CERCA
Celebration of Excellence in Research and Creative Activity—VIRTUAL EVENT

Discover Student Research

2021
29th Annual Student Research Days

The Power of University of Wisconsin Eau Claire
Office of Research and Sponsored Programs Powering Creative Activity
Celebration of Excellence in Research and Creative Activity
(29th Annual Student Research Days)

Abstracts of Student Presentations

University of Wisconsin-Eau Claire

April 19th - 23rd, 2021 Virtual Presentations on Canvas
Acknowledgements

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Lastly, we thank **student participants** and their **faculty mentors** for all the hard work that led up to the polished presentations we see and hear throughout CERCA week.
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A Note to Our Departments, Staff, and Students

Thank you so much for your patience while we complied our abstract book from CERCA 2021. We appreciate everyone’s flexibility during these unprecedented times. Thank you to everyone who worked hard to create a virtual CERCA program. Finally, a special thank you to everyone who participated in CERCA 2021. We appreciate every project involved in CERCA 2021!
Evaluating the Rationality of Views on U.S. Treatment of Indigenous People: A Philosophical Approach  
Presenter: Hannah Dvorak  
Faculty nominator: Kristin Schaupp

Should US treatment of indigenous people be considered genocide or not? While there are many different responses to this debate, there are four main contenders. Using a philosophical lens developed in response to epistemological work on disagreement, specifically in response to the question of whether on-going disagreement is rational, I analyze each of the four main contenders and assess their rationality. One notion missing from the philosophical debate on disagreement is a distinction between perfect and imperfect rationality. Using this distinction requires that we view rationality and irrationality as a multilevel spectrum. Applying these philosophical insights to the debate about US treatment of indigenous people allows us to determine to whether the typical responses are rational or irrational, and why this is the case. This approach can also help us to understand why multiple responses can be considered rational, even when, as I will argue here, one position stands out from the others as most rational.

Episodes of Ethnic Cleansing: Local-Level Dynamics During the Kosovo War  
Presenter: Matthew Tentler  
Faculty nominator: Damir Kovacevic

How and why did policies of ethnic cleansing unfold across various municipalities during the Kosovo War (1998-00)? Why did some municipalities experience horrific war crimes, intense violence, and targeted group destruction, while others did not? These questions highlight the importance of the local level – meso level – for understanding violence across time and space. The meso level is a tool that studies violence at an analytical level below the nation-state. In this paper, we investigate the meso-level dynamics of the Kosovo War, with particular attention to the episodes of ethnic cleansing that occurred in certain places at certain times. We contend that violence is not uniform. Onset, duration, and intensity vary from village to village, city to city, and region to region. Thus, to explore this process, we employ a micro-comparative study of three municipalities (Dečani, Glogovac, and Suva Reka) for a more in-depth understanding. We find that to understand why policies of ethnic cleansing may unfold, one must account for both the scope conditions – war and exclusionary ideology – and the explanatory variables – political authority, territorial superiority, and agent collaboration.
Menomonie Room

**Models of Micrometeorite Heating in Earth’s Atmosphere**

*Presenters: Tyler Gonzales*

*Faculty nominator(s): Paul Thomas and Phillip Ihinger*

I discuss the development of a numerical simulation of the atmospheric passage of interplanetary dust particles to analyze their physical characteristics, including their shape and size. Interplanetary dust particles arise in a variety of ways, some even landing on the roofs of buildings. These particles can be found using numerous techniques including magnetic detection due to the high magnetic content of some of these particles.

**Observing Low Altitude Features in Ozone Concentrations Using UAS**

*Presenter: Josie Radtke*

*Faculty nominator: Patricia Cleary*

Ozone is a pollutant formed in the atmosphere by photochemical processes involving nitrogen oxides and volatile organic compounds when exposed to sunlight. Ozone is regularly measured at ground stations and sampled infrequently through balloon and aircraft platforms which have demonstrated the non-uniformity with altitude. An unmanned aerial system (UAS) platform for measuring ozone has been developed. First a Typhoon H hexacopter UAS was flown with a portable ozone monitor, POM, and a meteorological temperature and humidity sensor, InterMet system, iMet was flown as a part of the CHEESEHEAD19 campaign to compare tower measurements at two separate inlet heights. In June 2020, a DJI M600 hexacopter was flown with the same sensors to measure Lake Michigan shoreline ozone concentrations. This UAS platform has revealed low-altitude structure in ozone concentrations in a shoreline environment. These are the first such measurements of low-altitude ozone via UAS in the Great Lakes Region, which has revealed a very shallow layer of ozone rich air lying above the surface.

**Addressing Public Concerns About Frac Sand Mining in West Central Wisconsin Through Community Outreach and Air Monitoring Analysis**

*Presenters: Reggie Eggen, Katrina Kawak, Mark Larsen, Madaline Massetti, Kasee Meyer & Joseph Vue*

*Faculty nominator: Crispin Pierce*

The COVID-19 pandemic halted frac sand activity within west-central Wisconsin and our team installed and analyzed data from air quality monitors to collect baseline PM2.5 concentrations in communities near frac sand facilities prior to mining resumption. Additionally, our team worked to address community concerns about living near a frac sand facility. We found statistically significant differences in PM2.5 concentrations varying on location; however, we found no correlation between PM2.5 concentrations and the distance to the frac sand mines. We also found no statistical significance in PM2.5 concentrations when comparing urban and rural areas, simulating differences in traffic or that the summer 2020 west coast wildfires, which generated large PM2.5 concentrations locally, did not increase PM2.5 levels within Wisconsin. A ten-question survey asking participants to identify their concerns and rate their confidence in the air monitoring found that participants ranked their confidence in air monitor findings as an average of 4.5 out of 5 and their comfort with the air monitor website as an average of 4.25 out of 5.
Ho-Chunk Room

Prenatal Screening for Adverse Childhood Experiences: An Exploration of Patient Perspectives
Presenter: Elizabeth Galloway
Faculty nominator(s): Jeanette Olsen and Pamela Guthman

Adverse Childhood Experiences (ACEs) can have lasting effects on one’s health throughout the lifespan and can ultimately impact the next generation. The prenatal period provides a unique opportunity for healthcare professionals to establish relationships with women, screen for ACEs, provide education, and make referrals to resources that support healing. The purpose of this mixed-methods study was to learn more about women’s views on screening for ACEs during healthcare visits in pregnancy. Survey data were collected from 154 women from Northwestern Wisconsin with a history of one or more pregnancies. Women were recruited through regional health department social media pages in Fall 2020. Quantitative measures included demographic variables, ACE scores, and preferences regarding screening format, strategies, and resources. Additional perspectives were captured through open-ended questions. Following data analysis, results will describe women’s perspectives on ACEs screening during prenatal healthcare visits inclusive of screening format and additional education and resources they would like to receive. Findings will inform strategies for efficiently and sensitively screening for ACEs during pregnancy and provide direction for educational and interventional resource development.

Creating a Culture of Civility: Incivility in Nursing Education & Practice
Presenters: Shelby Christopherson, Rita Donahue, Briunna Wells & Sophia Wusterbarth
Faculty nominator(s): Linda Sargent and Ann Aschenbrenner

Incivility in nursing is so well-known there’s a saying that nurses eat their young. "Incivility, bullying, and lateral violence are still prevalent and are a significant driver of nurse dissatisfaction and job turnover" (Abersold, 2020). This study aims to promote a culture of civility by raising awareness of incivility in the nursing profession, identifying behaviors associated with incivility, and helping students develop skills to respond to uncivil encounters. The topic is introduced to students in video and PowerPoint lecture formats including background information, definitions and examples of incivility, and examples of how incivility impacts the nursing profession. Case studies with questions are utilized, as well as post-clinical discussions. Cognitive rehearsal and role-playing using student-created scenarios and scenarios obtained from other nursing incivility studies expose students to uncivil behaviors in a controlled environment. "Awareness of the importance of incivility and capability to change uncivil behavior have effective roles on improving incivility" (Abedini, 2019). Students will be given a survey before clinical and again after to measure growth of knowledge and preparedness to handle uncivil encounters.

Forgiveness, Civility, and Personality: Exploring the Relationship of These Concepts in Nursing Education and Practice
Presenters: Emma Booth & Jessica Rusciano
Faculty nominator: Ann Aschenbrenner

PURPOSE: The study aim is to describe the relationships among forgiveness, civility, and personality characteristics in nursing education and practice. Design: Descriptive, cross-sectional, quantitative study
of employed registered nurses in education and clinical practice. METHODS: Online, quantitative survey, shared via email and social media. Participants were invited to share the survey link with other nurses. The Clark Workplace Civility Index; Hartland Forgiveness Scale; Big 5 Personality Scale: sub scales agreeableness and negative emotionality were combined into one survey and administered using the anonymous response setting in Qualtrics. FINDINGS: Data analysis will be completed during the month of March. Anticipated findings include a relationship among civility, forgiveness, and personality characteristics. Civility will be associated with high forgiveness and agreeability. Lower civility will be associated with greater negative emotionality and lower forgiveness. CONCLUSIONS: The relationships discovered amongst the variables may be used for developing educational programs to improve civility in nursing education and practice and to provide foundation for future studies.

Chancellors Room

College Students’ Second-Language Experiences: Investigating Persistence and Speaking Context
Presenter: Kalli Charles
Faculty nominator/mentor: Christine Vriesema

College students across the U.S. sign up for second-language courses for their major, minor, and personal interest. Many students persist in learning their second language while others become discouraged when they make mistakes. Although mistakes are a normal and functional part of the learning process, students who feel discouraged are more likely to be perfectionistic in their language-learning and even intend to quit their second language altogether. This project explored whether (1) college students’ discouragement and normalizing behaviors after second-language mistakes varied across speaking contexts; and (2) how student characteristics (perfectionism, second-language speaking comfort) and experiences (discouragement, normalizing mistakes) predicted students’ intentions to quit learning a second language. Results indicated that striving towards perfection predicted greater intentions to quit and that college students experienced greater discouragement after mistakes with native speakers compared to mistakes that occurred in whole-class settings and with peers. Based on these results, future research and interventions might explore whether explicitly framing learning as a process, minimizing social comparison, and normalizing mistakes across learning contexts might help enhance student outcomes in second-language learning contexts.

Hidden Rhetorical Roles in the Twentieth Century Business Office: The Leadership Communication of Secretaries and Typists in the Archive of Tiger Oil Memos
Presenter: Twyla Alix
Faculty nominator/mentor: Marcy Orwig

Bakhtin’s (1981) explanation of heteroglossia demonstrates how words are influenced by the text—or genre—of a profession, a particular person, or specific time period, and that each word “tastes of the context or contexts in which it has lived its socially charged life; all words and forms are populated by intentions” (p. 293). While Bakhtin’s definition of heteroglossia has been widely used to analyze genres in literature, it has not been applied to better understand the genres of professional communication. As a result, this research analyzes the memo artifacts in the archive of the Tiger Oil Company. These memos, which date from the late 1970s, provide insight to the rhetorical voice of overlooked secretaries and
How Does Cost Resilience Work in Healthcare Industry? Evidence from Public Traded Companies
Presenter: Kyle Schmocker
Faculty nominator/mentor: Jidong Zhang

The project is to explore cost management and behavior in the healthcare industry. The project is derived from collaborative research with the Mayo Clinic. The project will use the public data which were extracted from the financial research database and IRS Tax database. The analysis focuses on the investigation of the relationship between different cost drivers and revenues. Our paper will contribute to revenue management and cost management in the healthcare industry. The conclusions not only have managerial implications but also make a theoretical contribution to healthcare research.

Session 2

Centennial Room

A Walk in Her Shoes: How Women of Color Navigate Through a Predominately White Institution
Presenter: Alejandra Serna
Faculty nominator(s): José Alvergue and Kelly Wonder

The purpose of this research study is to see how women of color that identify as Black and/or Latina navigate through a predominately white institution, such as the University of Wisconsin‐Eau Claire. In addition, another purpose of the research is to successfully apply the narratives of these women, audio‐recorded as ‘testimonies,’ to gain greater insight on how students adjust to an environment outside their comfort‐zones. This project aims to provide awareness to enhance the experiences of future students who sacrifice their culture in hopes of a higher education diploma.

Understanding Femicide: Violence, Corruption, and Protest
Presenter: Claire Ganschow
Faculty nominator: Manuel Fernández

Mexican women currently face an undeniable crisis in relation to gender‐based violence and femicide in Mexico. For nearly three decades, Ciudad Juárez, a city situated on the US-Mexico border, has experienced alarming rates of disappearances, murders, and sexual assaults among all genders. However, the crimes against women are horrifying in a different manner because they are typically victims of extreme sexual violence and their murders are scrutinized under machista culture. To understand why and how femicide has risen to such great degrees over the past decade, it is necessary to understand three aspects of the crimes. In order to recognize the ways in which these crimes are committed, the violence that is associated with femicide must be uncovered. In addition, corruption within the Mexican government and police forces is a clear example as to why so many femicide cases remain unsolved and why women and their families receive no justice. As a result, women and feminists have taken to the streets of Mexico in protest to demand to be heard and take back their power.
Silenced Geographies: A Case Study of Roberto Tecpile’s Journey from Mexico to Western Wisconsin
Presenter: Rebecca Reif
Faculty nominator(s): Jeff DeGrave

The purpose of this project is to humanize the migrant experience using maps and to offer a poststructural critique of Western research practices through a case study of Roberto Tecpile, a migrant worker from Veracruz, Mexico who has been working in the United States since 1998. This research builds on previous geospatial representations of migrant experiences as well as anthropological critiques of Western research practices and cartography. Combining qualitative data collection methods and geospatial technology, this project maps key points in Roberto's journey that visually represent one migrant's individual experience crossing the US-Mexico border. Ultimately, Roberto’s journey is ongoing. Thus, there are no definitive conclusions about his life. Instead, this research emphasizes the variability in migrant experiences and offers a critical analysis of academia's role in reproducing potentially harmful power relations through a self-reflective analysis of the relationship between the researcher and the researched.

Ecofighter- A Sustainability Tracking Platform
Presenter: Brandon Pessman
Faculty nominator: Rakib Islam

Today, climate change is more relevant than ever. It will affect the generations to come if we do not make simple changes (e.g., minimizing usages of polythene bags) in the way we perform our day-to-day activities. EcoFighter is a web and mobile application for tracking and visualizing people's eco-friendly behaviors that collectively can create a huge positive impact to fight against climate change. The app can track everything from your reusable bag usage to how many times you refill your water bottle in a day. The app can keep you up to date with how your friends are doing and even how your school is doing as a whole. Users of the app can participate in competitions to redeem rewards, such as coupons to local businesses, contributions to nonprofits, exclusive content, and more by showing their eco-friendly behaviors. Such a reward system will keep people motivated and excited to ensure their sustainable eco-friendly behaviors.

Presenters: Sakumi Kawamoto, Chloe Knuth, Philip Long & Hannah Raddenbach
Faculty nominator(s): Eric Jamelske and James Boulter

Climate change (CC) is perhaps the most important issue of our time. As the world’s two largest economies and greenhouse gas polluters, China and the United States are key players in international CC negotiations. To better understand the views of Chinese and American citizens we analyzed survey data from 2015 (N=7,556), 2017 (N=7,415) and 2020 (N=4,013). Support for each country fulfilling their commitment under the Paris Agreement was examined with no mention of the other country (control) and
conditional on knowing the other country would not fulfill their commitment (treatment). Our results indicated greater support among Chinese for their country to fulfill their Paris Agreement commitment compared to Americans with little change in this general result over time. Support in both countries declined in 2015 and 2017 when it was known the other country would not fulfill their commitment with this result being less evident in 2020. There was also consistently more variation in Paris Agreement support among Americans with a consistent and significant political division among Americans as liberals/conservatives showed the most/least support respectively.

**Investigating Trends and Patterns in Chinese and American Climate Change Views Using an Index of Acceptance, Knowledge, Concern and Obligation to Act, Using Survey Data From 2015, 2017, and 2020**

Presenters: Maddie Culhane, Savanna Grunzke, Caleb Kulich & Katelyn Worzalla
Faculty nominator(s): Eric Jamelske and James Boulter

Climate change (CC) is perhaps the most important issue of our time. As the world’s two largest economies and greenhouse gas polluters, China and the United States are key players in international CC negotiations. To better understand the views of Chinese and American citizens we analyzed survey data from 2015 (N=7,556), 2017 (N=7,415) and 2020 (N=4,013). A CC acceptance/knowledge/concern/obligation index (CCI) was calculated with higher scores indicating more alignment with the scientific realities of CC. Comparisons are presented across countries in each year and within each country across years. We also report on responses to individual survey questions that are incorporated into the CCI calculation. American views on CC are also compared across political affiliations. Our results indicated relatively consistent differences between Chinese and American CC views with some notable changes over time. Chinese CCI scores were generally higher than for Americans, while there was consistently more variation in American CCI scores. Additionally, there was a consistent and significant political division among Americans with the following pattern in CCI Scores (conservative < moderate < liberal).

**Ho-Chunk Room**

**Using Social Network Analysis to Inform Covid-Era community Aphasia Group Programming**

Presenter: Anna Livera
Faculty nominator: Thomas Sather

In the pre-COVID era, aphasia has been highly associated with reduction in social networks among both individuals with aphasia and their care partners. Among the multitude of negative impacts of the COVID era is increased risk of social isolation. Community aphasia groups have historically been a means to mitigate the impacts of aphasia related to social isolation. Over the past year, community aphasia group programming in the Chippewa Valley has gone entirely virtual. Social network analysis was used to evaluate network characteristics of these service deliveries pre- and post-COVID. Multiple social network characteristics are visualized and discussed, specifically measures of centrality including both in-degree and out-degree. Implications for post-COVID era delivery, including network diversity and network vulnerability, are discussed.
**Characterization of Edge Damage Induced on Rebco Superconducting Tape by Mechanical Slitting**

*Presenter: Nate Hartnett*
*Faculty nominator: Matthew Jewell*

Rare-earth barium-copper-oxide (REBCO) superconductors are high-field superconductors fabricated in a tape geometry that can be utilized in magnet applications exceeding 20 Tesla. During a mechanical slitting step in the manufacturing process, edge cracks can be introduced into the tape. We sought to understand which layers were the mechanically weakest by locating the crack initiation layer and identifying the geometrical conditions of the slitter that promoted or suppressed crack formation. The described cracking was investigated by selectively etching and characterizing each layer with scanning electron microscopy, laser confocal microscopy, and digital image analysis. The total number of cracks measured in 30 mm of wire length was between 3000 and 5700 depending on the layer and their crack densities were 102 cracks/mm for REBCO, 108 cracks/mm for LMO, and 183 cracks/mm for Al2O3. These results indicated that there are separate crack initiation mechanisms for the REBCO and the LMO layers. With a better understanding of the crack growth behavior exhibited by REBCO tapes, the fabrication process can be improved to provide a more mechanically stable and cost-effective superconductor.

**Comparison of Leaf Damage and Trichomes of Wisconsin Helianthus Populations Growth in Varying Environments**

*Presenter: Madilyn Vetter*
*Faculty nominator(s): Nora Mitchell and Kelly Wonder*

Defenses against predators are important adaptations in plants. Leaf hairs, or trichomes, are a mechanical defense mechanism that reduces insect herbivore damage. Under global climate change, plants may encounter novel insect predators as species move northward and growing seasons lengthen. It is important to understand what mechanisms will enable crops and their wild relatives to respond to these novel pressures. Traits (such as trichomes) may exhibit phenotypic plasticity in response to environmental conditions or change genetically through time (evolve). Here, we ask if sunflowers alter mechanical defenses to defend against insect damage. Sunflowers (*Helianthus*) are an important crop and exhibit natural diversity throughout North America. We assessed plant mechanical defenses and insect damage on over 600 individuals from three species (*H. grosseserratus*, *H. maximiliani*, and *H. giganteus*) in three settings: greenhouse, common garden, and wild populations throughout Wisconsin. We found differences in insect damage and trichome densities between growing environments, indicative of environmentally driven plasticity. This research will help us understand how plants respond to novel predators and focus agricultural efforts such as pesticide development.

**Chancellors Room**

**Counseling Capacity to Support Students with Schizophrenia**

*Presenter: Delaney Collins*
*Faculty nominator(s): Jennifer Muehlenkamp and Kelly Wonder*
Schizophrenia is a serious and persistent mental illness that affects 1% of the population and has an average age of onset that coincides with traditional college student age. College counseling centers would be a likely first point of contact for a student experiencing a first-onset of schizophrenia or a place for ongoing support managing schizophrenia. Little is known about the training and perceived confidence of university counselors to support students with schizophrenia. This study used a mixed-methods approach to examine the training, perceived knowledge, stigma towards, and confidence in one's ability to treat a student with schizophrenia among university counselors and directors. Results from the quantitative portion show that counselors with more training and experience report less stigma and greater confidence to support students. Qualitative interviews with directors suggest that while they are aware of student needs, counseling centers may not be equipped to provide best-practices to students with schizophrenia. Implications of these findings for college counseling centers will be discussed.

**Yoga & Self-Injury: Pathways of Protection?**
**Presenter:** Emily Wagner  
**Faculty nominator:** Jennifer Muehlenkamp

The purpose of this study was to examine whether practicing yoga has the potential to reduce NSSI frequency by increasing body regard, mindfulness, and self-compassion. Participants included 676 college students (mean age = 19.98; 34.0% first year students) from UWEC who completed an online survey measuring the variables listed above. Independent sample t-tests and mediation-regression analyses were conducted to evaluate hypotheses. While yoga practice did not differ between those with and without NSSI, regression analyses showed that mindfulness was associated with reduced NSSI because of its influence on self-compassion and body regard. Practicing yoga may help to reduce NSSI because it can increase mindfulness, self-compassion and body regard. Additional implications and limitations of this study will be discussed.

**What’s Worse: Lazy but Smart, or Stupid but Hardworking? Gender Differences in Mate Preferences and Aversions**
**Presenters:** Jamie Peterson & Emily Wagener  
**Faculty nominator:** April Bleske-Rechek

We investigated gender differences in the pursuit of positive mate characteristics and gender differences in the avoidance of negative mate characteristics. In Study 1, men and women rated a comprehensive list of 76 positive characteristics or 76 negative characteristics. Women preferred characteristics in the “Hardworking” and “Wealthy” categories more than men did, and they avoided characteristics associated with being “Lazy,” “Poor,” “Unreliable,” “Cold,” “Submissive,” “Uncultivated,” and “Prudish” more than men did. In Study 2, we began with an initial list of 11 core traits and their negative counterparts (e.g., smart/stupid, good-looking/ugly) to create a series of trade-off questions. Women more often than men traded off other positive traits to obtain a mate who was thoughtful, polite, and family-oriented; men more often traded off other positive traits to obtain a mate who was good-looking and smart. Further, women more often than men settled for other negative traits to avoid a partner who was disloyal, and men more often settled for other negative traits to avoid a partner who was ugly or stupid.
Centennial Room

An Examination of Creativity in the Virtual World Language Classroom
Presenter: Jesselyn Nadolny
Faculty nominator: Anne Hlas

This study will investigate creativity in the virtual world language classroom during the COVID-19 pandemic. In recent years, many researchers agree that the advancement of creativity necessitates its purposeful inclusion in classroom. While there is a recent burgeoning interest in creativity within education, little has been researched related to creative factors within the online language classroom. For this reason, this research study will focus on how creativity is defined in the world language K-12 classroom by analyzing self-selected creative and uncreative artifacts submitted by K-12 language teachers. The research question that guides this study is: how do K-12 world language teachers define creative and uncreative artifacts in the virtual classroom?

Creating an Inclusive Syllabus to Engage International Students and Local Students
Presenters: Xiaoxue Liu & Yutong Yin
Faculty nominator: Kaishan Kong

As study abroad programs increase in popularity, the population of foreign exchange students increases across universities around the world. The main topic of this research project is peer-scaffolding in Chinese-English language learning. In the process of peer scaffolding, corrective feedback contributes to second language acquisition (Ellis & Rod, 2009) and intercultural communication. This project seeks answers to three research questions. (1) In what way(s) does tandem learning help with students’ language improvement? (2) In what way(s) does tandem learning help students deepen their cultural knowledge? (3) What are essential and applicable elements in a syllabus to create an inclusive and diverse learning environment? The researchers identified language learners’ language gains by analyzing the recording of their conversation in completing tasks, worksheets that elicit examples of language gains, as well as using language-related episodes and interviews. This case study sheds light on progressive and innovative learning. The results provide insightful information on the advantages and challenges in peer scaffolding, which may illuminate potential pedagogies for professors in any department—not limited to foreign language only.

Creating Independent Learning Modules to Facilitate Language Proficiency Development
Presenter: Gretta Wiederhold
Faculty nominator: Martina Lindseth

This project supports efforts toward enabling learners to reach the benchmark target language proficiency of Intermediate High. Students at the upper levels of language instruction are at very different levels of proficiency, which makes strategic use of time inside and outside the classroom especially challenging and crucial. Learners share a lack of structural control, but to varying degrees. Instructional design must be individualized, integrate independent learning activities, maximize use of appropriate technologies,
and allow for flexibility in terms of content and time-on-task. The main goals of this project are (1) to determine which structures need to be controlled for speakers at Intermediate High to be intelligible to native speakers and (2) to design focused grammar tutorials to help students acquire these structures.

**Menominee Room**

**Identifying Opportunities to Participate in Advanced Energy: An Investigation into Estimating Real Capacity for Green Manufacturing and Structural Reform**

*Presenter: Megan Roehl*

*Faculty nominator: Thomas Kemp*

Global climate change will require changes in how we produce energy. At the same time, recent geopolitical events combined with the COVID-19 outbreak is certain to lead to a reevaluation of global supply chains. Taken in combination it is likely that market and policy changes will create significant opportunities for the domestic manufacture of the components associated with the production of ‘green’ energy. Using a combination of NAICS industrial data and proprietary firm data, that is scalable to the national level, we attempt to determine the real capacity for Wisconsin State manufacturers to participate in the component supply chain associated with wind and solar power.

**Characterizing the Issuance and Usage of Benefits Offered Through the Women, Infants, and Children Farmers Market Fruit and Vegetable Program in Wisconsin Before and During the COVID Pandemic**

*Presenters: Kayla Irlbeck, Zach Ledwith, Tristan Shuttleworth, & Madelyn Zenner*

*Faculty nominator: Eric Jamelske*

Food insecurity is a significant issue facing many American households. The Women, Infants and Children Program (WIC) provides increased access to food for families in need. It is particularly challenging for low-income households to purchase/eat the recommended number of fruits and vegetables (FV). Farmers’ markets offer a wide variety of fresh, local and healthy foods, especially FV, but data show that low-income households are much less likely to shop at farmers’ markets. The Wisconsin WIC Farmers’ Market Fruit and Vegetable Program (FMFVP) improves access to FV at farmers’ markets in season for qualifying WI households. In 2020, COVID-19 significantly increased the number of families facing food insecurity while Wisconsin farmers’ markets also faced a variety of challenges regarding how to operate safely. Additionally, all families faced challenging decisions about where/when to shop for food during the pandemic. This study analyzed the issuance and usage of FMFVP benefits among Wisconsin WIC households between 2019 and 2020. Among our many findings is that issuance and usage of WIC FMFVP in Wisconsin decreased in 2020 compared to 2019.

**Investigating Utilization Trends for a Supplemental Nutrition Assistance Program-Market Match Incentive Program at the Eau Claire Farmers’ Market Before and During the Covid Pandemic**

*Presenters: Ethan Blaney, Katie Klingbeil, Andrew Lindaas, & Katelyn Reckin*

*Faculty nominator: Eric Jamelske*

Food insecurity is a significant issue facing many American households. The Supplemental Nutrition Assistance Program (SNAP) provides increased access to food for families in need. It is also important to
increase the accessibility/affordability of healthy/nutritious foods including fruits and vegetables (FV) for these households. Farmers’ markets offer a wide variety of fresh, local and healthy foods, especially FV, but data show that low-income households are much less likely to shop at farmers’ markets. The Eau Claire Farmers’ Market (ECFM) offers a Market Match Program (MMP) to incentivize SNAP participants to shop at the market in season. In 2020, COVID-19 significantly increased the number of families facing food insecurity while the ECFM also faced a variety of challenges regarding how to operate safely. Additionally, all families faced challenging decisions about where/when to shop for food during the pandemic. This study analyzed utilization trends and behaviors/opinions among SNAP households for the MMP at the ECFM between 2019 and 2020. Among our many findings is that more SNAP households used the ECFM MMP in 2020 compared to 2019.

Ho-Chunk Room

Honors 188: South Korea’s Response to Covid-19
Presenters: Clara Krause & Micah Link
Faculty nominator(s): Mary Canales and Mohammad Alasagheirin

The modern world is experiencing a pandemic of epic proportions. The Covid-19 pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), provided a “teachable moment” for students enrolled in HNRS 188 Critical Issues in Global Health. The Covid-19 country assignment was designed specifically to connect the course with the evolving global pandemic situation. Students, working in assigned pairs, examined how Covid-19 affected one specific country through production of 4 videos during the semester. Students uploaded their videos to the Canvas discussion board so classmates could learn, in total, how the pandemic affected 11 different world regions.

Honors 188: India’s Response to COVID-19
Presenters: Ellie Decker & Keaten Deets
Faculty nominator(s): Mary Canales and Mohammad Alasagheirin

The modern world is experiencing a pandemic of epic proportions. The Covid-19 pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), provided a “teachable moment” for students enrolled in HNRS 188 Critical Issues in Global Health. The Covid-19 country assignment was designed specifically to connect the course with the evolving global pandemic situation. Students, working in assigned pairs, examined how Covid-19 affected one specific country through production of 4 videos during the semester. Students uploaded their videos to the Canvas discussion board so classmates could learn, in total, how the pandemic affected 11 different world regions.

Chancellors Room

Stability Bounds for Sampling Erasures
Presenter: Tyler Gonzales
Faculty nominator: Sam Scholze

The Shannon-Whittaker Sampling Theorem states that a frequency bounded signal can be completely determined by its sampled values on a sufficiently small grid. Thus, the theorem allows us to convert analog signals to digital signals by sampling (or evaluating) the signal at these points. In prior work, it
was shown that if a signal is oversampled, and if some of the sampled values are lost when transmitting the signal, then it is still possible to perfectly reconstruct the signal. However, in certain situations, the reconstruction algorithm is very unstable. In Tyler's talk, stability bounds on the reconstruction algorithm will be provided. These bounds allow us to determine when it is and when it is not feasible to perform the reconstruction.

**GCD of Sums of K Consecutive Fibonacci, Lucas, and Generalized Fibonacci Numbers**

**Presenters:** Dan Guyer  
**Faculty nominator(s):** aBa Mbirika and Sam Scholze

We explore the sums of k consecutive terms in the generalized Fibonacci sequence given by the recurrence $G_n = G_{n-1} + G_{n-2}$ for all $n$ greater than or equal to 2 with integral initial conditions $G_0$ and $G_1$. In particular, we give precise values for the greatest common divisors (GCDs) of all sums of k consecutive terms. When $G_0 = 0$ and $G_1 = 1$, we yield the GCD of all sums of k consecutive Fibonacci numbers, and when $G_0 = 2$ and $G_1 = 1$, we yield the GCD of all sums of k consecutive Lucas numbers. We give two tantalizing characterizations for the GCD of all sums of k consecutive generalized Fibonacci numbers, one involving a simple formula in k and another involving generalized Pisano periods of the generalized Fibonacci sequence modulo an integer m. Although the two equivalent characterizations look vastly different, the fact that they coincide leads to some surprising and delightful new understandings of the Fibonacci and Lucas numbers.

**Inharmonicity in Guitar Strings**

**Presenter:** Chris Murray  
**Faculty nominator(s):** Scott Whitfield and Kelly Wonder

In a real vibrating string in a musical instrument, the pitch that is produced deviates from that predicted in a very simple idealized model. In acoustical physics this deviation is referred to as inharmonicity. We investigated the role that inharmonicity plays in the pitch of 26 types of guitar strings, both monofilament and wrapped. Inharmonicity is characterized by a single parameter, usually denoted as B, which reflects the material composition of the string, its shape and tension. We measured this inharmonicity parameter B and compared its value to a direct calculation based on a model equation. We found excellent agreement between the two determinations of B for monofilament strings, but generally poor agreement for wrapped strings which are typical of the lower pitched strings on a guitar (E, A and D).

Session 4

**Centennial Room**

**Limitations and Barriers Faced by Latinx ELL’s in United States Education Programs**

**Presenter:** Marissa Rahn  
**Faculty nominator(s):** Paul Hoff and Manuel Fernández

This presentation addresses the inequalities faced by the Latinx English Language Learner (ELL) population by examining the barriers built through a history of language segregation, Language Instruction Education Programs, flaws in financial funding policies, and unequal assessment practices in
United States education. Despite protective laws that exist calling for equal education regardless of language, economic status, race, and ethnicity, these students face added obstacles in their learning that hinder them from reaching the same standards as their peers. Latinx students remain segregated across districts, English pull out continues, and drop-out rates are comparatively high for the Latinx ELL student population. Through a review of essential data, the research draws attention to the holes in applied educational practices, such as assessment and language instruction methods, that do not follow evidence-based approaches called for by laws requiring equal access to education. This presentation further explores successful patterns of language instruction, funding, and assessment that should be followed to reliably enforce anti-segregation policy and create an equal education system that benefits all students alike.

**Documenting the Undocumented: Covid-19 Oral Histories & Immigrant Workers in Rural Wisconsin (Nursing)**

Presenters: Caleb Aronson, Dawsen Cossalter, Halle Hurst, Taylor Johnson, Allison Seehusen, Meghan Sommers, Carly Swanson & Vanessa Tettamanzi

Faculty nominator(s): Cheryl Jiménez Frei, Lisa Schiller, and Lorraine Smith

At the onset of the COVID-19 pandemic, UWEC’s Public History Program and McIntyre Library joined with the Chippewa Valley Museum to launch the Chippewa Valley COVID-19 Archive (CVCA), a rapid-response project archiving oral histories and artifacts related to COVID-19 and its impacts in Western Wisconsin. One of the imperatives of the archive is to preserve a diverse picture of the pandemic’s effects across our communities. With this goal in mind, Documenting the Undocumented is working to preserve oral histories with migrant and undocumented Latinx farmworkers, who have become the essential—but often silenced—backbone of Wisconsin’s dairy industry. Documenting these experiences will be essential for future scholars, students, and policymakers to understand COVID-19’s impacts in the rural Midwest, as well as the intersections of race, access, and structural inequality the crisis has highlighted. This multidisciplinary project brings together students and faculty in History, Languages, and Nursing, and the oral histories we collect will be available on CVCA as well as A Journal of the Plague Year, a global COVID-19 archive created by Arizona State University.

**Menomenee Room**

**Emotionality in Climate Change Commentary**

Presenters: Emma Dimick, Angela Hugunin, Olivia Misoriski & Ben Worner

Faculty nominator(s): Kris Knutson, Jim Boulter, and Eric Jamelske

Climate change, a pressing and existential threat, is thought of as a contentious issue. Curiosity about how climate change is perceived in such divergent ways has guided our research and led us to ask, “How do an individual’s beliefs and attitudes about climate change affect the emotions they display when communicating about it?” In Summer 2017, data were collected via an online survey resulting in approximately 3000 responses from a demographically representative US American population. From this survey, we examined a random subset of open-ended responses. We were especially interested in the emotionality in the open-ended responses because knowledge of emotionality can help us develop more effective messages and messaging strategies. Using thematic analysis, open-ended responses to the prompt, “What is the first thing that comes to mind when you hear, ‘climate change’ or ‘global warming’?” were coded. Our analyses indicate anger and disgust dominate the messages written by
climate deniers while fear and sadness are most prevalent in the messages written by climate acceptors. These findings can help communications professionals better target messages about climate change.

**Bringing Clarity from Chaos: Notes on the Creative Nonfiction Process**  
**Presenters:** Angela Hugunin & Katie Johnson  
**Faculty nominator:** BJ Hollars

Powerful storytelling lies at the intersection of research and personal experience. This collaborative presentation will consist of readings from creative nonfiction pieces from both Katie Johnson and Angela Hugunin, seniors studying English, followed by a conversation about their creative processes and approaches to memoir. While their works explore different topics, their approaches to reaching a wide range of readers involve research, self-reflection, and careful attention to craft.

