) of the glacier surface. One source is unmanned aerial systems (UAS) derived imagery using structure from motion photogrammetry. The other source is satellite derived TanDEM-X data. We also assess sources of uncertainty with both the field collection process and DEM differencing methodologies.

## Cultivating a Renewed Environmental Ethic Using Luther’s Doctrine of Finitum Capax Infiniti

*Michelle Simms ’19*

Advisor: Sarah Ruble, **Religion**

Ecological ethics has become a prominent topic as the realities of environmental degradation and climate change emerge in the 21st century. While the operative framework of ecology has reached an understanding of humans as an inextricable part of the environment, the Evangelical Lutheran Church in America continues to maintain a separation between humans and the rest of the earth within its congregational resources and practices. I argue that Luther’s doctrine of finitum capax infiniti (“the finite bears the infinite”) can renew current ecological initiatives within the ELCA, re-frame members’ understanding of their ecological identity, and produce a shift in principles of ecological prosperity in the Lutheran tradition. Through analyzing creation care resources disseminated by the ELCA and through interviewing ELCA pastors and chaplains, this study depicts the gap between humanity and ecology maintained in ELCA environmental values and practice, and describes how finitum capax infiniti can restore a paradigm of human flourishing. Ultimately, these findings have the potential to reinstate ecological identity within ELCA members, identify ecological relationship as bearing the fingerprint of the divine, and cultivate a renewed principle of global sustainability.

## Kindness is overrated: An examination of college women's autobiographical memories after exposure to a sexist event

*Amy E. Specker ’19, Kaleb Krengel ’19, Hanan Mohamud ’19, Ashley Schauer '19*

Advisor: Jennifer Ackil, **Psychological Science**

Past research has found strong evidence that both hostile and benevolent sexism directed toward women has been harmful in a number of ways. Specifically, women exposed to benevolent sexism have reported increases in intrusive thoughts while completing a cognitive task and increases in feelings of incompetence. Dumont, Sartlet, and Dardenne (2008) discovered that exposing participants to a benevolently sexist environment lead to recall of more memories of incompetence. This study expanded these findings by examining the content of women's autobiographical memories after exposing them to either a hostilely sexist event, benevolently sexist event, or no sexism event. Our results, while not statistically significant, indicates that exposing participants to a sexist event had an impact on participant memories. Participants who were in the hostile and benevolent sexist conditions reported feelings of incompetence and mentioned negative emotions in their memories relative to the no sexism group who indicated none of these things in their memories. We conclude that both types of sexism can be harmful to women in comparison to an environment that is not sexist toward them.

## Little League Shoulder: A Critically Appraised Topic Paper

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Advisor: Liz Drake, **Health and Exercise Science**

Focused Clinical Question: Does using ice after practice help reduce pain associated with proximal humeral growth plate separation better than strengthening SITS muscles of the shoulders in youth baseball players? Search Strategy: The online databases searched were SPORTDiscus, PubMed,CINAHL Plus, and Cochrane and yielded seven articles. The articles had to be published within the last two decades. Results and Summary of Search: The research divulged few articles relevant to the original LLS topic, which is why the articles have been included despite their low levels of evidence. All the studies point to LLS as being an overuse injury and reveal that prevention of injury and rest are the main ways of treating LLS. A few weaknesses of some of these articles would include that it focuses more on prevention and treatment. Clinical Bottom Line: The results of this review suggest that Little League Shoulder (LLS) is an overuse injury that affects adolescents in overhead sports, specifically baseball pitchers. Although information specifically regarding our clinical question could not be found, multiple interventions to related injuries could be adapted to work for this particular injury. Implications: The purpose of the paper was to determine if icing after practice would help reduce pain associated with Proximal Humeral Growth Plate separation better than strengthening the SITS muscles of the shoulder in youth baseball players. Unfortunately, research on these criteria has not been completed. The evidence discovered on the topic of Little League Shoulder points to avoiding overuse and rest as the best treatment.