**Presentations and Conversations on Ruminations and Fixations: The Behind-the-Scenes Story of the Formation of a Creative Writing Podcast**  
**Presenters:** Devin Colburn  
**Faculty nominator:** BJ Hollars

This presentation will focus on Devin Colburn's newly created podcast "Presentations and Conversations on Ruminations and Fixations: A Podcast About Creative Writing" which is currently being produced in cooperation with The Heyde Center for the Arts, where Devin is interning. By offering the behind-the-scenes story (and challenges) of this new medium, he hopes to inspire others to stretch their creativity similarly. This podcast serves first as an avenue for presenting my creative work, as each episode will start off with me reading one of my pieces. And after each oration will be a section where me and a knowledgeable cohost will discuss the content of the piece as well as craft elements.

**Ho-Chunk Room**

**Changing Perceptions of Inclusion: The Role of a Universal Design for Learning Framework in Pre-Service Teacher Preparation**  
**Presenters:** Mason Chartier & Ashley Raisbeck  
**Faculty nominator:** Karsten Powell

This study focuses on how instruction utilizing a Universal Design for Learning (UDL) framework influences secondary pre-service general educators’ knowledge and perceptions of educating students with disabilities. Though inclusion of students with disabilities into the general education classroom is widely accepted in secondary schools, pre-service educators complete limited coursework needed to successfully include these students. For this study, 29 pre-service general educators completed pre- and post-course surveys which focused on students’ perceptions of—and preparation for—inclusive education. Additional measures included inclusive lesson plans that participants developed which illustrate how participants implemented UDL principles. The survey allowed us to examine six constructs, two of which indicated significant change: (a) participants’ efficacy for including students with disabilities in their classrooms and (b) their knowledge and skills associated with UDL. Findings indicate that pre-service educators may require more than one inclusive methods course to develop their inclusion-related skills. Additional recommendations include providing pre-service teachers with a placement that
involves inclusion with students with disabilities and a collaboration course between pre-service special educators.

**Database Development for Accessibility/Adaptations for People with Special Needs**  
**Presenters:** Tessa Ferry, Katie Henschell, & Abbie Sonstegard  
**Faculty nominator:** Lee Anna Rasar

This project involved integration of data from multiple faculty – student collaborative projects through ORSP and CETL to create a searchable database of adaptations which allow accessibility for music engagement for people with special needs in public school settings. It is also applicable for adults with special needs and in other settings. The project was intentionally created to be accessible to students, their families and significant others, educators, health care practitioners, and the general public. It allows filtering in multiple categories based on type of musical engagement (singing, dancing/moving to music, performing on instruments, listening to music, composing, conducting, and reading music), national standards that can be connected with that engagement for lesson planning, type of goal areas (motor, cognitive, language, social, emotional, behavioral), and type of exceptionalities for which accommodations need to be made. A technology major joined forces with a music major and a student with a topical music minor, including a Blugold Fellow, to provide an outsider view for what pieces to include and how to easily access and efficiently use the database.

**Implementing EDI into Studio Art Education**  
**Presenter:** Mackenzie Mevis  
**Faculty nominator(s):** Cedar Marie and Stephanie Turner

As educators we have the unique opportunity to expand students’ knowledge and understanding of cultures outside of their own. Art Education student Mackenzie Mevis discusses their Scholarship of Teaching and Learning collaboration project with Professor Cedar Marie to include EDI initiatives in a first-year studio art course. The process of redesigning the curriculum required us to examine and reflect on the ways we could better serve the needs of first year Art & Design students using an EDI Lens.

**Chancellors Room**

**Structural and Energetic Properties of OC-BX3 Complexes: Computations and IR Spectroscopy**  
**Presenter:** Jordan Munos  
**Faculty nominator:** Jim Phillips

Research in the Phillips group is concerned with “donor acceptor” complexes that exhibit novel structural and energetic properties. A donor-acceptor complex refers to an association of two molecules; a “donor”, which donates a lone pair of electrons to an “acceptor”, which accommodates it via an empty bonding site. Here, the specific focus is complexes of carbon monoxide with boron trihalides (OC–BX₃, with X = F, Cl, and Br), which exhibit evidence for “bond-stretch” isomerism. This refers to the idea that a molecule can have two distinct structures that differ only by the length of a specific bond. We have used quantum-chemical computations (computer simulations of the bonding) to obtain structures, binding
energies, frequencies, and B-C potential energy curves (energy vs. of B-C distance). We have also conducted low-temperature, matrix-isolation IR spectroscopy experiments, which involve trapping the complex at 5-10K in solid neon and recording its infrared spectrum. At this point, even though high-level theory predicts distinct structure for both OC–BCl₃ and OC–BBr₃, we observe only one form in the experiments.

**Three-State PH-Driven Biaryl Lactone Molecular Switches with Amine Donors**

**Presenter:** Aaron Bruckbauer  
**Faculty nominator:** Bart Dahl

Biphenyl lactones with amine donor groups and nitro or cyano acceptors should be great candidates for molecular-based electronics and sensing applications. Research by our group previously demonstrated two-state molecular switches using weaker methoxy donor groups on biphenyl lactones via lactone cleavage at high pH and reformation at low pH, which affects the optical properties of these switches. We are now researching the possibility to enhance the optical properties by incorporating dimethylamine or diphenylamine donor groups. This allows for a third switch state increasing the molecules usefulness as a pH sensor by creating a narrow range of pH available for the ON state. Like switches previously studied by our group, the biaryl switches should become non-planar at high pH (OFF state – lactone cleavage) and planar at low pH (ON state – lactone formation). However, a third OFF state exists via amine protonation at very low pH which will cause a third OFF state for the molecule. The ON state should result in visibly colorful switches, the OFF state should result in visible changes in appearance.

**Investigation of the Effects of Variable-Sized Polyethylene Glycol on the Conformation and Function of Prolyl-tRNA Synthetase Using Experimental and Computational Methods**

**Presenter:** Jessica Liebau  
**Faculty nominator:** Sanchita Hati

Poly (ethylene glycol) (PEG) is hydrophilic, highly flexible, non-toxic, and non-immunogenic. PEG has versatile applications in proteomics and biological research as it is believed to be biologically inert. For example, PEG2000 (molecular weight is 2000 g/mol) is one of the components of the Pfizer-BioNTech COVID-19 Vaccine. However, recent studies have demonstrated that PEG can alter conformation (three-dimensional structure) and thereby the function of cellular proteins. The molecular mechanism of the impact of PEG on protein function is not completely understood. Present experimental studies suggested that the impact of PEG on protein function and the type of protein-PEG interactions depends on the molecular weight of PEG molecules. To have a better understanding of the impact of PEG on protein conformation and function, the protein prolyl-tRNA synthetase (ProRS) has been chosen. ProRS specifically catalyzes the covalent attachment of proline to tRNAPro, a crucial step in protein biosynthesis in all living organisms. The molecular mechanism of PEG-protein interactions has been probed using enzyme kinetics, fluorescence spectroscopy, and molecular modeling. The preliminary results of our study will be presented.
Nursing Symposium

Senior nursing students participated in clinical practicums in multiple diverse community health settings. They engaged in various projects to promote health across the lifespan and enhance health equity. Students understood the basics of community/public health nursing and the complexity. They also demonstrated leadership and applied the concepts of quality and safety in collaboration with community partners. They reflected on personal beliefs and values to demonstrate cultural sensitivity and awareness. Clinical reasoning was used to promote and maintain health in populations diverse in culture, socioeconomic status, and education.

Health Equity: Education and COVID-19 Vaccination for Wood County’s Hispanic Population

Presenters: McKenzie Bainer, Rita Donahue, Tara Guden, and Tiffany Guden
Faculty Mentor: Susan Kunferman

Everyone has a fair and just opportunity to be as healthy as possible. We aim to remove obstacles to health such as poverty, discrimination, and their consequences. Our research is aimed at creating a vaccine outreach campaign with tailored messaging to Hispanic population of Wood County and disseminate it via trusted outlets. This includes planning and executing a COVID-19 vaccine clinic with Hispanic population at forefront. This plan aims to vaccinate between 100-200 people and gain confidence working with diverse cultures. This will help us advocate to reduce health disparities.

Health and Safety Promotion in a Native American Community

Presenters: Ellen Anderson, Loni Bauer, Paige Bruening, Shelby Christopherson, Laura Creswell, Jenna Dailey, Tiffany Derynda, Heather Goesch, Katherine Griesbach, Nicole Haider, Taylor Kintopf, Trista Kizer, Maggie Latzig, Halli McCauley, Alexis McNally, Olivia Miller, Grace Odegaard, Jenny Rusch, Kendra Skwierzynski, Audrey Sonsalla, Bruinna Wells, Sasha Westphal, Leah Witzel, and Emily Zuehlke
Faculty Mentor(s): Lorraine Smith and Josephine Arriola

COVID-19 Messaging for Kids and Teens

Presenters: Haley Kalal, Elizabeth Keena, Alaina Lanser, and Alyssa Mammel
Faculty Mentor: Pamela Guthman

The purpose of this project was to increase awareness and provide education and health promotion for kids, teens, and young adults about how to protect themselves from COVID-19 and how to cope with mental health issues.
Partners in Safety and Health
Presenters: Caleb Aronson, Dawsen Cossalter, Halle Hurst, Taylor Johnson, Allison Seehusen, Meghan Sommers, Carly Swanson, and Vanessa Tettamanzi
Faculty Mentor(s): Lisa Schiller and Lorraine Smith

Together to Eliminate the Health Disparity in Barron County
Presenters: Makalya Mullen, Megan Ogrin, Tatum Pass, Jake Pedersen, Mara Rohloff, Sydney Schwartz, Rachel Swanson, and Megan Weise
Faculty Mentor: Mohammad Alasagheirin

Returning to the Community: A Quality Improvement Project
Presenters: Devan Oliver, Jami Ravulson, Hannah Schaetzel, and Lili Wagner
Faculty Mentor: Pamela Guthman

Our aim is to help address current programs in place and assess the need for resources for people to return successfully to their communities. We will identify themes from stories told by individuals who have been incarcerated. We will narrate the experiences people have when trying to return back into communities through the use of a photovoice technique. Our purpose it to support this community and provide more resources for them.

Combatting Battle Fatigue From the COVID-19 Response
Presenters: Hailey Draxler, Autumn Adler, Haley Hetze, Alicia Jensen, and Mikayla Schmeiser
Faculty Mentor: Susan Kunferman
What happens when the healthcare workers struggle with fatigue, anxiety and depression? In the ongoing wake of the COVID-19 pandemic, countless people are suffering from Battle Fatigue, Compassion fatigue and are unsure of where to turn. Action is needed to mitigate the risks of these mental strains. We seek to establish baseline, interventions. A reevaluation to measure outcomes is essential.

Math Retreat
Applied Math and Statistics
Zoom Room 1

Cryptorithms!
Presenter: Madelyn St. Pierre
Faculty Mentor: Jennifer Harrison

I will be doing a presentation on cryptarithms, a puzzle where the numbers of a sum have been replaced by letters where each letter represents a unique digit. Cryptarithms are thought to have originated from China and have been studied as a recreation math since the early twentieth century. Following an introduction to cryptarithms, you will be able to get involved and try one yourself. I will then present one that I will work through with a presentation and visuals for the audience to follow along with. Come and learn about a fun, non-typical math topic!
Patterns of Binary
Presenter: Mackenzie Lenz
Faculty Mentor(s): Jennifer Harrison, Dr. Pierson, and Dr. Stecher

In my presentation, I will talk about the Golden Ratio and why we can see it in nature. I will share examples of the Golden Ratio in nature such as a nautilus shell and the head of a daisy. I will also discuss how Da Vinci used the Golden Ratio in his paintings. Depending on time there are also some recent uses of the Golden Ratio like homepage design that are attractive to a person’s eye.

Don’t Limit Your Possibilities
Presenter: Shelby DesJardin
Faculty Mentor: Jennifer Harrison

I am going to introduce a problem to my audience and then put them in groups and let them try to solve the problem. After a certain amount of time I’m going to bring everyone back together and open it to sharing how they solved the problem. The problem I picked has multiple ways to go about it. After people share I am going to say that the point of the presentation was to show that you can do things multiple ways and get different answers and they can still be correct. Not just in math, but life in general. Don’t limit your possibilities and don’t stop yourself from exploring different ways of doing things!

Your Solutions May be the Problem
Presenters: Abbie Groppe and Bryce Johnson
Faculty Mentor: Jennifer Harrison

In mathematics, we are asked to solve problems and find a solution. Many students can memorize tricks and strategies to help guide them to the answer. These tricks can hinder conceptual learning for the students, since they are not using wholistic mathematics. Students should gain a concrete understanding of the material rather than just tricks like memorizing the acronym PEMDAS or using the short cut of cross multiplication. Those participating in the presentation will be allowed to discuss other tricks they’ve seen or used as well as learn more studious ways to gain and teach mathematical skills.

You Can’t Beat the Odds
Presenter: Allie Gorman
Faculty Mentor: Jennifer Harrison

Have you ever played the lottery or know someone who has? If so, have you felt hopeful about winning or were you aware of the odds of winning? In my presentation for the math retreat, we will take a specific look at the odds of winning the lottery and discuss how we are able to calculate this probability. In addition, we will look at how the process of finding this probability relates to other real-life situations.

The Monty Hall Problem and Bayes’ Theorem
Presenter: Kaitlyn Gerndt
Faculty Mentor: Jennifer Harrison
This presentation will discuss the famous Monty Hall Problem and how it relates to probability through playing the game for ourselves and running simulations. Online interactive simulations will be done along with code written in RStudio to showcase the outcomes. Furthermore, we will cover how to theoretically predict the outcome of problems like this using Bayes Theorem.

**Expanding on the Goat Problem**  
**Presenter: Grace Liebl**  
**Faculty Mentor: Jennifer Harrison**

The goat problem is about a goat tethered to a square building with 20 ft long sides. The goal is to figure out how much area the goat can graze with a 40 and 50 tether and how different locations on the building affect it as well. To take it a step further I will look at how changing the shape of the building, along with the length of the tether will affect the grazing area. In some scenarios, the area for grazing overlaps, so I will explore that idea as well. I will go over the problem in GeoGebra for the square then have people look at the triangle and pentagon before explaining how it will work and going through it in GeoGebra.

**October Primes**  
**Presenter: Katelin Nelson**  
**Faculty Mentor: Jennifer Harrison**

If you are looking for a problem that is as fun as it is challenging, stop in and check out my presentation on the October Primes problem! The goal of the October Primes problem is not only figure out what the solution of the given multiplication problem—“OCTOBER”—translates to but is also to try and solve the missing blanks of the given multiplication problem. By only being given 10 conditions, along with the typical rules of a cryptarithm, and a few blanks of missing numbers, the October Primes problem is definitely one that sparks and demands mathematical reasoning and logic. So if you’re up for a fun challenge, come check out my presentation on the October Primes problem!

**Zoom Room 2**  
**A Search for Primitive Roots in the Eisenstein Integer Ring**  
**Presenters: Dan Guyer and Lily Leith**  
**Faculty Mentor: aBa Mbirika**

Named after Gotthold Eisenstein (1823-1852), the Eisenstein integers are a well-studied collection of complex numbers. In fact, Dr. aBa and former UWEC student Emily Gullerud discuss the various complex prime numbers that occur in this new context in their work from 2018, recently published in 2020. While they exhibited what residue classes exist when Eisenstein integers are divided by powers of complex prime numbers, we study the structure of these residue classes. In particular, we examine the classes that are coprime to powers of these prime numbers. We question if all possible (coprime) residue classes can be created by repeated multiplication of a single residue class. Furthermore, we work to understand the relationships between these coprime remainders via group-theoretic means. That said, all group-theoretic results will be introduced as necessary throughout the talk.

**Galois Theory and Groups of Field Extensions**
Galois theory, proposed by Évariste Galois, is a topic addressed in the area of Abstract Algebra that originally sought to further understand or solve topics such as the theory of equations or classical Greek problems of geometry. In more modern mathematics, Galois theory is used to provide a link between fields and groups. More specifically, given that $E$ is an extension of a field $F$, the "Galois group" $E$ over $F$ (with the operation of function composition) is the set of all automorphisms of $E/F$, defined by the automorphisms $E$ that fix $F$ pointwise. We will further discuss this definition and its implications as well as the Fundamental Theorem of 7 Galois Theory before giving a brief overview of potential applications, such as the insolvability of the quintic polynomial and connections to number theory.

**An Introduction to Cyclotomic Polynomials**
**Presenter:** Dan Guyer  
**Faculty Mentor:** aBa Mbirika

We will explore the concept of cyclotomic polynomials. Through a discussion of roots of unity, and polynomials, we will construct these polynomials. Then, we shall explore various properties of cyclotomic polynomials, including the fact that they will always have integer coefficients. Time permitting, we will discuss surprising applications of cyclotomic polynomials.

**A Closer Look at the Josephus Problem**
**Presenter:** Gabriel Hamilton  
**Faculty Mentor:** Jennifer Harrison

The goal of this presentation is to outline the Josephus problem and to solve it using different strategies. The end result of this presentation is to show that a common solution to a problem can be achieved through various models. The different interpretations of a problem lead to greater enrichment and understanding of the math behind the scenes. There will be intervals throughout the presentation where guest participation is encouraged. Whether participation is through a poll, survey, or other method has yet to be determined.

**Reverse! Reverse!**
**Presenter:** Amanda Rolf  
**Faculty Mentor:** Jennifer Harrison

My presentation is about one math problem where you have to change your usual mindset while working on this. It involves using the strategy of working backwards.

**Abstract Math Using a Ruler and Compass**
**Presenter:** Shane Falkum  
**Faculty Mentor:** aBa Mbirika

It is well known that there is no general way to trisect an angle using just a straightedge and a compass. While it is easy to say something is difficult to do, it can be much more difficult to prove something is
impossible. Similarly impossible constructions, using just a straightedge and a compass, are squaring the circle and 13 doubling the cube. In this presentation we will explore these constructions, as well as the mathematics necessary to prove their impossibility.

**The Snake Lemma**  
**Presenters:** Taylor Kriesel and Katie Henschell  
**Faculty Mentor:** aBa Mbirika

The snake lemma is used specifically in homological algebra to create exact sequences, i.e., diagram chasing. Through this presentation, we hope to prove the snake lemma and detail its applications in mathematics. The applications include but are not limited to algebraic topology, number theory, and natural transformations.

**What is Riemann’s Hypothesis**  
**Presenter:** Joseph Wahl  
**Faculty Mentor:** No Mentor Listed

Riemann's zeta function has its origins in the p-series discussed in Calc II, where \( \sum \frac{1}{n^s} \) converges when the real part of \( s \) is greater than 1. The zeta function \( \zeta(s) \) is defined by analytical continuation of \( \sum \frac{1}{n^s} \) to the entire complex plane. Riemann concluded that \( \zeta(s) \) is analytic everywhere with the exception of a simple pole at \( s=1 \). Even further, Riemann claims that all the zeros in the strip \( 0 < \text{Re}(s) < 1 \) lie on the line \( \text{Re} \ s=1/2 \). This hypothesis is still one the most important unresolved claims in mathematics, but more than 100,000 of these zeros have been verified using numerical analysis. Riemann’s hypothesis also has connections to the distribution of primes.

**Zoom Room 3**  
**Nontotient Numbers and Their Criteria**  
**Presenter:** Shane Falkum  
**Faculty Mentor:** Mckenzie West

The Euler totient function is defined as a function which counts the positive integers which are less than, and relatively prime to a set value. It is well known that the output of this function will always be even. However there exist even values which are never mapped to by this function. These values are known as nontotients. In this presentation, we will explore nontotients and the work that has been done to establish when a value will be nontotient. Notably, we will cover the work of Bateman and Selfridge in their 1963 paper, and the work done by Mingzhi in 1993.

**Knitting Wallpaper Groups**  
**Presenters:** Danya Morman and Pavithra Mohan  
**Faculty Mentor:** Mckenzie West

This project has aimed to study, analyze, and replicate the properties of the seventeen unique wallpaper groups through the medium of knitted works. Wallpaper groups are classes of tessellations made through translations designated by their reflexive and rotational symmetries and are an excellent introduction to
the study of groups which is a primary topic of abstract algebra. Most of our time has been focused on the
development and construction of the knitted patterns, and these patterns will be distributed online for
public use. These knitted works provide a physical representation of the groups which will allow us to
further study the mathematics behind their classifications.

**S-Representations**  
**Presenter: Natalie Wijesinghe**  
**Faculty Mentor: Mckenzie West**

Over the past two semesters Dr. Mckenzie West and I have conducted research on interesting ways to
represent integers. This presentation will give a background on these so called “S-representations” before
introducing a specific form of S-representation we used heavily in our research over the past months. In
the end we will create enough of a foundation to introduce the theorem we have been researching, which
gives cool results involving finiteness.

**Applications of the Sophie Germain Primes**  
**Presenters: Caitlin Hedberg, Megan Heindl and Katie Henschell**  
**Faculty Mentor: Mckenzie West**

Sophie Germain primes are any prime number p such that 2p+1 is also prime. For example, 5 is a Sophie
Germain prime as 5(2)+1=11, which is also prime. It is theorized that there are infinitely many Sophie
Germain prime numbers. Furthermore, it was proven that a variation of Fermat’s Last Theorem is true for
Sophie Germain primes. In this talk, we will be looking at the applications of Sophie Germain primes to
cryptography, primality testing, and pseudorandom number generation.

**The Fibonacci Sequence**  
**Presenters: Scott Lawton and Seth Mitchell**  
**Faculty Mentor: Mckenzie West**

Mathematical sequences often bring about unique and predictable patterns. However, it is rare for a
sequence of integers to have applications that go far beyond the computational. The Fibonacci Sequence
does just that. Biology, music, physics, and other fields apply the Fibonacci Sequence in often unexpected
ways. How far does its scope go?

**The Collatz Conjecture**  
**Presenter: Huston Wilhite**  
**Faculty Mentor: Mckenzie West**

Pick any positive whole number. If it is even, divide it by two. If it is odd, multiply it by three and add
one. According to the Collatz conjecture, repeatedly preforming this process will always yield one.
Despite its innocent appearance, the Collatz conjecture has remained unproven for over 80 years. We will
discuss several different approaches that have been taken to gain insight into the problem and attempt to
visualize some of the patterns formed by this sequence.

**Prime Numbers and Musical Scales**
Presenters: Ben Dickinson and Simon Arneberg  
Faculty Mentor: Mckenzie West

Although the twelve-tone scale has become dominant in modern music, it's far from the only scale to have been proposed or used in practice. In fact, due to the surprising connection between number and music theory, we can construct workable scales from any set of prime numbers. We will discuss the desired properties of an "optimal" scale and what lead to the ubiquity of the modern twelve-tone system.

A Look at Nonlinear Diophantine Equations  
Presenter: Peter Spryer  
Faculty Mentor: Mckenzie West

Beginning with a simple linear definition, we extend the notion of Diophantine Equations to include nonlinear examples and their solutions. We look at several famous cases and discuss the history behind them – including Fermat’s Last Theorem and its eventual proof, Pell’s Equation and Bramagupta’s earlier solution, Euler’s Sum of Powers Conjecture and its counterexample, and the Ramanujan/Hardy taxi cab number anecdote.

Zoom Room 4  
The Fast Fourier Transform  
Presenter: Ben Dickinson  
Faculty Mentor: Alex Smith

Using tools from complex analysis to transform functions from the time domain into their periodic components, the Fourier Transform has found a home in most areas of mathematics and several practical applications including mp3 and JPEG encoding. The Fast Fourier Transform, a method for quickly computing discrete transforms, has been named one of the most important algorithms of the 20th century. In this talk we'll discuss the intuition behind Fourier analysis and outline the structure of the FFT algorithm.

Extending Fibonacci to the Complex Numbers  
Presenter: Seth Mitchell  
Faculty Mentor: Alex Smith

Using Binet's formula, we can extend the Fibonacci sequence to the entire complex plane, which will allow us to calculate the generalized Fibonacci function of a complex variable. Through various visuals and domain coloring, we can gain insight into the fluidity of the 4-dimensional function used to represent the complex Fibonacci.

The Gamma Function and Its Analytic Continuation  
Presenter: Huston Wilhite  
Faculty Mentor: Alex Smith

The Gamma function is one of the most ubiquitous special functions in mathematics, with applications in fields ranging from number theory to quantum mechanics. Despite this, it has rather humble beginnings as
the factorial function. While the factorial is only defined for positive integers, we can define the Gamma function in a way that extends the factorial to all complex numbers, with the exception of the negative integers and zero. We will examine how it is that the Gamma function is able to be extended from only positive integers to almost the entire complex plane using analytic continuation.

**Optimization of Settler and Food Supply for Mars Mission**  
**Presenters: Payton Mae Sevals, and Ruishen Yang**  
**Faculty Mentor: Wufeng Tiong**

What seemed impossible became a reality 64 years ago when the first satellite was successfully launched into outer space. From there many more space travels were successfully launched, but now scientists want to take it a step further by colonizing a different planet, Mars, because of how similar it is to Earth. Assuming an atmosphere is created, water is uncovered and accessible, and the average temperature increases, there are still many other factors that need to be evaluated for the journey to Mars, such as the number and demographics of the first crew and necessary food. In this paper, we first discussed the demographics and individual characteristics of the first crew. Then, we estimated that a minimum of 140 settlers will need to be brought to Mars to ensure a suitable and reasonable survival for the first flight crew. Finally, given that the weight is a major concern when considering sending an object into space, we calculated the minimum amount of preservable food that needs to be sent from earth before and during the trip for the first flight crew. In the end, we discussed the suitable types of food that can grow on Mars to help colonizers adjust to their new life. Our findings in this paper provides a good starting point for discussion and further research on the number and demographics of the first crew settlers and the appropriate food supply for Mars mission.

**Stability bounds for Reconstruction from Sampling Erasures**  
**Presenter: Tyler Gonzales**  
**Faculty Mentor: Sam Scholze**

The Shannon-Whittaker Sampling Theorem states that a frequency bounded signal can be completely determined by its sampled values at a countable number of points. Thus, the theorem allows us to convert analog signals to digital signals by sampling (or evaluating) the signal at these points. In prior work, it was shown that if a signal is oversampled, and if some of the sampled values are lost when transmitting the signal, then it is still possible to perfectly reconstruct the signal. However, in certain situations, the reconstruction algorithm is very unstable. In this presentation, we provide stability bounds on the reconstruction algorithm and use them to determine when it is feasible to perform the reconstruction.

**Quaternions: Background and Basics**  
**Presenter: Akagaonye Torti**  
**Faculty Mentor: No Mentor Listed**

I will discuss the history of quaternions, a concept thought of by William Rowan Hamilton and who discovered its application to fourth dimensional space. In modern times, quaternions have been replaced but vectors, however the fine use in computing spatial rotations. I will also discuss basic information about quaternions: the definition, algebraic properties, and how they relate to and generalize complex numbers.
**Proving the Fundamental Theorem of Calculus with Riemann-Stieltjes Integration**
**Presenter:** Dan Guyer  
**Faculty Mentor:** Sam Scholze

By expanding upon typical Riemann sums, we will introduce Riemann-Stieltjes sums. Then, as a result of this formulation, we will develop the Riemann-Stieltjes integral. By exploring essential properties of the Riemann-Stieltjes integral, we can establish the Fundamental Theorem of Calculus as desired.

**Julia Sets and Mandelbrot Sets**  
**Presenter:** Dawson Dubberke  
**Faculty Mentor:** No Mentor Listed

One of the most interesting things about the complex numbers is the shapes and patterns that emerge from graphing functions. The graphs of Julia and Mandelbrot sets blow most graphs out of the water. The detail is unbelievably intricate, and the relative simplicity of the iterated maps and orbits that define them add even more interest. Working from graphs of selected Julia sets, I will describe what exactly they are, and how we can find them. From there, I will discuss the discovery of the Mandelbrot set. Once I have established the mathematical basis of Julia and Mandelbrot sets, I will explore some of the applications therein.

**Zoom Room 5**  
**Application of the Entropy Weight and TOPSIS Method in Health and Sustainability Evaluation of Higher Education Systems**  
**Presenter:** Pinzhe Chen, Ike Minh, and Ruishen Yang  
**Faculty Mentor:** Wufeng Tiang

In this paper, we introduced an evaluation index system for the health and sustainability of higher education systems. We first defined six key components of health and sustainability indicators for the development of higher education, which are financial status, accessibility, equity, diversity and inclusion, academic performance, and affordability. Then, we calculated the corresponding weights of each indicator and evaluated the health and sustainability of United States, Brazil, and Zimbabwe based on entropy weight and TOPSIS method. In the end, we discussed further actions that need to be taken to help with developing a healthy and sustainable higher education system. Collecting the data of other nations and evaluating the overall health and sustainability of higher education systems would be explored in our future work.

**Entropic Multi-Level Image Thresholding Methods Using Gray Level-Local Variance Histogram**  
**Presenter:** Grant Mauthe  
**Faculty Mentor:** Surina

In this talk, we discuss how to construct the multi-level thresholding cost functions based on various entropies and two-dimensional (2D) histograms. We use the particle swarm optimization algorithm (PSO) to calculate the optimal threshold values of the cost functions. Firstly, we introduce the Particle Swarm Optimization (PSO). It is a stochastic process of optimizing a continuous nonlinear function by moving a
number of particles in a n-dimensional searching space. We use a few multi-variable functions as examples to show the effectiveness of the algorithm. Next, we introduce two types of 2D histograms: gray level-local average histogram (GLLA) and gray level-local variance histogram (GLLV). Generally, models using 2D histograms give better image thresholding results than the ones using one-dimensional (1D) gray level histogram. We illustrate and visualize 2D histograms of an image by using MATLAB programs. At last, we apply the PSO algorithm to optimize the multi-level cost functions. We run our MATLAB programs extensively on The Berkeley Segmentation Dataset and Benchmark (BSDS300) and compare our results on the four performance indices with the ones from various thresholding models.

**Crossing Changes, Link Homotopy, and Word Problems**  
**Presenter:** Chris Davis  
**Faculty Mentor:** No Mentor Listed  

The `\textquote{unknotting problem} in knot theory attempts to study the complexity of a collection of tangled up curves (also called a link). More precisely it asks how many crossings must be changed to reduce that link to an unknotted, unlinked collection of curves. In a current joint work with Orson and Park we study a version of the unlinking question whereby we only count crossing changes between different components. We translate this topological problem into a much easier algebraic problem, specifically a word problem. I will close with related questions open for future research improving our result by studying the combinatorics of this word problem.

**A Special Case of a Model of Lewis and Li**  
**Presenters:** Logan Ickert and Ted Molkentin  
**Faculty Mentor(s):** Tim Pervenecki and Surina  

We investigate a special case of a hybrid dynamical model studied by Mark Lewis and Bingtuan Li. The model is a composition of the Beverton-Holt model and a growth/survival function $g$. We analyzed the model with several functions for $g$ with the goal of identifying equilibrium solutions and their stability. We also drop some of the assumptions Lewis and Li gave about the function $g$ to see how that would impact our findings.

**A Stage-Structured Model with Cannibalism**  
**Presenter:** Logan Ickert  
**Faculty Mentor:** Tim Pervenecki  

We consider a nonspatial age-structured model of a species that engages in cannibalism. We assume that adults cannibalize younger stages in the species but that there is no interaction between juvenile stages. We investigate the equilibrium solutions and stability of solutions for the model.

**Zoom Room 6**  
**Baseball Analytics: Calculating WAR for the Northwoods League**  
**Presenter:** Max Firminhac  
**Faculty Mentor:** Jessica Kraker
Baseball has long served as a frontrunner for the integration of analytics with application, connected in part to the consistency of historical statistics as well as the widespread interest in the national professional and more local semi-professional sport leagues. This project builds on prior data-exploration and data-gathering for the local Northwoods League, with recognition of a reduced set of available technical information (as compared to MLB). The intention is to create a WAR calculation for the league using the available data. The original WAR statistic in the MLB uses data that is unattainable for the NWL. Therefore, this project attempts to modify the WAR statistic with reasonable substitutes to make it accessible for the NWL. The two primary focuses of the current project are modeling and coding generalization. Coding generalization summarizes the structure of the available data organization as well as discusses functions written to compute necessary inputs for the metrics, including different portions of the WAR analogy. With the adjustments and additional back-computations of metrics for individual players, we now have sufficient available information for modeling these player utilities. We summarize the modeling results found by connecting information about: player-by-game appearance, season-break information, refined player utility estimates, and use of reconfigured statistics.

Data Analytics Techniques for Claim Modeling
Presenter: Su Qian Ng
Faculty Mentor: Marie-Claire Koissi

Data analytics strongly rely on data and available techniques and analytics tools. Recent years have seen an increase in data volume worldwide. Advanced computational methods and machine learning tools have been developed to extract meaningful information from these data. The presentation surveyed data analytics techniques and discussed their application in Claim Modeling. R and Python will be used as software. Keywords: Big data; Machine Learning; Supervised and Unsupervised Techniques; Data Visualization; Claim Modeling.

Demystifying Quantum Mechanics
Presenter: Sean Parsons
Faculty Mentor: No Mentor Listed

Quantum Mechanics is strange. These four words may be one of the largest understatements ever, yet behind that strangeness is an eloquent yet simultaneously convoluted logic crafted to describe the experimental revelations of the early 20th century. I will qualitatively touch upon some historical background, three experimental revelations paramount to the development of quantum mechanics, the wavefunction, operators, eigenvalue problems, and the relationship of quantum mechanics to complex numbers; I will work to decode that logic. While you will walk away thinking the predictions of Quantum Mechanics are still strange, I think you will also walk away with a better understanding of why Schrödinger and other scientists designed Quantum Mechanics the way they did.

Schrödinger's Equation and Complex Analysis
Presenter: Austin Redders
Faculty Mentor: No Mentor Listed

This presentation offers an in depth look at how complex numbers are used to understand quantum mechanics and Schrödinger's equation. It will cover the general idea of quantum mechanics, the accomplishments of Erwin Schrödinger, and his representation of waves via complex numbers.
Proteins are known to fold and form knots that can be studied using knot theory. We aim to devise an updated method of protein folding by reviewing the model proposed in Flapan et. al (2019) by incorporating virtual knotting. We will be looking at identifying nontrivial virtual knots that can be found using the modified Flapan theory.

11th Annual Andrew Balas Lecture

An Introduction to Spatial Graph Theory

Presenter: Erica Flapan
Faculty Mentor: No Mentor Listed

Spatial graph theory developed in the early 1980’s when topologists began using the tools of knot theory to study graphs embedded in 3-dimensional space. Later, this area came to be known as spatial graph theory to distinguish it from the study of abstract graphs. Much of the current work in spatial graph theory can trace its roots back either to the groundbreaking results of John Conway and Cameron Gordon on intrinsic knotting and linking of graphs or to the topology of non-rigid molecules. This talk will present the history of spatial graph theory and survey some of the current trends in the field. No background is required to understand the talk. Erica Flapan was a professor at Pomona College from 1986 to 2018. In addition to teaching at Pomona College, for most of the summers from 2000 until 2015, Flapan taught at the Summer Mathematics Program for freshmen and sophomore women at Carleton College. In 2011, Flapan won the Mathematical Association of America’s Haimo award for distinguished college or university teaching of mathematics. Then in 2012, she was selected as an inaugural fellow of the American Mathematical Society. From 2015-2017, she was a Polya Lecturer for the MAA. Since January 2019, she has been the Editor in Chief of the Notices of the American Mathematical Society. Erica Flapan has published extensively in topology and its applications to chemistry and molecular biology. In addition to her many research papers, she has published an article in the College Mathematics Journal entitled “How to be a good teacher is an undecidable problem,” as well as three books. Her first book, entitled "When Topology Meets Chemistry" was published jointly by the Mathematical Association of America and Cambridge University Press. Flapan also co-authored a textbook entitled "Number Theory: A Lively Introduction with Proofs, Applications, and Stories" with James Pommersheim and Tim Marks, published by John Wiley and sons. Finally, in 2016, the AMS published her book entitled “Knots, Molecules, and the Universe: An Introduction to Topology”, which she wrote in collaboration with 12 mathematicians from all over the country.
WiSys Quick Pitch

Shifts in Leaf Investment Strategies of Sunflowers Across Climatic Gradients in the Upper Midwest
Presenter: Michael Bylander
Faculty Mentor: Nora Mitchell

Assessment of Air Exchange Rate and COVID-19 Transmission
Presenters: Sydney Dame, Danielle Zahn (Second place, Science and Technology)
Faculty Mentor: James Boulter

Understanding the Severity of COVID-19: A Point of View Through the Lens of a Computational Chemist
Presenter: Carl Fossum (First place, Science and Technology)
Faculty Mentor: Sudeep Battacharyay

Optimizing Deep Learning Architectures for Remote Sensing Image Analysis
Presenters: Pavithra Mohan and Matt DeWitte
Faculty Mentor: Rahul Gomes

Named Entity Recognition in Medical Text Documents
Presenter: Cole Pearson
Faculty Mentor: Jim Seliya

Behavioral Biometrics Based User Authentication Schemes Using Machine Learning
Presenter: Laura Pryor
Faculty Mentor: Rushit Dave

Macromolecular Crowding: Insights into Protein Function and Drug Delivery
Presenter: Nathaniel Severson
Faculty Mentor: Sanchita Hati

Physical Layer Authentication Using Machine Learning - A Review
Presenter: Nyle Siddiqui
Faculty Mentor: Rushit Dave
Comparison of Leaf Damage and Trichomes of Wisconsin Helianthus Populations Grown in Varying Environments
Presenter: Madilyn Vetter
Faculty Mentor: Nora Mitchell

Investigating Utilization Trends for a Supplemental Nutrition Assistance Program-Market Match Incentive Program at the Eau Claire Farmers’ Market Before and During the COVID Pandemic
Presenters: Ethan Blaney and Andrew Lindass
Faculty Mentor: Eric Jamelske

Analysis of Lunchtime Waste-Sorting Habits at the University Student Center
Presenters: Mark Fiore and Katrina Kawak (Second Place, Social Sciences and Humanities)
Faculty Mentor: Scott Clark

Examining Trends and Patterns in Chinese and American Support for Participation in the United Nations Paris Climate Agreement Over Time
Presenters: Chloe Knuth and Sakumi Kawamoto
Faculty Mentor: Eric Jamelske

Characterizing the Usage of Benefits Offered Through the Women, Infants and Children Farmers Market Fruit and Vegetable Programs in Wisconsin Before and During the COVID Pandemic
Presenters: Zach Ledwith and Madelyn Zenner
Faculty Mentor: Eric Jamelske

Investigating Trends and Patterns in Chinese and American Climate Change Views Over Time Using an Index of Acceptance, Knowledge, Concern and Obligation
Presenters: Caleb Kulich, Maddie Culhane (First place, Social Sciences and Humanities)
Faculty Mentor: Eric Jamelske

Body Regard Moderates the Relationship Between Anxiety and Suicidal Ideation
Presenter: Emerson Ngu
Faculty Mentor: Jennifer Muehlenkamp

Identifying Opportunities for Wisconsin to Participate in Advanced Energy Manufacturing
Presenter: Megan Roehl
Faculty Mentor: Thomas Kemp
Distinguished Master's Thesis

“We’re Black, We’re Proud, We’re Commandos”: Respectability Politics, Armed Self-defense, and Gender Dynamics in the Milwaukee NAACP Youth Council, 1958 – 1968
Presenter: Paul Ergen, Graduate of the MA-History Program
Faculty Mentor: Selika Ducksworth-Lawton

By the 1940s, Milwaukee was one of the most segregated cities in the country. Most black Milwaukeeans were forced to live in a ghetto known as the Inner Core. Black Milwaukeeans faced racial discrimination and segregation in housing, schools, and employment opportunities. Within the racial cultural landscape of the inner core, activists developed ideas, ideologies, and tactics in their quest for social justice. The National Association for the Advancement of Colored People Milwaukee branch Youth Council was the vanguard of several civil rights insurgences in Milwaukee during the 1960s. The Youth Council conducted a series of direct-action campaigns against racial discrimination in Milwaukee. However, the Youth Council’s direct-action tactics and the espousal of militant Black Power ideology put them in direct conflict with Milwaukee’s adult branch of the NAACP. The adherence to or rejection of respectability politics was at the core of this conflict. Within the black community, the issue of respectability politics created tensions between the two organizations along the lines of class, gender, education, skin complexion, and migratory status. The Youth Council’s direct-action protests also drew the ire of white Milwaukeeans, some of which engaged in white supremacist violence in an attempt to stop Youth Council campaigns. In 1966, in a response to white supremacist violence, the Commandos, an all-male proto–Black Power self-defense organization, were organized to protect demonstrators from violent white counter protestors. The Commandos symbolized a working-class rejection of nonviolence.

Latin American and Latiñx Capstone

Latinx English Language Learners in Wisconsin Schools
Presenter: Bailey Wilson
Faculty Mentor: Manuel Fernández

Decriminalizing Discipline: Abolition of Policing in Schools to Avert the School-to-Prison Pipeline
Presenter: Stephanie Hoeksema
Faculty Mentor: Rose-Marie Avin

Equity in the Classroom for English Language Learning Hispanic/Latinx Students
Presenter: Hannah Pakkala
Faculty Mentor: Manuel Fernández

The Fight for an Equitable Education: Latinx Youth Advocating for Equal Representation in Arizona’s Public Schools
Presenter: Madie Weingart
Faculty Mentor: Heather Moody
**Barriers to Education: The Importance of a Students’ Immigration Status**  
Presenter: Maddy Keithly  
Faculty Mentor: Manuel Fernández

**Language Barriers: The Importance of Multilingualism**  
Presenter: Ryan Dunlap  
Faculty Mentor: Gerardo Licon

**Analysis of the Reasoning for Decreased Cancer Survival Rates in Latinx Immigrant Farming Communities**  
Presenter: Alexa Forde  
Faculty Mentor: Manuel Fernández

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**Spotlight on First-Year Research**

*Hidden Rhetorical Roles in the Twentieth Century Business Office: The Leadership Communication of Secretaries and typists in the Archive of Tiger Oil Memos*  
Presenter: Twyla Alix  
Faculty Mentor: Marcy Orwig

*COVID-19 in Wastewater*  
Presenters: Sydney McGuine, Claire Buttel, Ryan Mohr, Hannah VonRuden, and Trevor Sigdahl  
Faculty Mentor: Crispin Pierce

COVID-19 wastewater surveillance is a method of sampling a population's wastewater to find the concentration of SARS-CoV-2 RNA. Biosurveillance has become increasingly popular due to the COVID-19 pandemic and a study at the University of Arizona found they could detect an outbreak seven days before symptom onset. Our study aims to monitor the SARS-CoV-2 RNA concentration on the University of Wisconsin-Eau Claire Campus in hopes to mitigate the spread of COVID-19. Wastewater sampling will occur twice a week at several designated locations and be sent to the Wisconsin State Laboratory of Hygiene for analysis. By completing this study we will have solidified a method to detect new disease spread in the future, further employing biosurveillance to proactively counter new disease outbreaks and a chance to study COVID-19 vaccine effectiveness. Through this research, we were also given the opportunity to work with the Eau Claire Cavaliers baseball team and formulate COVID-19 safety protocol for their 2021 season.

*Fostering Communication: A Look into the Communication Patterns in Foster Family Units*  
Presenter: Elie Zimmerman  
Faculty Mentor: Nicole Schultz
Communication is crucial to how individuals interact with others. Communication theories have been developed to help researchers study these patterns effectively, and the structuration theory by Anthony Giddens in particular allows researchers to notice rules and norms created by communication. Within familial units, different dynamics are present in the way members communicate. Research has been conducted to analyze how and why families communicate in the ways that they do. Through foster care, many families have non-biological and/or temporary members. The experience of foster parents, foster children, and social workers has an impact on how they communicate with each other. This study aims to analyze the communication patterns of foster parents specifically by interviewing various individuals about personal experiences. How do foster parents communicate with social workers and vice versa? How does this communication outside of the home affect the foster care experience inside the home? Findings of this study identify patterns in communication and give foster parents resources to better communicate about their foster children and with their foster children.

**Body Regard Moderates the Relationship Between Anxiety and Suicidal Ideation**

**Presenters:** Emerson Ngu, Isabel Jayne Yu, and Carley Ann Owens  
**Faculty Mentor:** Jennifer Muehlenkamp

Previous research has found a correlation between disturbed body regard and suicidal behavior (Orbach, 2001, Muehlenkamp, 2012). Anxiety has also been identified as a key component of suicidal ideation and intent (Thibideau, 2013). Researchers suggest poor body regard may impact how other risk factors, such as anxiety, relate to suicide (Muehlenkamp, 2012). This project explored the role of the body regarded as a moderator between anxiety and suicidal ideation. Linear regression was conducted on data collected from Undergraduate students (Mean Age=19.58 SD=1.85, 84.9% white) who completed self-report questionnaires to assess how body regard may impact the relationship between anxiety and suicidal thoughts or behavior. Results indicated that the full model was significant $F(3,372)=31.75$, $p<.05$ accounting for 20.4% of the total variance of lifetime suicidal ideation. Suicidal ideation was found to be greatest when anxiety is high, and body regard is low, ($t=4.31$, $p<.01$, 95%CI: 0.04 to 0.12). With high body regard, however, anxiety has a non-significant effect on SI, ($t=0.837$, $p>.05$, 95%CI: -0.03 to .0695). Within high anxiety individuals, low body regard is a risk factor for developing suicidal ideation. Increasing one’s body regard in clinical treatment may lower the risk of suicide.

**English Panel**

**A House Upturned: Women, Witchcraft, and Hierarchy During the Rise of Capitalism**

**Presenter:** Evan Peterson  
**Faculty Mentor:** Theresa Kemp

The purpose of this essay is to analyze how Thomas Heywood and Richard Brome’s play The Late Witches of Lancashire reflects a trend in early modern England in which hierarchy and sexual division were asserted through popular media, shaping public opinion in a manner that prefigured the social relations of capitalist production. To accomplish this, I have adopted a Marxist-Feminist analytical form that argues for a gendered interpretation of the English enclosures with an emphasis on witch trials. This analysis seeks to expand upon both mainstream Marxist and feminist understandings of Early Modern England, feminizing the former and grounding the latter in a historical material context. In particular, I have focused on the affirmation of strong social hierarchy, the demonization of poverty and female
sexuality, and the corruption of motherhood. Counter to the prevailing opinion, I argue that the transition to capitalism was not wholly progressive, especially for poor and working women. Works such as The Late Witches of Lancashire illustrate how this period was marked by the erosion of women’s autonomy in production and motherhood, increased domination of women by men, and of working people by incipient state authority.

**Catholics and Witches: Lowest Class Citizens under King James 1**  
**Presenter:** Alivia Kistler  
**Faculty Mentor:** Theresa Kemp

Religious tensions and the role said tensions play in creating early modern witch pamphlets is essential to understand the importance of “witches” in early modern England. In relation to anti-Catholicism, there exists a conversation between social classes concerning popular ideals about the devil-working witch character. Research began with the realization that no upper-class Catholic man had been accused of witchcraft—to the knowledge of contemporary scholarship—throughout early modern England’s witchcraft panic. A direct relationship ties the lower-class practicing Catholicism to the middle and upper classes practicing Protestantism in Lancashire during this period. These connections heighten with the fact that low-class Catholics were majority of accused witches. I argue the elites’ religion needed to be disseminated to yield easy consumption by middle and low classes, while also oppressing the lowest class as they had no voice in the acceptable religious practices of England and were interpreted as witches for their lack of agency in personal beliefs. Intersecting lower-class women with the general hostility to Catholicism manifests as fear of witchcraft. Class conflicts and religious paranoia in Potts’ “Wonderfull Discoverie”—early modern England’s most influential pamphlet—offers a “why” to the amount of witch hunting occurring in this time and place.

**The Doubled Edged Sword: Exploring Witchcraft and Female Sexuality in the Early Modern Era**  
**Presenter:** Allison Potter  
**Faculty Mentor:** Theresa Kemp

This paper examines the relationship between witchcraft and female sexuality in Early Modern England. In writing on this topic, I hope to demonstrate ways in which the two subjects were associated, and how their relationship with one another represents female sexuality as a whole during this period. In order to do so, I provide a close reading of Henry Goodcole’s pamphlet, The Wonderful Discoverie of Elizabeth Sawyer, a Witch, and look at how Goodcole associates Sawyer’s accused witchcraft with her personal sexuality. I include various references from scholars regarding these topics, and build upon the different and sometimes contrasting ideas they present regarding the relationship. I argue that Goodcole utilizes contradictory narratives regarding female sexuality and witchcraft of the time to ridicule and condemn Sawyer for her sexuality, trapping her in a paradox which reflects women’s sexuality during that era as a whole.

**Elizabeth Sawyer: Antithesis to Womanhood**  
**Presenter:** Megan Schaefer  
**Faculty Mentor:** Theresa Kemp
My project, Elizabeth Sawyer: Antithesis to Womanhood, looks at the pamphlet The wonderful discoverie of Elizabeth Sawyer, a Witch (1621), and is inspired specifically by the Diane Purkiss article “House, Body, Child” in which she brings forth the idea of the antimother. This serves as the primary lens I use to analyze Sawyer’s circumstances. This is important as it enables Sawyer’s story to be explored through the relationship between speech and body and demonstrates the ways in which Sawyer was perceived as an antithesis to womanhood highlighted through anger and poverty. Looking at the pamphleteer, Henry Goodcole, and what his part was in crafting Sawyer’s perceived identity helps illuminate the role that the community played in witchcraft trials during this time.

The Wise-Woman, Theatre, and Threatened Patriarchy
Presenter: Rome Balciunas
Faculty Mentor: Theresa Kemp

This project’s goal is to examine the way in which elements of Thomas Heywood’s play The Wise-Woman of Hoxton engage in conversation with masculine gender roles. At the time, theatre was an ill-reputed art, due largely to the connection between playhouses and prostitution - a connection intrinsically linked to the upset of gender roles and social reputation that was invited by the attendance of performances by respectable women. The Wise-Woman has been analyzed as a response on Heywood’s part to that reputation, both in the way it acknowledges/subverts the playhouse/brothel connection as well as the way its female characters use ambition and intelligence to propel the narrative. The play can be read as a subtle challenge to patriarchal norms of the time. Through close critical reading of the male and male-presenting characters in The Wise-Woman, and the examination of those characters in relation to the social/artistic context of the play, the aim of this project is to fit the masculine characters of the play into this picture of threatened patriarchy, to analyze the ways in which masculinity is deconstructed by the play, and to speculate upon the impact that the play may have had on male audience members.

WGSS 496: Externships
The Chippewa Valley LGBTQ+ Community Center
Presenters: Brook Erickson, Zoe Herdina, Anecia Larsen, Maria Masson, and Corinne Springer
Faculty Mentor: No Mentor Listed

The Chippewa Valley LGBTQ+ Community Center aims to provide services and create educational programs that promote well-being and unity within & among the LGBTQ+ community. They work to promote understanding, tolerance, and acceptance of the LGBTQ+ community and of individuals within that community in the Chippewa Valley region.

Family Support Center
Presenters: Kylie Engel, Julia Los, and Megan Sterstock
Faculty Mentor: No Mentor Listed

The Family Support Center empowers all individuals, families and communities to live free from domestic violence, sexual assault, child abuse and interpersonal violence through education, prevention and intervention. The Family Support Center is an equal opportunity agency. The Family Support Center celebrates the diversity of all people and does not discriminate in any manner on the basis of race, color, national origin, sex, religion, age, ability, gender identity or expression, or sexual orientation.
The Community Table
Presenters: Carleen Baron and Bailey Rieger-Borer
Faculty Mentor: No Mentor Listed

The Community Table’s Mission is to serve balanced, nutritious meals in a safe, welcoming environment and to connect those in need with existing resources. They do this by engaging diverse volunteers in service and by fostering partnerships with local organizations. TCT also enlightens the public to issues of hunger in the community; and supports efforts of community agencies to increase the self-reliance of individuals and families.

Western Dairyland - Women's Business Center
Presenter: Hannah Hintz
Faculty Mentor: No Mentor Listed

The Women's Business Center (WBC) specializes in providing services to assist women entrepreneurs. Special efforts are made to assist economically and socially disadvantaged women. The Center continues their commitment to provide intensive group and one-on-one business training and technical assistance that will assist women to grow their business ideas and acquire or improve their business management skills. In recent years, as women have been encouraged to work outside the home and join the corporate world, women are now starting businesses at much higher rates than men. However, many of these female-led startups cannot survive past the development phase due to lack of support and resources. There is a great need for services tailored to maintaining and growing existing businesses as well as increasing revenues for these newfound female-led businesses.

Intersectional Womxn Center
Presenters: Cecilia Alexander, Krisany Blount, Natalie Leonardelli, and Marin Munos
Faculty Mentor: No Mentor Listed

This is a collaborative research project on the need for an Intersectional Womxn Center at the University of Wisconsin-Eau Claire that includes some ethnographic-type of research with interviews and focus groups, while at the same time develop a theoretical analysis of why such a space is necessary. Students will use the information for presentations in both academic (e.g. CERCA) and non-academic contexts.

Study Abroad and Immersions Panel

Introduction of Panel
Presenters: Molly Larson, Miranda Golz, Sophia Schecklman, Mary Kate Schneeman, Jenna Luginbill, and Abby Mathison
Faculty Moderator: Jeff DeGrave

Moderator- Jeff DeGrave Presented series of 10 broad questions to panel
1. Please briefly describe your study abroad program. (Location, academics, housing, etc.)
2. If you completed an internship, research project or service learning while abroad – can you talk about that experience, and how it enhanced your overall study abroad experience?
3. Quickly, what was the biggest initial obstacle (real or perceived) that you needed to overcome or figure out before you went abroad—and how did you resolve it?
4. Was there a particular paper or project during your program that stood out as interesting? If so, explain the project and topic, and how it enhanced your overall study abroad experience.
5. Which part of your program allowed you to learn the most about the local culture—and why?
6. What was the most challenging part of the experience and why?
7. How has the experience been coming back after your program abroad? What ways do you see that you’ve changed, if at all? What are some things, if any, that you do differently now, after being abroad?
8. How has the experience fit into your academics at UWEC?
9. How do you see your experience impacting your future career or future goals after graduation?
10. What are some things you would say to other students thinking about studying abroad?

**CERCA 2021 Presentations**

**Art & Design**

**Art & Design Adobe Tutorials**

Presenters: Kyler Lueck, Taylor Wilkinson, and Caleb Carr  
Faculty Mentor/Collaborator: Jyl Kelley

The aim of this project was to research content and develop instructional videos for using Adobe software in photography classes that are more connected to course content than generic tutorials. Can instructional videos specific to an instructor’s course content be more effective than generic tutorials? 3 students (Caleb Carr, Kyler Lueck, & Taylor Wilkinson) worked with Jyl Kelley during summer 2020 to organize content, capture and edit video, and research best methods of creating instructional videos at UWEC. The project was assessed with student surveys that measured and compared pre vs post confidence level of using new instructional videos vs generic tutorials. The results...Yes, student-made tutorials are engaging, exciting, and effective, for fellow students!

**Bachelor of Fine Arts Senior Exhibition**

Presenters: Jake Borchert, Meghan Adlington, Madelyn Wood, Taylor Wilkinson, Keri Ogden, Sarah Stresnak, Alyssa Alcorta, Sarah Ryan, Caroline Hehir, and Caleb Carr  
Faculty Mentor/Collaborator(s): Amanda Bulger, Ned Gannon, Jill Olm, Wanrudee Buranakorn, and Chris Theo

The Bachelor of Fine Arts Exhibition will be on view in the Foster Gallery April 23 - May 9, 2021. It features capstone projects by 10 department of Art & Design BFA candidates.

**Biology**

**Analysis of Antibiotic-Resitance Gene Transfer Among Environmental Isolates**

Presenters: Thu Nguyen, Abigail Thomann, Wynter Stearns, and Libby Crigler  
Faculty Mentor/Collaborator: Sasha Showsh

Antibiotic-resistant bacteria are rapidly increasing in number as well as lethality and are especially prevalent in nosocomial infections. Antibiotic-resistant bacteria were discerned from other environmental
strains on minimum inhibitory concentration (MIC) plates. From the sample, only ICQ104 expressed antibiotic resistance (to 39 μg/mL erythromycin (Erm)). To test the possibility of conjugative transfer of antibiotic resistance to other environmental strains, ICQ104 was mated with recipient Staphylococcus epidermidis 860 (Se860). Se 860 possessed chromosomal resistance to streptomycin (Strep) and spectinomycin (Spec) prior to mating. The resulting transconjugants were plated on SSE media containing Spec, Strep, and Erm to assay for the transfer of antibiotic resistance genes. Erm resistance was not transferred to the transconjugants, as they were unable to grow on the media. Further tests will be conducted before the significance of these results can be determined.

**Analysis of PHYB Mutations Identified in a Genetic Enhancer Screen in Arabidopsis thaliana**

Presenters: Morgan Angove, Aidan Voon, Sofia Arisian, Jett Nauman, and Charles Running- Fischer

Faculty Mentor/Collaborator: Derek Gingerich

The plant Arabidopsis thaliana contains the genes LRB1 and LRB2 (Light-Response BTB 1 and 2) that encode proteins functioning as target adaptors in complexes that target the phytochrome red/far-red-light receptors for degradation. Plants containing mutations of both the LRB1 and 2 genes express hypersensitivity to red-light. To learn more about this pathway we conducted a screen to identify mutations which increased the red-light hypersensitivity of lrb1 lrb2 double mutant plants. In several of the lines the putative enhancer mutations are within the PHYB gene, which encodes the phytochrome acting as the major red-light receptor in Arabidopsis. Recent work has focused on characterizing the effects of these mutations on light responses and phytochrome action. For instance, we are attempting to clone cDNAs encoding the mutant phytochrome B’s. These cDNA will be used to generate overexpression lines that can definitively demonstrate that the PHYB mutations are responsible for the enhancer phenotype. We have also been performing crosses with the enhancer lines to generate populations with various combinations of the PHYB, LRB1, and LRB2 mutations. Plants from these populations can be analyzed to further our understanding of the interactions between these genes. Progress on these projects and other work will be presented.

**Assessing Efficiency of qPCR Primers for Neuronal Marker Genes in Zebrafish**

Presenter: Brianna Hameister

Faculty Mentor/Collaborator: Bradley Carter

Quantitative qPCR (qPCR) is an established technique used to measure mRNA levels and has been broadly used to measure gene expression in zebrafish. Previous studies have shown the value of qPCR in time-course experiments for tracking the expression of targeted genes throughout development. However, qPCR primers need to be empirically characterized to assess primer design assumptions. The purpose of this study was to establish qPCR protocols in our laboratory and to determine the efficiency quotients for the genes expressed in different types of neurons (gad1b, glyT2, and vglut2a). Primer efficiency quotients for the genes gad1b, glyT2, and vglut2a were determined to be 1.86, 2.15, and 1.86, respectively. Primers yielded relatively little signal in cDNA samples without reverse transcriptase, indicating specificity for the mRNA target. Our next steps in the study will be to use these primers and run a time-course assay to establish a baseline of gene expression changes in zebrafish using these reagents.

**Assessing the Transmission of Bacteriophage Through Masks**

Presenter: Vy Huyen

Faculty Mentor/Collaborator: Sasha Showsh
The primary transmission route for the novel virus COVID-19 is via close contact with respiratory droplets. The use of face masks has been recommended by the CDC and WHO to prevent the transmission of COVID-19. We used phage T4 (a virus that infects bacteria) to evaluate the effectiveness of different masks in preventing the transmission of phage through respiratory means. Our initial data demonstrates that masks can reduce the transmission of phage by up to 7-fold. This relates to a 99.99% reduction in transmission. The current data can provide a better insight into the protective efficacy of various masks to control the spread of COVID-19.

Can These Mutations Lead to Blindness? - Analyzing the Effects of DNA Variants

Presenters: Caterra Leavens, Katie Yun Jin Sadowska, and Daniel Reither
Faculty Mentor/Collaborator(s): Jamie Lyman Gingerich and Derek Gingerich

Genetic testing involves examining a patient's DNA sequence to look for changes (mutations) in the DNA that can potentially cause disease or illness. While some of the changes are benign, many have not yet been characterized and are thus classified as variants of uncertain significance (VUS). In collaboration with Prevention Genetics, our lab has begun to analyze VUS that are predicted to affect the splicing of genes related to ocular diseases. Disruption or alteration of splicing can affect gene function and lead to disease. We are using a minigene system in which the gene segment under investigation is cloned into a plasmid vector and then transfected into eukaryotic cell culture. The mRNA transcripts are then collected and analyzed to determine the effects of the variant on the transcript. Analysis of VUS could lead to a change in variants' interpretation and directly have an impact on patients and their families by supporting diagnosis and access to treatment.

Creating and Testing Tools for Investigating gp93 Biology

Presenters: Isabelle Tenorio, Nicholas Vazquez, Ruby Gravrok, Ashley Walker, and Cenna Olson
Faculty Mentor/Collaborator: Crystal Del Valle

Mammalian glycoprotein 96 (gp96) and canopy 3 (CNPY3) are both required for chaperoning (folding) toll-like receptors (TLRs), infection recognition proteins, and integrins, cell adhesion molecules. Due to sequence similarity, just as gp96 and CNPY3 chaperone TLRs and integrins in mammals, we believe glycoprotein 93 (gp93) and canopy b (CNPYb) chaperone tolls and integrins in Drosophila melanogaster (fruit flies). To investigate this, we are constructing and testing multiple tools to study gp93 biology. First, toll and integrin genes are being cloned with tags to detect their expression in Drosophila S2* cells, as most do not have commercially available antibodies. Therefore, genes are being amplified from fly cDNA via polymerase chain reaction (PCR) and ligated into a cloning vector. Second, RNA interference (RNAi) constructs specific to chaperone genes must be made to knock down their expression in cells. Hence, multiple genes are being amplified via PCR and in vitro transcribed into RNAi. Lastly, integrin-specific antibodies are being tested via flow cytometry to confirm integrin expression in S2* cells. Thus far, multiple genes have been cloned, multiple RNAi constructs have been made, and we have verified integrin βPS expression in S2* cells. Collectively, these tools will enable us to study gp93 biology.

Equitably Improving Scientific Literacy Through Transparent Design and Inclusive Pedagogy in a Liberal Education K1 Laboratory Course, Biol 181

Presenter: Thomas Adams
Faculty Mentor/Collaborator: Kelly Murray
Scientific literacy involves development of skills and knowledge to better understand how science works and what scientific evidence can tell us about the world. The UW-EC Liberal Education Framework addresses scientific literacy through its K1 Outcome: describe and evaluate models of the natural and physical world through collection, scientific analysis of data, and use of mathematical or computational methods. Biology 181, Laboratory for Environmental Biology and Conservation, now has a K1 lab designation. The goal of this project was to redesign this laboratory course using best practices of transparent design and inclusive pedagogy to increase scientific literacy. We re-worked previous course activities and designed/tested new laboratory modules. We sought to build scientific literacy for ALL enrolled students while we helped to support learning for students from under-represented groups in particular. Research suggests that these students should benefit more from inclusive and intentional strategies/practices. The Test of Scientific Literacy Skills (TOSLS) was given to students pre-and post-class as the assessment tool (Gormally et al, 2012) to quantify whether their scientific literacy improved. While no significant improvements occurred, outcomes revealed target concepts to improve scientific literacy and Biology 181 overall. Course redesign will continue into Fall 2021.

**Ethanol Exposure Alters Motor Abilities in Zebrafish Embryos**

**Presenter: Emily Vanderpas**

**Faculty Mentor/Collaborator: Bradley Carter**

Autism Spectrum Disorder (ASD) is a cognitive condition characterized by challenges in social interactions and behaviors. Several biological studies have identified different environmental factors that may influence the development of ASD, including exposure to alcohol during pregnancy. Alcohol exposure is a primary characteristic of Fetal Alcohol Syndrome (FAS), a condition that can also lead to impaired behavioral development throughout childhood. The primary goal of this research is to determine the effects of short-term, minor exposure to ethanol on the behavioral development of human embryos. In order to determine the possible effects, zebrafish embryos were exposed to either a vehicle or ethanol solution of varying concentrations. At 5 days post-fertilization, the average total movement distance between treatment groups would be recorded for each experimental run. Across all trials, one run yielded a significant difference of average total distance between the control group and all treatment groups. This means that there is a possibility that short-term exposure to ethanol will have an impact on the motor abilities of a developing human embryo. These results can be used to determine environmental regulations on alcohol exposure throughout pregnancy and encourage further study of the connections between environmental factors and ASD development.

**Evaluation of Microfiber Cloths in the Removal of Microorganisms**

**Presenter: Samantha Halada**

**Faculty Mentor/Collaborator: Daniel Herman**

*Bacillus subtilis* and *Escherichia coli* are species of bacteria associated with food-borne ailments. Strains of *Bacillus subtilis* are associated with food poisoning while a variety of strains of *E. coli* are associated with food-borne gastrointestinal diseases. Because of organisms such as these, maintaining proper kitchen hygiene is essential. The Norwex™ company has developed microfiber cloths that have silver nanoparticles woven in between the fibers. The company claims that the microfiber is capable of removing 99% of bacteria from surfaces and that the silver is an anti-microbial agent that will inhibit the growth of microbes in the cloth. In a 2019 study done previously in this lab, the ability of the Norwex™ microfiber cloth to remove microbes from surfaces and inhibit microbial growth within the cloth was compared to a similar microfiber cloth that lacks the silver nanoparticles. The purpose of this study is to confirm the findings of the previous study using a modification of the previous procedures. Preliminary results using the bacterial species *Bacillus subtilis* do not show a significant difference between the two types of microfiber cloths in removing bacteria from surfaces. Both clothes are able to remove
approximately 99% of the bacteria applied to the surface of a sterile petri dish. In addition, there was 0% survival of the bacteria within the cloths after air drying for 18-24 hours in a sterile laminar flow hood. Future experiments will utilize additional species of bacteria as well as the yeast *Saccharomyces cerevisiae* to determine if the results obtained for these species are consistent with the results we have observed for *B. subtilis*.

**Examining Decomposition of Leaves from Native and Non-Native Tree Species in Streams**

*Presenters: Emma Dimick, Ava Gehrke, and Emily Critelli*

*Faculty Mentor/Collaborator: Todd Wellnitz*

Leaves that fall into streams decompose and provide a vital food resource for stream organisms known as “shredders”. Leaves from non-native trees, however, may decompose at different rates than native tree leaves and have different palatability to shredders. This study examined leaf breakdown rates of native elm (*Ulmus americana*) and non-native buckthorn (*Rhamnus frangula*), and the effect that shredders had on each. We conducted a field and laboratory experiment. The field experiment used replicate leaf packs containing either elm or buckthorn leaves placed in three streams having different shredder assemblages. Leaf packs were constructed of nylon mesh and half had large holes cut in them to allow shredder access. In the laboratory experiment, amphipod shredders were added to 30 cups of stream water containing cut leaf discs of either buckthorn or elm. Five additional cups for each leaf type had no amphipods and served as controls. After 21 days, the stream experiment showed that buckthorn leaves broke down approximately twice as fast as did elm, but shredders did not affect leaf biomass loss. The laboratory experiment showed that both leaf type and amphipod shredders affected leaf breakdown, with shredders causing significantly greater leaf biomass loss for buckthorn.

**Extracting Novel Antibiotic-Producing Microbes from Soil**

*Presenters: Vy Huyen and Jakie Buttafuoco*

*Faculty Mentor/Collaborator: Daniel Herman*

The increase in antibiotic-resistant microbes is of great concern in the medical community. Many bacteria previously susceptible to commonly used antibiotics have evolved resistance, resulting in serious medical and public health concerns. Infections caused by resistant bacteria are difficult and costly to treat. In response to this growing crisis, we are endeavoring to identify novel antibiotic producing microbes from soil samples collected from Northeast Iowa. Bacteria are isolated from soil samples and tested to determine if they are producing substances that inhibit or kill one or more of four tester strains (*Escherichia coli, Enterococcus faecalis, Staphylococcus aureus*, and *Salmonella enteritidis*). We have isolated numerous bacterial isolates from soil samples that produce antimicrobial substances and we have characterized these isolates using a variety of physiological tests. The amplified 16s rRNA will be sequenced to identify the antibiotic-producing isolates. Future experiments will involve partial purification of the antimicrobial substances and identification of gene(s) responsible for the production of antimicrobial substances through transposon mutagenesis.

**High-Resolution Melt Analysis Can Distinguish Variable PCR Products for Genotyping CRISPR Mutagenesis in Zebrafish**

*Presenter: Ashley Lutzke*

*Faculty Mentor/Collaborator: Bradley Carter*

The CRISPR/Cas9 system is a well-known method to induce mutations in zebrafish. A method for screening the first generation of zebrafish for mutation is required to determine if the mutation was
successfully induced and will be passed on to the following generations. The purpose of this study was to explore High-Resolution Melt Analysis (HRMA) as a method of screening zebrafish for CRISPR-induced mutations. Using microinjection and the CRISPR/Cas9 system, we obtained tyr1 mutants that produced less pigment in melanocytes, allowing them to be visibly distinguished from control fish. By running an HRMA assay designed to target tyr1 on these fish, we tested if HRMA can distinguish mutant fish with a visible phenotype from control fish. HRMA was able to distinguish different lengths of PCR product from synthetic DNA templates based on the tyr1 gene. We also found that HRMA was able to distinguish mutation in our tyr1 mutant fish when compared to wild-type fish. We conclude that HRMA has the potential to be both an effective and time-efficient method to screen zebrafish for CRISPR-induced mutations. In the future, this method can be used to screen for mutations that do not produce visible phenotypes.

**Impact of Fertilizer Quantity on Pothos (Epipremnum Aurem) Vegetative Growth**
**Presenter:** Mattea Linberg  
**Faculty Mentor/Collaborator:** Kristina Beuning

Fertilizer management is important in plant production facilities to limit waste, save money and reduce runoff. This study focused on finding the optimal quantity of fertilizer to produce maximal vegetative growth in pothos (Epipremnum aureum), a common houseplant produced and sold at garden centers. The recommended one tsp/gal of 9-3-6 Foliage Pro solution was applied to a total of 30 pothos plants in four-inch pots (409 cm³) growing in a soilless mix of vermiculite, sand, and coco coir. The solution was applied in three amounts: 50mL, 150mL, or 250mL biweekly to each of ten plants. Ten additional control plants received no fertilizer. After six applications (13 weeks), plants were harvested and specific leaf area (SLA) and root, shoot, and leaf dry biomass were measured. Leaf, shoot, and total biomass all increase with increasing quantity of fertilizer. Yet, root: shoot biomass, root: total biomass, and SLA all peak at the 150mL treatment suggesting increased plant growth due to fertilizer applications ≥150 mL occurs proportionally among the pothos root, shoot, and petiole. Further research will address the fertilizer quantity above which no additional aboveground biomass is produced.

**Investigating Autism Spectrum Disorder Through Environmental Contaminants; Effects of Lead Exposure on Zebrafish Development**
**Presenters:** Simon Garey and Brianna Hameister  
**Faculty Mentor/Collaborator:** Bradley Carter

Autism Spectrum Disorder (ASD) is a developmental disorder that affects the ability of individuals to communicate and interact with their environment. Lead is an extremely toxic heavy metal that has been used in paint, piping, and children’s toys. Studies have shown that lead exposure can impair neurodevelopment and correlates with increased prevalence of ASD diagnoses. However, the amount of lead exposure required and the biological method for this developmental impairment is not currently known. The purpose of this experiment was to examine the impact of lead acetate trihydrate on the early development of zebrafish. Embryos were treated with varying concentrations of lead acetate trihydrate and then imaged through stereomicroscopy. Different morphological differences were identified, including pericardial edemas, improper swim bladder formation, and spine curvature. These differences were used to pinpoint the concentration with no observable adverse effect (NOAEL) and lowest observable adverse effect (LOAEL). Our results indicate that NOAEL/LOAEL values for lead in zebrafish development may be lower than previously reported studies. These findings are applicable for
further research into investigating lead and ASD biology and can assist in informing environmental and product regulations.

**Investigating Phenotypic Plasticity Along Two Axes of Plant Variation in Helianthus**

Presenters: Aleks Leonardson and Lydia McNabb  
Faculty Mentor/Collaborator: Nora Mitchell

Climate factors, such as temperature and rainfall, affect both leaf investment (specific leaf area; SLA) and plant height. Previous research has found evidence of relationships between traits and environmental factors, where taller plants with higher SLA values are associated with hotter and brighter environments. As temperature increases in many regions, any resident plants must cope with increased heat and transpiration. We ask whether plants exhibit phenotypic plasticity regarding SLA and overall height, with weedy perennial sunflowers (*Helianthus*) as our model study system. Plasticity is how organisms rapidly adjust traits in response to growing conditions in the environment, as opposed to genetic (evolutionary) change occurring over generations. We established two replicate common gardens separated by approximately 3km in Eau Claire, Wisconsin, each containing 75 randomly distributed individuals from three species, *H. grosseserratus*, *H. giganteus*, and *H. maximiliani*. During the growing season, we collected leaves and measured SLA and final plant height. We noted phenotypic plasticity in both traits, with higher SLA values and taller plants in one garden. Evidence of plasticity in these two important traits in similar environments illuminates the potential for plasticity to act as a mechanism for responding to novel climatic conditions under global climate change.