## To Walk Alongside: Awakening Ecological Spirituality

*Alexander Theship-Rosales ’19*

Advisor: David Obermiller, **Environmental Studies**

"To Walk Alongside: Awakening Ecological Spirituality" is an independent-study film project. The film is the product of a year of investigation into ‘ecological spirituality’ by means of a research paper, over a dozen interviews, and extensive video editing. ‘Ecological Spirituality’ as a concept may be thought of as an examination into humanity’s spiritual connection to the environment; people and the natural world together. “To Walk Alongside,” through recorded interviews, examines the honest reflections of people from a variety of spiritual worldview. Each talent/interviewee was asked the same series of questions that prompted insight into how ecological spirituality is informed by their own diverse religious and spiritual perspectives. These insights were compiled and organized by the common themes “Dominion,” “Interconnection,” “Balance,” “Affinity,” and “Compassion.” The film’s ultimate goal is to invite audiences to consider their own inherent ecological spirituality. At the Celebration of Creative Inquiry, a page describing the project, a display of the trailer for the film, and biographies of each of the people interviewed for the film will be available to view. Alex Theship-Rosales will also be present to speak about the project and answer questions.

## Perceptions of a Healthy Diet Among College Students

*Veronica Vasina ’19*

Advisor: Stephanie Otto, **Health and Exercise Science**

College poses many challenges as well as opportunities for developing healthy nutritional behaviors. Ha and Bish (2009) looked at a three-day food diary of college students and reported greater levels of health-related understanding among senior year compared to first year students. Another study looked at college students’ eating habits and knowledge of nutritional requirements for health. The study found students had a fair amount of knowledge regarding nutritional requirements, but college gave them freedom to choose the type and amount of food they consumed (Noriega and Shin, 2018). The purpose of this study was to examine perceptions of a healthy diet among college students. In order to answer this question, each subject completed an open-ended survey to examine what they believed was a healthy diet. Terms were categorized into common themes and frequency analysis was used to interpret the data. Analysis revealed four major topics among this sample: 1) macro and micronutrients, 2) balanced, 3) energy, and 4) processed foods. Most commonly, participants described their perceptions of a healthy diet as needing to get the right amount of macro and micro nutrients with 47% of participants using these terms. Balanced diet was the next most commonly identified theme with 26% of participants saying things like: food groups and variety. Participants identified energy as the third most commonly identified determinant of a healthy diet with 15% of participants using terms such as fuels and function at your best. Finally, 12% of participants wrote that a healthy diet doesn't have much processed foods, using terms such as natural and clean. The results of this study help frame how college age students define and perceived a healthy diet. This information may provide some direction for future researchers to develop intervention studies targeted at topics that emerged among this sample.

## Determining Frequency Of Adverse Events In Monoclonal Antibody Therapy Trials Utilizing R Text Mining Functionality

*Arun Velamuri ’19*

Advisor: Sanjive Qazi, **Biology**

Monoclonal Antibody Therapies are treatments that enlist the natural immune system functions to fight cancer. Clinical trials testing the efficacy of this and other cancer treatments often yield adverse events data, which constitute unfavorable changes in the health of a participant of a clinical trial, with serious adverse events constituting events that result in death, are life threatening, require inpatient hospitalization or extend a current hospital stay. The NIH U.S. National Library of Medicine’s ClinicalTrials.gov is a clinical trials database with hundreds of thousands of federally and privately funded clinical trials from across the globe, including clinical trials utilizing Monoclonal Antibody Therapies. An initial dataset, consisting of 78,755 adverse events extracted from 653 Monoclonal Antibody Therapy related clinical trials from ClinicalTrials.gov, was analyzed using R text mining functionality to determine adverse event likelihood across various cancer types.

## Predicting Pitch Type in MLB

*Avery Wood ’19*

Advisor: Laura Boehm Vock, **Statistics**

Pitchers strive to be unpredictable; estimating pitcher predictability is a potential way to evaluate pitching effectiveness. It will also be important to account for predictable patterns in pitching in models of at-bat outcomes, if such patterns exist. In this light, we use random forests, a tree-based classification method, to predict pitch type (e.g. four-seam fastball, curve ball, slider, etc.) using the characteristics of the previous pitch. We examine the 396 MLB pitchers who threw more than 1000 pitches over the 2015 to 2018 seasons. The data is acquired from Statcast, a service that records data, including pitch velocity, type, location, etc. , from every pitch in every MLB game. We examine pitch type and 15 potential explanatory variables, including initial velocities in three dimensions, results of the pitch, and the locations where the ball left the pitcher’s hand and where it crossed home plate. We specifically compare Clayton Kershaw, one of the best pitchers in the MLB and Yu Darvish, who is known for his particularly diverse arsenal of pitches. Initial results for both pitchers have prediction accuracies slightly better than a coin flip. We will further investigate the predictability of all 396 pitchers in our data set, and then comparing them to try and identify factors associated with high predictability.