**Is It Raining Plastic? Microplastics in Lakes of the Boundary Water Canoe Area Wilderness**

Presenter: Reed Kostelny  
Faculty Mentor/Collaborator: Todd Wellnitz

Research over the past decade has found microplastics (plastic particles < 5mm) in almost every environment, but information on their distribution and abundance in wilderness areas is incomplete. We examined microplastic contamination patterns in the Boundary Waters Canoe Area Wilderness (BWCAW) by analyzing lake water and atmospheric deposition from rain. Lake water samples were collected from nine lakes and atmospheric deposition samples were taken at four locations. Lake water samples were passed through glass fiber filters in the field; in the lab, microplastics on filters were counted and characterized under a dissecting microscope. Atmospheric deposition was quantified by using four, 50 cm diameter metal funnels attached to mesh bags that were left in the field for two months. In the lab, the mesh bags were backwashed, and microplastics were filtered and processed in the same manner as lake samples. We found lake water had 33.4 ±5.9 microplastic particles/L and rain/atmospheric deposition samples had 5.81 ±1.3 particles/m²/d. Microfibers were the most common particles in lake water, whereas fragments were most common in rainwater. Particle color frequencies also differed between rainwater and lake water. These data suggest microplastics in lakes may have sources other than atmospheric deposition, such as recreational canoeists.

**Lichen and Moss as Biomonitor of Microplastic Pollution in the Boundary Waters Canoe Area Wilderness**

Presenter: Anakah Denison  
Faculty Mentor/Collaborator: Todd Wellnitz
The Boundary Waters Canoe Area Wilderness (BWCAW) is known for its pristine lakes and natural beauty, but like all areas impacted by humans, this highly visited and beloved wilderness is contaminated with microplastics. Microplastics are small, pervasive (< 5mm) pieces of plastic that take the form of fibers, films, and fragments. Previous research has found microplastics in BWCAW lake water, soils, and invertebrates, but their source is unknown. To determine the extent to which recreational canoeists might contribute to this pollution, we sampled a common moss (*Pleurozium schreberi*) and lichen (*Cladonia rangiferina*) from 14 canoe campsites and 14 control sites (undisturbed shoreline areas) over the course of a week-long canoe trip in June 2020. In the laboratory, the samples were dried, ground, and digested with hydrogen peroxide, and filtered through membrane filters. Filters were examined under a dissecting microscope for microplastics, which were then characterized and counted. Both mosses and lichens are established biomonitors for atmospheric pollution, but they have yet to be widely used in monitoring microplastics. We expect that the observed counts will be similar to atmospheric deposition samples and that there will be no significant difference between camp and control sites.

**Methylene Chloride Exposure Alters Morphological Development in Zebrafish Larvae**
**Presenters: Noah Titera and Carely Owens**
**Faculty Mentor/Collaborator: Bradley Carter**

Autism spectrum disorder (ASD) diagnoses have strikingly increased in recent decades. Whether the observed increase in diagnosis is due to better awareness or environmental factors, understanding and identifying the epidemiology of this disorder has the potential to greatly reduce risk factors and increase the quality of life for patients and their communities. Methylene Chloride (MC) is a volatile organic compound that shows an association between environmental exposure and ASD prevalence in humans (Kalkbrenner 2014). How MC exposure may be related to ASD biology has not been characterized in the literature. The purpose of this study was to assess the impact of MC exposure on early development in Zebrafish larvae. A 1:10 ratio of MC and Ethanol solution was used to emulsify MC into an aqueous embryo medium solution (E3). Zebrafish larvae were treated at 10hpf and 24hpf with 10ppm, 100ppm, 1000ppm, or 1000 ppm vehicle. Morphological data collected at 48 and 72 hours allowed for analysis of, eye size, pericardial area, hindbrain width, and eye diameter. Significant visual differences in eye area, eye diameter, and pericardial area were observed in the developing Zebrafish larvae after treatment with 1000ppm MC compared to that of the vehicle.

**Microplastic Accumulation in Freshwater Crayfish in the Boundary Waters Canoe Area Wilderness**
**Presenters: Morgan Mack and Zach Kuchta**
**Faculty Mentor/Contributor: Todd Wellnitz**

Microplastic debris (defined as plastic particles < 5 mm) can be found worldwide in marine, freshwater, and terrestrial ecosystems. Microplastic contamination has been well documented in marine environments and in marine organisms; however, freshwater systems have been less studied. This is especially true for remote lakes located far from anthropogenic source pools. Among the most isolated lakes in the continental USA are those located within the Boundary Waters Canoe Area Wilderness (BWCAW) of northern Minnesota. As part of a larger study examining microplastic pollution in the BWCAW, we quantified microplastic loads within lake-dwelling crayfish. We collected crayfish from four lakes using baited minnow traps and by hand-sampling with nets. Preserved specimens were returned to the lab, where gills and digestive tracts were excised, digested in potassium hydroxide, and then filtered. Microplastics on filters were then counted under a dissecting microscope. Our results indicate crayfish accumulate microplastics by passive and active means. Passively, by the entrapment of suspended
particles within their gills and actively, by ingestion of microplastic-contaminated food. Understanding how microplastics move through aquatic food webs requires knowledge of how and where microplastics accumulate in organisms. This study is the first step in building this knowledge.

**Microplastic Distribution Among Freshwater Biofilms**  
*Presenter: David May*  
*Faculty Mentor/Collaborator: Todd Wellnitz*

Microplastics (MP) have garnered much attention in recent years as novel ecological pollutants. MPs are of particular interest in freshwater environments because of their ubiquity and potential to interfere with ecosystem processes. Biofilms – extracellular films created by algae and bacteria – are critical components of lake ecosystems. They form the basis of food webs and may entrap and retain MPs. Yet little is known about how MPs are distributed in biofilms or the degree to which human activity shapes their distribution. This study investigates whether MPs abundance in biofilms differs between areas of high and low human traffic. We accomplished this objective in two ways. First, by examining biofilms collected near campsites in the Boundary Waters Canoe Area Wilderness (BWCAW) that receive high human traffic and comparing them to biofilms collected from undisturbed control sites. Second, we compared MP abundance in BWCAW biofilms to those collected from lakes around Eau Claire, Wisconsin, which receive more frequent and concentrated human activity. We predicted that MPs abundance would be: Eau Claire lakes >> campsites > controls. Our null hypothesis holds that samples will not differ because sources other than those stemming from human contact (e.g., atmospheric deposition) account for most MPs in samples.

**Plant Functional Trait Dispersion is Influenced by Environmental Gradients and Spatial Scaling**  
*Presenters: Samantha Gellerup, Cole Baumann, Amanda Meier, Cassidy Michels, Hayley Partello, Katie Pribnow, Brianna Runde, Andrew Boardman, Carter Peuse, Abe Tinker-Sackett, and Andrew Thometz*  
*Faculty Mentor/Collaborator: Evan Weiher*

Functional community assembly seeks to understand and explain communities in terms of mixtures of functional traits. Environmental gradients (e.g., soil moisture, soil organic matter, and tree canopy cover) can produce communities of similar species (trait clustering), while competition can favor resource partitioning and produce communities of functionally different species (trait overdispersion). Previous work has shown that these patterns depend on the spatial extent of the species pool and the level of resource stress. We sampled plants at 114 sites (38 locations across Wisconsin, containing 3 sample plots at each) and examined each site on a scale of three-grain sizes: (0.1m$^2$, 1.0m$^2$, 10m$^2$). Data on four functional traits (two size traits and two leaf economic traits) was collected at each site, along with environmental data consisting of soil moisture, soil organic matter, and tree canopy cover. With a large-scale species pool perspective, communities were made of similar species (were clustered), but with a small-scale perspective, the pattern switched toward overdispersion. Soil moisture influenced trait dispersion, but the pattern in northern forests was not consistent with the pattern in southern forests.

**Polycystic Kidney Disease and Protein Localization: Analysis of the Role of gar-3 in Protein Localization to Cilia in Caenorhabditis elegans**  
*Presenter: Hailee Sparks*
Faculty Mentor/Collaborator: Jamie Lyman Gingerich

Gar-3, a gene that encodes a G protein-coupled acetylcholine receptor, has been shown to play roles in both neurotransmission and protein localization to synapses. We asked whether gar-3 also affects the localization of PKD-2 protein to primary cilia in *C. elegans*, a free-living nematode. Dysregulated PKD-2 localization has been linked to polycystic kidney disease. Thus, understanding the factors that mediate PKD-2 protein localization to cilia might help us better understand the molecular basis of polycystic kidney disease. We chose to utilize *C. elegans* as our model organism because it is transparent and has a cilia structure similar to cilia found in mammalian kidneys. In order to address our question, we used both genetic and reverse genetic techniques to reduce gar-3 gene expression in *C. elegans* transgenic for PKD-2::GFP. This allowed us to use fluorescent microscopy to assess PKD-2 localization to primary cilia in a living animal and draw conclusions about how this might affect the progression of polycystic kidney disease. If gar-3 is associated with PKD-2 localization, this would provide new insight into polycystic kidney disease.

**Shifts in Leaf Investment Strategies of Sunflowers Across Climatic Gradients in the Upper Midwest**

Presenters: Michael Bylander and Thu Nguyen

Faculty Mentor/Collaborator: Nora Mitchell

The earth is undergoing a period of global warming, this warming period is impacting many organisms and ecosystems as changes in climate alter average precipitation and temperature. The strategies plants employ to stay competitive in their changing environments must continue to shift. This research asks how plant leaf investment strategies vary across climatic gradients in the Upper Midwest, using sunflower (*Helianthus*) species as a model system. Understanding how sunflower leaf traits relate to differences in climate will help to predict how species distributions may change and how plants may respond to climate change. Our team collected data on three species of sunflower (*H. grosseserratus, H. maximiliani, and H. giganteus*) from 20 different sites across Wisconsin and Minnesota. We collected field measurements to calculate Specific leaf area (SLA) which is used as a proxy for investment strategy, where higher SLA leaves are associated with faster growth strategies, and lower SLA leaves are associated with more conservative strategies. We found no evidence that SLA was related to precipitation, however, SLA was found to be inversely related to temperature. This finding could indicate a shift toward more conservative leaf investment strategies in areas experiencing higher average temperatures under future climate change.

**Spider Functional Trait Diversity is Correlated with Plant Functional Trait Diversity**

Presenters: Andrew Boardman, Carter Peuse, Andrew Thometz, Abe Tinker-Sackett, Cole Baumann, Samantha Gellerup, Amanda Meier, Cassidy Michels, Hayley Partello, Katie Pribnow, and Brianna Runde

Faculty Mentor/Collaborator: Evan Weiher

Functional community assembly seeks to understand and explain communities in terms of mixtures of functional traits. Environmental stress can produce communities of similar species (trait clustering), while competition can favor resource partitioning and produce communities of functionally different species (trait overdispersion). Previous work has investigated variation in plant functional diversity, but little is known about how functional diversity may be correlated across trophic levels. Using pitfall traps, we...
sampled ground-dwelling spiders at 105 sites (35 locations across Wisconsin, containing 3 sample plots at each). We measured a variety of spider traits, including the size (length x width) of the chelicerae (mouthparts) that are associated with the spider’s prey. We also measured plant size (height) and leaf economic traits. The functional diversity (variance, range, mean distance) in spider chelicera size was positively correlated with the functional diversity of plant size, but it was independent of leaf economic traits.

**Studying the Effects of Extra Sets of Chromosomes on C. elegans Neurons**
**Presenters:** Sydney Dame and Dayne Kramer
**Faculty Mentor/Collaborator:** Jamie Lyman Gingerich

Polyplody is a condition in which organisms have more than two sets of chromosomes. *C. elegans*, free-living nematodes, are typically diploid and have two sets of chromosomes, but can stably reproduce and live as tetraploids. We use RNA interference to reduce the expression of *rec-8*, a gene that plays a role in meiotic chromosome segregation in *C. elegans*, to induce nondisjunction and produce stable lines of tetraploid worms. We identify *rec-8* tetraploids by the associated Lon phenotype, in which the worms are longer-than-normal due to enlarged cells. Polyplody is thought to be linked to abnormal structure and function of primary cilia, which are organelles that play a crucial role in regulating cellular division and proliferation. Since defects in primary cilia are linked to many human diseases, we are interested in the effects of polyplody on ciliated neurons in *C. elegans*. We report our progress on producing and characterizing tetraploid *C. elegans*.

**Zebrafish, Genes, and Human Kidneys: Developing a Better Understanding of Polycystic Kidney Disease Using Zebrafish with Cystic Kidneys**
**Presenter:** Megan Schleusner
**Faculty Mentor/Collaborator:** Jamie Lyman Gingerich

Polycystic Kidney Disease (PKD) is one of the most common causes of end-stage kidney disease. A devastating disease that affects 12 million individuals worldwide, there is no known cure. By understanding how PKD develops and the molecular mechanisms leading to cyst formation, we can begin to develop strategies to alleviate symptoms. Previous work identified the *spinner* mutant zebrafish, which develop pronephric cysts and have a characteristic body curvature. In collaboration with the Ekker and Sussman labs at Mayo Clinic, we have used a genome editing approach in combination with analysis of gene expression to try to identify the causative gene. In addition, we present a literature review of known zebrafish cystic kidney mutants and a comparison to the *spinner*.

**Chemistry**

**Chemiluminescence Flow Analysis for Monitoring of Respirable Crystalline Silica**
**Presenters:** Ryan Meyer, Roy Cornett and Celine Liew
**Faculty Mentor/Collaborator:** James Boulter

We are developing a novel analytical method to quantify respirable, airborne silicon-containing particles. Analysis techniques for particulate silica currently meeting federal standards require that an 8-hour sample be collected by filter and analyzed offsite, potentially delaying silica quantification and any response to minimize negative health impacts of workers by days. In our research, we form heteropoly
acids (HPA) from silica and molybdate to react with luminol to produce light in a process known as chemiluminescence. To accomplish this, we are using Sequential Injection Analysis (SIA), in which adjoining layers of analytes and reagents are assembled into a flowing stream. The reaction occurs at the interface of these layers, which subsequently enter a flow cell monitored by a photomultiplier tube to quantify how much light is created in the reaction. We are working to establish a detection limit on the order of micrograms of silica per analysis and a range of linear response in our reaction.

**Designing Donor-Acceptor Complexes with the Potential to Change Structure in Different Phases**  
**Presenter:** Keisha Kappel  
**Faculty Mentor/Collaborator:** James Phillips

Our primary goal is to design donor-acceptor complexes with the potential to change the structure between gas-phase and solid-state or solution. In addition, for the purpose of exploring nanotechnology applications, we are exploring complexes with an overall geometry that places connecting bonds on opposite sides of a 5-coordinate metal. We are surveying a series of structures with quantum-chemical computations. (i.e., these are computer simulations of electron distribution and bonding). From these, we obtain equilibrium geometries, vibrational frequencies, and Ge-N potential energy curves (a relationship between the bond length between the N and Ge atoms and the binding energy of the complex). The general form of these structures is R-MX₃-N (R=CF₃; X=Cl, Br; M=Ge; N=NH₃, CH₃CN). For CF₃-GeCl₃-NH₃, the most stable geometry found was with NH₃ and CF₃ located in adjacent bonding sites. The structure with NH₃ and the CF₃ on opposite sides is slightly less stable. For CF₃-GeBr₃-NH₃, the most stable geometry found was with NH₃ and CF₃ bound on opposite sides, while the adjacent form was nearly as stable. Ge-N potential curves will also be discussed, as well as recent results on additional complexes currently under our consideration.

**Exploring the Effects of Monomer and Polymer Cosolutes on the Conformation of Escherichia coli Prolyl-tRNA Synthetase Using Intrinsic Tryptophan Fluorescence Spectroscopy**  
**Presenters:** Carl Fossum and Ben Johnson  
**Faculty Mentor/Collaborator:** Sudeep Bhattacharyay

In recent years the effects of molecular crowding on the structure, function, and dynamics of proteins have been studied extensively. While many studies are performed in dilute conditions, the intracellular environment can be simulated by including synthetic crowding agents in protein studies. In the present study, the effects of a few common synthetic molecular crowders on *Escherichia coli* prolyl-tRNA synthetase (Ec ProRS) are being investigated. Ec ProRS functions as a catalyst for the attachment of proline onto transfer ribonucleic acid and is vital for protein synthesis. The difference between synthetic polymers and their monomers relating to their effect on Ec ProRS’s structure, dynamics, and function is of interest. A polymer cosolutes could affect enzyme function mainly through excluded volume and hard interactions, while a monomer could employ soft, chemical interactions. To reveal these differences and understand the molecular mechanism of the crowding effect, Intrinsic Tryptophan Fluorescence Spectroscopy and Quantum Chemical calculations are being performed. Herein, the results of our studies will be presented.
First Steps for the Synthesis of a New Asymmetric Flexible Tridentate Pincer Ligand Featuring a Rigid Backbone

Presenters: Gorana Puzovic and Megan Wysocki
Faculty Mentor/Collaborator: Deidra Gerlach

Catalysts featuring a metal center with a unique ligand allow for basic chemical research. One of the most known and used types of ligand is tridentate pincer ligands, but a less-studied form is the flexible asymmetric tridentate pincer ligand. This type of pincer ligand allows for greater flexibility and more variation in rotation which provides for greater catalytic functions in the industry. This project aims to produce a flexible NNC ligand that will coordinate via two nitrogens and one carbene to a transition metal. The first step in developing this new flexible pincer ligand is to produce 1H-imidazole-1-methenamine for the pendant arm of the flexible pincer ligand. The synthesis began with the creation of 1H-imidazole-1-methanol, followed by the synthesis of 1-(chloromethyl)-1H-imidazole which helps in the formation of an N-substituted phthalimide. The amine is formed further through a Gabriel synthesis and primary amine using hydride, acid, and neutralization. After the successful synthesis of 1H-imidazole-1-methanol, steps are being taken to move forward with the synthesis of the 1-(chloromethyl)-1H-imidazole. The crystal structure of the alcohol precursor will be presented; this structure is being prepared for publication in the peer-reviewed journal *Acta Cryst E*. Further progress toward the synthesized 1H-imidazole-1-methenamine will be presented.

Impact of Oxidative Stress on the Binding of SARS-CoV-2 Spike Protein to Angiotensin-Converting Enzyme 2: A Molecular Dynamics Study

Presenters: Bethany Laatsch, Carl Fossum, Alex Narkiewicz-Jodko, Harrison Lowater, and Leo Lonzarich
Faculty Mentor/Collaborator(s): Sudeep Bhattacharyay and Sanchita Hati

The receptor-binding domain of the SARS-CoV-2 spike protein as well as the human cell surface receptor angiotensin-converting enzyme II (ACE2) contains several cysteine residues. These cysteine residues exist either in the form of disulfide bridges (oxidized) or as thiols (reduced). It has been shown that certain preexisting conditions, associated with high oxidation, such as diabetes, obesity, heart conditions, and age can put individuals at a higher risk of contracting COVID-19. Therefore, we hypothesized that the oxidized state of these proteins allows the virus bind more easily to the receptor. To test our hypothesis, we used molecular dynamics simulations to study the interacting residues at the binding interface of the complex formed by the receptor-binding domain of SARS-CoV-2 and the peptidase domain of ACE2. Four complexes of ACE2 and SARS-CoV-2 in different redox states were generated by either preserving the disulfides or reducing them to thiols. Molecular dynamics simulations were carried out for each protein complex over 200 ns timescale. The data suggests a change in solvation-free energies due to redox changes, demonstrating an impact on the binding affinity of the SARS-CoV-2 RBD towards the human ACE2 receptor protein.

Investigating the Effects of Molecular Crowding on Protein Structure using Atomic Force Microscopy

Presenters: Alex Narkiewicz-Jodko and Nathaniel Severson
Faculty Mentor/Collaborator: Sanchita Hati and Sudeep Bhattacharyay
To explore the structure-dynamics-function relationships in proteins, most studies are usually conducted in simple salt-buffer solutions, however, the interior of a cell is densely crowded. The concentration of macromolecular crowders such as proteins, nucleic acids, ribosomes, and lipids ranges between 100 and 450 g/L inside a cell. The crowded intracellular environment, entirely different from the dilute conditions used in in vitro studies, can cause crowding and confinement effects. Previous studies have shown molecular crowding can significantly influence protein stability and can induce changes in protein dynamics and function. In order to investigate the effects of these macromolecular crowders on protein structure, we employ the use of Atomic Force Microscopy or AFM. AFM uses a nanoscopic probe to tap the surface of a sample to create a topographical representation of it. By analyzing the topography of the samples of our protein of interest in the presence of different macromolecular crowders, we hope to draw conclusions as to how the nature of the protein and macromolecular crowders in the sample affect protein structure.

**Investigation of the Effects of Variable-Sized Poly(ethylene glycol) on the Conformation and Function of Prolyl-tRNA Synthetase Using Experimental and Computational Methods**

**Presenters:** Jessica Liebau and Bethany Laatsch  
**Faculty Mentor/Collaborator:** Sanchita Hati and Sudeep Bhattacharyay

Poly(ethylene glycol) (PEG) is a biocompatible, hydrophilic, flexible, non-toxic polyether commonly used in proteomics because it is widely regarded to be a biologically inert molecule. This includes PEG2000 (molecular weight of 2000g/mol), which is a component in the Pfizer-BioNTech COVID-19 vaccine. However, recent studies suggest that PEG may impact protein function, depending largely on the molecular weight of the PEG. In this study, we observe the effects of PEG on the enzyme prolyl-tRNA synthetase (ProRS). ProRS catalyzes the covalent attachment of proline to tRNAPro and thus is essential for protein biosynthesis. The molecular mechanism of PEG-protein interactions has been probed using enzyme kinetics, fluorescence spectroscopy, and molecular modeling. Herein, we present the results of our study.

**Ion Know Which Nafion is Better**

**Presenters:** Mai Yer Yang, Dani Lehto, Ethan Henseler, and Anna Claire  
**Faculty Mentor/Collaborator:** Krysti Knoche Gupta

The electrochemical analysis of lanthanide trifluoromethane sulfonates (triflates) using Nafion® EW 1100 and Nafion® 117 compares the two ion-exchange membranes. This contributes to the understanding of Nafion® film characteristics and the current knowledge of lanthanide group properties and electrochemical mechanisms. The cyclic voltammetry of this system reveals a complex and fascinating mechanism comprising at least two distinct reduction reactions as well as three oxidation reactions in the reverse direction. Part of the current theory to explain why this method allows observation of the three redox behavior of lanthanide triflates is Nafion® solubilizes the lanthanide compounds, possibly by replacement or equilibrium of a ligand with a sulfonate group. Experiments are conducted with bench top electrochemical cells using a three-electrode system involving the two kinds of Nafion® film modified platinum working electrode, silver/silver+ quasi-reference electrode, and platinum wire/mesh counter electrode. Our group predicts if the lanthanide triflate interacts with the ion exchange sites on the Nafion® membrane, the membrane with more sites will have a higher current density because there are more molecules near the film.
**Modeling Air Pollution Episodes at a Shoreline Lake Michigan Site**  
**Presenter:** Joe Tirado  
**Faculty Mentor/Collaborator:** Patricia Cleary

There are many atmospheric reactions that attribute to the levels of ozone in the troposphere. To better quantify ozone levels during a high ozone episode at a site, Chiwaukee Prairie, where our group sampled ozone via an Unmanned Aerial System (UAS) in June 2020. I am currently working with a box model on MATLAB that can compute ozone concentration from a defined source region in Chicago, IL. By using historic data sets, information such as HYSPLIT back trajectories, atmospheric profiles from the UAS, and ground-based monitoring data, we can compute how an air parcel produces ozone that arrives at Chiwaukee Prairie on a given day. Modeling ozone concentrations in the troposphere is important to understand how to improve the air quality, making it safer to breathe.

**Molecular Dynamics Simulation Studies of the Severe Acute Respiratory Syndrome Coronavirus 2 - Bound Angiotensin-Converting Enzyme 2: Insight into the Role of a Conserved Disulfide**  
**Presenters:** Alyssa Huelsbeck, Aspen Hatzenbeller, and Tiffany Heinzen  
**Faculty Mentor/Collaborator:** Sudeep Bhattacharyay

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is a pathogenic coronavirus in humans. Coronaviruses are large RNA viruses that contain spikey proteins on their surface, giving the appearance of a crown and the name coronavirus. These spike proteins, known as S-proteins, are glycoproteins and type-I transmembrane proteins. The spike contains a receptor-binding domain that functions by binding to the peptidase domain of the angiotensin-converting enzyme 2 (ACE2) receptor which is expressed in human lung, heart, kidney, and intestinal cells. For this reason, it is of critical significance to understand the structure of these proteins and the ACE2 host cell receptor they bind to, as well as the mechanism of virus entry into the host cell. The binding and entry of the viral protein are also impacted by the thiol-disulfide balance on the cell surface. In the present study, the disulfide linkage C480-C488, located close to the binding surface, has been probed by either converting them to thiols or by mutating both cysteines to alanine. The effect of these alterations on structure, key interactions, and protein motions were probed by using long-duration molecular dynamics simulations on a GPU-based Blugold high-performance computing cluster. The results of these simulations will be presented.

**Observations of a Shallow Inversion Layer in a Shoreline Lake Michigan Environment Using Meteorological Measurements on an Unmanned Aerial System**  
**Presenter:** Ben Kies  
**Faculty Mentor/Collaborator:** Patricia Cleary

The lower atmosphere is typically well-mixed during the daytime because the earth's atmosphere is heated by solar heating warming up the ground or ocean surfaces. Inversions in the atmosphere in the daytime, where warmer air lies above colder air, restrict this mixing and can allow for pollutants to build up. From June 15th-19th 2020, an unmanned aerial system (UAS) equipped with a meteorological sensor and an ozone sensor was flown to measure atmospheric vertical profiles in both the early morning and early afternoon at the Chiwaukee Prairie State Natural Area shoreline site in Southeastern Wisconsin. The iMet-XQ2 meteorological sensor was used to measure temperature, humidity, and altitude data from the UAS flights. This data was used to identify air mass inversions as low as 40 m AGL, indicating
marine air influence overhead. The data was also compared to the calculated saturated adiabatic lapse rate and used to better understand vertical gradients in ozone concentrations.

**Physical Shock Induced Triboluminescence for Monitoring of Respirable Crystalline Silica**

**Presenter: Roy Cornett**

**Faculty Mentor/Collaborator: James Boulter**

This project objective is to explore an innovative method for the detection of respirable crystalline silica. The development of faster monitoring methods has the potential to reduce the risk of workers getting silicosis by offering a significant improvement in response time over conventional methods. Many crystalline materials emit light when subjected to physical shocks, a phenomenon known as triboluminescence (TL). It is well documented that crystalline silica exhibits TL under certain conditions. There are extensive studies exploring the mechanism behind TL, but it is not frequently used for the identification or quantification of materials. The proposed instrument uses an impactor to deliver a physical shock to the sample and quantitatively measures the light produced by the collision using a photomultiplier tube. The project is focused on determining the optimal settings to trigger TL in the samples by varying the mass and velocity of the impactor as well as the type of analyte. After proof of concept is established the instrument could be miniaturized and tested in the field.

**Raman Spectroscopy as a Diagnostic Technique to Identify Cancer-Specific Biomarkers**

**Presenters: Cailin McCracken and Harrison Lowater**

**Faculty Mentor/Collaborator: Sanchita Hati**

Cancer now tops heart disease as the number one cause of death in the United States [1] and is the second leading cause of death globally, accounting for an estimated 9.6 million deaths in 2018 [2]. There is an urgent need for developing rapid, highly accurate, and non-invasive tools for cancer screening and early detection. High costs and radiation exposure resulting from current techniques like computed tomography (CT) and magnetic resonance imaging (MRI) restrict their use for screening [3]. To address these shortcomings, we plan to use Surface Enhanced Raman Spectroscopy (SERS) to identify cancer biomarkers in human saliva samples as an efficient, cheap, non-invasive method of cancer screening [4]. Raman spectroscopy is reliable when analyzing biofluids because of its ability to provide reliable data in the presence of water. SERS works by inelastically scattering light that interacts with molecular vibrations in the sample to produce characteristic Raman Shift (cm⁻¹) for every molecule present. In contrast to regular Raman, SERS utilizes nanoparticles to enhance the intensity of the Raman signal by a significant order. Saliva will be collected from cancer patients as well as healthy individuals that will serve as a control group for SERS experiments. The dysregulation of enzymes in the Citric Acid Cycle has been associated with cancer growth and proliferation [5-7]. We plan to detect these enzymatic dysregulations by analyzing and quantifying metabolites (enzymatic substrate and product) present in saliva samples of normal and cancer patients. Three commonly dysregulated TCA enzymes that have been linked to cancer development are succinate dehydrogenase (SDH), fumarate hydratase (FH), and isocitrate dehydrogenase (IDH) [8] that convert succinate to fumarate using FAD⁺, fumarate to malate, and isocitrate to alpha-ketoglutarate respectively. These metabolites, as well as many others, are therefore of interest.
**Role of a Conserved Disulfide on the Interactions between Severe Acute Respiratory Syndrome Coronavirus 2 and Angiotensin-Converting Enzyme 2**

**Presenters:** Gavin Walk and Noah Titera  
**Faculty Mentor/Collaborator:** Sudeep Bhattacharyay and Sanchita Hati

Coronaviruses are large, positive-strand RNA viruses capable of infecting an array of mammalian and avian species. They possess densely glycosylated spike-shaped proteins on their surfaces. The receptor-binding domain (RBD) of the spike protein specifically recognizes and binds to the extracellular peptidase domain of the human angiotensin-converted enzyme 2 (ACE2) with high affinity. There is evidence to suggest that entry of viral glycoprotein is affected by the thiol-disulfide balance on the cell surface and disrupting this can prevent coronaviruses from infecting the host cell. Both the RBD and ACE2 contain cystine residues, and the existence of disulfide bridges within them has been established when the species are under oxidative stress. It has also been established that the complete reduction of these disulfide bridges to sulfhydryl groups completely impairs the ability of the RBD to bind to ACE2. However, it is still unknown how each individual disulfide bridge impacts binding. In the hope to gain an insight into a possible mechanism of disrupting the virus’s life cycle, the disulfide bridge between residues C344 and C361 in ACE2 were probed using molecular dynamics simulations. Results of these computational analyses on structure, dynamics, and protein-protein interactions will be presented.

**Structural and Energetic Properties of HX-O Complexes**

**Presenter:** Diego Lowney  
**Faculty Mentor/Collaborator:** James Phillips

The Phillips lab focuses on investigating chemical systems that show the potential to undergo structural changes in condensed-phase media. I am exploring these questions in a series of HX-B complexes (X=Cl, Br; B= acetone, methanol, dimethyl ether, and water) as well as assessing the matrix effect on the hydrogen bond strength, by observing the frequency of the H-X stretch in solid argon, neon, and nitrogen. For this project, I am investigating the hydrogen-bonded complexes, with the specific questions ‘do any oxygen donor- hydrogen-halide complexes exhibit partial proton?’ and ‘what is the extent to which a “matrix” (solid argon, neon, and nitrogen) enhances hydrogen bond strength?’. In addition, I will predict structures, frequencies, and bond energies using quantum-chemical computations. At this point, we have a nearly complete set of computational results, and will likely have some preliminary experiential results to share as well.

**Study of Small Molecules Binding to Xanthine Oxidase**

**Presenter:** Keng Chang  
**Faculty Mentor/Collaborator:** Thao Yang

In this project, we study the binding of small molecules to xanthine oxidase (XOD). The molecules have a similar skeletal structure to that of the purine ring with different peripheral atoms or groups. We will present the binding results of 4-Amino-1H-pyrazolo[3,4-d] pyrimidine-6-ol (APP6O). We performed ligand-protein docking using the free Autodock software and carried out a binding study in solution by Saturation Transferred Difference NMR technique. XOD is an enzyme found in the human serum and organs (e.g., lung, liver). The normal function of XOD is the oxidation of hypoxanthine to xanthine, then to uric acid. High activity of XOD can lead to the disease gout, which is caused by the buildup of a high level of uric acid in the blood. Molecules that can bind to XOD are potential inhibitors, which could be developed as possible remedies for treating gout symptoms. The results of interactions between the
docked molecule and side chain groups and the affinity energies were evaluated compared to the known binding of uric acid and allopurinol to XOD. Both the computer docking results and NMR results showed that the APP6O molecule binds to XOD.

**Synthesis of Pyran-4-one from Organic Precursor 4-oxo-4H-pyran-2,6-Dicarboxylic Acid**  
**Presenter: Devon Hucek**  
**Faculty Mentor/Collaborator: Stephen Drucker**

Pyran-4-one (γ-pyrone (C₅H₄O₂)), a conjugated enone, is a molecule of interest in the laser spectroscopy studies conducted in our lab. Spectroscopic parameters of the molecule’s electronic structure serve to test excited-state computational methods. However, γ-pyrone comes at a high cost from commercial sources and can be synthesized from precursor molecule 4-oxo-4H-pyran-2,6-dicarboxylic acid (chelidonic acid,(C₇H₄O₆)). Our goal is to synthesize quality samples of pyrone that are fit for use in our spectroscopic studies. We have followed a patented procedure for the synthesis of chelidonic acid, which involves a condensation followed by neutralization and an extensive reflux process. The resulting product is then decarboxylated via reflux to make pyrone. This mixture is then worked up to isolate a pyrone/water solution. Pyrone has a high affinity for water and is stored in a desiccator until crystals form. We have successfully characterized both chelidonic acid and pyrone via H-NMR and IR spectroscopy, and after successful crystallization, the resulting pyrone is deemed pure enough to use in our laser spectroscopic studies.

**Synthesis of Tridentate (PCN) Ligands for the Development of Organometallic Catalysts**  
**Presenters: Cole Birch and Connor Dolan**  
**Faculty Mentor/Collaborator: Deidra Gerlach**

Catalysis plays a great role in the world today with one of the most prominent industries being the polymers industry. Linear alpha olefins (LAO’s) are short to long-chain carbon molecules whose uses range from plastics to motor oils to synthetic lubricants. This project aims to develop a ligand that can direct a metal complex to selectively catalyze the formation of lucrative short-chain linear alpha olefins from ethylene. The target ligand is a tridentate ligand that uses phosphorous, carbon, and nitrogen to bind to the transition metal of choice and features a benzimidazole backbone. This ligand design is a continuation of research initiated in Dr. Carney’s group at UWEC. After the synthesis and characterization of this ligand, the obtained organometallic complex is anticipated to function as an effective catalyst. Presented here are the first synthetic steps of this project to obtain the free pre-ligand. This synthesis utilizes a combination of open-to-air and air-sensitive techniques. Future work is planned to complete the synthesis of the metal complex and test the catalytic ability for the selectivity of the desired LAO’s.

**The Intersection of Experiment and Theory in Understanding Excited-State Molecular Structures**  
**Presenters: Sean Parsons and Devon Hucek**  
**Faculty Mentor/Collaborator: Stephen Drucker**

A fundamental scientific goal is to develop models so scientists can make predictions about how the natural world behaves. The relationship between mathematical predictions and experimental observations
is at the heart of science, as experimental observations inform model development. While chemists have developed models able to make accurate predictions for the structural characteristics of ground-state molecules, excited-state molecules still pose a challenge. Chemists want to understand the reactivity of excited-state molecules, but this first requires knowing the excited-state structure. Our work specifically focuses on comparing structural predictions versus experimental observations for the excited states of four cyclic enone molecules: cyclohexenone (CHO), cyclopentenone (CPO), cyclopentenedione (CPD), and γ-pyrone. We tested the ability of time-dependent density functional theory (TDDFT) to predict the vibrational frequencies of these four molecules. We accomplished this by varying mathematical parameters—the functional and basis set—to see when TDDFT succeeds in matching experimental values and when it fails. TDDFT is less resource-intensive than computational ab initio methods, and so it is widely used for predictions. However, the quality of these predictions can vary. We conclude that the PBE0 functional performs consistently the best compared to B3LYP, BLYP, and PBE, regardless of the four molecules studied, S1/T1 excitation state, and basis set choice. Notably, PBE0, unlike the other functionals, avoids significant errors with basis set augmentation. This observation matters as basis set augmentation is a frequent practice when dealing with excited states, but we observed it can cause significant errors if not carefully applied to the calculation of excited-state frequencies. Additionally, we shall present our experimental efforts to obtain the structural characteristics of excited-state γ-pyrone using jet-cooled phosphorescence excitation spectroscopy.

**Understanding the Lake Breeze Front in Eastern Wisconsin Through Remote Sensing and Aircraft Measurements**

*Presenter: Caitlin Hedberg  
Faculty Mentor/Collaborator: Patricia Cleary*

The lake breeze is a meteorological phenomenon that factors into the air quality near the shorelines of Lake Michigan with significant impacts in studies of meteorology, chemistry, atmospheric physics, and more. Using high-resolution radar imagery of base reflectivity on days with ozone levels greater than 70ppb, we were able to categorize near-shore and inland lake breeze events from ground-based monitoring data sets, to better quantify the correlation between lake breeze events with ozone episodes. During the Lake Michigan Ozone Study of 2017, an aircraft flew spirals above and within the marine inversion layer. One such day captured spirals above the lake breeze front at a shoreline site, with unique signatures of small spatial gradients in ozone and wind direction in the spiral. We intend to use the data collected from the aircraft platform to understand the low altitude meteorology and air quality relationships near this lake breeze front.

**Understanding Topography and Near-shore Gradients in Ozone at the Lake Michigan Shoreline**

*Presenter: Aidan Voon  
Faculty Mentor/Collaborator: Patricia Cleary*

Surface ozone is generated by photochemical production in a stable atmosphere which can be affected by a multitude of factors. We are looking at the correlation between topography, lake breeze extent, and ozone gradients in the shoreline environment of Lake Michigan. Typically, the high ozone events in shoreline areas of Lake Michigan are due to the shallow marine inversion layer containing higher ozone concentrations. Currently, I am working on getting geospatial and monitoring data from the WiDNR and historic data from mobile measurements during the Lake Michigan Ozone Study 2017. Then, I will explore if there is a relationship between the topography of the areas of steep shoreline gradients in ozone.
Communication and Journalism

Adapting and Adopting New Technologies During the COVID-19 Pandemic

Presenters: Mary Kittridge, Morgan Peleschak, Shayla Stewart, and Nic Zakrzewski

Faculty Mentor/Collaborator(s): Pete Knutson and Kris Knutson

In response to the COVID-19 outbreak, universities across the globe have had to adapt the ways that they do business; one major change was moving classes online or into online and in-person hybrid configurations. We are engaging in this research study to better understand how students have adapted to and adopted modern technologies during the COVID-19 pandemic. Additionally, we seek to understand why they have chosen to use these technologies in the ways that they have. Sensemaking is the process by which people interact with others to make sense of their experiences (Weick, 1995). To understand how university students make sense of rapid changes in how they receive their education, we will conduct focus groups with 4-5 participants. We will utilize thematic analysis techniques to identify central themes in participant answers. We expect our participants will highlight a series of challenges and opportunities that students experience in the virtual classroom. We hope these qualitative responses will be informative to the University faculty, staff, and administrators as they consider how to utilize modern technologies in a post-COVID classroom.

Assessing Community Needs Through the Perspectives of Non-Profit Leaders in Eau Claire, Wisconsin

Presenters: Oscar Sexauer, Maddie Loeffler, and Emily Skoog

Faculty Mentor/Collaborator(s): Ellen Mahaffy, Pamela Forman, and Karen Mumford

The City of Eau Claire faces a diverse set of issues that affect the quality of life of residents. Problems like poverty, hunger, and ecosystem damage represent just a few of these challenges. Critical to improving community quality of life is identifying and then prioritizing the key community issues so that resources can be directed to address them. To assist the City of Eau Claire in identifying key issues, we conducted a community needs assessment through interviews with local non-profit leaders. We chose a stratified pilot sample of 12 organizations from a list of over 100 non-profit organizations across multiple sectors (community engagement; environmental; health and wellness; equity and inclusivity; social services; and youth). Following our transcriptions of the interviews with community leaders, a qualitative analysis has pointed to issues with infrastructures such as transportation, sustainability, and class and racial inequities. In addition, we identified the ways that these issues impacted sub-groups in Eau Claire and how these issues should be addressed.

Changing at the Drop of a Hat: The Effects of College Student Personality and Technological Self-Efficacy on Anxiety with Utilizing New Technologies

Presenters: Jordan Vlasak, Morgan Willey, Sage Leary, and Ireland Mcabee-Thomas

Faculty Mentor/Collaborator(s): Kris Knutson and Pete Knutson

When Covid-19 started spreading across the world, organizations and schools were forced to quickly switch to online platforms. Individuals were left to cope with varying approaches to using tools such as cameras, microphones, and group chats. This led us to wonder, how do an individual’s personality traits (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism) and their perceptions of
technological self-efficacy affect their anxiety with utilizing new technology and using specific software features. Personality is a core element of human nature and plays a vital role in how we react to situations and interact with others. Self-efficacy is one’s belief in their ability to succeed in a given situation. When it comes to technology many people experience anxiety when learning new software. Utilizing a survey design, we will investigate the relationships between personality, technological self-efficacy, and anxiety in college students in the United States. We expect personality variables, specifically openness and extraversion, will have a significant effect on individuals’ levels of technological anxiety such that those with lower extraversion will have higher anxiety and those with higher openness will have lower anxiety; self-efficacy will mediate these relationships.

**COVID-19 Messaging Strategies to University Students and Staff**  
**Presenters:** Molly Cianchette, Luke Schowalter, Stephanie Cox, and Maddy Neubauer  
**Faculty Mentor/Collaborator(s):** Pete Knutson and Kris Knutson

During the COVID-19 pandemic, organizations, specifically universities, have had to reimagine how they communicate with their stakeholders. Students, faculty, staff, and alumni want to know how universities are adapting to the pandemic and what their processes for keeping people safe are. To that end, we set out to analyze the messaging of universities across the UW-System to understand what messages they communicated to stakeholders, how universities developed policies for conducting multiple instructional methods (e.g., in-person, hybrid, online, etc.), how university messaging followed (or didn’t follow) CDC guidance, and how those messages were received by their audiences. Using rhetorical criticism and applying organizational crisis communication theory, we expect to see that messages that were sent out across the UW System were uniform. We are interested in whether those university messages align with CDC guidance and messaging. Our analysis will also examine how the university’s messaging changed as CDC guidance and community spread fluctuated.

**Fostering Communication: A Look into the Communication Patterns in Foster Family Units**  
**Presenter:** Elie Zimmerman  
**Faculty Mentor/Collaborator:** Nicole Schultz

Communication is crucial to how individuals interact with others. Communication theories have been developed to help researchers study these patterns effectively, and the structuration theory by Anthony Giddens in particular allows researchers to notice rules and norms created by communication. Within familial units, different dynamics are present in the way members communicate. Research has been conducted to analyze how and why families communicate in the ways that they do. Through foster care, many families have non-biological and/or temporary members. The experience of foster parents, foster children, and social workers has an impact on how they communicate with each other. This study aims to analyze the communication patterns of foster parents specifically by interviewing various individuals about personal experiences. How do foster parents communicate with social workers and vice versa? How does this communication outside of the home affect the foster care experience inside the home? Findings of this study identify patterns in communication and give foster parents resources to better communicate about their foster children and with their foster children.
International Media Framing of Current Territorial Disputes in the Asia-Pacific Region, 2017-2020
Presenter: Lauren Spierings
Faculty Mentor/Collaborator: Won Jang

The Asia-Pacific region has been an area of interest for propaganda scholars. South Korea, Japan, and China have been locked in a territorial dispute over the islands since the end of World War II in the Asia-Pacific region. The dispute is significant and unique in that it involves three U.S. allies and partners placing Washington in an uncomfortable position. U.S policy has long been that it takes no position on sovereignty and abide by any negotiated resolution of the dispute. This study examines the framing of the issue by global international news agencies. Specifically, the study identifies the persistence of news frames cross-nationally and examines influences shaping the coverage by analyzing the international news agencies’ coverage of current debates surrounding the issue. This study is noteworthy and has the potential to contribute to propaganda studies based on the context in which it is taking place.

Unmet Expectations: College Students’ Discussions of “Loss” and Coping During the COVID-19 Pandemic
Presenters: Shelby Purves, Morgan Meyer, Alicia Steiner, and Heng Jin Ying
Faculty Mentor/Collaborator(s): Pete Knutson and Kris Knutson

The COVID-19 pandemic has required unprecedented changes for university students across the world. The college experience is seen as a rite of passage in the United States. Many incoming students have expectations for this time, often influenced by social media, movies, books, family, and friends. The pandemic has necessitated that students adjust their expectations. These observations have led us to ask, what do college students perceive they have “lost” due to COVID-19 related changes, and how have students coped with those “losses”? We know that people break rules in situations when they feel deindividualized (Le Bon, 1895). We aim to apply these observations to current experiences that college students are having. To answer this question, we will conduct a minimum of ten 30-minute one-on-one interviews with college students at the University of Wisconsin – Eau Claire. Using thematic analysis techniques, we will illuminate the central themes of loss and coping students articulate. We expect that students will talk about the ways that they have broken regulations and the motivations behind their behavior. We hope to better understand how students have dealt with the COVID-19 pandemic and created for themselves their desired college experiences despite the pandemic’s effects.

Communication Sciences and Disorders
Connecting Student Twitter Discussion Posts to Aphasia Course Learning Outcomes
Presenters: Brooke Anderson and Faith Tullar
Faculty Mentor/Collaborator(s): Thomas Sather and Lesley Mayne

This project investigates graduate student perceptions of Twitter use in an online aphasia course. Twitter may be an effective pedagogical strategy to support learning within, and outside, the classroom. It can provide opportunities for students to explore course-based material and facilitate discussion. As part of the course-based assignments, students posted Twitter relics quarterly to discussion boards within Canvas. A majority of our past quantitative data show student perceptions support Twitter as an effective learning strategy. In this qualitative portion of the study, these Twitter relics were coded a priori using
course learning outcomes. Key ideas from the shared Twitter relics were connected to course outcomes related to anatomical and neurological characteristics of aphasia, assessments, communication partner strategies, and the impact of aphasia on participation, language, identity, and the environment. Implications for Twitter use as a pedagogical strategy to reinforce course learning outcomes will be discussed.

**Do Students Develop Empathy by Changing Their Speech: A Qualitative Analysis of Simulated Stuttering Assignments**  
**Presenters:** Bailey Harding and Annika Kornmann  
**Faculty Mentor/Collaborator:** Bryan Brown

The overall goal of this research is to determine if a stuttering simulation project develops empathy in undergraduate students enrolled in a Fluency Disorders Course in the Communication Sciences and Disorders department at UWEC. Disability simulation is common across various allied-health professions, however, there is conflicting research regarding the efficacy of simulated stuttering, which fluency disorders instructors frequently require. The intent of this project is to determine the cognitive and environmental effects of a stuttering simulation project on students’ empathetic clinical skills in contrast with a project not requiring disability simulation. Students either simulated stuttering or avoided words beginning with particular sounds, then wrote a reflection. Reflections were analyzed using a phenomenological qualitative approach to identify themes and subthemes related to the experience of this changing speech project. Data analysis is ongoing and will be completed shortly. Preliminary conclusions suggest that empathy development was not a uniform feature of simulated stuttering or sound avoidance. In the presentation, this will be tied to previous presentations reporting quantitative data, which tells a similar story.

**Faculty Perspectives in Teaching Cultural Competence in Communication Sciences and Disorders**  
**Presenters:** Morgan Mertig and Mal Kelly  
**Faculty Mentor/Collaborator:** Abby Hemmerich

Faculty in Communication Sciences and Disorders (CSD) support student growth in academic and clinical knowledge and skills, but they should also be providing exposure to aspects of cultural and linguistic diversity. Development of cultural competence, as well as skills for supporting lifelong learning about cultural and linguistic diversity, should be infused early and often. To better understand this complex content area and the challenges associated with an effective pedagogy, faculty participated in a focus group. Discussion centered around faculty preparedness and self-efficacy for best practices for teaching and learning cultural competence in the CSD field. Qualitative results will discuss the importance of authentic experiences while developing and building on one’s cultural competence. Results also yielded examples of current practices used to teach about multiculturalism in CSD, as well as discussions of how this can be improved in the future. Implications of these findings may identify changes to curriculum and/or development of future experiences for students in immersion or other authentically diverse settings.

**Interpreters Working with People with Aphasia**  
**Presenter:** Summer Marske  
**Faculty Mentor/Collaborator:** Thomas Sather
The purpose of this project is to present best practice summaries for interpreters working with people with aphasia, in order to support equitable aphasia service delivery. Aphasia is a language disorder that can affect language comprehension and expression, reading, and writing. For individuals with aphasia who are multilingual, aphasia can impact their native language as well as non-native languages. The majority of speech-language pathologists in the United States are monolingual English speakers. Therefore, the use of an interpreter is essential for bridging linguistic barriers between the clinician and client. The language difficulties inherent in aphasia present a unique set of challenges for the interpreter, the clinician, and the patient. An interpreter with a strong understanding of aphasia would be more likely to provide effective interpretation. This poster provides suggested best practices to improve the interpretation process throughout services for people with aphasia. Examples of implementing these practices with individuals with aphasia will be discussed. This content is applicable to both practitioners and interpreters working with individuals with aphasia.

**Student Perceptions of Text versus Video Feedback on an Asynchronous Discussion Forum**

**Presenters:** Rachel Meyer, Nicole Weiss, and Gabriela Zepeda  
**Faculty Mentor/Collaborator(s):** Abby Hemmerich and Thomas Sather

Online asynchronous courses can leave students feeling isolated. In a previous study examining audio-video discussion responses, researchers concluded that audio-video discussion responses enhance a sense of connectedness between students in online programs (Denson & Shurts, 2020). The purpose of this study is to gain perspectives on students' experience of text and video instructor feedback to their team discussions in an online asynchronous undergraduate course. The class was assigned to discussion teams; teams were counterbalanced to experience two units with video feedback and two units with text feedback from instructors. After exposure to both types of feedback, student perspectives were collected via a survey in which a Community of Inquiry framework was embedded. Results gathered will be related to which type of feedback the students found most beneficial to their learning and engagement with the instructor. Implications for instructors will include benefits and challenges of various modalities for discussion feedback in an online format.

**Student Perspectives on Cultural Competence Education within the Communication Sciences and Disorders Major**

**Presenters:** Maggie McKernan and Madison Feld  
**Faculty Mentor/Collaborator:** Abby Hemmerich

Students in Communication Sciences and Disorders (CSD) often report insufficient cultural competence after graduation, as they enter a field that serves vastly diverse populations. The student perspective is important for understanding cultural competence knowledge, preparedness, and training provided within the major. A survey of UWEC CSD students’ perspectives on cultural competence education was used. The survey consisted of questions based on Green (2015), along with questions authored by the research team. Demographic information, knowledge of cultural content, perceptions of courses’ inclusion of cultural competence lessons, and overall perceptions of cultural competence within the CSD major were included. Quantitative data showed that cultural competence content was prevalent in language-based CSD courses but was lacking or less obvious in science-based courses. Qualitative data showed wide ranges of cultural competence awareness and understanding across the freshman through graduate student participants. Based on student recommendations, increasing cultural competence training within the CSD major could include more diverse case studies in science courses along with more detailed discussions of
cultural competence within class lectures. Students highly valued learning about various cultural and linguistic perspectives, but there is room for much more training to be added.

**Computer Sciences**

*Identification of DNA Methylation Markers using Feature Selection and Deep Learning*

**Presenters:** Aaron Huber, Rick Jansen, and Nijhum Paul  
**Faculty Mentor/Collaborator:** Rahul Gomes

DNA methylation involves adding a methyl group to the Cytosines in the DNA and it plays a crucial role in gene expression. The study of DNA methylation is important in cancer detection due to its role in silencing tumor suppressor genes or enhancing oncogenes expression. Methylation data can be generated using high throughput sequencing techniques where a single donor can have up to 850,000 methylation markers (CpGs) across the human genome. Given the high ratio of markers to samples in these cancer datasets, it is necessary to filter markers to reduce dimensionality. In this research, we implement a novel feature selection algorithm to identify breast cancer-specific CpGs using the publicly available Cancer Genome Atlas Program (TCGA) datasets. The feature selection stage utilizes several classification and clustering algorithms that are able to select a subset of methylation markers that contribute towards gene expression from an Illumina 450K array. We then implement a Convolutional Neural Network to develop a diagnostic prediction model for cancer detection. Our goal is to develop a workflow that can apply to other datasets or cancer types. Our implementation will make the process both scalable and accurate for representing non-linear relationships in these datasets.

*Mining Opinions from Technical Discussions in Software Engineering*

**Presenters:** Jiang Zhu and Oliver Mahan  
**Faculty Mentor/Collaborator:** Rakib Islam

Discussions of experienced software engineers in various social forums (e.g., Stack Overflow) become valuable information for other software engineers to perform software development activities. These discussions centered around software-specific entities (e.g., tools, libraries, and APIs) where software engineers provide their opinions on the various aspects (e.g., bug, performance, and security) of the entities. Such opinions are often embedded with sentiments (i.e., positive or negative) that play crucial roles to a considerable degree in the perceptions of other software engineers about those entities. Those perceptions influence the choices they make about whether and how they should use those entities for software development. However, given the plethora of information posted in unstructured formats in technical social forums, it is a challenging task for a software engineer to mine those opinions manually and make informed decisions about entities. Here, we envision an automated software system that will mine the technical discussions from the unstructured content of social forums and generate opinions on the various aspects of the entities.

*Optimizing Deep Learning Architectures for Remote Sensing Image Analysis*

**Presenters:** Pavithra Mohan and Matt Dewitte  
**Faculty Mentor/Collaborator(s):** Rahul Gomes and Papia Rozario
Deep Learning tools have become very efficient in high-resolution image analysis compared to traditional classification models. One such example is the implementation of semantic segmentation using a Convolutional Neural Network (CNN). Unlike image labeling, where an image is classified into one label, we can use semantic segmentation to identify the class labels of every pixel in an image. This makes CNN an ideal tool for Land Use Land Cover (LULC) modeling. One drawback of CNN is that its deployment requires a lot of computing resources compared to traditional classification models. This project attempts to create a deep learning architecture by reducing complex mathematical operations that plague the deployment of CNN in resource-constrained environments. Preliminary results indicate that there is a potential to achieve higher accuracy by using optimized kernel variants along with pre-trained weights and variable dilation rates. The proposed model will be trained using the Potsdam dataset and Vaihingen dataset obtained from the International Society for Photogrammetry and Remote Sensing (ISPRS). Using the concept of transfer learning, the trained model will be used to assess the LULC change dynamics for the lower Chippewa Valley watershed region in Wisconsin.

Criminal Justice

*Philosophy in Community-Oriented Policing: What Are The Most Important Features?*

**Presenters:** Anna Green  
**Faculty Mentor/Collaborator:** Ming-Li Hsieh

Given there are discrepancies about the philosophy of Community Oriented Policing (COP) in implementation and operations across jurisdictions, the current research project aims to identify the main components in defining COP. Therefore, this study attempts to address this objective by using a systematic literature review approach. Twenty peer-reviewed research articles have been selected and compiled a score for each domain (e.g., decentralization, geographically defined, close interactions with local communities, outcome measurement). Preliminary findings suggested that several attributes are influential including problem-solving policing, cooperation, overall police performance, use of local knowledge, community input, and conversation. These components indicate key aspects to the definition of COP. Police departments that do not embody these components should not claim they have adopted COP in everyday policing.

CVTC

*Mental Health*

**Presenter:** Anna M Boschen  
**Faculty Mentor:** Franki Larrabee

*Individuality*

**Presenter:** Joshua Christopher Larson  
**Faculty Mentor:** Franki Larrabee

*Technology and Sleep*

**Presenter:** Courtney Marie Sieg  
**Faculty Mentor:** Franki Larrabee

*Wellbeing/COVID*

**Presenter:** Kendra J Buchholz
Faculty Mentor: Franki Larrabee

**Punishment or Rehabilitation**  
Presenter: Austyn M. Kleinhans  
Faculty Mentor: Franki Larrabee

**Gaming**  
Presenter: Miah T. Renteria  
Faculty Mentor: Franki Larrabee

**COVID**  
Presenter: Savannah P. Topper  
Faculty Mentor: Franki Larrabee

**Social Media Pressures**  
Presenter: Jacob K. Wagenknecht  
Faculty Mentor: Franki Larrabee

**Impact of Music**  
Presenter: Jacob Holden  
Faculty Mentor: Franki Larrabee

**Dreams**  
Presenter: Brittany J. Klatt  
Faculty Mentor: Franki Larrabee

**Mask Wearing**  
Presenter: John G. Whaley  
Faculty Mentor: Franki Larrabee

**COVID Impact on Mental Health**  
Presenter: Maggie M. Cracker  
Faculty Mentor: Franki Larrabee

**COVID**  
Presenter: Rayna R. Lemke  
Faculty Mentor: Franki Larrabee

**Stress**  
Presenter: Abby R. Stark  
Faculty Mentor: Franki Larrabee

**Benefits of Pets**
This project aimed to increase the understanding of cultural competence in health care as the U.S. becomes more diverse. Having cultural competence is essential in health care to help eliminate disparities and ensure quality care for minoritized individuals. To explore this topic, virtual interviews were conducted with 12 health care professionals from the same facility. Semi-structured interview questions examined how these individuals define and apply cultural competence in their practices. Participants also reflected on their cultural competency training and access to resources to improve their practice. Analysis of the results revealed that participants used similar phrases to define cultural competence. Many of these phrases included “cultural knowledge”, “cultural awareness”, and being “individualized to the patient”. Participants also shared that applying cultural competence is an “ongoing learning process”, requires the “desire to learn and understand” and involves asking their patients questions. Potential areas for improvement were revealed, including cultural competence education from Computer Based Trainings (CBTs) and in the hiring process, as well as transgender education. This study has the potential to provide valuable knowledge of health care professionals’ understanding and application of cultural competence and lead to improvements at this healthcare facility.

In U.S. P-12 classrooms, HMoob culture, language, and history are often not taught and thus silenced. With the curriculum focusing on a monolingual White perspective, HMoob American students are
disconnected from schools that do not resonate with their lived experiences. By centralizing the experiences and narratives of HMoob Americans, all students would be enriched and, particularly, HMoob American students would be validated. The following research question will be examined: What impact does integrating HMoob language, culture, and social justice curriculum have for middle and high school HMoob Americans? This research focuses on an out-of-school summer youth program that implements HMoob culture, history, and language as well as engages in social justice actions. I will examine about 93 student reflections from the 2015 to 2019 programming years. My expected outcomes are to examine the effects of culturally relevant teaching, the growth of self-identity, their social justice awareness, and their motivation to attend higher education. In doing so, we will explore how such programming could be implemented and connected with P-12 schools.

**Examining Speech Assessment Tools for Bilingual Latinx Students**
**Presenter: Sarah Wilke**
**Faculty Mentor/Collaborator: Nga-Wing Anjela Wong**

With the number of Latinx students continuing to rise in U.S. schools, it is imperative that speech-language pathologists (SLPs) are well-prepared to work with their students; especially in presence of a lingual supremacy system. The mismatch between the proportion of bilingual Latinx students and the amount of eligible SLPs creates an inequitable environment. Inequities often lead to misdiagnosis; resulting in both academic and cultural ramifications. To mitigate this, the following research question will be examined: What speech assessment tools are SLPs in a local school district implementing to evaluate bilingual Latinx students? The literature points to SLPs not utilizing appropriate assessments due to a lack of access or training. Thus, this project has two aims: 1) to analyze a local school district’s assessment materials when evaluating bilingual Latinx students’ speech and 2) to inform SLPs on what assessments are available in order to better support the needs of their clients. An initial survey will be used to reveal what assessment techniques are currently being implemented. Additionally, focus groups will be conducted to share and discuss culturally relevant resources. In doing so, the lingual hierarchy that permeates into United States society can be alleviated.

**English**

**An Ecocritical Look at Orson Scott Card’s Ender’s Game**
**Presenter: Leah Woodward**
**Faculty Mentor/Collaborator: Frank Fucile**

Ecocriticism uses the growing realization that humanity is just one part of an interconnected ecosystem as a tool to analyze literary representations of the environment. This less anthropocentric perspective on the world around us encourages readers and scholars to better understand the place of human beings in the universe. Ecocriticism thus offers insights into works of science fiction—a genre often concerned with that very question. Orson Scott Card’s award-winning 1985 novel Ender’s Game considers the devastating consequences of humanity’s destructive tendencies when turned toward an alien species that they know nothing about. In the process, it offers commentary on the dangers of anthropocentrism and encourages a new, more empathetic way of viewing the organisms that humanity shares this universe with. By analyzing the ways that Ender and his siblings interact with their environment in contrast to how the militaristic government encourages them to interact with it, this essay will show that Ender’s Game ultimately promotes an anti-anthropocentric view. Crucially, Ender’s empathy for the nonhuman other fundamentally contradicts the military’s ultimate goal of destruction and provides an ethical counterpoint.
to anthropocentrism that will continue to be relevant to new generations of readers growing up in an ongoing climate crisis.

**Enregisterment and Indexicality in American English**  
**Presenter: Kyrielle Peterson**  
**Faculty Mentor/Collaborator: Lynsey Wolter**

The aim of this project was to create a unit plan that explores the significance of social identity and how people perform language. My unit plan addresses how enregisterment and indexicality of language varieties occur over time. Indexicality refers to the level at which features of a language are noticed and to what extent they are associated with a community. Enregisterment is a level of indexicality where people identify a feature and associate it with a specific speech community. As part of my research, I reviewed literature that focused on five language varieties: African American English, White English, Chicano English, Native American English, and Asian American English. The goal of this literature review was to find articles relating to the intersection of race and class in a language that could be used in English 325 this spring. Indexicality and enregisterment are affected by race, class, and locality and allow for exploration of how language ideology can harm different dialect speakers. I used a backward design to craft learning outcomes and assessment tools. The results of this research and literature review benefit teaching linguistics through the inclusion of multiple social dialects to explore race and class in American English.

**Picking Apart Parasite**  
**Presenter: Sam Downing**  
**Faculty Mentor/Collaborator: Stacy Thompson**

Sam Downing is a senior at UWEC majoring in Integrated Strategic Communications and minoring in English – Critical studies of Literatures, Cultures, and Film. He graduated from a small high school known as Brookwood in Ontario, Wisconsin. After graduation, Sam hopes to pursue a graduate degree in Media Studies. Sam’s research focuses on how film, particularly the 2020 best picture winner Parasite, reflects societal values and prompts empathetic action. He believes that film has always been a source of unique storytelling, granting empathetic stories to be shared among the masses. Bong Joon Ho’s Parasite has received universal praise for its presentation of classism among contemporary South Koreans. Parasite showcases the universal concept of class division through different filmmaking techniques and Ho’s craftmanship won the film four Oscars, including a historical win for the 2020 Best Picture, the first foreign film to do so. Based on Sam’s analysis of the film’s success, Parasite has the potential to open doors in and out of the film industry, such as new opportunities for foreign filmmakers to a modern housing reform in South Korea.

**Geography and Anthropology**  
**Anabaptist Executions, 1524-1614 (Illustrative Map)**  
**Presenters: Katrina Berg and Emily Decker**  
**Faculty Mentor/Collaborator: Paul Kaldjian**

Oftentimes, across genres (from reports through creative non-fiction to fiction), maps that would spatially situate the narrative are not included. Such works create unlimited cartographic opportunities. One such document is The Anabaptist Executions Guide, 1524-1614, a compilation of Anabaptists martyred in the wake of the Protestant Reformation. This project draws from the Guide’s spatial data to create a map that
supports and enhances the text. We used creative cartographic techniques to add the geography to the chronology of Anabaptist martyrs. Our goal was to create a map that provides a meaningful spatial reference for use in the 21st century while also capturing a sense of the 16th century Europe in which the events took place. It also provides an opportunity to demonstrate the importance of geographic context in history and the humanities – the 16th century may seem impossibly distant, but the cities of Amsterdam and Vienna are not. To make our map, we supplemented skills from our geography program courses with techniques we learned and taught ourselves. These enabled us to preserve unique typefaces, colors, and etchings from maps and in books of the 16th and 17th centuries and to use QR codes to couple the static map to an interactive map with more information on specific executions and historical documents. The map was entered into and received recognition at, the annual Wisconsin Land Information Association (2021) map competition.

**Comparison of Rolling Shutter Effects on Photogrammetric Accuracy Using UAV Platforms**  
**Presenter:** Patrick Galarza  
**Faculty Mentor/Collaborator(s):** Papia Rozario and Martin Goettl

The application and usage of Unmanned Aerial Vehicles (UAVs) for photogrammetry and Remote Sensing, particularly in monitoring environmental changes has increased rapidly in the past few years. Consumer UAVs, also known as drones, have gained popularity due to their competitive pricing and robust nature. However, most of these UAVs have a particular drawback, that is, they are typically equipped with cameras that have rolling shutters. Imagery extracted from such camera sensors have been known to yield lower accuracy when compared to imagery acquired from global shutter sensors. In this paper, we evaluate the impact of the different shutter cameras of two UAV platforms, namely Mavic 2 Pro and Phantom 4 pro on the accuracy of their remotely sensed imagery.

**Exploring Anti-Homeless Hostile Architecture in Minneapolis: A Novel Google Earth Street View-Based Approach**  
**Presenter:** Jessica Peterson  
**Faculty Mentor/Collaborator:** Gloria Howerton

Hostile architecture is an urban design element that influences how people are allowed to use space. While it targets several communities such as teenagers, I am specifically interested in its use as a spatial deterrent for those experiencing homelessness. The goal of this research is to form a better understanding of hostile architecture use and the social and spatial impacts of its implementation as well as examining the spaces where hostile architecture is present in Central Minneapolis, MN. The increased presence of hostile architecture has prompted studies similar to this one, and this research adds to the growing spatial analysis of hostile architecture in the United States. Using Google Earth street view, I conducted ground research and compiled a comprehensive list of where hostile architecture is located in Central Minneapolis. I then compared this list to the placement of homeless aid and various districts within Central Minneapolis. The results of this research show a clear correlation between the type of infrastructure, amount of homeless aid, and the amount of hostile architecture present. On this basis, I argue that hostile architecture is a tool of homeless exclusion that needs to be eradicated via multi-faceted solutions that encompass the true causes of homelessness.

**Fluvial System Response to Abrupt Base-Level Fall: Mapping Tributary Stream Terraces in the Lower Chippewa River Watershed**
Presenters: Katie Grong and Hunter Delikowski  
Faculty Mentor/Collaborator: Douglas Faulkner

The Lower Chippewa River (LCR), a tributary to the Upper Mississippi River (UMR) in west-central Wisconsin, was a glacial meltwater stream during the Late Wisconsinan. During regional deglaciation, two significant episodes of UMR incision lowered the LCR’s base level abruptly, which incised in response. Based on terrace mapping and OSL dating, Faulkner et al. (2016) determined that LCR incision was prolonged and episodic and proposed a model to describe and explain the progression of incision up the LCR valley. Our research, which focuses on the incision of LCR tributaries, is a first step in testing the Faulkner et al. model. We began by mapping terraces along tributaries to the LCR. We used LiDAR-derived DEMs to identify and digitize terrace remnants and to determine their heights above their adjacent rivers. In addition, we analyzed the size of tributary watersheds and their proximity to the UMR as possible controls on tributary terrace formation and preservation of terrace remnants. This was done to determine if the spatial pattern of terraces in tributary valleys is consistent with the model. We found that it is. Dating terrace remnants is necessary to determine if the timing of tributary incision is also consistent with the model.

Presenters: Amy Blazanin and Abi Fischer  
Faculty Mentor/Collaborator: Harry Jol

Anthropogenic influenced environmental changes such as rising sea levels and deforestation have negatively impacted the Great Dune Ridge in Naglių Nature Reserve and National Park, Lithuania. Using non-invasive ground-penetrating radar (GPR) we examine the subsurface of the Great Dune Ridge to analyze the dunes' internal structure as well as search for buried soils. The GPR data on the Great Dune Ridge was collected using Sensors and Software pulseEKKO GPR system with antennae frequencies of 225, 450, and 900 MHz. The collected GPR profiles were then processed, analyzed, and interpreted using EKKO_Project software. Our preliminary assessment of the GPR data shows dipping reflections, which we interpret as aeolian sand dune migration. Through analysis and interpretation of the GPR data on the Great Dune Ridge, our research team will be able to provide guidance to the National Park on the aeolian history and future management of the dune field.

**On-Water Bathymetric Survey of a Steep and Rocky Segment of the Eau Claire River**  
Presenter: Aidan Mills  
Faculty Mentor/Collaborator: Sean Hartnett

Bathymetric mapping has many useful applications when concerned with water features. From pure scientific pursuits to recreational benefit, understanding the bathymetry of water features can be invaluable. Because of advancements in technologies concerning on-water mapping such as compact GPS-enabled Sonar, the ability to survey more technical water features is possible. The specific segment of the Eau Claire River of interest in this survey is the relatively shallow, steep, and rocky three-mile segment starting at the Altoona Dam and extending to the confluence of the Chippewa River near Phoenix Park, Downtown Eau Claire. This project aimed to produce a bathymetric map of this segment of the Eau Claire River because no map of the type existed for this segment. The production of this bathymetric survey relied on the ability to outfit kayaks with compact GPS integrated Sonar equipment. Conducting
this survey via kayak was necessary because of the many technical rapids concealed along the path of this segment of the Eau Claire River. The product of this survey is an accurate and highly detailed bathymetric map that will aid in both the professional and recreational use of this segment of the Eau Claire River.

**Progradation on Wisconsin Point Along the Superior Barrier Using Ground Penetrating Radar**

**Presenters: Grace Uchytil and Madeline Lundquist**

**Faculty Mentor/Collaborator: Harry Jol**

The Duluth-Superior barrier, located on the western coast of Lake Superior, is the longest freshwater barrier system in the world. Little research has been conducted on the Wisconsin Point barrier. To better understand the formation of the Wisconsin Point barrier (Superior, WI), what lies beneath the surface, and how one can protect areas such as this from future erosion, multiple sources of data were collected. Satellite imagery and topographic maps were used with ground penetrating radar (GPR) to get topographic data. GPR emits radio frequencies into the subsurface and records their echoes to construct images of the subsurface layering stratigraphy. Four cross-barrier transects on the barrier were collated using a pulseEKKO 100 GPR system with 100 MHz antennae frequency. The data was processed using Sensors and Software’s EKKO Project software. After interpretation of different coastal barrier systems, such as those on Atlantic and Australian coasts, and comparing that data to our own, we have found there is evidence of longshore drift and coastal progradation on Wisconsin Point. The information presented will be used to further coastal barrier research, help understand barrier erosion, and provide ways to protect the endangered bird, the Piping Plover, that are in danger in these areas.

**Quantifying Agricultural Contributions to Surface Water Quality Impairment in the Lower Wisconsin River Watershed**

**Presenter: Briar Striegel**

**Faculty Mentor/Collaborator: Cyril Wilson**

Agricultural activities create a plethora of water quality issues for aquatic ecosystems across space and time. Nonpoint source pollutants released by farmland and livestock operations can lead to the eutrophication of waterways, disrupting food chains, impacting local biodiversity, and providing an environment that encourages the growth of parasitic and invasive species populations. This study utilized geospatial technologies of remote sensing and geographic information system (GIS) to quantify the extent of agricultural footprint on water quality impairment within the Lower Wisconsin River watershed (LWRW) over a 20-year period. Using a hybrid image classification approach, land use/land cover (LULC) information was retrieved from Landsat ETM+ and Landsat-8 satellite sensors. LULC, soil, elevation, and climate data were integrated with the Soil and Water Assessment Tool (SWAT) to predict nitrogen, phosphorus, and suspended sediment pollution in the LWRW between 2000 and 2020. Results of the modeling exercise conspicuously demonstrated the spatial and temporal trends in water quality impairment tied to agricultural activities in the LWRW. This study calls for more comprehensive land management practices to aid in mitigating water quality impairment in the LWRW.

**Street Sign Namescapes: An Analysis of Eau Claire, WI Street Names**

**Presenters: Peyton Tohulka, Cadie Ash, and Laurel Aleson**

**Faculty Mentor/Collaborator: Paul Kaldjian**
Drawing from geographical concepts of reading and writing landscapes (identifying clues to determine local culture, identity, etc.), and using Deirdre Mask’s *The Address Book: What Street Addresses Reveal About Identity, Race, Wealth, and Power* (2020) as a guide and inspiration, this study examines Eau Claire, Wisconsin’s 1,119 street names for patterns, trends and significance. Though taken for granted as practical fixtures of the landscape, street names contain meaning that can reflect local values, attitudes, and identities. This content analysis of city streets – named after people, plants, places, ideas, etc. – provides insights into who the community has been and is becoming. Our analysis suggests that the street namescape reflects past sets of perspectives and values, e.g., those of powerful and wealthy, white men. Given the permanence and prominence of street names, a community like Eau Claire can – and should be – intentional about street naming as a way of demonstrating and reflecting community priorities, values, aspirations, and diversity of the current local population.

**Subsurface Investigation of Cape Kolka, Latvia: A Progradational Strandplain Along the Baltic Coast**

**Presenters:** Hailee Jefferies, Donatas Pupienis, Cameron P. Wingren, Kelly M. Jerviss, Logan Bergevin, and Joseph D. Beck  
**Faculty Mentor/ Collaborator(s):** Harry Jol

The Cape Kolka strandplain is located along the northern tip of Latvia, situated between the Baltic Sea and the Gulf of Riga. The strandplain has been prograding due to excess sediment being carried northwards through longshore drift from erosion due to sea levels rise. The project utilizes ground penetrating radar (GPR) which emits electromagnetic pulses into the subsurface that reflect off layers and are then recorded at the surface. A Sensors and Software pulseEKKO Pro GPR system was used with 100 and 500 MHz antennae frequencies. The data was collected along a 1,000 m sandy road that is perpendicular to the coast and 37.6 km from the northern tip. To geometrically correct the GPR profiles, a topographic profile was collected with a TopCon RL-H₃CL laser leveler along the road at intervals of 5 m. Profiles were collated and processed using EKKO Project software using AGC gain, a velocity of 0.069 m/ns, dewow, and grey color palette. The dipping reflection facies include prograding stratigraphy that are interpreted as former beach faces. The results will provide a better understanding of coastal strandplains and how to better manage these sensitive environments in light of rising sea levels and associated erosion.

**The Geography of Community**

**Presenters:** Katrina Berg, Lauren Becker, Liam Brandt, Savanna Grunzke, Hailee Jefferies, Aidan Mills, Stephanie Pasowicz, Zachary Rau, Melanie Rausch, Maddy Rauscher, Dustin Shimoda, Richard Smilowski, Lyndsey Tyznik, and Nathan Walker  
**Faculty Mentor/ Collaborator:** Paul Kaldjian

With the rapidly changing and culturally shifting socioeconomics and technologies of the last few decades, much attention has been given to the concept of community, its demise, and fragmentation, and what can be done to build and strengthen it (consider Robert Putnam’s *Bowling Alone*, 2000 and Peter Block’s *Community: The Structure of Belonging*, 2008). From “senses of community” to “community development”, “imagined communities” to “communities of practice”, from neighborhoods to nations, the community has been examined from a wide range of disciplinary perspectives: sociology, psychology, geography, political science, urban affairs, planning, law, architecture, health, sustainability, and tourism, among numerous others. Cutting across almost all of this literature is an explicit and implicit recognition...
of geography inherent to the community. This is seen in references to such things as space, place, scale, landscape, and the natural and built environments. This project reviews the academic literature to identify, document, and acknowledge the myriad ways in which a geographic perspective and awareness enhance an understanding of the community and efforts to build and support it.

Geology

3D Visualization of Geologic Structures
Presenter: Mallory Gross
Faculty Mentor/Collaborator(s): Robert Lodge and Merilie Reynolds

An important skill in geology is the ability to visualize spatial relationships of geologic units beneath the Earth. Virtual and physical models allow students to observe and measure geologic structures and visualize their relationships to surface map patterns. Although such models have been utilized in geoscience education in the past, their impact on student learning has not been tested. We have created several new virtual and 3D-printed physical models to complement existing assignments in two upper-level undergraduate geology courses at UWEC including a classroom and field course. To assess the impact of the models on learning, students will be asked to complete a short survey before and after each course to test their 3D visualization skills and to reflect on which learning experiences helped them with 3D thinking. This research project will help us better understand how helpful physical and virtual models are to students and if the type of learning environment they are deployed in affects their impact. We hope this study will lead to the adoption of more effective teaching methods in geology courses at UWEC and at other institutions.

A Case Study at Mud Lake: the influence of phosphorus loading through lacustrine groundwater discharge on eutrophication events in a stratified flow-through lake in Western Wisconsin
Presenter: Maddie Palubicki, Retta Isaacson, and Jacob Erickson
Faculty Mentor/Collaborator(s): Sarah Vitale, Brian Mahoney, Anna Baker, and Laurel McEllistrem

Regional analysis in western Wisconsin demonstrates that phosphorus (P) concentrations are anomalously high in both surface water and groundwater. Lake eutrophication events are common in western WI and generally attributed to anthropomorphic nutrient loading from surface runoff. However, high levels of P detected in regional aquifers suggest that groundwater discharge may contributing to eutrophication events. The objective of this study is to understand the mobility of P in groundwater and its impact on Mud Lake. Water quality was measured in Mud Lake from June-September in 2018, 2019, and 2020. Groundwater discharges into the lake throughout the entire field season. Surface water pH and dissolved oxygen (DO) rise in late summer before returning to “normal” levels in fall. These fluctuations are consistent with algal bloom growth. The pH and DO in groundwater are essentially constant. P in surface water is relatively constant during the summer months, while groundwater P fluctuates with highest P occurring in mid-late summer. Water quality indicators suggest that P mobility may be a combination of excessive P inputs as well as reducing conditions, which may vary throughout the groundwater flow path. Potential nonpoint sources of elevated P in the groundwater include agricultural land use and regional geology.

Analysis of Lunchtime Waste-Sorting Habits at the University Student Center
Presenter: Katrina Kawak and Mark Fiore
Faculty Mentor/Collaborator: Scott Clark

The fight for environmental sustainability at the community level is often judged by the quality of waste streams: How much waste is recycled and how much is being landfilled? Proper waste disposal is rooted in individual habits and behaviors that are relatively simple to execute but may not be appropriate. The goal of our research was to gain an understanding of the habits and behaviors of students as they disposed of their lunchtime waste. During the fall 2020 semester, we recorded observational data in the dining area of the student center, documenting how effectively students used the appropriate bins for their waste. Analysis of the data revealed that most individuals (over 75%) spent less than half a second at the waste bins. Another key finding is that there is a roughly equivalent bi-modal distribution of ~50% who try to sort their waste and ~50% who do not appear to make an effort to sort their waste. Future intervention efforts need to target habits and behaviors of these two distinct groups: one message to encourage those who do not sort their waste to change their habits, and a separate intervention for those who simply need to better sort waste.

Assessment of the source and mobility of phosphorus in the hydrologic system in western Wisconsin

Presenters: Maggie Callahan, Jacob Erickson, and Madeline Marchiafava
Faculty Mentor/Collaborator(s): Sarah Vitale and Brian Mahoney

Lake eutrophication due to nutrient loading from phosphorus (P) is a growing problem across the Midwest, causing a loss of aquatic biodiversity, damage to fisheries, and adverse impacts on human health. Although eutrophication is often blamed on anthropogenic sources, preliminary results suggest significant amounts of nutrient loading may be petrogenic. This investigation’s objectives are to distinguish the source of P contamination in surface and groundwater in western Wisconsin and to understand the mechanisms behind P mobility in the regional hydrologic system since P has been historically considered immobile in groundwater systems. The project includes a regional analysis of surface and municipal well groundwater samples in western WI, measured for P, iron, manganese, nitrate and basic water quality parameters, to obtain a baseline spatial P distribution and an understanding of the geochemical environment. Sequential extraction analyses of P-bearing geologic units help determine the natural conditions under which P may be mobilized. Results demonstrate groundwater P concentrations frequently exceed WI surface water regulatory limit (max 100 ppb), and that P is highly mobile along flow pathways into lakes and streams. This research is important in developing a comprehensive understanding of P migration in Wisconsin’s regional hydrologic systems to implement effective waterway management.

Characterizing Felsic Volcanic Rocks of the Lynne Zn-Cu-Pb Deposit, Oneida Co. Wisconsin

Presenter: Shelby Short
Faculty Mentor/Collaborator: Robert Lodge

The primary objective of this research was to describe the petrographic and geochemical characteristics of least-altered felsic volcaniclastic and coherent volcanic rocks that host Zn-Pb-Cu massive sulfides in the Lynne Deposit of Oneida County, Wisconsin. The Lynne deposit was first discovered in 1990 by Noranda Exploration, the current owner and lessee of property where the Lynne Deposit is located. The Lynne Deposit is one of many Volcanogenic Massive Sulfide (VMS) deposits in Northeastern and Northcentral...
Wisconsin. VMS deposits are created in submarine environments when high temperature hydrothermal fluids precipitate sulfide minerals. These deposits formed 1.8 to 1.9 Ga when the Pembine-Wausau Terrane collided and accreted onto the Superior Craton in the Penokean Orogeny. The felsic volcanic stratigraphy of the Lynne Deposit was described and analyzed from drillholes that intersect representative felsic units throughout the deposit stratigraphy above and below the ore horizon. Samples of these felsic volcanic strata have been petrographically and geochemically analyzed to determine the concentration of major and trace elements. These analyses will help interpret the volcanic and tectonic setting of the deposit and allow for a regional comparison between the Lynne deposit and other sulfide occurrences in the Penokean.

**Determining the Relationship Between Intrusive and Volcanic Rocks at the Lynne Zn-Cu-Pb Deposit, Oneida Co. Wisconsin**

**Presenter:** Lilly Glodowski  
**Faculty Mentor/Collaborator:** Robert Lodge

The purpose of this research is to determine the temporal relationship between the intrusions and the surrounding volcanic rocks hosting the Lynne Zn-Cu-Pb deposit in Oneida County, WI. Volcanogenic massive sulfide (VMS) deposits are among the richest sources of copper, zinc, lead, silver, and gold that are associated with submarine volcanism in extensional tectonic settings. During the Paleoproterozoic (1.8-1.9 Ga) Penokean Orogeny, ancient VMS deposits formed in Wisconsin due to back-arc volcanism within the Pembine-Wausau Terrane. The Lynne deposit, discovered by Noranda Exploration in 1990, is one of several VMS deposits with economic potential in northern Wisconsin. Petrographic observations of the Lynne drill core show the presence of felsic and mafic dykes, along with a large granophyre/granodiorite pluton at the bottom of the deposit. The felsic dykes are fine grained and light in color. The mafic dykes appear fine grained, dark in color, and are occasionally accompanied by plagioclase phenocrysts. The granodiorite and granophyre are coarser grained and present in multiple colors ranging from shades of grey to yellows and pinks. Geochemical data obtained from these samples will enable direct comparisons of the tectonic and magmatic settings between intrusive and volcanic rocks.

**Experimental Study of Hydroxyl Stretching in Aluminosilicate Glass Cooled from High Temperature at Variable Quench Rates**

**Presenters:** Katherine Langfield and William Guenther  
**Faculty Mentor/Collaborator:** Phillip Ihinger

The physical properties of natural silicate magma are strongly influenced by the dissolution of water into the aluminosilicate melt framework. Of note is the presence of hydroxyl species (X-OH) that break apart the rigid silicate framework. Glass scientists observe an unusual broad absorption band associated with the stretching of hydroxyl species near 3500 cm\(^{-1}\) in the infrared spectra of water-bearing glasses. In an earlier study, we deconvolved this broad O-H stretching band into seven universal bands at uniform 150 cm\(^{-1}\) intervals in both natural and artificial aluminosilicate glasses. Our observation questions the standard explanation, that variable degrees of hydrogen bonding cause the unusual ‘low-energy tail’ of the prominent broadband absorption. We suggest that the low-energy tail results from the interaction of photons with a series of vibrational modes preserved in the glass at quantum states that differ by 1.8 kJ/mol. In this study, we present the results of an experimental study on water-rich, natural obsidian glasses quenched from high temperatures within cold-seal pressure vessels. We characterize the infrared absorption features in glasses cooled at quench rates varying by several orders of magnitude. Our results

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Further our understanding of the nature of absorption bands associated with dissolved water in silicate glass.

**Fossilpedia™: Geospatial Data Curation and mapping of Fossils from the Hell Creek Formation in South Dakota**

**Presenters:** Thomas Hebert and Jonathan Sargent  
**Faculty Mentor/Collaborator(s):** Phillip Ihinger and Papia Rozario

The lack of accurate, consistent, and precise data collection of exhumed fossils has been a major obstacle to developing consistent inferences and conclusions based on paleontological work. We have developed and designed an innovative and cutting-edge map and sortable database that integrates GIS technology and sub-centimeter GPS equipment. The database of late Cretaceous fauna and lithology discovered in the Hell Creek Formation of South Dakota categorizes, sorts, and maps data by species, anatomical designation, spatial coordinates, source lithology, horizon, and date of discovery, among others. Specimens are also photographed, and this is included in the database. Upon completion, this database and map will be available to scholars and the public at large. With accurate and consistent measurements of location and with a comprehensive list of fields to sort by, this database allows for better conclusions on areas of taxonomy, ontogeny, species proliferation, and more.

**GIS-Based Surficial Geology Map of Eau Claire County, West-Central Wisconsin**

**Presenter:** Chelsea Moran  
**Faculty Mentor/Collaborator:** Kent Syverson

A GIS-based 1:250,000-scale surficial geology map of Eau Claire County has been produced as part of a Wisconsin Geological and Natural History Survey [WGNHS] project to compile a statewide surficial geology map. The previously mapped county to the north (Chippewa County, Syverson, 2007) provided a geologic framework. LiDAR DEMs, USDA digital soil survey data, 7.5’ topographic maps, and WDNR well logs were compiled in ArcGIS to draw geologic contacts. WDNR well logs were used to estimate unit thicknesses. Eau Claire County is underlain by stream-dissected glacial sediments and Paleozoic sandstone bedrock. River Falls Formation outwash is ~16 to 30 m thick in northwestern Eau Claire County. This eroded stream sediment is associated with dissected Paleozoic bedrock uplands. Till of the Merrill Member of the Copper Falls Formation is ~4.5 to 17 m thick in northeastern Eau Claire County and displays rolling topography. Late Wisconsinan Copper Falls Formation outwash is ~12 to 40 m thick and found throughout Eau Claire County in the Chippewa and Eau Claire River valleys and their tributary valleys. Sand dunes modify Late Wisconsinan outwash terraces. The WGNHS will incorporate this map information in an updated statewide surficial geology map.

**Measuring Stream Baseflow Conditions in West-Central Wisconsin**

**Presenters:** Katherine Langfield, Angy Rafferty, Mark Fiore, and Jacob Erickson  
**Faculty Mentor/Collaborator(s):** Sarah Vitale and Nicole Clayton

This study seeks to measure baseflow conditions in West-Central Wisconsin to aid in determining the impacts of groundwater withdrawals on local streams. Streamflow is measured monthly at fourteen (14) sites across eleven (11) streams during baseflow conditions using an OTT MF ProWater Flow Meter. Baseflow conditions are determined by referencing recent rainfall totals and the USGS streamflow gauge records. Streams with two or more sites are used to determine if streams are gaining or losing water. A stream gauge and seasonal pressure transducer have been installed at three sites to establish a relationship
The purpose of this project is to determine the specific style of hydrothermal alteration that occurs within the volcanic strata at Lynne Zn-Cu-Pb deposit. The Lynne deposit is a volcanogenic massive sulfide deposit (VMS) that forms from metallic-rich fluid exhaling on the ocean floor, typically during extensional submarine volcanism. These deposits form as a type of mounded or tabular body of sulfide minerals. Wisconsin is host to a chain of VMS deposits within a 1.9-1.8 Ga accreted volcanic arc called the Pembine-Wausau terrane. Noranda Exploration discovered the Lynne deposit in 1990 but the deposit was never mined. For this project, core from the initial exploration was re-logged and sampled throughout the hydrothermally altered strata hosting the deposit. Examination of the core reveals two main alteration types: talc carbonate and calc-silicate. Samples were made into thin sections and were processed to obtain geochemical data. This research quantifies alteration through mass balance geochemical analysis of the altered rocks, showing which elements were mobilized by hydrothermal fluids. Understanding the element mobility during ore formation will allow for comparisons to be made between other deposits elsewhere in Wisconsin.

Petrography of the Sulfide Ore Zones in the Lynne Zn-Cu-Pb Deposit, Oneida Co., Wisconsin
Presenter: Evan Weber
Faculty Mentor/Collaborator: Robert Lodge

This study examines the sulfide mineralization of three of the ore zones within the Lynne Zn-Cu-Pb deposit to determine how the mineralizing hydrothermal system formed and evolved over time. The Lynne deposit is located in northern Wisconsin near Rhinelander, and it is part of the 1.8-1.9-billion-year-old Pembine-Wausau terrane. These metals are found in sulfide minerals in volcanic massive sulfide (VMS) deposits that formed in hydrothermal vents in submarine extensional environments. The Lynne deposit was discovered by Noranda Exploration in 1990 and consists of mainly zinc, copper, and lead sulfides. Drill core obtained during mineral exploration efforts in 1990-91 were re-logged and, their ore zones were described in detail. Samples collected from these cores were cut into thin sections for reflected-light petrography. These thin sections were also analyzed on a scanning electron microscope to obtain mineral chemistry data and identify sub-microscopic minerals that are more sensitive to fluid conditions than traditional Zn-Cu-Pb sulfides. This project illustrates the mineralogical characteristics that make the Lynne deposit unique when compared to other VMS deposits in Wisconsin.

Role of Liquid Immiscibility and Sequential Extraction in the Evolution of the Bushveld Layered Mafic Intrusion, RSA.
Presenter: Kalie Ress
Faculty Mentor/Collaborator: Phillip Ihinger

The Bushveld layered mafic intrusion is the world’s largest magmatic body and hosts much of the known platinum, chromium, titanium, and vanadium reserves. The origin and magmatic evolution of the
intrusion is still the source of much controversy. Surprisingly, the rocks of the 2.05 By intrusion are relatively undeformed and unaltered and are available for critical geochemical and petrologic analysis. Recently, we have proposed a new model for the origin of layering in mafic intrusions by analyzing the whole-rock major element variations within individual layers of the much smaller Skaergaard intrusion of Greenland. Our model invokes liquid immiscibility of evolved interstitial melt trapped in successive convective boundary layers of the crystallizing magma chamber. Complementary liquids of vastly different densities (with subsequent contrasting mobilities) results in an easily-recognized, diagnostic geochemical ‘fingerprint’. We have compiled a rich dataset collected from scattered published sources that span the stratigraphy through most of the 8 km-thick Bushveld body. Our analysis shows that immiscibility may have played a role in both the early (Lower and Critical Zones) and final (Upper Zone) stages of the crystallizing pile, but that crystallization of the bulk of the intrusion (Main Zone) was not influenced by liquid immiscibility processes.

**Surface Water and Groundwater Chemistry of Western Wisconsin: Establishing an Environmental Baseline**

*Presenters: Retta Isaacson, Madeline Palubicki, Jacob Erickson, and Maggie Callahan*

*Faculty Mentor/Collaborator(s): Sarah Vitale, Brian Mahoney, and Laurel McEllistrem*

The expansion of silica sand mining and concentrated animal feeding operations in western WI over the past decade generated concerns about potential contamination of surface water and groundwater systems. However, the baseline chemical characteristics of the regional hydrologic system have never been documented. This investigation represents a comprehensive analysis of surface water and groundwater chemistry throughout western WI, an area that encompasses sampling sites in the northeastern upper Mississippi River watershed between Barron and Tomah. The dissolved metal content of surface water sites (n=54) and municipal groundwater wells (n=13), has been quantified with each site sampled multiple times (2-4) over the past 4 years to evaluate temporal variations in water chemistry. Geochemical analysis of Paleozoic stratigraphy (n~50) constrains trace metal concentrations in regional aquifers. Initial results demonstrate that surface water and groundwater in the region is very clean, with virtually all trace metals well below EPA drinking waters standards. The single exception is phosphorous, which exceeds standards in both surface water and groundwater and is an important component of regional lake eutrophication events. This environmental baseline is vital to the development of reasonable environmental safeguards that will facilitate economic growth and sustainable development while protecting water resources in western WI.

**The Potential Role of the Choiyoi Eruptive Activity in the Great Permian Extinction**

*Presenter: Katie Richart*

*Faculty Mentor/Collaborator: Brian Mahoney*

The Great Permian Extinction occurred at the end of the Permian Period (~300-250 Ma), when 95% of marine and 70% of terrestrial life became extinct. The cause of this massive extinction event is still unknown, but it may have been caused by climate change, volcanic eruptions, or meteorite impact. Large igneous provinces (LIPs) are known to expel large volumes of magma over a short period of time and have been linked to these global mass extinctions. LIPs can be dominated by silica rich volcanic activity to produce silica large igneous provinces (SLIPs). The Choiyoi Group of West Central Argentina is amongst the largest SLIPs recognized on earth, with an aerial extent of ~500,000 km2. This eruption is
comparative to 125 Yellowstones, capable of ejecting large amounts of material into the atmosphere. Twelve rock samples were collected from the Choiyoi Group near Uspallata, Argentina and were processed for geochemistry and geochronology. Using these samples and their respective structural data we are able to create a stratigraphic section that characterizes the Choiyoi Group, constrains the tectonic setting, and provides an estimate of the eruptive flux rate. These characteristics will provide insight into the potential role of the Choiyoi eruptive activity in the mass extinction event.

**Three-Dimensional Mapping of Eau Claire County Aquifers**

**Presenters:** Angy Rafferty and Maddie Palubicki  
**Faculty Mentor/Collaborator:** Sarah Vitale

Groundwater is an important resource in west-central Wisconsin, and knowledge of the quantity of available groundwater is important for the environmental and economic well-being of the region. In recent years, greater demands have been placed on the land and natural resources in Wisconsin, with a 600% increase in concentrated animal feeding operations (CAFOs) since 2000 and a 300% increase in silica sand mines since 2011. This project entails using groundwater well records in conjunction with spatially accurate well positions to define the three-dimensional extent of the aquifers in Eau Claire County with the intent to better quantify available groundwater resources. In collaboration with the Eau Claire County Department of Planning and Development and the Eau Claire City County Health Department, wells in the northwest portion of the county with digitized records have had positions manually corrected by being moved to structure points in ArcGIS. Following corrected geolocation of wells, the project will begin analyzing rock and sediment descriptions from the corrected wells logs. Supplemental data include topographic maps and existing geologic maps and reports. These data will be used to produce refined geologic maps and cross-sections in collaboration with the Wisconsin Geological and Natural History Survey.

**U-Pb Geochronology of Felsic Plutons in Neoarchean Sturgeon Lake Greenstone Belt, Ontario, Canada**

**Presenter:** Trevor Nelson  
**Faculty Mentor/Collaborator:** Robert Lodge

The emplacement of granitoid plutons in Archean granite-greenstone belt terranes can provide a more complete magmatic and deformational history than the volcanic and sedimentary rocks. Granitoid plutons in greenstone belts record tectonic processes and crust-mantle interactions from the earliest formed basement assemblages, to synvolcanic and syndeformation, to post-tectonic events. Previous mapping in the Sturgeon Lake greenstone belt constrained spatial relationships between plutonic rock and supracrustal assemblages but lack definitive timing of plutonic emplacement. This study represents ongoing research that characterizes the plutonic suites in the Sturgeon Lake greenstone belt. Newly acquired U-Pb geochronologic data of previously characterized sample suites provide a complete geologic history overview of the Sturgeon Lake greenstone belt. Ages were determined by separating zircon grains found within each plutonic sample, ablating each grain via Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS), and measuring the abundances of radiogenic isotopes of U and Pb. Preliminary data reveal precise dates for multiple felsic plutons throughout the greenstone belt and further defines the magmatic and deformational history of the belt. Ongoing research also includes trace-element chemistry of the zircons to distinguish between the magmatic characteristics of mineralized and un-mineralized systems.
Zircon Trace-Element Geochemistry of Granitoid Plutonic Suites in the Sturgeon Lake Greenstone Belt, Ontario, Canada
Presenter: Rory Johnson
Faculty Mentor/Collaborator: Robert Lodge

The geochemical characteristics of Archean granitoid plutons may vary due to the origin and timing of their melts, mantle-crust interaction, and subsequent magmatic-hydrothermal activities. While traditional whole-rock analyses are useful for these interpretations, they do not provide a definitive linkage with time of formation. Understanding how these geochemical characteristics vary throughout the magmatic history of Archean greenstone belts is essential in reconstructing tectonic settings. For this study, samples were collected from granitoid plutons in the Sturgeon Lake greenstone belt of northern Ontario, Canada. The belt is part of the Western Wabigoon terrane in the Superior Craton. Using standard mineral separation techniques, zircon grains were isolated and analyzed individually for trace-element geochemistry and U-Pb geochronological data. Zircon grains within the plutons provides constraints on timing of magmatic emplacements based on their U-Pb isotopic abundances and their formation conditions based on the trace-element abundances. Zircon grains were analyzed using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) at Laurentian University in Sudbury, Ontario. Once a precise age was gathered from U-Pb dating, trace-elements were analyzed to determine temporal variations of magmatic conditions. This determination is important in understanding differences in mineralized or unmineralized systems in Sturgeon Lake and other Archean greenstone belts.

History
Black Masculinity in the Civil Rights Era: Non-Violent Protest versus Armed Self-Defense
Presenter: Crystalina Peterson
Faculty Mentor/Collaborator: Selika Ducksworth-Lawton

The Civil Rights Movement of the 1960s evolved after centuries of racist policy and violence towards the Black community, creating a lasting change to the way our nation interacts with Black Americans. As the movement grew, two factions developed, and each of these groups represented a unique set of ideas and methods to achieving true equality for all. One of the key factors in these ideologies is based on the concept of Black masculinity and how each group viewed the role of Black men in American society. From “respectability politics” and non-violent protest, to armed self-defense and direct action, this presentation will explore the origins of these concepts and demonstrate how they were used in the pursuit of civil equality. The unique stereotypes and expectations placed on Black men in the United States had a major effect on these methods, lasting influence on the effectiveness of the 1960s movement.

Consumerism, Eugenics, and the “Ideal Teenage Girl” in 1910-1940 American Culture
Presenter: Kiersten Clifford
Faculty Mentor/Collaborator: Patricia Turner

This project argues that Eugenics coupled with a new understanding of adolescence converged to create an ideal of the “teenage girl”. She was white, upper-middle-class, and sexually chaste. Those who did not fit into this ideal were attempted to be redeemed through public health and education. Advertisements, seeking to influence these newly defined consumers reinforced the idea of the teenage girl to the general
public. In accordance with Eugenic policy, white teenagers were deemed the most “fit”, while Native American and Black female adolescents were found wanting. This paper utilizes advertisements, women's publications, and primary source documents in public health and education. This research contributes to the cultural understandings of adolescence in the United States by documenting the influence of Eugenics and consumerism in defining the ideal “teenage girl” in the early 20th century. There has been a small amount of literature written about each of these topics separately but there are no sources on this topic that draw this comparison between advertisements and public health and education. Due to the lack of literature specifically on this topic this paper is significant and will contribute to this field of study.

Language Barriers: The Importance of Multilingualism
Presenter: Ryan Dunlap
Faculty Mentor/Collaborator: Gerardo Licon

On Feb. 2, 1848, the “treaty of Guadalupe Hidalgo,” was signed. With it, the Mexican-American war was ended, and control of what is now the southwest region of the U.S. was transferred from Mexico to the U.S. For the thousands of families that called this area their home, a promise was made that they would retain their land and rights. For a time, this promise was upheld, but in 1879 a new amendment to the Californian constitution was put in place that required that all official documents of the state of California be printed in English only. In a state comprised mainly of people that spoke only Spanish, this marked a turning point in their ability to retain their property, rights, and culture. This paper aims to analyze the effects that policies of monolingualism such as these have had, and continue to have, on the Spanish-speaking population in the U.S. It will discuss the ramifications of such policies, including cultural assimilation, and language-based discrimination. It will also discuss possible ways to rectify these issues going forward, such as through improved access to bilingual education.

Vote: The 19th Amendment and The Chippewa Valley
Presenters: Anna Wendorff and Emma Mabie
Faculty Mentor/Collaborator(s): Gregory Kocken and Liliana LaValle

The Chippewa Valley is filled with stories of women who fought for their right to vote in the early 1900s. Through diaries, newspapers, oral histories, and letters, our research team created a virtual exhibit. This exhibit explores these important stories by examining the local people and moments connected to this era in our history. This virtual exhibit broadened existing research on women’s studies and the 19th Amendment, with the focus being on the Chippewa Valley. This exhibit utilized the online source, Omeka. Through Omeka, we were able to organize the information into a website that tells the story of the Chippewa Valley. To discover these stories, research was conducted using newspaper databases and collections from the University of Wisconsin-Eau Claire Special Collections and Archives, the Wisconsin Historical Society, the Chippewa Valley Museum, and L.E. Phillips Memorial Public Library. Once research was completed, our team began to connect pieces of different stories to create a timeline of events and then organize them on the website we created. Our final exhibit tells one part of the larger story of Women’s Suffrage in the Chippewa Valley during the early 1900s, and all that they had to overcome to be where we are today.

Institute for Health Sciences

Mapping Alcohol Outlet Density in the City of Eau Claire, Wisconsin
Presenters: Carly Nelson, Ale Alvarez Salazar, Katrina Berg, and Grace Helgeson
Faculty Mentor/Collaborator(s): Katie Wilson, Laura Suppes, and Karen Mumford
According to the Centers for Disease Control and Prevention (CDC) approximately 95,000 deaths are attributed to excessive alcohol use in the United States each year. Excessive alcohol use contributes to chronic conditions such as high blood pressure and liver disease. Many factors are associated with excessive alcohol use, including those at the individual-level (e.g. sex, age), the community-level (e.g. norms and attitudes), and the policy-level (e.g. liquor licensing laws). One factor that operates at the environmental-level is alcohol outlet density (AOD). AOD is defined as the number of physical locations where alcohol can be purchased based on population or area. We employ Geographic Information Systems (GIS) to map alcohol outlet density in Eau Claire, Wisconsin. Address data for city-wide alcohol outlets from 2020 were obtained from the Wisconsin Department of Revenue and mapped using GIS. We also mapped data from the 2010 census and City of Eau Claire Police Department. We present a map of alcohol outlets and an analysis of the geospatial associations between AOD, socio-cultural characteristics, and the incidents of crime-related behaviors. Findings from this study will contribute to understanding the impacts of alcohol availability within the city of Eau Claire.

Kinesiology

**Effects of Music on Athletic Performance**
**Presenter:** Cailen Andrews  
**Faculty Mentor/Collaborator:** Matthew Wiggins

Arousal or mental/physical stimulation can have a significant impact on sports performance. By achieving or maintaining an optimal arousal state, athletes can perform better, both mentally and physically. Listening to music during exercise may serve as a tool to achieve and maintain this optimal arousal. The purpose of this study is to explore the practicality of music’s use in intense exercise/sport. This study utilized the Broad Jump (BJ) and Illinois Change of Direction Test (ICODT) to assess low body power and agility. Participants performed three trials of each test. The first trial served as a test run to acclimate the participants to the movements. The second trial used no music, and the last trial used the participant’s choice of music. The only song requirement was a tempo of >100BPM (fast tempo). A Paired samples T-Test showed a mean increase of 0.099m and a standard deviation of 0.0599m from non-music to music trial for the BJ, and a t-value of -5.88. The ICODT had a mean decrease of 0.634s from the non-music to music trials, a standard deviation of 0.455sec, and a t-value of 4.402. Both tests produced statistically significant results (p-value <0.005). The results indicate music can facilitate high-level performance.

**Pre-Participation Physical Evaluation Methods to Identify Deficiencies in Musculoskeletal Health for Athletes**
**Presenters:** Hannah Geisler, Dalton Dowd, Cailen Andrews, and Harper Baenen  
**Faculty Mentor/Collaborator:** Corey Hannah

Pre-participation exams are done before annual participation in sport. Missing in many, is an orthopedic examination which would help outline a baseline for an athlete, identifies any treatable musculoskeletal injuries or deficiencies that are present, and helps identify predispositions to injury. We tested three assessments: Selective Functional Movement Assessment, Manual Muscle Testing, National Athletic Training Association 90-second test. This study included 21 student-athletes assessed as either functional or dysfunctional. Any participant with 25% or greater dysfunctional results was denoted dysfunctional. The SFMA showed the following results of 85.71% sensitivity, 14.28% specificity, 33.33% positive predictive value, and 66.66% negative predictive value. MMT and the NATA 90-second test showed
sensitivities of 0%, specificities of 100%, and a negative predictive value of 66.66%. The SFMA showed the greatest amount musculoskeletal information for clinicians.

**Self-Reported Physical Activity Level of Retired Collegiate Athletes Differentiated by Sport**

**Presenters:** Kaylin Cox, Ila Steinke, and Kate Glynn

**Faculty Mentor/Collaborator(s):** Robert Stow and Saori Braun

Division I student-athletes (SAs) experience transitioning away from sport(s) is heavily researched. Division III is the largest number of SAs yet lacks research. This study identified SAs’ susceptible to discontinuing adequate physical activity (PA) and identify transitional challenges. Methods: 422 (N=1,358) retired DIII SAs from UWEC responded to a Qualtrics survey. Demographics, occupation, mental health, prior injury, and current physical activity level (PAL) were addressed. Results: Retired SAs health perception predicted PA frequency (1, N = 354) = 23.35, p<.001. Higher perceived health perceptions were 3.5 times more likely to participate in high levels of PA. Individualized competitors were 3.05 times more likely to engage in moderate-frequency exercise and 3.92 times more likely to engage in high-frequency exercise, than those who participated in team sports. Poor-fair health status reporters were 57.5% less likely to participate in moderate-frequency exercise and 22.5% less likely to participate in high-frequency exercise. The survey (n=302) showed routine/structure (28.8%) and lacking a team (35.4%) were the largest transitional difficulties. Conclusion: This study showed sport type and perceived health were predictors of PAL upon retirement. Routine, structure, and lacking a team were areas SAs struggled to transition from

**Self–Reported Injuries and Illnesses in DIII Marching Band Members**

**Presenters:** Rita Acosta, Reba Rortvedt, and Katie Ruhde

**Faculty Mentor/Collaborator(s):** Robert Stow and Saori Braun

Introduction: The purpose of this study was to evaluate the self-reported injuries/illnesses in marching band (MB) members compared to traditional collegiate student-athletes due to a lack of information in the literature. Participants: One hundred and eighty-three members of the University of Wisconsin-Eau Claire Blugold MB participated in our study. One hundred and fifteen participants identified as female, sixty-five as male, and three as transmen. Ages ranged from 18-23. Methods: Participants were emailed a Qualtrics survey for data collection. Participants were asked to provide their years of MB experience, current physical activity levels, and previous injury history. MB responses were compared to student-athlete injury data from the same institution. Results: Results showed that 30.1% of the MB reported a history of injury associated with their participation. A breakdown of injury classifications found that 69.87% of injuries were to the lower-body, 19.28% to the upper-body, and 10.85% were uncategorized. In terms of heat illnesses, 43.7% reported a history of illnesses. Conclusion: Between student-athletes and MB members, it was shown that MB had higher injury/illness rates in all three categories. This demonstrates that MB participants have a similar injury occurrence as student-athletes and further investigation should be initiated to review causation and severity.

**The Correlation of Mental Health on Injury Rates in Division I Athletes Versus Division III Athletes**

**Presenters:** Maddie Ames, Kiara Marksman, Grace Erickson, and Carrie Fischer

**Faculty Mentor/Collaborator(s):** Robert Stow and Corey Hannah
Collegiate student-athletes have many stressors in their daily life beyond the average college student. There have been numerous studies on the mental health/stress of college students, however there is minimal information regarding how stress impacts student-athletes. The Biopsychosocial model stipulates that stress has an impact on an individual’s chance of injury, meaning the individual may be more prone to injury. The intention of this study was to evaluate student-athletes self-reported mental health scores and its relation to injury. A survey was sent to student-athletes from NCAA division I to III institutions. The questions were related to participant demographics, injury history, and a DSM-5 Self-Related Level 1 Cross-Cutting Symptom Measure. The researchers evaluated the DSM-5 scores of each domain and based on the standards, 94 (N=141) or 66% of the participants scored high in at least one domain, meeting the standards for further investigation/screening. From this subpopulation, 96.8% (n=91) self-reported an injury that required them to seek medical attention. The data supports the hypothesis that mental health may correlate with injury rates and additional investigation should be undertaken to develop resources that may assist with student-athlete’s mental health.

Languages

**An Evaluation of Curriculum Changes in Japanese 302**

**Presenter: Melanie Rausch**
**Faculty Mentor/Collaborator: Tomomi Kakegawa**

This student-faculty collaborative research project involves the examination of existing literature about various topics in foreign language acquisition including extensive and intensive reading, goal setting, student performances and presentations, teaching methods, assessments, and effective strategies for creating an inclusive classroom. The literature was used to evaluate the curriculum of Japanese 302 at the University of Wisconsin-Eau Claire. Results of the evaluation show that many aspects of the curriculum are already effective at accommodating various needs, but other aspects need to change or be replaced. To accommodate for future students’ diversity in their needs, interests, learning styles, and proficiency levels, potential changes to the curriculum were proposed based upon the literature, evaluation results, and previous student surveys. Research was also done regarding effective Japanese language books for the class, in terms of learning, acquisition, and assessment. These books and the changes in the curriculum will be implemented for Japanese 302 when it is next offered in the Spring 2022 semester.

**Creating an Inclusive Syllabus to Engage International Students and Local Students**

**Presenters: Yutong Yin, Xiaoxue Liu, and Alyssa Schroeckenthaler**
**Faculty Mentor/Collaborator: Kaishan Kong**

The population of foreign exchange students increases around the world. Observing how domestic and international students work with one another on an academic and social scale can provide insightful information on the advantages and challenges their interactions may bring. Student-student interaction, in a form of tandem learning, has a positive impact on meaningful learning (Madland, Colin, & Richards, Griff, 2016). In this process, corrective feedback contributes to second language acquisition (Ellis, Rod, 2009). In order to gain a deeper understanding of tandem learning through interaction between Chinese-speaking international students and local learners on the UW-Eau Claire campus, this qualitative study addresses three research questions: (1) In what way(s) does tandem learning help with students’ language improvement? (2) In what way(s) does tandem learning help students deepen cultural
knowledge? (3) What are essential and applicable elements in a syllabus to create an inclusive and diverse learning environment? Data included conversation recordings, worksheets and writing examples. The researchers discovered six themes and offered suggestions to instructors on how to connect international students with domestic students to foster each other’s cultural learning. This study is significant in offering specific ideas to enhance diversity in classrooms from international students’ perspectives.

**Growth Mindset, Grit and Language Learning**  
**Presenter:** Mikayla McEnery  
**Faculty Mentor/Collaborator:** Anne Hlas

This study investigates growth mindset within learning and teaching a second language. In general, people who exhibit more of a growth mindset tend to focus more on improvement and show more joy in the learning and teaching processes of learning a language than those with a fixed mindset. The study also examines research related to the role of grit and resilience in the success of second language students. In this session, practical ideas will be shared to promote a growth mindset and grit for the language classroom and why they can play an important role in student success. In addition, this session will propose future research directions related to these areas.

**Teaching Methodologies in L2 Spanish Phonetics: Segmentals and Suprasegmentals in Word and Sentence Reading Styles**  
**Presenters:** Amber Lamers and Marely Sanchez Rodriguez  
**Faculty Mentor/Collaborator(s):** Fabiola Varela-Garcia and Jeffrey Goodman

Since the emergence of the communicative approach, L2 instruction has often focused on communicability, relegating explicit pronunciation instruction to a secondary status. Studies reported on negative effects of the lack of formal emphasis on pronunciation (Tarone, 1978; Krashen and Terrell, 1983; Diller, 1978; Gregg, 1984; Krashen, 1985; Frantzen and Rissel, 1987; Chaudron, 1987; Terrell, 1991). Researchers have also highlighted the benefits of focusing on explicit instruction in conjunction with the communicative approach (Scovel, 1969; Murakawa, 1981; Zampini, 1994; Elliot, 1995b; Arteaga, 2000). While Lord (2000) reported progress both within the classroom and studying abroad, surprisingly greater improvement was found in the classroom context. This quasi-experimental design examines and reports the significance that multimodal explicit, communicative, and standard teaching methodologies have on learning Spanish pronunciation in 94 English native speaking adults. Our research questions are: 1. Do time and type of methodology have an impact on learning outcomes when teaching Spanish phonetics as L2? 2. Are there interactions between factors? Multivariate analysis (Mixed ANOVAs) formally assessed improved Word and Sentence reading styles across time as a function of instruction type. ANOVA identified the main effects of time, (different) instruction type and interactions while learning Spanish segmental and suprasegmentals as L2.

**Materials Science and Biomedical Engineering**  
**Characterization of Cold Work in Stabilization Copper of ITER Superconducting Wires**  
**Presenter:** Marina Mordell  
**Faculty Mentor/Collaborator:** Matthew Jewell
ITER is an international collaborative effort to build the world's largest magnetic fusion reactor in pursuit of large-scale clean energy production. The superconducting Nb₃Sn wires that comprise the machine's cables have an outer layer comprised of copper. This copper layer can be damaged during the reactor's operation, due to the Lorentz force present in the magnetic field, resulting in cold work that can be superficial or extend all the way to the diffusion barrier, possibly impacting the Nb₃Sn filaments. Using Scanning Electron Microscopy (SEM), we have quantified the extent of the cold work and correlated it with surface damage on the wires. We have identified four distinct groupings of damage, and in this poster we discuss the impact on the wire performance and the cable design. Acknowledgements: This work was financially supported by the ITER Organization, contract 43-1665 and benefited from the support of the Materials Science & Engineering Center at UW-Eau Claire.

**Characterizing the Rheological and Dispersant Behavior of ARGET ATRP-Synthesized Stimuli-Responsive Block Copolymers via Rheology and Pendant Drop Method**

**Presenters:** Hunter Koltunski, Colton Carney, Kaylee Erickson, Henry Liautaud, Ben Hamill and Jacob Hahr

**Faculty Mentor/Collaborator:** Elizabeth Glogowski

The focus of this research is to study stimuli-responsive “smart” block copolymers for applications in architectural coatings, such as paints, primers, and stains. The smart copolymer polyethylene glycol (PEG) -block- poly(2-(dimethylamino)ethyl methacrylate) (PDMAEMA) is of interest because of its property changes due to changes in pH and temperature. Such polymers may interface with opacifiers, namely titanium dioxide (TiO₂), to improve dispersion in architectural coatings. Optimized pigment dispersion would increase coating productivity, and may reduce environmental impact and cost of manufacturing. PEG-b-PDMAEMA block copolymers were synthesized through Activator ReGenerated by Electron Transfer Atom Transfer Radical Polymerization (ARGET ATRP). Copolymers of varying PEG molecular weights and PEG:PDMAEMA ratios were synthesized and characterized to study their effects on polymer properties. To determine successful synthesis, Nuclear Magnetic Resonance Spectroscopy (NMR) and Gel Permeation Chromatography (GPC) were used. Viscosity, a fluid’s resistance to flow, was measured using a Discovery HR2 Rheometer to determine optimal dispersion of particles for paint formulations. A Rame-Hart 250 was used to measure interfacial tension (IFT) between aqueous polymer solutions and toluene, a common architectural coating solvent. This research is ongoing to further explore how these polymers can improve productivity of architectural coatings and reduce environmental impact.

**Designing Surgical Biocompatible Materials to Aid Cancer Treatment**

**Presenters:** Aaron Ellefson, Cuyler Monahan, Kira Haus, and Marshall Apps

**Faculty Mentor/Collaborator(s):** Elizabeth Glogowski and Jeremy McBride

Enhancing cancer treatment through the use of biocompatible materials will save numerous lives. The Mayo Clinic Health System-Eau Claire collaborative project will achieve this goal through the production of medical foam for tumor ablation. This procedure is less invasive than open surgery by using a microwave probe to destroy cells so the body can remove the tissue. Currently, non-ideal materials such as saline or carbon dioxide are used to prevent unnecessary damage during ablation. They separate healthy tissue from the tumor site, but do not maintain an essential proximity. The foam collapse was
observed through time-lapse to track the decay rate. This provides quantitative data for relative stability, stiffness, and density. Foam modification through additives has increased stability when compared to the non-altered foaming solution. Ongoing research aims to understand the effects of contact with human tissue may have on foam stability. Two hydrogel tissue mimics, polyacrylamide and agarose, with thermochromic dye, are being developed to observe the insulating effect of the foam during ablation. CO₂ foaming is another avenue of investigation for its potential to determine stability and improve patient comfort. Future work includes adapting and customizing the foam’s properties with new additives for the field of interventional radiology.

**Filament Agglomeration in Bi₂Sr₂CaCu₂O₈₋ₓ (Bi-2212) Wires**  
**Presenter:** Kate O’Brien  
**Faculty Mentor/Collaborator:** Matthew Jewell

Bi₂Sr₂CaCu₂O₈₋ₓ (Bi-2212) is a superconductor capable of producing large magnetic fields for advanced magnet systems. However, during the heat treatment to form the Bi-2212 in a composite wire, individual Bi-2212 filaments can agglomerate, or conjoin, reducing the wire performance. In this project, we have identified conjoined filaments by coloring them based on their proximity to other filaments. This data set will then be used by a deep learning algorithm to automatically identify instances of conjoined filaments in the future. To complete this analysis, we use ImageJ to threshold and mask the image, and then determine the proximity of filaments by measuring the pixel width between the connected filaments. Finally, a color overlay is applied to the filaments depending on their status of conjoined or separate. In this presentation we will present the extent of filament agglomeration in this wire, and the prospects for improving the performance of the wire as a result.

**Gray and Ductile Cast Iron Microstructural Characterization using Image Analysis and Logistic Map Programming in FIJI**  
**Presenter:** Timothy Lui  
**Faculty Mentor/Collaborator:** Matthew Jewell

This project aims to develop a programming structure and user interface that allows for easy characterization of polished cast iron samples and their subgroups using their graphite microstructure. The morphology (shape) of the graphite particles in cast iron has a significant impact on the mechanical properties of the material. These subgroups are broken down by the graphite size, distribution, and shape. To do this, cross-sections of grey and ductile cast iron samples are polished using a diamond paste, imaged using a confocal microscope, and then analyzed using an image analysis program called FIJI. Once images have been acquired and thresholded, a programmed logistic map is used to distinguish the type of cast iron and its subgroups. Engineering standards are used to correlate the graphite particle shape to the shape descriptors of each of the seven types of iron. These values are then used by the program to help distinguish the graphite types. This project will create a useful process for metallurgical engineers to help understand the structure and properties of their material, as well as hopefully lead to improved processing methods. This will in turn lead to less waste, better material quality, and ease of manufacturability.

**Mechanical degradation in Nb3Sn superconducting cables**  
**Presenters:** Cameron Johnson and Zach Fellenz  
**Faculty Mentor/Collaborator:** Matthew Jewell
Certain fusion reactors use cable-in-conduit conductors that contain Nb3Sn superconducting wires that degrade during electromagnetic cycling. In this study we are comparing heat treated cables that have not been through electromagnetic cycling to cables that have undergone this testing and have experienced performance degradation. This analysis is performed by disassembling the conductors and visually examining and characterizing the extent of damage on the wires. Dents on the surface of the strands are imaged using scanning laser confocal microscopy, and their dimensions are then measured. Our results show that defects on the surface of the wires grow longitudinally after testing, but do not deepen. This indicates that the wires are primarily rubbing against, rather than pressing against, each other during electromagnetic testing. It is also shown that the average number of defects on the wires remains the same in each conductor, indicating that the damage occurs at consistent intervals along the lengths of the strands. These analyses will allow us to propose design improvements for future conductors and help specify a safe operating envelope that minimizes damage.

The Image Analysis of the Transverse Cross-Section of Nb3Sn Cables
Presenters: Benjamin Thronson and Cheyanne Wade
Faculty Mentor/Collaborator: Matthew Jewell

The purpose of this project is to examine the movement and shape of wires in the transverse cross-section of cable in conduit conductors (CICCs) after thermal and electromagnetic cycling for the ITER fusion reactor. The ITER project provides a pathway to nearly limitless clean energy production, but the large superconducting magnet system that supports it is vulnerable to performance degradation during operation. After sample preparation, samples are imaged using a Confocal Laser Microscope, and the images are evaluated using the open-source image processing software called imageJ. The main results that have been found so far are that the Lorenz force, created by the electromagnetic cycling and the currents, is causing a movement in the wires in the direction of the Lorenz force. This movement in the wires causes an increased void fraction in the opposite side of the Lorenz force direction, which in turn allows wires to bend and this bending is a possible cause of a loss of current in the conductor. With this data, we hope to send the information we have gathered back to the ITER group so that they are able to find the optimal operating parameters for their conductors.

UV-Vis and DLS characterization of smart properties of PEG-PDMAEMA block copolymers synthesized by ARGET ATRP
Presenters: Yunyi Huang, Sorfina Suzali, and Dai Junjie
Faculty Mentor/Collaborator: Elizabeth Glogowski

The purpose of this project is to synthesize and characterize smart polymers that have controlled polymer architecture. Smart polymers are polymers that respond to a change in environment; the polymer becomes insoluble with an increase in temperature depending on the pH of the solution. Poly((2-dimethylamino)ethyl methacrylate) (PDMAEMA) was synthesized via Activator Regenerated by Electron Transfer Atom Transfer Radical Polymerization (ARGET ATRP) because it reduces cost, and it is more environmentally friendly than traditional ATRP. To determine the effect of polymer structure on smart properties, each smart polymer composition is tested using Dynamic Light Scattering (DLS) and Ultraviolet–visible spectroscopy (UV-Vis) to assess the pH and temperature sensitive behaviors. DLS is used to test the size of polymer because as solubility changes with temperature, the polymer switches from individual polymer chains to aggregates or micelles. UV-Vis measures the transmittance of light through the polymer.
solution, and the transmittance drops suddenly at the cloud point, or the temperature where the polymer solution becomes cloudy due to the change in solubility. These smart polymers have potential for use in drug delivery and enhanced oil recovery.

Wire damage as revealed by etching in ITER superconducting cables
Presenter: Gus Mantey
Faculty Mentor/Collaborator: Matthew Jewell

The ITER magnet system is the largest superconducting magnet project in the world, but the superconducting cables can be degraded during electromagnetic operation. In this project, we assess this damage by etching transverse cross-sections of the cable. The damaged wires in all transversely cut samples were exposed using a nitric acid technique, imaged with a confocal microscope, and analyzed using ImageJ. The low pressure zone (lpz) petal of the cable demonstrates the most damaged wires, and the damage is due primarily to strand bending. The wires in the lpz petal for all samples have an 11.8% higher void fraction than all other wires. Within the lpz petal, the bent wires’ average void fraction is 11.5% higher than that of the undamaged wires for sample 5A6, demonstrating a positive correlation between void fraction and bending damage. Sample 3A3 had the largest increase of void fraction from undamaged to bent wires which was 51.1%. The damaged wires are also much closer to the cable wrappings and further from the central spiral on average compared to undamaged wires within the lpz petal. Since most damaged wires occur in the lpz of the cable because of the higher void fraction, a new design of the cable could include 2 or 4 more wrappings for a total of 8 or 12 separated petals. This would reduce bending damage to the wires during testing.

Mathematics
A Search for Primitive Roots in the Eisenstein Integer Ring
Presenters: Dan Guyer and Lily Leith
Faculty Mentor/Collaborator: aBa Mbirika

Named after Gotthold Eisenstein (1823-1852), the Eisenstein integers are a well-studied collection of complex numbers. In fact, Dr. aBa and former UWEC student Emily Gullerud discuss the various complex prime numbers that occur in this new context in their work from 2018, recently published in 2020. While they exhibited what remainders exist when Eisenstein integers are divided by powers of complex prime numbers, we study the structure of these remainders. In particular, we examine the remainders that are coprime to a prime power. We question if all possible (coprime) remainders can be created by repeated multiplication of a single remainder. Furthermore, we work to understand the relationships between these coprime remainders via group-theoretic means. In particular, we describe these coprime remainders as direct products of cyclic groups. That said, all group-theoretic results will be introduced as necessary throughout the talk.

Application of the Entropy Weight and TOPSIS Method in health and Sustainability Evaluation of Higher Education Systems
Presenters: Ruishen Yang, Pinzhe Chen, and Ike Minh
Faculty Mentor/Collaborator: Wufeng Tian

In this paper, we introduced an evaluation index system for the health and sustainability of higher education systems. We first defined six key components of health and sustainability indicators,
sustainable environment for the development of higher education, financial status, accessibility, equity, diversity and inclusion, academic performance, and affordability. Then, we calculated the corresponding weights of each indicator and evaluated the health and sustainability of United States, Brazil, and Zimbabwe based on entropy weight and TOPSIS method. In the end, we discussed further actions that need to be taken to help with developing a healthy and sustainable higher education system. Collecting the data of other nations and evaluating the overall health and sustainability of higher education systems would be explored in our future work.

**Baseball Analytics: Calculating WAR for the Northwoods League**  
**Presenters:** Maxwell Firminhac, Luke Baldwin, and William O’Brien  
**Faculty Mentor/Collaborator:** Jessica Kraker

Baseball has long served as a frontrunner for the integration of analytics with application, connected in part to the consistency of historical statistics as well as the widespread interest in the national professional and more local semi-professional sport leagues. This project builds on prior data-exploration and data-gathering for the local Northwoods League, with recognition of a reduced set of available technical information (as compared to MLB). The intention is to create a WAR calculation for the league using the available data. The original WAR statistic in the MLB uses data that is unattainable for the NWL. Therefore, this project attempts to modify the WAR statistic with reasonable substitutes to make it accessible for the NWL. The two primary focuses of the current project are modeling and coding generalization. Coding generalization summarizes the structure of the available data organization as well as discusses functions written to compute necessary inputs for the metrics, including different portions of the WAR analogy. With the adjustments and additional back-computations of metrics for individual players, we now have sufficient available information for modeling these player utilities. We summarize the modeling results found by connecting information about: player-by-game appearance, season-break information, refined player utility estimates, and use of reconfigured statistics.

**Graphical and Computational Practice in Teaching the Central Limit Theorem**  
**Presenters:** Eduardo Mejia and Michael Seifert  
**Faculty Mentor/Collaborator:** Abra Brisbin

The Central Limit Theorem is one of the most challenging concepts in Math 246: Elementary Statistics, a course that many UWEC students must take to satisfy graduation requirements. In this study, we gathered data from two sections of Math 246 to investigate whether graphical or computational problems have different effects on students’ ability to solve Central Limit Theorem problems throughout the semester. Using a Bayesian hierarchical model, we found that on average, students take more attempts to be successful on numerical homework problems, compared to multiple-choice problems. We will also present results of a permutation test showing the effect of problem topic (graphical versus computational) on students’ performance on a post-test at the end of the semester.

**Optimization of Settlers and Food Supply for Mars Mission**  
**Presenters:** Payton Mae Sevals and Ruishen Yang  
**Faculty Mentor/Collaborator:** Wufeng Tian

What seemed impossible became a reality 64 years ago when the first satellite was successfully launched into outer space. From there many more space travels were successfully launched, but now scientists want
to take it a step further by colonizing a different planet, Mars, because of how similar it is to Earth. Assuming an atmosphere is created, water is uncovered and accessible, and the average temperature increases, there are still many other factors that need to be evaluated for the journey to Mars, such as the number and demographics of the first crew and necessary food. In this paper, we first discussed the demographics and individual characteristics of the first crew. Then, we estimated that a minimum of 140 settlers will need to be brought to Mars to ensure a suitable and reasonable survival for the first flight crew. Finally, given that the weight is a major concern when considering sending an object into space, we calculated the minimum amount of preservable food that needs to be sent from earth before and during the trip for the first flight crew. In the end, we discussed the suitable types of food that can grow on Mars to help colonizers adjust to their new life. Our findings in this paper provides a good starting point for discussion and further research on the number and demographics of the first crew settlers and the appropriate food supply for Mars mission.

**Safety of Radon Concentrations in Wisconsin Homes: A Statistical Investigation**

**Presenter:** Leah Koepke  
**Faculty Mentor/Collaborator:** Mohammad Aziz

The purpose of this study is to determine if the radon concentrations in Wisconsin homes is safe overall and provide a best estimate of the radon level in the state homes. We also investigate the approximate underlying true distribution of radon concentrations for Wisconsin homes. Several parametric and nonparametric statistical techniques are used for preliminary analysis of the data. To further investigate the relationship between predictor variables and radon concentration, multiple linear regression and logistic regression analysis are performed. Measurement factors, such as whether the home has a basement and whether the measurement was made in a basement, are also discussed. From our results, a recently developed skew-t distribution is found to closely approximate the distributions of radon concentrations compared to a national finding best fitting lognormal distribution. We also observe that, radon concentration is high in basement compared to other floors, and the radon problem is severe in southern Wisconsin compared to other regions of the state. A county-to-county variation in radon levels is also observed in our analysis. Radon level in Wisconsin homes is found at a dangerous level and radon testing is recommended for homes in Wisconsin.

**Tracking COVID Locally and Adaptively**

**Presenter:** Shin Yee Lim  
**Faculty Mentor/Collaborator:** Jessica Kraker

In summer 2020, the project started with the faculty mentor creating a dashboard to visualize and summarize information about local COVID data. The goals of the current project include: effectively communicating data and findings with the community; formatting and preparing data appropriately for forecasting; and creating and fitting models for predicting the future cases for decision making in different areas related to COVID. Skills developed include learning a new programming package dplyr in R and hosting code on GitHub, which were then applied in preparatory work such as building new data frames and calculations. In order to forecast future occurrences, time series models with lagged COVID-case counts were created. Historic results, summaries of the data, and models will be updated and presented in visual and digital form on the dashboard and poster. As part of our conclusions, we will discuss a predictive model for future outcomes (such as hospitalizations), built on age-grouped case-counts to account for the disparities in outcomes observed for different ages in the COVID pandemic.
Unexpected Classroom Events and How They Demonstrate a Math Teacher’s Mathematical Knowledge for Teaching  
Presenter: Jessie Knutson  
Faculty Mentor/Collaborator: Melissa Troudt

In this poster, we will present our pursuits to document and describe how teacher knowledge can be observed in experienced mathematics teachers’ in-the-moment instructional decisions. Specifically, we looked for ways teachers displayed their mathematical knowledge for teaching when unexpected events occurred in classroom discourse. We viewed and analyzed the classroom instructions of high school teachers engaged in teaching lessons on exponential functions via pre-recorded videos of classes over several lessons in addition to video interviews with the teachers in which they explain the decisions they made in regards to the lesson. We present our findings from two teachers, Mandy and Molly, and their decisions on how to respond when prompted with unexpected answers or questions from students that altered the whole class discussions. We noticed some themes in the patterns of teacher responses. In general, the response from teachers to unexpected events resulted in a shift in their behavior from their usual demeanor in order for their lessons to continue as planned. Since each decision made during the class was not addressed in the interview, we hypothesize explanations for the teachers’ rationale for these decisions based on behaviors that are typical to the teacher.

Music and Theatre Arts  
A Focus on LGBT+ Identity in Appealing to Generation Z Classical Music Listeners  
Presenter: Emily Mettner  
Faculty Mentor/Collaborator: Julie DeBoer

As Generation Z comes of age, they join the market for classical music event attendance. Studies conclude that Gen Z is the most “out” generation yet, with 1/3 of its population identifying as LGBT+. This small-scale study was designed to gauge Gen Z interest in classical music performances related to LGBT+ representation, with intent to provide a pathway for promoting these events to the younger population. Participants were asked to participate in a 14-day study, in which they ranked and commented on different promotional materials advertising a variety of events, each with a different representational draw. Results suggest that Gen Z has a vested interest in events related to the LGBT+ community, as well as events promoting musicians from under-represented populations. These findings provide the basis of a bridge between classical music and Gen Z, and with further extension of study, could yield a concrete method of increasing future classical music event attendance.

A Song Recital for the 21st Century  
Presenters: Jacob Hilton, Reanna Madson, and Elijah Vanderpoel  
Faculty Mentor/Collaborator: Kenneth Pereira

The purpose of this project is to help explore the format of the song recital, and to utilize multimedia sources in the storytelling aspect of song cycles and recital programs. We plan to create and film a structured storyline to help contextualize the message of Vaughan Williams’ Songs of Travel to a younger audience, utilizing other related poetry from Robert Louis Stevenson’s poetry collection, relating the text to a story set in the present day, and expressing this artform through the mediums of film and live
performance. The result of the project will be the performance of the upcoming recital that includes the complete song cycle and film this April.

**Adaptations for People Who Are Neurodiverse to Successfully Participate in Music Classrooms**  
**Presenter:** Tessa Ferry  
**Faculty Mentor/Collaborator:** Lee Anna Rasar

This faculty – student collaborative research project examined adaptations needed to make music activities accessible to and successful for students who are neurodiverse. Task analyses were created to represent meaningful ways for them to interact within a musical environment in a scaffolded developmental sequence from simple to complex and from a hierarchy of cues/prompts/supports ranging from least intrusive to more involved cues (visual, tactile, conceptual, rhythmic, pitch-related, harmony-related). Results provide a very useful tool for lesson planning, execution, goal setting, and improvement in quality of life. Areas of engagement included: listening and performing (singing, playing, dancing, conducting, and composing); associating symbols/images with music; expressing interest in creating music; identifying different tones, genres, and styles of music; expressing musical preferences including those related to mood/feelings; improvising within different structures (within rhythmic meters and patterns of varying levels of difficulty/complexity, within harmonic structures when using chords); improvising within different styles; maintaining memory for musical activities with ability to replicate desired performance effects; playing with flow and rhythm; playing specific songs; performing with others; performing independently; leading others in performance; multi-tasking while performing; and making meaningful connections to music and other parts of life and making musical decisions related to those connections.

**Aleatoric and Nontraditionally Notated Choral Music**  
**Presenter:** Abbey Monreal  
**Faculty Mentor/Collaborator:** Chia-Yu Hsu

The purpose of this research project was to write two compositions with aleatoric and nontraditional notations specifically for choir. The use of these different compositional techniques is becoming more popular throughout the 21st century, but they are still rarely used in choral pieces. Throughout this project, I composed two pieces using different techniques and had them performed by strong choral participants. These participants were surveyed for the effectiveness of the notation and their experience singing these pieces. While it is not possible to sing in a full choir setting due to COVID-19, some valuable feedback was still provided by this small group of singers. It was concluded that this notation was effective and produced the desired result by the composer but needed more clarification.

**Exploring Advanced Costume Craft Techniques for UWEC Theatrical Productions**  
**Presenter:** Semisi Faleta  
**Faculty Mentor/Collaborator:** Amanda Profaizer

In January 2020, the Kennedy Center American College Theatre Festival (KCACTF) occurred in Madison, Wisconsin with UWEC theatre students and faculty in attendance. Technical theatre samples and design presentations included costume craft products and techniques being utilized throughout the industry for the development of professional costume crafts. Of note were presentations highlighting the use of products including foam, Worbla, and Fosshape. While incorporating these products and
techniques would be highly beneficial to students at UWEC interested in technical design, current teaching and production development schedules typically do not allow time for experimentation of new products or techniques for upcoming theatrical productions. Student researcher and Theatre Comprehensive Major, Semisi Faleta sought to explore the use of advanced costume crafts technology presented at KCACTF for upcoming UWEC theatrical productions. With the support of UWEC faculty mentor Amanda Profaizer and ORSP, Mr. Faleta tested the use of several products and techniques to inform proper use of new and innovative products and design techniques benefitting UWEC theatrical productions and ultimately elevating the level of technical instruction and design at UWEC. Mr. Faleta will present research, design, final costume pieces, and provide an evaluation of products and techniques used throughout this research project.

**Origins of Folk Songs Used in the Music Classroom**  
**Presenters:** Abbey Monreal, Danny McDonnell, and Grant Singer  
**Faculty Mentor/Collaborator:** Laura Dunbar

The goal of this research project is to develop a database for educators to know which folk songs are appropriate to use in the classroom. This information is important because it helps to eliminate songs with racist, sexist, or inappropriate origins from being used in the classroom. Throughout this research, our team is also discovering alternative songs to use in their place which teach similar concepts. Technological advancements have made it easier to investigate the origins of many songs still used in the classroom today. It is especially important to eliminate these songs in today’s climate because the origins of these pieces can easily be accessed by our students. So far, our research team has been able to uncover the origins of many commonly used songs, citing specific sources for educators to investigate further. Additionally, we have begun to compile a list of replacement songs which teach similar concepts. We hope to continue this research, as there are so many folk songs yet to be researched.

**Refocusing Choral Literature and Conducting to Benefit Future Educators**  
**Presenters:** Maddie LeBouton and Danny McDonnell  
**Faculty Mentor/Collaborator(s):** Laura Dunbar and Frank A. Watkins

The goal of this study was to refocus the course MUED 400 in order to provide the most beneficial, applicable information and experiences for future choral educators. To achieve this, a survey was sent to local choral music educators, which included UW-Eau Claire choral music education alumni and choral educators from area schools who attended a variety of other universities. Participants were asked to provide insight into what skills and knowledge they use most often in their classrooms, including conducting and selecting repertoire from diverse genres. Many UW-Eau Claire graduates found that the repertoire studied in MUED 400 was above the skill levels of their beginning choirs, resulting in them feeling they were missing resources for finding quality middle-level repertoire. It was also found that most choral educators surveyed rely on publisher sites that do not typically contain works by underrepresented composers, like JW Pepper. In response to this, we asked participants to contribute to a list of choral literature they highly recommend for a variety of skill levels. We supplemented this with a compilation of resources for finding repertoire by historically underrepresented composers such as composers of color, female composers, and the many intersections of minoritized choral artists.

**Nursing**

** Civility, Forgiveness, and Personality Characteristics: Exploring the Relationships of These Concepts in Nursing Education and Practice**
**Incivility in nursing education and practice is an ongoing problem, studied in-depth since the 1980’s. Forgiveness and personality are concepts that have not been studied together with civility. The project focuses on nursing but is applicable to other professions and interactions. The positive relationships amongst all study variables can be used as a foundation for developing educational programs to improve civility in nursing education and practice and as a basis for future studies. To date, no studies reporting interventions focused on forgiveness and personality characteristics as strategies for improving civility have been identified.**

**Developing Future Public Health Nurses Through Academic-Practice Linkages: A Literature Review**  
**Presenter: Kaitlyn Moore**  
**Faculty Mentor/Collaborator: Pamela Guthman**

Public health nursing, the initial specialty within nursing, is now facing uncertainty of its future (Canales & Drevdahl, 2014). Public health nurses and educational programs have decreased over the years creating a drastic shortage. As public health nurses retire or change specialties, there are a lack of appropriately educated public health nurses and lack of nurses wanting to practice in the population health setting (Young et al., 2014). Several organizations have identified a well-educated public health workforce is needed to meet the growing health concerns of the nation. Nursing curriculum needs to make a change to produce a greater number of high-quality public health nurses (Canales & Drevdahl, 2014).

**Educating the Educators**  
**Presenters: Gabrielle Peterson and Eleanor Sladek**  
**Faculty Mentor/Collaborator: Meg Lagunas and Stacey Stafne**

Evaluation and feedback are key to professional improvement and instructional quality in higher learning including nursing simulation (INACSL, 2016). Simulation educators, those who facilitate student learning during the simulation, function in different roles than traditional didactic teaching. Therefore, the uniqueness of simulation teaching has created a need for innovative educator evaluation methods. The purpose of this project is to create and evaluate a peer-to-peer feedback exercise for simulation educators who work in the UW-Eau Claire Nursing Clinical Learning Center. This ongoing mixed-method study will use a combination of survey and interview data to address the study questions.

#1: Does a peer-to-peer feedback exercise increase a simulation educator’s: a) confidence level in their ability to use simulation as a teaching technique? b) skill with teaching simulation as demonstrated by self-score on the Debriefing Assessment for Simulation Healthcare tool? #2: Is a peer-to-peer feedback exercise feasible for simulation educators to complete once per academic year? #3: Does a peer-to-peer feedback exercise provide “useful” evaluation data for simulation educator’s performance reviews. Data collection is ongoing due to the unique stressors of being a simulation nurse educator during a pandemic.

**Returning to the Community: A Quality Improvement Project**  
**Presenters: Emily Webster and Brelynn Updike**  
**Faculty Mentor/Collaborator: Pamela Guthman**
The goal of this collaborative quality improvement project including UW-Eau Claire College of Nursing and Health Science students (UWEC-CONHS), Chippewa Valley Justice Action Team, Eau Claire County Human Service Department (ECCHSD’s). FREE-Reclaiming Women’s Freedom of the Chippewa Valley, and Ex-Incarcerated People Organizing (EXPO) is to raise awareness about the gaps and resources needed to support people as they return to their community after having experience incarceration. Nursing students have had their own stigmas and biases challenged through enhanced understanding of people’s lived experiences. Students have learned about the importance of the nurse as a change agent through advocacy. The data collected will be used to elevate awareness about the gaps and barriers and the need for programmatic improvement.

Targeted Education for School Staff on Electronic Nicotine Delivery Systems: A Nurse-Led Intervention
Presenter: Lindsey Boehm
Faculty Mentor/Collaborator: Lorraine Smith

There is a public health epidemic in adolescents’ use of Electronic Nicotine Delivery Systems (ENDS), also known as electronic cigarettes, vaping products, or JUULs. However, little is known about the level of knowledge school staff have about ENDS. The purpose of this study is to identify knowledge strengths and deficits held by school staff about ENDS and examine the effectiveness of this nurse-led intervention. A descriptive, non-randomly selected pre-test/post-test design was used with 125 Wisconsin school staff. Results revealed further educational needs of school staff in areas of advertising trickery that entices youth, including the multiple flavors of ENDS products. Following the educational intervention, post-test results showed a significant overall improvement in participant knowledge scores. Recommendations include implementing nurse-led education about ENDS to a more diverse population of school staff. Providing nurse-led ENDS education to school staff offers an upstream, proactive approach to address this public health epidemic.

Philosophy and Religious Studies
The Role of Aesthetics in Holocaust Education and Remembrance
Presenter: Phoenix Woodfill
Faculty Mentor/Collaborator: Steven Fink

Many critics have claimed over the years that art has no place in discussions of the Holocaust. That to attempt and introduce an aesthetic understanding onto such an atrocity reduces the suffering of victims into a commodity. The purpose of my project is to investigate the art produced during and after the Holocaust to understand its place within the realm of aesthetics as well as modern education and efforts of remembrance. I explored the production of art during the Holocaust, whether by Jews in camps and ghettos or by the Nazi regime, to gain an appreciation for the heterogeneous expression of experiences between the two groups. I also investigated post-war attempts at presenting the Holocaust, particularly the realm of memorials. Many complex questions arise when considering how to approach an artistic representation of suffering and incomprehensible horror of the Holocaust. I will use this research to provide support for the endeavors of artists working to not let such a monumental event in human history be forgotten or the voices of the victims be lost to the often dispassionate diatribes of historical education devoid of an appreciation for the role of aesthetics and art.

The Body-Mind Connection and Healing
Presenter: Inga Jystad
Contemporary biomedical medicine offers one specific perspective on physiological and psychological health and healing. The connection between bodily health and mental wellness is still relatively unexplored and not fully understood. The main research question to be explored within this project is thus: “what are the effects of the body-mind connection and how does it relate to healing?”

Physics and Astronomy

*Gamma Ray Spectrometry using a NaI(Tl) Scintillator*
Presenter: Brendan Power
Faculty Mentor/Collaborator: Lyle Ford

I've converted the Physics department's single-channel scintillation gamma detector into a multi-channel spectrometer by integrating a multi-channel analyzer (MCA) into the current system. The original system could not fully describe the spectrum of a radioactive source as it only gave information about the amount of energy detected in a specific energy window. By not being able to give a more detailed description than this the single-channel system had limited utility. I've incorporated an MCA into the system and wrote a python program to display and interpret the data taken from the MCA. I've used this system to determine unknown isotopes in many radioactive samples, as well as show the linearity of the system, and the effects of background radiation on sampling. This improved system can be used by the Physics department for further studies in gamma ray spectrometry.

*Modeling Convective Overshoot in Accreting White Dwarfs*
Presenter: Caitlin Hedberg
Faculty Mentor/Collaborator: William Wolf

This research utilizes the Modules for Experiments in Stellar Astrophysics (MESA) software to study the circumstances surrounding accreting white dwarfs growing in mass that are known to produce type Ia supernovae and are considered the forges of nearly half of all 56Fe in the universe. The existence of the supernovae presupposes an explosion within the white dwarf to trigger such an event to create novae, though the source of the initial ignition is debated. A key question arises from the growth of the white dwarf to create the conditions for such an ignition, such as accreting matter from a companion star. Thus, the research team is divided into two branches: the first focusing on models with convective mixing, the second focusing primarily on diffusion within the white dwarf which will together produce a large database of models to assess the viability of these mechanisms to facilitate long term growth of the white dwarf. This research seeks to assess the validity of previous studies of convective overshoot in accreting white dwarfs by using a newer version of MESA while simultaneously creating a database of new models to contribute to the understanding of white dwarfs.

*Musical String Inharmonicity*
Presenter: Chris Murray
Faculty Mentor/Collaborator: Scott Whitfield

In the idealized model, the normal modes of vibration for a string all have frequencies that are integer multiples of the lowest frequency. In the real world, these frequencies tend to be higher than their ideal values. This effect is called string inharmonicity. Inharmonicity is caused by the stiffness of the string material. The purpose of this study is to test the veracity of the accepted model of string inharmonicity by
directly measuring string dimensions, string stiffness, and the frequencies produced by its vibration. The results suggest that the actual behavior of strings of different materials does conform to the accepted model of inharmonicity if the preconditions of the model are met.

**Redevelopment and Evaluation of LabVIEW Programming for Adaptive Optics Imaging Methods**

**Presenters: Joe Jasper, Joseph Carroll, and Ruthe Woehlke**

**Faculty Mentor/Collaborator: Kim Pierson**

Within the medical community, adaptive optics scanning laser ophthalmoscopes (AOSLOs) represent a powerful clinical and experimental tool for non-invasive assessment of the living retina. However, current devices are large, unwieldy, and in limited quantity. To meet the need for a convenient mobile device capable of precision imaging, a handheld AOSLO is being built based on a design published by Duke University in 2018. The current LabVIEW operating software requires redevelopment to meet industry standards of quality and increase the speed of image acquisition, which is fundamental to advancing the potential of mobile AOSLO imaging for future applications. The current program uses both LabVIEW and MATLAB to record, display, and process retinal images and their resulting data. This code was originally written using multiple files, coding structures, and lacked speed and efficiency, necessitating extensive redevelopment before implementation. However, some coding improvements have been completed, including the reconstruction of case structures, re-definition of variables, optimization of pathways, and creation of documentation. This code improvement project intends to optimize program speed and efficiency, update the coding structure to reflect industry standards, and produce superior levels of data and image quality when the program is operated.

**Two-Dimensional Physical Modeling of the Human Vocal Tract Using Computer-Aided Design**

**Presenter: Alexa Julson**

**Faculty Mentor/Collaborator: Nathan Miller**

Precise shaping of the surfaces of the human vocal tract is necessary for the controlled production of sound and speech. Air passes from the lungs through the vocal folds, causing them to vibrate rapidly. The tension of the vocal folds controls the fundamental frequency which is produced along with the harmonic series corresponding to that fundamental. The upper vocal tract creates a natural resonator whose shape determines which frequencies of the complex waveform are enhanced. These favored spectral regions are called formants the characteristics of output sound which determine what vowel is being produced. This research probes the fascinating differences in shape and size of a resonator and the resulting frequency spectra. Through the construction and exploration of a two-dimensional physical model of the upper vocal tract we are determining how well we can reproduce the changes in the acoustic spectrum corresponding to different vowels. The vowels produced will be compared with those of the International Phonetic Alphabet in a plot of the frequencies of the first two formants. Computer-aided design is being used to construct the physical models using reference diagrams from the literature of the speech sciences.

**Using an AC Light Dimmer to Simulate Sunlight**

**Presenter: Jack Flatten**

**Faculty Mentor/Collaborator: Kim Pierson**
This project is part of a program to develop a new type of solar water heater. The purpose of this individual project is to create an array of ELH light bulbs on a fixture that will be placed on top of a set of dual testing stations to mimic sunlight. These testing stations will be used to test different designs for a solar water heater in an inside controlled environment. In 1974 NASA constructed a similar testing system with these same light bulbs but on a much larger scale. The AC light dimmer will be used with the light fixture to provide the exact same light intensity for each panel. This will guarantee that each test will be consistent, which will make comparing the solar water heater responses more precise. This presentation will explain how an AC light dimmer works and how it can be incorporated into an array of lights to simulate the sun. The results of this project will help advance research in renewable energy.

**Political Science**

**Evaluation of the Cuban Missile Crisis and Foreign Policy Analysis: John F. Kennedy, 1961 – 1963**

**Presenter:** Collin Abel  
**Faculty Mentor/Collaborator:** Damir Kovacevic

Analysis of qualitative historical case studies regarding the foreign policy of the John F. Kennedy presidential administration (1961-63), specifically to evaluate the effectiveness and impact of decision-making regarding U.S.-Soviet relations of the Kennedy administration within the context of the Cuban missile crisis and broader Cold War “Flexible Response” doctrine. By evaluating decision making primarily via declassified documents listed on the “Office of the Historian” web page, it is the goal of this research to use operational code analysis of the Kennedy administration to evaluate cognitive reasoning behind decision points during the Cuban missile crisis, such as the use of the descriptors “quarantine” and “blockade”. Using the following criteria: public support by the American public, international crisis leadership, relations with foreign leaders, success of decisions, and respect for sovereignty, it is the hope of this project to produce a perspective about the Kennedy administration, the broader Cold War, and broader-still nature of U.S.-Russo international relations. It is the intention of this project to produce a better understanding of the discipline of international relations by way of historical case study analysis through an instance of perceived U.S. hegemony and morality to prevent nuclear conflict.

**Episodes of Ethnic Cleansing: Local-Level Dynamics during the Kosovo War**

**Presenter:** Matthew Tentler  
**Faculty Mentor/Collaborator:** Damir Kovacevic

How and why did policies of ethnic cleansing unfold across various municipalities during the Kosovo War (1998-00)? Why did some municipalities experience horrific war crimes, intense violence, and targeted group destruction, while others did not? These questions highlight the importance of the local level – meso level – for understanding violence across time and space. The meso level is a tool that studies violence at an analytical level below the nation-state. In this paper, we investigate the meso-level dynamics of the Kosovo War, with particular attention to the episodes of ethnic cleansing that occurred in certain places at certain times. We contend that violence is not uniform. Onset, duration, and intensity vary from village to village, city to city, and region to region. Thus, to explore this process, we employ a micro-comparative study of three municipalities (Dečani, Glogovac, and Suva Reka) for a more in-depth understanding. We find that to understand why policies of ethnic cleansing may unfold, one must account for both the scope conditions – war and exclusionary ideology – and the explanatory variables – political authority, territorial superiority, and agent collaboration.
Psychology

**Adding Performance Feedback to Math Wise to Enhance Math Computation Fluency**

**Presenters:** Lauren Steinhoff and Madeline Halbur  
**Faculty Mentor/Collaborator:** Mary Beth Tusing

Academic standards (Common Core State Standards, 2010) suggest that second-grade students should be able to add and subtract double-digit numbers by the end of the school year. Math Wise is a second-grade supplemental tutoring intervention for math computation. It has been used as part of an existing intervention program at a local elementary school. Previous progress monitoring data from the intervention show that students in the program make good growth in computation accuracy, but they do not build desired levels of computation fluency. Research has shown that performance feedback, specifically feedback on speed of academic performance can lead to positive gains in academic fluency (Coddington, Burns, & Lukito, 2011). In this study, we examined the effects of adding performance feedback and goal-setting fluency intervention to the Math Wise program. Two second-grade students took part in the study. Intervention was three times per week for five weeks as was delivered virtually. An AB single-case design evaluated the addition of the fluency intervention on students’ math computation accuracy and speed. Students did not make significant gains following the addition of the fluency intervention. Findings are discussed in terms of limitations to the current study and future intervention research.

**Body Regard Moderates the Relationship Between Anxiety and Suicidal Ideation**

**Presenters:** Emerson Ngu, Isabel Jayne Yu, and Carley Ann Owens  
**Faculty Mentor/Collaborator:** Jennifer Muehlenkamp

Previous research has found a correlation between disturbed body regard and suicidal behavior (Orbach, 2001, Muehlenkamp, 2012). Anxiety has also been identified as a key component of suicidal ideation and intent (Thibideau, 2013). Researchers suggest poor body regard may impact how other risk factors, such as anxiety, relate to suicide (Muehlenkamp, 2012). This project explored the role of the body regarded as a moderator between anxiety and suicidal ideation. Linear regression was conducted on data collected from Undergraduate students (Mean Age=19.58 SD=1.85, 84.9% white) who completed self-report questionnaires to assess how body regard may impact the relationship between anxiety and suicidal thoughts or behavior. Results indicated that the full model was significant \( F(3,372) =31.75, p<.05 \) accounting for 20.4% of the total variance of lifetime suicidal ideation. Suicidal ideation was found to be greatest when anxiety is high, and body regard is low, \( (t=4.31, p<.01, 95\% CI: 0.04 \text{ to } 0.12) \). With high body regard, however, anxiety has a non-significant effect on SI, \( (t=.837, p>.05, 95\% CI: -0.03 \text{ to } .0695) \). Within high anxiety individuals, low body regard is a risk factor for developing suicidal ideation. Increasing one’s body regard in clinical treatment may lower the risk of suicide.

**Changes in the Ability of Rats to Discriminate Between Naltrexone and Saline Reveal Individual Differences in Stimulus Control**

**Presenters:** Sam Petit, Erika Cedarbloom, Abigail Vigil, Eleanor Lucas, Jonathon Zajac, and Alex Petrey  
**Faculty Mentor/Collaborator:** David Jewett

We investigated whether the discriminative stimulus effects of naltrexone (NTX), a non-specific opioid antagonist, are mediated by kappa-opioid receptors. Male Sprague-Dawley rats were trained to discriminate injections of NTX (0.1-3.2 mg/kg) from injections of saline (SAL) while given chronic,
intermittent sucrrose access (25%). Discrimination criteria consisted of 80% or greater condition-appropriate responses for 8 of 10 consecutive sessions. Immediately prior to discrimination acquisition, NTX-appropriate accuracy rapidly increased. Stimulus control was maintained for approximately 25 sessions before NTX-appropriate responding decreased. During post-acquisition training sessions, the mean condition-appropriate responding was 82.05% when given SAL and 68.15% when given NTX. In some subjects, the accuracy of SAL-appropriate responding was maintained while the accuracy of NTX-appropriate responding fluctuated over time; the inverse was true for other subjects. Some subjects demonstrated varying accuracy for both conditions. Several subjects developed a sensitivity to NTX, with doses as small as 0.0001 mk/kg producing NTX-appropriate responses. A single dose of the kappa-opioid agonist U69,593 (0.01 - 0.1 mg/kg) administered 30 minutes before NTX eliminated NTX-appropriate responding in some subjects. Our data indicate that NTX produces discriminative stimulus effects in rats given chronic, intermittent sucrrose. Observations of post-acquisition training sessions suggest there are individual differences in stimulus control.

**College Students’ Knowledge and Perceptions of Anxiety, Attention-Deficit/Hyperactivity Disorder, and Learning Disabilities**

**Presenter:** Hannah Burmeister  
**Faculty Mentor/Collaborator:** Mary Beth Leibham

An increasing aspect of diversity in higher education is a disability, with approximately 19% of college students reporting a disability (U.S. Department of Education, National Center for Education Statistics, 2015). In order to promote the full inclusion of students with disabilities, it is important to understand how disability is perceived. Various studies have demonstrated that disability is not always perceived positively by college students and these perceptions may impact the persistence and satisfaction of students with disabilities (Fleming et al., 2017). Green (2007) found that college students tend to share a common perspective that feelings of sadness, pity, and awkwardness are often felt towards students with disabilities. It is likely that multiple factors such as faculty attitudes, availability of services, campus culture, and peer perceptions are associated with students with disabilities retention and completion rates. The purpose of this study is to explore college students’ knowledge and perceptions of disabilities. Using an online Qualtrics survey methodology, college students’ knowledge and perceptions of three disorders, namely anxiety disorder, Attention Deficit Hyperactivity Disorder (ADHD), and Learning Disabilities (LD) will be examined. We expect that individuals who report a closer relationship to someone with a disability will have more positive attitudes and more accurate knowledge about anxiety disorder, ADHD, and LD compared to students who don’t report a close relationship to someone with a disability. Additionally, we expect that students in human service majors such as psychology, education, and social work will also have more positive attitudes and more accurate knowledge about these disabilities compared to students in other majors. We believe that this study will contribute to the existing disability research by expanding our awareness of disability attitudes and knowledge among college students.

**Decision Making with Delayed and Probabilistic Outcomes: Extension to COVID-19 Risk Behaviors**

**Presenter:** Sydney Sherman  
**Faculty Mentor/Collaborator:** Carla Lagorio

Delay and probability discounting are phenomena by which individuals devalue outcomes that occur after a delay or are not guaranteed to occur. Decades of research have shown that individuals differ in how steeply they devalue delayed or probabilistic outcomes, which has been used to characterize an individual’s “self-control and impulsivity” and propensity to engage in risky behaviors. Indeed, these
measures have been strongly correlated with clinically significant behavior patterns such as substance abuse. Given the public health concern surrounding the COVID-19 pandemic, and the wide variance in people’s adherence to disease containment strategies, it is important to understand how individual differences in impulsivity and risk-taking can translate to real-world behaviors in response to the pandemic. Undergraduate students enrolled in Psychology courses at UWEC completed an online survey measuring individual delay discounting scores along with discounting of probabilistic monetary gains and losses to assess whether these measures are correlated with adherence to public safety recommendations surrounding the COVID-19 pandemic. Overall, this research can better elucidate the behavioral mechanisms underlying people’s engagement with public health recommendations and can provide guidance to health management teams who might profitably modify how they convey the impact of delayed probabilistic negative outcomes to the public.

**Mediators of Suicidal Ideation in Bisexual College Students**

**Presenters:** Delaney Collins, Maggie Foltz, and Amber Bouche

**Faculty Mentor/Collaborator:** Jennifer Muehlenkamp

Bisexual youth show a significantly greater likelihood of reporting repetitive self-destructive behaviors including suicidal ideation (SI), compared to gay and lesbian peers (Batejan, et al., 2015). This study hypothesized that burdensomeness and thwarted belongingness (TB) act as mediators between the expectation of rejection and SI in bisexual individuals. Undergraduate bisexual students (n= 96, Mage= 19.77, SD= 2.16; 67% female, 8% genderqueer; 88% white) were recruited from two Midwest universities. Participants completed an online survey that measured TB, burdensomeness, SI, and expectation of rejection. Results from our mediational linear regression revealed that the study’s hypotheses were partially supported. Only burdensomeness was a significant mediator of the relationship between expectation of rejection and SI (b = .02, CI = [.00 to .04]), and the effect was small. Contrary to hypotheses, the sense of belongingness was not a significant mediator in this model (effect =- .001, CI= [-.009 to.018]). Our findings indicate that for bisexual individuals, feelings of burdensomeness may be a potential mechanism through which expectations of rejection influence the risk of SI. It is necessary that research continues to investigate unique causes of suicidal thoughts and behaviors among bisexual persons to help guide and inform prevention and treatment efforts.

**Mental Health Clinicians’ Experiences with Transitioning to Telehealth Service During COVID-19**

**Presenter:** Paige Suvanto

**Faculty Mentor/Collaborator:** Mickey Crothers

The COVID-19 pandemic necessitated an abrupt, unexpected shift of outpatient mental health services to internet-based telehealth platforms. It is important to learn how mental health clinicians experienced this change. This study addresses three research questions: (1) How have mental health clinicians experienced the shift to telehealth during COVID-19? (2) What are the most prominent challenges clinicians have experienced in shifting to telehealth service delivery? (3) Has the shift to internet-based treatment delivery affected clinicians’ compassion satisfaction and burnout levels? An electronic survey will be administered to a convenience sample of clinicians from four regional mental health clinics. The Professional Quality of Life Scale (ProQOL) (Stamm, 2010) will be used to measure clinician compassion satisfaction and burnout. The survey also includes qualitative items to explore clinicians’ experiences during the transition. Paired samples t-tests will be used to evaluate changes in compassion satisfaction and burnout before and after the transition to online service delivery. Qualitative methods will be used to analyze responses to the open-ended survey questions. We are testing the assumption that the transition may have increased clinicians’ stress, thereby decreasing compassion satisfaction and
increasing the risk of burnout. Findings will add to the professional literature on clinicians’ responses to this change.

**Pain, Body Regard, and NSSI**

**Presenters:** Emma Steffel and Nicholas Grande  
**Faculty Mentor/Collaborator:** Jennifer Muehlenkamp

Non suicidal self-injury (NSSI) is a prevalent concern among young adults, especially among those who report poor body regard (Hamzaa & Willoughby, 2018; Muehlenkamp, 2012). People who engage in NSSI have also been found to endure physical pain for larger quantities of time compared to those that do not self-injure (Hooley & St. Germain, 2013). The purpose of this study was to examine the effect body regard has on the relationship between pain tolerance and NSSI frequency. We hypothesized that body regard moderates the relationship between pain endurance and NSSI frequency, such that those with low body regard will show higher endurance to pain and frequency of self-injury. We recruited college-aged students (n=62, 57% female, 62% white) who completed self-reported questionnaires that evaluated NSSI, body regard, subjective experiences of pain, and engaged in a cold pressor task to test pain endurance. Results from independent samples t-test replicate previous findings showing that body regard and pain endurance differentiate those with and without a history of NSSI. Body regard did not moderate the relationship between pain endurance and NSSI frequency, but it had a stronger main effect on NSSI frequency than pain endurance. Implications of these results will be discussed.

**Perceptions of Hearing People Towards Deaf People: A change within education**

**Presenters:** Ximona Pederson and Nicole Jones  
**Faculty Mentor/Collaborator:** Christine Vriesema

Schools within the United States have been slowly adding American Sign Language (ASL) to their curriculum as an option for foreign language credit. ASL is ranked as the 3rd most used language in the United States (Lee & Scott, 2018). The purpose of this study is to find what perceptions hearing people have about deaf people and determining if previous perceptions change once receiving education about the population. I examined if hearing students’ perceptions of deaf people changed before and after taking an American Sign Language 1 course. I conducted an online pre-and post-test survey sent to students at the beginning and end of the semester. My hypothesis was hearing students’ perceptions of Deaf people and their culture would positively increase showing a better understanding of deaf people compared to their perceptions before taking ASL 1. I ran a paired-samples t-test using SPSS comparing the difference of students’ perceptions. Within my findings, I discovered hearing students’ perceptions of deaf people and their culture positively increased after completing an ASL 1 course. I am hoping with this information, I will have evidence to show surrounding high schools the importance of adding ASL courses to their curriculum.

**Perceptions of Profanity: The Complexities of Category and Context**

**Presenters:** Martha Hernandez and Brock Erdman  
**Faculty Mentor/Collaborator:** April Bleske-Rechek

People vary widely in how often they swear (Mehl & Pennebaker, 2003) and in their reactions to others’ swearing (Jay, 2009). Indeed, as described by the scientist and linguist Steven Pinker (2007), some uses of taboo language are creative and witty, while others are annoying or evoke moral repugnance. We propose that how people respond to swear words depends on the conceptual category to which each swear word belongs and the context in which it is used. To test this idea, we selected swear words from each of
three categories (Religious = hell, damn; Excretory = shit, piss; Sexual-Genital = pussy, cock, fuck) and constructed phrases for their use in three different contexts (Idiomatic = “They are up shit creek”; Cathartic = “Shit, that took a while!”; Aggressive = “You’re a piece of shit”). In the study, participants reported either how offended they were or how frequently they used such phrases. Participants reacted more negatively to sexual-genital swear words than to excretory and religious swear words, and more negatively to aggressive than cathartic or idiomatic uses of swear words. Women and men were similar in their reported use of profanity, but women rated it as more offensive than men did.

Perceptions of the Teaching Profession Among Midwest College Students
Presenters: Allisyn Kleutsch, Stefania Draghicchio, and Ted Molkentin
Faculty Mentor/Collaborator: Christine Vriesema

There is growing concern around teacher recruitment and retention in the U.S. Combined with public perceptions of teaching as unattractive and of lower occupational status, there is a need to tackle these issues. In this study, we drew from factors related to teaching attractiveness to ask what factors predict an individual’s teaching interest and support for education policy. Factors included participant sex, political orientation, perceptions of teaching difficulty, occupational status, societal value, demand level, and anticipated teaching efficacy. Education policy measured participants’ support for allocating funding towards teacher salary, educational research, and schools. We administered an online survey to college students at one Midwest university. Eighty-eight students participated. We ran two multiple regression analyses. First, greater levels of anticipated efficacy for instruction predicted greater teaching interest. Second, participants who were less conservative and who perceived higher teaching demands, more professional value, and lower societal reported greater education policy support. Findings indicated that perceptions of the teaching profession did not predict teaching interest; however, they did predict education policy support. Surprisingly, political orientation was the largest predictor. We can use this information to create interventions emphasizing teaching expertise and value to improve bipartisan support for U.S. education.

Program Evaluation: COVID-19 Distance Learning
Presenter: Hannah Young
Faculty Mentor/Collaborator: Melissa Chaffin

The purpose of this study was to consider how the shift to virtual instruction due to the COVID-19 pandemic impacted students. A survey was administered to approximately 950 middle and high school students to gain insight regarding their levels of happiness, anxiety, and stress following the switch. Additionally, the study aimed to determine what barriers students faced when accessing virtual instruction. Results were disaggregated by race and educational programming (i.e. special education status, English Learners) to analyze whether specific groups of students experienced higher levels of difficulties due to the change to virtual learning. Results indicated that students experienced moderate levels of happiness, anxiety, and stress. Students of color endorsed higher levels of stress than students identified as white. The largest barriers reported were: accessing materials, the internet, and devices. The largest reported need from students was more time and ways to collaborate with other students. The results of this study have helped to inform ongoing virtual instruction.

Shoot the Messenger: Changes in Evaluations of Scientific Information as a Function of Messenger Identity
Presenters: Parker Lay, Ryan Dobson, and Kora Witthun
Faculty Mentor/Collaborator: April Bleske-Rechek
In this research, we tested the hypothesis that a messenger’s identity affects readers’ evaluation of the quality of the messenger’s information, judgment of the messenger’s credibility, and desire to share versus censor the messenger’s information. In Study 1, on sex differences, community adults and college students reviewed a handout describing research findings on sex differences relevant to women’s under-representation in certain occupations; each handout included scientific information that runs counter to prominent narratives about gender discrimination as the primary cause of women’s under-representation. We manipulated the sex of the messenger providing the information by describing them as a male or female professor. In the community sample, women responded less favorably when the messenger was male and men less favorably when the messenger was female. In Study 2, on gender dysphoria, community adults and college students reviewed a handout describing research findings on gender dysphoria; each handout included scientific information that runs counter to prominent narratives about gender dysphoria prognosis and treatment. We manipulated the identity of the messenger by describing them as trans or non-trans. We found that college students responded less favorably to the non-trans messenger than to the trans messenger, regardless of their transgender/ally status.

Undergraduate Students’ Beliefs about the 50 Greatest Myths of Popular Psychology
Presenter: Brianna Sexton
Faculty Mentor/Collaborator: Carla Lagorio

The current study examines how many undergraduate students believe in common myths that are prevalent in the field of psychology. Historically, these psychological statements have been misunderstood by many and can lead to potentially unwise decision-making and further perpetuation of the myths. Students may enter an introduction to psychology courses with misconceptions concerning psychological topics, so understanding the belief prevalence of these common myths can be essential for instilling accurate knowledge. For this study, data was collected from a sample of students enrolled in Introduction to Psychology at the University of Wisconsin-Eau Claire between January 2016 – August 2020. During this time, over 1000 students completed a brief survey where they answered two questions about each of the “50 great myths of popular psychology” – whether they have heard of and whether they believe each myth. Results will highlight the myths that are most and least believed to be true. Ideally, this information can inform professors of topics that need to be elaborated upon, and longer-term data could produce information about historical trends in the beliefs of these common myths over time.

Using Brief Experimental Analysis in a Virtual Reading Intervention
Presenters: Mackenzie Bauer and Miranda Golz
Faculty Mentor/Collaborator: Melissa Chaffin

According to the National Center for Education Statistics (2019), only 35% of 4th graders and 34% of 8th graders are proficient in reading. These statistics indicate the need for high-quality reading interventions. The purpose of this study is to examine how Brief Experimental Analysis (BEA) can be used to identify potentially effective interventions for oral reading fluency in a distance learning summer reading clinic. The two reading interventions used in this study are repeated reading and listening passage preview. Researchers assessed if these two interventions are stronger combined or separate for individual students. Researchers used an alternative treatment design to compare the full intervention to the BEA-selected intervention. Participants included 4 elementary-aged students. Interventions were given 3 times a week, about 30 minutes a session, for a month via Microsoft Teams. Researchers used Cold Times and Hot Times to track the effectiveness of each intervention using an alternating treatment design. Overall,
researchers found that the combination of interventions and the single interventions created similar positive effects for participants. Interventions were delivered with fidelity and effectiveness in the distance learning format.

**What’s Worse: Lazy but Smart, or Stupid but Hardworking? Gender Differences in Mate Preferences and Aversions**

**Presenters: Emily Wagener and Jamie Lyn Peterson**
**Faculty Mentor/Collaborator: April Bleske-Rechek**

It is well-documented globally that men more than women prioritize physical attractiveness while women more than men prioritize dominance and status. The current study builds on the authors’ previous research comparing gender differences in seeking positive mate characteristics with gender differences in avoiding negative mate characteristics. We hypothesize gender differences in the avoidance of negative attributes to be more robust than previously documented gender differences in pursuit of positive attributes. Using 11 core traits and their negative counterparts, we created a series of trade-off questions. Positively framed trade-off questions asked participants which was better as a long-term mate, someone who is “X+” but “Y-” or “Y+” but “X-.” Negatively framed questions asked which was worse, someone who is “X-” but “Y+” or “Y-” but “X+.” In the positive frame, women traded other positive traits to obtain a thoughtful, polite, and family-oriented mate; men traded to obtain a good-looking and smart mate. In the negative frame, women settled for other negatives to avoid a disloyal mate; men avoided an ugly or stupid mate. Initial findings imply that men and women differ in not only what they most prioritize, but also what they avoid most in a long-term partner.

**Survey on COVID-19: Related Behaviors and Opinions**

**Presenters: Amber Miller, Josie Hunt, Maggie Westerland, Margot Lortie, Camryn Langley, and Aaron Huber**
**Faculty Mentor/Collaborator: David Leland**

In response to the COVID-19 pandemic, preventative safety measures (e.g. mask-wearing, hand washing, social distancing) have become commonplace, although with varied acceptance. In addition, there have been profound changes in social interaction and learning environments. We investigated UWEC students’ attitudes and behaviors regarding safety measures; partying and other social behavior; and online vs. in-person instruction. A Qualtrics survey was administered to 219 UWEC students between the ages of 18 and 30. We hypothesized that those more accepting of safety measures would be more politically liberal (vs. conservative) and less inclined to engage in risky social behavior. Additionally, we hypothesized that attitudes toward online learning would be more favorable since the pandemic (vs. before). Preliminary findings suggest that the perceived effectiveness of masks is negatively correlated with partying behavior and, consistent with polling of the general population, positively correlated with liberal political leanings. We also found that students prefer online learning to other options since the pandemic began, perhaps due to perceived safety of virtual attendance vs. in-person or becoming more accustomed to online delivery. We expect this research to reveal insights into UWEC students’ pandemic-related attitudes and behaviors that may also generalize to other institutions of higher learning.

**Sociology**

**Asexuality’s Intersections: Exploring the Diversity of Asexual Communities and Identities**

**Presenter: Emily Lepien**
Faculty Mentor/Collaborator: Peter Hart-Brinson

Asexuality is defined by the Asexuality Visibility and Education Network (AVEN) as someone “who does not experience sexual attraction” (AVEN, 2020). It is one form of sexuality that has historically been misrepresented, and only recently has there been greater scholarship and societal understanding of asexuality. Through a literature review of asexuality scholarship in biology and the social sciences, this project seeks to illuminate how asexual communities represent a wide range of sexual and romantic attitudes while also exploring asexuality’s intersections with gender identity, race, age, and ability. Furthermore, since asexuality still is an unfamiliar term and concept for many people, the literature review also serves as a form of education about asexual communities and how expectations about sex impact people at both interpersonal and societal levels.

Generational Change and the Rise of Religions “Nones”
Presenter: Allison Schwarz
Faculty Mentor/Collaborator: Peter Hart-Brinson

Earning the label “Nones”, people with no religious affiliation have dramatically increased in recent decades. Previous research suggests four possible contributing factors: changing beliefs, increased autonomy, conflicting liberal attitudes, and differing political beliefs. These factors are all accentuated by generational change but the causes of this remain unknown. This research investigated these trends through semi-structured qualitative interviews exploring people’s reasons for religious identification that quantitative research fails to explain. We conducted 17 interviews, 5 socially distanced and 12 via video conferencing. Participants were split for analysis by two factors, age cohort and religious identity. Divided among age cohort there were 9 students and 8 adults whereas among religious identity there were 12 religious and 5 nonreligious participants. Across generations autonomy was important to most participants choosing their religion and desiring that choice for others. Preliminary analysis also suggests major differences in how people define their beliefs and how people perceive religion interacting with today’s increasingly secular culture. Despite the small sample size, this research indicates strong support for the theory of autonomy and liberal attitudes decreasing religiosity in America. Further research could expand upon the connection between generational change and liberal attitudes by probing into specific facets of American culture.

I Can See Myself There: UW-System Webpage Diversity and Student of Color Enrollment in College
Presenter: Maria Espino
Faculty Mentor/Collaborator: Jeff Erger

This project investigates how university retention and recruitment efforts for students of color (SOC) may be affected by university website content. Data was collected from 4-year UW websites with a focus on visible diversity shown through the website images and how “deep” information on the website was located. Critical Race Theory and much research on recruitment and retention shows that “representation” can have powerful effects, whether present or absent. Quantitative analysis using linear regression shows moderate to strong relationships between the level of images of SOC “one click” deep on university websites and enrollment increases by SOC from 2009-2019. Qualitative analysis shows that few institutions mentioned Equity and Diversity prominently, a “white savior” tone can be seen at times, particularly in study abroad and service-learning pages, and non-photographic content likely has a
powerful relationship to SOC enrollment. Given the rising number of SOC in the UW System and Wisconsin overall, especially those who say they are of two or more ethnicities, implications for future recruitment efforts are discussed.

Special Education and Inclusive Practices

The Foundations of Creativity: Fostering Educational Practices in the Classroom
Presenter: Kaitlyn Mortenson
Faculty Mentor/Collaborator: Kirstin Rossi

Human beings naturally possess vast creative capacities that have the potential to develop into numerous new ways of thinking and constructing, therefore, this research set out to further understand those natural processes. This was done through studying the foundations of creativity, along with how it develops throughout the lives of individuals, specifically in students and teachers. The rapid development of society in the 21st century unmasks a dire need for contributions of unique and novel ideas, and yet the educational ideals extinguish that very notion by killing creativity. This research provides knowledge to understand the creative process of both children and adults, including how it can be supported within education. The research was gathered from various books defining the creative process and academic articles illustrating studies that examined specific elements that contribute to creativity. From compiling the research, a graphic was created that organized the creative process within individuals and the supports needed for the specific populations: students and teachers. The conclusions made by this research will foster educational practices that support creativity amongst students and teachers. Further examination and data collection will be collected through interviews with current educators and experiences gained from the firsthand student teaching experiences of the presenter.

Watershed Institute

Addressing public concerns about frac sand mining in west central Wisconsin through community outreach and air monitoring analysis
Presenters: Madaline Massetti, Reggie Eggen, Katrina Kawak, Mark Larsen, Kasee Meyer, and Joseph Vue
Faculty Mentor/Collaborator: Crispin Pierce

The COVID-19 pandemic halted frac sand activity within west-central Wisconsin and our team installed and analyzed data from air quality monitors to collect baseline PM2.5 concentrations in communities near frac sand facilities prior to mining resumption. Additionally, our team worked to address community concerns about living near a frac sand facility. We found statistically significant differences in PM2.5 concentrations varying on location; however, we found no correlation between PM2.5 concentrations and the distance to the frac sand mines. We also found no statistical significance in PM2.5 concentrations when comparing urban and rural areas, simulating differences in traffic. Furthermore, we found that the summer 2020 west coast wildfires, which generated large PM2.5 concentrations locally, did not increase PM2.5 levels within Wisconsin. To assess the concerns of community members where monitors were installed, we created a ten-question survey asking participants to identify their concerns and rate their confidence in the air monitoring. Our results showed that participants ranked their confidence in air monitor findings as an average of 4.5 out of 5 and their comfort with the air monitor website as an average of 4.25 out of 5. Additionally, the survey allowed to us to gather feedback and address any questions participants may have had.
**Analysis of Stakeholder Concerns of the Bokan Mountain Rare Earth Element Mine**

**Presenters:** Mallory Gross, Abi Fischer, and Kiara Miller  
**Faculty Mentor/Collaborator: Karen Mumford**

A rare earth element (REE) mine is being established in southern Alaska. The mine is under development by Ucore Rare Metals, Inc., an exploration and technology company focused on mining developments in the United States and Canada. The proposed Bokan Mountain project is located on Prince of Wales Island in southeastern Alaska. There is high demand for REEs which will contribute to a more sustainable economy through production of electric vehicles, renewable energy technology and defense and aerospace innovations. REEs to be mined from the area include dysprosium, terbium and yttrium. Despite the increased demand for REEs, conflicts among stakeholders over the development of the mine exist. In this study we analyze the specific characteristics of the mine and the perspectives of stakeholder groups including the Office of the Governor of Alaska, the U.S. Forest Service, the Southeast Alaska Conservation Council, and the Kaigani Haida tribal community. Based on our analysis of stakeholder perspectives, we then present strategies to address the concerns of the stakeholder groups. As controversies over development and mining projects continue to occur, careful analysis of stakeholder perspectives may be useful in developing strategies to meet the interests and needs of all parties.

**COVID-19 In Wastewater**

**Presenters:** Claire Buttel, Sydney McGuine, Ryan Mohr, Hannah VonRuden, and Trevor Sigdahl  
**Faculty Mentor/Collaborator: Crispin Pierce**

COVID-19 wastewater surveillance is a method of sampling a population's wastewater to find the concentration of SARS-CoV-2 RNA. Biosurveillance has become increasingly popular due to the COVID-19 pandemic and a study at the University of Arizona found they could detect an outbreak seven days before symptom onset. Our study aims to monitor the SARS-CoV-2 RNA concentration on the University of Wisconsin-Eau Claire Campus in hopes to mitigate the spread of COVID-19. Wastewater sampling will occur twice a week at several designated locations and be sent to the Wisconsin State Laboratory of Hygiene for analysis. By completing this study, we will have solidified a method to detect new disease spread in the future, further employing biosurveillance to proactively counter new disease outbreaks and a chance to study COVID-19 vaccine effectiveness. Through this research, we were also given the opportunity to work with the Eau Claire Cavaliers baseball team and formulate COVID-19 safety protocol for their 2021 season.

**Survey of Float Tank Operating Practices**

**Presenter:** Madison Swenson  
**Faculty Mentor/Collaborator: Laura Suppes**

Float tanks are public baths with high concentrations of magnesium sulfate that allow a person to float on the surface of the water. Float tanks are relatively new in the United States and are thus under-researched. Little is known about how they are operated to maintain a safe swimming environment. The lack of data on float tank operations makes regulating float tanks difficult for public health departments that oversee the safety of publicly used spaces, like swimming pools. The goal of this study is to gain an understanding of typical float tank operating practices by issuing a questionnaire on water treatment, testing, replacement and other maintenance methods. A survey was completed by 53 float tank operators.
across the US. Results from this study will help guide public health policy efforts aiming to regulate float tank operations.

**Assessment of Air Exchange Rate and COVID-19 Transmission**

**Presenters:** Sydney Georgette and Danielle Zahn  
**Faculty Mentor/Collaborator:** James Boulter

Containing and minimizing the spread of COVID-19 remains a concern for many educational institutions like UW-Eau Claire, where students have returned to in-person classes. COVID-19 is transmitted through aerosolized respiratory particles. Poor ventilation allows these aerosolized particles to build up in closed, indoor spaces. Ventilation physically removes pathogens from a space and/or dilutes the concentration of infectious aerosolized particles, limiting risk of disease transmission [2].

We present a simple, cheap, and definitive method of assessing risk of COVID-19 transmission by calculating ventilation rate. As we increasingly “return to normal” and move forward from the pandemic, we believe that ventilation will play a crucial role in disease prevention and overall health.

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